

## Estimation of fiscal capacity of the subjects of Russian Federation

### Introduction

One of the important tasks of reforming the interbudgetary relations in the Russian Federation is to improve the efficiency of the system of federal financial assistance to the budgets of the Federation's subjects. In this area, the most important role among the general trends of the improvement of this system belongs to implementing the principles of objectivity in the calculations of financial assistance, as well as the stimulating character of financial assistance. To achieve these goals it is necessary to calculate the actual volume of financial assistance to the regions on the basis of the estimates of potential tax revenues and standard consumption requirements, because the use of actual (reported) estimates may create negative stimuli for the regional authorities in terms of unjustified lowering of the tax rates and overstating the regional budget expenditures<sup>1</sup>. Considering the above circumstances, it should be noted that the methodology of estimating the Federation's subjects' potential tax revenues (gross fiscal resources) currently applied by the Ministry of Finance in its calculations of financial assistance does not meet some of the usual requirements to such calculations<sup>2</sup>. Firstly, the currently utilized form of the relationship between the fiscal capacity and the main factors (the methodology utilizes the system of forecasting the regions' fiscal capacities as fixed shares of the regions' withdrawal of taxes in gross regional product) does not seem well-grounded. Secondly, the complex system of various indices and adjustments to the obtained fiscal capacity values results in an unnecessarily complicated methodology, and also decreases the transparency and verifiability of the assessment methods applied.

On the other hand, it should be noted that the multitude of the regions within Russia, as well as the high region-to-region differences in their natural, climatic, and socio-economic conditions, and in the final analysis, in their fiscal capacities, renders impossible any assessment of the regional fiscal capacities by any comparatively simple methods.

For this reason, the main purpose of the present study is to carry out an overview and a comparative analysis of the different methods that can be applied in the evaluation of the fiscal capacities of sub-national administrative-territorial entities in a state with a multi-layer budgetary and taxation system, to calculate the fiscal capacities of the Russian Federation's subjects by the methods of econometric modelling, to compare the resulting estimates of the fiscal capacities of Russian regions by means of different methods, as well as to develop proposals on the improvement of the existing mechanisms for assessing regional fiscal capacities and expenditure requirements.

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<sup>1</sup> For more details concerning the role played by the principles of the distribution of financial assistance in the fiscal and budget-related decisions on the part of the authorities receiving the transfers, see P. Kadochnikov, S. Sinelnikov, I. Trunin, E. Shkrebel, "Otzenka effekta federal'noi pomoshchi na fiskal'noe povedenie organov vlasti sub'ektov Rossiiskoi Federatzii" ("An appraisal of the effect of federal financial support on the fiscal behavior of the authorities of the Russian Federation 's subjects" ), Moscow; CEPRA, 2001.

<sup>2</sup> For more detail concerning the development and the present state of the system of distribution of the federal financial assistance furnished to the regions, see I. Trunin, "Istoriia razvitiia biudzhethnoi sistemy i mezhbiudzhethnykh otnoshenii v Rossii" (A history of the development of the budgetary system and interbudgetary relations in Russia // Interbudgetary relations) // *Mezhbiudzhethnye otnosheniia*. Vol. I. Moscow, 2001.

### **An overview of the theoretical approaches to the assessment of the fiscal capacities of sub-national administrative-territorial entities**

In a state with a multi-level structure of the budgetary system a problem inevitably arises, that of providing equal opportunities for sub-national administrative-territorial entities in their access to government services. One of the methods to solve this problem would be to redistribute a part of the resources transferred to the federal (national) budget from the sub-national administrative-territorial entities in the form of tax payments, thus providing financial assistance to the budgets of lower levels. For this financial support to be of an objective character and to stimulate the efforts of the recipient administrations aimed at mobilizing their budget revenues, it is necessary to calculate the base for defining the scope of the financial support to be provided to the sub-national administrations on the basis of the indices of their fiscal, or tax, capacity. In the literature on fiscal federalism, two main approaches to calculating fiscal capacity are usually defined: first, an estimation of regional tax capacity on the basis of the representative tax system method (RTS), and second, the method of applying macroeconomic indices for the purpose of assessing the potential of sub-national administrations for mobilizing the tax revenues within their own budgets.

Before considering the various methods of fiscal capacity evaluation, it should be noted that the understanding of fiscal capacity depends on the method of its assessment. At the same time, when formulating the notion of the budgetary fiscal capacity of an administrative-territorial entity, it should be taken into account that in terms of the task in question the fiscal capacity indices are used for interbudgetary equalization, i.e. for granting to the administrations of sub-national administrative-territorial entities (regions) equal opportunities for providing government services on their respective territories. Therefore the results of assessing the fiscal capacity of each region should reflect the ability of regional taxpayers to finance the provision of government services within the region in question, on the condition that the taxation rules (tax rates and tax exemptions) are similar for all administrative-territorial entities. An efficient system of interbudgetary equalization must be constructed in such a way that if this ability turns out to be lower than a certain criterion set by the federal center, then the region in question has the right to receive federal assistance, and the volume of this assistance can be defined under these conditions not only by the magnitude of the region's fiscal capacity but also by the level of expenditure requirements of the regional administration.

Now we are going to consider the different methods applied in the countries with multi-layer budgetary structures for estimating the fiscal capacities of sub-national administrations. The first (and the simplest) of the methods under study is the representative tax system method which consists in predicting (or estimating) potential tax revenues within a region's budget by applying standard (or average for the country in question) tax rates to the respective tax bases<sup>3</sup>. The data on the size of the region's tax base are supplied by the government taxation bodies. The results of the assessment obtained by this method represent the volume of potential tax revenues that would have been received by the region if it had been utilizing on its territory a typical (representative) tax system. Here the fiscal capacity can be estimated

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<sup>3</sup> It should be noted that in the matters concerning the potential of taxation, the term "tax rate" must be considered not only from the standpoint of legislation but also from that of the economy - as a relationship between the tax receipts and the tax base. Such an interpretation of the tax rate will enable the regional authorities to change the level of tax rates even in those cases when from the formal point of view the law does not permit it; to this end, they can resort to granting tax rebates, tax deferrals, permissions to accrue tax liabilities, etc.

separately on each of the tax revenue items in accordance with the respective tax base and the average tax rate. Thus, the representative taxation system method is based on the assessment of the regional administration's ability to ensure the payment of the required taxes to the budget charged to the tax base as declared by the taxpayers and revealed by the taxation bodies.

The second method of calculating regional fiscal capacity is based on an *indirect assessment of potential tax liabilities* of the region's taxpayers, providing the regional administration is making taxation efforts average for the country in question. This calculation is made by means of utilizing for the assessment of the tax base, as regards the taxes paid to the budget of a sub-national administrative-territorial entity, one or several macroeconomic indices characterizing the ultimate income of the region. In other words, the assessment of the fiscal capacity by this method is based on the principle that the sources of all the tax payments, no matter which tax base is utilized, in the final analysis are represented by the taxpayers' incomes, so the tax base in this region, in the wider meaning of this term (i.e. for the cumulative regional taxes or the taxes paid to the regional budgets) is represented by the cumulative regional income - whether the taxes on the income are paid at the moment of its receipt (the profits and income taxes) or its utilization (the sales taxes and excises)<sup>4</sup>. Thus, the method of assessing the fiscal capacity by macroeconomic indices is based, in contrast to the representative tax system method, on the estimation of the regional administration's ability to mobilize the tax revenues, judging by the ability of taxpayers to pay certain taxes calculated by the average share of tax payments in the ultimate income obtained on the territories of sub-national administrative-territorial entities.

The procedure of assessing regional fiscal capacity by utilizing the representative tax system method is further subdivided into several methods that differ by the applied approaches to the assessment of the tax base in a certain region. Among these, the "statutory" and the "broader" approaches should be singled out. The former approach is based on a presumption that it is possible to obtain from the taxation bodies the data necessary for the calculation of the indices constituting the tax base as regards all the taxes imposed on the region's territory or paid to the regional budget. When assessing the fiscal capacity by utilizing the latter approach of the representative tax system method, indirect tax base estimates are calculated because in some cases it is impossible to directly estimate the tax base<sup>5</sup>. The experience of the countries with multi-level budgetary systems utilizing the representative tax system method for fiscal capacity assessment shows that any improvement of this method results in applying predominantly indirect methods of calculating the tax base for the purposes of estimating the territories' fiscal capacities<sup>6</sup>.

It should be noted that when indirect estimates are utilized the representative tax system method essentially resembles the macroeconomic indices method; however there remains the following difference between the two methods: when the macroeconomic indices method is applied, the modeling of potential tax revenues is carried out without taking into

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<sup>4</sup> See Barro (1984), p. 8.

<sup>5</sup> The difficulty of a direct calculation of the tax base can be exemplified by the assessment of potential receipts of payments for the use of natural resources. It can be suggested that the taxable basis of such payments is the economic rent obtained through the use of natural resources which is to be assessed as the tax base. It is evident that neither the laws nor the reports from the taxation bodies acting in compliance with the former contain any data regarding the economic rent which makes it necessary to assess it indirectly. Similar considerations are also valid in respect to the property tax base.

<sup>6</sup> See *The Representative Tax System (1999)*

consideration the peculiarities of the tax bases or individual tax rates, whereas the representative tax system method proceeds from the necessity of a most accurate calculation of the tax base of each of the main budget-forming tax sources and takes into account the corresponding peculiarities associated with the tax payments and tax rates in question.

On the other hand, there exists a certain arbitrariness in the differentiation between these two methods: if the calculation of the fiscal capacity by the representative tax system method is based on fiscal capacity modelling by applying the rules for calculating the tax base with gradual aggregation of those indices that characterise the tax base when the switch-over to the indirect estimation of potential tax liabilities is made, the estimation by applying macroeconomic indices, on the contrary, is based on utilising a single macroeconomic index as that characterising the base for all the taxes in a given region, with gradual desegregation of the characteristic utilised, with taking into account the rules for imposing each of the taxes, in case the results of the estimation based on an aggregate index are unsatisfactory.

Below we are going to consider the advantages and limitations of all the discussed methods of estimating regional fiscal capacities from the point of view of different criteria of the efficacy of their utilisation.

**Independence from the fiscal policy of the federal authorities.** It is necessary to note that the efficacy and the productiveness of any concept of measuring the fiscal capacity from the standpoint of the goals of interbudgetary equalisation depends on the ability of the chosen methodology for estimating the regional fiscal capacity to measure the region's ability to mobilise its tax revenues, without taking into account the actual of a particular decision on the taxation policy within this particular region choice on the part of the regional administration (i.e. without taking into consideration the actual fiscal efforts of the regional administration). On the other hand, when calculating the fiscal capacity indices the choice of the private sector must not be taken into account, i.e. the results of the estimation of the regional fiscal capacity must be independent of the region's consumption pattern and the composition of investments, as well as from the preferences of the region's economic agents.

The dependence of the fiscal capacity estimation on the fiscal choice made by the regional administration and by the economic agents has been known as "feedback effect". This effect is usually considered to be present in cases when the tax base indices or other factors utilized in the estimation of fiscal capacity, in their turn, are dependent upon the choice of the regional administration or other economic agents.<sup>7</sup> Elimination of the feedback effect is one of the most important goals in the development of the methods of fiscal capacity estimation, so we are going to find out which factors can produce this effect when each of the different methods for estimating the fiscal capacity is applied.

*The private/government sector ratio in the economy.* Suppose there exist two similar regions - A and B. Region A will make the decision to increase the government sector share in its economy (and correspondingly increase the tax rates in order to increase the revenues in the regional budget). The result of this decision when assessed by the representative tax system method for this region will be represented by a decrease in the estimated fiscal capacity in accordance with the growing share of the government sector, as compared to Region B. At the same time, the total regional economic activity level, and consequently the region's fiscal capacity, have remained unchanged. This lower result of the estimation of the fiscal capacity of Region A when the representative taxation system method is applied is achieved because, according to this method, only the taxable activity of the private sector is taken into account, whose share in Region A decreases, as far as the share of the government sector grows.. At the same time the calculated results, if the method of assessing the fiscal

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<sup>7</sup> See Barro (1986), p.79

capacity is truly efficient, should not depend on the regional administration's choice, including that concerning the size of the region's government sector.

As one can see in this example, the assessment of a region's fiscal capacity by the representative taxation system method to a certain degree depends on the sub-national administration's choice, including its preferences as regards the relative shares of the private and the government sectors in the regional economy. The utilization in the fiscal capacity assessment of a certain macroeconomic index that includes the data on the size of both the private and the government sectors of the economy results in a considerably smaller dependence of the final estimates on the decisions made by the regional administration as regards changing the shares of the private and the government sectors in the region's economy (one example of such an index is that of the gross regional product).

*The change in the private sector's consumption pattern.* In the majority of states with multi-level budgetary systems the taxation powers of sub-national administrations and the tax revenues of sub-national budgets involve several kinds of taxes with different rates and tax bases. In this case (i.e. if the fiscal capacity is assessed by utilising data on several tax bases, and the tax rates differ depending on a particular tax base) the changes in the structure of the aggregate tax base (i.e. the ratios of the sizes of the tax bases for several taxes for which the potential revenues are calculated) may influence the assessment of the fiscal capacity by means of the representative taxation system method.

As an example, a situation can be described when an increased taxation level (tax rates) imposed on the sales of alcoholic beverages in Region A result is a corresponding decrease in the consumption of alcohol expressed in terms of value is compensated by a growth in the sales of tobacco products. If the assessment of the fiscal capacity by the representative tax system method utilises different standard tax rates for alcohol and tobacco products, the result of such an assessment will be represented by a certain change in the size of the fiscal potential of Region A, as compared to Region B where the taxation level has not been changed. Thus, the assessment of the fiscal capacity by the representative tax system method can also be influenced by the fiscal choice made by the regional administration.

It is important to note that a change in the fiscal capacity assessed by the representative tax system method can take place in an absence of any changes either in the budgetary restrictions imposed by the regional administration or in the potential ability of the regional taxpayers to pay taxes. On the other hand, when the macroeconomic indices method is applied for the assessment of fiscal capacity, the changes in the consumption pattern (and the tax rates) do not influence the resulting final estimates (provided the total consumption level remains constant), because the calculations take into account only the aggregate consumption data.<sup>8</sup> In other words, if the tax rates imposed on the consumption of tobacco and alcohol products differ, and in Region A 100% of the consumption pattern is represented by tobacco products, while in Region B - by alcohol products, a situation may emerge when, depending on the consumption value ratio between the two regions, the fiscal capacity estimates based on the indices representing the region's consumption volume will be similar in both regions. In this case, such a situation can be regarded as a shortcoming of the method applied, because the estimated results should not depend on the choice as regards consumption made by the economic agents.

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<sup>8</sup> It should be noted that it is impossible to completely avoid the effect of the influence of indirect taxes on the assessment of the potential of taxation. Thus, the index of the gross regional product depends on the value of indirect taxes which are reflected in the composition of market prices.

*A change in the total economic activity level.* As it is known, the level of the imposed tax rates can make its impact on the total economic activity level in a region through influencing the tax base size, depending on the elasticity of the demand for a particular product or service with a certain price. It would be logical to assume that such changes will influence the results of the assessment of the fiscal capacity resulting from applying all the methods under consideration. However it should be noted that the reaction to these changes of the estimation based on macroeconomic indices will be lower than in the case of applying the representative tax system method, because the base for constructing macroeconomic indices will involve a much broader range of data than that encompassed by the tax base. Ideally, the degree of the dependence of the macroeconomic estimation of the fiscal capacity on the fiscal choice will be proportional to the influence exerted by the fiscal choice on the total economic activity level.

*Capitalization of taxes in asset prices.* This mechanism of the "feedback effect" is produced by the influence of differential taxation on the market asset price. Let us once again consider two identical regions A and B. An increased property tax rate in Region A will result in a lower market value of assets in this region, as compared to Region B, to the same degree in which the property taxes are capitalised in the price of these assets. As a result, if the representative tax system utilises the market value of assets as the base for the property tax, the fiscal capacity assessment for Region A calculated in accordance with this method will be decreasing along with the increasing property tax rates.

In contrast to the assessment by the representative tax system method, the fiscal capacity assessment on the basis of macroeconomic indices will adjust the cost of property to the capitalization of tax only to the degree in which the capitalised tax value influences the size of the imputed rent. For this reason, the influence of the property tax rates on the total estimate of the potential revenues generated by this particular tax as assessed by the macroeconomic indices will be weaker than in the case of the representative tax system model, because the weight of the imputed rent in the basic indices utilised in the assessment according to the former method is not very high.

*The changes in the spatial arrangement of the economic activity.* The differences in the fiscal policy of the regional administration also can influence the interregional location of the economic activity. For example, if Regions A and B are identical, then in case of increasing corporate income rates in Region A the enterprises located on its territory may decide to move their activity to the territory of Region B. A similar influence on the location of the economic activity can be exerted by the policy of the regional administration as regards the property taxes and the sales taxes. In any case, the highly mobile economic activity which potentially could be located in a region with a high taxation level in practice moves to regions with more benevolent tax situation. Such distortions in the territorial arrangement of the economic activity influence the fiscal capacity assessment carried out by any methods.

When analysing the possibility for creating the "feedback effect", it is necessary to note that all the mechanisms of this effect described above become active when the fiscal capacity is assessed by the representative tax system method. In fact, the size of the tax base depends on the tax rates, and consequently the results calculated by this method whose main component is the tax base assessment cannot avoid the influence of the regional administration's fiscal policy. On the other hand, all the mechanisms under study become active, though to a smaller degree, also in the case when the fiscal capacity is assessed by the

macroeconomic indices<sup>9</sup>. The smaller influence of the fiscal choice on the fiscal capacity assessment by analysing the macroeconomic indices can be explained by two causes: firstly, this approach does not involve an analysis of the regional administration's actual taxation policy and focuses on the basic sources of tax revenues, and consequently of the fiscal capacity, and secondly, the broader base for the macroeconomic data calculations reduces the influence of the "feedback effect" on the final estimates. On the other hand, when the fiscal capacity is assessed by the representative tax system method the results of the calculated potential revenues generated by each tax are represented as aggregate values. This aggregation can decrease the influence of the deviations that occur in the calculation process on the resulting index, because the antidromous errors in the calculations of each tax in this case are thus eliminated.

**The registration of aggregate regional income.** One of the criteria of the efficacy of the fiscal capacity assessment is the completeness of the utilised data on the economic agents' incomes in a region, which, as it was already mentioned earlier, represent an ultimate tax base for all taxes. From this point of view, the expediency of the macroeconomic indices method is supported by its capability of a more comprehensive registration of the aggregate income of the region's economic agents, as compared to the assessment by the representative tax system method. Indeed, if the macroeconomic indices method is based on the gross regional product, the indirect assessment of the aggregate tax base is provided by the most complete database on the aggregate regional income among those available. At the same time, the representative tax system modelling based on an analysis of the legislatively defined tax base, cannot register all the existing sources of the regional income<sup>10</sup>. In particular, the methods applied in most countries of the world for calculating the statistical gross product indices involve also a certain assessment of the "shadow" economic activity on a region's territory.

However, the macroeconomic indices might not be able to register all the components of the regional income. Thus, if the calculations utilize the gross domestic product index that includes only the income obtained within a region, then the resulting fiscal capacity assessment will not be able to register the income obtained by the region's residents outside its territory. On the other hand, the regional product index similar to the gross national product index (when the incomes of the region's residents are registered) does not include the incomes obtained on the region's territory by non-residents which results in corresponding distortions in the fiscal capacity assessment.

