

Redistribution and Stabilization of Regional Revenues in the Russian System of Intergovernmental Fiscal Relations

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INTRODUCTION

The principles that national governments usually proclaim when granting financial aid to subnational governments include equalization of their budget revenues, their capacity to provide public goods as well as and other indices. This lets us suppose that public revenues in the course of equalization process are being redistributed in behalf of lower-revenue regions. A more thorough analysis of the methods that federal governments use to allocate grants-in-aid among regions under the proclaimed principles comes to reveal a formally progressive pattern of regional revenues redistribution: the lower revenue a region has, the more grants-in-aid it gets and, hence, the more equal are bound to be the regions themselves.

However, quite a lot of cases come into notice when the proclaimed principles were violated because either the applied methods of grants-in-aid distribution left much to desire or a federal government had to make some discretionary decisions that pursued political or other aims (in particular, grants-in-aid for getting over natural calamities, industrial catastrophes and other emergencies). As a result, far from ensuring progressive regional revenues redistribution, federal grants-in-aid deepened economic inequality of the regions.

The task that the authors of the present research set themselves was, first, to estimate what influence federal grants-in-aid have on gross regional income and regional budget revenues; second, to study how payment of federal taxes to the federal budget affects gross regional income and regional budget revenues; and, third, to estimate the effect that fiscal instruments, i.e. federal grants-in-aid and federal taxes paid to the federal budget, have on gross regional income and regional budget revenues, in other words, to evaluate the influence of net federal tax, i.e. the difference between tax revenues of the federal budget gained on the territory of a subject of the Russian Federation and financial grants-in-aid the subject received from the federal budget.

Besides estimating redistribution effects the federal fiscal instruments have on regional revenues and authorities, the research paper investigates stabilization influence of federal taxes and grants-in-aid on regional revenues.

I. MODERN APPROACHES TO ANALYZING INTER-REGIONAL REDISTRIBUTION AND REVENUE STABILIZATION THROUGH FEDERAL FISCAL INSTRUMENTS

Modern approaches to reducing inter-regional inequality

Every country, no matter if it is a federation, confederation or unitary state, consists of some subnational jurisdictions that in no way can be considered homogeneous according to various parameters (economic development level, public goods demand, &c.). Different jurisdictions in one country bring forth the problem of inter-regional inequality and demand this problem be solved.

The present research treats inter-regional inequality as that between indices of income earned by economic agents under the jurisdiction of a subnational government (gross regional income) or directly between revenue indices of a subnational government. Surveying inter-regional inequality, the authors do not consider the problem of inequality of individuals in the state but intend to confine themselves strictly to investigating inter-regional inequality of gross incomes of economic agents in a region (in terms of the Russian economic statistics – per capita gross regional product (GRP)) and regional budget revenues. It is not generally assumed in this paper that more equality of the indices in question at the regional level makes individual incomes more equal. This might occur if we presupposed the population of

subnational jurisdictions homogeneous. In this case, if fiscal instruments are believed to equalize gross income indices of regions, they are able to even individual incomes as well¹.

Regional revenues redistribution through federal grants-in-aid generally deals with the necessity of inter-territorial equalization of public goods provision levels. A federal government guarantees (either directly by the Constitution and other constitutional legislative acts or by concepts and principles the government bases its fiscal and budget systems on) that if subnational governments apply equal fiscal efforts, they will be able to grant their citizens comparable level of public goods at an equal level. It is with these purposes that the mechanism of inter-budgetary equalization through distributing grants from the national budget is used.

A federal government is not likely to set itself an explicit objective to equalize gross national product at the level of its territories. But national authorities do declare to achieve equal living standard (better living standard in low-income regions) and remove inter-regional differences of social and economic development of the territories. As far as it concerns the subject-matter we can state that, given inter-regional differentiation of economic development in subnational administrative and territorial formations, one of the objectives of national authorities may be to equalize inter-regional inequality of gross regional incomes. An important instrument to implement this equalization is a system of grants-in-aid for subnational budgets².

Besides using a system of grants-in-aid for regions, inter-regional redistribution of revenues (regional budget revenues and GRP) can be carried out through levying federal taxes that are being paid to the federal budget. The principles, that a national government is guided by when estimating the influence of taxation on the tax-payer's welfare with regard to social justice, determine expediency of the progressive fiscal system³ when higher taxes are laid upon individuals with higher incomes and tax revenues are being redistributed in behalf of lower-income tax-payers. The progressive pattern of a national (federal) fiscal system can help a government equalize both gross incomes of economic agents in the regions and budget revenues of subnational powers.

Therefore, in any state with a multilevel budget structure, an efficient federal fiscal system promotes a certain inter-regional redistribution (equalization) of revenues. The basic instruments of this redistribution are a system of intergovernmental grants (aimed at equalizing fiscal capacity of regional governments), a fiscal system of the progressive pattern (aimed at redistributing incomes among individuals and, indirectly, among regions) and a mechanism of tax revenue distribution among the levels of the budget system.

Redistribution and stabilization properties of fiscal instruments used by federal government

Both theoretical and empiric sources single out redistribution and stabilization properties of the fiscal system⁴. Unlike intergovernmental grants in the system of inter-regional revenue redistribution, stabilization functions of intergovernmental grants-in-aid imply compensation for decrease in revenues caused by asymmetric external shocks. A national government declares public goods provision levels should be equalized and inter-regional differences in social and economic development should be removed, but it is unlikely to call directly for necessary stabilization of regional budget revenues. Nor does the government call for stabilization of gross regional incomes. Nevertheless, the stabilization

¹ Analyzing regional revenue inequality implies surveying GRP, regional budget revenue, per head amount of grants-in-aid and tax revenue paid to the federal budget with account of inter-regional differentiation of prices (in detail see below).

² See Appendix 1 for more detailed description of the ways of disclosing inter-regional redistribution in the Russian system of national accounts.

³ In terms of the present research work, the progressive fiscal system is a pattern when higher-income regions pay relatively more taxes in comparison with lower-income ones.

⁴ *Obstfeld M., Peri J. (1997), Zumer (1998).*

functions of the system of grants-in-aid for regional budgets come, first, from irregular emergency aid granted when the budget situation changes; and, second, from the ability of the grants distribution method to react to changes of taxation potential and needs of consumption in the preceding periods⁵. The federal government can also stabilize regional budget revenues by redistributing tax revenues and taxing powers among the levels of the budget system (this stabilization, however, is possible when there exist simultaneous fluctuations of tax revenues in all or most regions).

In spite of the fact that governments do not include stabilization of gross regional incomes in the list of their tasks, the economic theory teaches that some taxes react as automatic stabilizers on gross regional product. The system of grants-in-aid can be supposed to gain the same properties to stabilize gross regional revenues. This hypothesis wants an in-depth examination of each individual case.

In general, the mechanism of stabilization lets the regions consolidate risks and insure themselves against irregular fluctuations of revenues⁶. Therefore, the target of stabilizing such a system is to cushion short-term fluctuations of regional revenues whereas the ultimate goal of the federal policy of inter-regional equalization is to remove inter-regional differentiation of incomes and/or budget security in the long term.

Review of empirical papers on redistribution and stabilization properties of the federal fiscal instruments

The research work by *Sala-i-Martin and Sachs (1992)* turned out one of the first to estimate how efficient the federal fiscal system is when making compensations for local asymmetric shocks. The authors carried out their analysis with the only purpose of evaluating stabilization effects of the state finance system at the federal level. They separately investigated the role of intergovernmental transfers⁷ and the fiscal system in compensating for fluctuations of revenues at the regional level. To do this, the authors estimated the equations that showed the dependence of tax revenues and federal grants on the per capita individual income (calculated in logarithms of ratios to the average) separately for each of the nine groups of U.S. regions (states).

The research found that if individual incomes in a region get 1 per cent lower, the federal tax revenues go 0.34 per cent down and the amount of federal grants-in-aid drags 0.06 per cent up. Therefore, the final decrease in disposable income is as little as 0.6 per cent, i.e. approximately 40 per cent of the initial regional revenue shift get absorbed by the federal budget which makes a weighty contribution to stabilizing regional revenues.

The main drawback to provoke criticism of the work by *Sala-i-Martin and Sachs (1992)* was that the authors failed to draw equalization (redistribution) properties of the federal fiscal system from stabilization ones, i.e. they did not make any distinction between inter-regional and inter-temporal equalization. The research work by *von Hagen (1992)* took the critical remark into consideration and studied the same equations, this time in first differences, to find the stabilization effect in a pure form (i.e. to tell apart temporary and trend

⁵ It is noteworthy that, on the one hand, too great stabilization of actual regional budget revenues is not desirable because it creates negative fiscal incentives for the local authorities to apply their own fiscal efforts. On the other hand, it is not unreasonable for the system of intergovernmental grants to use the stabilization effect of the system of intergovernmental grants as a reactor to changes in regional tax capacity and expenditure needs because this effect strengthens the equalization properties of such a system.

⁶ The ideal stabilization pattern implies that in a long-term period the net amount of grants for each region (both positive and negative ones) will equal zero. Since in practice any stabilization pattern of intergovernmental transfers gains redistribution properties, it is widely assumed in economic literature that in a long-term period the amount of net grants for each region is positive: See *Vigneault (2002)*.

⁷ The present paper follows many others in supposing a grant for a region to finance public goods provision in this region. Therefore, it is rightful to consider the grant for the region the one transferred directly to the resident of the given region.

fluctuations). To accumulate more facts and evidence, the researcher analyzed cross-section data arranged by U.S. states. The results of *von Hagen*'s calculation revealed that when one took the stabilization effect in a net form, the American federal budget turned out to absorb as little as 10 per cent of the decrease in local incomes, but when one estimated the system as a whole, any change of local incomes regardless of its nature laid 47 per cent upon the federal budget.

The estimation of stabilization and redistribution effects made by *Melitz and Zumer (1998)* for both individual disposable income and gross regional product led to different results. For example, with individual income fluctuations calculated, the coefficients that described the stabilization function of the federal fiscal system amounted to 20 per cent in the USA and 10-14 per cent in Canada (meaning that federal compensations for a change of individual disposable incomes were as much as 20 per cent in America and 10-14 per cent in Canada), and the coefficients to estimate redistribution properties amounted to 17 per cent for both countries. When the researchers used gross regional product, the stabilization effect turned out to amount to 12 per cent in the USA and 14 per cent in Canada, and the redistribution effect – 14 and 23 per cent, correspondingly⁸.

The paper by *von Hagen and Hepp (2000)* was devoted to redistribution and stabilization effects of intergovernmental equalization grants in Germany. The authors tested if the system of intergovernmental equalization was efficient enough in insuring the regions (*Länder*) against asymmetric shocks and if the redistribution properties of the system were powerful enough to react upon changes in gross regional product and regional tax revenues. Taking a theoretical model as a sample, the researchers came to the conclusion that intergovernmental equalization involved both inter-regional redistribution of budget revenues and a mechanism to share the risks of fluctuations of tax revenues among the citizens of various regions (i.e. the system of intergovernmental equalization in Germany possessed stabilization properties).

The reports presented by *von Hagen and Hepp* testified that when applied for gross regional product, the German system of inter-budget equalization was hardly able to show stabilization properties. Its redistribution function applied for gross income was slack as well (coefficient of stabilization for gross income was found to be 0.82 per cent, that of redistribution – 3.4 per cent). As the same time, the authors witnessed the system of intergovernmental equalization in Germany possess rather powerful redistribution and stabilization properties that concerned local tax revenues: the calculation proved that the system of equalization grants made a 55.5 per cent compensation for regional tax revenues fluctuations and a 111 per cent one for a negative swerve of the region from the country average level of tax revenues (the German system of intergovernmental grants paid an eager attention to rendering fiscal grants to the regions with lower than the average tax revenues). Summing it up, the main conclusion the authors came to was that the system of intergovernmental equalization in Germany was oriented, first of all, towards equalizing tax revenues of the regions regardless of gross income fluctuations.

A thorough survey of empiric examinations of redistribution and stabilization effects of the national fiscal system showed that models of intergovernmental revenue redistribution and revenue time stabilization were quite a new thing. By the present day they haven't yet worked out any universally recognized methodology to analyze the said effects. Different approaches to analyzing redistribution and stabilization properties of fiscal systems breed different results of empiric estimations. It is worth while mentioning that a lot of authors found redistribution and stabilization properties of national fiscal systems in the European

⁸ Since Great Britain and France do not publish gross regional product, Melitz and Zumer had to evaluate properties of the state finance system judging by individual disposable incomes, relating to which the stabilization effect amounted to 20 per cent in the two countries, and the redistribution effect reached 38 per cent in France and 26 per cent in Great Britain.

countries are stronger than those in the USA and Canada. This can be explained by the fact that today Europe experiences more fiscal centralization than North America.

Like most of the mentioned papers, the authors of the present work intended to analyze inequality and instability of regional revenues with regard to the balance between revenues of regional governments and incomes of the economic agents under the jurisdiction of the regional governments, and regardless of inequality of individual incomes. The work did not cover distribution of tax burden and tax liabilities among residents of different regions, emphasis being laid upon revenue distribution among governments (regional budget revenue) or among economic agents that execute their activities under the jurisdiction of certain local authorities (gross regional income). When estimating equalization and stabilization properties of the Russian fiscal system at the federal level, the authors of the present research confined themselves to a positive analysis of these properties and were unlikely to put forward any value judgments about how reasonable and desirable this or that degree of inter-regional redistribution (stabilization) might seem from the point of view of the economic development in the country.

II. Main hypotheses on the nature of redistribution and stabilization of regional revenues carried on by the Russian federal government

Differences in gross regional product in Russia

Eighty-nine subjects of the Russian Federation are marked by a considerable degree of social and economic differentiation. Inter-regional differences in economic development level, tax base and expenditure needs make intergovernmental fiscal arrangements play an important part and include conferring spending powers to the budgets of different levels, distribution of tax revenues and a mechanism of sharing federal grants-in-aid among regional budgets in the Russian Federation.

