

Evaluating scenarios of a personal income tax reform in Russia

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ABSTRACT

This article is aimed at evaluating different scenarios of the personal income tax reform in Russia, intended to replace the flat tax scale with a progressive scale. To test the expediency of this plan, the authors present a three-parameter model to calculate the expected effects from different scenarios. The model is based on the idea that the best project should simultaneously reduce the assets ratio, increase budgetary revenue and should minimize the risk of the reform's non-fulfillment. The research relies on the statistical data on the population's income distribution. To neutralize distortions, the authors calibrated the initial statistical data on distribution in the high-income group (tenth decile) of the population. The risk of non-fulfillment was assessed through an expert poll. The proposed model was used to test four reform projects, which were developed by the Government, the Communist Party, the Liberal Democratic Party, and the party "Just Russia". It was found that the best project, according to the three parameters applied in the analysis, was the governmental project, which preserves the flat income scale and raises the rate from 13 to 15%. It was also shown that the other projects dramatically overestimated the growth in tax revenues due to incorrect calculations of the distribution of the population's incomes in the tenth decile group. Thus, at the moment there are no rational alternatives to the governmental project of the reform and there is also no consensus between the Russian opposition parties and the expert community, which prevents them from working together to design a single reform project. It is concluded that at present Russia needs a balanced project which would include multi-step adjustments of the personal income tax over an extended period of time – ten years or more.

KEYWORDS

progressive personal income tax; flat personal income tax; tax reform, social inequality; budgetary income

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Оригинальная статья

Оценка сценариев реформы подоходного налога в России

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АННОТАЦИЯ

Целью статьи является оценка различных проектов реформирования подоходного налога в Российской Федерации. Для обсуждения целесообразности отмены плоской шкалы подоходного налога и ее замены на прогрессивную шкалу

авторы предлагают трехпараметрическую модель, позволяющую проводить сценарные расчеты ожидаемых эффектов от различных вариантов налоговой реформы. Главная идея модели состоит в том, что лучшим является такой проект реформы, который дает лучший интегральный результат с учетом возможного уменьшения коэффициента фондов, роста доходов бюджета и риска невыполнения проекта реформы. Информационным массивом исследования являются статистические данные о распределении доходов населения. Для нейтрализации искажений выполнена калибровка исходных статистических данных относительно распределения высокодоходной группы (десятого дециля) населения. Риск невыполнения проекта оценивался на основе экспертного опроса. Разработанная модель была применена для проверки четырех проектов реформы подоходного налога: проекта Правительства Российской Федерации; проекта Коммунистической партии Российской Федерации; проекта Либерально-демократической партии России; проекта партии «Справедливая Россия». Апробация модели показала, что лучшим по трем параметрам является проект Правительства РФ, предлагающий сохранить плоскую шкалу налога и повысить ставку с 13 до 15%. Также было выявлено, что предложения всех политических партий, выступающих за введение прогрессивной шкалы подоходного налога в России, кратно превышают рост налоговых поступлений от внедрения своих предложений из-за неправильного учета распределения доходов населения в десятой децильной группе. Все это свидетельствует об отсутствии рационального альтернативного предложения по внедрению прогрессивной шкалы подоходного налога, а также об отсутствии в России в настоящее время консенсуса между оппозиционными политическими партиями и экспертным сообществом, что не позволяет им выступить с единым и хорошо проработанным проектом реформы подоходного налогообложения. Сделан вывод о том, что на данном этапе Россия нуждается в сбалансированном проекте введения прогрессивного подоходного налога с учетом многошаговых корректировок налоговой шкалы в течение длительного времени (10 лет и более).

КЛЮЧЕВЫЕ СЛОВА

прогрессивный подоходный налог, плоская шкала подоходного налога, реформа налога, социальное неравенство, доходы бюджета

1. Introduction

The establishment of market economy in Russia led to predictable income stratification of society. Social conflicts are becoming more intense and attract a lot of attention while the introduction of international sanctions limited the country's budgetary revenues. Both problems could, at least partially, be solved through the introduction of a progressive personal income tax scale, which in Russia has been a widely discussed issue in the last two years.

The analysis shows that society is divided into two camps on the issue of introducing the progressive personal income tax. On the one hand, the State Duma receives constant proposals to introduce this fiscal instrument, on the other hand, the Russian government unflinchingly refuses to back up these initiatives. Thus, in 2017 three political fractions supported the draft law to introduce a progressive indi-

vidual income tax scale: the Communist Party of the Russian Federation (CPRF), the Liberal-Democratic Party of Russia (LDPR) and the Party "Just Russia" (PJR). The draft laws proposed by these parties differed only in details – in tax rates and the gradation of income. However, the government did not support these initiatives and in the end, the Duma rejected these draft laws. It should be mentioned that "Just Russia" submitted drafts for discussion in the Duma over ten times, with invariably negative results. In this case, it is impossible to overlook the fact that all projects to introduce the progressive personal income tax were always approved by the Parliament of the Kabardino-Balkar Republic. Thus, we can conclude that there is, so far, no political consensus in Russian society regarding the progressive personal impact tax. The situation got worse in 2018, after the pension reform had been initiated. From that moment, it became

clear that the government chooses to solve budgetary problems at the expense of the poor, rather than rich, members of society.

At present there are four projects of the reform proposed by the three political fractions (PJР, LDPR and CPRF) supporting the introduction of the progressive scale of income tax and the one proposed by the government, which would like to keep the flat scale while simultaneously raising its rate from 13% to 15%. Each of the scenarios is characterized by different risks of non-fulfillment. The aim of this article is to develop standard methodology for the economic evaluation of tax reform projects and selection of the optimal one. Three groups of risks will be taken into consideration – fiscal (additional revenue for the budget), social (changing the income disparity), and behavioral (the degree of project feasibility). The calculations should illustrate the functionality of the developed methodology so that they could be used in the future to examine other reform projects.

