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An integral approach to evaluating the effectiveness of tax incentives

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ABSTRACT

The article analyzes the prospects and opportunities for using integral indicators to evaluate the effectiveness of tax incentives. The following key indicators are selected: the integral index of 13 tax incentive indicators' growth rate; the multidimensional mean calculated on the basis of trade turnover of the Eurasian Economic Union; a complex rating evaluation of the effectiveness of regional tax incentives. Tax incentive indicators are understood as those indices that best reflect the economic performance of companies in a certain business sector. The goal of the article is to determine the priority areas of using tax incentives based on the comparative theoretical analysis of integral indicators for evaluating their effectiveness. Research methodology includes the analysis of tax incentives' indicators calculated on the basis of official statistics and characterizing budgetary, social and economic effectiveness. Besides, the authors use the instruments of the regression and correlation analysis. It is determined that the coefficient approach is best used to evaluate time oriented tax incentives, while the absolute approach –socially or spatially oriented tax incentives. The authors use their own methodology to prove that in 2011–2016 tax incentives for agriculture (from the industry-based perspective) and for research and development (from the target-based perspective) were effective. The use of the complex rating of tax incentives' effectiveness at the regional level showed that high effectiveness was achieved only in two subjects of the Russian Federation, while absolute effectiveness was not achieved in any of them. At the same time, most regions stayed in the range of sufficient and low effectiveness. Research results can be used by the Ministry of Finance and the Government of the Russian Federation when developing ways of improving the taxation policy.

KEYWORDS

Tax benefits, effectiveness criteria, tax incentives, multidimensional mean, integral index

JEL H21, C13

HIGHLIGHTS

1. The coefficient approach is most commonly used to evaluate tax incentives, although it is advisable to use the absolute approach through the calculation of the multidimensional mean for some social and territorial tax incentives
2. To analyze the effectiveness of tax incentives, the authors selected thirteen tax incentive indicators that reflect the social and economic development of an industry. They include budgetary revenues by tax type, the number of workplaces in the full-time equivalent, GVA, growth rate of investments in fixed assets, etc.
3. It is advisable to evaluate the effectiveness of the instruments of industry-based and target (specific) tax incentives by using the integral index of the tax incentive indicators' growth rate
4. It is suggested that the multidimensional mean should be used to evaluate the impact of reduced tax rates on VAT and excise duties on the volume of trans-border trade of the Eurasian Economic Union countries

5. The regional tax policy of stimulating production should be evaluated through the complex rating of the effectiveness of regional tax incentives by using the instruments of the regression and correlation analysis

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Интегральный подход к оценке эффективности налогового стимулирования

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АННОТАЦИЯ

Статья посвящена анализу перспектив и возможностей применения интегральных показателей для оценки эффективности налогового стимулирования. В качестве основных показателей выбраны: интегральный индекс темпов роста 13 индикаторов налоговых льгот; многомерная средняя, рассчитываемая на основе показателей товарооборота стран ЕАЭС; комплексная рейтинговая оценка эффективности региональных налоговых льгот. Под индикаторами налоговых льгот понимаются показатели, которые наилучшим образом отражают состояние хозяйственной деятельности предприятий, занятых в определенной отрасли. Цель статьи – на основе сравнительного теоретического анализа интегральных показателей эффективности налоговых льгот определить приоритетные направления их использования. Методика исследования включает в себя анализ индикаторов налоговых льгот, определяемых по данным официальной статистики и характеризующих бюджетную, социальную и экономическую эффективность; используются инструменты корреляционно-регрессионного анализа. Определено, что коэффициентный подход целесообразно использовать для оценки налоговых льгот, имеющих временную направленность; в то время как абсолютный подход для льгот, имеющих социальную или пространственную направленность. Доказано, что налоговое стимулирование сельского хозяйства (в отраслевом разрезе) и НИОКР (в целевом разрезе) в период с 2011 по 2016 г/ было эффективным. Применение авторской методики комплексной рейтинговой оценки эффективности налоговых стимулов в региональном разрезе показало, что высокая эффективность зафиксирована только в двух субъектах Российской Федерации, абсолютная эффективность не достигнута ни в одном из субъектов. В то же время большинство регионов находились в пределах достаточной и слабой эффективности. Результаты исследования могут быть использованы Министерством финансов и Правительством Российской Федерации при разработке направлений совершенствования налоговой политики.

КЛЮЧЕВЫЕ СЛОВА

Налоговые льготы, критерии эффективности, налоговое стимулирование, многомерная средняя, интегральный индекс

ОСНОВНЫЕ ПОЛОЖЕНИЯ

1. Коэффициентный подход наиболее часто используется при оценке налогового стимулирования, однако для ряда социальных и территориальных налоговых стимулов целесообразно использовать абсолютный подход через расчет многомерной средней

2. Для анализа эффективности налоговых стимулов отобрано 13 индикаторов налоговых льгот – показателей социально-экономического развития отрас-

ли. В их числе суммы поступлений в бюджет по видам налогов, число рабочих мест в эквиваленте полной занятости, ВДС, темп роста инвестиций в основной капитал и др.

3. Оценку эффективности инструментария отраслевого и целевого (направленного) налогового стимулирования целесообразно проводить с помощью интегрального индекса темпов роста индикаторов налоговых льгот

4. Многомерную среднюю предложено использовать при оценке влияния льготных налоговых ставок по НДС и акцизам на обороты трансграничной торговли в рамках стран ЕАЭС

5. Региональную налоговую политику в части стимулирования производственной деятельности следует оценивать с использованием комплексной рейтинговой характеристики эффективности региональных налоговых льгот путем применения инструментов корреляционно-регрессионного анализа

1. Introduction. The problem

Tax incentives are a vital instrument that allows the state to influence the financial and investment activities of companies, the development of social sphere, research and innovations. At the same time, reduced taxation does not always lead to the expansion of production or perspective development of business. In practice it is quite common for taxpayers to use tax incentives simply to minimize their tax liabilities. It destroys the multiplication effect from these incentives and reduces revenues to the budget. According to official statistics, tax incentives in 2016 resulted in reduced revenues to the budget in the amount of almost 2 bln. rubles (Table 1).

