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Редакционная политика

Цели:

- создание информационной площадки для обнародования результатов исследований социально-экономических и иных последствий налоговых реформ и анализ ожидаемых эффектов от преобразований налоговых систем;
- приращение научно-теоретических знаний в области публичных финансов и налогообложения как науки, направленной на поиск новых конструктивных решений в сфере налогообложения;
- разработка комплекса мер практического, организационно-экономического, информационного характера, для повышения эффективности и справедливости налогообложения и налоговых преобразований;
- международное сотрудничество представителей научного сообщества, общественности, бизнеса и государственных органов по совершенствованию налоговых систем.

Стратегические задачи:

- всесторонний анализ международного и отечественного опыта реформирования налоговых систем;
- разработка мер профилактики уклонения от уплаты налогов;
- поддержка междисциплинарного подхода к изучению налогообложения и налоговых реформ;
- взаимодействие ученых различных наук (экономики, математики, социологии и психологии) и практиков с целью совершенствования национальных налоговых систем.

Editorial policy

Objectives:

- creation of an information platform to make public the results of studying socio-economic and other consequences of tax reforms and analysis of the effects of transformations of tax systems;
- growth of scientific and theoretical knowledge in the fields of public finance and taxation as a science aimed at searching new constructive solutions in the taxation sphere;
- development of practical, economic and organizational measures for increasing the efficiency and justness of taxation and tax reforms;
- international cooperation of representatives of the scientific community, the public, the business sector and government agencies in the improving the tax system.

Strategic tasks:

- comprehensive analysis of the national and the international experience in reforming tax systems;
- development of measures to prevent tax evasion;
- support of the inter-disciplinary approach to studying taxation and tax reforms;
- cooperation of scholars of various sciences (economics, mathematics, sociology and psychology) with the aim of improving taxation and tax systems.

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СОДЕРЖАНИЕ

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DOI 10.15826/jtr.2019.5.2.062 *Original Paper*

Challenges and Prospects of Taxation in the Digital Economy: Symposium "Theory and Practice of Tax Reforms" as a Case of Focused Discussion in the Post-Soviet Space

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ABSTRACT
Economic debates in Europe and America for many decades by now have been dealing with such problems as optimization of tax systems, eco-balance in taxes and ways to maximize the efficiency of tax reforms. Post-Soviet economists of the 1990s did not have an opportunity to participate in such discussions which would have proven useful since there was an urgent need for adequate theoretical justification of the tax reforms in CIS countries and other former Soviet republics. To fill this gap in research, two economists Igor Mayburov from Russia and Yuriy Ivanov from Ukraine organized the first in the post-Soviet space symposium on taxation in 2009. Since then, the symposium has been regularly held in different cities and attracted leading tax specialists from various countries. Each symposium focuses on a specific theme, selected from the most relevant tax problems faced by post-Soviet countries. The theme of the next symposium is announced 1.5 years in advance. Meanwhile, the participants conduct their studies and prepare monographs. The 11th International Symposium "Theory and Practice of Tax Reforms" was held on 30 June – 6 July 2019 in Tomsk and was hosted by the Institute of Economics and Management of the National Research Tomsk State University. The symposium was devoted to theoretical and practical aspects of the transformations in taxation and tax administration caused by the digital economy. 95 specialists from 40 universities and 26 cities of six countries (Russia, Belarus, Germany, China, Slovenia and Ukraine) took part in the symposium. The symposium was also supported by 35 universities. The symposium provided a platform for discussion of the most relevant and up-to-date issues of tax reforms, enabling its participants to devise new theoretical and methodological approaches to enhancing tax policies and taxation systems, and, last but not least, to form new research collaborations. The symposium included a plenary session, five panels, a round table, administrative practicum, and presentation of journals in the field of taxation. This article aims to inform the reader about the specific characteristics of this symposium, its results and potential role in the improvement of tax systems of different countries

KEYWORDS
taxes, taxation, tax administration, digital economy, digital technologies

JEL H22, H26

УДК 336.221 *Оригинальная статья*

Перспективы трансформации налогообложения в цифровой экономике: кейс построения фокусной налоговой дискуссии на постсоветском пространстве

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АННОТАЦИЯ
Экономисты стран Евросоюза и США на протяжении многих десятилетий регулярно обсуждают такие проблемы как построение оптимальных налоговых си-