For our analysis of the problems associated with the tax reform it is important to remember that we are going to discuss the personal income tax, although this tax is not currently used in Russia and is substituted by its distant equivalent – the so-called income tax on natural persons. The difference between them lies in the fact that the personal income tax takes into account the per capita family tax, while the income tax on natural persons is limited to the income of a specific person; in other aspects these two taxes are functionally identical. To ensure a smooth transition from the Russian income tax on natural persons to the internationally accepted personal income tax, we first need to ensure comparability of these taxes.

2. Analytical overview of the problem

Various aspects of social inequality and income tax are discussed in numerous publications; however, for the purposes of this article, it will be sufficient to point out several key ideas to show how this study fits into the general research trend.

First and foremost, it should be noted that the majority of countries with a low

share of the personal income tax in their budgetary revenues are also characterized by a low level of income, especially wages [1–4]. Although Russian people's incomes have grown considerably in the last two decades, they still have not reached the level at which the personal income tax can become the fiscal dominant of the budgetary system. From this point of view, in Russia no adjustments to the system of the personal income tax can make the role of this tax more significant, and this fact should be taken into consideration while reforming the Russian tax system.

It should be borne in mind that the transition of Russia to the flat scale of the personal income tax happened at the same time as similar reforms in other countries, for example, Sweden. Such political decisions mainly stemmed from the understanding that, due to a large number of special regimes and benefits, this tax had probably lost much of its former effectiveness, especially regarding its redistribution functions [5–7]. Econometric calculations in the following years showed that this tax is mainly oriented at leveling the wages, while its potential for the redistribution of taxable incomes of high-income groups is, on the whole, low [8].

An important milestone in the research of the personal income tax was the introduction of models of individual tax evasion, in which the function of utility depended on the size of individual "wealth". One of the first such models was proposed as far back as in 1972 [9], and it was followed by a stream of publications discussing its specific aspects [10; 11]. With reference to Russia, it was shown that the personal income tax played a modest role in the tax system due to various tax evasion mechanisms used by high income taxpayers [8].

In the past decade in Russia, many studies have put emphasis on analytical description of the fiscal effects and the effects of social inequality. Thus, for example, the distribution of income in population groups was approximated using the Verhulst differential equation, which made it possible to obtain an analytical expression for the assets ratios, Gini

index and the coefficient of specific polar incomes, as well as to determine that there were no significant changes in the structure of income distribution in 2009–2015 [12]. Another study applied a model of the income distribution function in Russia with the use of the two-parameter long-normal distribution, which allowed the authors to evaluate the assets ratio in 1998 at the level of 17.6 for the country as a whole, while for Moscow it was at the breathtakingly high level of 46.0 [13].

More advanced recent research has been mainly aimed at modeling the progressive scale of the personal income tax. This trend was largely determined by the fact that the modern theory of optimal income taxation, which goes back to the works of J. Mirrlees [14], does not provide any comprehensive answers to the question about the optimal progression degree for the personal income tax scale or the size of top rates and the range of their variations. Furthermore, the obtained analytical results are very sensitive to the initial suppositions and assumptions, which in their turn, according to some researchers, are themselves weakly grounded and insufficiently substantiated [15]. Therefore, in 2011, R.O. Smirnov put forward a game model of constructing the progressive scale of the personal income tax using the differential “coupling equation” as the main condition for the model’s solution [16]. The results he obtained made it possible to reduce the problem of selecting the top rates of the tax and the grades of the scale to the problem of choosing five entrance parameters for this model, which could be easily determined on the basis of statistical data. For the case of long-normal distribution of income, the progressive scale of the personal income tax was determined as fractions of the mathematical expectation, and the percentage (effect) of this type of tax from the aggregate tax revenue was expressed through the parameter of dispersion in the distribution [17].

Theoretical research in the sphere of taxation made it possible to determine that a small change of prices caused by the introduction of the personal income tax leads to a considerable change (deteriora-

tion) of the standard of living [18]. Further modeling of the economic effects from the introduction of the progressive personal income tax allowed the researchers to derive the function of the redistribution of the tax burden and to compare multiple variants of the non-linear tax [19].

As for the flat personal income tax scale, it was shown that the instruments ensuring its progressiveness are the standard benefits. However, the incomplete and delayed indexation of the benefits of the income tax on natural persons and the abolition of the standard benefit led to a decrease in the progressiveness of the personal income tax in the decade following its introduction. The emerging effect of “cold progression” lead to additional taxing of the sums which should have been removed from the taxable base due to the social purpose of the taxes [20].

In recent years, some ultramodern instrumental approaches to studying the income tax phenomenon have been developed, including analysis of the dynamics of income tax evasion based on the standard model of statistical mechanics, namely, the Ising model of ferromagnetism [21]. This approach falls within the framework of econophysics and makes it possible to examine a heterogeneous society whose agents are characterized by a certain social temperature and connection with the external fields that govern their behavior. This new approach to modeling allows us to analyze big communities consisting of at least four different interacting types of agents.

Research based on the agent-oriented models and aimed at studying behavioral and social aspects of taxation has also recently gained popularity. Thus, there are works aimed at determining the role of professional affiliation in the observance of tax legislation (tax discipline) and the conditions of auditing (checking) a fixed number of taxpayers for each type of professions [22].

