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ASSESSING THE EFFECTIVENESS OF DIGITALIZATION OF TAX CONTROL OVER VALUE-ADDED

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ABSTRACT

Objective: The article assesses the effectiveness of the digitalization of tax control over value-added on Russia's state budget, using statistical methods to analyze dynamics, comparison, and calculation of relative and average values. The study aims to develop a new methodology that addresses not only the economic but also the social effects of digitalization.

Methods: Methods of assessing the effectiveness of tax control implementation were analyzed, and a new methodology was developed based on these methods. This methodology is distinguished by the use of indicators that consider both the economic and social effects of digitalization within the Russian context.

Results: The study reveals that the digitalization of tax control, particularly through the ACS "VAT-2" system, has led to a significant increase in additional tax revenues for the budget and a reduction in the number of audits conducted. Additionally, an improvement in the effectiveness of tax audits and greater taxpayer compliance with tax laws were identified.

Conclusions: The digitalization of tax control has shown a significant positive impact on increasing budget revenues and reducing tax fraud. The proposed new methodology can be used to further enhance the effectiveness of tax control activities within the context of digital transformation.

Keywords: Tax control. Value-added tax. Digitalization. ACS "VAT-2". Effectiveness assessment.

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AVALIAÇÃO DA EFICÁCIA DA DIGITALIZAÇÃO DO CONTROLE FISCAL SOBRE O VALOR AGREGADO

RESUMO

Objetivo: O artigo avalia a eficácia da digitalização do controle fiscal sobre o valor agregado no orçamento do Estado da Rússia, utilizando métodos estatísticos para análise de dinâmica, comparação e cálculo de valores relativos e médios. O estudo visa desenvolver uma nova metodologia que aborde não apenas os efeitos econômicos, mas também os sociais da digitalização.

Métodos: Foram analisados os métodos de avaliação da eficácia do controle fiscal, e com base nisso, uma nova metodologia foi desenvolvida. Esta metodologia distingue-se pelo uso de indicadores que consideram tanto os efeitos econômicos quanto os sociais da digitalização no contexto russo.

Resultados: O estudo revela que a digitalização do controle fiscal, especialmente através do sistema ACS "VAT-2", resultou em um aumento significativo na receita tributária adicional para o orçamento e uma redução no número de auditorias realizadas. Além disso, identificou-se uma melhoria na eficácia das auditorias fiscais e uma maior conformidade dos contribuintes com as legislações fiscais.

Conclusões: A digitalização do controle fiscal demonstrou ter um impacto positivo significativo no aumento das receitas do orçamento e na redução de fraudes fiscais. A nova metodologia proposta pode ser utilizada para melhorar ainda mais a eficácia das atividades de controle fiscal no contexto da transformação digital.

Palavras-chave: Controle de impostos. Imposto sobre valor agregado. Digitalização. ACS "VAT-2"; Avaliação da eficácia.

1 INTRODUCTION

Over the past decade, marked by a manifold increase in information flows, one of the leading objectives in the work of tax services in numerous countries worldwide is the improvement of tax control. This is explained by the fact that analog approaches no longer meet modern requirements for the quality and effectiveness of tax control. In the current conditions, improvement of the efficiency of the tax system is largely supported by the development, introduction, and application of information technologies that create a foundation for analytical work and provide information and technological support for the fulfillment of tax administration objectives. Thus, information technologies become a critical factor in ensuring the effectiveness of tax control.

In Russia, the value-added tax (VAT) is one of the primary tax sources of revenue for the federal budget, providing one-third of all its revenues (Federal Tax Service of Russia, 2022).

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Given the specifics of VAT calculation, VAT is the least susceptible to the influence of changes in prices for raw materials, energy, and natural resources, in contrast to the mineral extraction tax. This advantage enables the VAT to ensure the long-term stability of the state system. Because of this, the VAT acquires great fiscal importance, especially in times of economic crises (Mishustin, 2016). This tax is of substantial importance for the Russian tax system, which justifies the need to conduct high-quality tax control over its calculation and payment.

The specificity of calculating the VAT and the possibility of legal minimization of tax deductions enabled taxpayers to deploy various schemes to reduce tax liabilities using unverified refunds, which are detrimental to the replenishment of the state budget.

The primary objective of tax control is to maintain a balance between the interests of the state and business, under which, on the one hand, the pressure on bona fide taxpayers who fulfill their obligations to the budget on time and in full is reduced. On the other hand, taxpayers who evade payment of taxes and fees and violate tax legislation are inevitably penalized (Federal Tax Service of Russia, 2018).

The introduction of the risk-oriented approach to tax control activities with the use of advanced automated analytical tools has allowed prioritizing the encouragement of taxpayers to voluntary revision of their tax liabilities instead of punishment (Chapkina, 2018). The Russian Federation is experiencing global reforms connected with the development of the digital economy, the main purpose of which is to increase the competitiveness of the country (Kirova & Kozhebatkina, 2020; Kulikov, 2019).

In this light, digitalization of the control and supervisory functions of tax authorities is intended to ensure:

- reduction of tax evasion by providing additional tools for tax analysis and the detection of violations;
- reduction of the costs of control activities;
- optimization of labor resources.

Global changes in tax control over the VAT took place in 2015 when tax authorities were given a new tool in the form of a specialized software product developed by the Federal Tax Service (FTS) of Russia to automate control of VAT declarations – the Automated Control System (ACS) "VAT-2".

The development of the automated control system for the calculation and payment of the VAT began in 2013 (Federal Tax Service of Russia, 2013).

The prerequisite for the realization of this project was the introduction of an obligation to submit VAT tax declarations electronically from January 1, 2014 (except for VAT non-payers

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performing the duties of tax agents) (Federal Tax Service of Russia, 2014). Per the Order of the FTS of Russia of October 29, 2014 No. MMV-7-3/558, this obligation entered into force on January 1, 2015 and extends to all taxpayers. The Order also established a new VAT declaration form supplemented with sections 8-12.

This change made it possible to create a digital software product to automate the process of identifying taxpayers who illegally claimed VAT refunds in the submitted declarations, as well as those who did not calculate the tax. Thus, tax authorities gained the ability to trace sellers up the chain, identifying not only gaps between buyer and seller data but also dubious counterparties listed in purchase books. This, in turn, made it possible to exclude invoices of problematic counterparties from deductions and make additional assessments, including on declarations submitted by taxpayers for payment, at the stage of a desk tax audit (DTA).

Currently, there is a particularly urgent problem of assessing the effectiveness of tax control, which implies the need to achieve the desired results with the least amount of funds within the amount of monetary resources provided by the state budget (Tikhonova & Dzyuba, 2018).

2 LITERATURE REVIEW

The ACS "VAT-2" supports the process approach in the implementation of desk tax control functions, provides their automation, and increases their efficiency (Sorokina & Belogorskaya, 2015). Since 2015, the following DTA processes have been automated: acceptance of the declaration; examination of declarations for logical control; calculation of reference ratios, generation and submission of auto-requests for explanations on reference ratios; comparison of counterparty transactions; generation and submission of auto-requests for explanations on discrepancies and processing of formalized explanations on discrepancies.