**Creating stimuli for the regional administration.** When analyzing the approaches to the fiscal capacity assessment, one should take into account the previously considered prerequisite that the calculated fiscal capacity values are to be utilized for defining the volume of the interbudgetary equalization transfers to the regions. In this connection the corresponding methods of both fiscal capacity assessment and distribution of financial support may create stimuli for the regional administrations to choose certain strategies of behavior as regards taxation levels and budgetary expenditures. In the literature on the problems of fiscal capacity assessment, three types of stimuli are defined: the stimuli associated with tax rates, those associated with influencing tax bases, and those associated with moral hazard strategy<sup>11</sup>. The volume of the financial assistance provided to the region according to an

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<sup>9</sup> Barro (1986) notes that the only effect manifesting itself in the assessment of the potential of taxation carried out on the basis of macroeconomic indices is the one of "feedback" caused by the distortions in- the territorial arrangement of the economic activity.

<sup>10</sup> See Courchene (1984a)

<sup>11</sup> For details see Courchene (1984b), Bird and Slack (1990), Smart (1998)

efficient interbudgetary equalization system should not depend on any changes of the regional tax rates introduced within a certain region. However, if a considerable part of the tax base is concentrated inside a region, and the weight of this particular region in the final value of the standard (average) tax rate utilized for fiscal capacity assessment is high, this region than has the stimuli for decreasing its own tax rates, in order to influence the country's average index utilized to calculate the fiscal capacity and, consequently, the volume of the allocated financial support. On the other hand, an efficiently organized system of interbudgetary transfers must take into account any increases of the tax bases in the regions (through corresponding decreases in the volume of financial assistance) which might create negative stimuli for developing their own tax bases. The moral hazards associated with the possible choice of a regional administration as regards the method of fiscal capacity assessment may reveal themselves in different ways: for example, the regional administration may impose high taxes on those goods the demand for which has a pronounced price elasticity, in order to maximize its total incomes, considering the transfers (when high tax rates are imposed on the goods with highly price-elastic demand, the tax base becomes smaller which results in a decreased fiscal capacity as assessed by the RTS method, which in its turn leads to an increase in the financial assistance allocated to the region). Besides, the regional administration may influence the tax base values represented in statistical and tax reports through manipulating the registration and reporting rules applied at government and municipal enterprises, in order to underreport the fiscal capacity.

The degree of the influence of the fiscal capacity assessment method on the regional administration's behavior depends, among other things, also on how detailed the indices utilized are. If the regional administrations see that by making particular decisions they are able to directly influence the magnitude of the values utilized in the calculations of their fiscal capacity (and consequently, the volume of financial to be rendered), the intensity of the negative stimuli increases. Thus, the analysis of macroeconomic indices calculated by aggregating the data on the regional economy lowers the risk of creating stimuli influencing the choice of a particular strategy on the part of the regional administrations whose goal is to attract a maximum of financial support from the federal (national) budget.

**Interregional export of the tax burden.** Tax burden export is defined in the literature as direct or indirect taxation imposed on non-residents of a particular region. Here, the method of assessing fiscal capacity should be based on the index of the aggregate income obtained on the region's territory. In other words, the resulting value of the regional fiscal capacity must take into account the opportunities of the regional administration as regards tax burden export, because the taxes paid by non-residents participate in the formation of the budgetary restriction on the part of the regional administration (and pertaining to their own budget revenues).

Tax burden export can be carried out by two principal methods. Firstly, the regional administration can impose its own taxes whose sum is equal to the tax credit on federal (national) taxes. Secondly, taxation in the regions can be imposed on the economic activity associated with interregional transactions or with the participation of enterprises - residents of other regions. In the first instance the burden is transferred to the federal (national) budget, in the second - to the economic agents from other regions. The application of the first variant is impossible under the Russian conditions, because in Russia there is no practice of deductible taxes in an obvious form<sup>12</sup>, therefore we are going to consider the second method of tax

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<sup>12</sup> It should be noted that such a phenomenon as the deduction of one tax from another does exist if only in a disguised form; thus, the rising of turnover taxes (such as the highway tax, the housing maintenance and social amenities tax) as carried out by the territorial authorities results in the shrinking of the base of the federal profits



burden export<sup>13</sup>. One example of the second method is represented by the taxation on the goods realized to non-residents, imposing taxes on the incomes paid to non-residents, taxation of the property belonging to non-residents. More complex instances of interregional tax burden export are the taxes imposed on the enterprises whose products are realized, among other customers, to non-residents. An especially typical example of this latter instance is represented by the regional taxes on the use on natural resources where the lion's share of the tax burden is transferred to non-residents.

It should be noted that none of the methods for assessing the fiscal capacity can ensure registration of the entire scope of the tax burden export when generating the final results. Nevertheless it can be stated that the assessment utilizing the representative tax system method is capable of registering this export to a greater degree, because the calculation of the tax base utilizes the data of tax reports which allow to specify the exported tax burden within the total tax sum. For example, tax burden export is registered in the methodology of assessing the fiscal capacity utilizing such indices as realization of goods and services to non-residents, the information on the property belonging to non-residents of other regions, the information on the profits distributed among shareholders - residents of other regions, as well as the information of the taxable income of non-residents obtained in a particular region.

The registration of the tax burden export in the fiscal capacity indices should be based on the results of the assessment of the scope of this export on the whole in the national economy, because when the volumes of the tax burden export are relatively small the corresponding error in the calculations carried out in accordance with any of the method of the fiscal capacity assessment may turn out to be negligibly small. For example, the estimates of the interregional tax burden export volumes calculated for the USA (financial year 1980-81) demonstrate that the average level of this export constitutes 9.3% of regional and local taxes (the share of the exported taxes in the country varied between 5% and 25%)<sup>14</sup>.

**The interrelation of the tax bases.** When the fiscal capacity is estimated by the representative tax system method, the tax revenues are modeled for each of the taxes paid to the regional budgets. It is presumed that any region is capable of collecting a particular tax at an average rate, and the only variable influencing the region's fiscal capacity level is the magnitude of the regional tax base. Here it is not taken into account that, for example, the tax base of the personal income tax is meaningful not only as regards the budget revenues generated by this particular tax but also as regards other taxes and levies. In the instance when the population of Region A has a higher income than the population of Region B, the budget of Region A will be characterized by a higher level of the revenues generated not only by the personal income tax but also by the property taxes, sales taxes, excises and other taxes paid by individuals. Thus, the traditional representative tax system method does not take into account the fact that the potential income generated by a particular tax represents also a function of the tax base for other taxes.

It should be noted that neither of the methods of the fiscal capacity assessment registers the interdependence of the tax rates imposed in different regions. If, for example, the administration of one region has decided to impose low rates of the sales tax or abolish this tax altogether, the administration of a neighboring region whose entire territory directly borders on the region with a favorable tax regime will be forced to maintain the sales tax rate

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tax, though it must be admitted that the use of such methods is becoming increasingly restricted due to the recently adopted policy of gradual abolishing of turnover taxes.

<sup>13</sup> See *Barro (1984)*

<sup>14</sup> See *Barro (1984)*, *Comson and Navratil (1997)*

at a sufficiently low level, so as not to create the stimuli for the population to make their purchases in the neighboring region.

**The dependence on the consumers' preferences.** When the share of the sales taxes and excises in the aggregate sources of the regional budgets' revenues is considerable, utilizing the corresponding tax base values for fiscal capacity assessment may result in a dependence of the resulting estimates on consumers' preferences. If, for example, the consumption patterns in two regions with similar levels are such that the population in Region 1 consumes a larger quantity (expressed as value) of taxable goods, the fiscal capacity assessment for this region will also be higher than for Region 2 with a similar income level. A more general distortion associated with the representative tax system method applied for assessing the fiscal capacity of a region whose tax system is characterized by a predominance of consumption taxes is represented by a dependence of the assessed fiscal capacity values on income distribution between consumption and savings: in a region with a larger share of savings the fiscal capacity will be lower, despite the fact that the actual capability of paying for government services (to effect tax payments) is equal for both regions.

As a summary to our comparative analysis of the main methods for assessing fiscal capacity it should be noted that despite the necessity to eliminate the limitations of the methods of assessing the regional fiscal capacity discussed above, the interbudgetary equalization procedures remain one of the most important preconditions for efficient functioning of the system of interbudgetary relations.

Canada's experience in applying the representative tax system method indicates that due to numerous innovations introduced, the methodology aimed at assessing the fiscal capacity of the subjects of the Canadian Federation has evolved into a complex sequence of calculations which are rather difficult to evaluate as to how accurately they reflect the interregional differentiation of the fiscal capacity.<sup>15</sup> Similar situation is emerging in Russia where the desire to refine the valuation methods concerning the fiscal capacity has resulted in the development of a complex methodology for its assessment. Bearing in mind the drawbacks of the existing statistics, the efficiency of such a methodology is open to doubt.

Next to be assessed in the present work is the fiscal capacity of the Russian Federation's subjects to be carried out in accordance with the two methods described above. It should be noted that the pure form of the representative tax system method cannot be used for the assessment of the fiscal capacity of Russian regions because of the insufficiency and unreliability of the statistical data available on the size of the tax base in the regions. The application of assessment methods based on purely macroeconomic indices for the whole volume of the tax payments flowing into the budgets of the Federation's subjects can also be considered rather inefficient due to the high degree of interregional differentiation of the structure of tax receipts, the intricacy of the Russian tax system, and the deficiency of tax reporting in Russia.

The assessment of the regions' fiscal capacity on the basis of gross regional product

The gross added value produced in a region represents an index of incomes best characterizing in the aggregate form the economic activity level in the region. Let us consider several variants of the fiscal capacity assessment on the basis of this index.

In this case, the simplest assessment can be represented by the average tax load imposed on the product:

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<sup>15</sup> See The Representative Tax System (1999).

$$\tau = \frac{\sum_i TA_i}{\sum_i Y_i}, \quad (1)$$

where

$\tau$  – the average (effective) tax rate for added value on the average in the country;

$TA_i$  – the sum of tax liabilities of the i-region (tax receipts plus the increase in arrears);

$Y_i$  – the gross regional product of the i-region.

Herein the term "tax liabilities" will mean the totality of the actual tax revenues of the region and the increase in accumulated debts to the budget (arrears and deferred payments). This index characterizing the calculated taxes imposed on the region's enterprises tax liabilities). The present work contains an assessment of the fiscal capacity regarding the calculated taxes as distinct from the paid (collected) ones. Thus it becomes possible not to take account of the difference between the efforts exerted by the regions in order to collect taxes and to level off the difference between the tax rates. In any case, the assessments of both the tax liabilities and the collected taxes will differ only in the (average) share of indebtedness from region to region. In both cases, the efforts at tax collecting are levelled off. But in case of application of actual tax collection, the unexplained dispersion will increase by the amount of the difference between the tax efforts as regards the collected taxes which will influence the accuracy of the assessment of the coefficients. Table 1 shows the average rates of tax load by the types of budgets; the rates are calculated in accordance with (1).

**Table 1. The shares of aggregate tax payments and the increase in indebtedness and tax liabilities (calculated taxes) in % of GRP (the sum<sup>16</sup> by the regions), 1999.**

Уровень бюджета	Налоговые доходы	Прирост задолженности	Начисленные налоги
Консолидированный бюджет РФ	21,2%	2,9%	24,1%
Федеральный бюджет РФ	8,7%	2,1%	10,8%
Территориальные (консолидированные) бюджеты РФ	12,6%	0,8%	13,3%

<u>Budget level</u>	<u>Tax receipts</u>	<u>Increase in indebtedness</u>	<u>Calculated taxes</u>
<u>Consolidated budget of RF</u>	<u>21.2%</u>	<u>2.9%</u>	<u>24.1%</u>
<u>Federal budget of RF</u>	<u>8.7%</u>	<u>2.1%</u>	<u>10.8%</u>
<u>Territorial (consolidated) budgets of RF</u>	<u>12.6%</u>	<u>0.8%</u>	<u>13.3%</u>

<sup>16</sup> The gross volume of regional production is smaller than the GDP which increases the share of taxes with respect to the gross value (for example, in the year 1999 the share of actual tax receipts of the consolidated "budget amounted to 19.5 per cent of the GDP).

Source: the Ministry of Taxation and Levies, the State Statistics Committee, authors' calculations.

Budget level — Tax receipts — Increase in indebtedness — Calculated taxes  
Consolidated budget of RF  
Federal budget of RF  
Territorial (consolidated) budgets of RF

Thus, the assessment of the fiscal capacity can be presented as follows:

$$TA_i^* = \tau \cdot Y_i \quad (1.2)$$

where

$TA_i^*$  – the assessment of tax liabilities of the i-region (tax receipts plus the increase in indebtedness).

Insofar as for the consolidated budget  $\tau = 0.241$  (see Table 1), the assessment of the fiscal capacity will be as follows:

$$TA_i^* = 0.241 \cdot Y_i \quad (1.3)$$

The assessment of the fiscal capacity of the regions on the basis of the model (1.3) is presented in Table 1, Supplement 2..

It should be noted that the use of such an assessment implies an involvement of certain preconditions. Firstly, it is assumed that the tax load per one unit of added value is constant for all the industries. Also, this assessment puts the regions in unequal conditions because it is scale-sensitive. In other words, the largest (in terms of economic performance) region is included into this assessment as having a larger weight. The advantage of this method consists in the fact that the composite absolute error of the forecast will be equal to zero, i.e. the sums of the assessments on the regional scale will be equal to the actual tax receipts. It can be convenient in terms of budget planning, but it should be taken into account that the quality of the assessment (the standard error) of the fiscal capacity will differ from region to region. For large regions the assessment will be more accurate than for small ones. This may be unacceptable in case of an assessment of the fiscal capacity aimed at levelling off the differences.

Thus, for example, if we compare the assessments obtained in such a manner for the Republics of Tatarstan and Dagestan where the difference in the GRP volume is almost 10-fold, and the share of (calculated) taxes in the GRP is equal to 21% and 8%, respectively, the assessed values of the fiscal capacity will differ from the actual ones by 14% and 188%, respectively. It happens, among other things, due to the fact that because of this method of assessment, the Republic of Tatarstan had a nearly 10-fold advantage in weight when the average tax load was assessed.

While the differences in the tax burden between small and large regions are determined by objective economic reasons and are to be taken into account in the assessment of the fiscal capacity of the territories, the assessment based on the absolute average rate on the national scale will be biased. It is another matter whether the differences in tax burden between the regions should be regarded as economically predetermined.

The answer could be looked for from both the economic and the technical points of view. Below the econometric analysis of the relation between the calculated taxes and the GRP is represented.

#### *The assessment involving the use of regression models*

Figure 1 illustrates the field of correlation between the tax liabilities<sup>17</sup> and the GRP. The experience<sup>18</sup> in the assessment of the relation between tax receipts (tax liabilities) and the GRP indicates that the linear approximation trend of this relationship does not pass through the origin. The presence of a significant constant is assumed in the regression:

$$TA_i = c_0 + c_1 \cdot Y_i + \varepsilon_i, \quad (2.1)$$

where

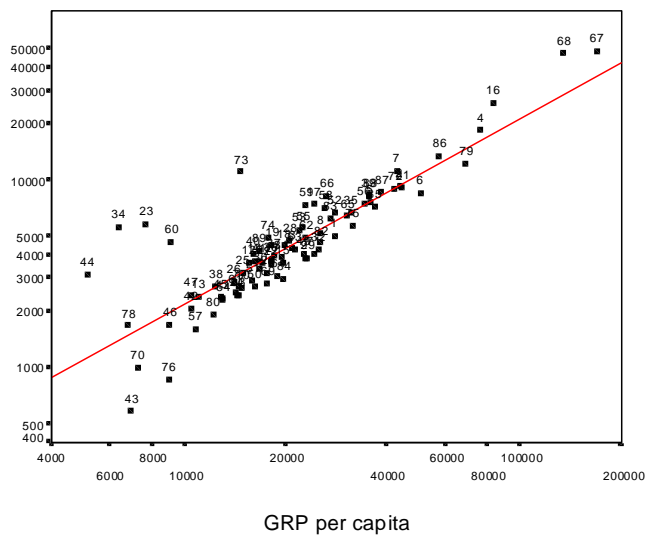
$TA_i$  – the sum of tax liabilities of the i-region (tax receipts plus the increase in indebtedness) per capita;

$Y_i$  – the gross regional product of the i-region (per capita);

$\varepsilon_i$  – error, the unexplained remainder of the regression;

$c_0$  and  $c_1$  – coefficients, the parameters of the regression equation.

The precondition on which the linear model is based is the uniform tax burden per one unit of added value by the regions. This holds true if the structure of tax bases of the economic agents participating in the production of the GRP is the same for all regions, or if the tax rate is the same for all the tax bases included in the GRP.



**Fig 1. The field of correlation (dispersion graph) between the calculated taxes and the GRP (per capita) by the regions in the year 1999**

<sup>17</sup> Hereinafter, all the nominal characteristics of the regions are presented “per capita” for the sake of compatibility.

<sup>18</sup> The relationship between the tax liabilities and the GRP in the years 1996-97 has been examined in our previous works (see S. Batkibekov, P. Kadochnikov, O.Lugovoi, S.Sinelnikov, I.Trunin (2000); P.Kadochnikov, O.Lugovoi, S.Sinelnikov, E.Shkrebela (1999)).

Table 2 lists the results of the assessment of the model (2.1) for the year 1999.

Table 2. The results of the assessment of the model (1) for the year 1999

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
88	0.920	0.919	988.606	0.000
	<b>Coefficients</b>	<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	-1 432.371	327.409	-4.375	0.000
<b>C<sub>1</sub></b>	0.290	0.009	31.442	0.000

The results of the assessment indicate that both parameters of the model have a high statistical significance. Coefficient  $c_1$ , characterizing the effective tax rate of the added value - the share of taxes in the gross regional product - is much higher<sup>19</sup> than the average share of taxes in the GRP on the national scale (see Table 1). Naturally, it is related to the significant negative constant of the assessed model.

Its interpretation can be as follows.

In accordance with the model, if the GRP per capita corresponds to the relation

$$Y_0 = -\frac{c_0}{c_1} = 4939.21 \quad (\text{thou roubles per capita}), \quad (3)$$

the *i*-region has zero tax liabilities. Thus, this value represents a minimum nontaxable level of the GRP. Nevertheless, according to its economic essence the added value cannot be produced without wages and salaries being paid and the profit or income being received, and therefore certain tax liabilities are to emerge. In accordance with the model, in the year 1999 the regions where the GRP per capita was lower than 4.939 thousand roubles have negative tax liabilities. Actually, there were no such regions in Russia in the year 1999. Also it should be noted that the lowest values of the GRP are accompanied by an especially substantial dispersion of the values of calculated taxes which makes it more difficult to reach certain conclusions concerning the true nature of the relationship under study in this interval of values.

It should be noted that the assessment (2.1) given in Table 2 is still sensitive to the size of income. The regions with a larger GRP per capita (as distinct from the assessment given in Table 1 where the absolute value of income was presented) have more "weight" in the assessment. In order to level off the regions in the course of assessment, let us use the weighted least-squares method where the role of the scales is played by the reverse values of the variable under consideration.

$$w_i = Z_i^{-1}, \quad (4)$$

where

$w_i$  – the weight used for the assessment by the weighted least-square method (WOLS/WLS);

$Z_i$  – the explained variable in the regressions.