Table 1

Annual increase of tax expenditure of the consolidated budget of the Russian Federation in 2015–2016, by tax type

Tax	2015	2016	Increase, %
Tax on business profits	615.0	690.0	+12.2
VAT	414.0	435.5	+5.2
Mineral extraction tax	323.9	379.0	+17.0
Tax on the property of organizations	365.6	347.1	-5.1
Tax on the property of natural persons	18.2	21.4	+17.6
Transport tax	7.7	8.2	+6.5
Land tax	70.5	49.3	-30.1
<i>Total</i>	1773.9	1930.5	+8.8

Source: compiled by the authors based on data from the official site of the Russian Federal Tax Service.

At present it is not sufficient just to provide tax incentives, it is absolutely necessary to assess their effectiveness. The latest Directions of Tax Policy of Russia¹ for 2016–2018 state that the assessment of the effectiveness of new tax reductions should be an obligatory element of introducing tax incentives. This position is broadly supported by the research community as well as agencies and governments of different countries [1]. For example, the European Council publishes the report “Effectiveness of tax incentives for venture capital and business angels to foster the investment of SMEs and start-ups”².

The evaluation of effectiveness, as a rule, consists in comparing the result of some action with the costs involved in implementing it. The effects of providing tax incentives are compared with losses for the budget [2]. In this connection, it is necessary to state that tax incentives and tax expenditures should be interpreted as the denominator in the equation for assessing effectiveness. Within the context of this research, tax incentives and tax expenditures are the amount of revenue lost for the budget because certain tax preferences were provided for some types of activities or groups of taxpayers [3].

¹ Main Directions of Tax Policy in the Russian Federation in 2016 and plans for 2017 and 2018.

² Effectiveness of tax incentives for venture capital and business angels to foster the investment of SMEs and start-ups. Final Report. TAXUD/2015/DE/330. Available at: https://ec.europa.eu/taxation_customs/sites/taxation/files/final_report_2017_taxud_venture-capital_business-angels.pdf.

There is no unified system of evaluating the effectiveness of tax expenditures in the USA, but the practical experience in this sphere is developing through the legislative activity of the states. At present practically every state has at least one program of tax stimulation (in other words, tax incentives) and the methodology of evaluating tax expenditures from the viewpoint of the correlation expenditures-effectiveness³. In the UK the effectiveness analysis for tax incentives is carried out by both private companies and governmental agencies. A great role in this process is played by HM Treasury and HM Revenue and Customs. Besides, Office of Tax Simplification (OTS)⁴, created in 2010, has been actively involved in this work in recent years.

The issues of evaluating the effectiveness of tax incentives have been actively discussed in Russia in the past decade. In November 2010 the former Finance Minister A. Kudrin noted that it was necessary to reduce the number of tax incentives, which at that moment amounted to about 5% of Russia's GDP⁵. At the state level the question of systematizing tax incentives was first raised in the Budgetary Address of the President of the Russian Federation in 2010⁶. "Main Directions of Tax Policy in the Russian Federation in 2011–2013" for the first time set the task of a gradual abolition of federal incentives for regional and local taxes. Later each year these documents mentioned the issues of evaluating the effectiveness of tax incentives.

In 2018 the Russian Ministry of Finance developed a Project for Evaluating the Effectiveness of Tax Incentives. The effectiveness of incentives is determined based exclusively on the calculation of

financial costs for a region or a specific municipality. In the authors' opinion, this approach is not rational. For example, for social incentives it is necessary to take into account indicators that characterize their influence on the standard of living of the general population or some specific categories of taxpayers. The authors believe that it is advisable to use a complex approach to evaluating the effectiveness of incentives that should be based on several groups of indicators (characteristics) depending on the goal of introducing the incentive. In this aspect, the effectiveness of tax stimuli could be evaluated through integral indicators calculated with the use of the chosen characteristics.

In this research, the authors analyzed the existing approaches to using the integral indicators of tax incentives' effectiveness and determined the areas of using such indicators depending on the goals of incentives.

2. Literature review

At present the issues of using tax incentives are widely discussed in economists' research and practical work of tax agencies' employees, tax consultants and auditors. Tax incentives are one of the crucial mechanisms of the state's tax policy aimed at reaching social, economic, ecological and political goals [4]. The authors of [5] note that socio-economic development and modernization of the subjects of the Russian Federation directly depend on the development of effective tax regulation tools. This is the key condition for the creation of a favorable business climate, the stimulation of investment and innovations, for helping the financial independence and autonomy of the regions. According to V.G. Panskov, tax incentives are a vital instrument of implementing state tax policy [6]. The importance of studying the advantages and drawbacks of using tax incentives as well as the procedure of providing them and evaluating their effectiveness are stressed in the works by E.M. Zolt and A. Easson [7]. L.N. Lykova views tax incentives from the standpoint of evaluating the effectiveness of reducing the profit tax, the tax on the

³ For more details see the official site of the Joint Legislative Audit and Review Committee in Washington State, the USA. Available at: <http://leg.wa.gov/jlarc/Pages/aboutjlarc.aspx>.

⁴ Available at: <https://www.gov.uk/government/organisations/office-of-tax-simplification>.

⁵ Available at: https://www.minfin.ru/ru/press-center/?id_4=31928.