According to the FTS of Russia, over the past 8 years, the VAT tax gap has dropped by 7.21 points and now amounts to only 0.79%, which supports the presence of an effect from the digitalization of tax control over the VAT (Figure 1).

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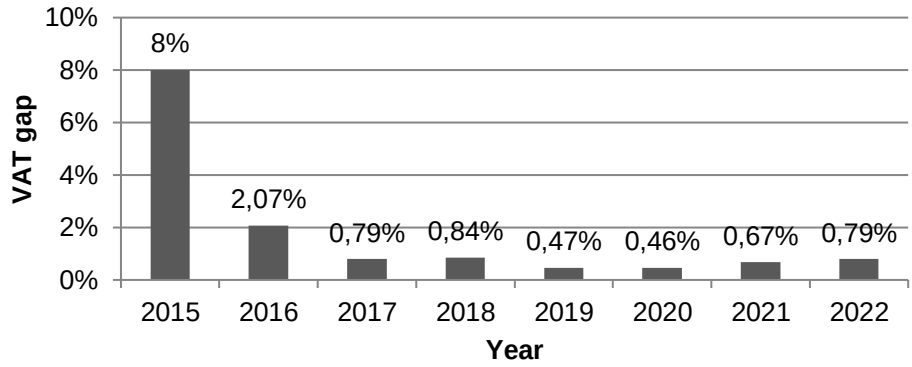

Figure 1. Tax gap for the VAT
Source: compiled by the authors according to the FTS of Russia

Digitalization of control over VAT payments has become one of the key factors that provided faster growth in tax revenues in recent years (Kokuitseva & Ovchinnikova, 2021; Sinelnikov-Murylev et al., 2022).

The FTS has developed and employed its own methods to assess the results of control activities, including those over the VAT.

Order of the FTS of Russia of November 9, 2017, No. MMV-7-1/846@ approved a list of effectiveness and efficiency indicators for the control and supervisory activities of the FTS (Federal Tax Service of Russia, 2017).

The work of the tax service is assessed by the type of control and supervisory activity, i.e., tax control, using 21 indicators. External assessment is the actual value of key performance indicators of control and supervisory activities (Group A), which is posted annually, starting from the results of 2018, on the official website of the FTS of Russia. The indicated Order approved the list of indicators with their key values for the period from 2018 to 2020.

The key effectiveness indicators for control and supervisory activities (Group A) include, first, deviation of actual receipts of revenues administered by the FTS of Russia from accruals; second, the ratio of the volume of arrears to the volume of revenues from taxes, fees, and insurance contributions to the budget system of the Russian Federation.

The internal assessment contains indicative indicators – indicators of efficiency that reflect the level of security of the values protected by law. This security level manifests in minimizing the infliction of harm (damage) to these values, considering the involved labor, material, and financial resources and administrative and financial costs of controlled entities when control and supervisory activities are carried out with respect to them. Among these indicators are income received per one ruble of costs and the receipt of revenues administered by the FTS of Russia per one employee (group B). According to the approved Order, assessment is also carried out based on indicative indicators characterizing various aspects of control and

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supervisory activities (group C).

The FTS of Russia also utilizes a method for assessing the effectiveness of territorial tax authorities and establishing analytical scores to distribute material incentives. Under this method, at the end of each reporting quarter (period) over which the results of work are assessed, based on reports and information resources data, the efficiency indicators of territorial authorities of the FTS and respective scores are calculated, as well as scores of additional assessment of tax authorities' performance, proposals for determining the coefficients are made, and ratings are formed.

The assessment covers all aspects of tax authorities' activities, including control work: an integral indicator is calculated to assess the effectiveness of control and related legal work, pre-trial settlement of tax disputes, and the quality of bankruptcy procedures.

The integral indicator of control activities efficiency is calculated from general indicators and the established weights of their importance. Ultimately, the value of each indicator is equal to a certain analytical score. The FTS of Russia with the algorithm for calculating indicators also provides information on the maximum and minimum points obtainable by tax authorities.

At year-end, the FTS of Russia publishes a report on the operation of the service on its official website nalog.gov.ru. The report presents information that directly concerns control activities: sums of revenues as a result of DTA and field tax audits (FTA), the number of these audits, and the sum of additionally accrued payments. The method itself with its indicator calculation algorithm and reference values is proprietary information and cannot be distributed to the general public.

Apart from the so-called official methods of assessing the effectiveness of tax control, several other approaches drawing on the main assessment indicators have been developed by researchers.

To assess the reliability and effectiveness of tax control, V.K. Resh (1999) proposes to use basic and additional indicators, as well as relevant criteria indicators, based on which a comprehensive assessment of the performance of the tax authority is conducted.

G.N. Kartashova (1999) suggests that an objective criterion to assess the effectiveness of the tax system is "the indicator of the difference between the amounts of tax payments expected and actually received by the budget" (p. 17).

The use of such tax control effectiveness criteria as expenses on control is substantiated by A.Z. Dadashev (2002).

Professor D.G. Chernik (1997) proposes to assess the state of control work of the tax inspection using information from the staff schedule of the inspectorate, as well as the data

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used in the tax reporting form 2-NK.

The scientific standpoint of E.V. Ivanova (2011) suggests assessing the effectiveness of tax administration using quantitative and qualitative indicators divided into four main groups: indicators of overall efficiency; indicators of DTA; indicators of FTA; and indicators of work with taxpayers who do not submit tax reporting or submit reporting with null values.

A.L. Anisimov and Yu.B. Melnikov (2017) present a coefficient of general effectiveness calculated as a ratio of the amount recovered from additional accruals per tax authority employee to the amount of expenses per employee.

A.V. Tikhonova and D.V. Dziuba (2018) argue the expediency of employing the audit effectiveness coefficient, the indicator of audit effectiveness per employee, it is effective to employ the coefficient of audit effectiveness, the coefficient of penalties, the share of additional accruals in total revenues, and the indicator of overall effectiveness.

Drawing on the numerous approaches, we should note that the problem of choosing criteria for the assessment of control work results is still unresolved. Alternative assessment methodologies are waiting to be explored.

The goal of this study is to assess the effectiveness of tax control over the VAT given the effects of digital transformation and to conduct an in-depth analysis of the results of control work of the FTS Department (FTSD) for the Khanty-Mansi Autonomous Okrug-Yugra (KhMAO-Yugra) and its territorial tax bodies.

To achieve the established research goal, we determined the following objectives for the study:

1) to analyze the existing methods of assessing the effectiveness of tax control;

2) to improve the system for tax control effectiveness assessment including in the analysis of the social and behavioral effects resulting from the digital transformation of tax control;

3) to establish the results achieved with the automated software product performing the functions of control over the VAT in the activities of tax authorities of the KhMAO-Yugra with consideration of the effects of digital transformation.