The analysis of the indices that describe distribution inequality of gross regional income and local budget revenues shows inequality scale of GRP and budget revenues in Russian regions is rather big and unlikely to shrink down. This high degree of differentiation requires great funds be redistributed among Russian regions. In 2000, revenues of Russian regional and federal budgets amounted, correspondingly, to 11.2 and 14.3 per cent of GDP, with as much as 1.35 per cent of GDP transferred to regional budgets as federal grants-in-aid. In 2001, the amount of federal grants was as high as 2.4 per cent to prove more centralization of revenues and greater volume of funds redistributed through the federal budget.

More federal grants was followed by recent increase in the share of taxes paid into the federal budget. In 2001, the total share of taxes accrued to the federal budget reached 10.53 per cent of GDP. It also proves that the federal government had been gradually increasing centralization of budget assets, accumulating more funds in the federal budget, and, thus, gaining more power to redistribute revenues across regions.

Differences in per capita regional budget revenues

To estimate the scale of funds redistribution aimed at equalizing tax revenues of regional budgets, we examined recent dynamics of appropriate indices in the Russian Federation. The analysis found that the share of federal grants-in-aid in consolidated regional tax revenues (i.e. sum of regional and municipal budget revenues, not including federal budget revenues) was declining since 1996 till 1999 and came to rising up in 1999. The greatest share of federal grants in GDP was recorded in 2001. This corresponds with the tendency towards centralizing tax revenues in the federal budget and strengthening the federal power to redistribute regional tax revenues by means of grants-in-aid.

The rise in federal budget revenues is believed to have been caused by the factors that have nothing to do with budget funds redistribution among different levels of government. At

the same time, centralization of tax revenues in the federal budget increased amounts of federal financial aid. This centralization is found to increase in course of time: the share of the federal taxes accrued to the federal budget in the budget system revenues had been getting larger till it reached 52.6 per cent in 2001 (net of customs duties and other customs payments).

The share of net federal tax in tax revenues received by all budgets (i.e. budgetary system) in the regions reached its maximum in 2000. In 2001 the share of net federal tax swung a bit down because the share of financial aid in regional revenues rose significantly but it remained considerably high.

The analyzed redistribution mechanisms (federal taxes accrued to the federal budget and grants-in-aid) provide bigger possibilities of equalizing tax revenues of regional budget than those of equalizing GRP. Having compared many-year correlations between amounts of the taxes included into the federal budget and amounts of intergovernmental grants, we concluded that recent tax centralization and strengthening of the federal budget resulted in greater amounts of funds-to-redistribute though sometimes they did not lead to greater net federal taxation burden on the region. It means that in past years the federal government enthusiastically used redistribution mechanisms to make the regions equal.

Main hypotheses on redistribution properties of the Russian budget system

The amounts of funds redistributed by the federal government among Russian regions through rendering grants and/or collecting federal taxes in the regions and accruing them into the federal budget are rather great. It is not *a priori* stated, however, that this redistribution meets the declared requirements of regional income equalization. In other words, one has to check if the fiscal instruments used by the federal government have a progressive effect on gross regional income or tax revenues of regional budgets.

Fiscal aid rendered by the federal budget to the regions influences the amount of regional budget revenues and total regional disposable incomes as well as the relations among the said indices in different regions (as a result of uneven grants distribution among the subjects of the Russian Federation). Collecting federal taxes whose revenues come to the federal budget affects inter-regional relationships of disposable incomes because of redistribution nature of some taxes and different structure of taxation base in lots of regions. But equalization of regional budget revenues by means of the fiscal system cannot be achieved merely at the expense of redistribution properties of some taxes. This can be done if one also uses the system of tax revenues distribution among the budgets of different levels. Such a system has a direct power to change the share of tax revenues paid into regional budgets in the total amount of tax revenues paid into the budgets of all levels (i.e. effective rate of distributing the taxes collected in a region among the federal and regional budgets).

Equalization of gross regional income through federal grants-in-aid

The conclusions the authors drove at in *Kadotchnikov, Sinelnikov, Trunin (2002a)*, frame a hypothesis that when distributing grants among regions, the federal government is guided by the criterion of regional revenues and seeks to redistribute average per capita revenues of the regions in behalf of poorer (according to the average per capita revenue) regions. One has to notice that this not-spoken-in-public principle of distributing funds does not run counter to the openly declared intention to equalize fiscal capacities (public goods provision) across the country.

The data featuring the correlation between the amount of federal grants-in-aid and gross regional product showed that, taking as a whole, the country sees negative dependence of aggregate federal aid (adjusted to inter-regional index of prices) on gross regional product. Some regions failed to follow the tendency of reducing the grants amount received with increase in GRP. The subjects of the Russian Federation that enjoyed relatively higher average per capita GRP and greater amount of intergovernmental grants are: the Nenetsky

Autonomous District, the Republic of Tatarstan, the Republic of Bashkortostan, the Republic of Sakha, the Sakhalin Region, the Khabarovsk Region, the Republic of Kalmykiya. The regions that received less federal aid in comparison with the regions of nearly the same GRP are: the Ivanov, Chita, Penza, Kurgan Regions, the Jewish Autonomous Region, the Republics of Mariy El and Chuvashiya.

The observed tendency shows the federal government equalizes gross regional incomes through granting financial aid from the federal budget. The given hypothesis on the nature of gross regional income redistribution by means of the system of federal grants-in-aid is going to be tested below by building and estimating a model that will set dependence of the amount of financial support and the average per capita regional revenues.

The term of progressivity will be interpreted further on by analogy with progressivity of taxes: a grant will be considered progressive if high-revenue regions receive a relatively smaller amount of the grant than low-revenue ones. In other words, a system of intergovernmental grants seems progressive if the effective rate of fiscal grants (ratio of granted transfers to the average per capita GRP or any other index under equalization) decreases as regional revenues get higher or, the same maxim put in other way, if the marginal rate of grant is less than the average⁹. In terms of grant elasticity to the amount of regional revenues, progressivity means that the said grant elasticity to regional revenues equals less than unity.

Two important features of the grants-in-aid analysis are worth while mentioning. First, the given federal grant is generally considered as a positive amount of funds granted to the regions. It means that in the total amount of taxes paid into the federal budget net tax is calculated as the difference between the taxes paid and the grants received. Second, the above stated definition of progressivity does not necessarily imply that in a progressive grant allocation system higher-revenue regions should get smaller absolute grants than lower-revenue ones. In a progressive system of grants distribution the regions with higher revenues are given a relatively smaller amount of grant (the share of grants in GRP is smaller in the regions with higher revenues).

Equalization of regional budget revenues through federal grants-in-aid

Besides equalization of the average per capita incomes of economic agents in a region through federal grants-in-aid distribution (gross regional income equalization), the influence of the latter upon inter-regional relationships of regional budget revenues deserves being examined. A qualitative graphic analysis of the system of federal grants-in-aid shows a generally negative dependence of the total amount of federal grants-in-aid on tax revenues collected in the regions. The federal government can be supposed to reduce inter-regional inequality in the average per capita regional budget revenues by means of financial aid rendered from the federal budget. However, there exist several regions that deviate significantly from the general tendency¹⁰.

By analogy with equalization of gross regional incomes, to estimate the equalization effect the system of federal grants-in-aid has on regional budget revenues, the grants distribution system is supposed to be progressive to the sum total of regional budget revenues

⁹ The average rate of grant is the ratio of grants-in-aid transferred to a region to gross regional product. The marginal rate of federal grant is the growth of grants when regional revenues get one percentage point higher.

¹⁰ Among the regions are: the Evenkiysky Autonomous District (grants-in-aid are 14.22 times as big as the Russian average, but regional budget revenues are 6.29 times as high as the average), the Chukotsky Autonomous District (grants-in-aid are 6.29 times as big as the average in Russia, and regional budget revenues are 1.6 times as high as the average), the Republic of Tatarstan (grants-in-aid are 3.52 times as big as the country's average, and regional budget revenues are 1.58 times as high as the average), the Republic of Altay (grants-in-aid are 4.81 times as big as the average, and regional budget revenues are 1.29 times as high as the average), and the Republic of Sakha (Yakutiya) (grants-in-aid are 3.3 times as big as the average in Russia, but regional budget revenues are 0.77 times as high as the average).

to make inter-regional inequality of budget revenues less distinct: i.e. the regions with higher budget revenues should receive a relatively smaller amount of grants-in-aid.

Equalization of gross regional income through the federal fiscal system

Redistribution of revenues among regions is carried out both by rendering financial aid from the federal budget and withdrawing a part of the incomes earned in a region into the federal budget by means of several federal taxes. Destination and nature of revenue redistribution among regions through the fiscal system depend on what structure this system has, what taxes and in what proportions are paid into regional and federal budgets.

Two features should be paid attention to when analyzing redistribution through the fiscal system. First, redistribution nature of particular taxes is important for the whole system to possess redistribution properties. The federal taxes which are progressive with respect to income are bound to guarantee withdrawal of more revenues from higher-income regions and less revenues from lower-income ones to accrue them into the federal budget. Second, there may appear dependence of the structure of tax revenues withdrawn from the regions on gross incomes in these regions. Taking into account the fact that the federal taxes sharing rates between the federal and regional budgets differ, it is rightful to consider the effective rate of tax payments from the territory of the region to the federal budget to depend on the amount of incomes in the region. In other words, there is supposed to be dependence of the amount of taxes (the share of tax revenues) paid into the federal budget that determines revenue redistribution among regions upon the structure of federal tax revenues collected in a region. This structure, in its turn, depends on the amount of incomes in the region.

To understand the nature of the present-day Russian fiscal system and its ability to redistribute regional revenues in behalf of worse-off regions (the progressive taxation system) or in behalf of better-off ones (the regressive taxation system), it is necessary to examine in detail the Russian fiscal structure and methods of administering main federal taxes as well as the pattern of tax revenue distribution among the budget system levels in the country.

The basic items of the federal budget revenue are corporate income (profit) tax, value-added tax, excise duties, payments for utilization of natural resources and customs duties. This research does not cover customs duties because there is general lack of regional statistics concerning customs earnings. The items of Russia's federal budget revenue in 1994-2001 are given below:

TABLE 1

Structure of Russia's Federal Budget Revenue in 1994-2001 (per cent of aggregate tax revenue)

	1994	1995	1996	1997	1998	1999	2000	2001
Corporate profit tax	35	28	17	18	17	24	50	46
Individual income tax	11.5	30	3	1	5	6	4	0
Value-added tax (VAT)	39	41	48	53	50	45	33	33
Excise duties for excisable goods and materials	5	6.7	17	18	19	12	7	11
Payments for utilization of natural resources	1.6	6	5	7	3	6	4	8
Sum total	74	105	90	97	95	93	98	98
Aggregate tax earnings	100	100	100	100	100	100	100	100

Sources: The State Committee of the Russian Federation for Statistics, the Ministry of Finance of the Russian Federation, the authors' estimations.

The table shows that VAT made the largest part (about 50 per cent) of federal budget revenue till 1999 inclusive. In 2000 and 2001 the proportions changed, with personal income tax accruing the most to the regional budget. The share of excise duties (above 10 per cent in all years save for 2000) was also significant in the total amount of tax revenue. Table 2 provides the tax revenue structure of the federal and regional budgets in 1999-2000.

TABLE 2

Tax Revenue Distribution among Budgets of Different Levels in 1999-2000

Tax	Federal budget	Consolidated budgets of the Russian regions
1. Corporate profit tax	an 11 per cent rate	a rate doesn't exceed 19 per cent
2. Value-added tax (VAT)	85 per cent * 100% **	15 per cent * 0% **
3. Individual income tax	16 per cent* 1 per cent**	84 per cent* 99 per cent**
4. Alcohol, vodka, wines and spirits excises	50 per cent	50 per cent
5. Imported goods, primary commodities, fuel and motor vehicles excises	100 per cent	0 per cent
6. Excise duties for other excisable goods	0 per cent	100 per cent
7. Tax on acquirement of foreign currency	60 per cent	40 per cent
8. Land-tax	30 per cent	70 per cent
9. Sales tax	0 per cent	100 per cent
10a. Uniform presumptive income tax for enterprises and institutions	50 per cent	50 per cent
10b. Uniform presumptive income tax for businessmen	0 per cent	100 per cent

* Till January 1, 2001

** Since January 1, 2001

Sources: The Tax Code of the Russian Federation, the Law on Fundamental Taxation System in the Russian Federation.

The table makes it obvious that the vertical structure of VAT revenue and income tax revenues regarding their allocation among levels of the budget system has changed profoundly since 2001. In this case, some would-be amendments in the redistribution patterns and the progressive fiscal system depend on the properties of particular taxes.

To analyze what influence aggregate federal taxes paid into the federal budget have on revenue redistribution among regions, one has to take into consideration the aforesaid nature of each tax and its redistribution properties as well as dependence of the effective rate of tax payments to the federal budget on tax revenue structure that is mainly described by the amount of regional incomes.

Presumably, lower-income regions have higher share of VAT revenues in consolidated tax revenue collected in those regions. At the same time, the amount of VAT refunded to exporters (provided this refund is paid by a regional department of the Treasury at the expense of VAT revenue collected in the region) is subtracted from the sum of regional tax revenue and, therefore, cuts consolidated tax revenue. As a result, the regions with large exporters registered there (usually, Russian regions with higher GRP) have a relatively small amount of federal budget revenue. Given the low proportion of VAT payment to regional budgets, higher federal taxes imposed on lower-income regions seem quite reasonable and favorable.

There is, however, an argument for a growing or at least persistent share of VAT in aggregate tax revenue collected in a region provided that GRP rises. Food and other goods tax-exempt or taxable at a reduced rate are supposed to make the biggest share in low-income regions and lessen VAT contribution to aggregate tax revenue. One cannot ignore the fact that Russia was widely using a system of non-monetary offsets of tax liabilities in budget performance till 1999. There was no treasury system to distribute tax revenues among the budgets of different levels, and the regional authorities could offset the regional share of VAT but had to accumulate VAT debt to the federal budget. Various regions used to carry out those

offsets and prevented the share of VAT in regional tax payments to the budgets of all levels from depending directly on gross regional income¹¹.