стем, экологизацию налогообложения, эффективность проводимых налоговых реформ и другие. Экономисты постсоветского пространства в 90-х годах прошлого века не имели такой возможности. При этом очень высокой была потребность в научном обосновании проводимых в этих странах налоговых реформ. Чтобы восполнить этот научный пробел два экономиста Игорь Майбуров из России и Юрий Иванов из Украины созвали первый на постсоветском пространстве налоговый симпозиум в 2009 г. С тех пор налоговый симпозиум ежегодно проводится в разных городах и собирает ведущих специалистов по налогообложению из разных стран. Каждый симпозиум имеет свой тематический фокус, посвященный наиболее актуальному для стран постсоветского пространства аспекту налогообложения. Этот научный фокус декларируется за полтора года до проведения симпозиума. Участники симпозиума проводят исследования и к каждому симпозиуму готовят тематические монографии. XI международный симпозиум «Теория и практика налоговых реформ», состоялся 30 июня – 6 июля 2019 г. в Томске на базе Института экономики и менеджмента Национального исследовательского Томского государственного университета. Тематический фокус XI симпозиума – теоретические и практические аспекты трансформации налогообложения и налогового администрирования в цифровой экономике. Актуальность проведения симпозиума с такой тематикой обусловлена ожидаемыми трансформационными изменениями в налогообложении и налоговом администрировании в связи с форсированной цифровизацией всех социально-экономических процессов. В налоговом симпозиуме приняли участие 95 специалистов, представлявших 40 университетов из 26 городов шести стран (России, Белоруссии, Германии, Китая, Словении и Украины), 35 университетов. Целью симпозиума является обсуждение актуальных проблем реформирования налоговых систем, выработка новых теоретико-методологических подходов к совершенствованию налоговой политики и налогообложения, формирование творческих коллективов для проведения совместных исследований налоговой направленности. В рамках симпозиума было проведено пленарное заседание, пять тематических секций, круглый стол, административный практикум, презентация журналов, поддерживающих налоговую тематику. Целью настоящей статьи является знакомство широкого круга читателей со спецификой проводимого налогового симпозиума, его результатами и их потенциальной ролью для совершенствования налоговых систем различных стран

КЛЮЧЕВЫЕ СЛОВА
налоги; налогообложение; налоговое администрирование, цифровая экономика, цифровые технологии

1. Symposium background and rationale

As tax reforms in post-Soviet countries have shown, borrowing international experience and transplanting it in another country is not as easy as it may seem (by transplantation we mean the process of borrowing institutions which previously developed in a different institutional environment [1, p. 24]). The main problems post-Soviet governments had to deal with stemmed from the significant discrepancy in the levels of socio-economic and institutional development of Western and post-Soviet countries and, most importantly, from the lack of tax traditions and tax culture in the post-Soviet space.

Due to the lack of these basic prerequisites, in the early 1990s, many post-Soviet countries were tempted to start with those few non-rational forms of taxation they already had. This was the case, for example, with turnover taxes (or deductions from profits) levied from enterprises until the early 2000s.

Thus, the attempts of post-Soviet countries to copy Western experience led to some serious fiscal losses. In certain cases, those tax alternatives which were viable in principle were discredited. For example, the VAT, considered to be a perfect indirect tax form in Europe, was for twenty years regarded as "the most corrupt tax" in some post-Soviet countries and suggestions were made to replace this tax by the sales tax.

As we stated above, one more significant factor that influenced the evolving

tax systems of post-Soviet countries was the low culture of borrowing, resulting in simple copying of developed countries' positive experience. Soviet science lacked in-depth studies of taxation as in 1930–1990 the role of taxes in socialist economy was generally misunderstood and administrative methods were used to redistribute financial resources, for example, regular deductions from profits. Meanwhile, Western science went far ahead. Moreover, in the early post-Soviet period, many scholars also remained largely unaware of the most recent advances in international financial studies, which impeded efficient borrowing of the up-to-date taxation experience [2].

In the early 1990s, the first studies on taxation were published and the first university departments specializing in taxation started to appear. The studies, however, lacked systematicity and consistency and there was a generally felt need for some kind of an integral communicative platform to discuss these matters. The symposium "Theory and Practice of Tax Reforms" was created in the 2000s and its primary purpose was to address this gap in research and communication. It soon turned into a major communication platform for taxation specialists in the post-Soviet space.

This article aims to inform the reader about the specific characteristics of this symposium, its results and potential role in the improvement of tax systems of different countries.

2. Symposium history

The first to come up with the idea of organizing a symposium on taxation for Russian and Ukrainian scholars were two economists Igor Mayburov (Russia) and Yuriy Ivanov (Ukraine). This idea was first proposed and discussed in May 2008 in Kharkiv. They also created conceptual frameworks for the following symposia and headed the programme committee. The organization of these symposia was overseen by host universities in different cities and countries. At each symposium, the collegial decision was taken as to the time and venue of the next event.

At the first Ukrainian-Russian tax symposium, the participants repeatedly voiced their concerns about the quality of contemporary taxation studies, pointing out that they tend to present a somewhat simplified analysis of the problem and jump to conclusions without providing sufficient empirical justifications. Another matter of concern was a perceivable lack of monographic studies and specialized journals on taxation. The published studies did not go beyond stating the problem and criticizing the current tax policies. Therefore, what was generally lacking was an in-depth theoretical and methodological analysis applying mathematical modelling methods to explore the alternative scenarios. These gaps were largely addressed through collaborative research publishing projects implemented prior to each symposium.