3 METHODS

Assessment of the effect of the software product ACS "VAT-2" on the effectiveness of tax control over the VAT can be conducted using our developed methodology, which considers the effects of digital transformation, based on the example of the work of the FTSD of the KhMAO-Yugra.

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Thus, the solution to assessing the effectiveness of tax control over the VAT in the conditions of digital transformation consists in determining the economic and social (behavioral) effects of the introduction of digital technologies. In this, the assessment of the costs of introducing digital technologies as part of cost-effectiveness assessment is carried out by traditional economic analysis tools.

The economic impact of the introduction of digital technologies is evaluated by an increase in the revenue part of the budget by the amounts additionally accrued and recovered as a result of tax control. For this study, the social effect, customarily assessed through the uniformity of tax burden distribution due to the reduction of tax violations (Dorofeeva & Suvorov, 2010), is proposed to be supplemented with the effects of digital transformation – behavioral indicators characterizing the taxpayer's attitude to tax legislation and tax control measures carried out with respect to them. The effectiveness of digital transformation of tax control is thus confirmed by quantitative indicators relating to the ratio of costs for the introduction of digital technologies to the resulting total economic and social, including behavioral, effect of their implementation (Table 1).

Table 1. System of indicators to assess the effectiveness of tax control in the conditions of digital transformation

Indicator	Calculation	Reference value
1. Overall effectiveness of control activities		
Indicator of the overall effectiveness of control activities calculated per one employee	amount of recovered payments as a result of control activities per one employee of the control unit/average cost per employee for primary activities	amount of expenses < amount of additionally recovered payments
2. Overall effectiveness of control activities in the conditions of digitalization		
Indicator of the overall effectiveness of control activities in the conditions of digitalization	amount of recovered payments as a result of control activities/costs of maintaining the tax department + costs of implementing the digital software product	amount of expenses < amount of additionally recovered payments
3. Tax audit effectiveness indicators		
The share of effective DTA	number of DTA that discovered violations/total number of conducted DTA	evaluated dynamically
The share of effective FTA	number of FTA that discovered violations/total number of conducted FTA	tends to 100%
Amount of additional accruals per one DTA	the total sum of additional accruals as a result of DTA/number of DTA that discovered violations	evaluated dynamically
Amount of additional accruals per one FTA	the total sum of additional accruals as a result of FTA/number of FTA that discovered violations	13.7 mln. rub. (benchmark of the FTS of Russia)
Indicator of taxpayer coverage by FTA	number of taxpayers inspected by FTA/total number of registered taxpayers (legal persons and individual entrepreneurs)	tends to 0%
Average duration of FTA	the total duration of FTA/number of FTA	153 days (benchmark of the FTS of Russia)
Indicator of unjustified VAT refunds	number of DTA that established unjustified VAT refunds/total number of DTA that inspected VAT refunds from the budget	tends to 0%
4. Behavioral indicator		

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Indicator of voluntarily revised tax liabilities	sum of voluntarily revised and paid tax liabilities/total sum of additional tax accruals as a result of control activities	evaluated dynamically
5. Indicators of reconciling VAT discrepancies		
Indicator of elimination of scheme discrepancies in the VAT	the sum of unresolved VAT discrepancies/total sum of VAT discrepancies	tends to 0%
6. Employee workload indicators		
Indicator of workload per one desk block employee	number of conducted DTA/number of employees in desk block divisions	evaluated dynamically
Indicator of workload per one field block employee	number of conducted FTA/number of employees in field block divisions	evaluated dynamically
7. Indicators of fiscal significance of additional accruals		
Overall indicator of payments recovered from additional accruals as a result of control activities	amount of payments recovered from additional accruals as a result of control activities/total sum of additional accruals as a result of control activities	tends to 100%
Indicator of payments recovered from additional accruals as a result of DTA	amount of payments recovered from additional accruals as a result of DTA/total sum of additional accruals as a result of DTA	tends to 100%
Indicator of payments recovered from additional accruals as a result of FTA	amount of payments recovered from additional accruals as a result of FTA/total sum of additional accruals as a result of FTA	no less than 65% (benchmark of the FTS of Russia)
Indicator of payments received as a result of control activities relative to the total amount of received payments	the sum of payments recovered as a result of control activities/total amount of received tax and additional payments to the budget	evaluated dynamically

Source: compiled by the authors

The indicators are partially supplemented by information on benchmark values established by the FTS of Russia and published annually as planned indicators. In addition, we use the information provided in the Order of the FTS of Russia of November 9, 2017 No. MMV-7-1/846@ "On indicators of effectiveness and efficiency of control and supervisory activities of the Federal Tax Service", which was created to implement the priority project "Introduction of a system for assessing the effectiveness and efficiency of control and supervisory activities".

4 RESULTS AND DISCUSSION

The FTSD of the KhMAO-Yugra exercises control and supervision over compliance with legislation on taxes and fees, as well as regulatory legal acts adopted in accordance with it, and over the correctness of calculation, completeness, and timeliness of payment of taxes, fees, insurance contributions, and other obligatory payments to the budget system of the Russian Federation. The chief objective of the Department as a supervisory executive authority is to preclude violations of tax legislation by taxpayers in the framework of tax control.

One of the key forms of tax control is desk tax audit, specifically DTA and FTA. Therefore,

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our assessment of the effectiveness of tax control over the VAT relies on tax audit effectiveness indicators (Table 2).

Table 2. Indicator of the effectiveness of FTA and DTA of the VAT conducted by the FTSD of the KhMAO-Yugra

Indicator	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of taxpayers inspected over the reporting period in desk VAT audits, thousand units	70.1	71.9	71.5	65.7	67.8	63.4	66.7	59.3	50.2	42.6	47.3
Number of DTA that revealed VAT violations, thousand units	6.3	5.9	8.2	6.9	7.2	6.1	5.5	4.9	3.5	2.4	2.2
Desk audit effectiveness indicator, %	9.0	8.3	11.4	10.5	10.6	9.6	8.2	8.2	6.9	5.5	4.7
Number of taxpayers inspected over the reporting period in FTA of the VAT, units	550	422	436	323	225	183	138	53	47	97	108
Number of FTA that revealed VAT violations, thousand units	410	311	337	261	177	149	101	39	41	94	102
Field audit effectiveness indicator, %	74.5	73.7	77.3	80.8	78.7	81.4	73.2	73.6	87.2	96.9	94.4

Source: compiled by the authors according to the FTS of Russia

The average effectiveness of FTA inspecting the VAT from 2012 to 2022 amounts to 81.1%, while the average effectiveness of DTA over the same period is only 8.5%. Thus, over the studied period, there was a significant change in the effectiveness of DTA and FTA of the accuracy of VAT calculation and payment (Figure 2).