Increase in GRP was supposed to raise the share of profit in GRP and, consequently, the share of corporate profit tax in aggregate tax revenue. Therefore, the sharing rate of corporate profit tax with respect to the federal budget being rather small as compared to VAT, the effective rate of all regional taxes concerning GRP was due to be falling down when income and GRP got growing.

Two things – a hundred per cent payment of gas and oil excises to the federal budget, and their bigger share in regional taxes paid by high-GRP regions – made gas and oil excises strengthen the progressive character of the fiscal system with respect to GRP and equalize regional revenues. Alcohol excises are divided into halves and shared between regional and federal budgets, i.e. the share of these excises in the federal budget revenue is smaller than those of VAT and income tax. What has been mentioned above makes it possible to suppose growing GRP to cut payments to the federal budget first (if GRP is rather low) and then to increase the share of federal budget revenue in tax revenue of budgets of all levels collected in a region.

Notwithstanding the fact that the share of other payments for natural resources utilization to the federal budget is smaller than those of VAT and excise duties paid for oil and gas, the former is rather significant¹². The share of these payments in tax revenue in a region rises if GRP increases (because extractive regions have high GRP) and, therefore, a progressive pattern of tax collection into the federal budget as related to GRP is quite presumable.

An insignificant share of corporate profit tax payments to the federal budget and a smaller share of corporate profit tax in GRP enfeebled by growth of GRP can increase the effective rate of consolidated tax revenue to the federal budget as related to GRP when GRP gets higher. It means that a relatively poor region can obtain a bigger share of income tax in tax revenue collected there as related to GRP, and when GRP raises, it can lessen this share and ensure a higher effective rate of tax payments to the federal budget.

Apparently, the made analysis frames a hypothesis that a method of tax collection and a structure of tax distribution among levels of a budget system can specify the progressive nature of the Russian tax system as related to GRP. In other words, collection of federal taxes and accrual of the revenue to the federal budget promote progressive redistribution of the average per capita gross regional income (reduction of inequality) when the share of taxes collected in regions in the federal budget rises simultaneously with growth of the average per capita gross regional income.

¹¹ Till 1999 Russia could pay its region a part of a grant from the Fund for Financial Support to Regions (FFSR) at the expense of the federal share of VAT paid in the region (i.e. the region was allowed to include a part of VAT revenue amounted to the sum of the federal grant into regional budget revenue). However, that did not change proportions of VAT revenue distribution among federal and regional budgets because the transfer payment was disclosed in tax revenues and expenditures of the federal budget and increased budget revenue of the subject of the Russian Federation in item *Financial Support*.

¹² Till January 1, 2002 payments for extraction of hydrocarbonic materials and other minerals were delivered to regional budgets at rates of 60 and 70 per cent of the total receipts to the regions. The Russian regions that contained autonomous districts included 50 per cent of federal tax revenue (20 and 12.5 per cent correspondingly) into their regional budgets. On January 1, 2002 a new tax was introduced - minerals tax - that took the place of payments for natural resources, excise duties for oil and condensed gas and recovery payments for reproduction of mineral raw materials. New rules of tax revenue distribution among the Russian Federation, a territory (region) and an autonomous district within the territory (region) were established. First, at extracting hydrocarbonic materials minerals tax gets distributed in the following proportion: 74.5 per cent to the federal budget, 20 per cent to the autonomous district budget, and 5.5 per cent to the regional one. At extracting hydrocarbonic materials on the territory of a subject that is not an autonomous district within a territory (region), the federal budget gets 80 per cent and the regional one – 20 per cent. Second, at extracting common minerals the whole amount of minerals tax is included into budgets of Russia's subjects.

Equalization of regional budget revenues through federal taxes

It has already been mentioned that equalization of gross regional income cannot be an explicit objective the federal government sets itself when redistributing funds among regions by means of fiscal instruments (collecting federal taxes, accruing revenue into the federal budget and distributing federal grants-in-aid). One of the articulately declared tasks of fiscal reforms and improvement of grants-in-aid distribution methods in Russia is to even material well-being of the population in different regions and guarantee equal opportunities of public goods provision.

When discussing equalization of regional budget revenue that implies accrual of several federal taxes collected in a region to the federal budget, one can rather conditionally treat intergovernmental grants as a mechanism of withdrawing the share of regional revenues that depends on taxation structure in the region.

It is necessary to add that the analysis of redistribution and stabilization of regional budget revenue through federal taxes differs a little from that of equalization of regional budget revenues through the system of federal grants-in-aid. The key indicator for determination of federal financial aid amount is regional budget revenues (and expenditures). It means that if grants-in-aid are treated as a negative federal tax, the rate of this tax will be calculated in regard to a tax-exclusive base of regional budget revenues¹³. The equalization property of federal taxes (those accrued into the federal budget) requires an analysis of dependence of the taxes paid into the federal budget on aggregate tax revenue of all budgets collected in a region. In this case, the share of tax revenues paid into the federal budget can be interpreted as a rate of tax revenue payment to the federal budget levied on a tax-inclusive base, i.e. the total tax amount collected in a region.

As shown above, an analysis of the effects that a tax system has on redistribution of gross regional income should consider characteristics of each tax and its redistribution properties as well as dependence of the effective rate of tax revenue payments to the federal budget on the structure of tax revenue that can be described by amount of regional income.

If a tax system imposed only one tax whose revenues were distributed in a set proportion between regional and federal budgets, then, regardless of this tax nature, the effective rate of total tax payments to the federal budget would reflect the set nominal rate and could differ from the latter only if the legal proportions were violated by tax arrears, errors in treasury procedures, etc. But since many kinds of taxes have different sharing rates between federal and regional budgets and they make different shares in budget revenues of regions, the effective federal share of tax in total amount of tax payments can be supposed to depend on structure of regional budget revenue. At the same time, structure of regional budget revenue presumably depends on total revenue amount of these budgets. If the two dependencies are true, there exists a hypothetical relation between the share of tax revenue sent to the federal budget in the total amount of taxes collected in a region and aggregate tax revenue gained there.

It is not easy to suppose *a priori* how tax revenues accrued to the federal budget depend on the total amount of taxes collected in a region. In underdeveloped regions with small tax base the main items of budget revenue can be VAT, income tax and alcohol excises. In this case the share of taxes paid into the federal budget is rather big because VAT has been fully paid into the federal budget since 2001, its federal share amounting to 75 per cent till 1998 inclusive and 85 per cent in 1999 and 2000. In the regions with medium taxation base an enhancing share of income tax in tax revenue gained by the budget system in a region cuts the share of taxes paid into the federal budget because the rate of income tax distribution differs from that of VAT in behalf of a region.

¹³ This statement lets the analysis made by *Kadotchnikov, Sinelnikov and Trunin (2002a)* conclude that amounts of federal grants-in-aid turn out negative dependence on regional budget revenue.

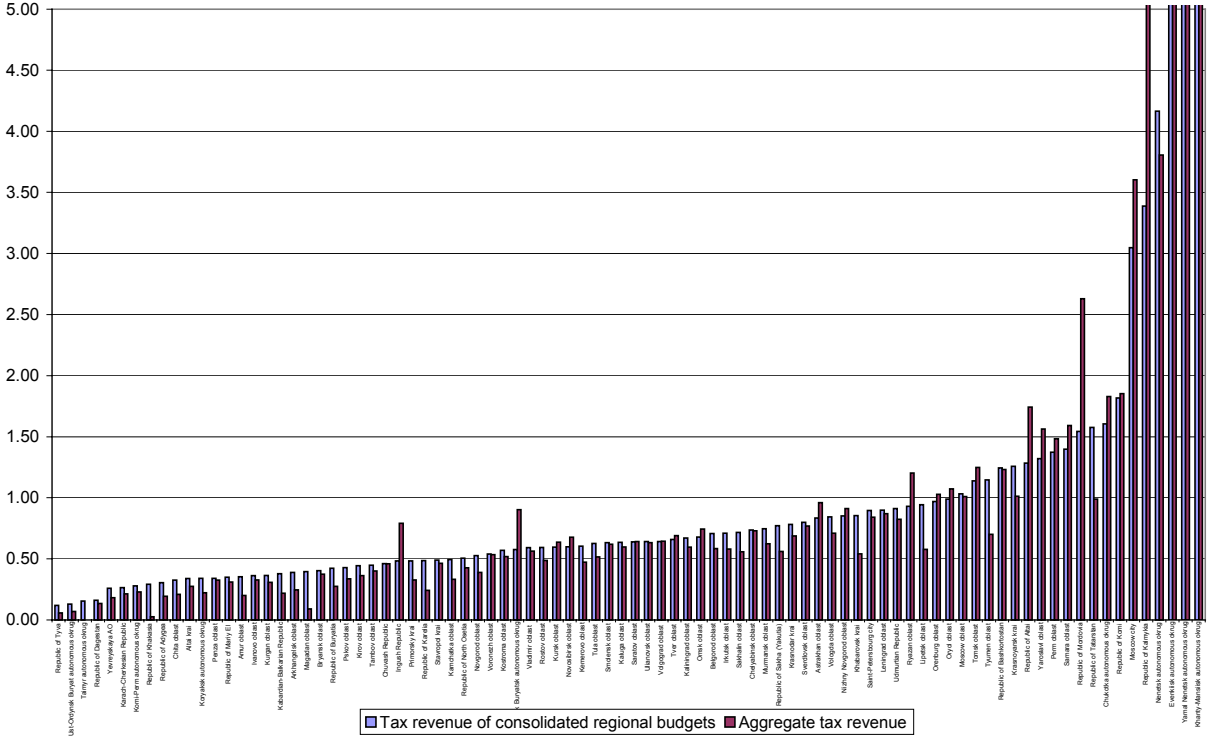
Therefore, in a certain interval of relatively small quantities of GRP, the system of federal taxes can be assumed regressive, i.e. fall in the share of tax revenues gained by the federal budget in a region in the total amount of tax revenue is followed by increase in the total amount of taxes collected in the region (correlation between tax payments to the federal budget and tax revenue gained by regional budget, with the amount of regional tax revenue growing).

In the regions with larger tax base, formed at the expense of minerals extraction, the share of taxes paid into the federal budget can rise in comparison with the regions where the share of payments for natural resources utilization in tax revenue structure is small because the sharing rate of payments for natural resources utilization implies a higher share of the federal budget as compared with that of income tax. Lessened shares of income tax, excise duties for alcohol and profit tax caused by a higher share of payments for natural resources utilization make it justifiable to think the system of tax revenue distribution among budgets of different levels progressive, i.e. inter-regional inequality of regional budget revenue is reduced by including a certain amount of federal taxes into the federal budget.

Let us see distribution of aggregate tax revenues of the federal budget made by a region and distribution of tax revenues gained in regions in 2001 (as related to the average in the country):

FIGURE 1

Tax Payments to the Federal Budget Made by a Region and Per Capita Aggregate Tax Revenue Gained in the Region Adjusted to Inter-Regional Index of Prices (the indices relate to the 2001 Russian average)



Sources: The State Committee of the Russian Federation for Statistics, the Ministry of Finance of the Russian Federation, the authors' estimations.

The figure reveals a high degree of correlation between tax revenue of the federal budget gained in a region and aggregate tax revenue collected there. There are, however, some regions that deviate from the dependence: the Republic of Kalmykiya (tax revenues of the federal budget is 6.09 times as high as the average and tax revenue gained in the region is only 3.39 times as high as Russia's average), the Republic of Tatarstan (0.99 and 1.85) and the Republic of Mordoviya (2.63 and 1.54). The Republics of Kalmykiya and Mordoviya obtained such indices because there are zones of reduced taxation exempted from regional and

local taxes and prone to compensation of a part of federal taxes included into the regional budget provided that the whole amount of taxes is paid into the federal budget. Other regions with a relatively high share of taxes included into the federal budget in aggregate tax revenue obtained such indices because they enjoy tax allowances for regional budgets and a higher specific weight of VAT, excise duties and payments for hydrocarbon materials extraction in aggregate tax payments of regional tax-payers (they are oil and gas producing regions, regions with low wages and/or taxable income).

Total equalization of gross regional income through the fiscal system (federal taxes and grants-in-aid)

To describe the Russian system of intergovernmental fiscal relations and its ability to redistribute the average per capita regional revenue, it is necessary to analyze the dependence of federal budget tax revenue gained in a region less the amount of financial aid rendered to the region (let this difference be called net federal tax conformably to a region), on the average per capita regional income¹⁴.

A substantial analysis backs the idea of negative net federal tax at small amounts of GRP, i.e. low-income regions get more grants-in-aid and pay less into the federal budget. High-income regions with big GRP are more likely to have positive net federal tax, i.e. they pay more taxes into the federal budget and receive fewer grants-in-aid.

Final equalization of regional budget revenues through the fiscal system (federal taxes and grants-in-aid)

As it was mentioned before, a profound interpretation of the difference between tax revenues of the federal budget and federal grants (negative tax) as net federal tax for regional budget revenues, requires conformity of the bases with whose regard grants and tax revenues of the federal budget are measured (a base for grants-in-aid to which coefficient of their effective rate is applied is regional budget revenue; bases for the taxes paid into the federal budget can be both aggregate tax revenue gained in a region and regional budget revenue). That is why one has to make indices conform to a uniform base before measuring net federal tax and analyzing the results.

Twenty-six Russian regions had a negative net federal tax, i.e. they were net payees of federal budget funds. At the same time, as many as 62 regions had a positive net federal tax and could be considered net donors of the federal budget. Final settlement of the federal budget balances found that the Taymyrsky Autonomous District, the Republic of Tyva, the Komi-Permyatky, Koryaksky and Ust-Ordynsky Buryatsky Autonomous Districts had the greatest per capita amount of funds. The most significant net donors of the federal budget were the Yamalo-Nenetsky, Khanty-Mansiysky and Evenkiysky Autonomous Districts, the Republic of Kalmykiya and the city of Moscow.