There are also some model applications of the imitation type used to assess different scenarios of the income tax reform. One of them is the MIKMOD-EST model, which belongs to the class of the

so-called micro-simulation models [23]. This model was developed and is used by the German Federal Ministry of Finance to evaluate different proposals regarding the reform of the income tax of individuals. Its advantage is the total inclusion of all taxpayers with the above-threshold income, which makes it possible to conduct calculation experiments even for the most selective reforms. Its drawback is the absence of information necessary for modeling the behavioral reactions of taxpayers to the changes in taxation.

Various models of the progressive scale of the income tax based on the principle of multiplier-accelerator remain relevant. It is believed that in the cases of non-linear progressive taxation, an increase of tax rates could destabilize economic growth [24]. The advantage of such models is that they demonstrate conditions for stable growth as a “corridor” of parameter values for the fiscal regime of stability and such findings can thus be used in policy-making.

There is also vast research literature focusing on the risks associated with tax reforms. Currently there are various definitions of this concept (for more detail see [25; 26]). In spite of the multitude of approaches to their interpretation, all authors agree that tax risks are caused by the uncertainty of both external and internal environment, they are connected with the threat of financial and other losses for the state and taxpayers, they have a negative character and are rather hard to identify and to assess [27].

Causes of uncertainty include the following categories of risks [28]: information risks connected with different interpretations of legislative acts; risks associated with tax liabilities (managerial mistakes, drawbacks of the document flow, portfolio risks, etc.); risks of the environment resulting from uncertainties in the enforcement of tax legislation; and reputational risks, that is, adverse impacts on reputation of companies. Some authors extend this list to include risks of financial accounting and management [29]. Moreover, many researchers believe that tax risks result from the great tax burden, which makes

taxpayers try to evade their tax obligations and thus contributes to the growth of the shadow economy [30; 31]. This is the key argument of those who advocate the flat scale of the income tax on natural persons when discussing the choice of a taxation system for Russia. Specifically, the Russian government has rejected all the draft laws for changing the taxation system pointing out the negative experience of 1992–2000 when the progressive scale of tax rates was used in Russia. These negative effects included difficulties of administering and the attempts of taxpayers (both employers and employees) to reduce the tax burden by minimizing the paid (received) income. Furthermore, the government maintained that the introduction of the flat scale of income tax on natural persons in 2001 contributed not only to the increase of tax revenue, but also to the stabilization of tax collection.

We share the view of L. Lykova [32], who examined the possibility of restoring the personal income tax in Russia and offered a quantitative evaluation of the possible results of this step for three hypothetical scenarios of the reform. In particular, she shows the drawbacks of the existing statistical information and models the income distribution curve. The calculations of the budgetary revenue and the decile coefficient demonstrated that none of the three scenarios ensures a considerable reduction in the decile coefficient, which supports the conclusion of the previous studies that showed the weak redistribution function of the personal income tax.

I. Mayburov and A. Kireenko [33] discuss the influence of election cycles on the Russian tax system and show that the tax burden on the main elements of GDP increases during the first years of the political cycle and decreases during its last years. Thus, in the pre-election period, the nominal tax burden on the economy is constantly decreasing, in the election year and the following year of the election cycle the effective rates of revenue, consumption and labor rise; these effective tax rates go down in the following years. Consequently, the starting date of the tax reforms is crucial for their implementa-

tion and the choice of this date should take into account the beginning of the election cycle.

In the following sections of the article we are going to combine some of the above-mentioned aspects of taxation within the framework of a single analytical scheme which would include the real projected parameters of reforms and model constructions.

3. The three-parameter model of the progressive personal income tax

We use a three-parameter model to evaluate the expediency of introducing the progressive personal income tax. In this case, the model scheme will take into account the three key parameters – social (assets ratio), fiscal (growth in tax revenue), and behavioral (the degree of the project’s feasibility). In other words, it is expected that the introduction of the progressive personal income tax should lead to a reduction in the assets ratio and growth in tax revenue. It is also important to take into consideration the risk that the reform will fail, that is, it will not reach the desired effect. The main idea of this scheme is that the calculations should be based on these three parameters. Let us take a closer look at all the dependences that would be used further.

The initial value of the assets ratio, that is, before the progressive scale of the personal income tax is introduced, is calculated in a rather trivial way:

$$F_0 = \frac{D_{10}}{D_1}, \tag{1}$$

where D_1 and D_{10} signify the income of the 1st and the 10th decile groups.

The initial value of tax revenues from the personal income tax could be evaluated by the following simplified equation:

$$T_0 = \alpha D - V, \tag{2}$$

where D is the population’s aggregate income; α is the basic rate of the personal income tax¹; and V is the tax benefits.

Then the assets ratio after the introduction of the progressive personal income tax is calculated as:

$$F_1 = \frac{D_{10}^*}{D_1^*}, \tag{3}$$

where D_1^* , D_{10}^* stand for the aggregate income of the 1st and the 10th decile groups after the introduction of the progressive scale of the personal income tax.

In the simplest case it is possible to neglect the tax benefits ($V = 0$). Then the whole effect of the tax reform is determined by the new value (after the introduction of the progressive personal income tax) of the income of the 10th decile group D_{10}^* :

$$D_{10}^* = (1 - \alpha)W_{max}L_{10} + \sum_{i=2}^n L_{10,i} \sum_{j=1}^{i-1} (1 - \beta_j)(W_{10,j,max} - W_{10,j,min}) + \sum_{i=1}^n (1 - \beta_i)(\bar{W}_{10,i} - W_{10,i,min})L_{10,i} \tag{4}$$

where W_{max} is the maximum income for the basic rate of taxation (α); L_{10} is the size of the 10th decile group; $L_{10,i}$ is the size of the i subgroup of the 10th decile group; β_i and β_j is the tax rate of the i and the j subgroups of the 10th decile group, correspondingly; $W_{10,j,max}$ is the upper income threshold of the j subgroup of the 10th decile group; $W_{10,i,min}$ and $W_{10,j,min}$ are the lower income threshold of the i and the j subgroups of the 10th decile group, correspondingly; $\bar{W}_{10,i}$ is the average income of the i subgroup of the 10th decile group; $i = \overline{1, n}$; $j = \overline{1, n}$; $n = 5$.