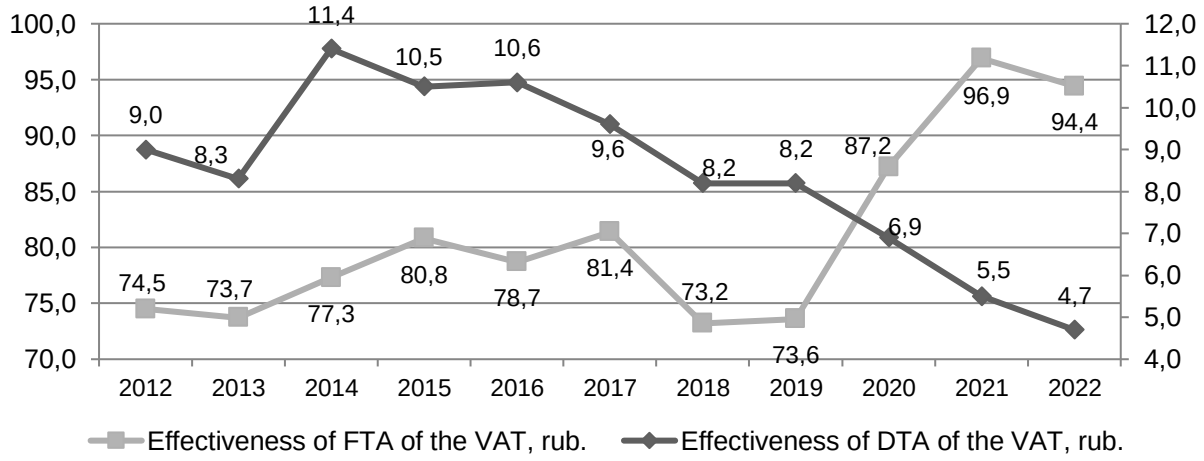

Figure 2. Dynamics of the effectiveness of DTA and FTA of the VAT
Source: compiled by the authors

By the end of 2022, the effectiveness of FTA inspecting the accuracy of VAT calculations reached a little short of 100% (94.4%). In contrast, in 2012, prior to the introduction of the ACS "VAT-2", which compares tax declarations automatically, the effectiveness of audits was 74.5%. In addition, it is important that from 2012 to 2022, the main emphasis in FTA was placed on control over the calculation of the VAT. In 2012, the share of FTA inspecting this tax in the total number of FTA conducted was 88% (a total of 624 audits, 550 of which detected VAT violations), and in 2022, this share reached 94%.

The effectiveness of DTA focusing on the VAT shows a different pattern. By the end of

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the analyzed period, the effectiveness of DTA was 4.7%, compared to 9% at the start. Thus, the introduction of the digital software complex resulted in a considerable reduction both in the number of DTA of the VAT conducted and in the number of those revealing violations (Figure 3).

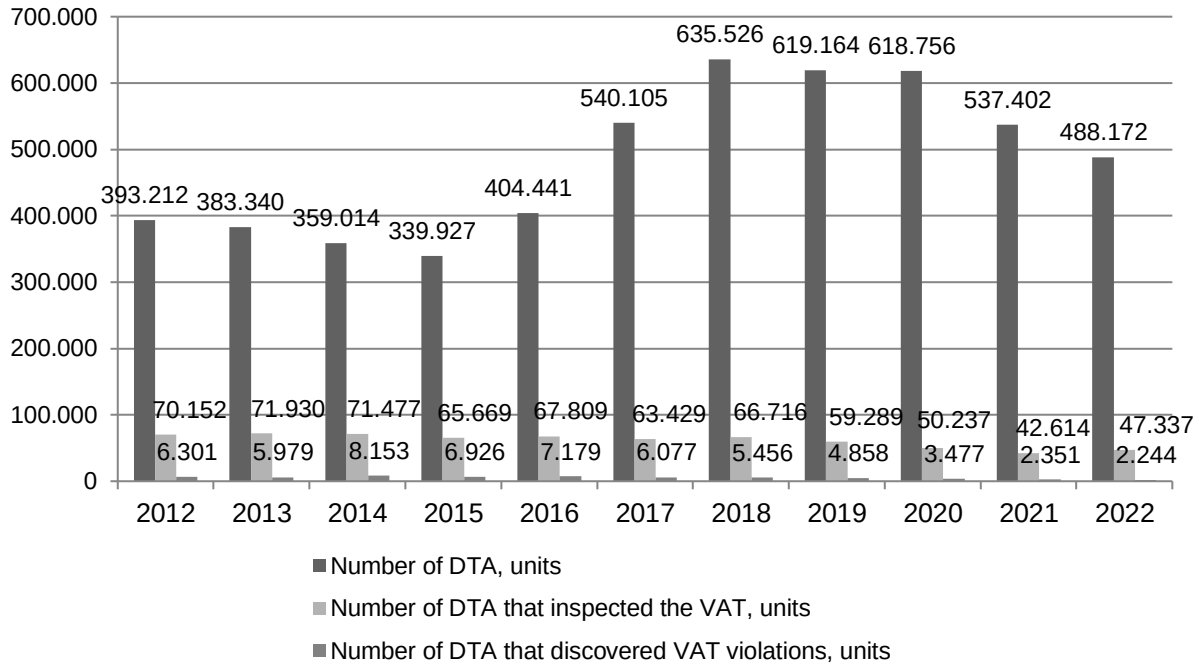

Figure 3. Ratio of the number of DTA conducted to the number of audits that inspected the VAT and established violations
Source: compiled by the authors

In 2012, the tax authorities of Yugra conducted 70,152 DTA of the VAT, of which 6,301 established violations. The effectiveness of these audits thus equaled 8.98%. In 2016, as a result of the complete introduction of the ACS "VAT-2" software complex, of the 67,809 DTA conducted to inspect the VAT, 7,179 revealed violations, the effectiveness of these audits amounting to 10.59%.

From 2016 to 2022, both the number of DTA and the number of audits revealing violations were reducing. This effect is likely attributable to a significant rise in the role of tax authorities' analytical work and voluntary clarification of tax liabilities to the budget by taxpayers themselves. Since 2015, the business environment has been coming out of the shadows. Elimination of fraudulent taxpayers submitting false declarations, which are used by organizations to inflate VAT exemptions, is another critical component of the functions of tax authorities.

The VAT is responsible for the major share of additional accrued payments (Table 3).