Models of testing the scope of funds redistribution across the regions

A progressive tax is that whose income elasticity exceeds unity or whose marginal rate goes beyond the average rate. It means that higher-income regions pay relatively more taxes than lower-income ones. Consequently, a progressive grant will be treated as dependence of a grant on an equalization parameter (GRP or tax revenue) that supplies higher-income regions with a relatively smaller amount of the grant than lower-income ones. It means that elasticity of the grant described by an equalization index should be less than unity.

Here are the symbols to be used below:

¹⁴ By analogy with this one can measure net grant-in-aid: per capita grants-in-aid less per capita taxes paid to the federal budget.

X_{it} – Federal grants-in-aid, tax revenue of the federal budget or net federal tax (difference between taxes payments to the federal budget and grants-in-aid received) per capita transferred to/from region i in the year of t .

Y_{it} – Index of equalized income described in a tested model either by gross regional product or per capita tax revenue in region i in the year of t ¹⁵.

The present research proved the hypothesis on progressivity of fiscal system by evaluating the following three models of federal grants-in-aid, tax revenue of the federal budget and net federal tax.

Linear model of tax payments to federal budget (federal grants)

The linear model of tax payments to federal budget (federal transfers) with account of the introduced symbols can look as follows:

$$X_{it} = \alpha_t + \beta_t \cdot Y_{it} + \varepsilon_{it} \quad (1)$$

Despite the fact that the given model requires linear instruments of redistribution, *Equation (1)* can describe a progressive tax. In case of the linear model, the condition that a tax is progressive (i.e. elasticity of tax payments as related to revenues exceeds 1) is equivalent to that of $\beta > 1$ ¹⁶. If $\beta = 1$, the tax is proportional; if $\beta < 1$, regressive. Correspondingly, the analysis of the model is carried out through testing one-sided hypotheses on the signs of coefficient β . If one fails to reject the two null hypotheses, the used methods won't be able to draw definite conclusions about redistribution nature from the results of the measurement. To test progressivity of the grants-in-aid system, one should develop a hypothesis that elasticity of grants-in-aid with respect to revenue is less than 1. On condition that a region receives a positive amount of grant-in-aid, in model (1) this condition is equivalent to that of $\beta < 1$. If $\beta = 1$, the grant is proportional; if $\beta > 1$, regressive.

Linear model of the effective rate of tax payments to federal budget (federal grants)

The second model to test progressivity of the fiscal system evaluates a linear model of the dependence of the effective tax (grant) rate on an index whose equalization is going to be analyzed. The model can be written down like this:

$$\frac{X_{it}}{Y_{it}} = \beta_t + \gamma_t \cdot Y_{it} + \varepsilon_{it} \quad (2)$$

The condition of progressive tax revenue (elasticity of tax payments as related to an equalization index exceeds 1) is equivalent in the model to that of $\beta > 1$ ¹⁷. Like the previous model, the present one tests two one-sided null hypotheses on the sign of coefficient β (the progressivity test of the grants-in-aid distribution system based on the second model is carried out by analogy with the previous one, the hypothesis to prove being $\beta < 1$).

Logarithmic model of tax payments to the federal budgets (federal grants)

The third model to examine progressivity implies non-linear (iso-elastic) dependence of tax payments (grants) on an equalization index. The analysis of progressivity there confines

¹⁵ Federal grants-in-aid are said to use tax revenue of consolidated regional budget as an equalization index, tax revenue of the federal budget and net federal tax use tax revenue of budgets of all levels gained in a region as an equalization index.

¹⁶ An additional condition demands the tax in question should be a tax, not a grant, i.e. it should guarantee positive tax payments. Further calculations will not check if this additional condition is satisfied because the analyzed tax data meet the requirement and guarantee a positive amount of payment. Since GRP is positive for all regions, it is impossible for the two coefficients β and γ to be negative in the model. Coefficient β can be negative only if γ is positive, i.e. if the tax is regressive.

¹⁷ If it is observed that the tax is a tax – not a grant – that guarantees positive meaning. The data used in the calculation satisfy this condition.

itself to checking hypotheses on elasticity of the dependence of federal grants-in-aid or tax payments to the federal budget on gross regional product (tax revenue of regional budgets or other equalization indices), i.e. checking hypotheses on coefficient λ in models of a $X_{it} = \chi_t \cdot Y_{it}^\lambda$ kind¹⁸. The equation of the econometric model looks as follows:

$$\text{Log}(X_{it}) = \gamma_t + \lambda_t \cdot \text{Log}(Y_{it}) + \varepsilon_{it} \quad (3)$$

To check if the coefficient before GRP logarithm exceeds unity or not, two one-side null hypotheses have to be tested. Progressivity of a grant is evaluated in the same way by testing two null hypotheses and checking if $\lambda < 1$.

Progressivity test through the Kakwani and Musgrave indices

Besides evaluating progressivity through testing hypotheses on coefficients of econometric equations, there are some criteria based on concentration indices¹⁹, calculated through Lorenz curves. The most widely spread among them are the Kakwani and Musgrave indices²⁰. These indices compare inequality of regional revenue distribution after redistribution to inequality of regional revenue distribution before redistribution. If inequality of regional revenue after redistribution is higher than that before redistribution, the instruments of revenue redistribution are considered regressive and vice versa. Inequality of regional revenue distribution is described by the Gini index, and the Kakwani index is calculated as difference between the Gini index of pre-redistribution revenue and concentration index after redistribution. For the Kakwani index the criterion of progressivity is a positive meaning of the index. The Musgrave index is calculated as the ratio of the index of tax payment concentration to the Gini index, and its criterion of progressivity is a figure that exceeds unity.

The results of the progressivity test for fiscal redistribution based upon the three econometric models and the two indices of progressivity are given below. One of the drawbacks of econometric criteria is that tax payments and grants-in-aid are *a priori* supposed to depend on GRP and the hypotheses on progressivity are tested within the frame of a considered model. The criteria based on the Kakwani and Musgrave indices are devoid of this drawback. Moreover, Lorenz curves can show that the tax being tested can be regressive in a certain lot of regions and progressive in the whole country. However, the Kakwani and Musgrave indices could hardly avoid drawbacks: intricate calculation and doubtful statistic significance of the criteria (the present research did not make this calculation)²¹.

Stabilization of regional revenues through rendering federal grants-in-aid from regional budget and paying taxes into the federal budget

The mechanism of stabilization of regional budget revenue through a system of federal grants-in-aid and tax payments to the federal budget means increase in grants-in-aid and decrease in tax payments to the federal budget if regional revenues rise, and the other-way-round change of grants and tax payments if regional revenues fall. Analogously, one can find stabilization effect that grants-in-aid and tax payments to the federal budget have on regional budget revenue and – unlike inter-regional redistribution – this effect can be traced down at any degree of progressivity or regressively.

Detailed considerations that put forward a hypothesis of dependence of regional revenues on federal grants-in-aid and tax payments to the federal budget have already been

¹⁸ If λ exceeds 1, then the tax in examination is progressive; if λ is less than 1, the tax is regressive. It redistributes revenues from higher-revenue regions to lower-revenue ones in the first case and vice versa in the second case. Correspondingly, grants-in-aid system has it the other way round: if λ is less (more) than 1, the system is progressive (regressive).

¹⁹ See D. B. Suits (1977), S. Zavakili (1991), (1992)

²⁰ See N.C. Kakwani (1977), (1997), Musgrave (1961), (1976).

²¹ E.g. Beach, Davidson, 1983.

given above. As far as they concern regional revenue stabilization, it is worth while mentioning that the system of grants and tax payments may function differently at symmetric and asymmetric shocks affected regional revenues.

At an asymmetric income shock that affects few regions federal grants-in-aid can be supposed stabilizers of regional revenue fluctuation. A decrease in revenues and, therefore, tax capacity makes the Fund for Financial Support to Regions (FFSR) grant more funds to the shock-stricken regions and maybe more irregular grants-in-aid. Analogously, rise in regional revenues causes reduction of grants-in-aid. At a symmetric shock, however, that simultaneously affects all or most regions the amount of federal budget funds granted to the regions also changes. The change of grants-in-aid available for distribution prevents this instrument from stabilizing regional revenues. The stabilization effect will appear only if there is a considerably non-proportional (progressive or regressive) dependence of grants-in-aid on GRP or regional budget revenues. But it is hardly justifiable to suppose the dependence at not too big shocks of regional revenues.

At the same time, a profound analysis shows that regional revenue stabilization through payment of regional taxes to the federal budget can act as a stabilizer both at an asymmetric shock and at a shock that affects all or most regions at once. It can be explained by the fact that tax revenue redistribution is not limited by federal budget funds whose amount depends on the state of regional economies affected by a shock.

The easiest and most logical way of testing stabilization is to estimate the linear model equation in time differences. However, since the coefficients can differ in years, the transition to the panel data can lead to further alteration of redistribution coefficients. That is why the model has to contain ΔY_i and Y for different years whose correlation is rather high. To prevent multicollinearity, the equations below were calculated for pairs of years in succession regardless of the panel data²²:

$$\Delta X_i = \alpha + \beta \cdot \Delta Y_i + \gamma \Delta Y_{i,t-1} + u_i \quad (4)$$

In this case coefficient β can be interpreted in two ways:

- If GRP of a region is a ruble bigger than that of another, the former pays β rubles more taxes (or receives grants-in-aid) than the latter;
- If GRP of a region in the second moment gets a ruble bigger, the region pays β rubles more taxes (receives grants-in-aid).

Coefficient γ describes time instability of coefficient β and shows that if a region's GRP in a certain year is a ruble bigger than that of another, increment in transfers to the said region will be as high as change of coefficient β .

By analogy with the redistribution analysis, this research investigates the ability of the system to stabilize GRP and tax revenue and uses tax revenue of regional budget and its fluctuations in appropriate models instead of GRP. Regional revenue stabilization in the two cases is checked by testing two one-side hypotheses concerning coefficient β .

III. ESTIMATION RESULTS

We used statistical data on 88 Russian regions (all regions save for the Chechen Republic) since 1994 till 2001 (annual data), 704 observations altogether²³. The subjects of the measurement were per capita indices with account of inter-regional price differentiation and GDP deflator that made indices of different years comparable. This adjustment could not completely remove heteroskedasticity, i.e. the dependence of the remainders of the measured models on the size of regions (for example, GRP). That is why whenever heteroskedasticity

²² Since this model was deduced from the redistribution model, it has to use the same data, i.e. analogous adjustment of indices in regard of GDP growth and inter-regional price level.

²³ The source of regional budget statistics is the Ministry of Finance of the Russian Federation. The source of statistics on population, GRP and other indices is the State Committee of the Russian Federation for Statistics.

appeared, the method of the least squares used the White correction to obtain adequate measurement of coefficient dispersion.

The econometric test of progressivity considered the three models mentioned above: linear model, effective rate model and logarithmic model. The used data had a panel structure that is why before consolidating the equations for different years into a panel, the research checked the coefficient difference in those models measured separately for different years and included them in the model specification.

The progressivity test of the fiscal and grants-in-aid system compared the three models at each stage and showed that, first, different models turned out the best for different fiscal instruments; second, each model had its specific drawbacks. The linear model ignored potential non-linearity and progressivity connected with possible increase in the marginal rate caused by revenue growth. The effective rate model ignored fixed tax revenue that did not depend directly on regional revenue (for example, property tax). The logarithmic model supposed constant elasticity of redistribution instruments concerning regional revenue, etc. Therefore, none of the models provides either plainer explanation or deeper analysis of the results and balances. That is why the progressivity hypotheses have to be tested by the three models, the results being compared with each other and with the Kakwani and Musgrave indices of progressivity.

Modeling results of gross regional income equalization through federal grants-in-aid

The modeling results of gross regional revenue equalization through federal grants-in-aid are given below and describe federal grants-in-aid, tax revenue of the federal budget and net federal tax for the three models (nine equations).

Table 3: Modeling Results of GRP Redistribution in 1994-2001

		Linear model			Effective rate model			Logarithmic model		
		Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax
Uniform coefficients	Constant (t-stat)	0.330 (15.852)				0.103 (12.886)	-0.037 (-2.867)			
	GRP (t-stat)				-0.005 (-4.887)					
1994	time-effect (t-stat)		0.373 (10.59)	0.018 (0.190)	0.184			-0.883	-2.105	-2.494
	GRP (t-stat)	0.011 (1.561)	0.002 (0.603)	-0.008 (-0.622)		-0.002 (-3.832)	0.001 (1.628)	-0.233 (-1.272)	0.539 (2.615)	0.607 (1.546)
1995	time-effect (t-stat)		0.396 (8.090)	0.164 (1.980)	0.122			-1.240	-1.858	-2.604
	GRP (t-stat)	-0.005 (-1.046)	0.011 (1.215)	0.011 (0.904)		-0.002 (-3.776)	0.003 (2.294)	-0.470 (-2.438)	0.477 (2.909)	0.784 (2.314)
1996	time-effect (t-stat)		0.391 (8.490)	0.093 (1.460)	0.128			-1.168	-1.752	-2.538
	GRP (t-stat)	-0.004 (-1.755)	0.012 (1.319)	0.015 (1.388)		-0.002 (-3.178)	0.003 (2.061)	-0.279 (-2.006)	0.446 (2.855)	0.576 (1.853)
1997	time-effect (t-stat)		0.334 (6.290)	-0.005 (-0.06)	0.139			-0.595	-1.925	-2.743

		Linear model			Effective rate model			Logarithmic model		
		Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax
	GRP (t-stat)	-0.004 (-1.720)	0.017 (1.515)	0.021 (1.609)		-0.002 (-3.311)	0.003 (2.126)	-0.606 (-2.710)	0.498 (3.851)	0.731 (2.362)
1998	time-effect (t-stat)		-0.083 (-2.04)	-0.495 (-6.39)	0.105			0.448	-3.227	-4.911
	GRP (t-stat)	-0.019 (-4.735)	0.074 (7.671)	0.105 (6.912)		-0.006 (-3.511)	0.007 (3.317)	-1.475 (-5.913)	1.149 (8.575)	1.748 (7.150)
1999	time-effect (t-stat)		-0.105 (-1.43)	-0.471 (-4.510)	0.100			0.532	-2.395	-2.666
	GRP (t-stat)	-0.024 (-4.823)	0.101 (6.439)	0.130 (7.358)		-0.003 (-2.039)	0.010 (4.449)	-1.936 (-5.242)	0.809 (4.187)	0.787 (2.660)
2000	time-effect (t-stat)		0.004 (0.020)	-0.334 (-1.740)	0.101			0.458	-2.816	-3.473
	GRP (t-stat)	-0.021 (-4.054)	0.119 (6.401)	0.140 (8.608)		0.002 (0.860)	0.014 (3.623)	-1.890 (-5.470)	1.148 (6.727)	1.347 (4.413)
2001	time-effect (t-stat)		-0.194 (-1.230)	-0.607 (-4.22)	0.127			-0.202	-2.526	-3.258
	GRP (t-stat)	-0.011 (-2.857)	0.168 (7.002)	0.189 (8.001)		0.003 (1.686)	0.013 (4.659)	-0.972 (-4.963)	1.102 (6.128)	1.304 (5.309)
R²		0.067	0.255	0.274	0.068	0.018	0.036	0.326	0.303	0.235

The results of each equation are put into the columns according to the results of the equality test for the coefficients of different years (if the hypothesis on equality is not rejected, the results of coefficients for all years are given in the first lines). The signs to the right of the coefficients in each equation show the results of progressivity test: “+” means that the regressivity hypothesis is rejected and the system is progressive, “0” means that both hypotheses are taken, “-” means that the progressivity hypothesis is rejected and the system is regressive.