⁶ Budgetary Address of the President of the Russian Federation D. A. Medvedev of June 29, 2010 "On the Budgetary Policy in 2011–2013".

property of organizations and the transport tax in different regions of the Russian Federation [8]. Another work [9] evaluates the effectiveness of tax incentives aimed at stimulating investments. It is concluded that the reduction of tax burden resulting from the use of tax incentives leads to a considerable increase in own capital formation. The establishment of tax incentives in law and their use are based on the key principles of taxation formulated in the works of A. Smith [10].

A great role in the actual practical evaluation of the effectiveness of tax incentives is played not only by the existing normative and legal acts adopted at different levels, but also by authorial methodologies. The goal of such methodologies is to identify the drawbacks in the existing analytical algorithms of evaluating the effectiveness of incentives and to develop objective and precise approaches. These problems are discussed in a considerable number of publications by Russian economists. According to Yu. A. Ryumina, A. S. Balandina, K. A. Bannova, the following issues should be viewed as basic for the evaluation of the effectiveness of tax incentives:

- the issue of the scientific validation and legislative recognition of the concept of "tax incentives", because it is necessary to differentiate between a "tax incentive" and other concepts, such as tax preferences, relief, exemptions;

- the issue of setting the goal of introducing tax incentives and classifying them according to the tasks. When introducing an incentive and evaluating its effectiveness, the initiator of the incentive should define specific goals, take into account both economic and social effectiveness and differentiate the benefits;

- the issue of developing a system of universal criteria to evaluate the effectiveness of tax incentives, such as budgetary, economic and social effectiveness [11].

Although the value of stimulating investment in research and innovation cannot be doubted, the initiators of tax incentives should monitor the effectiveness of providing such stimuli. The following foreign authors [12; 13] pay special attention

to the evaluation of stimulating research and development activities through taxation. The authors of [12] examine the effectiveness of tax incentives in the sphere of research and development in China. The regression and correlation analysis based on data regarding the condition of the system of taxation in China allowed the authors to evaluate the impact that tax incentives have on the expenditures on research and development and to determine the role of institutional conditions in the creation of such effects. The authors conclude that tax incentives are effective stimuli for research and development and that the effectiveness of tax incentives can grow if entrepreneurship development is intensified and political rent is reduced.

In the work by Ch.-H. Yang, Ch.-H. Huang and T.Ch.-T. Hou the authors studied the influence of tax stimuli on research and development activities at the production enterprises in Taiwan. The authors used econometric tools to evaluate the effectiveness of various tax incentives and come to the following conclusions:

- the effectiveness of using tax incentives varies in different business sectors. Tax incentives aimed at increasing investment in research and development are most effective in the industrial sector;

- the most popular types of incentives for Taiwanese companies are tax benefits and preferences. The organizations should present proof of the effectiveness of tax credits for research and development;

- the study identified a considerable positive effect of tax incentives on innovations through the R&D credit. The effect of using these instruments is limited and the initiator of the incentive should conduct a thorough analysis of the effects' duration after the incentive is no longer active [13].

G. Crespi, D. Giuliadori et al. tried to evaluate the effectiveness of tax benefits for research and development using the example of the Argentinean tax system. The authors used structural models and concluded that tax incentives reduce the cost of capital for research and development. The reduction of the "cost" of innovations has a considerable influence on a company's decision to invest. The

effectiveness of tax incentives for research and development in Argentina is higher in those industries where the level of technological development is low [14].

The macroeconomic effect from such tax incentive tools as investment tax credit, reduced tax on capital growth, etc. was analyzed in the work by A.N. Houndonougbo, M. Mohsin. This research is based on the US tax system. The authors conclude that the investment tax credit has a strong positive effect on production and investment in agriculture. The budgetary effectiveness of investment tax credit is 85%. The reduction of the tax on capital growth is the least effective instrument in all the studied aspects. The analysis of the impact of tax incentives on macroeconomy over time shows that the prosperity of the country is growing [15].

Most researchers view tax incentives as an effective instrument for supporting the economy of the country as a whole as well as some specific industries and sectors. The work [16], based on the example of Spain, showed that tax benefits and state subsidies are ineffective instruments for stimulating investment in research and development. State resources spent on these instruments are greater than the amount of additional private investment. Although the effectiveness of tax incentives is low, they have a great importance for ensuring the growth and productivity of the economy [16].

A number of authors use the scenario approach to evaluating the effectiveness of tax benefits. It primarily refers to environmental fiscal payments. Thus, the EU experience is examined in the works by E. Shafiei, B. Davidsdottir et al. [17], G.C. Piciu, C.L. Trică [18]. E. Shafiei and B. Davidsdottir used scenario modeling for 2015–2050 to assess the consequences of fiscal regulation on the integrated energy and transport system in Iceland. Their models are based on scenarios with various combinations (taxes, subsidies, duties). R. Kok [19] analyzed Dutch experience of providing tax benefits for electric vehicles. This study determined that such tax incentives had the greatest impact on changes in consumer behavior. In

the period of 2007–2013 the Netherlands became the European leader in the lowest average annual CO² air emissions and the share of electric vehicles.

Most authors single out the integral method of evaluating tax incentives among the multitude of existing methodologies of effectiveness assessment, but the number of research works in this sphere is not large [20]. For example, L.L. Igonina and I.V. Mamonova analyzed the integral indicator of evaluation. This indicator is based on the values of social, budgetary and economic effectiveness [21]. The analytical method of L.L. Igonina and I.V. Mamonova differs from most regional and local methodologies in the statistical validity of obtained values.

A.P. Kireenko and E.N. Orlova developed an interesting approach to evaluating the effectiveness of tax benefits. They presented a methodology of evaluating budgetary and economic effectiveness of innovation benefits with the use of effectiveness coefficients [2]. The coefficient of budgetary effectiveness is calculated as a quotient:

- of the volume of increased tax revenues to the budget in the reporting period connected with the widening tax base;

- of the volume of tax expenditures (the amount of taxes not collected for the budget because of tax benefits) in the reporting fiscal year.