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Table 3. Additional VAT accruals as a result of control activities conducted by the Department in 2012-2022

Year	Sum of additional accruals across all taxes and fees as a result of audits, thousand rub.	Sum of additional VAT accruals as a result of audits, thousand rub.				Share of additional VAT accruals in the total sum of additional accruals across all taxes and fees, %
		Total	As a result of FTA	As a result of DTA	Additional accruals as a result of other control measures and penalties for overdue payments of taxes, contributions, and fees	
2012	6,288,616	2,839,098	2,083,144	399,033	356,921	45.15
2013	5,303,367	2,827,915	2,151,252	306,534	370,129	53.32
2014	5,250,681	2,593,795	1,939,633	293,549	360,613	49.40
2015	5,195,263	2,702,301	2,043,585	300,323	358,393	52.01
2016	6,111,360	3,420,736	2,463,081	361,849	595,806	55.97
2017	6,601,062	3,550,371	2,521,007	418,899	610,465	53.78
2018	3,730,016	2,188,641	2,044,372	144,269	684,791	58.68
2019	2,738,545	2,008,385	1,679,977	328,408	295,595	73.34
2020	2,305,672	1,187,926	1,008,774	179,152	0	51.52
2021	6,018,158	2,998,878	2,693,253	305,625	0	49.83
2022	11,184,903	5,861,074	4,755,672	1,105,403	XXX	52.40

Source: compiled by the authors according to the FTS of Russia

The sum of additional accruals as a result of tax audits in 2012 was 6,288.6 mln. rub., of which 2,839.1 mln. rub., or 45.15%, come from additional accruals of the VAT. Overall dynamics clearly show an upward trend in the share of the VAT in the overall sum of additional accruals. The 54% share confirms the importance of quality control in relation to this tax.

Another important indicator describing the quality of tax control is the amount of additional accruals per one DTA and FTA inspecting the VAT. The values of this indicator for the FTSD of the KhMAO-Yugra over the years are presented in Table 4.

Table 4. Information on additional VAT accruals per one effective tax audit conducted by the Department from 2012 to 2022

Indicator	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of DTA that discovered VAT violations, units	6,301	5,979	8,153	6,926	7,179	6,077	5,456	4,858	3,477	2,351	2,244
Total sum of additional accruals as a result of DTA (VAT), mln. rub.	399	307	294	300	362	419	144	328	179	306	1,105
Sum of additional accruals per 1 effective desk audit, thousand rub.	63.32	51.35	36.06	43.32	50.42	68.95	26.39	67.52	51.48	130.16	492.42
Number of FTA that discovered VAT violations, units	410	311	337	261	177	149	101	39	41	94	102
Total sum of additional accruals as a result of FTA (VAT), mln. rub.	2,083	2,151	1,940	2,044	2,463	2,521	2,044	1,680	1,009	2,693	4,756
Sum of additional accruals per 1 effective field audit, thousand rub.	5,080	6,916	5,757	7,831	13,915	16,919	20,238	43,077	24,610	28,649	46,627

Source: compiled by the authors according to the FTS of Russia

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Analyzing the effectiveness of DTA of the VAT in 2012, we find additional accruals as a result of 6,301 audits to amount to 399 mln. rub., which corresponds to 63.32 thousand rub. in additional accruals per one audit. In 2022, tax authorities conducted a total of 2,244 DTA of the VAT, which is 2.81 times less than in 2012. As a result of these inspections, additional revenues to the budget amounted to 1,105 mln. rub., meaning that the effectiveness of one DTA of the VAT was 492.42 thousand rub. Thus, the growth rate of the effectiveness of one DTA of the VAT since the start of the analyzed period equals 680.95%.

The FTA form of control is a more effective means of budget replenishment compared to DTA. In 2012, the FTSD of the KhMAO-Yugra carried out 410 FTA, which detected VAT violations totaling 2,083 mln. rub. Therefore, the effectiveness per one DTA was 5,080 thousand rub. In 2022, authorities conducted 308 fewer audits (102 audits), yet the sum of additional accruals increased by 2.3 times and reached 4,756 mln. rub. The effectiveness of one FTA revealing a VAT violation thus equals 46,627 thousand rub., 9.2 times more than in 2012. We can thereby conclude that with respect to FTA, there is a trend of a decrease in the number of inspections with an improvement in their effectiveness (Figure 4).

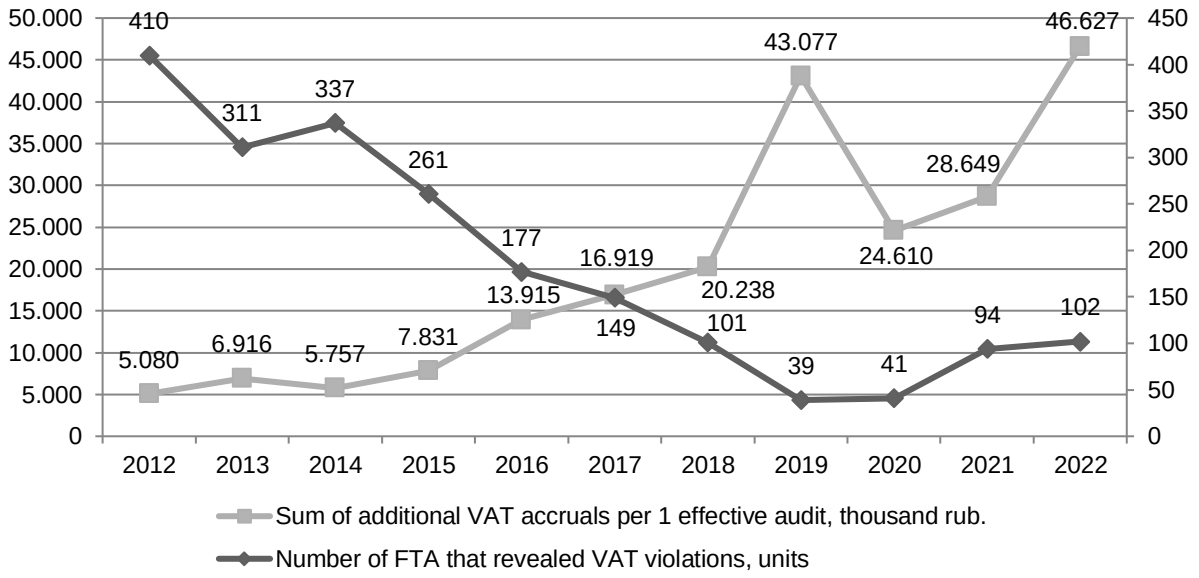

Figure 4. Information on the number and effectiveness of FTA of the VAT conducted by the Department
Source: compiled by the authors

Analyzing the indicators of desk and field tax audits that discovered violations in the calculation and payment of the VAT, we should highlight that both DTA and FTA show a trend of decrease in the number of control activities with a rise in their effectiveness.

The ACS "VAT-2" clearly succeeds in fulfilling its main purpose, determining risk zones and carrying out complex qualitative data analysis with a minimal number of audits. At present, the main emphasis is placed on preempting and precluding potential violations of

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legislation on taxes and fees.

The analysis conducted through our methodology shows a considerable decrease in the number of VAT DTA revealing violations as part of the work of tax authorities of the KhMAO-Yugra. This result is associated both with the overall reduction of DTA inspecting the VAT and with the improvement of taxpayers' integrity with regard to the calculation and payment of the VAT and preventing the occurrence of violations (Table 5).