The results of the assessment of the model (2.1) by the weighted least-square method are given in Table 3. The dispersion graph of the actual and predicted values is given in Figure 2.

<sup>19</sup> The hypothesis that the coefficient  $G, = 0.24$  is argued against at the significance level of 99% (Wald coefficient restriction criteria).

Table 3. The results of the assessment of the model (2.1) by the weighted least-square method (WOLSWS) for the year 1999.

Obs.	R Square	Adjusted R Square	F	Sig.
88	0.839	0.837	447.224	0.000
	Coefficients	Std. Error	t	Sig.
$C_0$	-688.448	237.503	-2.899	0.005
$C_1$	0.245	0.012	21.148	0.000

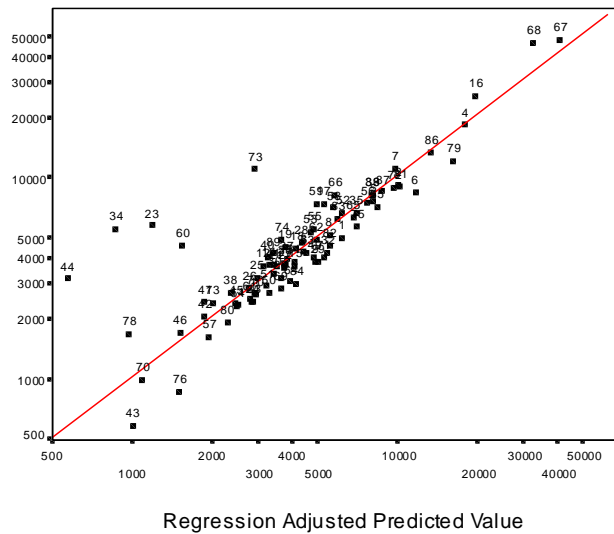


Figure 2. The dispersion graph of the actual and predicted values of the explained variation model (2.1) for the year 1999

As one can see in the table, the angular coefficient ( $C_1$ ) has significantly decreased as compared to its previous assessment. The constant preserves its significance though its absolute value has declined. Now the minimum non-taxable GOT per capita is equal to 2,810 thousand roubles in accordance with the model. The determination coefficient of the model with a weighted assessment has diminished apparently due to the increased weight of the low-income regions in the assessment, which implies greater scattering (see Fig. 2).

The model of the assessment of the fiscal capacity for the year 1999 which is based on the regression relationships (with the equal input in the assessment, on the part of the regions) can be presented as follows:

$$TA_i^* = (-688.448 + 0.245 \cdot Y_i) \cdot N_i \quad (5)$$

where

$TA_i^*$  – the assessment of the fiscal capacity of the i-region (tax receipts plus the increase in indebtedness to the budgetary system of the RF).

Nevertheless, the assessment based on the WOLS method levels off the input into its calculation as on the part of the regions, which is more correct as far as the aims of levelling are concerned.

It should be emphasised that the difference between these methods consists in the choice of the aims for assessment. If the aim is to assess the fiscal capacity of the Russian Federation on the whole, it is necessary to take account of the "weight" shared by the regions in the national income (Models 1.2 and 1.3), otherwise the assessment will be biased. In order to achieve the interbudgetary levelling-off, it is necessary to assess the regions' capacity to obtain income. The composite error on the national scale is less important in this case. More important is the assessment of the capacity of any given region. Therefore the priority in the assessment is the equality of the regions (Model 5). If the focus is places on the overall assessment, it will be more accurate (that is, closer to the fact) for the high-income regions playing the role of natural donors (for which the assessment of their capacity is less important), and less "accurate" (more distant from the fact) for the low-income regions (the recipients of financial aid from the Federal government).

Table 4 clearly illustrates the differences between the typical features of the assessments based on different models.

**Table 4. The comparison of the statistical properties of the models based on the GRP**

	<i>Модель 1.3</i>	<i>Модель 2.1</i>	<i>Модель 5</i>
Ошибка суммарной оценки для России в целом, %	0.0%	-0.5%	-8.2%
Станд. откл. абсолютных ошибок, млн. руб.	5 668	3 556	5 891
Станд. откл. относительных ошибок, %	36.9%	30.1%	27.8%

	<i>Model 1.3</i>	<i>Model 2.1</i>	<i>Model 5</i>
<u>Error of the aggregate assessment for Russia, %</u>	<u>0.0%</u>	<u>-0.5%</u>	<u>-8.2%</u>
<u>Stand. deviation of absolute errors, million roubles</u>	<u>5 668</u>	<u>3 556</u>	<u>5 891</u>
<u>Stand. deviation of relative errors, %</u>	<u>36.9%</u>	<u>30.1%</u>	<u>27.8%</u>

~~Model 5~~  
~~Error of the aggregate assessment for Russia, %~~  
~~Stand. deviation of absolute errors, million roubles~~  
~~Stand. deviation of relative errors, %~~

Thus, the assessment based on the model (1.3) results in an aggregate zero error for Russia on the whole, though the dispersion (the standard error) of relative errors by the regions reaches its maximum. The assessment based on the linear regression model (2.1) results in the minimum dispersion of absolute errors by the regions. The use of the scales (4) in the assessment of the coefficients makes it possible to minimize the relative error and to achieve a minimum dispersion of the relative errors concerning the regions.

#### **The assessment of the fiscal capacity of the Federation's subjects by the representative tax system method**

The application of this method in the Russian Federation is limited due to the absence adequate statistical data on the tax bases. The rates of taxes and benefits differ for various



groups of goods and types of activity. Those among them which are set by the Federal legislation and are not involved in the tax-related efforts of the regions must be taken into account in the assessment of the fiscal capacity. As previously noted, the tax-related efforts of the regions differ within the framework of the authority delegated to the regions in the field of tax rating, as well as by the level of tax collection, and do not depend on the particularities of the structure of the economic activity in any region.

This section comprises an assessment of the fiscal capacity treated separately for a number of major taxes that generated more than 90% of the tax revenues that came into the consolidated budget in 1999. They include the VAT, the profits tax, the income tax on individuals, a number of excises and payments for the use of natural resources, the enterprise assets tax, the housing and social infrastructure maintenance tax<sup>20</sup>, and the sales tax. Other taxes coming into the budgets of all levels were modelled separately as a uniform body. An assessment of the fiscal capacity concerning the off-budget highway fund also took place.

Before turning our attention to the assessment of the fiscal capacity of the subjects of the Russian Federation, let us delineate certain specific features of the methodology used for this purpose. As previously mentioned, the assessment is carried out by the methods of the regression analysis of the data on the tax bases, if these data are provided by the State Statistics Committee of the RP or the RF Ministry of Taxation and Levies, or on their characteristics (macro economic indices which are assumed to be related to the actual base or to determine its size). As a rule, the information provided by the State Statistics Committee is insufficiently disaggregated and therefore cannot be used as a tax base. For example, the profit performance of enterprises and organizations operating in a certain region is an aggregate index containing no information on the structure of the tax base of the profits tax on organizations (i.e. on the objective differences in the order of taxation specified by the Federal legislation). The assessment of the fiscal capacity resulting from the construction of the regression averages both the objective (specified by the Federal legislation) and the subjective differences (tax-related efforts of the territorial authorities) in the tax base. Therefore, the obtained results must not be seen as a rigid assessment of the fiscal capacity by the widened representative tax system method.

Apparently, the increasing distortions in the tax base characteristics used (caused by both the objective and subjective factors) are accompanied by a growing difference between the final assessments of the fiscal capacity on the one hand, and the actual tax receipts (liabilities) on the other. In other words, in terms of the econometric analysis, the constructed models of the regional fiscal capacity will interpret a lesser proportion of the tax liabilities' dispersion. Thus, if not the actual base but only its characteristic is used, the error in the regression interpreted as a deviation of the tax-related efforts from their average value on the national scale will be determined, firstly, by the interregional difference in the tax-related efforts of the territorial authorities, and secondly, by the objective difference between the regional structures of the tax bases:

$$\varepsilon = \delta + \sigma$$

where

$\sigma$  – the error caused by the objective differences of the tax -base structure (e.g. the dispersion over the regions) not taken into account by the applied index characterizing the tax base; if the actual base is being used, then  $\sigma = 0$ ;

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<sup>20</sup> Abolished on January 1, 2001.

$\delta$  – the error caused by the differences (e.g. the dispersion over the regions) in the tax-related efforts of the territorial authorities; if the degree of the taxing power of the regional authorities is low as regards the tax being modelled, then  $\delta = 0$ ;

$\varepsilon$  – the aggregate error caused both by the unaccounted difference in the structure of the tax base (if the characteristic of the tax base is used as a specific index) and the difference in the tax-related efforts of the territorial authorities.

Thus, our aim is to find such characteristics of the tax bases which do not depend on the tax-related efforts of the territorial authorities but do provide the most accurate interpretation of the base; their use must also result in a minimum of error in the value of the objective differences between the tax bases  $\sigma$ . If the process involves the use of some index of the base which does not depend on the tax-related efforts of the territorial authorities, the value  $\delta$  will be exogenous (constant,  $\bar{\delta}$ ) and the aim of constructing the model will amount to minimization of  $\sigma$ , which is equivalent to minimization of  $\varepsilon$ :

$$\min_{\Theta}(\sigma) \equiv \min_{\Theta}(\bar{\delta} + \sigma) = \min_{\Theta}(\varepsilon)$$

where

$\Theta$  – the vector of the parameters.

The advantage of the regression method over the simple averaging of the effective tax rate (the relation between the tax liabilities and the characteristic of the base) in this case consists in the fact that the former method makes it possible to assess how accurately the given index characterizes the base of the given tax. If the percentage (share) of the interpreted dispersion ( $R^2$ ) is large ( $\varepsilon$  assumes small values), it means that the applied index accurately characterizes the base, because  $\sigma \leq \varepsilon$ . Therefore, we can assert that the process of the assessment of the regression models is accompanied by the testing of the hypothesis concerning the possibility to use the given index as a characteristic of the tax base. In this case, the zero-hypothesis suggests that the index used does not characterise the base. The hypothesis is rejected if some statistically significant relationship is found. The absence of such a relationship does not permit to reject the zero-hypothesis. Nevertheless, it does not mean that the given index cannot characterise the base because the absence of an indisputable statistical relationship can be caused by a high degree of interregional differentiation of the tax-related efforts being exerted ( $\delta$  assumes considerable values).

If the creation of the fiscal capacity for some single tax involves the use of several variants of alternative models, the choice between them must be made bearing in mind the foregoing conclusions so as to follow the criterion of the quality of interpretation regarding the actual values, i.e. determination coefficient (when it is assumed that the index is independent of the tax-related efforts, and the value  $\delta$  is constant). As there can be several characteristics of the bases for each of the taxes, and it is not always possible to choose the most appropriate variant proceeding from the purely economic considerations, we used different variants of specification of the models making a choice between them from the point of view of their best interpreting properties.

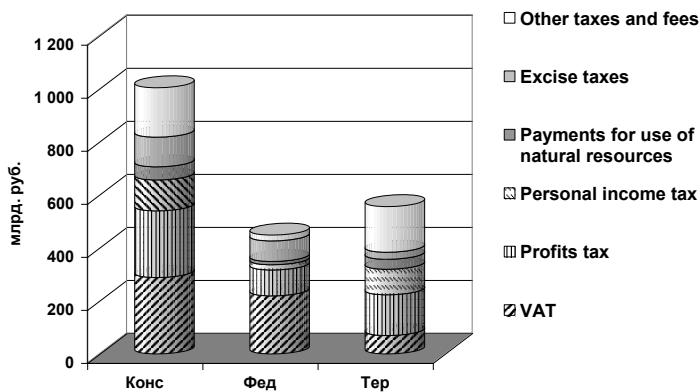
It should be noted that the regression method also makes it possible to take into account the subjective differences in tax collection defined as the differences in the tax-related efforts of the territorial administrations, so as to improve the quality of the assessments. During the transition from the assessment of the models to the assessment of the regional fiscal capacity, these differences can be registered at a certain level. Such methods were applied, for example, in the assessment of the regional expenditure requirements (see the reference to the work on the expenditure requirements). We are not going to use this method

in the assessment of the fiscal capacity because of the difficulties presented by the selection of the correspondent indices characterising the interregional differences in the tax-related efforts ( $\delta$ ) and not characterising the objective differences in the tax bases ( $\sigma$ ).

*The structure of budget tax receipts*

Figure 3 illustrates the structure of the tax revenues received by the budgets (consolidated, federal and regional) in the year 1999. A more detailed structure of the receipts is given in Appendix 1.

More than one half (53%) of all the receipts (calculated) of Russia's consolidated budget for the year 1999 were formed by the revenues relating to two taxes: the VAT and the profits tax. The income tax accounted for 12%, the excises and the payments for the use of resources for 11% and 5%, respectively, and all the other taxes and revenues-fees - for 19%. Eighty-eight per cent of the Federal budget revenues were formed by the VAT payments, the profits taxes and excises. These major Federal taxes constituted only 57% in the territorial budgets in the year 1999, while other taxes - 31%. The taxes completely transferred to the budgets of the subjects of the Russian Federation in the year 1999 included some excises on alcoholic beverages (except for vodka and liquors listed also in the Federal budget), the property taxes (approximately 10% of the territorial budget revenues), the sales tax (approximately 4%), and the local taxes and revenues (approximately 10%) whose major part was formed by the housing and social infrastructure maintenance tax (approximately 9%).



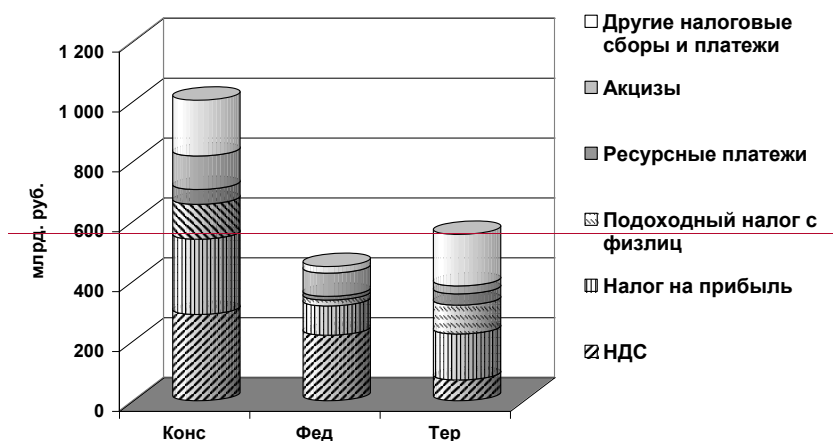


Figure 3. The structure of calculated taxes at the three levels of the budgetary system, 1999

As a whole, the modelled taxes account for approximately 91% of all tax revenues of the RF budgetary system, 96% of the federal budget revenues and 89% of the territorial ones (the year 1999). Other taxes are modelled as an aggregate value.

#### *The value added tax*

In accordance with the Tax Code of the RF, the objects for imposing the value added tax are the trade turnovers of goods, including those of technico-industrial purpose, on the territory of the RF, the work performed and the services rendered. The tax rate is either 10% or 20% according to the category of commodities (the beneficial rate is applied to the majority of food products and some products for children's use). The exported goods and services (except for oil and gas shipped to the CIS countries) have a zero tax rate<sup>21</sup>. There is also a number of tax benefits covering various categories of goods (work, services) and taxpayers.

Thus, in compliance with the law "On the Value Added Tax"<sup>22</sup>, which was effective in the year 1999, the categories exempted from the value added tax (most of these exemptions are preserved in the Tax Code) were as follows:

- items and services of medical purpose;
- a number of financial services;
- passenger services, both inter-city and commuter;
- municipal services and services in the rented housing sector;
- a number of services in the sphere of science and education, research activity and engineering work;
- a number of goods and services in the sphere of culture and the arts;

<sup>21</sup> Having begun as of June 1, 2001, the change-over to the principle of the country of destination is under way in the levying of the VAT.

<sup>22</sup> See the RF "Law on the Value Added Tax" of 06.12.1991 in the edition valid in the year 1999. At the present time, the levying of the VAT is regulated by Chapter 21 of the Tax Code of the effective from January 1, 2001.

- goods and services produced and realized by the disabled-persons organizations;
- realization of precious stones and metals, legal services, realization of science- and education-related printed matter, etc.

Let us consider several indices to obtain a characteristic of this tax.

#### The assessment based on retail turnover<sup>23</sup>

By introducing a number of suggestions primarily concerning the absence of interregional trade in nontaxable goods and services, one could argue that the possible characteristic of the taxable basis for the value added tax on the territory of the Federation's subject can be the magnitude of retail turnover. Firstly, this index reflects the income level of the population and the level of the economic activity in the region. Secondly, it characterizes the ultimate consumption on the part of households, i.e. the taxable basis for the value added tax. This relationship will be most pronounced in the cases when the regional economy is extremely isolated, i.e. the interregional relations are either very limited or nonexistent. Thirdly, the model considers a relatively long period of time allowing for the consumption of intermediate products that have not become the object of retail sales (equipment, materials, investments) to be ultimately incorporated in the price of the final product.

Naturally, these assumptions are rather far-fetched. Besides, such relationship suggests a permanence of the gross product structure (consumption, investments, government expenditures, net exports).

Let us test the hypothesis concerning the relationship between the calculated VAT and the retail turnover. The model to be assessed is as follows:

$$VAT_i = c_0 + c_1 \cdot RT_i + \varepsilon_i, \quad (6.1)$$

where

$VAT_i$  – the value added tax (calculated) in the i-region (per capita);

$RT_i$  – the retail turnover of the i-region (per capita).

**The results of the assessment of the model (6.1) are given in Table 5.**

Table 5. The results of assessment of model 6.1, [WOLSWLS](#), 1999

<i>Obs.</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>F</i>	<i>Sig.</i>
79	0.620	0.615	125.682	0.000
<i>Coefficients</i>		<i>Std. Error</i>	<i>t</i>	<i>Sig.</i>
$C_0$	-110.484	89.141	-1.239	0.219
$C_1$	0.146	0.013	11.211	0.000

The free member in the model is statistically insignificant and thus can be ignored:

$$VAT_i = c_1 \cdot RT_i + \varepsilon_i, \quad (6.2)$$

<sup>23</sup> According to the definition adopted by the State Statistics Committee, the retail turnover means the value of consumer goods spot-sold to the population for the needs of personal consumption or household usage.

Table 6. The results of assessment of model (6.2), [WOLSWLS](#), 1999

Obs.	R Square	Adjusted R Square	F	Sig.
79	0.796	0.793	303.975	0.000
Coefficients		Std. Error	t	Sig.
C <sub>1</sub>	0.133	0.008	17.435	0.000

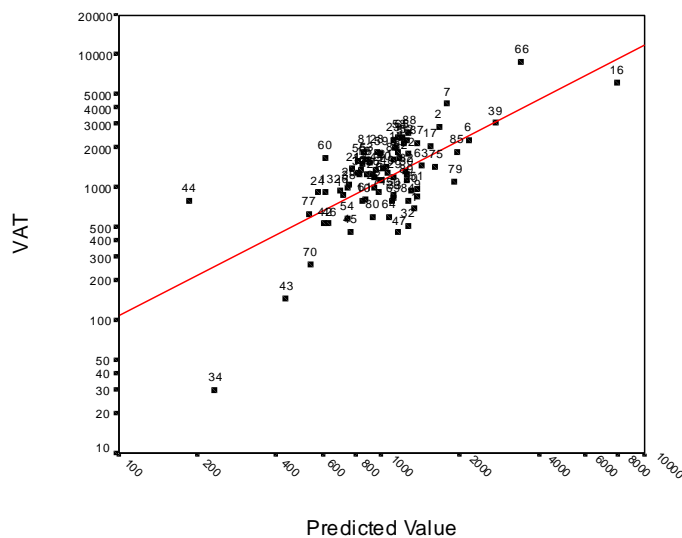


Figure 4. The dispersion graph of actual and predicted values interpreted by variation model (6.2), 1999 г.