The coefficient of economic efficiency is similarly calculated as a quotient:

- of the growth (reduction) index of tax expenditure;

- of the growth (reduction) index of the following indicators of innovative activities of benefits' recipients: the volume of innovative goods (works, services), spending on technological innovations, value of fixed assets, investment in fixed assets, the number of valid patents.

The researchers used a combined ratio of effectiveness as an integral indicator. When testing this approach, the authors used only those indicators that are linked with the recipients of tax benefits. The conducted analysis showed that the provided tax benefits have a low effectiveness.

O.V. Mandroshchenko analyzed the effectiveness of tax benefits based on the

expediency of having them in the tax system. The author conducts the assessment with the use of the coefficient of tax incentives calculated as a ratio of net profit to the part of the newly created value [20].

The overview of research publications on the topic allowed the authors to determine that the instruments of statistical and econometric modeling are often used in practice in other countries to evaluate the effectiveness of tax incentives. This is a rather prospective research area. Equally interesting is the use of scenario approaches to evaluating the effectiveness of tax incentives. It should be noted that scenario approaches contain a share of subjectivity because any scenario reflects its author's view of the tax component in the activities of economic entities. The statistical approach is more objective as its results are solely based on empirical data.

Finally, the most commonly used instrument of evaluating the effectiveness of tax benefits is the integral coefficient. The analysis of publications shows that the methodologies of calculating such coefficients differ greatly. At present there is no system of universal criteria for evaluating the effectiveness of tax benefits which could be used as a basis for the calculation of integral coefficients. Besides, the coefficient approach is not always possible, for example, it is advisable to use the absolute approach though the calculation of the multidimensional mean for a number of social and territorial tax incentives. In this situation the effect of the tax incentive, not its effectiveness, takes center stage. The presented research attempts to differentiate between the spheres where different integral indicators of evaluating the effectiveness of tax incentives are used.

3. Methods

Integral evaluations as an instrument of analyzing the condition and development of the economic system could be used in the following methods:

- linear mean values (arithmetic, geometric and chronological, simple and weighted);
- multidimensional mean values;
- complex rating evaluations.

Nowadays integral indicators are used quite often because they are universal. It is possible to use them to carry out a simultaneous evaluation of various impacts that the characteristics of a certain factor have on the final result. Mean values are common characteristics of aggregates and could be used to evaluate any parameter. The method of multidimensional mean ranges multidimensional objects and, in most cases, breaks them into groups (segments). This fulfills the tasks set by the researcher and is the simplest and most effective method of processing the results of observations over multidimensional values.

Nevertheless, the above-mentioned characteristics could be used in different models of evaluation applied to the discussed problems of evaluating the effectiveness of tax incentives. The authors analyzed the existing methodologies of complex evaluation of the effectiveness of tax incentives using the example of different regions of the Russian Federation. The conducted research allowed them to determine key criteria of effectiveness: budgetary, economic and social. Both coefficient and absolute approaches can be used for such evaluation (Figure 1).

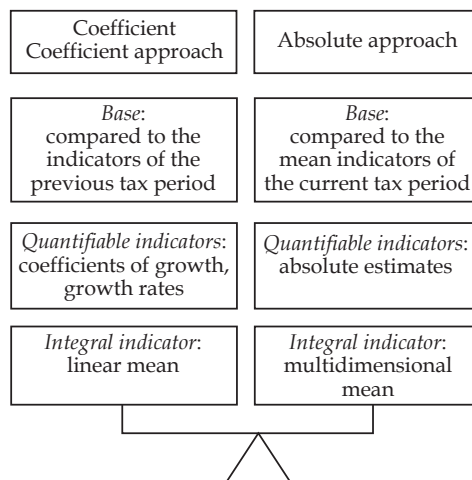


Figure 1. Key characteristics of integral approaches used to evaluate the effectiveness of tax incentives

The authors note that the coefficient approach is much more common in the analysis of different aspects of tax incentives' effectiveness. The goals of tax in-

centives primarily consist in changing the target indicators in dynamics (the growth of GDP and tax revenues to the budget, reduction of accounts payable, etc.). In this case, the calculation of mean coefficients is the best way as it evaluates the efficiency of tax incentives with sufficient objectivity. At the same time, it makes sense to evaluate the effect from social tax benefits at the regional level by comparing the values of regional characteristics with the average values in the country. For example, in the countries whose regions have wide powers in this sphere, it is possible to evaluate types of personal income as one of the indicators of the effectiveness of tax policy regarding the income tax. In the presented case, the authors calculated the multidimensional mean for different indicators of income because it is the most rational solution. At the same time, neither the first, nor the second option makes it possible to determine the net effect from tax incentives. This is quite objective and typical of evaluations used in most countries. The authors come to the conclusion that it is only possible to calcu-

late the “net” effect by conducting separate sample surveys and by a detailed evaluation of the parameters of the object of the study, which is virtually impossible at the level of the whole country.

4. Results

4.1. The use of the integral index of the industry-based evaluation of tax benefits’ effectiveness

Tax benefits included in the tax legislation are diverse and differentiated. It makes sense to evaluate the effectiveness of separate industries because the list of benefits provided to taxpayers is not uniform [22]. At the same time, it is necessary to evaluate the effectiveness of tax incentives for specific sectors of economy from the viewpoint of their effectiveness: economic, social and budgetary [23]. Consequently, the authors present a model of macroeconomic industry-based evaluation of the effectiveness of tax incentives’ instruments. The model presented in Figure 2 includes a system of indicators necessary for monitoring.