Table 5. Indicators of the effectiveness of tax control over the VAT conducted by the FTSD of the KhMAO-Yugra

Indicator	Unit of measurement	Indicator value for 2012	Indicator value for 2022
Tax audit effectiveness indicator			
Share of effective DTA	%	9	4.7
Share of effective FTA	%	74.5	94.4
Amount of additional accruals per one DTA	thousand rub.	63	492
Amount of additional accruals per one FTA	thousand rub.	5,080	46,627
Indicator of taxpayer coverage by FTA	%	1.17	0.34
Average duration of FTA	days	149	184
Indicator of unjustified VAT refunds	%	30	4
Behavioral indicator			
Indicator of voluntarily revised tax liabilities	%	16.4 (as of 2016)	19.9
Sum of additional VAT payments received as a result of voluntary revisions	thousand rub.	560 (as of 2016)	1 165
Indicators of reconciling VAT discrepancies			
Indicator of elimination of scheme discrepancies in the VAT	%	16.6 (as of 2018)	12
Employee workload indicators			
Indicator of workload per one desk block employee	number of audits	351	222
Indicator of workload per one field block employee	number of audits	3.79	1.21
Indicators of the fiscal significance of additional accruals			
Overall indicator of payments recovered from additional accruals as a result of control activities	%	41	33
Indicator of payments recovered from additional accruals as a result of DTA	%	95	21
Indicator of payments recovered from additional accruals as a result of FTA	%	31	36
Indicator of payments received as a result of control activities relative to the total amount of received payments	%	0.56	0.39
Overall effectiveness of control activities			
Indicator of the overall effectiveness of control activities calculated per one employee	rub.	2.11	5.86

Source: compiled by the authors

Importantly, territorial tax authorities work every year to exclude from the Unified State Register of Legal Entities fraudulent legal persons whose activities are aimed at creating schemes to minimize tax liabilities in relation to the VAT (ghost firms and dummy companies). This work is carried out using analytical modules built into the software complex

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– ACS "VAT-2".

The first priority in the realization of FTA is given specifically to control over the calculation of the VAT. This trend is observed across the entire analyzed period. In 2012, the share of FTA that inspected the accuracy of VAT calculation and payment was 88%, and in 2022 – 94%. It should be noted that taxpayers are included in FTA plans only if pre-inspection analysis reveals risks that point to tax law violations on their part. This supports the increase in the effectiveness of FTA of the VAT using digital products. The dynamics are as follows: the effectiveness of FTA focusing on the VAT in 2012 was 75%, in 2016 – 79%, and in 2022 – 94.4%.

The introduction of the ACS "VAT-2" software complex and the transition to the risk-oriented approach have also provided for a reduction in the sum of tax claimed by VAT taxpayers for refund. The number of declarations submitted for refund in 2012 amounted to 2,170. Of these, 642 cases were recognized as unjustified, totaling 332,938 thousand rub. and making up 30% of the total number of refunds. Over the analyzed period from 2012 to 2022, unjustified refunds of the VAT were dropping. Specifically, in 2022, the share of declarations with unjustified VAT refund claims was only 4%, which is 7.5 times less than in 2012.

Analysis of additional tax accruals as a result of DTA and FTA demonstrates that the VAT accounts for the greatest share in the total amount of additional accruals.

Despite the general increase in the effectiveness of FTA, as a result of the introduction of the ACS "VAT-2", the average duration of FTA is observed to increase. Whereas in 2012, their average duration was 149 days, in 2022 this indicator reached 184 days, which is 35 days more (an increase of 1.23 times). Thus, while the number of FTA lowers, their average duration considerably increases. This fact is also determined by some objective reasons. In connection with the amendments introduced to the Tax Code of the Russian Federation by Federal Law No. 163-FZ of July 18, 2017 (introduction of Article 54.1 of the Tax Code) (State Duma of the Federal Assembly of the Russian Federation, 2017), the established practice of conducting FTA was revised, which had a negative effect on their duration.

With the introduction of the software complex allowing to discover and analyze VAT evasion schemes in the work of tax authorities in the region, the sums of established discrepancies in the VAT had been growing, however, the efficiency of elimination of scheme discrepancies in the VAT also increased. The share of unresolved discrepancies in 2022 was 12%, in contrast to 16.6% in 2018.

Since 2012, there has been a visible reduction in workload per employee of the desk block conducting audits of the calculation and payment of the VAT. In 2012, there were 351 audits

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per employee. By 2022, the indicator dropped to 222 audits, which is 1.58 less than at the start of the analyzed period. This trend is attributed to the reduction of FTA concerning the VAT. In addition, 2017 marked the start of the operation of the control and analytical department, which deals exclusively with the control of VAT declarations. This fact caused a rise in the number of employees controlling the accuracy of VAT calculation.

In contrast to the desk block, the average workload per employee in the field block in 2022 was 1.21 audits, compared to 3.79 in 2012, 3.13 times lower than in 2022. The factual number of employees was reduced by 56 workers between 2012 and 2022 (almost 2 times less). Thus, with a decrease in the number of personnel and workload per employee, the effectiveness of FTA inspecting the VAT grew.

Indicators of tax payments received in the budget after the implementation of the ACS "VAT-2" demonstrate a trend of increase both in additionally accrued and recovered VAT payments. In 2012, territorial tax authorities of the Okrug additionally accrued VAT in the amount of 2.48 bln. rub. based on the results of their DTA and FTA. By 2017, this value increased by 0.46 bln. rub. and totaled 2.94 bln. rub. Finally, in 2022 it reached 5.86 bln. rub., which is double the amount at the start of the analyzed period.

A similar situation is observed with respect to payments received to the budget based on the results of control and analytical work. In 2012, the budget received VAT payments in the amount of 1.02 bln. rub., by 2017, revenue almost doubled, reaching 2.11 bln. rub., and in 2022, budget revenues from the VAT hit 3.08 bln. rub., three times higher than the level of 2012. Despite an increase in additional payments to the budget, the percentage of recovery of additionally accrued tax based on the results of control measures lowered.

In 2012–2022, on average, per 1 ruble of costs allocated to one employee of the control unit providing control over the correctness of VAT calculation and payment, the budget received 3.36 rubles recovered within the framework of VAT control work. With a virtually unchanged number of staff in the control block over the period from 2012 to 2022, the amount of VAT revenues to the budget increased, causing the said increase in the sum of revenues per 1 ruble of expenses on employees providing control over the VAT.

Analysis of purchases made by the Service by placing bids in the Unified Information System of Public Procurement shows that from 2014 to 2017, the FTS of Russia concluded 14 contracts within the framework of 44-FZ and 223-FZ totaling 2,510,551.27 mln. rub. to create and deploy the ACS "VAT-2" in the activities of tax authorities (State Duma of the Federal Assembly of the Russian Federation, 2011, 2013). The contract was executed entirely at the expense of the federal budget.