The volume of tax revenues from the personal income tax after the introduction of the progressive scale is calculated according to the formula:

$$T_1 = \alpha D + \sum_{i=2}^n L_{10,i} \sum_{j=1}^{i-1} \beta_j (W_{10,j,max} - W_{10,j,min}) + \sum_{i=1}^n (\bar{W}_{10,i} - W_{10,i,min}) \beta_i L_{10,i}, \tag{5}$$

For further analysis, it is necessary to evaluate the two parameters mentioned above: the change of the assets ratio after the introduction of the progressive scale

$$\Delta F = F_1 - F_0, \tag{6}$$

¹ In the existing system of flat taxation $\alpha = 13\%$.

and the absolute and the relative change of tax revenues regarding the personal income tax

$$\Delta T = T_1 - T_0, \quad (7)$$

$$\lambda = (\Delta T / T_0 - 1) \cdot 100\%. \quad (8)$$

To compare different scenarios of the tax reform, criteria (6) and (8) can be aggregated into one with the help of mass coefficients ζ and $1 - \zeta$. Then it is possible to use the simplest convolution equation:

$$Q = \zeta \lambda + (1 - \zeta) |\Delta F|, \quad (9)$$

where ζ is the mass coefficient.

To compare the scenarios in which the progressive scale is introduced with that of changing the flat scale, it is sufficient to evaluate the tax revenues for the second case according to the equation:

$$T_1 = \alpha^* D - V^*, \quad (10)$$

where α^* is the new flat rate of the personal income tax.

However, even the combination of the fiscal and social effects does not allow us to determine the best reform scenario as we need to take into account one more important parameter – risk (R). Risk in this case is understood as the probability that the scenario will not in practice provide the desired effect. In this sense, integral effect Q acts as the *potential effect* that could be reached fully or partially in the implementation of the project. Thus, to make a decision regarding the expediency of the project, it is necessary to have one more project feature – the size of the *risk of its fulfillment/non-fulfillment*. The combination of the potential effect with the rate of risk makes it possible to assess the *factual (real) effect*.

At the qualitative level, it is evident that the government's project and the project proposed by the PJR include a low risk; the CPRF project, a medium risk; and the LDPR project, a high risk. However, this rough estimate of risk does not allow for a correct comparison of these projects, which differ considerably in the size of their potential effect. To do this, a concrete index of risk R is needed, with its specific quantitative value. This index could be used to range the projects of the personal

income tax reforms on the basis of the aggregate criteria of result E .

Theoretically, the aggregate criterion E could be set in the additive and the multiplicative form. In instrumental terms, the multiplicative criterion is preferable and could be written the following way:

$$E = Q(1 - R), \quad (11)$$

where the potential fiscal-social effect Q is corrected by the factor of reliability $D = 1 - R$, which is the measure reverse to risk R . It is easy to see that the reliability coefficient D acts as some kind of efficiency coefficient. Thus, equation (11) includes a maximally transparent interpretation of the modeled process: the final effect is the value of the potential effect with the assessment of the efficiency coefficient of the given reform scenario.

The equations we applied above make it possible to accurately determine the social and fiscal results of both scenarios with different progressive scales of the personal income tax and the scenarios of simply changing the flat scale.

4. Initial data for modeling

All macroeconomic evaluations of tax effects, as a rule, are relative and are not supposed to be highly precise. However, our task in this case is to make our calculations as accurate as possible to understand the comparative effect of different scales – the flat one and the progressive one. To achieve this, it is necessary to prepare the initial data for macro-calculations very thoroughly. Below we present the algorithm of calibrating the statistical aggregates and their “corrected” values that will let us obtain non-contradictory results in the future.

The first set is the data on the distribution of the population's incomes broken into groups, each comprising 10% (Table 1). To balance all values, the last column of Table 1 is calculated as the product of columns 3 and 4, which led to a small error compared with the Rosstat data.

We can also use the information on the distribution of the population's incomes by social groups to look at income intervals (Table 2).

Table 1

Distribution of monetary income by 10% groups of the population in 2016

Income groups	Share of the group in the total volume of the population's monetary income, %*	Size of the group, ths. people	Average monetary income per capita, RUB per month*	Monetary income of the group in 2016, RUB
First	1.9%	14,680,400	5,983	1,053,993,998,400
Second	3.4%	14,680,400	10,368	1,826,476,646,400
Third	4.5%	14,680,400	13,704	2,414,162,419,200
Fourth	5.6%	14,680,400	17,107	3,013,651,233,600
Fifth	6.8%	14,680,400	20,875	3,677,440,200,000
Sixth	8.2%	14,680,400	25,313	4,459,259,582,400
Seventh	10.0%	14,680,400	30,903	5,444,020,814,400
Eighth	12.6%	14,680,400	38,632	6,805,598,553,600
Ninth	16.7%	14,680,400	51,305	9,038,135,064,000
Tenth	30.3%	14,680,400	93,253	16,427,896,094,400
Total	–	146,804,000	–	54,160,634,606,400

* See: Social position and living standards of the population – 2017, Table 6.3.