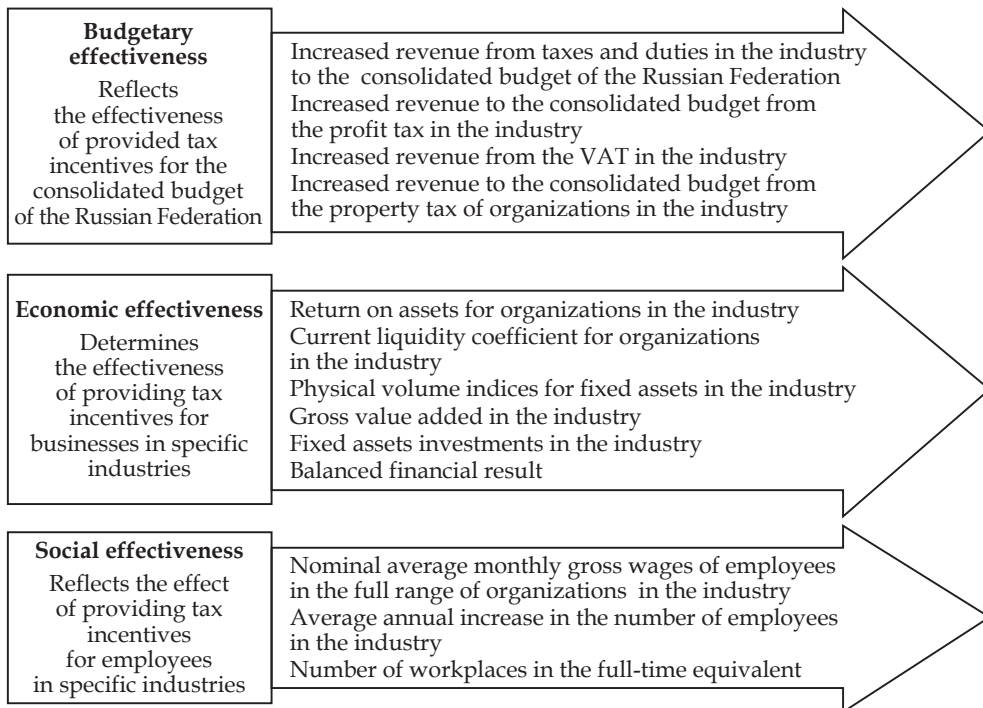


Figure 2. A model of evaluating the effectiveness of tax incentives’ instruments for industries

A methodology has been developed to evaluate the effectiveness of tax incentives' instruments. The methodology is based on the integral index (1) that is calculated as the product of geometric mean indicators of the model:

$$I_{HC} = \sqrt[n]{i_1 \cdot i_2 \cdot i_2 \dots i_n}, \quad (1)$$

where:

I_{HC} – the integral index of evaluating the effectiveness of tax incentives' instruments for the industries;

$i_1 \cdot i_2 \cdot i_2 \dots i_n$ – individual indices of specific indicators of effectiveness.

The model of industry-based evaluation of the effectiveness of tax incentives' instruments consists of a set of indicators. These indicators reflect the economic condition of companies working in a certain industry in the best way and can demonstrate the effectiveness of tax incentives. The calculation of the integrated index makes it possible to draw conclusions regarding the effectiveness of the mechanism used to stimulate different indus-

tries. The presented model is universal because it can be used to evaluate all sectors of economy. As an example, the authors used a model of industry-based evaluation of the effectiveness of tax incentives' instruments for the agricultural sector. Agricultural companies have an opportunity to use a considerable list of tax benefits for business profit tax and VAT. Companies could use the unified agricultural tax that considerably reduces the tax burden [24]. The main task of stimulating agriculture is to support the economic growth of companies in the sector that is a prioritized by the state. In Table 2, the authors present the calculated indicators of the effectiveness of tax incentives for agriculture. All individual basic indices are calculated as shares against the level of 2010.

The authors analyzed the effectiveness of tax incentives for agriculture and came to the conclusion that the growth rate of revenues from this industry to the consolidated budget has increased in the period under consideration. The growth

Table 2

Indicators of the model of tax incentive instruments' effectiveness in agriculture

Indicator	Individual index					
	2011	2012	2013	2014	2015	2016
<i>Budgetary effectiveness</i>						
Total tax revenues to the consolidated budget of the Russian Federation	1.003	0.897	0.933	1.350	1.697	1.826
Total revenues from the tax on business profit to the consolidated budget	1.111	1.335	1.271	1.735	2.067	2.211
Total revenues from the VAT to the consolidated budget	1.430	2.578	2.774	1.409	0.831	1.529
Total revenues from the tax on the property of organizations to the consolidated budget	0.856	0.917	0.951	0.988	0.969	1.112
<i>Social effectiveness</i>						
Total number of people employed in agriculture: average annual number	1.000	0.985	0.970	0.940	0.943	0.941
Nominal gross wages of people employed in agriculture (monthly)	1.168	1.325	1.474	1.661	1.824	1.983
Number of workplaces in the full-time equivalent	0.997	0.978	0.962	0.950	0.982	0.963
<i>Economic effectiveness</i>						
GVA	1.368	1.364	1.500	1.670	2.007	2.166
Growth rate of investment in fixed assets, physical volume	1.513	1.133	1.166	1.053	1.014	1.325
Profits in the industry	1.553	1.784	0.846	2.636	4.455	4.625
Indices of the physical volume of fixed assets	1.006	1.004	1.010	1.007	0.997	1.204
Current liquidity coefficient	1.026	1.072	0.900	0.995	0.987	0.963
Returns on assets	1.379	1.379	0.724	1.620	2.447	2.412