As could be expected, according to the assessment, there exists an apparent interrelation between the tax liabilities regarding the VAT and the retail turnover. Nevertheless, the model offers a rather weak interpretation of the tax liabilities of certain regions, including the Republic of Kalmykia (No 34) and the Republic of Ingushetia (No 44). First of all, such deviations can be explained by the special fiscal status of these territories - until recently there existed zones of favorable taxation which resulted in discrepancies between the volume of retail turnover and the VAT receipts.

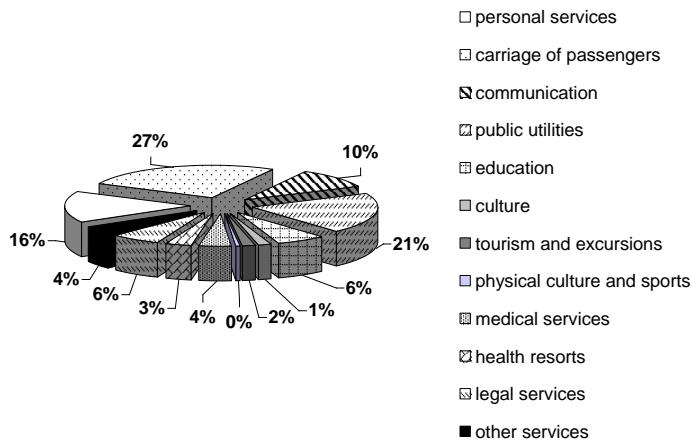
The interpreting properties of the model are rather limited because, among other things, the retail turnover does not reflect the complete range of the consumable products. Thus, a certain part of incomes is not taken into account in the model. This category includes, for example, the services rendered to the population.

#### **The assessment based on retail turnover values and the cost of the services rendered to the population**

In accordance with the methodology adopted by the State Statistics Committee, the volume of the paid services rendered to the population reflects the volume of consumption (by the population) of various types of services. It includes the volumes of the services rendered to the population by officially registered enterprises and organizations, and also incorporates the experts' estimation of the covert and informal

activity on the services market.<sup>24</sup> On the one hand, the accounting of informal activity worsens the interpreting properties of the model because the shadow sector does not pay taxes. On the other hand, as this informal activity creates a certain added value, it should be taken into account in the assessment of the fiscal capacity because its legalization can result in additional incomes. Nevertheless, as previously noted, the intent of the present study is to assess the fiscal capacity in its most restricted sense which suggests the use of the actual officially declared bases.

The second factor to be taken into consideration when using this index is the structure of the latter. Most services are entitled to the value added tax allowance and do not form a base for this tax. They include, for example, the services rendered in such spheres as education, culture, public utilities, carriage of passengers and some others.



<sup>24</sup> Similar adjustment is carried out regarding the majority of indices including that of retail turnover, as furnished by the State Statistics Committee.

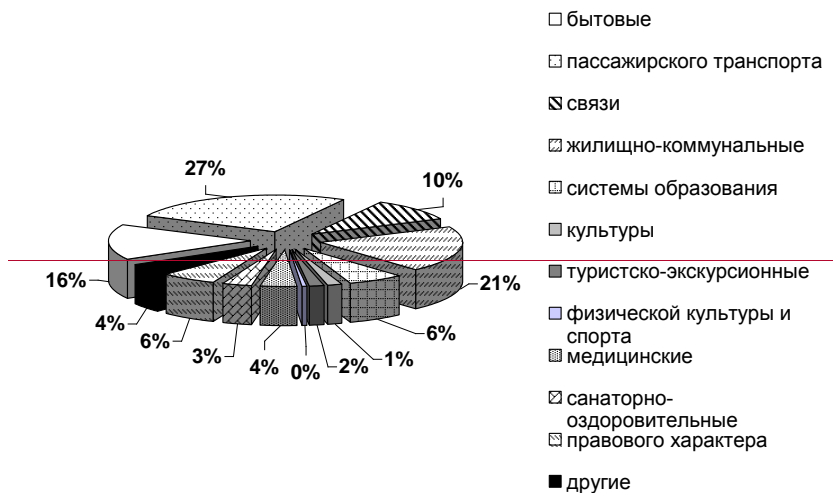


Figure 5. The structure of the volume of paid services rendered to the population, 1999 г.

personal services  
 carriage of passengers  
 communication  
 public utilities  
 education  
 culture  
 tourism and excursions  
 physical culture and sports  
 medical services  
 health resorts  
 legal services  
 other services

If the services are not liable to the VAT, and the value of adjustment for the informal economic activity does not differ significantly from one region to another (does not create any additional dispersion), the foregoing will not influence the assessment of the tax liabilities carried out by the regression method (and can be taken into account in the constant).

Let us check the possibility of utilizing this index as a characteristic of the VAT base. The models to be tested are:

$$VAT_i = c_0 + c_1 \cdot UN_i + \varepsilon_i, \quad (6.3)$$

$$VAT_i = c_0 + c_1 \cdot RT_i + c_2 \cdot UN_i + \varepsilon_i, \quad (6.4)$$

where

$RT_i$  – the retail turnover of the i-region (per capita);

$UN_i$  – the volume of the services rendered to the population in the i-region (per capita).



The results of the assessment of the models (6.3)-(6.4) are given in Tables 7 and 8.  
**Table 7. The results of the assessment of model (6.3), WOLS/WLS, 1999**

Obs.	R Square	Adjusted R Square	F	Sig.
79	0.511	0.505	80.491	0.000
Coefficients		Std. Error	t	Sig.
<b>C<sub>0</sub></b>	-65.447	103.837	-0.630	0.530
<b>C<sub>1</sub></b>	0.523	0.058	8.972	0.000

Table 8. The results of the assessment of model (6.2), WOLS/WLS, 1999r.

R	R Square	Adjusted R Square	F	Sig.
0.792	0.628	0.618	64.054	0.000
Coefficients		Std. Error	t	Sig.
<b>C<sub>0</sub></b>	-142.886	92.583	-1.543	0.127
<b>C<sub>1</sub></b>	0.121	0.097	1.242	0.218
<b>C<sub>2</sub></b>	0.120	0.025	4.878	0.000

According to the results of the assessment, the services rendered to the population offer a less efficient interpretation of the tax liabilities than the retail turnover. This conclusion is not unexpected. Nevertheless, in the model where these variables are used together, the retail turnover prove to be insignificant which is apparently caused by the interdependence of these indices (VIF=3.596, Tolerance=0.278). The coefficients of both variables used in the model are very close in values and thus have no statistical difference, and so can be integrated. Thus, with the insignificant constant being eliminated, we derive the following:

$$VAT_i = c_1 \cdot (RT_i + UN_i) + \varepsilon_i, \quad (6.5)$$

The results of the assessment of this model are given in Table 9, while the graph of the dispersion of actual and predicted values is presented in Figure 6.

Table 9. The results of the assessment of model (6.3), WOLS/WLS, 1999

Obs.	R Square	Adjusted R Square	F	Sig.
79	0.797	0.795	306.968	0.000
Coefficients		Std. Error	t	Sig.
<b>C<sub>1</sub></b>	0.106	0.006	17.520	0.000

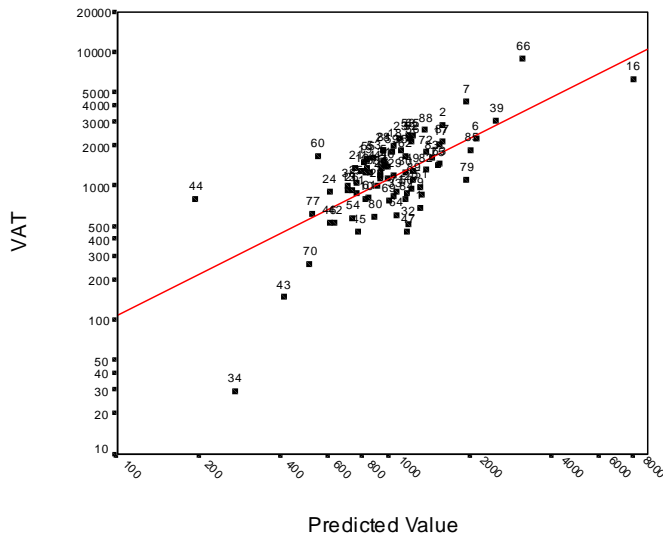


Figure 6. The dispersion graph of the actual and predicted values as interpreted by the variation model (6.5), 1999

Thus, according to the obtained results, the assessment of the VAT tax liabilities can be represented as follows:

$$VAT_i^* = 0.106 \cdot (RT_i + UN_i) \cdot N_i \quad (6.6)$$

It should be noted that the use of an additional constant did not substantially improve the interpreting properties of the models (compare  $R_{adj}^2$  of the models (6.4) and (6.1), or  $R^2$  of the models (6.5) and (6.1)). The previously observed outliers remain in the widened model as well. The use of the data of the indices ensures a relatively rough assessment of the VAT liabilities which apparently results not only from the difference in effort exerted by the tax authorities in various regions but also from the fact that these indices represent a rather crude assessment of the VAT tax base.

#### The assessment based on the GRP

An essential indicator of income is the gross added value generated in a region, i.e. the gross regional product (GRP).

$$VAT_i = c_0 + c_1 \cdot Y_i + \varepsilon_i, \quad (6.7)$$

where

$VAT_i$  – the value added tax (calculated) in the i-region (per capita);

$Y_i$  – the gross regional product of the i-region (per capita).

Let us check the possibility of utilizing this index as a characteristic of the tax base. The results of the assessment of the model (6.7) are given in Table 10.

Table 10. The results of the assessment of the model (6,7), WOLSWLS, 1999

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
88	0.635	0.631	149.658	0.000
	<b>Coefficients</b>	<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	-108.573	87.127	-1.246	0.216
<b>C<sub>1</sub></b>	0.056	0.005	12.233	0.000

The model interprets approximately 64% of the dispersion of the calculated VAT. It should be pointed out that in the case of this tax the interpreting power of these models is unlikely to be high if the models do not discern between the categories of the products because the VAT rate differs for different categories of goods.

The model's constant is statistically insignificant and thus can be disregarded:

$$VAT_i = c_1 \cdot Y_i + \varepsilon_i, \quad (6.8)$$

The assessment of the coefficients of the model (6.8) is given in Table 11. The graph of the actual and predicted values is presented in Figure 7.

Table 11. The results of the assessment of the model (6.8) by the weighted least-square method, 1999

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
88	0.787	0.784	320.673	0.000
	<b>Coefficients</b>	<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>1</sub></b>	0.051	0.003	17.907	0.000

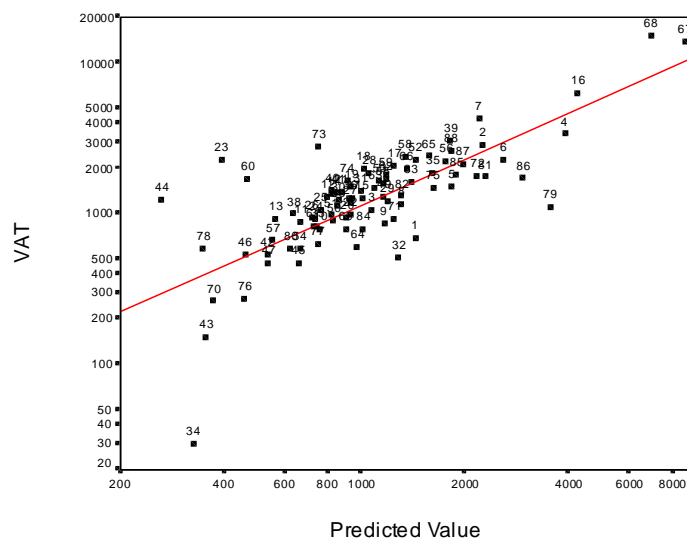


Figure 7. The dispersion graph of the actual and predicted values of the interpreted variation model (6.8), 1999

According to the results of the assessment, in the case of the GRP the effective value added tax rate amounts to approximately 5% (coefficient  $c_1$ ).

$$VAT_i^* = 0.051 \cdot Y_i \cdot N_i, \quad (6.9)$$

where

$VAT_i^*$  – the assessment of the VAT potential (presented in Table 1, Appendix 3).

The tax rates (the year 1999) for different categories of goods vary within the range of 10% to 20%. The differences in the rates are specified by the Federal legislation,<sup>25</sup> and therefore the differences in the tax load imposed on the regions producing different categories of goods can be objective. In other words, if one region primarily specializes in the production of foodstuffs, products for children's use and medicines which are taxed at the rate of 10%, while the other region - in the production of any other goods liable to the 20% VAT rate, their tax revenues will be objectively different irrespective of their tax-related efforts. This difference must be taken into account in the calculation of the fiscal capacity.

As previously noted, there exist a number of exemptions and benefits concerning this tax. Specifically, the VAT is not imposed on the exports, and the tax on the incoming resources is returned to the exporters. The compensation comes from the Federal budget (see above). In order to make allowances for this factor authorized by the Federal legislation and therefore not affecting the tax-related efforts of the territorial authorities, the exports will be incorporated in the model. We assume that the volume of exports has a negative impact on the volume of the VAT revenues in a region. Let us test this hypothesis.

$$VAT_i = c_0 + c_1 \cdot Ex_i + c_2 \cdot Y_i + \varepsilon_i, \quad (6.10)$$

where

$Ex_i$  – the volume of exports in the i-region (per capita).

The results of the assessment of the model are given in Tables 12 and 13.

Table 12. The results of the assessment of the model (6.10), **WOLSWLS**, 1999 г.

<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
0.809	0.654	0.645	70.842	0.000
<b>Coefficients</b>		<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	48.143	96.787	0.497	0.620
<b>C<sub>1</sub></b>	-0.453	0.165	-2.741	0.008
<b>C<sub>2</sub></b>	0.055	0.005	11.877	0.000

<sup>25</sup> According to the federal legislation (Federal Law of 06.12.1991 No 1992-1, Ed. as of 06.11 1999), the VAT rate is set at 10% for food products (except for the exciseable ones) presented in the list authorised by the Government of the Russian Federation and for the products for children's use presented in the list authorised by the Government of the Russian Federation; at 10% for grain, raw sugar, fish flour, fish and sea products realised for technical use and in production of fodder and medical preparations; and at 20% for the rest of the goods (work, services) including the exciseable food products.

Table 13. The results of the assessment of the model (6.10) with elimination of the constant, [WOLSWLS, 1999](#)

Obs.	R Square	Adjusted R Square	F	Sig.
79	0.807	0.802	158.485	0.000
Coefficients		Std. Error	t	Sig.
C <sub>1</sub>	-0.373	0.146	-2.556	0.013
C <sub>2</sub>	0.058	0.004	14.922	0.000

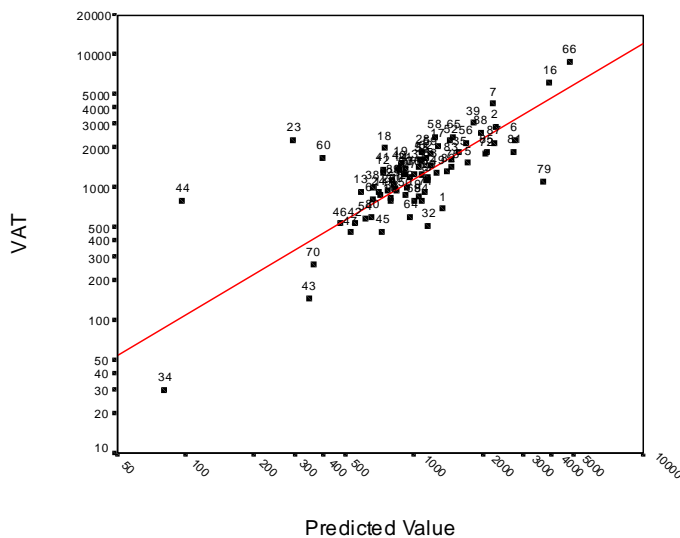


Figure 8. The dispersion graph of the actual and predicted values of the interpreted variation model (6.10), 1999

According to the results of the assessment, both factors are statistically significant in the model. The model interprets approximately 65% of the dispersion, which slightly exceeds that of the monofactor model (63.5 %). As seen from the dispersion graph (Fig. 8), according to the model, a number of regions - the Republic of Kalmykia, Dagestan, Sakha (NoNo 34, 43, 79, respectively) have fewer tax liabilities than on the average in Russia. On the contrary, according to the model, the Republic of Ingushetia, the Republic of Altai and Jaroslav Oblast have more VAT tax liabilities than on the average in Russia.

Apparently, one of the reasons for this is the significant specificity of the GRP structure of these regions. For example, the Republic of Altai, Ingushetia and Dagestan are agricultural territories. Due to the state policy, this branch of the economy has an objectively smaller tax burden as compared to other branches (industry, transport, market services). Let us try to take this fact into consideration when making our assessment by including a corresponding variable into the model:

$$VAT_i = c_0 + c_1 \cdot Y_i + c_2 \cdot Ex_i + c_3 \cdot SN_i + \varepsilon_i, \quad (6.11)$$

where

$SN_i$  – the proportion of the rural population in the i-region..

Table 14. The results of the assessment of the model (6.11), WOLSWLS, 1999

<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>F</i>	<i>Sig.</i>	
0,844	0,713	0,701	61,224	0,000	
	<i>Coefficients</i>	<i>Std. Error</i>	<i>t</i>	<i>Sig.</i>	<i>VIF</i>
<b>C<sub>0</sub></b>	1 078,085	278,787	3,867	0,000	
<b>C<sub>1</sub></b>	0,035	0,007	5,097	0,000	2,609
<b>C<sub>2</sub></b>	-0,111	0,175	-0,633	0,529	1,373
<b>C<sub>3</sub></b>	-19,506	5,005	-3,897	0,000	2,682

The introduced constant has a high statistical significance. As a result of its inclusion, the interpreting properties of the model increased to 71%. Nevertheless, at the same time the variable of the volume of exports lost its significance. The results of the assessment of the model (6.11) are given in Figure 9.

Table 15. The results of the assessment of the model (6.11), WOLSWLS, 1999

<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>F</i>	<i>Sig.</i>	
0,843	0,710	0,703	93,227	0,000	
	<i>Coefficients</i>	<i>Std. Error</i>	<i>t</i>	<i>Sig.</i>	<i>VIF</i>
<b>C<sub>0</sub></b>	1 127,111	258,684	4,357	0,000	
<b>C<sub>1</sub></b>	0,033	0,006	5,547	0,000	2,002
<b>C<sub>2</sub></b>	-20,951	4,281	-4,893	0,000	2,002

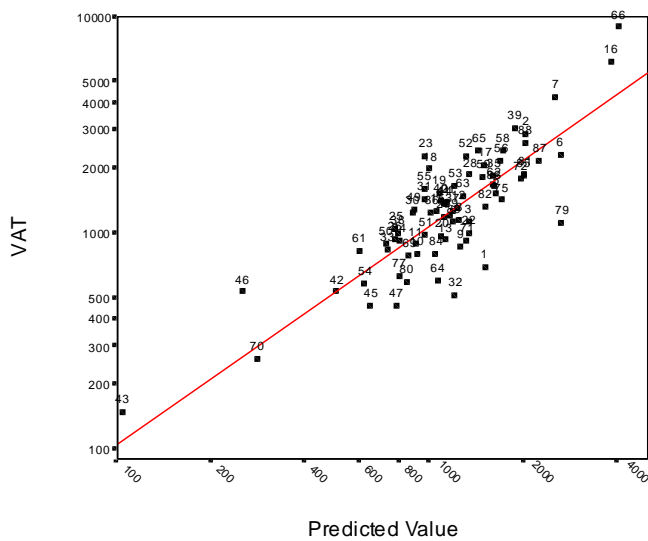


Figure 9. The dispersion graph of the actual and predicted values of the interpreted variation model (6.11), 1999 r.