Table 2

Distribution of the population's income by social groups with account for income intervals, 2016

Average monetary income per capita per month, RUB*	Boundaries of the average monetary income per capita per year, RUB	Distribution of the population by income groups, %*	Size of social groups, people
below 7,000	below 84,000	6.0%	8,808,240
7,000.1–100,000	84,000–120,000	7.9%	11,597,516
10,000.1–14,000.0	120,000–168,000	12.0%	17,616,480
14,000.1–19,000.0	168,000–228,000	14.3%	20,992,972
19,000.1–27,000.0	228,000–324,000	18.2%	26,718,328
27,000.1–45,000.0	324,000–540,000	22.7%	33,324,508
45,000.1–60,000.0	540,000–720,000	8.5%	12,478,340
over 60,000.1	over 720,000	10.4%	15,267,616
Total	–	–	146,804,000

* See: Social position and living standards of the population – 2017, Table 6.3.

We can compile the final decile table of the population's income (Table 3) by combining the data from Table 1 and Table 2 with the standard formula of calculating deciles². The values from Table 3 will be used at a later stage of our research to verify the two basic conditions of calibrating calculations.

The key principle in modeling the introduction of new tax scales and its results is that changes in taxation affect only two decile groups – the first and the tenth. The first is affected through tax benefits and reduction/abolition of the personal income tax rate; the tenth, through the introduc-

tion of the progressive personal income tax scale. Thus, eight decile groups do not take part in our calculations and do not influence the final calculations. Besides, the tenth decile is broken into five income groups, and the data for these groups are provided by the official web-site of the State Duma³.

Furthermore, the tax system in Russia deals with the so-called taxpayer, while the data in Table 3 encompass the whole population of the country, including non-working groups. Therefore, in Table 3 we need to focus on the average income of the taxpayer: the average income of the

² See: <https://studfiles.net/preview/5316597/page/4/>

³ See: <http://sozd.parlament.gov.ru/bill/427315-7>

Table 3

Decile table of the population's income, 2016

Decile	Boundaries of the average per capita income per year, RUB	Size of the group, people	Average per capita income per month, RUB	Average per capita income per year, RUB	Income of the group per year, RUB
First	0–102,228	14,680,400	5,983	71,796	1,053,993,998,400
Second	102,228–144,400	14,680,400	10,368	124,416	1,826,476,646,400
Third	144,400–184,400	14,680,400	13,704	164,448	2,414,162,419,200
Fourth	184,400–227,161	14,680,400	17,107	205,284	3,013,651,233,600
Fifth	227,161–269,119	14,680,400	20,875	250,500	3,677,440,200,000
Sixth	269,119–332,440	14,680,400	25,313	303,756	4,459,259,582,400
Seventh	332,440–385,187	14,680,400	30,903	370,836	5,444,020,814,400
Eighth	385,187–529,533	14,680,400	38,632	463,584	6,805,598,553,600
Ninth	529,533–728,471	14,680,400	51,305	615,660	9,038,135,064,000
Tenth	over 728,471	14,680,400	93,253	1,119,036	16,427,896,094,400
Assets ratio		15.6		54,160,634,606,400	

population is corrected with the help of the coefficient that takes into account the share of the adult population⁴, which accounts for 78% of the total population. To simplify the analysis, it is assumed that this share is the same for all decile groups, each of them is reduced by this value, and afterwards the taxpayer's average income is calculated again.

The first condition of calibration is used to evaluate the average income of the lower income group of the 10th decile: $W_9 < W_{10,1}$, that is, the average income of even the lowest subgroup of the top decile cannot be smaller than the average income of the previous decile group. If we conduct calculations of this parameter for the subgroup 10.1 using the rule of the arithmetic mean, as the analysts of all major political parties – CPRF, LDPR and PJR – do, the above-mentioned condition will not be observed. It happens because the distribution of income inside the income group is configured in such a way that it is heavily left-weighted – to the lower boundary of income, while common averaging presupposes the concentration of taxpayers in the middle of the income interval or its even distribution over the whole income interval. Such simplification could result in serious calculation errors in the calculation of the socio-economic effect from

the introduction of the proposed scales of the progressive personal income tax (this question will be discussed in more detail further).

Thus, we need to deal with the problem of defining the corrective effect of the coefficient for the calculation of the average income of the 10th decile's subgroups. Let us suppose that the average per capita income in the lower subgroup of the 10th decile, that is, in subgroup 10.1, should be at least 5% higher than the average income of the 9th decile. Then it equals $65,534^5 \cdot 1.05 = 68,810$ RUB per month, or 825,728 RUB per year. Based on this, it is easy to determine the aggregate income of subgroup 10.1 ($D_{10,1}$) as the product of the size of the group ($L_{10,1}$) and the average income ($W_{10,1}$), that is, $D_{10,1} = W_{10,1} \cdot L_{10,1}$. After that, the corrective coefficient (k) is calculated according to the formula of aggregation of the income boundaries: $k = (W_{10,1, \max} + W_{10,1, \min}) / W_{10,1}$. The calculations produce the coefficient $k = 4.52$.

The obtained numerical value is highly significant due to its considerable difference from the standard correction coefficient $k = 2$. It means that all the existing applied macro-assessments of the budgetary income from the introduction of the progressive personal income tax are overestimated 1.5–2 times due to the

⁴ According to the methodology of the World Inequality Lab, we shall assume that the adult population are people aged 20 and over.

⁵ The re-calculation was carried out for the adult population.

incorrect distribution of taxpayers inside the high-income subgroups.