The linear model evidently shows there was no significant dependence of federal grants-in-aid on GRP till 1996 because, first, besides direct grants from the federal budget, the country used some other kinds of financial support in early 1990s, e.g. applying differentiated sharing rates of federal taxes (VAT or income tax) to regional budgets. Second, till 1996, the amount of federal grants-in-aid depended rather on planned regional budget indices for a next period budget agreed upon by federal and regional governments than on the objective fiscal state of a region. As a result, the total amount of federal grants-in-aid had nothing to do with gross incomes of the regions.

In the linear model, GRP coefficients correspond with GRP redistribution by means of equalization instruments. They found that in 1996-1997 a region would get a 0.004 ruble more grant-in-aid if it had a ruble lower GRP, i.e. the marginal rate of federal grants-in-aid was 0.4 per cent of GRP. In 1998-2000 the coefficient reached 0.019-0.024 which means that a region with higher GRP got fewer grants-in-aid: growth of GRP made financial aid 1.9-2.4 per cent less than the increase in GRP.

In the effective rate model, dependence of the rate on GRP shows that if the coefficient equals 0.005, the comparison of any two regions considers the used corrections²⁴ per capita at comparable inter-regional year-by-year prices and GRP of the first region is a ruble higher than that of the second one, the effective rate of financial aid granted to the first region is 0.055 per cent lower than the figure of GRP difference between the two regions. The logarithmic model shows that negative elasticity of grants-in-aid concerning GRP was gradually increasing from year to year. In 1995-1997 a region with one per cent bigger GRP received 0.3-0.6 per cent smaller grants-in-aid, but in 1998-2001 the difference rose: if a region's GRP was one per cent bigger than of another, the amount of financial aid granted to the region was 1-2 per cent smaller than that granted to the second one with lower income.

The test for all models and all years found that the system of grants-in-aid is progressive to GRP. The logarithmic model says about a stronger correlation: high-revenue regions receive relatively less financial aid as compared to low-revenue ones, moreover, they receive irrelatively smaller amount of grants. Therefore, the system of grants-in-aid redistributes funds from high-revenue regions to low-revenue ones.

Modeling results of GRP equalization through federal taxes accrued to the federal budget

The modeling results of GRP equalization through federal taxes (paid to the federal budget) showed that in the linear model the coefficient concerning GRP was significant and positive in 1998-2001 and that the marginal rate of federal taxes, that are paid to the federal budget, was increasing. A ruble bigger GRP corresponded to a 0.074 ruble bigger payments in 1998, a 0.1-0.12 ruble bigger one in 1999-2000, a 0.17 ruble bigger payments in 2001. The analogous effective rate modeling found that the constant for all years varied insignificantly and amounted to 10 per cent. The effective rate was negatively dependent on GRP in 1994-1999. When it got one point bigger, the correction coefficients being considered, the rate of federal taxes that are paid to the federal budget became 0.02-0.06 points smaller. In the logarithmic model the coefficient to GRP logarithm that describes elasticity was significant for all years and varied from 0.45 in 1995-1997 to 1.15 in 1988 and 2000-2001.

The linear model found that regional revenue redistribution through the federal fiscal system increased significantly in recent years (up to 10 per cent in 1999-2000 and 17 per cent in 2001). This can be explained by the changed vertical structure of the federal budget tax revenue: the share of federal budget tax revenue in aggregate tax revenue of all levels of budget increased from 46 per cent in 1998 to 60 per cent in 2001 owing to 1), lower sharing rates of federal taxes between federal and regional budgets (since April 1, 1999 the rate of VAT payments to regional budgets in total amount of tax had been falling from 25 per cent to 15 per cent, and VAT was finally included into the federal budget in 2001), 2), higher rates of federal taxes (excises in the first place) and, 3) some reduced or abolished regional and local taxes (since January 1, 2001 housing and socio-cultural development tax has been abolished and motor road tax has been reduced from maximum 2.75 per cent to one per cent). Consequently, the amount of funds redistributed among regions through federal taxes increased considerably.

Unlike grants-in-aid, tax revenue of the federal budget does not have a positive proof of progressivity. The results drive at only one conclusion about the changed redistribution potential of the fiscal system: striking evidence of persistent progressivity for the fiscal system in 1994-1997 is not observed in the following years. The effective rate model affirms progressivity of the fiscal system in 2001.

²⁴ It is impossible to use the coefficients of the effective rate model in the table to calculate directly how much the effective rate will change if per capita GRP get a ruble bigger/smaller (at 2001 price level). To compare annual indices, per capita GRP was adjusted to per capita GDP, which is why the coefficient should be divided by the figure of GDP deflator to calculate the growth of the rate. Calculated for 2001, the coefficient was divided by 9.04, for other years – by the figure of GDP (trillions of denominated rubles).

Apparently, the fiscal system was regressive with respect to GRP in 1994-1997. In other words, the system of federal taxes ensured a lighter burden of GRP taxation for higher-income regions as compared to lower-income ones. Later, there appeared less persistent evidence of regressivity. The figures obtained for several taxes showed that the fiscal system became rather progressive to GRP in recent years. However, the analysis failed to find a positive proof of progressivity for all tax payments to the federal budget in given periods.

Several hypotheses can be formed to explain the declining regressivity and steadily growing progressivity of the system of federal taxes accrued to the federal budget regarding GRP fluctuations.

Firstly, the last years of the given period are aforesaid to witness a significant concentration of federal taxes revenue in the federal budget. The latter had been gradually accumulating more and more VAT revenue. The VAT payments to the federal budget became proportional to GRP, the analysis found, and led to reduction of general regressivity of the federal taxes system. Analogously, rise in federal budget revenue caused by higher petroleum excises in 2001 made federal tax revenues less regressive to GRP.

Secondly, improvement of the country's economic situation prompted increase in both absolute amount of gross regional income and the share of economic agents' incomes in GRP. A higher share of profit in GRP led to non-proportional growth of corporate profit tax revenue in budgets of all levels (because when no profit was gained, which occurred in the preceding years, corporate profit tax payments equaled zero, and production of profit provoked a spasmodic rise in tax revenue). This tendency played an important role in decreasing regressivity of the system of federal taxes accrued to the federal budget regarding GRP since the last years were shown to witness a GRP regressive income tax paid into the federal budget.

Modeling results of GRP equalization through net federal tax

The modeling results of GRP equalization through net federal tax found that the marginal rate of net federal tax increased from 10.5 per cent in 1998 to 18.9 per cent in 2001. In the effective rate model, constant for all years was significant and amounted to -0.037, GRP was significant and influenced positively on the effective rate in 1995-2001, and the appropriate coefficient kept growing: if GRP got one point bigger, the effective rate of net federal tax became 0.011 point higher in 1995 and 0.14-0.15 point higher in 2000-2001 (the calculations used the deflator). In the logarithmic model, the coefficient to GRP (elasticity) was significant in 1995-2001 and varied from 0.58 in 1996 to 1.75 in 1998²⁵.

The test of the hypotheses on progressivity of net federal tax did not find persistent evidence of regressivity even in 1994-1997. Applied to 1988-2001, the linear and effective rate models undoubtedly rejected the hypothesis on regressivity and revealed progressivity of final redistribution. It means that, although tax payments to the federal budget were regressive in 1994-1997, the progressive system of grants-in-aid distribution used to ensure a just equalization of gross regional incomes, i.e. the final redistribution was not completely regressive (in the linear and logarithmic models the data corresponded both with the hypothesis of progressivity and the hypothesis of regressivity, and in the effective rate model the data reinforced the idea of progressivity). The last years witnessed a general tendency of rising progressivity of the whole system when almost all taxes reduced their regressivity.

The test of progressivity of redistributing fiscal instruments concerning GRP showed that the federal government would redistribute tax revenues from higher-income regions to

²⁵ The comparison of linear modelling results showed that net federal tax did not equal the difference between federal tax revenue and aggregate grants-in-aid. This happened because different specifications of the model were used: the test results suggested a uniform in years constant be taken for aggregate grants-in-aid and time-effects model be chosen for federal budget tax revenue and net federal tax, the hypothesis on equal constant being rejected. Should aggregate grants-in-aid be calculated under the same specification, net federal tax coefficients will coincide.

lower-income ones, reducing their income inequality. Progressivity of this redistribution was getting higher in the last years (the share of net tax received from higher-income regions and granted to lower-income ones changed in the same direction their incomes did).

GRP redistribution aimed at GRP equalization through fiscal instruments of the federal government (federal taxes and federal grants-in-aid) was getting more active from year to year, the analysis showed. In the linear model, the distribution coefficient to GRP was about 13-14 per cent in 1999-2000, but it leapt as high as 18.9 per cent in 2001.

The growth of equalization properties of fiscal instruments that were used by the federal government and entered into net federal tax was caused both by the changed structure of tax revenue distribution between the federal and regional budgets and some innovations in the system of federal grants-in-aid for Russia's regions.

As it was mentioned above, there are some factors that explain the increasing redistribution and equalization role of the system of federal taxes collected in the regions and fully or partially paid to the federal budget. The increment in federal budget revenue obtained through centralizing several federal taxes was a source for more federal grants-in-aid. Unlike the system of federal taxes, the system of grants-in-aid provided the analysis with striking evidence of its being progressive to GRP in recent years. Moreover, the latest amendments to the methods of grants distribution from the Fund for Financial Support to Regions (FFSR) – the main (up to 70 per cent of aggregate fund) source of grants-in-aid for the regions – were aimed at strengthening equalization properties of federal grants. The amendments imply that the clearing sum of a grant to a region is inversely proportional to the region's GRP and takes into account fiscal capacity, expenditure needs and other factors that are also inversely dependent on regional income. As a result, aggregate effect of net federal tax was applied to inter-regional equalization of regional incomes in the last periods rather than it used to be.

TABLE 4

Modeling Results of Tax Revenue Redistribution among Regional Budgets in 1994-2001

		Linear model			Effective rate model			Logarithmic model		
		Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax
Uniform coefficients	Constant (t-stat)					0.304 (7.403)				
	Revenue (t-stat)							-0.920 (-10.43)		1.687 (24.556)
1994	time-effect (t-stat)	0.787 (5.930)	-0.108 (-3.740)	-0.866 (-6.700)	3.196		-2.198	-1.592	-1.247	-2.012
	Revenue (t-stat)	-0.468 (-3.361)	0.427 (14.782)	0.713 (7.733)	-2.748 (-2.809)	0.020 (0.720)	1.430 (3.001)		1.382 (40.428)	
1995	time-effect (t-stat)	0.436 (5.790)	-0.207 (-5.180)	-0.578 (-10.10)	1.596		-0.527	-2.42	-1.104	-1.670
	Revenue (t-stat)	-0.276 (-3.634)	0.561 (15.618)	0.676 (23.968)	-1.322 (-3.457)	0.046 (2.085)	0.388 (2.848)		1.227 (37.017)	
1996	time-effect (t-stat)	0.386 (10.120)	-0.139 (-2.590)	-0.505 (-9.170)	1.268		-0.349	-2.068	-1.028	-1.914
	Revenue (t-stat)	-0.143 (-3.421)	0.511 (9.908)	0.582 (12.649)	-0.794 (-2.553)	0.044 (2.093)	0.244 (2.730)		1.167 (27.280)	
1997	time-effect (t-stat)	0.391 (9.000)	-0.087 (-2.440)	-0.475 (-8.350)	1.071		-0.284	-1.983	-1.125	-1.890

		Linear model			Effective rate model			Logarithmic model		
		Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax
	Revenue (t-stat)	-0.103 (-4.266)	0.429 (12.727)	0.492 (13.420)	-0.468 (-2.385)	0.022 (1.270)	0.159 (2.878)		1.094 (16.573)	
1998	time-effect (t-stat)	0.514 (7.280)	-0.184 (-3.160)	-0.641 (-10.13)	2.137		-0.997	-2.448	-1.15	-1.881
	Revenue (t-stat)	-0.451 (-4.618)	0.554 (7.275)	0.784 (11.875)	-2.399 (-4.556)	0.038 (0.979)	0.908 (3.548)		1.198 (14.294)	
1999	time-effect (t-stat)	0.287 (5.450)	-0.037 (-1.540)	-0.328 (-5.250)	1.159		-0.274	-2.979	-0.986	-1.412
	Revenue (t-stat)	-0.113 (-2.962)	0.438 (15.459)	0.509 (12.142)	-0.742 (-2.559)	0.053 (1.995)	0.251 (2.525)		1.056 (18.212)	
2000	time-effect (t-stat)	0.263 (4.740)	-0.194 (-2.140)	-0.420 (-5.010)	1.165		-0.194	-2.995	-0.913	-1.433
	Revenue (t-stat)	-0.055 (-1.469)	0.643 (6.723)	0.641 (8.565)	-0.541 (-2.888)	0.048 (3.354)	0.130 (2.979)		1.196 (15.278)	
2001	time-effect (t-stat)	0.249 (4.390)	-0.165 (-2.910)	-0.421 (-5.360)	1.308		-0.604	-2.333	-0.784	-1.479
	Revenue (t-stat)	0.093 (0.792)	0.646 (15.121)	0.606 (12.870)	-0.597 (-3.076)	0.064 (4.525)	0.265 (2.249)		1.239 (24.134)	
R²		0.114	0.907	0.779	0.193	0.014	0.147	0.316	0.824	0.587

“+” rejects the hypothesis of regressivity in behalf of the hypothesis of progressivity;

“0” rejects neither of the hypotheses;

“-” rejects the hypothesis of progressivity in behalf of the hypothesis of regressivity.