According to the results of the assessment, the majority of the values of scattering observed during the testing of the model (6,10) cease to be statistically significant in the model (6.11) which indicates that the specific factors dominant in these regions are registered.

Inasmuch as these differences are objective (the agricultural regions turn out products which are taxed at a lower rate) it can be assumed that the given specification of the model is more accurate.

Thus, the obtained assessment of the tax liabilities of the regions carried out on the basis of the VAT and the proportion of rural population will be as follows:

$$\boxed{VAT_i^* = [1127 + 0.033 \cdot Y_i - 21 \cdot SN_i] \cdot N_i}, \quad (6.12)$$

where

$VAT_i^*$  – the assessment of the VAT potential (see Table 1, Supplement 3).

### **The profits tax on organizations**

The transfer of the profits tax revenues to the federal and territorial budgets is carried out in accordance with the authorized ratios (in the year 1999 the tax rates for the federal and territorial budgets were 11% and 19%, respectively). The object of taxation in the case of this tax is the gross profit of enterprises and organizations. There exists a number of benefits and tax deductions concerning this tax (the returns on the sales of medicines and medical equipment, the income from the realization of services in education, the income from the gambling business, the returns of the sales of audio and video recordings, etc.). The income of social organizations of disabled persons also falls under this definition. There is a number of benefits regarding the financing expenses on capital investments, the costs of maintenance of objects in the social sphere, the charitable contributions, the costs of the development of the social sphere and public utilities as well as of the penitentiary system, the profits of small enterprises exempted, from taxation during the first two years of their existence, the profit spent on compensating for the losses (exempted from taxation for the period of 5 years), etc. The regional and local authorities also have the right to reduce the tax rates within the prescribed limits; the right can be extended to cover individual enterprises. The federal rate of the profits tax is the same for all types of activity and is equal to 11%.

If the aforesaid benefits are substantial and significantly differ from one region to another, the use of the aggregate profit as a base for this tax will most likely result in a certain increase of the standard error of the regression. The dispersion graph of the profits tax and the aggregate profit is shown in Figure 10.

Let us test the hypothesis concerning the possibility of utilizing the given index as a characteristic of the tax base for the profits tax. The model to be tested is as follows:

$$TP_i = c_0 + c_1 \cdot PR_i + \varepsilon_i \quad (7.1)$$

where

$TP_i$  - the profits tax (calculated) in the i-region (per capita);

$PR_i$  - the profit of enterprises and organizations in the i-region (per capita).

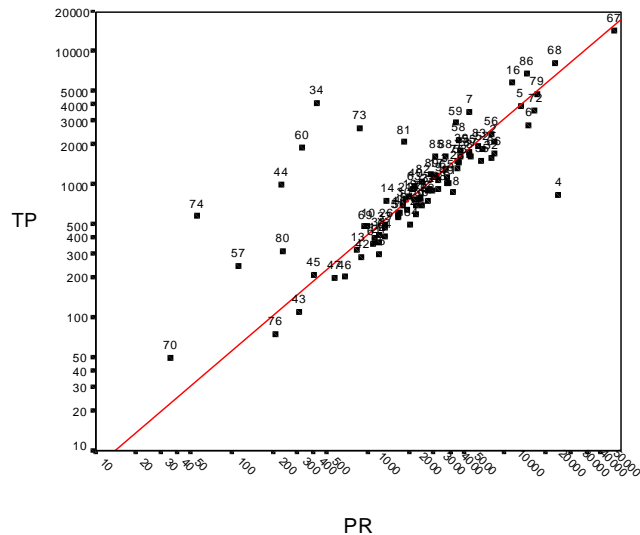


Figure 10. The graph of the dispersion of the actual and predicted values of the interpreted variation model (7.1), 1999

The results of the assessment of the model (7.1) by the weighted least-square method with the elimination of the outliers are given in Table 16. The dispersion graph of the actual and predicted values is presented in Figure 11.

Table 16. The results of the assessment of the model (7.1), WOLSWLS, 1999

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
80	0.872	0.871	533.304	0.000
	<b>Coefficients</b>	<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	104.987	35.144	2.987	0.004
<b>C<sub>1</sub></b>	0.269	0.012	23.093	0.000
<b>Excluded obs.</b>		4, 34, 44, 60, 73, 74, 78, 80		

### **CORPORATE PROFITS TAX**

The profits tax revenues are routed to the federal and territorial budgets in accordance with the predetermined proportions. Specifically, the 1999 tax rates amounted to 11 percent and 19 percent respectively. Gross profits of enterprises and organizations are subject to taxation. Still there are a number of tax allowances and benefits, such as profits from sales of audio and video tapes, medical appliances and drugs, educational services, gambling profits etc, profits gained by associations of the handicapped and so on. Some other allowances cover investment and social security expenditures, philanthropic contributions, expenses for developing social and communal spheres and maintenance of the special contingent, profits of minor businesses which are exempt from taxation within the first two years of operation, profits used to cover losses within the five-year period and so forth. In addition, regional and local authorities are allowed to cut tax rates within a certain established range for some



categories of taxpayers, including enterprises. The federal profits tax rate is common for all types of activities and amounts to 11 per cent.

In all likelihood, in case the allowances listed above are high enough and vary substantially across Russia, the use of an aggregated profit as a tax base is expected to increase the standard regression error. Table 10 gives a diagram of dispersion of the profits tax and aggregated profits.

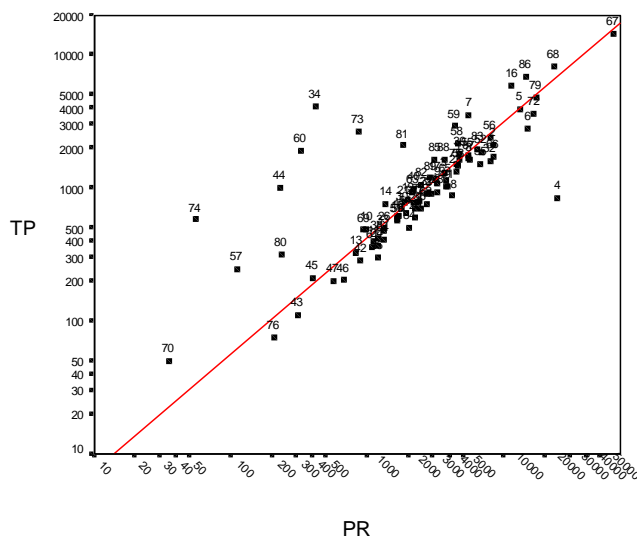
Let us check an assumption that this index can be used to characterize a base for the profits tax and analyze the following model:

$$TP_i = c_0 + c_1 \cdot PR_i + \varepsilon_i, \tag{7.1}$$

where

$TP_i$  is an assessed per capita profits tax in  $i$ -region;

$PR_i$  is a per capita profit of enterprises and organizations in the  $i$ -region.

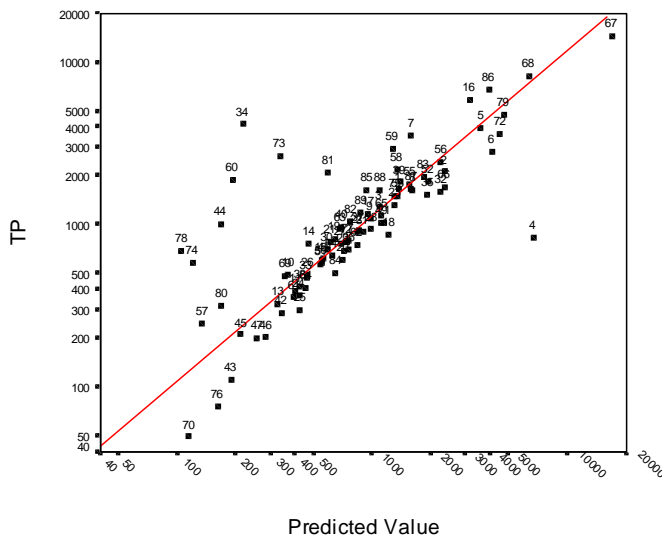


**Fig.10. Diagram of dispersion of factual and predicted values of the explanatory variable model (7.1), 1999.**

Results of evaluating the model (7.1) by means of the weighted least-square method, except for the outliers, are shown in Table 16 and a diagram of factual and model-predicted values in Fig.11.

**Table 16. Results of assessing the model (7.1), ~~WLSM~~WLS, 1999.**

<i>Obs.</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>F</i>	<i>Sig.</i>
80	0.872	0.871	533.304	0.000
<i>Coefficients</i>		<i>Std. Error</i>	<i>t</i>	<i>Sig.</i>
$C_0$	104.987	35.144	2.987	0.004
$C_1$	0.269	0.012	23.093	0.000
<i>Excluded obs.</i>		4, 34, 44, 60, 73, 74, 78, 80		



**Fig.11. Diagram of dispersion of factual and predicted values of the explanatory variable model (7.1), 1999.**

Judging from the evaluation, the model accounts for around 88 percent of the dispersion of the levied tax, except for outliers. As expected, low explanatory properties of the model are due to differences in an amount of allowances given at both federal and regional levels.

The tax rate varies within the range of a regional share of the tax depending on the types of operations carried out. For instance, Moscow<sup>26</sup> has the following tax revenue rates to be routed to the municipal budget<sup>27</sup>:

- 27 percent for banks and other types of credit institutions;
- 25 percent for the profit obtained through intermediate trade and deals, as well as for underwriters, brokers and stock exchanges;
- 19 percent for the other organizations.

<sup>26</sup> Moscow and St.Petersburgh have a status of RF territorial entities.

<sup>27</sup> See: GNI (State Taxation Inspection for Moscow) instruction # 11-13/13116 dated 29 June 1999 'Concerning assessment of the profits tax'.

Annex 3, Table 2, presents some evaluations of the fiscal capacity (theoretical values) of the profits tax in accordance with the following model:

$$TP_i^* = (113.201 + 0.260 \cdot PR_i) \cdot N_i, \quad (7.2)$$

where

$TP_i^*$  is an estimate of the profits tax fiscal capacity for  $i$ - region.

It should be noted that in line with the use of an aggregate profit index, the estimate obtained approximates both the differences in the taxation efforts of the regional authorities and the remaining federal allowances, which do not depend on the efforts taken by the local authorities.

### PERSONAL INCOME TAX

According to the taxation legislation of the Russian Federation, the income tax is based on all the gains that taxpayers receive both in money and in kind, except for social security and insurance benefits, bank interests, etc, which are not liable to taxation. The tax rate is progressive and varies from zero to 15 percent. In addition, there is a flat rate for some types of income, such as payoffs, bond incomes, etc.

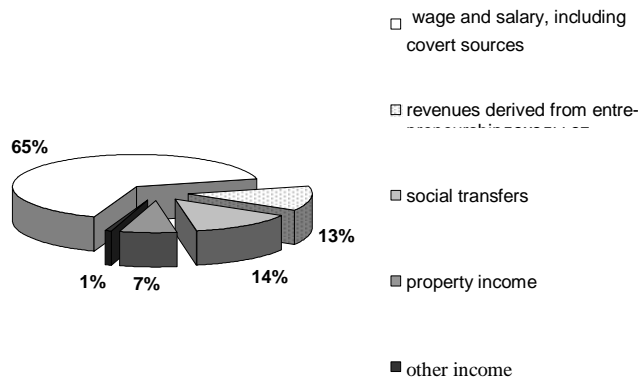
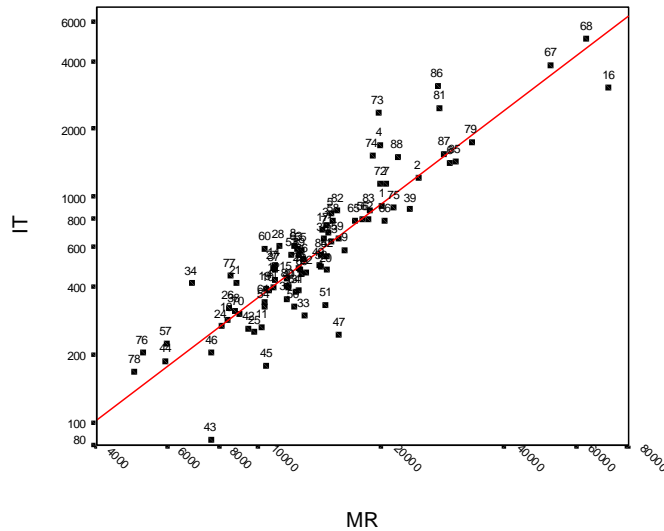


Fig.12. Composition of individual money incomes in 1999 as reported by the State Statistics Committee (Goskomstat).

Fig.13 shows a diagram of dispersion, or correlation, between the income tax revenues in the budget of the Russian Federation and per capita money incomes of the population<sup>28</sup> with due regard for approximation trend.



**Fig. 13. Diagram of dispersion between the income tax and incomes of the population in 1999.**

Let us check whether we can use the given index to describe the factual fiscal base. Table 17 provides an evaluation of the fiscal capacity for the individual income tax based on cash incomes of the population:

$$IT_i = c_0 + c_1 \cdot MR_i + \varepsilon_i, \quad (8.1)$$

where

$IT_i$  is a per capita total of the income tax in  $i$ -region;

$MR_i$  is an average per capita income of the population in  $i$ -region.

**Table 17. Results of evaluation of model (8.1), WLSMWLS, 1999.**

<sup>28</sup> According to the State Statistics Committee, the money incomes of the population include wages and salaries of employees, cash incomes of those engaged in entrepreneurship, benefits, stipends and other social transfers, property income as interest for deposits, securities, dividends and other incomes, including covert salary and wages, which enterprises and organizations conceal from taxation and pay in a variety of ways, such as unregistered earnings, acquisition of realty estate and long-use commodities for their employees, provision of subsidies, loans, payment of salaries through insurance and opening of deposit accounts in banks, etc.

<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>F</i>	<i>Sig.</i>
0.867	0.751	0.748	259.380	0.000
	<i>Coefficients</i>	<i>Std. Error</i>	<i>t</i>	<i>Sig.</i>
<b>C<sub>0</sub></b>	-257.590	48.745	-5.284	0.000
<b>C<sub>1</sub></b>	6.009E-02	0.004	16.105	0.000

The results show that a percentage of the explained dispersion is not very high ( $R^2 = 0.75$ ), which is presumably due to the heterogeneous composition of the population across Russian regions and difference in tax rates for various types of incomes. The effective income tax rate is around 6 percent. Like in case of evaluation of the fiscal capacity by means of linear models based on the gross regional product, the constant is statistically significant, which can be interpreted as availability of untaxable level of incomes.

We have already mentioned above that an index of cash incomes of the population as estimated by Goskomstat embraces all types of money incomes, including those that were not liable to taxation in 1999.

Let us check whether we can use the given index to describe the factual fiscal base and assess the following model:

$$IT_i = c_0 + c_1 \cdot W_i + \varepsilon_i, \quad (8.2)$$

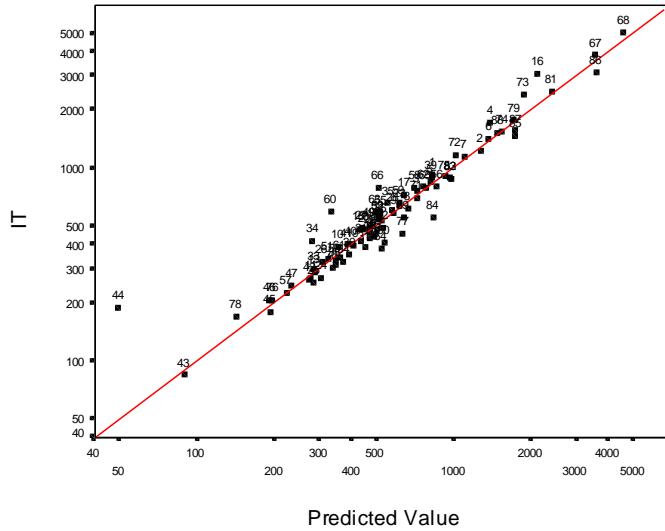
where

$IT_i$  is a total of the per capita income tax in  $i$ -region;

$W_i$  is a registered per capita nominal wage less an increase in arrears in  $i$ -region. The results are presented in Table 18. A diagram of dispersion of factual and predicted values is given in Fig.14.

**Table 18. Results of evaluating the model (8.2), WLSMWLS, 1999**

<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>F</i>	<i>Sig.</i>
0.973	0.947	0.946	1 522.626	0.000
	<i>Coefficients</i>	<i>Std. Error</i>	<i>t</i>	<i>Sig.</i>
<b>C<sub>0</sub></b>	-140.648	18.005	-7.811	0.000
<b>C<sub>1</sub></b>	0.113	0.003	39.021	0.000



**Fig. 14. Diagram of dispersion of factual and predicted values of the explanatory variable model (8.2), 1999**

As is evident from the results, the paid wage is the best base for the collected income tax, in contrast to aggregate cash incomes of the population. A percentage of the explained dispersion is around 95 percent against 75 percent when cash incomes are used, see Table 17. It is presumably due to the fact that wages make up the bulk of taxable incomes of the population.

The significant negative constant of the model has a specific economic meaning. This is part of the income that is not liable to taxation as a result of the progressive tax rate. According to (3) the untaxable minimum figure averages 1,245 rubbles across Russia. Therefore the effective tax rate of wage is 11.3 percent, which is a little lower than the minimum rate of 12 percent. Thus, in accordance with the results of the evaluation (see Table 18), an estimate of the income tax capacity should be presented as follows:

$$IT_i^* = (-140.648 + 0.113 \cdot W_i) \cdot N_i, \quad (8.3)$$

where

$IT_i^*$  is an estimate of the fiscal capacity for the income tax in  $i$ -region;

$N_i$  is the number of people who live in  $i$ -region.

However, the wage/salary does not cover all the incomes that are subject to taxation. Let us take them into account by interpreting them as 'the other cash incomes' amounting to a difference between the money incomes and the wage/salary:

$$IT_i = c_0 + c_1 \cdot W_i + c_2 \cdot (MR_i - W_i) + \varepsilon_i, \quad (8.4)$$

where

$IT_i$  is a per capita total of the income tax in  $i$ -region;

$W_i$  is a registered per capita wage in  $i$ -region, less an increase in arrears;

$(MR_i - W_i)$  is the other per capita incomes of the population in  $i$ -region. The results of the model (8.4) evaluation are given in Table 19. A diagram of dispersion of factual and predicted values is shown in Fig. 15.