For other subgroups of the 10th decile, the aggregate income is calculated as the difference of the income of the whole decile group and the income of the lower subgroup (10.1). Afterwards, their common correction coefficient is calculated according to the following equation:

$$k = \sum_{i=2}^5 L_{10,i} \frac{W_{10,i,\min} + W_{10,i,\max}}{D_{10} - D_{10.1}}, \quad (12)$$

where D_{10} is the aggregate income of the 10th decile group and $D_{10.1}$ is the aggregate income of the lower subgroup of the 10th decile group.

The result of our calculation is a common value for the correction coefficient $k = 3,56$. However, with the values we have for group 10.4, the second condition of calibration is violated: $W_{10.4,\min} < W_{10.4} < W_{10.4,\max}$. According to this condition, the average income of the subgroup should be within the corresponding income intervals. Such

violation of the boundaries of the intervals is unacceptable and requires additional correction, which is done with the help of an expert review with the consequent redistribution of income of subgroup 10.4 in favor of subgroup 10.5. The final correction coefficients for the subgroups look the following way: $k_{10.1} = 4.52$; $k_{10.2} = 3.56$; $k_{10.3} = 3.56$; $k_{10.4} = 2.90$; $k_{10.5} = 3.99$.

To illustrate the calibration conditions (12), let us examine Figure 1, which shows different distributions of taxpayers inside the income subgroup of the high income group. An evident simplification of this scheme is the linear character of the distribution function $L(W)$. However, instead of a horizontal line corresponding to the hypothesis of averaging the subgroup's income, this straight line changes its angle and thus shows where the greatest taxpayer mass is concentrated; the area of the figure does not change because the total volume of the subgroup's income does not change.

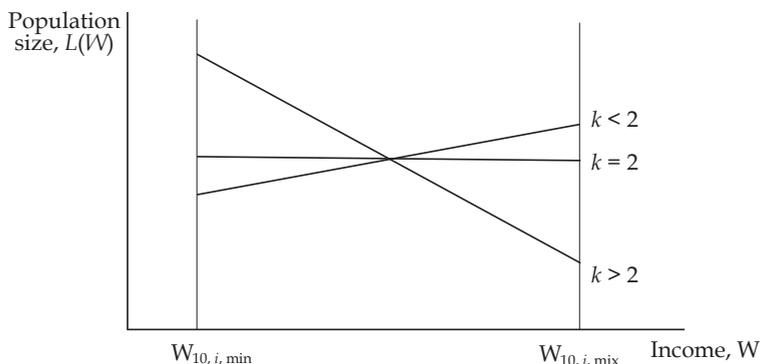


Figure 1. Distribution of the population inside income groups of the 10th decile

Table 4

Initial data on the incomes of high-come population groups, 2016

Decile groups and subgroups	Size of subgroups, people	Lower boundary of the annual income, RUB	Higher boundary of the annual income, RUB	Income of the group	Average annual income of the taxpayer, RUB
First	11,493,000	0*	102,230*	1,053,993,998,400	91,707
Ninth	11,493,000	529,533*	728,471*	9,038,135,064,000	786,403
Tenth	11,493,000	728,471**	-	16,427,896,094,400	1,429,383
10.1	11,008,820	728,471	3,000,000	9,090,246,885,680	825,724
10.2	448,800	3,000,000	10,000,000	1,637,055,302,221	3,647,628
10.3	34,369	10,000,000	500,000,000	4,918,177,769,408	143,099,240
10.4	587	500,000,000	1,000,000,000	303,620,689,655	517,241,379
10.5	424	1,000,000,000	-	478,795,447,436	1,129,234,546

* Data for the whole population.

** Data used both for the whole population and for the taxpayer.

As a result of our correction calculations, we now can form the initial data sufficient to assess the feasibility of introducing the progressive personal income tax in Russia (Table 4).

5. Expert risk assessment of the tax reform scenarios

The main risk of all tax reform scenarios is that the planned budgetary revenue will not be accumulated, consequently, the incomes of high-income groups will not be duly reduced and neither will social inequality. Keeping this in mind, we suggest a procedure of expert poll aimed at clarifying the feasibility degree of each of the four scenarios of the personal income tax reform. Our questionnaire consists of just one question supplied with a methodological commentary for the surveyed experts: “Currently there are three scenarios of reforming the income tax system in Russian public discourse, presented by three political parties and based on the introduction of the progressive scale of taxation. Moreover, there is an alternative scenario proposed by the government, based on keeping the flat scale of the income tax with an

insignificant increase of the tax rate (from 13 to 15%). Please give your expert opinion on the degree of feasibility of each of the four reform scenarios, taking into consideration that the increase of the tax rate will provoke tax evasion (last column of the Table). Your assessment should be on the scale from 0 to 100%, where 0 means that the consolidated budget will receive no additional revenue, and 100 means that the budget will receive the whole planned additional revenue”.

To simplify the assessment, the experts were given a table with a brief description of the four reform scenarios. Averaged assessments of the poll and the additional statistical characteristics are presented in Table 5.

Our poll was of experimental character and included only 15 Russian economic experts specializing in taxation and taxation risks. The experts included representatives from the Ural Federal University, Southern Federal University, Financial University under the Government of the Russian Federation, and the Central Economics and Mathematics Institute of the Russian Academy of Sciences.