It is important that the ACS "VAT-2" has been implemented in the work of tax authorities

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across the entire country. Therefore, it is impossible to estimate the ratio between the costs of developing and implementing the digital product to the sums of additional tax payments to the budget resulting exclusively from the control and analytical work of the FTSD of the KhMAO-Yugra. However, each of the 89 regions of Russia accounts for an average of 28,208 mln. rub. in expenses. The total amount of costs for the digitalization of tax control in the FTSD of the KhMAO-Yugra from 2014 to 2022 equals 33,377 mln. rub. (Table 6). Given that the total of additional VAT payments received as a result of control and control and analytical work amounts to 18,053 mln. rub. and the sum of additional VAT accruals is 24,587 mln. rub., it can be argued that as of the start of this year, the work of territorial tax authorities with respect to control over the calculation and payment of the VAT expressed in additional tax revenues to the federal budget has not yet recovered the costs of creation and implementation of the ACS "VAT-2".

Table 6. Total cost of the implementation of ACS "VAT-2" in the work of the Department

Indicator	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total costs of the development and implementation of ACS "VAT-2", mln. rub.	374,712	157,300	1,938,540	40,000	-	-	-	-	-
Average costs of the creation of ACS "VAT-2" for the FTSD of KhMAO-Yugra, mln. rub.	4,210.2	1,767.4	21,781.3	449.4	-	-	-	-	-
Costs of operation of the FTSD of KhMAO-Yugra (operation of the control unit), mln. rub.	623	617.4	431.2	670.6	632.8	616	523.6	527.8	526.4
Total costs of the FTSD of KhMAO-Yugra, mln. rub.	4,833.2	2,384.8	22,212.5	1,120	632.8	616	523.6	527.8	526.4

Source: compiled by the authors according to the FTS of Russia

The payback time of expenses on the digitalization of tax control with respect to the VAT was estimated using the forecasting method based on expense growth rate. Importantly, the majority of costs for the creation and implementation of the new automated software product were incurred between 2014 and 2017. In subsequent years, improvement of the software complex took place simultaneously with the development of other products. The sums that may substantially affect total costs from 2018 were not determined, hence the cost growth rate was calculated starting from 2019. In this case, costs over the identified period include average sums of expenditures incurred to maintain the operation of the control block of territorial tax authorities under the FTSD of the KhMAO-Yugra.

Analysis of the growth rates of both costs and additional accruals and revenues of the

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VAT demonstrates the following.

First, the dynamics of costs and additional VAT accruals and revenues are spike-like.

Second, overall dynamics in costs show a downward trend. Due to the lack of equal changes from year to year, extrapolation should be carried out based on the average cost growth rate, which equals -4.29%.

Third, the overall dynamics of VAT accruals and revenue have an upward trend. Additional VAT accruals and revenues also have not been found to have an equal change from year to year. Calculations are therefore made using average change rates – +28.5% for additional accruals and +11.3% for additional revenues.

Based on this, we estimated the amounts of costs and additional VAT accruals and received payments as a result of control activities in the following years (Table 7).

Table 7. Forecasted indicators of expenditures and additionally accrued and received VAT payments

Year	Indicator		
	Total costs for the FTSD of KhMAO-Yugra, mln. rub.	Additionally accrued VAT payments as a result of control activities, mln. rub.	Additional VAT payments received as a result of control and analytical control activities, mln. rub.
2014	4,833.2	2,233	2,593
2015	2,384.8	2,344	1,012
2016	22,212.5	2,825	1,608
2017	1,120	2,940	2,106
2018	632.8	2,189	2,153
2019	616	2,008	1,463
2020	523.6	1,188	1,558
2021	527.8	2,999	2,477
2022	526.4	5,861	3,083
2023	503.8	7,531	3,431
2024	482.2	9,677	3,818
2025	461.5	12,435	4,249
2026	441.7	15,979	4,729
2027	422.8	20,533	5,263
2028	404.7	26,385	5,858
2029	387.3	33,904	6,520
2030	370.7	43,567	7,257

Source: compiled by the authors

To determine payback time for the costs of creating and introducing the ACS "VAT-2", the costs and additional VAT payments received were calculated as a cumulative total (Figure 5).

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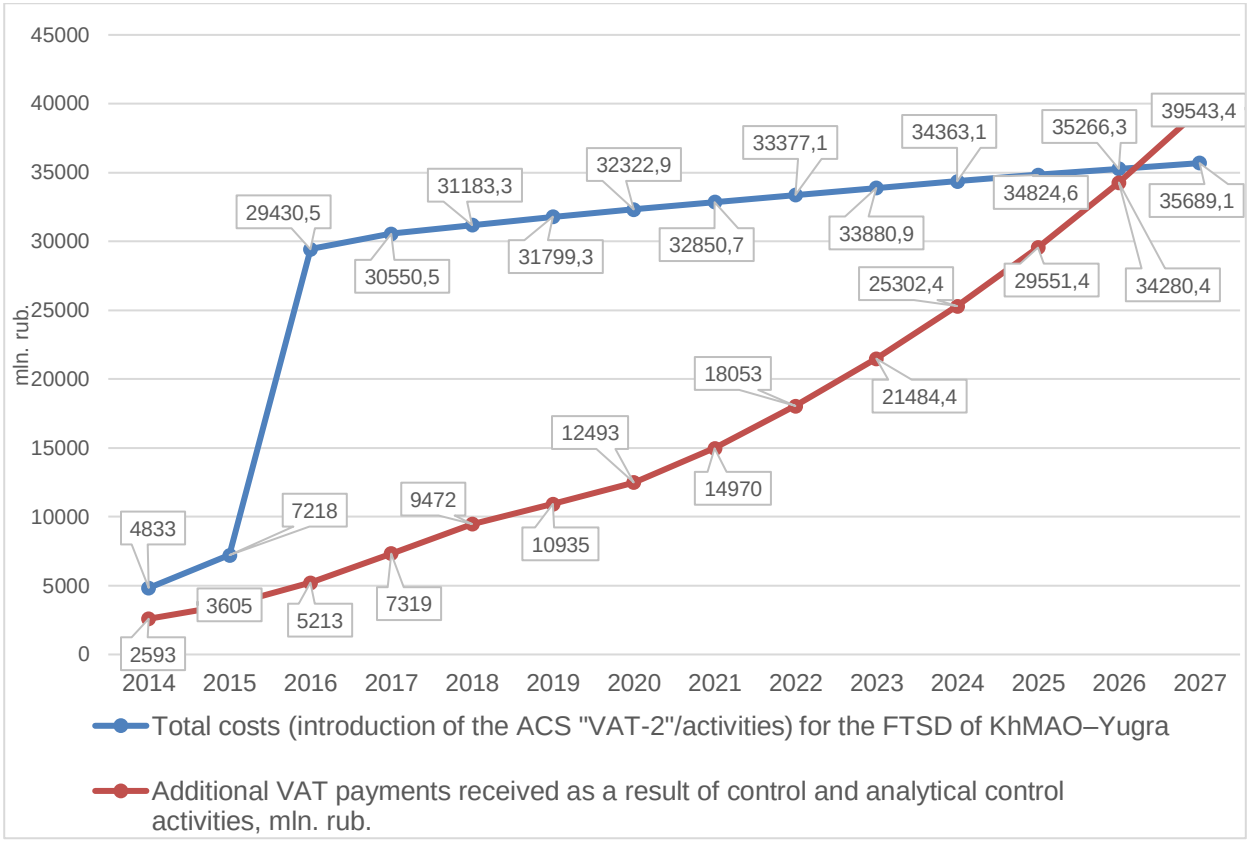

Figure 5. Information about expenditures on the ACS "VAT-2" and additional VAT payments received as a result of control activities as a cumulative total
Source: compiled by the authors

Thus, the forecasted indicators suggest that the costs of introducing the ACS "VAT-2" into the work of regional tax authorities will be recovered by additional VAT payments as a result of control activities by 2026.