Table 19. Results of evaluating the model (8.4). WLSMWLS, 1999

$R$	$R$ Square	Adjusted $R$ Square	$F$	Sig.
0.977	0.954	0.953	886.070	0.000
	Coefficients	Std. Error	$t$	Sig.
$C_0$	-190.370	21.304	-8.936	0.000
$C_1$	0.108	0.003	36.623	0.000
$C_2$	0.011	0.003	3.780	0.000

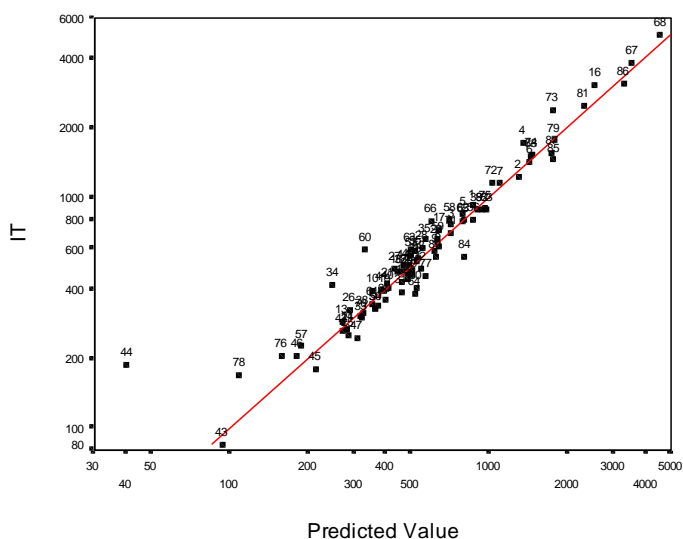


Figure 15. Diagram of dispersion of factual and predicted values of the explanatory variable model (8.4), 1999

As it follows from the evaluation, the coefficients of the two variables of the model are positive and statistically significant. The diagram of dispersion (Fig. 15) shows that some outliers stand out in the cloud of dispersion. The ‘strongest’ of them is region # 44, i.e. Republic of Ingushetia. It might be due to substantial differences in the income composition of the region (e.g. the untaxable incomes make up a smaller share, since the error is positive) or errors in defining the indexes used. The outlier values heavily affect the estimation of parameters of the regressive equation. In order to exclude this impact, let us ignore the region in the sampling. Given this consideration, the results of evaluation of the model (8.4) can be presented in Table 20.

**Table 20. Results of evaluation of the model (8.4). WLSMWLS, without regard for the outlying points, 1999.**

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
87	0.958	0.957	954.612	0.000
	<b>Coefficients</b>	<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	-203.584	20.929	-9.727	0.000
<b>C<sub>1</sub></b>	0.109	0.003	38.212	0.000
<b>C<sub>2</sub></b>	0.012	0.003	4.077	0.000
<b>Excluded obs.</b>	44			

$$IT_i^* = (-203.584 + 0.109 \cdot W_i + 0.012 \cdot (MR_i - W_i)) \cdot N_i, \quad (8.5)$$

where

$IT_i^*$  is an estimate of the fiscal capacity for the income tax;

$N_i$  is the number of people who live in  $i$ -region.

The fiscal capacity calculated in accordance with the model (8.5) is given in Annex 3, Table 3.

### **PROPERTY TAXES**

Taxes on property of juridical and physical persons as well as inherited property go to territorial budgets and account for around 10 percent of the budget revenues of the territories in total. Almost the entire revenues of this budget element (98 percent) is supported by the corporate property tax.

The tax is paid by all juridical persons, their subsidiaries or subunits and is applied to fixed assets, intangible assets and expenses in tax payers' balance. The tax rate is determined by territorial authorities and is restricted to about 2 percent by the federal legislation<sup>29</sup>. The law determines a number of federal benefits and provides for some regional benefits to be introduced as well. Let us check an assumption that fixed assets can be used to describe the factual base for the tax and analyze the following model:

$$FPT_i = c_0 + c_1 \cdot OF_i + \varepsilon_i, \quad (9.1)$$

where

$FPT_i$  is a per capita property tax in  $i$ -region;

$OF_i$  is a per capita value of fixed assets of enterprises and organizations in  $i$ -region.

The results of the model evaluation are given in Table 21.

**Table 21. Results of model (9.1) evaluation, WLSMWLS, 1999**

<sup>29</sup> Russian Federation Law # 36-FZ dated 22 February 1999.



<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
78	0.601	0.596	116.038	0.000
<b>Coefficients</b>		<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	-111.190	27.753	-4.006	0.000
<b>C<sub>1</sub></b>	3.66E-03	3.40E-04	10.772	0.000

The model accounts for around 60 percent of dispersion for the corporate property tax. It is noteworthy that the fixed assets do not cover the entire fiscal base, since the tax is also levied on the other assets placed on the balance sheet. It is our belief that the revenues gained in a region should somewhat characterize these assets. The other property taxes, i.e. on corporate and inherited property, securities operations, account for less than 2 percent of the total of the tax group. Since a new macrofactor is introduced as an explanatory variable, let us take these taxes into account:

$$PT_i = c_0 + c_1 \cdot OF_i + c_1 \cdot Y_i + \varepsilon_i, \quad (9.2)$$

where

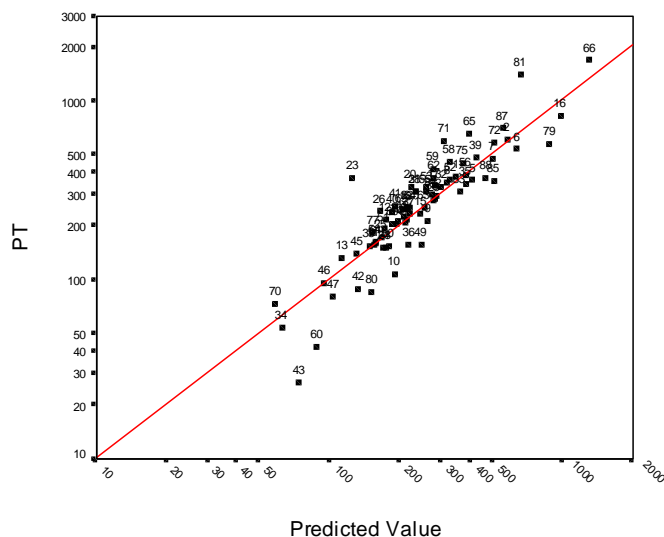
$PT_i$  is property taxes, i.e. a per capita total of all the property taxes ;

$Y_i$  is a per capita gross regional product in  $i$ -region.

Let us check the hypothesis that we can use these indexes to describe the factual base for the tax group in question. The results of the model evaluation are displayed in Table 22 and Fig. 16.

**Table 22. Results of evaluation of the model (9.2), ~~WLSM~~WLS, 1999**

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
79	0,820	0,815	173,270	0,000
<b>Coefficients</b>		<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	-62,179	19,819	-3,137	0,002
<b>C<sub>1</sub></b>	8,58E-04	3,81E-04	2,251	0,027
<b>C<sub>2</sub></b>	0,011	0,001	9,555	0,000



**Figure 16. Diagram of dispersion of factual and predicted values of the explanatory variable model (9.2), 1999**

The results of our evaluation show that both coefficients have a high statistical value. The explanatory level of the model has gone up as high as 82 percent against 60 percent for the single-factor model.

$$PT_i^* = (-62 + 8.6 \cdot 10^{-04} \cdot OF_i + 0.011 \cdot Y_i) \cdot N_i, \quad (9.3)$$

where

$PT_i^*$  is an estimate of fiscal capacity for property taxes;

$N_i$  is the number of people living in  $i$ -region.

Our estimate is given in Annex 3, Table 4.

### **SALES TAX**

The whole sales tax goes to regional and local budgets and is regulated by territorial legislation. It is noteworthy that currently there is no federal law that describes a specific procedure of the tax levying and the general procedure is regulated by the corresponding article of Law 'About fundamentals of the taxation system in the Russian Federation'. The tax rate is set by regional authorities and varies for various types of taxable goods, being basically as high as 5 percent and sometimes about 10 percent for excise taxes on some goods, as is the case in Tomsk region. The tax is paid by enterprises, organizations and individual entrepreneurs. The cost of goods, work and services, which are sold wholesale or by retail in cash, are subject to taxation. In considering the sales tax it should be noted that the Constitutional Court of the Russian Federation has found some provisions of the law 'About fundamentals of the taxation system in the Russian Federation' to be unconstitutional. That is why in case the sales tax legislation is not adjusted in accordance with the Russian Constitution, it should be annulled as decreed by the Court

It is most likely that the retail turnover could be best used to characterize the fiscal base. In any case it is the part of the goods that is paid for in cash. Let us check the hypothesis and evaluate the following model:

$$ST_i = c_0 + c_1 \cdot RT_i + \varepsilon_i, \quad (10.1)$$

where

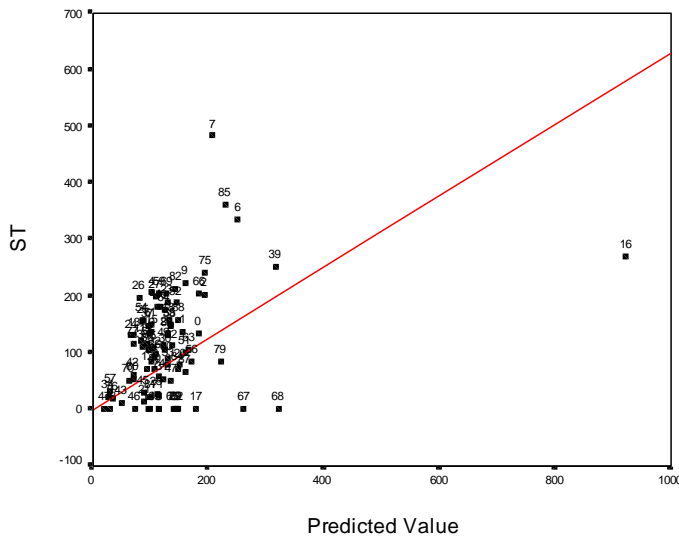
$ST_i$  is an aggregate per capita sales tax in  $i$ -region;

$RT_i$  is per capita retail turnover in  $i$ -region.

Table 23 displays the results of the model evaluation, and Figure 17 shows a diagram of dispersion of factual and predicted values of the sales tax.

**Table 23. Results of model (10.1) evaluation, WLSMWLS, 1999**

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
88	0.126	0.116	12.522	0.001
<b>Coefficients</b>		<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>0</sub></b>	64.934	15.158	4.284	0.000
<b>C<sub>1</sub></b>	0.005	0.001	3.539	0.001



**Figure 17. Diagram of dispersion of factual and predicted values of the explanatory variable model (10.1), 1999**

To judge from the results of our evaluation, the model has a rather moderate explanatory force. It is worth noting that the sales tax started to be introduced in Russia not so long ago. For instance, in 1999 the tax was not in force across all the Russian regions. To cite an

example, it came into effect in Novosibirsk and Magadan regions, as well as in Krasnodarsk territory as late as July 1, 1999 and in Primorsky territory and Kurgan region as early as April 1, 1999. Given the fact that it was effective only throughout a part of the calendar year or was not at all in some territories, we cannot expect a high degree of explication from the model.

Although the model (10.1) does not exhibit a regressive dependence, it does not mean that the retail turnover cannot be used as a sales tax base. The statistical data available allow us to use the retail turnover in characterizing the fiscal base in the best way possible. The problem is in estimating an effective (mean) tax rate, which can hardly be estimated by means of a regressive method increasing a level of dispersion of index in question, i.e. taxation efforts across the regions. If so, the method for estimation does not matter much, and accuracy of the regressive estimate is unlikely to be higher than the standard average rate. Therefore, in order to determine the fiscal capacity for the tax, we are expected to prefer a mean rate calculated as a ratio of the aggregate tax and the base, e.g. the retail turnover:

$$\tau = \frac{\sum_i ST_i}{\sum_i RT_i} = 0.012, \quad (10.2)$$

where

$\tau$  is a mean (effective) tax rate for retail turnover.

Thus an estimate of the fiscal capacity ( $ST_i^*$ ) for the tax may be presented as follows:

$$ST_i^* = 0.012 \cdot RT_i \cdot N_i \quad (10.3)$$

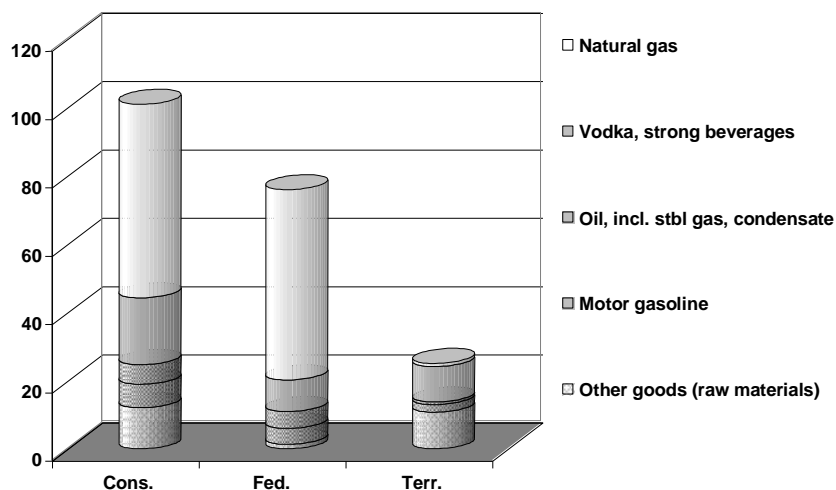
where

$N_i$  is the number of people living in  $i$ -region.

Annex 3, Table 4, presents results of evaluation of fiscal capacity for the tax.

### ***EXCISE TAXES***

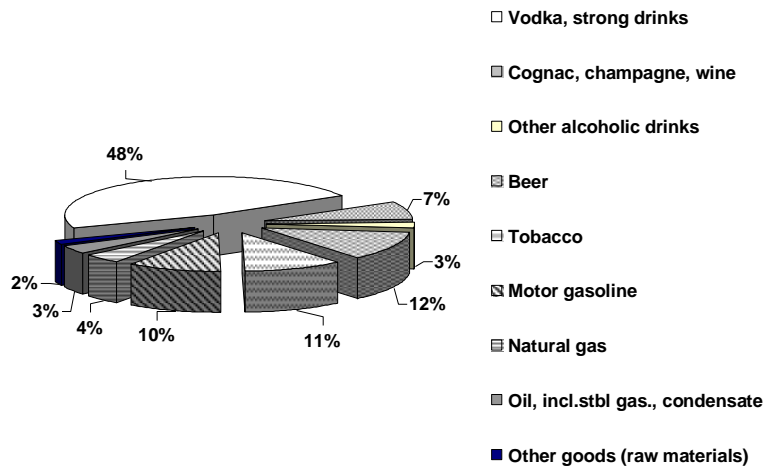
Excise taxes make up a major portion of income revenues in all types of budget, namely 11 percent of all income revenues of the consolidated budget of the Russian Federation, 21 percent of the federal budget and 5 percent of territorial budgets in 1999, see page 18.



**Figure 18. Composition of revenues derived from excise taxes for various types of budgets.**

The natural gas excise makes up a bulk of all the excises levied, with 100 percent of the revenues routed to the federal budget, except for Bashkiria and Tatarstan, the republics that have signed a special tax agreement with the federal authorities. It is followed by vodka and strong drink excises, which, together with those on gas, oil and gasoline, make up around 100 percent of all excises of the federal budget.

The vodka and strong drink excise tax ranks first in size of revenues fed to territorial budgets. It accounts for 48 percent (an aggregate figure across Russia), see Fig. 19, and is followed by beer, tobacco and gasoline excises making up over 30 percent of the excises. The remaining excise taxes, i.e. those imposed on cognac, champagne, wine and oil, etc, constitute around 20 percent of excise revenues going to territorial budgets, which accounts for about 1 percent of all tax revenues of territories in total.



**Figure 19. Detailed composition of excise revenues in territorial budgets, 1999.**

Consequently, excises on natural gas, vodka and strong drinks are the largest sources of the budgets.

### EXCISES ON ALCOHOLIC BEVERAGES

In accordance with the 1999 legislation, the excise tax is paid by producers of strong drinks. An amount of alcoholic beverages produced is subject to taxation, with excises imposed at specific rates. Now that the second part of the Taxation Code of the Russian Federation entered into force, responsibility for paying the excise taxes is shared in even proportion between producers of the beverages and juridical persons in charge of selling the drinks wholesale from warehouses, with revenues split between the federal and territorial budgets at each stage of excise payment.

Let us check whether we can use the volume of produced alcoholic beverages as an index for describing the factual tax base and evaluate the following model:

$$A_i^{alc} = c_0 + c_1 \cdot Q_i^{alc} + \varepsilon_i, \quad (11.1)$$

where

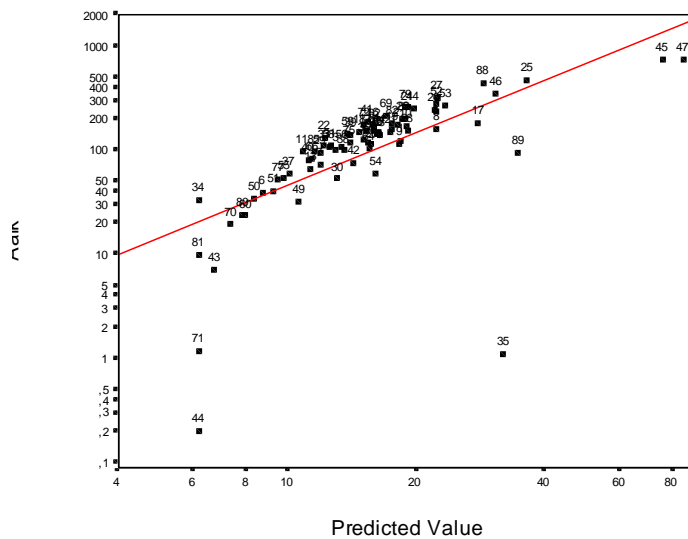
$A_i^{alc}$  is a total of excise revenues for vodka and alcoholic beverages in  $i$ -region;

$Q_i^{alc}$  is a per capita volume of vodka and strong drinks produced in  $i$ -region.

Table 24 displays the results of the model evaluation, and Figure 20 shows a diagram of dispersion of factual and predicted values.

**Table 24. Results of model (11.1) evaluation, WLSMWLS, 1999.**

Obs.	R Square	Adjusted R Square	F	Sig.
75	0,014	0,001	1,049	0,309
	Coefficients	Std. Error	t	Sig.
$C_0$	83,884	16,923	4,957	0,000
$C_1$	0,014	0,013	1,024	0,309



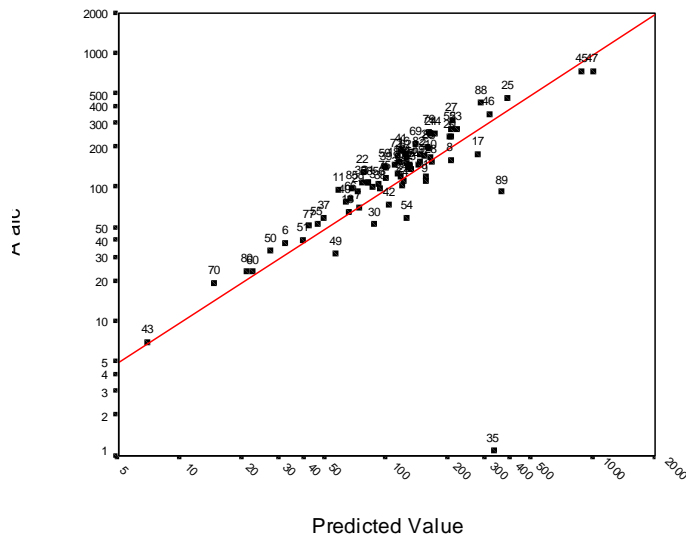
**Figure 20. Diagram of dispersion of factual and predicted values of the explanatory variable model (11.1), 1999.**

Among other things<sup>30</sup>, the sample excludes the regions that do not produce the products in question or produce them in small amount, such as Republic of Kalmykia, Republic of Ingushetia, Republic of Khakassia, Chukchi autonomous district, as reported by Goskomstat. As is evident from the table, the explanatory variable is insignificant in terms of statistics, which is presumably due to substantial outlier values affecting the results of our evaluation, see Fig.20. Table 25 and Figure 21 show results of evaluation of the model (11.1), excluding from the sample regions # 35 and #89, i.e. Republic if Tatarstan and Kaliningrad region respectively. The remaining regions that previously were outside of the basic cloud of dispersion do not differ very much from the other ones.