Table 5

Parameters of the four personal income tax reform scenarios in Russia

Scenario	Annual income interval, RUB		Tax rate	Feasibility degree of the scenario, (D), in % (from 0 to 100)	Range of assessments	Polarization coefficient
	Lower boundary	Upper boundary				
CPRF	0	100,000	5%	28.3	10–40	30
	100,001	3,000,000	5,000 RUB + 13% from the sum over 100,000 RUB			
	3,000,001	10,000,000	382,000 RUB + 18% from the sum over 3,000,000 RUB			
	10,000,001	-	1,642,000 RUB + 25% from the sum over 10,000,000 RUB			
LDPR	0	180,000	0%	8.3	0–20	20
	180,001	2,400,000	13% from the sum over 180,000 RUB			
	2,400,001	100,000,000	288.6 ths. RUB + 30% from the sum over 2,400,000 RUB			
	100,000,001	-	29,568.6 ths. RUB + 70% from the sum over 100,000,000 RUB			
PJR	0	24,000,000	13%	51.7	15–80	65
	24,000,001	-	3,120 ths. RUB + 18% from the sum over 24,000,000 RUB			
Governmental	Rate increase from 13 to 15%		All categories of the population except for the poorest groups	98.4	95–100	5

The analysis of Table 2 shows that, according to all our experts, the most reliable is the scenario suggested by government, while the most unrealistic and unachievable one is the rather radical project of the LDPR. Compared to it, the CPRF project is more realistic, while the PJR project is even more feasible. The coefficient of polarization, understood as the difference between the maximum and the minimum assessments of the experts, showed that the smallest discord of opinions characterized the government’s project, and the greatest – that of the PJR. Disagreement among the experts about the PJR scenario is explained by the fact that this scenario is riddled with contradictions in the sense that it proposes a transition from the flat to the progressive scale of the personal income tax, but at the same time uses very modest quantitative assessments and has all the features of a “palliative” medium scenario which will not bring any noticeable social changes.

The results of expert assessments shown in Table 5 are very important for understanding the true scale of the problem of tax reforms. For example, there is an almost 12 times difference between the tax collection in the government’s project and the LDPR project, which shows how hard it is to ensure an efficient transition from the flat to the progressive scale. Such figures unequivocally point to the fact that the establishment of a new scale of the income tax on natural persons will most likely be accompanied by a sharp drop in tax collection.

It should be noted that due to the lack of reliable statistical data on the feasibility of these scenarios, there is practically no other way to assess the project’s risks but to conduct an expert poll. No model constructions can give help us asses the project’s risks based on the available sta-

tistical data. Meanwhile, the questionnaire survey enables us to use the experience and intuition of experts, who in many cases very accurately predict the results of future reforms. If the experts are carefully selected and their number is maximized (for example, 100-150 people), it is possible to achieve a sufficiently high accuracy of assessment. If necessary, it is possible to use the procedure of open group discussion and to obtain a series of group assessments, each be based on consensus.

6. Results of analytical calculations

In the previous sections we have presented results of the preparatory analysis of different reform scenarios. In this section, we are going to describe the analytical calculations which would allow us to obtain practically relevant results. To achieve this, we will use the convolution of criteria (9) and obtain the integral evaluation of the scenario based on two parameters – social and fiscal. To calculate the mass coefficient ζ , we are going to assume that the fiscal and social effects of the four scenarios shown in Table 5 are equal in sum. Then the condition for the calculation of the mass coefficient will look the following way:

$$\zeta \sum_{j=1}^4 \lambda_j = (1 - \zeta) \sum_{j=1}^4 |\Delta F_j|, \tag{13}$$

where j is the index of the tax reform project (four projects in total).

The calculations give us the mass coefficient $\zeta = 0.153$. Then integral criterion (9) for the evaluation of each project will look the following way:

$$Q = 0.153\lambda + 0.847|\Delta F|, \tag{14}$$

The calculations based on equation (14) make it possible to describe a single fiscal-social result of the scenarios (Table 6).

Table 6

Fiscal-social result of the reform

Scenarios	Social inequality		Revenues of the state	
	Assets ratio (F)	Change of the assets ratio (ΔF)	Absolute increment (ΔT), trillion RUB	Relative increment (λ), %
CPRF	13.7	-1.9	0.49	7.0%
LDPR	12.4	-3.2	1.02	14.5%
PJR	15.3	-0.3	0.27	3.8%
Governmental	15.6	0.0	1.08	15.4%

With the help of the expert assessments of the projects' feasibility we can now calculate the cumulative effect (11): $E = QD$. In this case, index D is calculated as a share ($D < 1$) and, as it has already been mentioned, acts as a kind of efficiency coefficient. The results of applied calculations are presented in Table 7.

Table 7
Generalized assessment of the scenarios

Scenario	Integral criterion (Q)	Feasibility degree (D)	Generalized assessment (E)
CPRF	2.68	0.283	0.76
LDPR	4.93	0.083	0.41
PJR	0.83	0.517	0.43
GRF	2.36	0.984	2.32

The expert evaluations make it possible to range the reform projects by the value of the *expected* actual (real) fiscal-social effect E . In particular, there are interesting shifts between the governmental, CPRF and LDPR projects. The four projects had the following rating by integral criterion Q : LDPR - 1, CPRF - 2, governmental - 3, PJR - 4. If we apply the generalized assessment criterion, however, the hierarchy of projects looks completely different: LDPR - 4, CPRF - 2, governmental - 1, PJR - 3. Thus, the LDPR project, which was the most preferable in terms of its potential effect, dropped to the bottom of the list when the risk of non-collection of taxes was taken into account, while the governmental project, on the contrary, rose from the third to the first place. At the same time, the PJR project slightly improved its position and moved from the last to the third place, while the CPRF kept its second place.

It is necessary to pay attention to the fact that the hierarchy of priorities established earlier [34] and based on the simple qualitative risk assessment of the projects was exactly the same as the hierarchy based on the quantitative procedure that used the experts' evaluations, which proves the accuracy and relevance of our results. It means, in fact, that our qualitative assessment of the projects' risks matched the quantitative assessment obtained after the expert poll. Obviously,

this methodology could be used in the future to conduct two-stage assessment of projects' risks, with the first step consisting of a rough qualitative assessment, which is specified, if necessary, at the second stage by a more precise quantitative evaluation.