Source: based on data from the Unified Interdepartmental Information and Statistics System (EMISS). Available at: <https://www.fedstat.ru/>

in 2014 was 44% compared to 2013. The growth rate of income tax and property tax increased in 2014 to 36.5% and 3.9%, correspondingly. In 2016 revenues from the VAT to the consolidated budget of the Russian Federation increased by 83% compared to 2015. The individual index of the average number of employees in agriculture, included in the index of social effectiveness, has a negative trend. The individual index decreased by 3.1% in 2014 compared to 2013. The next analyzed indicator is the average monthly nominal wages of people employed in agriculture, which shows a trend towards increasing by 12.7% in 2014 compared to the previous year. In 2015 total tax revenues and the profit tax demonstrated a positive trend. In 2015 the cumulative revenues from the tax on the property of organizations decreased compared to 2014, but in 2016 there was a considerable growth. The economic effectiveness section is represented by the greatest number of indicators. Returns on assets more than doubled in 2014 compared to 2013. The authors observed a considerable growth of the indicator “net financial result” – over 300%. The index of the physical volume of investment in fixed assets and the physical volume of the index of fixed assets decreased in 2014 in comparison with 2013. The use of the integral index allowed the authors to obtain the following values for agriculture (Figure 3).

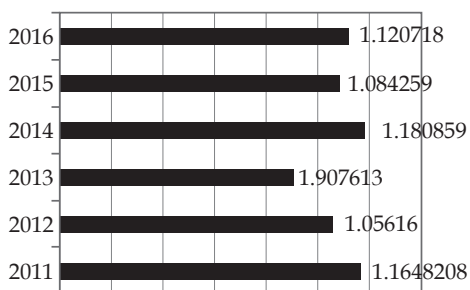


Figure 3. Values of the integral index of tax incentive instruments' effectiveness in agriculture in 2011–2016

The conducted analysis allows the authors to conclude that in the period under consideration tax incentives for

agriculture were effective. The value of the integral index was above 1, with the exception of 2013.

4.2. The use of the integral index of evaluating the effectiveness of targeted tax incentives

The evaluation of the industry-based effectiveness of tax incentives' instruments can be conducted using a system of indicators. These indicators are presented in Figure 2. Specific, rather than traditional, result indicators are used for some sectors, such as the growth of spending on technological innovations and the share of innovative goods (works, services) in the total amount of produced goods (provided work, services) [25]. The tax system of the Russian Federation provides a list of tax incentives that can only be used by companies involved in innovative activities, research and development work. The key goal of providing tax incentives in the sphere of research and development is to stimulate the innovative activities of companies, increase the share of knowledge-intensive production and reduce tax burden on companies working in this field. Based on this, the authors recommend evaluating the incentive indicators for this sector, presented in Table 3, separately, and use the integral index based on the calculation of the benchmark (2010 in the Table). Statistical tax reports do not include tax revenues from research and development activities to the consolidated budget. Official agencies do not calculate the specific weight of companies in different industries involved in research and development. For this reason, the authors used data on revenues to the consolidated budget of the Russian Federation from industries in general as an indicator of budgetary effectiveness.

Most specific indicators of innovations' effectiveness showed a positive trend in 2016 compared to 2015. The share of the products of hi tech and knowledge-intensive industries in GDP and the number of developed innovative production technologies is increasing. The obtained integral index values are presented in Figure 4.

Table 3

**Indicators of the model of industry-based tax incentives' effectiveness
in research and development**

Indicator	Individual indices, %					
	2011	2012	2013	2014	2015	2016
<i>Budgetary effectiveness</i>						
Total tax revenues to the consolidated budget of the Russian Federation	0.850	1.114	0.835	0.927	0.992	1.041
<i>Effectives of innovations</i>						
Volume of internal expenditure on research and development in the structure of GDP	0.970	1.009	1.009	0.968	1.007	0.987
Share of hi tech and knowledge-intensive industries in GDP	1.030	1.061	1.114	1.147	1.193	1.205
Specific weight of innovative goods, works, services in the general volume of shipped goods, provided work and services	1.310	1.664	1.913	1.818	1.763	1.781
Specific weight of innovative goods, works, services in the general volume of shipped goods, provided work and services of industrial sector companies	1.250	1.600	1.824	1.678	1.611	1.708
Specific weight of innovative goods, works, services in the general volume of shipped goods, provided work and services of service sector companies	2.090	2.404	2.812	3.206	3.238	2.979
Technological innovations for production	1.320	1.531	1.654	1.637	1.621	1.783
Innovation activity of organizations (specific weight of companies involved in technological, organizational, marketing innovations in the reporting year in the total number of surveyed companies)	1.090	1.079	1.079	1.058	0.994	0.895
Expenditures on innovations in the sphere of technologies	1.830	2.251	2.769	3.018	2.988	3.197

Source: based on data from the Unified Interdepartmental Information and Statistics System (EMISS). Available at: <https://www.fedstat.ru/>

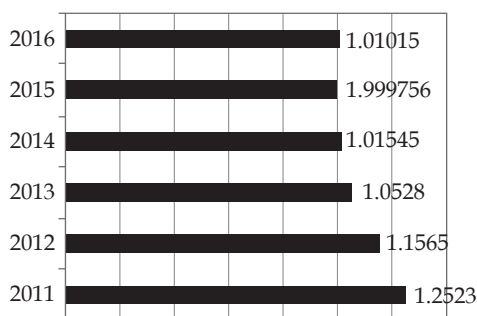


Figure 4. Values of the index of tax incentives' effectiveness in research and development in 2011–2016

The analysis allows the authors to conclude that the use of tax incentives' instruments in the sphere of research and development brings beneficial results because the integral index did not reach the threshold value of less than one.

4.3. The use of the multidimensional mean to evaluate the effectiveness of spatially oriented tax incentives

The spatially oriented tax incentives are fiscal stimuli aimed at equalizing specific socio-economic indicators within a state or integration units, or at promoting tax competition at the regional level. In this case, it is possible to use the multidimensional mean as the integral indicator of a tax incentive's effectiveness:

$$\bar{p}_i = \frac{1}{k} \sum_{j=1}^k \frac{x_{ij}}{\bar{x}_j},$$

where:

x_{ij} — the value of j attribute for i object;
 \bar{x}_j — the mean value of j attribute.