**Table 25. Results of evaluation of the model (11.1), WLSMWLS, 1999.**

<sup>30</sup> As mentioned above, the autonomous districts and regions that are part of the territories in question, are not analyzed separately, which is due to non-availability of information about them.

Obs.	R Square	Adjusted R Square	F	Sig.
73	0,869	0,867	471,638	0,000
Coefficients		Std. Error	t	Sig.
$C_0$	18,396	6,172	2,980	0,004
$C_1$	0,166	0,008	21,717	0,000



**Figure 21. Diagram of dispersion of factual and predicted values of the explanatory variable model (11.1), 1999.**

In accordance with the special agreement, over the period under study the republics of Tatarstan and Bashkortostan were exempt from paying a number of federal taxes, including the alcoholic beverage excise tax. That is why they are excluded from the sample. Although going in full to the territorial budget, the excise tax revenues are, in fact, very high.

Kaliningrad region is also a special entity in terms of economy, since it was granted a status of free economic zone. It is our belief, however, that, their special status should not affect the fiscal capacity of the regions, which is being estimated to be equalized. Although excise taxes on the spirit-based beverages, other than vodka and strong drinks, make up a minor portion of all the excises on alcohol, their incorporation in the model might improve its explanatory force. Model (11.2) also takes into account an amount of wines produced:

$$A_i^{alc} = c_0 + c_1 \cdot Q_i^{alc} + c_2 \cdot Q_i^{wsh} + \varepsilon_i, \quad (11.2)$$

where

$Q_i^{wsh}$  is a per capita volume of wine output, including champagne, in  $i$ -region.



Table 26. Results of evaluation of the model (11.3), WLSM, 1999.

Obs.	R Square	Adjusted R Square	F	Sig.
73	0,881	0,877	258,697	0,000
	Coefficients	Std. Error	t	Sig.
$C_0$	13,582	6,211	2,187	0,032
$C_1$	0,169	0,007	22,745	0,000
$C_2$	0,141	0,054	2,618	0,011

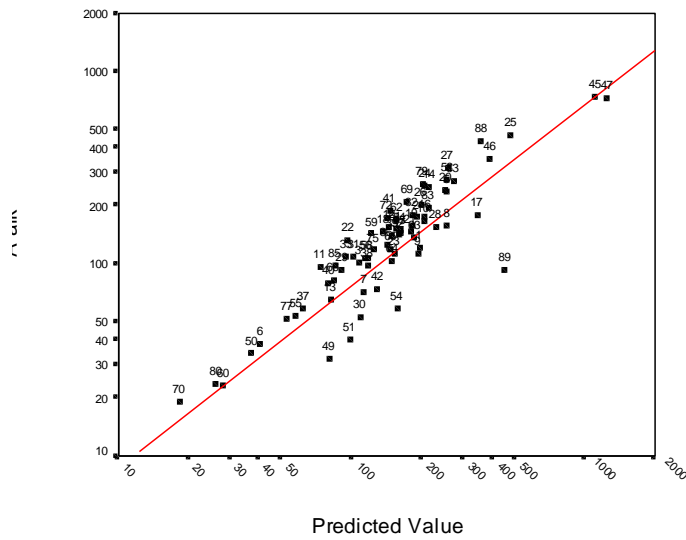


Figure 21. Diagram of dispersion of factual and predicted values of the explanatory variable model (11.3), 1999.

As is evident from our evaluation, the explanatory characteristics of the model have improved. Introduction of cognac output as an additional explanatory factor has proved to be insignificant. Thus evaluation of the fiscal capacity for alcoholic beverage excise taxes, in accordance with the results of evaluation given in Table 26, can be presented as follows:

$$A_i^{alc} = (13.6 + 0.17 \cdot Q_i^{alc} + 0.14 \cdot Q_i^{ysh}) \cdot N_i, \quad (11.3)$$

where

$A_i^{alc}$  is an estimate of the fiscal capacity for alcoholic beverage excise taxes;

$N_i$  is the number of people living in  $i$ -region.

The results of an estimate of the fiscal capacity for alcoholic beverage excises are shown in Table 6, Annex 3.

### GAS EXCISES

In 1999 natural gas excises accounted for more than 15 percent of all the revenues in the federal budget and less than 0.2 percent of the territorial budgets. They are part of territorial budgets only in the republics of Tatarstan and Bashkortostan. Another specific feature is that in accordance with the Russian legislation payments are made at the location of registration of the company, rather than at the place of extraction. As a result, we should differentiate between the gas extracting and paying regions.

Table 27 provides information about production of gas subject to excises, as reported by Goskomstat, and payments made by gas-producing regions, as reported by the Ministry for Taxation and Dues.

**Table 27. Extraction of natural gas and payment of gas excise taxes across regions, 1999**

Region	Extraction of natural gas, bln m <sup>3</sup>	Excise on natural gas, mln rubles	Region	Extraction of natural gas, bln m <sup>3</sup>	Excise on natural gas, mln rubles
Republic of Karelia	3,90	-	Stavropol territory	-	41,54
Republic of Komi	-	158,21	Rostov region	-	6,91
St.Petersburg	-	211,81	Republic of Bashkortostan	-	785,56
Briansk region	-	1,25	Republic of Udmurtiya	-	9,83
Moscow	-	49 614,69	Orenburg region	26,60	0,03
Moscow region	-	3 697,48	Perm region	-	142,00
Nizhegorodskaya region	-	655,06	Sverdlovsk region	-	247,00
Bielgorod region	-	3,50	Omsk region	-	0,02
Republic of Tatarstan	-	173,27	Tyumen region	541,00	-
Astrakhan region	8,70	0,32	Khanty-Mansi auton.district	19,70	205,40
Volgograd region	-	44,20	Yamal-Nenets auton. district	521,00	33,93
Samara region	-	127,96	Krasnoyarsk territory	-	154,52
Saratov region	-	183,07	Republic of Sakha (Yakutia)	1,60	-
Republic of Dagestan	-	4,69	Sakhalin region	1,80	35,22
Krasnodar territory	-	124,98			

Source: Goskomstat and Ministry for Taxation and Dues of the Russian Federation

The basic taxpayers of the excise taxes are Gasprom and Mezhrefiongas joint stock companies, which are registered in Moscow and Moscow Region respectively, and taxes are collected in the respective entities. Although the bulk of gas is extracted in Yamal-Nenets autonomous district (around 90 percent), it accounts for less than 0.1 percent of the aggregate revenues of excise taxes.

In terms of evaluation of the fiscal capacity of the territories, whose goal is to equalize their budgets, modeling of the tax is of no interest, since it is not a source of income for the regions, except for the special agreements, which are disregarded in evaluating the fiscal capacity, and its inclusion is not expected to influence the final outcome, i.e. equalization of budgets.

#### **OIL AND GAS CONDENSATE EXCISE TAXES**

Like in the previous case, the excise tax revenues are routed only to the federal budget, except for Tatarstan and Bashkortostan, and therefore do not impact the tax revenues of territorial budgets. The excises are collected at the place of company registration, which impairs the procedure of our estimate, see Table 28.

**Table 28. Extraction of oil and gas condensate and payment of the respective excises in regions in 1999.**

Region	Oil, Including gas condensate, bln tons	Excises on oil Including gas condensate, bln rbls	Region	Oil, Including gas condensate, bln tons	Excises on oil, Including gas condensate, bln rbls.
Republic of Komi	9,50	12,89	Chechen Republic	0,13	
Archangelsk region	-	0,01	Krasnodar territory	-	5,91
Nenetsk auton.distr.	1,90	17,73	Stavropol territory	-	0,00
St.Petersburg	-	0,06	Republic of Bashkortostan	12,20	2,65
Moscow	-	13,10	Republic of Udmurtia	7,70	42,56
Kirov region	-	0,00	Orenburg region	8,90	98,39
Republic of Kalmykia	-	0,66	Perm region	9,20	37,19
Republic of Tatarstan	26,30	36,95	Komi-Permyatsk aut. district	-	0,97
Astrakhan region	-	10,82	Novosibirsk region	-	0,18
Volgograd region	3,60	-	Tomsk region	6,10	14,71
Penza region	-	0,75	Tyumen region	200,00	9,75
Samara region	7,70	340,11	Khanty-Mansi auton.district	170,00	2 000,08
Saratov region	-	8,95	Yamal-Nenetsk auton.district	30,00	93,50
Ulianovsk region	-	0,03	Evenk auton. district	0,02	0,02
Republic of Dagestan	-	2,32	Irkutsk region	-	0,63
Republic of Ingushetia	0,14	-	Republic of Sakha (Yakutia)	-	5,14
Republic of Northern Osetia-Alania	-	0,01	Sakhalin region	1,80	0,27

Source: Goskomstat and Ministry for Taxation and Dues of the Russian Federation

#### **PAYMENTS FOR USE OF NATURAL RESOURCES**

These revenues, less excises which have been analyzed above, accounted for around 7 percent of the territorial budgets and around 3 percent of the federal budget in 1999. The bulk of the payments are made for a use of natural resources (5 percent of the revenues of the territorial budgets) and land tax (1.7 percent of the revenues of the same budgets).

The taxes are paid by enterprises that make use of natural resources in their operations or mine them. In order to estimate the fiscal capacity for this type of revenues, let us analyze the data about output of mined raw materials. As a matter of fact, the cost-wise volume is not enough to characterize the base of the resources payments, since the tax is paid on the basis of transfer prices. That is why our model incorporates not only the cost indexes of the volume of mining, but some qualitative factors as well:

$$RP_i = c_0 + \sum_{j=1}^m c_j \cdot Q_{i,j} + \varepsilon_i, \quad (12.1)$$

where

$RP_i$  is a total of payments for use of natural resources in  $i$ -region;

$Q_{i,j}$  is a per capita volume of mining of  $j$  industry in  $i$ -region,  $j = \overline{1;6}$ .

**Table 29. Explanatory variables of the model (12.1).**

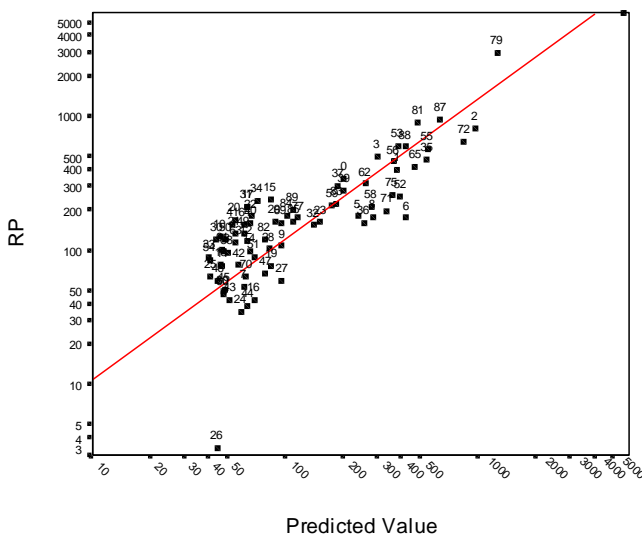
$j$	Coeff.	Industries
1	$c_1$	Fuel (cost volume)
2	$c_2$	Timber (cost volume)

3	$c_3$	Nonferrous metallurgy (cost volume)
4	$c_4$	Ferrous metallurgy (cost volume)
5	$c_5$	Volume of gas extraction (natural volume)
6	$c_6$	Volume of oil and gas condensate mined (natural volume)

Results of evaluation of the model are given in Table 30 and Fig. 23.

**Table 30. Results of the model estimate (12.1), WLSMWLS, 1999.**

Obs.	R Square	Adjusted R Square	F	Sig.	
80	0,759	0,739	38,297	0,000	
Coefficients		Std. Error	t	Sig.	VIF
$C_0$	38,871	9,310	4,175	0,000	
$C_1$	0,024	0,008	3,041	0,003	2,643
$C_2$	0,019	0,008	2,363	0,021	1,083
$C_3$	0,026	0,004	7,292	0,000	1,019
$C_4$	0,005	0,003	1,866	0,066	1,026
$C_5$	9,690	5,079	1,908	0,060	2,393
$C_6$	0,041	0,015	2,733	0,008	3,975



**Figure 23. Diagram of dispersion of factual and predicted values of the explanatory variable model (12.1), 1999.**

In this case we cannot expect the model to give an accurate description of the tax liabilities for resource payments, since a more accurate estimate needs disaggregated data for



An estimate of the fiscal capacity for this category of taxes may be presented as follows:

$$RP_i^* = 38.871 + 0.024 \cdot Q_{i,1} + 0.019 \cdot Q_{i,2} + 0.026 \cdot Q_{i,3} + 0.005 \cdot Q_{i,4} + 9.690 \cdot Q_{i,5} + 0.041 \cdot Q_{i,6} \quad (12.2)$$

where

$RP_i^*$  is an estimate of the capacity of payments for the use of natural resources in  $i$ -region.

Results of the fiscal capacity estimate for this particular group of taxes in accordance with (12.2) are given in Annex 3, Table 7.

#### TAX ON SOCIAL SECURITY AND MAINTENANCE OF HOUSING FACILITIES

Local taxes and duties are an important type of revenues in the territorial budgets, since they account for 9.4 percent of the consolidated budgets of Russian regions. In particular, they include resort fees, designated militia fees, advertisement tax, tax on maintenance of housing facilities and social infrastructure, trade license fees, etc. The tax on maintenance of housing facilities is a major local levy and accounts for 8.6 percent of the regional revenues (consolidated budgets).

The tax is imposed on a volume of sold products (such as works done, services), i.e. an earning or gross income from a sale, which is determined on the basis of disbursing prices, less value-added tax, tax on fuel and lubricants and excises.

In our view, the best characteristics for describing the base of the tax is presumably the cost volume of products and services as reported by Goskomstat, or the gross added value produced in the region. Let us check whether these indexes can be used to characterize the tax base and assess the two models:

$$TJ_i = c_0 + c_1 \cdot Q_i + c_2 \cdot UN_i + \varepsilon_i, \quad (13.1)$$

and

$$TJ_i = c_0 + c_1 \cdot Y_i + \varepsilon_i, \quad (13.2)$$

where

$TJ_i$  is a per capita total of revenues for the tax on maintenance of housing and social security facilities in  $i$ -region;

$Q_i$  is a per capita volume of industrial output in  $i$ -region;

$UN_i$  is a volume of services provided to the population in  $i$ -region;

$Y_i$  is a per capita gross regional product in  $i$ -region.

The results of evaluation of the two models can be found in Tables 32 and 33 and in Figures 25 and 26.

**Table 32. Results of evaluation of model (13.1), WLSMWLS, 1999.**

Obs.	R Square	Adjusted R Square	F	Sig.
88	0.744	0.738	124.682	0.000
Coefficients		Std. Error	t	Sig.
C <sub>1</sub>	5.43E-02	8.13E-03	6.680	0.000
C <sub>2</sub>	4.11E-03	9.18E-04	4.480	0.000

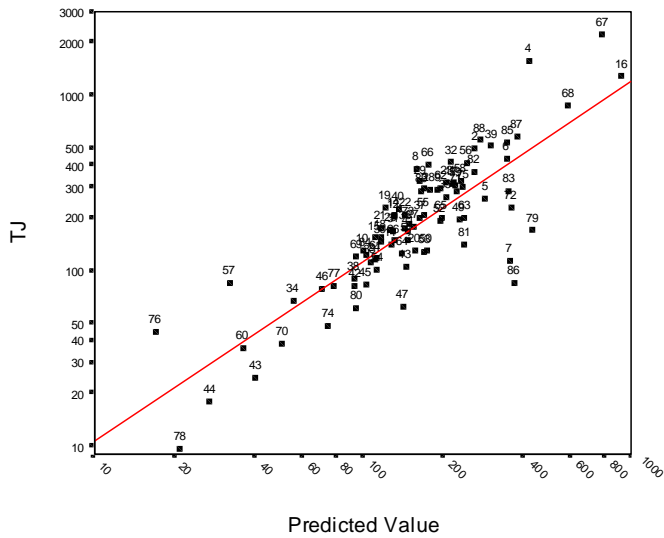
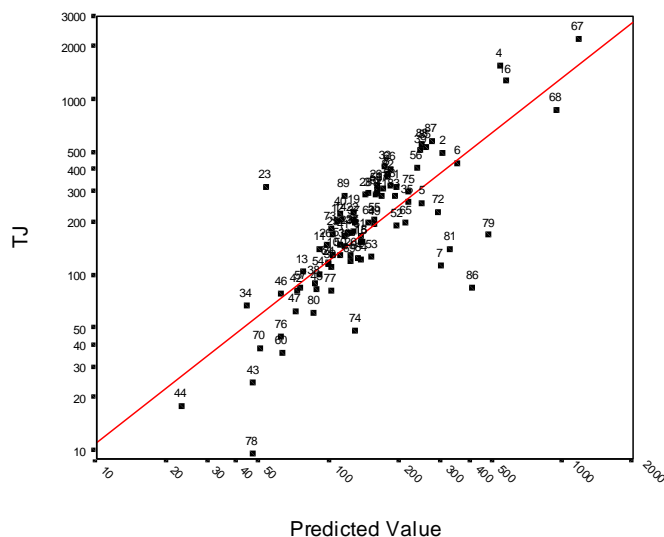


Figure 25. Diagram of dispersion of factual and predicted values of the explanatory variable model (13.1), 1999.

Table 33. Results of evaluation of model (13.2), WLSMWLS, 1999.

Obs.	R Square	Adjusted R Square	F	Sig.
88	0.696	0.692	198.825	0.000
Coefficients		Std. Error	t	Sig.
C <sub>1</sub>	6.94E-03	4.92E-04	14.101	0.000



**Figure 26. Diagram of dispersion of factual and predicted values of the explanatory variable model (13.2), 1999.**

As it follows from the analysis, the models account for around 74 percent and 70 percent of dispersion of tax revenues respectively.

$$TJ_i^* = (5.43 \cdot 10^{-2} \cdot Q_i + 4.11 \cdot 10^{-3} \cdot UN_i) \cdot N_i, \quad (13.3)$$

where

$TJ_i^*$  is an estimate of the fiscal capacity for the tax on maintenance of housing facilities;

$N_i$  is the number of people living in  $i$ -region.

Results of calculation of fiscal capacity estimate made in accordance with model (13.3) are given in Table 8, Annex 3.