Modeling results of regional budget revenue equalization through federal grants-in-aid

The modeling results of regional budget revenue equalization through federal grants-in-aid showed that regional budget revenue had a significant (negative) influence on aggregate grants-in-aid in 1994-1999 and the absolute meaning of the coefficient (the effective rate) varied from 0.45 in 1994 and 1998 down to 0.10 in 1997 and 1999. The linear model revealed a statistically significant negative dependence of federal grants-in-aid on regional budget revenue only in 1994-1999, with the marginal rate varying from 10 to 47 per cent. The absence of linear dependence of federal grants-in-aid on regional tax revenues in 2000 and 2001 seems to be caused by newly introduced principles of intergovernmental grants distribution.

The amount of federal grants-in-aid for 2000 was calculated in 1999 according to 1997 data (the last pre-crisis period with available statistics). It did not account for the changes in the country's economy dealt with unequal economic growth in different regions as compared with 1997 and sometimes directed great funds to Russia's regions with high growth rates of economy. The obtained coefficients reflected this. 2001 initiated fiscal and budget reforms that established the Fund for Compensations whose subventions and subsidies were granted to compensate regional budget expenditures on federal mandatory spendings with regard of the regions' needs of funds, not their revenues or fiscal capacities. Apparently, this system of grants-in-aid badly affected the obtained negative difference between the increment in regional budget revenue and federal grants-in-aid directed to a region.

The effective rate model recorded a negative dependence of aggregate grants-in-aid rate on regional budget revenues for all years. When the revenue got one point bigger (one ruble per capita at the prices comparable between years and regions), the effective rate became 0.06-0.07 lower in 2000-2001 and 0.26-0.30 lower in 1998 and 1994. A higher coefficient in 1994 accounts for the fact that the system of federal grants-in-aid remained rather subjective (the share of transfers from the FFSR in total amount of financial support did not exceed 10 per cent) in spite of unified sharing rates of federal taxes between federal and regional budgets. The 1998 increase in the coefficient coincided with more grants-in-aid delivery to the regions with poor taxation base and high expenditure needs caused by fall in real tax revenues in the crisis-stricken country. The coefficient fluctuations can also account for high dispersion of grants-in-aid ratio to proper regional budget revenues: grants-in-aid made up from 2 to 600 per cent of tax revenues of regional budgets throughout the given period.

The logarithmic model obtained the coefficient of elasticity that was uniform for all years and amounted to -0.92, i.e. if regional budget revenue increased as much as 1 per cent, aggregate grants-in-aid got 0.92 per cent smaller. The progressivity test of aggregate grants-in-aid concerning tax revenues of regional budgets resembles that of equalization properties concerning GRP: all models recorded a stable year-by-year result that proved the system of grants-in-aid was progressive, the hypothesis of regressivity being rejected. The logarithmic model showed that the system's elasticity concerning regional budget revenues was negative, i.e. higher-income regions were bound to receive smaller amounts of aid than lower-income ones when both the share of grants in budget revenue and absolute figures of the received funds were analyzed.

Modeling results of equalization of regional budget revenues through federal taxes accrued to the federal budget

The modeling results of equalization of regional budget revenues through federal taxes accrued to the federal budget found that the marginal rate (regional budget revenue coefficient) varied from 0.43-0.56 in 1994-1999 to 0.64-0.65 in 2000-2001²⁶. The effective rate model obtained a significant positive uniform constant that approximately equaled 0.3. The coefficient that described growth of the rate caused by increase in regional budget revenue was significant and positive: a 1 ruble bigger per capita regional income (at comparable prices) made the effective rate 0.2 point higher in 1994 and 0.5-0.7 point higher in 1999-2001. The logarithmic model of dependence of federal budget tax revenue on tax revenues of budgets of all levels recorded that elasticity was significant for all years and varied from 1.1-1.2 in 1995-2001 to 1.4 in 1994.

The progressivity test based on the models found that, according to the results for most periods, the federal fiscal system was progressive with respect to regional budget revenues as far as it concerned tax payments to the federal budget (the hypothesis of regressivity was rejected). This, however, did not cover 1997-1999 whose results obtained through one or two models turned out insignificant (the coefficients conformed both with the hypothesis of progressivity and the hypothesis of regressivity). This accounts for possible reduction of the system's progressivity and increase in standard deviations of the coefficients.

²⁶ The system of federal grants-in-aid is based on tax revenues of regional budgets, but tax revenues of the federal budget and net federal tax are based on revenues of budgets of all levels collected in a region (pre-redistribution indices). That is why to compare coefficients in the linear model for grants-in-aid and federal budget tax revenue, it is necessary to stick to a uniform base or evaluate final redistribution described by the figures of net federal tax (given in the table). The calculation showed that uniform coefficients of tax revenue redistribution of regional budgets exceeded 1 in all years save for 1997 and 1999. It means that throughout the longest part of the given period a 1 point increase in tax revenue of regional budgets made net federal tax 1.2-1.5 point higher in 1994-1996 and 1.7-1.9 point higher in 1998 and 2000-2001.

Therefore, during the longest while of the given period the system of tax revenues redistribution between the federal budget and consolidated budgets of Russia's regions remained progressive with respect to regional tax revenues, i.e. rise in the absolute amount of tax revenue collected in a region into budgets of all levels was followed by increase in the share of tax revenue of the federal budget in this index. It means that federal taxes were rising non-proportionally while aggregate taxation base in a region was also increasing. This could be caused by the fact that the regions with higher indices of taxation base were distinguished by a bigger contribution of payments and excises for natural resources utilization to the federal budget. Consequently, when aggregate tax revenue increased owing to, for example, more intensive production and processing of hydro carbonic materials, the largest part of this increase lay on the taxes paid to the federal budget. This result differs from those of dependence of federal tax revenue gained in a region on GRP that failed to find undoubtful evidence of progressivity.

Modeling results of regional budget revenue equalization through net federal tax

The modeling results of regional budget revenue equalization through net federal tax concerning a tax-inclusive base found that the linear model had a positive dependence of net federal tax on tax revenues of budgets of all levels, its coefficient swinging from 0.5 in 1999 to 0.78 in 1998. The effective rate model had a significant positive dependence of the rate on budget revenues of all levels, the coefficient amounting to 0.13-0.26 in 1996-1997 and 1999-2001 and reaching its highest 0.9 in 1998. Taking into account the used deflators, the results showed that 1 ruble higher budget revenues of all levels (per capita, at comparable prices) made the effective rate 1-10 per cent higher. The highest coefficients in 1994 and 1998 accounted for significant coefficients of redistribution through aggregate grants-in-aid (see above). The uniform for all years index of net federal tax elasticity concerning aggregate tax revenues in budgets of all levels was significant, positive and equaled around 1.7.

The progressivity test of all models for all years rejected the hypothesis that federal budget tax revenues gained in a region was regressive to aggregate tax revenue of the budget system gained in the region. In other words, the test found that in the given period the federal redistribution system remained persistently progressive with respect to tax revenues of consolidated regional budgets. It means that the system of fiscal instruments used by the federal government was aimed at redistributing tax revenues from higher-revenue regions to lower-revenue ones (per capita revenue gained in the regions).

The comparison of regional budget revenue equalization with GRP equalization revealed that the system of federal taxes fully or partially paid into the federal budget was rather progressive with respect to regional budget revenue (even in first years when federal budget tax revenue gained in a region was regressive to GRP). When applying fiscal instruments (federal taxes and federal grants-in-aid), the federal government could have used regional budget revenue index as a reference point for revenue redistribution (equalization) rather than gross regional income index. However, unlike intergovernmental grants, federal taxes do not pursue the aim of inter-regional equalization. Hence, the only apparent thing is that net federal tax has a stronger redistribution effect on tax revenue of regional budgets as compared to gross regional incomes.

Analogously to redistribution coefficients for federal budget tax revenue, those for net federal tax were statistically significant, positive throughout the given period and varied from 50 to per cent.

Progressivity test based on the Kakwani and Musgrave indices

Progressivity of the redistribution system can be tested through calculation of the Kakwani and Musgrave indices (see above²⁷).

TABLE 5

Calculation results of the Kakwani and Musgrave indices for 1994 – 2001

	GRP equalization						Regional budget revenues equalization					
	Kakwani index			Musgrave index			Kakwani index			Musgrave index		
	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax
1994	-0.007	0.017	0.012	0.970	1.083	1.055	0.020	0.094	0.116	0.970	1.083	1.055
1995	-0.006	0.011	0.006	0.972	1.051	1.025	0.025	0.075	0.101	0.972	1.051	1.025
1996	-0.006	0.012	0.007	0.972	1.057	1.031	0.018	0.070	0.091	0.972	1.057	1.031
1997	-0.004	0.014	0.010	0.980	1.069	1.052	0.015	0.070	0.087	0.980	1.069	1.052
1998	0.001	0.013	0.015	1.009	1.119	1.139	0.023	0.086	0.104	1.009	1.119	1.139
1999	-0.001	0.014	0.014	0.992	1.112	1.113	0.006	0.074	0.081	0.992	1.112	1.113
2000	-0.008	0.015	0.009	0.946	1.115	1.066	0.038	0.084	0.111	0.946	1.115	1.066
2001	0.000	0.018	0.020	0.999	1.135	1.156	0.076	0.079	0.149	0.999	1.135	1.156

The calculation results of the Kakwani and Musgrave indices back those of the econometric models in considering both the system of federal grants-in-aid distribution and net federal tax progressive. At the beginning of the given period aggregate tax revenue regarding GRP equalization was persistently regressive. In 1998-2000 the Kakwani index ran to 0 and the Musgrave index was close to unity, but they could hardly prove that tax payments were undoubtedly progressive. Tax payments to the federal budget remained progressive to tax revenues of regional budgets (the Kakwani and Musgrave indices exceeded 0 and 1 correspondingly).

Estimation of GRP stabilization through federal grants-in-aid and tax payments to the federal budget

The results of estimation of GRP stabilization through federal grants-in-aid and federal taxes recorded a significant figure that described GRP stabilization (i.e. rejected the hypothesis of non-stabilization) only in 1997 (see Appendix). In 1995 and 1996 they found the opposite effect – GRP destabilization. The stabilization test of aggregate tax payments to the federal budget showed that GRP stabilization took place only in 2000 when a 1 ruble increase in GRP (in real figures) made tax payments to the federal budget 0.4 ruble higher. 1998 saw the other way round effect – GRP destabilization (GRP decreased when tax payments rose). Generally, the test failed to record any steady tendency of GRP stabilization through fiscal redistribution (net federal tax). In some years (1997 and 2000) the changes in the fiscal system, federal taxes sharing rates and grants-in-aid corresponded with GRP fluctuations: GRP rise bred increase in net federal tax. In 1998, on the contrary, change of net federal tax corresponded with GRP destabilization.

Taking into consideration the specific features of Russia's fiscal, budget and intergovernmental systems, one can say that federal fiscal instruments were not used as

²⁷ The criterion of progressivity for the Kakwani index is a figure than exceeds 0, for the Musgrave index – a figure that exceeds unity.

stabilizers or, at least, aimed at compensating time fluctuations of gross regional income in recent years.

The federal government can not be considered to orient its fiscal and budget policy towards time stabilization of gross regional incomes. It is likely to be guided by budget performance indices of Russia's regions. To prove this hypothesis, the authors analyzed revenue stabilization of consolidated regional budgets through the given fiscal instruments.

Analysis of regional budget revenue stabilization through federal grants-in-aid allocation and levying federal taxes to the federal budget

The analysis of regional budget revenue stabilization through federal grants-in-aid and federal taxes paid to the federal budget showed that grants-in-aid had a stabilization effect on tax revenues of regional budgets in 2000 and 2001 and rejected the hypothesis of non-stabilization (see Appendix). The other years did not see any significant dependence of grants increase on increment in regional tax revenues. But the whole period enjoyed the stabilization effect that federal taxes accrued to the federal budget had on aggregate tax revenue gained in the regions, the hypothesis of non-stabilization being rejected). This stabilization effect of federal taxes on regional budget revenues can account for several factors.

First, the stabilization effect of the fiscal instruments used by the federal government was reinforced by tax-sharing between the federal and regional budgets. More taxes collected in a region and distributed among budgets of all levels automatically increased federal budget revenue gained in the given region. According to the definition used in the present work, this means stabilization.

Second, the redistribution analysis showed that federal taxes paid to the federal budget were mostly a progressive equalizer for the taxes collected in a region. That could mean certain stabilization if regional revenue varied from year to year. One can record stabilization if one transfers progressivity estimated according to regional statistics onto dependence between revenue and time equalizer, i.e. if one obtains equal year-by-year redistribution coefficients and coincidental coefficients used to analyze year-by-year regional statistics. If revenues fluctuate before redistribution, application of the progressive instrument (i.e. withdrawal of a bigger part of revenue from higher-revenue regions) can result in less significant revenue fluctuation after redistribution, even in relative figures.