These macroeconomic assessments lead us to the following conclusions.

Firstly, the results of introducing a progressive personal income tax scale are much more modest than it was declared in the analytical notes of the political parties. For example, the additional revenue from the reforms, according to the CPRF, should be 1.15 trillion rubles⁶, while our assessment shows that it is 2.3 times smaller. It should be noted that the initial data for our calculations and those carried out by the CPRF were practically identical, so the results are comparable without any special reservations. This fact testifies to the existence of serious methodological drawbacks in the simplified macroeconomic calculations of the CPRF analysts. The assessment of additional revenue in the LDPR project was 2.05 trillion rubles⁷, which also exceeds by two times our assessment. Finally, the sum of 0.20 trillion rubles⁸ indicated in the PJR project is, on the contrary, 35% less than our final assessment.

Secondly, the above-mentioned overestimation of the additional revenue from the tax reform makes it possible to conclude that it is important to adjust the initial data as we did in the previous section of this article because otherwise the final figures may be significantly distorted. The main source of the emerging aberrations is that the analysts' flawed understanding of the population distribution inside income groups. Thus, the analytical materials of three parties were based on simple averaging of the income relative to the boundaries of the income group and it was thus assumed that almost all taxpay-

⁶ See: <http://sozd.parlament.gov.ru/bill/427315-7>

⁷ See: <http://sozd.parlament.gov.ru/bill/1148107-6>

⁸ See: <http://sozd.parlament.gov.ru/bill/384276-7>

ers are either concentrated in the middle of the income interval or are evenly distributed inside it. We believe, however, that the actual pattern may be different: most members of the income group have incomes that are close to the left boundary of the income interval. This distribution with a concentration in the left part is rather natural: the higher is the income, the fewer people have it. This pattern is true not only for the intergroup distribution, but also inside the groups, including high income subgroups. This fact should be taken into account in all the subsequent macro-calculations of fiscal effects.

Thirdly, the “soft” options of the progressive personal income tax scale are of no macroeconomic interest. Thus, for the PJR project the income disparity reduction effect is microscopic and will be imperceptible in real life; the increase in state revenue will be less than 4% from the current level of the personal income tax collection, which will have practically no effect on the size and stability of the country’s budget. Taking into account the transformational expenses for changing the flat system and the high transactional expenses of the tax system in the future, we can assert with certainty that this scenario of the tax reform is pointless. The efforts needed for the readjustment of the tax system will look hollow in view of the presented modest economic results. The LDPR project looks more radical and interesting: compared with the project of “Just Russia”, it is likely to bring about a 10 times greater social effect in terms of disparity reduction. Moreover, it can increase the tax collection 4 times. The CPRF project is interim and too cautious to be viewed as a scenario of a serious reform.

Fourthly, the fiscal potential of reforming the flat scale by increasing the rate from 13 to 15% is much higher than the potential of the progressive scale. This scenario results in more gains in tax revenue than the LDPR project, and certainly the other two projects. Thus, a minimal transformation of the tax system with the preservation of a flat scale can exceed the fiscal results predicted within even the most radical scenario of manipulating the

progressive scale. This circumstance casts serious doubt on the feasibility of a large-scale reform and transition to a progressive scale. The weakness of increasing the flat scale’s rate is its neutrality related to social inequality, which does not change in this scenario.

Finally, the shifts in the rating system of the projects convincingly show that the risk factor is a significant element in the decision-making system and that it can radically change the regulator’s preferences. Moreover, the volatility of the risk factor is much higher than the volatility of the fiscal-social effect. Our calculations show that the maximum gap in the integral effect (Q) between the LDPR and the PJR projects was almost 6 times, while a similar gap in the feasibility criterion (D) between the PJR and the governmental projects reached 12 times. Thus, the differences between the projects are mostly connected with the group of risk factors rather than the potential of tax revenues or the reduction of income disparity.

7. Conclusion

In this article we have presented a range of analytical approaches to the evaluation of tax reforms, which can be considered as a first step in the development of applied instruments for assessment of reform projects. In this case, we took into account the social effect as the assets ratio, but in a more general case, the introduction of the progressive scale could affect not only the tenth, but also other decile groups. Thus, in more general calculations it is necessary to switch to the assessment of the social effect through the Gini index.

Furthermore, the reforms we examined were one-step while according to modern requirements, a serious reform should be multi-step [35], which means that the introduction of the progressive personal income tax should be extended for a period of over 10 years. Certain elements of the new system should be introduced every two or three years, which will allow the government to avoid any radical social shocks. For such an “extended” reform, it makes sense to evaluate the cu-

mulative effects for the ten years of transformation.

If we generalize the scheme of analytical calculations and take into account the expanding social groups affected by the reform and the reform period, we still will be able to apply the three-parameter scheme of reform projects.

Calculations presented in this article showed that the scenarios of the personal income tax reform are designed in such a way that they do not lead to any serious fiscal or social short-term gains. It would be wrong, however, to conclude that the introduction of the progressive personal income tax is not feasible. Undoubtedly Russia, with its class of super-rich people, should introduce a reasonable progressive

personal income tax system. At present, however, there are two key conditions to make such a reform possible: the availability of adequate and timely information on the incomes of all citizens and a balanced reform project. The first condition cannot be met at the current stage, but the rapid digitization of tax accounting gives hope for radical improvements in income statistics in the nearest future. The second condition cannot be met either as there is no fruitful cooperation between those political parties that support the introduction of the tax and the expert community that could develop such project. The fate of the personal income tax reform depends on how successfully Russia will manage to address these issues.

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