Digitalization generates a cumulative effect, which manifests in increasing the effectiveness of tax administration (Federal Tax Service of Russia, 2019). Given this conclusion, analyzing the ratio of the costs to introduce automated software for the VAT to the total sum of VAT payments to the budget from the region, we observe a positive economic effect almost immediately after the introduction of the ACS "VAT-2".

One of the quickest significant economic effects of implementing the ACS "VAT-2", which was an increase in tax revenue, first appeared in 2018 (Figure 6). Prior to the introduction of the ACS into the work of tax authorities, the sum of VAT revenues to the budget was 227 bln. rub., while in 2018 it reached 347 bln. rub., the growth rate amounting to +52.86%.

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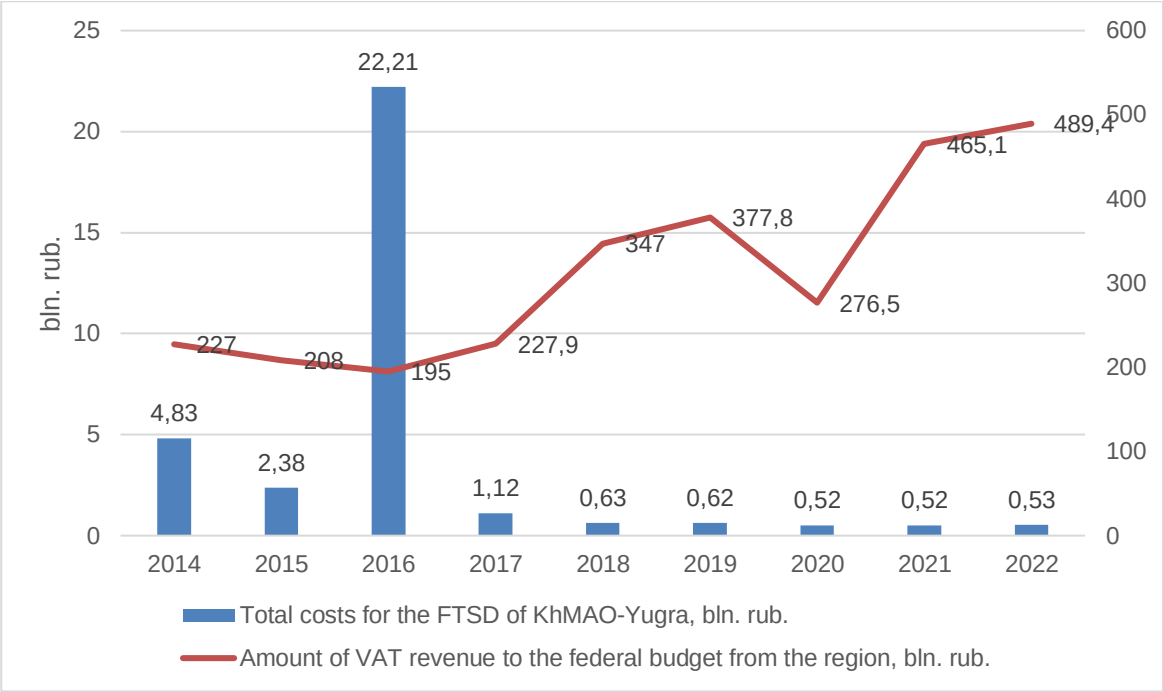

Figure 6. Information on the costs of creating and introducing the ACS "VAT-2" and the sum of VAT revenue to the federal budget from the region
Source: compiled by the authors according to the FTS of Russia

The total costs of implementing the ACS "VAT-2" do not exceed 12% of the total amount of VAT payments received to the budget from the region. To be exact, the share of expenses in 2014 was 2.13%, in 2015 – 1.14%, in 2016, the year with the highest sum of expenditures – 11.39%, and in 2017 – 0.49%.

Proceeding from this statement, the results of control activities of territorial tax authorities in the region fully recovered the costs of creation and implementation of the ACS "VAT-2".

5 CONCLUSIONS

The conducted analysis of the introduction of the ACS "VAT-2" into the work of tax authorities using the example of the FTSD of the KhMAO-Yugra established the following economic effects:

- Reduction of budget losses from illegal VAT refunds and increase in VAT revenues;
- Increase in additional budget revenues owing to the reduction of the shadow economy;
- Reduction in the number of dummy companies;
- Reduced number of tax audits with an overall increase in their effectiveness.

Furthermore, the analysis suggests that the digitalization of tax control creates a cumulative effect expressed in the rising effectiveness of tax administration.

In addition, systematic digitalization of tax control produces additional effects – the effects of digital transformation associated with a qualitative change in business processes and the

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emergence of special behavioral effects that augment the positive influence of digitalization and change the system of assessment of its economic effectiveness.

The proposed method of assessing the effectiveness of tax control over value-added in the conditions of digital transformation supplements the existing systems of indicator-based assessment of the behavior of participants in tax control – inspectors and taxpayers. Resolving the scientific objective of establishing the cumulative socioeconomic effect of the digital transformation of tax control, the method incorporates into the analysis such behavioral effects as aggressive control methods and taxpayer integrity.

Notably, the introduction of digital technologies into the work of tax authorities with regard to control over the calculation and payment of the VAT results in a decrease in aggressive control methods (FTA) with an overall improvement of their effectiveness. The criterion of tax control effectiveness is also found to affect taxpayer behavior. A real decrease in the number of tax offenses is observed under effective tax control. This effect is revealed in the analysis of the work of the FTSD of Russia in the KhMAO-Yugra with respect to voluntarily revised tax liabilities as part of the control and analytical work.

The conducted analysis also reveals a significant decrease in the number of DTA of the VAT that end up revealing violations in the work of territorial tax authorities of the KhMAO-Yugra. This finding is attributed both to an overall lower number of DTA inspecting the VAT and to higher integrity of taxpayers in the calculation and payment of the VAT and preventing the occurrence of violations.

Therefore, the implementation of modern tax administration methods that utilize digital products in the work of tax authorities reduces the burden on taxpayers, allowing them to virtually abandon traditional forms of audits. Today, a tax audit is an extreme measure when other means of dialogue with the taxpayer yield no result. At present, the main emphasis in the work of tax authorities is placed on taxpayers' voluntary revision of their tax liabilities.

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