Third, the federal government carried out stabilization of the kind by changing the sharing rates of federal taxes between federal and regional budgets. In 1999-2001 the federal budget used to centralize VAT revenue: in 1999 the sharing rate of VAT to regional budgets was reduced from 25 to 15 per cent, and since January 1, 2001 VAT has been fully paid to the federal budget. Taking into consideration the post-crisis economic growth in the country, one can say that, when aggregate tax revenue in budgets of all levels rose, a certain part of this increment was paid to the federal budget because the proportion of VAT distribution between the federal and regional budgets had changed. The present work treats this as manifestation of stabilization properties of federal fiscal instruments. In other words, the economic growth and VAT centralization in the federal budget combined led to a higher share of tax revenue gained in a region and accrued to the federal budget. This stabilization can by no means be regular (because to achieve stable intergovernmental relations, the federal government should not change too frequently the proportions of federal taxes shared with subnational budgets), but in the given period such a policy of the federal government turned out a powerful stabilizer of regional budget revenues.

According to the data given in the table, net federal tax also possesses stabilization properties, i.e. if budget revenues gained in a region get 1 ruble higher as compared to the previous period, the federal government collects through net federal tax 0.2-1.0 ruble as much as the increment mainly by means of federal taxes that are paid to the federal budget. The results of the analysis revealed steadily increasing stabilization properties of the system of federal fiscal instruments (federal taxes and federal grants-in-aid) in last two years of the

given period. However, this benefited rather from one time changes of legislation than self-regulation of the system itself.

The present work interprets intensiveness of the stabilization properties of the fiscal instruments used by the federal government as the federal government's participation in regional budget revenue fluctuations, i.e. governmental revenues and expenditures change when regional budget indices change. Hence, stronger stabilization properties of net federal tax in 2000-2001 accounted, first of all, for the budget reform of that time. Apparently, VAT centralization in the federal budget in 2001 and increase in grants-in-aid (due to the Fund for Compensations) that amounted to VAT payment to the federal budget did not result in country-wide change of net federal tax. However, the regions where the taken measures caused rise/fall in regional budget revenues were more likely to enjoy change of net federal tax that led, in its turn, to a higher index of stabilization properties of the federal fiscal mechanism.

Evidently, some analogous causes made us register high stabilization properties of fiscal instruments in 2000. The federal government introduced a new method of grants allocation from the Fund for Financial Support to the Regions to see a larger share of the federal budget in tax revenue of the consolidated budget. The index of the federal government's stabilization function increased because a considerable part of increment in many regional budgets was connected with the change of net federal tax, i.e. the difference between the amount of federal taxes paid to the federal budget by a region and the amount of grants-in-aid received by the region's budget.

The stabilization test of the fiscal instruments applied by the federal government to the regions revealed as follows. First, net federal tax (the difference between tax revenue of the federal budget gained in a region and grants-in-aid sent to the region during a certain period) cannot stabilize gross regional income. It is impossible to reject the hypothesis that there is no negative correlation between increment in revenue the federal budget gains in a region as net tax and that in gross income of the region. Presumably, there are no ties between the federal government's mechanism of grants-in-aid distribution and GRP.

Second, the stabilization test of net federal tax regarding tax revenues of the consolidated regional budgets found stabilization properties and strengthening of stabilization effect of the federal fiscal instrument in 2000-2001. This result satisfies the fiscal and budget policy of the Russian Federation as well as the lawmaking tendencies concerning the budget and fiscal systems. On the one hand, the federal government distributes the main amount of grants guided by regional budget revenue indices and cuts financial aid when the revenue increases (withdrawing a certain part of increment in the budget revenue). On the other hand, increase in tax revenue of the federal budget followed by increase in tax revenue gained in a region breeds stabilization: the more tax revenue a region gets, the more it contributes to the federal budget.

However, high stabilization indices concerning tax revenues of consolidated regional budgets recorded in recent years are unlikely to be caused by some self-regulation property of the federal fiscal system. They can be explained by the current budget reform aimed at centralizing tax revenues and increasing grants-in-aid distribution.

The comparison of the Russian stabilization effects indices with those in other countries showed that Germany's index of stabilization effect the federal fiscal instruments have on subnational tax revenues exceeds 1 – 1.11²⁸. But in Russia such stabilization is not an integral property of the system, but a result of the current reforms.

²⁸ See von Hagen, Hepp (2000).

IV. Main conclusions and recommendations on Russia's economic policy

The subject-matter of the present research is redistribution and stabilization properties of Russia's intergovernmental fiscal relations system in 1994-2000. Inter-regional revenue redistribution, aimed at reducing inequality of gross regional incomes and budget revenues, and intertemporal redistribution of regional revenues aimed at stabilizing regional budget and economic indices are carried out through paying federal taxes to the federal budget and granting financial aid to the regional budgets.

To develop the methodology for analysis of equalization and stabilization properties of the Russian fiscal system, we had to survey the economic efficiency criteria of the federal inter-regional redistribution system and empirical papers on redistribution and stabilization properties of intergovernmental systems. The qualitative analysis of some federal grants-in-aid and some federal taxes fully or partially paid to the federal budget was an important component of the research that prompted to frame the hypotheses of progressivity/regressivity of the fiscal instruments to gross regional incomes and regional budget revenues. When a fiscal instrument is progressive to any economic or financial index, it facilitates reduction of inequality measured by this index.

The progressivity test of the fiscal instruments was carried out by different methods: the method of econometric models (linear model, effective rate model and logarithmic model) and the method of inequality indices (the Kakwani and Musgrave indices). The authors investigated stabilization properties of the fiscal instruments and wondered if a bigger amount of federal grants-in-aid to the region and/or less tax revenue of the federal budget got in the region cause decrease in GRP or regional budget revenues. If the federal fiscal system does not possess stabilization properties, destabilization can appear: fall in regional revenues can be followed by decrease in the amount of federal grants-in-aid and growth of federal budget tax revenues gained in a region.

The progressivity and stabilization analyses of the redistribution system considered two objects under equalization through the federal fiscal instruments: gross regional product (the index of aggregate income of economic agents in a region) and tax revenues of a regional budget (the indicator of regional potential of public welfare taken into calculation of the amount of federal grants-in-aid to the region). The obtained indices for the two objects turned out a bit different.

The modeling results for federal grants-in-aid, federal taxes and net federal tax led to the following inference. The progressivity test of grants-in-aid distribution showed that the system was progressive to GRP in all years and according to all models. The persistently regressive tendency of the fiscal system concerning GRP that was registered in 1994-1997 failed to come out in 2000-2001. However, the authors did not find any evidence of the system's progressivity: the obtained data satisfied both the hypothesis of progressivity and the hypothesis of regressivity. The linear model of net federal tax dependence on GRP and the effective rate model of federal tax dependence on GRP revealed that net federal tax (the difference between tax revenue of the federal budget gained in a region and federal grants-in-aid transferred to the region) remained progressive in recent years.

The econometric modeling results for the fiscal system showed that the grants-in-aid distribution system was steadily progressive to regional budget revenues: higher-revenue regions received relatively smaller grants; moreover, the absolute amount of grants was also less than that of lower-revenue regions which says about a high degree of progressivity of the system. Federal budget tax revenues gained in a region were progressive too, at least one of the models found in all years and all models did in recent years.

The comparison of equalization of regional budget revenue with that of GRP revealed that in recent and even early years the system of federal taxes paid to the federal budget was progressive with respect to budget revenues, and in early years federal budget tax revenues

were regressive with respect to GRP. It means that the federal government is likely to use regional budget indices, not gross income ones, as a reference point for equalization through fiscal redistribution.

The analysis of the Kakwani and Musgrave indices for GRP equalization showed regressivity of federal taxes that go to the federal budget and progressivity of aggregate financial aid and net tax. The results do not contradict those of econometric modeling.

As far as the final equalization of the federal grants-in-aid and federal taxes systems is concerned, the linear model had the effective rate of net federal tax (the difference between federal budget tax revenue gained in a region and federal aid to the region) regarding GRP increased from about 10 per cent in 1998 up to 19 per cent in 2001. The comparison with analogous researches carried out for other countries showed that redistribution in the Russian Federation is lower than in all mentioned countries excluding the USA. In the United States this index equals 14 per cent, in Canada – 23 per cent, in France – 38 per cent, and in Great Britain – 26 per cent²⁹. The redistribution effect concerning tax revenues gained in the regions is much higher, the marginal rate of net federal tax in the country varied from 50 to 80 per cent.

The Kakwani and Musgrave indices for equalization of regional budget revenues proved progressivity of both financial aid and federal taxes that go to the federal budget as well as net federal tax throughout the period under investigation.

The stabilization analysis of the federal fiscal system could not reveal neither any stable significant negative dependence of increase in financial aid on increment in GRP nor stable positive dependence of bigger tax revenue of the federal budget gained in the region on GRP of that region. The stabilization effect the federal taxes had on regional budget revenues was found to be persistent and vary from 25 per cent in 1998 to 93 per cent in 2001. The stabilization effect the federal grants-in-aid had on regional tax revenues was registered only in the last year of the period under investigation and amounted to 40 per cent.

The change of net federal tax was positively dependent on the change of tax revenues gained in a region (the tax-inclusive base) and varied from 20 to one hundred per cent in 2001. The implemented reform resulted in more revenue centralization in the federal budget and bigger amount of financial aid to distribute (VAT centralization, establishment of the Fund for Compensations, enlargement of the Fund for Financial Backing to Regions, &c.) Some foreign countries have a lower stabilization index: 21 per cent in the USA and 14 per cent in Canada³⁰. The obtained results, however, cannot arrive at the conclusion that the Russian system of fiscal federalism has a significant stabilization function: if stabilization is considered the federal government's ability to compensate fully or partially revenue fluctuations caused by asymmetric shocks, then net federal tax was changed rather because of the policy pursued by the federal government than as a result of the properties of Russian system of intergovernmental relations. Therefore, to make substantiated conclusions about what stabilization effect the federal government has on the regional finance system, one should keep on observing after the main stage of the fiscal and budget reforms has been accomplished.

The results of the present research let the authors formulate some recommendations on further improvement of Russia's economic policy:

1. The qualitative analysis of the Russian system of intergovernmental fiscal relations showed that the federal government numbers reduction of social and economic inequality (i.e. equalization of GRP inter-regional differentiation) among the targets of its activity. As the research did not find that the fiscal system was progressive with respect to GRP, the equalization effect the federal fiscal system has on GRP can be strengthened in a short-term

²⁹ For survey of redistribution and stabilization indices see *Zumer (1998)*

³⁰ If foreign countries use tax revenues of budgets of all levels gained in a region (a province, etc.) as an equalization index, the obtained stabilization coefficients also take into consideration the tax-inclusive base.

period by further improvement of the methods of grants distribution from the Fund for Financial Support to Regions (FFSR). The political and economic properties demand the present-day fiscal system remain stable and should not undergo any changes. Therefore, more GRP redistribution through the federal fiscal instruments that will not modify the current fiscal system is possible if the federal government makes GRP differentiation indices more influential in the method of transfers distribution to the regions.

2. The research revealed that the main federal taxes had different degrees of progressivity concerning GRP. The most progressive taxes are payments for natural resources utilization. However, such taxes as VAT, personal and corporate income taxes, excise duties did not give evidence of being progressive to GRP (the hypothesis of regressivity was not rejected).

This makes it difficult to guarantee the strengthening of equalization properties of the fiscal system because it implies revenue centralization of the most progressive taxes and decentralization of other taxes. The obtained results, however, showed low progressivity or failed to reject the hypothesis of regressivity for most federal taxes. According to those results, decentralization of regressive taxes can make the federal government convert most federal taxes into regional taxes or make them accrue to the regional budgets that, in its turn, will lead to dramatic decrease in the federal budget revenue. Therefore, higher progressivity of the fiscal system concerning gross regional income (i.e. stronger equalization properties of the system) can be attained through reforming methods of collecting particular taxes, not through distributing tax revenues among the levels of the budget system.

3. The progressivity analysis of the federal fiscal instruments concerning regional budget revenues showed that if the federal government intends to equalize revenues of consolidated budgets of the Russian regions, it can benefit by using intergovernmental grants as most adequate equalizers because aggregate federal taxes can hardly reinforce progressivity of budget funds redistribution in the country (i.e. redistribution from high-revenue regions to low-revenue ones).

4. The qualitative analysis of the Russian system of intergovernmental regulation found that for the time being the federal government is reluctant to give priority to intertemporal stabilization of regional economic indices. Should this stabilization be achieved, some additional fiscal instrument could be introduced to cushion asymmetric shocks. In this case both the fiscal system (federal tax revenues fall down when regional revenues decrease) and the system of grants-in-aid for the regions (financial aid increases when regional revenues plunge down) could be adequate stabilizers.

5. When developing a system of intergovernmental regulation that is progressive with respect to regional budget revenues and/or GRP (a system that redistributes funds from higher-revenue regions to lower-revenue ones), one has to take into consideration that some non-fiscal instruments or those uncovered by the present work are able to reduce inequality: direct spendings of the federal budget on regional infrastructure development, economic stimulation, development of depressive regions, etc., and financing of federal programs of regional development. Unlike the instruments under investigation, the latter do not seem to reduce inter-regional inequality in a short-term period, but their long-term effect can turn out more influential than that of fiscal redistribution instruments provided that investments in regional economies are properly made.