The advantage of using the multidimensional mean is the opportunity to evaluate the effectiveness of a tax benefit at the initial stages of providing it (there

is no necessity to use a dynamic set of indicators). In particular, the multidimensional mean can be used to evaluate the impact of preferential tax rates on the volumes of trans-border trade of the Eurasian Economic Union countries. In this case, the following components should be used to calculate the integral indicator:

- the volume of goods exported in trans-border trade and taxed at preferential rates (for each trade flow of the EEU member countries);
- the volume of goods imported in trans-border trade and taxed at preferential rates (for each trade flow of the EEU member countries);
- volumes of import VAT in the budget of the EEU member country;
- the share of products taxed at preferential VAT rates in the total trade volume of a country.

It is necessary to ensure a uniform methodology for calculating the indicators that form the multidimensional mean. This is the primary and the most important condition for using this method.

The general procedure of evaluating the effectiveness of tax incentives with the use of the multidimensional mean is as follows (Figure 5).

It is important to note that if the multidimensional mean is highly variable, the

method has a subjective component connected with the expert assessment of the target value. At the same time, if the variation is relatively low, this method makes it possible to evaluate the effectiveness of a tax incentive with a sufficiently high degree of reliability.

4.4. The use of the complex rating evaluation of the effectiveness of regional tax incentives

The current tax legislation gives the subjects of the Russian Federation powers to determine and introduce benefits on certain taxes [26]. Thus, the evaluation of the effectiveness of tax incentives in the RF subjects is an integral element of administrating [27]. The authors believe that comprehensive diagnostics of effectiveness at the regional level should be based on the following system of indicators:

1. Indicators of social effectiveness: have a dual value because they could act as an incentive (indicators of the dynamics of real monetary income of the population, % – x_2) and a disincentive (unemployment rate, % – x_1).

2. Indicators of budgetary effectiveness: also allow to evaluate the incentive and disincentive effect from tax benefits. For the first group of effects, the following indicators are used:

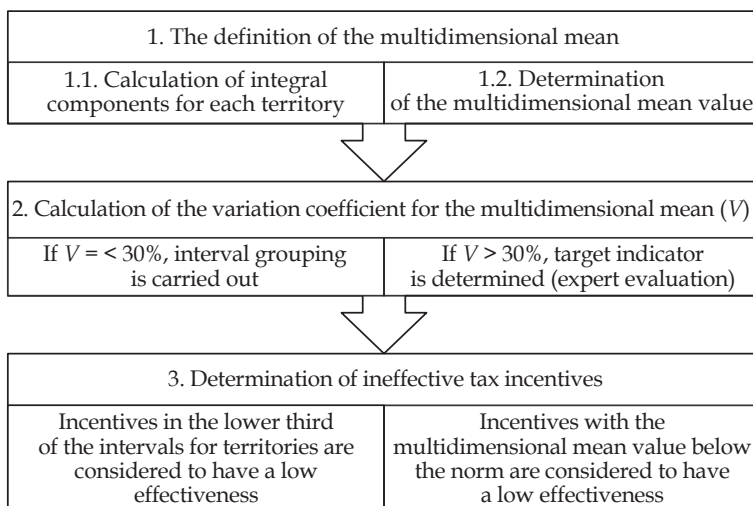


Figure 5. The methodology of evaluating the effectiveness of tax incentives by the multidimensional mean

- specific weight of increased revenues from the tax on business profits in the sum of lost revenues from providing benefits on this tax, % – x_3 ;

- specific weight of increased revenues from the tax on the property of organizations in the sum of lost revenues from providing benefits on this tax, % – x_4 ;

- specific weight of the shortfall of VAT in the sum of the imputed tax, % – x_5 ;

- specific weight of tax revenues of the consolidated budget of the RF subject in the gross regional product – x_6 .

For the second group, one indicator is used – specific weight of tax arrears in the gross regional product – x_7 .

3. Indicators of economic effectiveness act purely as incentives in the context of this research: the growth in total profits of all economic subjects, % – x_8 ; the level of innovative activity of organizations, % – x_9 ; increase of investments in fixed assets, % – x_{10} ; gross regional product per capita – x_{11} .

When building the model, the authors analyzed and calculated economic, budgetary and social indicators of activities for 85 regions of the Russian Federation. Inter-regional comparative analysis of tax incentives' effectiveness requires ranging the examined subjects of the Russian Federation. The authors used the score method which allowed them to assess sensitive values when building the regression equation. Table 4 presents the results of the systemic evaluation of regions from the standpoint of tax incentives' effectiveness and their ranging from the most to the least sustainable level.

The values of resulting indicators in systemic rating allowed the authors to conclude that tax incentives are most effective in Yamalo-Nenets Autonomous Okrug. The complex evaluation in this region is 43.99 points. The second place is held by the city of Sevastopol (39.04 points), the third – Khanty-Mansi Autonomous Okrug with 36.98 points. Regions with a low effectiveness of tax incentives include the Karachay-Cherkessia Republic with 18.96 points, Kemerovo Region with the result indicator of 16.87 points and the Ingush-

etia Republic with 15.55 points. There is a great gap in the level of tax incentives' effectiveness between different regions, it equals 28.44 points.