#### OTHER TAXES AND FEES

The taxes, for which we have made an estimate, make up the bulk of the budget revenues, but they leave out of account a wide set of revenues from taxes and tax payments that are collected across regions. Among them are a common combined income tax, some unaccounted excises, state duties, license and registration fees, nontax revenues, which account for around 3 percent of tax revenues and payments in the consolidated budget system of the Russian Federation, and some others, see Annex 1, Table 1. It is obvious that it is rather difficult to find a reliable base for such a heterogeneous group. It is likely that the level of region business activity could be used as an indicator. Let us check the hypothesis and evaluate the following model:

$$OT_i = c_0 + c_1 \cdot Y_i + \varepsilon_i \quad (14.1)$$

where





fund, which accounted for 9 percent of revenues when compared with the federal budget and 17.5 percent when compared with the territorial ones in 1999. Starting from 2000, the federal road fund is part of the federal budget.

The largest tax revenue routed to the road fund is the tax on road users. The tax is imposed on sales proceeds and difference between the selling and purchase prices of goods resulting from procuring, delivery and trade activities.

Like we did in case with the tax on housing maintenance fund, let us analyze two versions of models and check hypotheses that these factors can be used to characterize the fiscal base:

$$DF_i = c_0 + c_1 \cdot Q_i + c_2 \cdot UN_i + \varepsilon_i, \quad (15.1)$$

and

$$DF_i = c_0 + c_1 \cdot Y_i + \varepsilon_i, \quad (15.2)$$

where

$DF_i$  is a total of tax revenues transferred to a road fund in  $i$ -region.

The results of evaluating models (15.1) and (15.2) are given in Tables 35 and 36 and in Figures 28 and 29 respectively.

**Table 35. Results of evaluating model (15.1), WLSMWLS, 1999**

<b>Obs.</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>F</b>	<b>Sig.</b>
80	0.885	0.882	296.073	0.000
<b>Coefficients</b>		<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>1</sub></b>	0.024	0.003	9.054	0.000
<b>C<sub>2</sub></b>	0.095	0.019	5.093	0.000

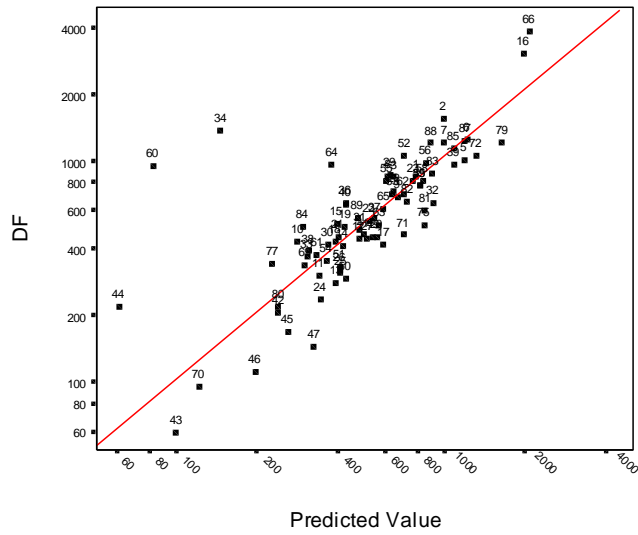
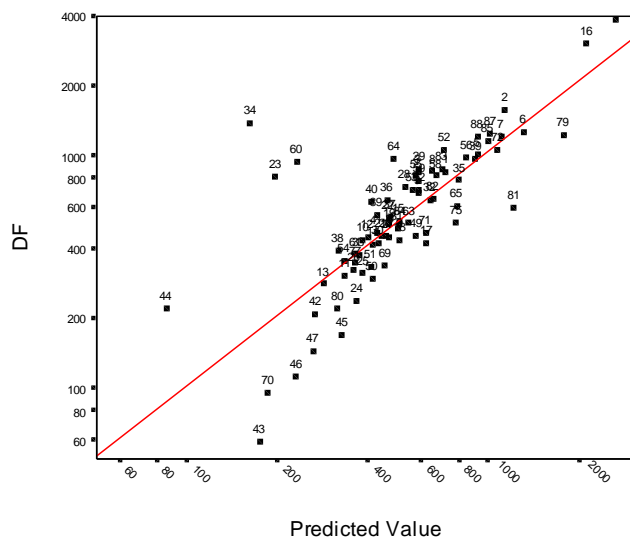


Figure 28. Diagram of dispersion of factual and predicted values of the explanatory variable model (15.1), 1999.

Table 36. Results of evaluating model (15.2), WLSMWLS, 1999

Obs.	R Square	Adjusted R Square	F	Sig.
80	0.882	0.881	584.028	0.000
	<b>Coefficient</b>	<b>Std. Error</b>	<b>t</b>	<b>Sig.</b>
<b>C<sub>1</sub></b>	0.025	0.001	24.167	0.000



**Figure 29. Diagram of dispersion of factual and predicted values of the explanatory variable model (15.2), 1999.**

Both models disregard free members because of their insignificance. The model coefficients of determination are 0.72 and 0.71 respectively and are not described in detail here.

#### ASSESSMENT OF AGGREGATE FISCAL CAPACITY

In summarizing the results obtained, we can represent an aggregate estimate of fiscal capacity of territories as a total of estimates of fiscal capacity for separate taxes and tax groups:

$$TA_i^{**} = VAT_i^* + TP_i^* + IT_i^* + PT_i^* + ST_i^* + A_i^{alc*} + RP_i^* + TJ_i^* + A_i^{gas} + A_i^{oil} + OT_i^*, \quad (16)$$

where

$TA_i^{**}$  is an estimate of fiscal capacity of  $i$ -region, i.e. tax revenues and increase in arrears for the budget of the Russian Federation, based on the representative taxation system;

$VAT_i^*$  is an estimate of the fiscal capacity for value added tax (model 6.12);

$TP_i^*$  is an estimate of the fiscal capacity for corporate profits tax (model 7.2);

$IT_i^*$  is an estimate of the fiscal capacity for income taxes (model 8.5);

$PT_i^*$  is an estimate of the fiscal capacity for property tax (model 9.3);

$ST_i^*$  is an estimate of the fiscal capacity for sales tax (model 10.3);

$A_i^{alc*}$  is an estimate of the fiscal capacity for excise taxes on alcoholic beverages (model 11.3);

$RP_i^*$  is an estimate of payments for using natural resources in  $i$ -region (model 12.2);

$TJ_i^*$  is an estimate of revenues from the tax on maintenance of housing and social facilities in  $i$ -region (model 13.3);

$A_i^{gaz}$  and  $A_i^{oil}$  are factual revenues from excises on oil, including gas condensate, and gas respectively (they are not modeled here, see above);

$OT_i^*$  is an estimate of the fiscal capacity for all the 'other taxes' in  $i$ -region, which have not been estimated separately so far.

Results of estimating the aggregate fiscal capacity by means of model (16) are given in Annex 3, Table 11.

### Comparison of estimates obtained by various methods

Annex 4, Table 1 shows the results of comparison of estimates obtained by the two methods used.

**Table 37. Comparison of estimates obtained on the basis of gross regional product and the broader method of representative taxation system, 1999.**

	<i>Model 5</i>	<i>Model 16</i>
Error in the aggregate estimate for Russia in total, %	-8.2%	-13.3%
Standard deviation of relative errors, %	27.8%	22.5%

As is evident from the results of the comparison, the aggregated model displays less deviation in the combined estimate for Russia on the whole. Still the relative standard error of the model turned out to be high. It might be due to the fact that in our evaluation based on the method of the representative taxation system (RTS) some taxes, such as oil and gas excises, have been ignored in the model and the fiscal capacity has embraced the factual values of tax liabilities. However, once they are excluded, the standard error changes slightly (22.6 percent against 22.5 percent), see Fig. 37.

The fact that the estimate obtained on the basis of the expanded method of representational tax system is closer to factual values is nontrivial, especially given rather low explanatory properties of the models for each of the estimated taxes. Apparently, it is due to the opposite sign of errors, which reduces the cumulative error in aggregation.

However, another criterion to be employed in choosing a model for estimation of the fiscal capacity is that it should not only account for factual tax revenues, but could also be used for objective equalization of budget revenues of the regions. As noted above, the fiscal capacity, which is calculated with the purpose of interbudget equalization in mind, is expected to be revenues that a region would receive, given the factual fiscal bases and mean tax rates (efforts). In the meantime, the objective differences in the tax load, which are predetermined by the federal statute, should also be considered in the fiscal capacity, whereas the subjective differences, those in rates and benefits which are delegated by regional authorities, should be removed or, to be exact, averaged. It is evident that strict differentiation between objective and subjective factors affecting the factual tax revenues can be done, if only based on the maximum disaggregated data with due regard for all the factors mentioned. However, such an

approach is unlikely to lead to the intended effects because of a number of weaknesses. First, it is highly sensitive to data and accumulates errors of various estimates. Second, the disaggregated method disregards the interdependence of fiscal bases, see above.

If so, a compromise solution is to make an integrated estimate based on the two methods:

$$TA_i' = \lambda \cdot TA_i^* + (1 - \lambda) \cdot TA_i^{**} \quad (17)$$

where

$TA_i^*$  is an estimate of the fiscal capacity of  $i$  region based on the aggregated method (model 5);

$TA_i^{**}$  is an estimate of the fiscal capacity based on the expanded method of RTS (model 16);

$TA_i'$  is a weighted estimate based on both methods;

$0 \leq \lambda \leq 1$  is a weighing coefficient.

A use of such an approach allows us to take into account, on the one hand, all the objective differences in fiscal bases (the expanded method of representational tax system) and, on the other hand, a common tax load on the product (interchangeability of bases).

Coefficient  $\lambda$  determining which method is weightier, can be set through the use of an expert method or calculated. One of the underlying principles in doing so can be minimization of the aggregate standard (relative) error:

$$\sigma(\lambda) = \left[ \sum_i w_i^2 \cdot (\lambda \cdot TA_i^* + (1 - \lambda) \cdot TA_i^{**} - TA_i)^2 \right]^{0.5} \rightarrow \min_{\lambda} \quad (18)$$

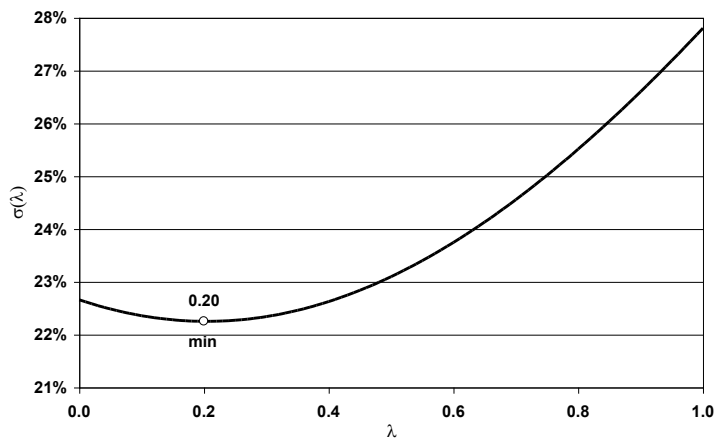
where

$w_i = TA_i^{-1}$  are weights allowing the relative error to be minimized;

$\sigma(\lambda)$  is a standard relative error of the model (17);

$TA_i$  is factual tax liabilities of  $i$  region.

Dependence of  $\sigma$  on parameter  $\lambda$  for estimates obtained on the basis of the 1999 data is shown in Fig. 30.



**Fig. 21. Dependence of the standard relative error of model (17) on parameter  $\lambda$ , 1999.**

As is evident from the figure, the function has an extremum within an interval with a minimum value of  $\lambda \approx 0.20$  (the expanded method of the representational tax system has a bigger weight with the aggregate estimate). Thus, in using the weighted estimate, which may be obtained on the basis of the two methodologies used, we can diminish an error of estimation. An estimate of the fiscal capacity based on model (17) with  $\lambda \approx 0.20$  is given in Annex 5, Table 1.

## AFTERWORD AND CONCLUSIONS

Books on fiscal federalism normally emphasize two basic approaches in calculating the fiscal capacity: (1) an estimate of the regional fiscal capacity based on the method of representational tax system and (2) use of macroeconomic factors in assessing the capacity for mobilizing tax revenues into regional budgets. These methods differ both in accuracy and difficulty of their use, special demands for their statistical base and efficiency of their use depending on the specific features of the state budget system as the background where they are used. Each of the techniques has its own strengths and weaknesses, which are analyzed very thoroughly in our paper. We have attempted to make estimation with the help of both techniques, although it should be noted that it is impossible to evaluate the fiscal capacity of the Russian subjects through the use of the method of representational tax system literally, since there is no adequate statistical base and the available statistics is not reliable enough. On the other hand, given a high degree of interregional differentiation of the fiscal capacity and a complicated fiscal system operating in Russia, we do not find it effective to assess the regional fiscal capacity on the basis of macroeconomic factors as well. That is why we have generally made use of modeling of the regional fiscal capacity by means of indirect estimates of the tax system. The gross regional product (GRP) is used to estimate an aggregate tax base by employing the method based on the use of macroeconomic indexes. As stated above, its use is favored, because it can better take into account an aggregate income of economic agents in a region, than the RTC technique. The former, which is based on the GRP, employs the fullest

information about the regional income. Another advantage of the technique is that it is simple enough.

As our calculations indicate, in this case the level of explanation of the factual fiscal liabilities, i.e. collected taxes and increase in arrears, is rather high, with the percentage of the explained dispersion amounting to over 90 percent. At the same time the method is important, because the composition of tax bases is equalized across the regions and a common tax rate is effective regardless of the type of regional economic activity. On the one hand, it allows less dependence of the estimate of the capacity on the fiscal choice of regional authorities and economic agents (feedback effect), but on the other hand, disregards objective differences between regions in income-gaining potential. Among them are industrial differences (the level of tax load in industries may vary in objective terms), composition of fiscal bases (production of excises-levied goods and commodities, etc), which affects the factual fiscal capacity as a result of some specific features of the Russian fiscal system.

The method can be slightly expanded through disaggregation of value-added index, which is used to estimate an aggregate regional fiscal base industry-wise, which allows us to take account of differences in the level of the tax burden on each industry. Our paper has not dealt with such an estimate, because industrial disaggregation of the GRP for the period under review (1999) is not available. Still you can find similar estimates for the 1997 regional fiscal capacity in the previous papers of ours<sup>31</sup>, and they have used the technique in question. The expanded method of the representational tax system implies that a separate estimate of regional fiscal capacity is made for each individual tax by means of an indirect estimate of the corresponding tax base. The present paper made an estimate of the fiscal capacity for basic taxes accounting for around 90 percent of all tax revenues in the budget system of the Russian Federation. They are the value-added tax, the corporate profits tax, the individual income tax, property taxes, a number of excises, resources payments, the tax on maintenance of housing facilities and the sales tax. A separate estimate was made of the fiscal capacity for tax revenues, which are routed to road funds. The fiscal capacity for the remaining taxes, that is factual tax revenues and an increase in arrears, was estimated as a total.

An estimate of the fiscal capacity for the corporate profits tax, the individual income tax, the sales tax and alcoholic beverage excises was based on the figures that are close to their tax base, but without regard for its composition. For the other taxes under research, such as VAT, property tax, resource payments, tax on maintenance of housing and social facilities, we have made use of indirect characteristics of the fiscal base.

In order to estimate the tax base for VAT, we have modeled a number of statistics, such as a total of retail turnover, cost of services offered to the population, and an amount of the gross regional product. In characterizing the composition of the corresponding regional tax base, we have used such figures, as volume of export and a share of the people living in the countryside, which were intended to take account of the volume of goods and services levied at a zero rate, as well as a group of goods imposed at a reduced rate. According to our study, in terms of explanation and economic interpretation, an ideal model is the one that uses figures for the gross regional product and a share of the people living in the countryside as part of the total population of a Federation subject to estimate the base.

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<sup>31</sup> See: 'Sovershenstvovaniye mezhibudjetnykh otnosheniy v Rossii', sbornik statei [Improvement of interbudgetary relations in Russia/ Collection of papers, IEPP, 2000, pp. 218-229].



The fiscal capacity for the corporate profits tax was modeled depending on a figure for an aggregate profit of an enterprise or organization, as reported by Goskomstat, as an estimate of the corresponding tax base. However, the explanatory properties of the model proved to be low enough, which is presumably due to an amount and unproportionate composition of distributing benefits for the tax at both the federal and regional levels.

In evaluating the regional fiscal capacity for the income tax, we have used figures for an amount of money incomes of the population and an aggregate total of the wage fund in the Federation subjects. The latter was primarily used to evaluate the tax base, because the figure for cash incomes of the population was not satisfactory and could hardly be used to estimate the fiscal capacity. The methodology of calculating the latter was based on expert estimates of unaccounted cash incomes. Moreover, it also takes into consideration the untaxable incomes, such as bank deposit incomes, insurance payments, etc. However, the wage figure does not take account of all types of incomes of the population subject to taxation. In this connection, the quality of estimates is getting higher, once both indexes are used jointly.

It is noteworthy that out of all modeled taxes, a percentage of the explained dispersion is the highest for the individual income tax (over 95 percent). The fiscal capacity for payments for using natural resources was modeled depending on the volume of output produced by raw material industries and figures for factual materials mined in the regions.

Potential tax revenues routed into the budget system, such as oil and gas excises, cannot be actually assessed by regressive techniques because of nonoverlapping of extracting and tax-paying regions. It should also be noted that the tax revenues are routed in full to the federal budget, except for republics of Tatarstan and Bashkortostan, signatories to respective special agreements, and they in no way influence the potential of the regions to gain their own revenues. That is why their modeling is of no interest for the purpose of interbudgetary equalization.

It might be well to point out that sales tax revenues can hardly be subject to a regressive estimate because of a high degree of scattering in fiscal efforts of the territories as regards the tax. The point is that in 1999 the tax was not in effect in some regions, while elsewhere it was introduced in the middle of the period under review. Therefore we have relied on an average effective rate, rather than on an effective tax rate.

The comparison of the estimates made with the help of the two techniques demonstrated that the technique of estimating the fiscal capacity based the use of macroeconomic figures is prone to a smaller standard error in explaining the factual tax liabilities. However, which model is used in every specific case should depend on criteria of effective interbudgetary equalization and with due regard for a specific procedure of collecting a variety of taxes. In order to make the system of estimating a regional fiscal capacity more effective, we have offered a technique aimed at combining the estimates made by means of various approaches to evaluating the regional fiscal capacity, which helped us to take into account both advantages and disadvantages of the two techniques and diminish the relative error in the summary estimate.

It is also worth noting that the results of our fiscal capacity estimation based on the techniques offered could be exploited by the Ministry of Finance of the Russian Federation in

distributing transfers from the Fund of Financial Support of Regions. When introducing our technique of fiscal capacity estimation, the basic goals that should be kept in mind are, first, to make a clear and easy-to-understand methodology of calculations and, second, to take account of some peculiar features inherent in passing over from fiscal capacity estimation by means of the available techniques to those offered here. The former task is vital, because the body of mathematics used in carrying out regressive estimates is rather complicated and it should be adapted to fit the capacity of the Ministry of Finance and regional authorities. The latter task is urgent, for differences between the in-action and offered techniques are inevitable, and therefore initially a mechanism for evening out the differences between them should be provided for.

In summing up the study made, we would like to emphasize that the subsequent developments should be based on integration of the evaluation results obtained through the use of the two techniques resulting in a joint aggregate estimate. At the same time expansion of the range of the available statistics, which might result from expected introduction of the so called 'tax passports' of the Federation subjects, is likely to move the fiscal capacity estimate based on the expanded technique of the representational tax system to a new higher level in terms of quality.

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