Appendix. Modeling Results of Regional Revenues Stabilization in Russia

	GRP Equalization	Equalization of Regional Budget Revenues
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		Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax		Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax
1995	constant	-0.154	0.028	0.184	constant	-0.309	-0.001	0.304
	(t-stat)	(-5.396)	(0.944)	(4.829)	(t-stat)	(-4.568)	(-0.062)	(3.788)
	change of GRP	0,038	0,037	-0,001	change of revenues	0,113	0,767	0,771
	(t-stat)	(4.207)	(1.537)	(-0.072)	(t-stat)	(0.631)	(18.553)	(11.304)
	GRP	-0.006	0.008	0.014	revenues	0.158	0.043	-0.055
	(t-stat)	(-3.284)	(1.382)	(2.693)	(t-stat)	(2.27)	(2.772)	(-0.94)
	R²	0.283	0.089	0.147	R²	0.073	0.938	0.603
1996	constant	0.063	0.003	-0.060	constant	0.010	0.080	0.050
	(t-stat)	(3.088)	(0.191)	(-2.372)	(t-stat)	(0.22)	(1.627)	(0.898)
	change of GRP	0.008	0.005	-0.003	change of revenues	-0.094	0.483	0.511
	(t-stat)	(1.927)	(0.955)	(-0.364)	(t-stat)	(-1.063)	(9.606)	(6.93)
	GRP	-0.002	0.000	0.002	revenues	0.053	-0.059	-0.076
	(t-stat)	(-1.324)	(0.007)	(0.736)	(t-stat)	(1.095)	(-1.235)	(-1.582)
	R²	0.034	0.007	0.008	R²	0.023	0.470	0.315
1997	constant	0.053	-0.054	-0.107	constant	0.054	0.051	-0.014
	(t-stat)	(1.894)	(-3.131)	(-3.566)	(t-stat)	(2.001)	(2.166)	(-0.36)
	change of GRP	-0.038	0.038	0.075	change of revenues	0.008	0.466	0.408
	(t-stat)	(-2.632)	(1.26)	(2.376)	(t-stat)	(0.101)	(7.417)	(5.136)
	GRP	-0.003	0.004	0.007	revenues	-0.038	-0.084	-0.049
	(t-stat)	(-2.201)	(1.542)	(2.514)	(t-stat)	(-1.285)	(-4.334)	(-2.073)
	R²	0.030	0.049	0.082	R²	0.012	0.647	0.232
1998	constant	-0.071	0.258	0.329	constant	-0.048	0.009	0.077
	(t-stat)	(-1.654)	(3.297)	(3.379)	(t-stat)	(-0.835)	(0.2)	(1.029)
	change of GRP	0.001	-0.073	-0.074	change of revenues	-0.016	0.242	0.233
	(t-stat)	(0.169)	(-4.222)	(-3.621)	(t-stat)	(-0.204)	(3.094)	(2.229)
	GRP	0.002	-0.074	-0.076	revenues	-0.017	-0.048	-0.058
	(t-stat)	(0.368)	(-4.359)	(-3.782)	(t-stat)	(-0.216)	(-0.799)	(-0.695)
	R²	0.006	0.607	0.475	R²	0.001	0.889	0.674
1999	constant	-0.015	-0.049	-0.034	constant	-0.027	0.087	0.074
	(t-stat)	(-0.237)	(-0.846)	(-0.42)	(t-stat)	(-0.35)	(3.318)	(0.967)
	change of GRP	0.060	0.019	-0.041	change of revenues	0.059	0.264	0.207
	(t-stat)	(1.375)	(0.677)	(-0.841)	(t-stat)	(1.265)	(5.45)	(3.358)
	GRP	0.000	0.028	0.028	revenues	-0.011	-0.027	0.030
	(t-stat)	(-0.019)	(2.236)	(2.04)	(t-stat)	(-0.111)	(-0.944)	(0.43)
	R²	0.035	0.200	0.117	R²	0.017	0.664	0.230
2000	constant	0.028	0.500	0.472	constant	0.017	0.097	0.074
	(t-stat)	(0.947)	(1.148)	(1.049)	(t-stat)	(0.902)	(8.019)	(3.295)
	change of GRP	-0.001	0.389	0.389	change of revenues	-0.082	0.808	0.829
	(t-stat)	(-0.054)	(1.932)	(1.879)	(t-stat)	(-2.581)	(23.579)	(24.333)
	GRP	-0.004	-0.059	-0.056	revenues	-0.008	-0.083	-0.074
	(t-stat)	(-0.879)	(-0.899)	(-0.816)	(t-stat)	(-0.383)	(-5.366)	(-3.932)
	R²	0.015	0.130	0.124	R²	0.081	0.979	0.973
2001	constant	0.082	-0.222	-0.305	constant	0.092	0.015	-0.085
	(t-stat)	(2.842)	(-0.812)	(-1.05)	(t-stat)	(4.029)	(0.4)	(-2.595)
	change of GRP	0.004	-0.013	-0.017	change of revenues	-0.474	0.931	1.008
	(t-stat)	(0.425)	(-0.1)	(-0.135)	(t-stat)	(-2.869)	(12.639)	(23.394)

	GRP Equalization			Equalization of Regional Budget Revenues				
	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax	Aggregate federal grants-in-aid	Aggregate tax revenue	Net federal tax		
	GRP	-0.001	0.054	0.055	revenues	-0.036	0.007	0.022
	(t-stat)	(-0.196)	(1.714)	(1.711)	(t-stat)	(-0.797)	(0.156)	(0.705)
	R²	0.000	0.020	0.018	R²	0.406	0.978	0.985

References

- Batkibekov, S., Kadotchnikov, P., Nekipelov, D., Sinelnikov-Murylyov, S. (2002), *Reform of Income Tax for Natural Persons and its Consequences*, Moscow, (Russian).
- Dneprovskaya, S., Trunin, I., Chetverikov, S. (2001), *Disbalance of Russia's Budget System*, Moscow, (Russian).
- Kadotchnikov, P., Sinelnikov-Murylyov, S., Trunin, I. (2002), 'Problems of Modeling the Influence of Intergovernmental Grants on Fiscal Policy of Subnational Authorities' // *Problems of Economics*, No.5, Moscow, p.p. 103 – 125, (Russian).
- Kadotchnikov, P., Sinelnikov-Murylyov, S., Trunin, I. (2002a), *Russia's System of Federal Grants-in-Aid for the Regions and its Influence on Fiscal and Budget Policy of the Regions*, Moscow, (Russian).
- Trunin, I. (1999), *Intergovernmental Relations in the Perm Region and the Republic of Altay*, Moscow, (Russian).
- Khristenko, V. (2002), *Intergovernmental Relations and Regional Finance Administration: Experience, Problems, Prospects*, Moscow, (Russian)
- Aronson, R. J. (December 1977), 'Some Comments on Fiscal Equity and Grants to Local Authorities' // *The Economic Journal*, Vol. 77, p.p. 774-779.
- Auerbach, A.J., Feenberg, D. (2000), *The Significance of Federal Taxes as Automatic Stabilizers*.
- Auerbach, A.J., Hines, J.R.J. (2001), *Taxation and Economic Efficiency*.
- Barry, B. in Teresa Ter-Minassian, ed. "United Kingdom" (1997), *Fiscal Federalism in Theory and Practice*, Washington, D.C., International Monetary Fund.
- Bayoumi, Tamim, Masson, P. (1995), *Fiscal Flows in the United States and Canada: Lessons for Monetary Union in Europe*.
- Besley, T., Coate, S. (1991), *Public Provision of Private Goods and the Redistribution of Income*.
- Blanchard, O., Shleifer, A. (2000), *Federalism with and without political centralization: China versus Russia*.
- Boadway, R. and F. R. Flatters (1982), 'Efficiency and Equalization Payments in a Federal System of Government: A Synthesis and Extension of Recent Results' // *Canadian Journal of Economics*, Vol. 15, p.p. 613-633.
- Boadway, Roberts, Shah (1994), *Fiscal Federalism Dimensions of Tax Reform in Developing Countries*.
- Brandt, R., Zhu, Z. (2000), *Redistribution in a Decentralized Economy: Growth and Inflation under China Reform*.
- Bucovetsky, S. (1997), *Federalism, Equalization and Risk Aversion*.
- Caplan, A.J., Cornes, R.C., Silva, E.C.D. (1999), *Pure Public Goods and Income Redistribution in a Federation with Decentralized Leadership and Imperfect Labor Mobility*.
- Carver (1904), 'The Minimum Sacrifice Theory of Taxation' // *Political science quarterly*, p.p.66-79.
- Chernick, H.A. (1979), 'An Economic Model of the Distribution of Project Grants' // P.Mieszkowski and W.H.Oakland (eds.), *Fiscal Federalism and Grants-in-Aid*, Washington, D.C.: The Urban Institute, p.p.81-103.
- Courchene, T.J., Martinex-Vazquez, J. C.E., McLure, Jr., Webb, S.B. (2000), 'Principles of Decentralization' // Marcelo M. Giugale and Steven B. Webb (eds.) *Achievements and Challenges of Fiscal Decentralization, Lessons from Mexico*, Washington, D.C.: World Bank, p.p. 116-122.
- Cripps, Francis, Godley W. (October 1976), *Local Government Finance and Its Reform*, Department of Applied Economics, University of Cambridge.

- Cullis, J., Jones, P. *Public Finance and Public Choice*, second edition.
- Due, J.F. (February 1994), *Excise Taxes, The World Bank Policy Research Working Paper*, Washington, DC: World Bank.
- Edgeworth, F.Y. (1897), *The theory of taxation* // *Economic journal*, 46-70, p.p. 226-236 and 550-571.
- Emiliani, N., Lugaresi, S., Ruggiero, E. in Teresa Ter-Minassian, ed. "Italy" (1997), *Fiscal Federalism in Theory and Practice*, Washington, D.C.: International Monetary Fund.
- Fatas A. (1998), *Does EMU need a Fiscal Federation* // *Economic Policy*, Vol. 26
- Fisher, R.C., Papke, L.E. (2000), *Local Government Responses to Education Grants* // *National Tax Journal*, Vol. LIII, No.1.
- Flatters F., J. Henderson and P. Mieszkowski, (1974), *Public Goods, Efficiency and Regional Fiscal Equalization* // *Journal of Public Economics*, Vol. 3, p.p. 99–112.
- Gramlich, E.M. *The Political Economy of Fiscal Federalism Ch.12: "Intergovernmental Grants: A Review of the Empirical Literature"*.
- Inman, R.P. (1988), *Federal Assistance and Local Services in the United States: The Evolution of a New Federalist Fiscal Order* // Harvey S. Rosen (ed.), *Fiscal Federalism: Quantitative Studies*, The University of Chicago Press.
- Kakwani, N.C. (1977), *Applications of Lorenz Curves in Economic Analysis*.
- Kakwani, N.C. (1977), *Measurement of Tax Progressivity: An International Comparison*.
- Keen M., H. Papapanagos and A.F. Shorrocks (2000), *Tax reform and progressivity* // *Economic Journal*, #110, p.p.50-68.
- King D. N. (June 1980), *The Theory of Equalization Grants*, Working Paper #8, London: Institute for Fiscal Studies.
- Lindhal, E. (1919), *Positive Lösung, Die Gerechtigkeit der Besteuerung*, translated as "Just taxation – a positive solution" // *Classic in the Theory of Public Finance*, R.A. Musgrave and A.T. Peacock (eds), Macmillan, London.
- Litvack, J., Ahmad, J., Bird, R. (1998), *Rethinking decentralization in developing countries*.
- Martin, P., Rogers, C.A. *Optimal stabilization in the presence of learning by doing*.
- Mathews, Russel (April 1977), *Mechanisms for Fiscal Equalisation in an Integrating European Community* // Report of the Study Group of the Role of Public Finance in European Integration, Vol. II, Commission of the European Communities, pp. 401-432.
- Melitz, J., Zumer, F. *Regional redistribution and stabilization by the centre in Canada, France, the United Kingdom and the United States: new estimates based on panel data econometrics*.
- Musgrave R. A. (1961), *Approaches to A Fiscal Theory of Political Federalism, Public Finances: Needs, Sources and Utilization, National Bureau of Economic Research*, New York, Princeton: Princeton University Press, p.p.97-122.
- Musgrave, R.A., Musgrave, P.B. (1976), *Public finance in theory and practice*.
- Oates W. E. (1972), *Fiscal Federalism*, New-York: Harcourt Brace Jovanovich.
- Oates, Wallace E. (September 1999), *An Essay on Fiscal Federalism* // *Journal of Economic Literature*, Vol. XXXVII, pp. 1120-1149.
- Obstfeld, M., Peri, G. (1998), *Regional Nonadjustment and Fiscal Policy: Lessons for EMU*.
- Persson T. and G. Tabellini (1996), *Federal Fiscal Constitutions: Risk Sharing and Redistribution* // *Journal of Political Economy*, Vol. 104, p.p. 979–1009.
- Persson, T., Tabellini, G. *Federal Fiscal Constitution: Risk Sharing and Redistribution*.
- Pigou, A.C. (1947), *A study in public finance*, 3rd edn, Macmillan, London
- Prud'homme, R. (1994), *On the Danger of Decentralization*.
- Ramsey F.P. (1927), *A Contribution to the Theory of Taxation* // *Economic Journal*, pp.47-61.
- Rubinfeld, D.L. *Handbook of public economics. Ch.11: "Economics of the Public Sector."*
- Sala-I-Martin, Xavier, Sachs, J. (1991), *Fiscal Federalism and Optimum Currency Areas: Evidence for Europe from the United States*, NBER Working Paper No. 3855.
- Smart, M. (July 22, 1996), *Taxation Incentives and Deadweight Loss in a System of Intergovernmental Transfers* // Working paper #UT-ECIPA-MSMART-96-03, Department of Economics, University of Toronto.
- Spahn, Paul B., Föttinger, W. in Teresa Ter-Minassian, ed. "Germany" (1997), *Fiscal Federalism in Theory and Practice*, Washington, D.C.: International Monetary Fund.
- Suits, D.B. (1977), *Measurement of Tax Progressivity*.
- Sunley E.M. (March 1998), *The Design and Administration of Alcohol, Tobacco, and Petroleum Excises: A Guide for Developing and Transition Countries*, IMF Working Paper, Washington, DC: IMF.
- Terra, B.J.M. (1996), *Excises* // *Tax Law Design and Drafting*, Chapter 8., ed. Victor Thuronyi, Washington: IMF.
- von Hagen (1992), *Fiscal Arrangements in a Monetary Union – Some Evidence from the US*.
- von Hagen, U., Hepp, R. (2000), *Regional risk sharing and redistribution in German Federation*.
- Zavakili, S. (1991), *Redistribution through Taxation: An International Comparison*.
- Zavakili, S. (1992), *The Distributional Implications of the Tax Changes in the 1980's*.

Zumer, F. (Avril 1998), '*Stabilisation et redistribution budgétaires entre régions: Etat centralisé, Etat fédéral*'//Revue de l'OFCE, #65, p.p. 243 – 289.