Table 4

Results of a complex evaluation of the level of tax incentives' effectiveness in the subjects of the Russian Federation

Rating	Region	Complex evaluation
1	Yamalo-Nenets Autonomous Okrug	43.99
2	the city of Sevastopol	39.04
3	Khanty-Mansi Autonomous Okrug – Yugra	36.98
4	Penza Region	36.25
5	the Sakha Republic (Yakutia)	35.58
6	Moscow Region	34.56
7	Vologda Region	33.77
8	the city of Saint Petersburg	32.93
9	the Chuvashia Republic	32.36
10	the city of Moscow	32.17
76	the Khakassia Republic	20.72
77	the Tyva Republic	20.56
78	Volgograd Region	20.33
79	The Mari El Republic	20.26
80	Chukotka Autonomous Okrug	20.12
81	the Kalmykia Republic	19.80
82	the Altai Republic	19.50
83	the Karachay-Cherkessia Republic	18.96
84	Kemerovo Region	16.87
85	the Ingushetia Republic	15.55

The objectivity and reliability of a complex score evaluation is supplemented by the regression and correlation dependence. The authors use indicators from Table 4 as a factor to build the regression equation, and the integral indicator of rating evaluation is used as the result indicator. The examined indicators were checked for multicollinearity ($R < 0,7$). The factors are not connected, which makes it possible to build a regression model (Table 5).

The connection between the independent and dependent variables could be expressed as a linear function. In this case,

Table 5

The matrix of paired correlation coefficients

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
x_1	1										
x_2	-0.03	1.00									
x_3	0.53	-0.07	1.00								
x_4	0.25	-0.04	0.01	1.00							
x_5	0.01	0.33	-0.07	-0.08	1.00						
x_6	-0.14	-0.05	-0.05	0.05	-0.22	1.00					
x_7	0.17	0.03	-0.01	-0.06	-0.10	-0.01	1.00				
x_8	-0.21	0.03	-0.10	0.08	-0.14	0.12	-0.03	1.00			
x_9	-0.53	-0.05	-0.21	-0.21	0.04	0.00	-0.15	0.23	1.00		
x_{10}	-0.03	0.40	-0.13	0.11	0.14	0.06	0.04	0.04	-0.09	1.00	
x_{11}	-0.16	-0.10	-0.13	0.23	-0.36	0.27	-0.12	0.23	0.05	0.02	1.00

if the heteroscedasticity of residuals is absent, we get the following equation:

$$\begin{aligned}
 Y = & (-10,99) + (-0,35)x_1 + 0,20x_2 + \\
 & + 0,0018x_3 + 0,0007x_4 + 0,23x_5 + \\
 & + 0,037x_6 + 0,879x_7 + 0,0083x_8 + \\
 & + 0,408x_9 + 0,096x_{10} + 0,000002x_{11}.
 \end{aligned}
 \tag{3}$$

The values obtained in the regression equation allowed the authors to conclude that independent variables included in the model and the rating evaluation of tax incentives have backward and forward linkages. One of eleven indicators has a disincentive influence on the effectiveness of tax incentives. The analysis of the indicators of social effectiveness shows that the change of the unemployment rate by 1% on average will reduce the systemic evaluation by 0.35%, other things being equal.

Multiple linear regression is characterized by indicators of the closeness of the link, which are the coefficients of determination and multiple correlation. The value of the coefficient of multiple determination is close to 1. The variations of variables included in the regression equation by 99.9% determine the change in the final variable. The value of the multiple correlation coefficient shows a close link between independent and dependent variables. The evaluation of the significance of the regression equation as a whole was carried out using the Fisher criterion, whose actual value exceeds the table value several times. It is possible to conclude that

the significance of the regression equation has the probability of 95%. The probability of making a type I error is negligible. According to the dispersion analysis, the designed model of systemic evaluation is, on the whole, significant. Student’s t-test also shows the significance of the regression equation’s parameters. Thus, it is possible to claim with a high probability that the model is accurate and can be used.

Using the regression equation (3), it is possible to evaluate the effectiveness of tax incentives’ instruments of a RF subject without the calculations of the rating evaluation method. The presented model is universal and could be used for any RF subject with equal accuracy. To evaluate the effectiveness of tax incentives, it is possible to use the risk zones’ scale developed by the authors, where 100% means perfect effectiveness, and 0% is insufficient effectiveness (Figure 6).

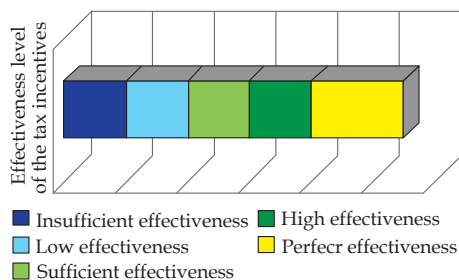


Figure 6. The scale of evaluating the efficiency of tax incentives’ instruments based on the method of systemic rating, %

It is possible to draw some conclusions based on the model of evaluating tax incentives' effectiveness developed by the authors. Eleven out of 85 analyzed regions of the Russian Federation show a low effectiveness of the tax incentives' mechanism, including Volgograd and Kemerovo Regions, the Altai Republic. Moscow and Vologda Regions, the Republic of Sakha (Yakutia) and the city of Moscow have a sufficient level of effectiveness of tax incentives. High effectiveness is observed in only two subjects of the Russian Federation: in Yamalo-Nenets Autonomous Okrug and in the city of Sevastopol. Perfect effectiveness of tax incentives was not achieved in any regions. The conducted research showed that in the period under consideration most subjects of the Russian Federation were within the sufficient and low effectiveness range.

5. Conclusion

The optimization of the introduction and evaluation of tax benefits means that it is necessary to provide the most effective tax incentives. Simultaneous analysis of the quality, economic feasibility of current preferences and the streamlining of tax administration will help compensate for the lost budgetary revenues in the initial period. The authors believe that the maximally objective and valid methodology of determining the effectiveness of tax incentives should include the definition of the integral indicator of effectiveness. This indicator should simultaneously take into account several factorial characteristics. The current study presents and tests the possibility of using several types of integral indicators. The authors also examine the specific characteristics of using integral indicators.

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