As we have said above, the symposium aims at providing a platform for discussion of the most relevant and up-to-date issues, at helping researchers devise new theoretical and methodological approaches and, last but not least, at stimulating new collaborations in the field.

The chronology of the symposia was as follows: the first event was held in 2009 and was hosted by Simon Kuznets Kharkiv National University of Economics (Kharkiv). In 2010, the symposium was organized at the Ural Federal University (Ekaterinburg); in 2011 – Ternopil National Economic University (Ternopil); in 2012 – Financial University under the Government of the Russian Federation (Moscow); in 2013 – Scientific Research Institute for Fiscal Law of the National University of State Tax Service of Ukraine (Irpen); and in 2014 – St. Petesrburg State University (St. Petersburg).

In 2015, the symposium changed its status and moved to a new, international level. Since then, the symposia have also become theme-based, that is, for each event a specific problem of taxation is now chosen.

In 2015, the 7th International Tax Symposium was hosted by Baikal State University of Economics and Law (Irkutsk) and focused on the problems of fiscal fed-

eralism and their possible solutions. Prior to the symposium, a monograph on fiscal federalism was published [3]. This was also the first time that a Chinese delegation took part in the event and since then its members have become regular participants of the symposium.

Although initially the language of the symposium was Russian and the papers were published in Russian, in 2015, the Programme Committee decided to stimulate the participants to present and publish their papers in English in order to reach wider English-speaking audiences. Therefore, in 2015 a new specialized journal was established – Journal of Tax Reform – to publish research manuscripts in English with subsequent indexing of the papers in international citation databases. The journal seeks to publish new research findings in the field of taxation and it also aims to popularize the work of symposium participants.

In 2016, the 8th International Tax Symposium was organized in partnership with Volga State University of Technology (Yoshkar-Ola). This symposium was centred around the idea of creating an inventory of terminology in the sphere of taxation with the view to reach some common understanding of the key concepts. It resulted in the publication of a tax encyclopedia, which was the first of its kind in the post-Soviet space [4].

In 2017, the 9th International Tax Symposium was hosted by the Baltic Federal University (Kaliningrad). Thematically, this symposium focused on taxation regimes of special economic zones and resulted in the publication of two monographs [5; 6].

In 2018, the venue for the 10th International Tax Symposium was the Far Eastern Federal University (Vladivostok). This time the symposium dealt with the problems of taxation of natural resources and environmental taxation and two monographs were published [7; 8].

3. 11th International Tax Symposium

In 2019, the 11th International Tax Symposium was hosted by the National Research Tomsk State University (Tomsk). The 11th Symposium was jointly organized by the National Research Tomsk State University, Ural Federal University, St. Petersburg State University, Financial University, Research Center for Industrial Problems of Development of the National Academy of Sciences of Ukraine, and the Institute of Economic Strategies of the Chinese Academy of Social Sciences.

This time, the proposed topic was the transformations of taxation and tax administration in the digital economy, which is currently one of the most widely discussed research problems. Digital technologies have a growing impact on economic and socio-economic processes, in fact, digitalization is transforming the very nature of these processes. AI systems start to take care of more and more routine procedures, which changes the labour market and the market of technologies, spurring the development of e-commerce and on-line trade. These are by no means the only consequences of the digitalization of economy. Most importantly, the digital economy changes people's minds and behaviour.

Taxation theory and practice cannot remain unaffected by these processes. Tax scholars not only seek to study the new aspects in the operation of tax systems and the process of taxation but also to create a theoretical and methodological foundation of modern tax administration, fiscal accounting and control that would be adequate to the new tax practices. The influence of the digital economy on the development of tax theory remains a largely underexplored topic in contemporary research literature, which led the symposium organizers to propose it for theoretical and methodological discussion.

The symposium resulted in two monographs [9; 10]. The papers submitted for the symposium were reviewed by the members of the Programme Committee and 42 papers were selected for presentation and discussion. A brief overview of the key papers is provided below[1].

[1] The papers presented at the symposium are available here: https://cloud.mail.ru/public/2jJf/4nuUqJBjX

4. Overview of papers

Gennadiy Morozov[2] presented his paper "Technological Development of Tax Administration in Tomsk Region". He contended that the mission of the Russian Federal Tax Service is not only to ensure efficient control and supervision but also to provide high-quality services to enable legal, transparent and comfortable business operations. The speaker described the four main stages in the development of the federal tax information system. The first stage (1991–2000) was characterized by the diversity of software applications and the lack of centralized information. At the second stage (2000–2005), standard software packages were introduced and the tax service started to use the first federal data resources. At the third stage (2005–2010), the Federal Tax Service obtained its official web-portal, which offered interactive services to taxpayers. At the same time a number of document management and workflow solutions started to be implemented. The fourth stage (2010 – to present) coincides with the ongoing process of consistent centralization of tax administration functions. For the Federal Tax Service, the world of the big data means processing 76 million declarations, 37.5 million tax claims, 15 billion VAT invoices, 250 million transfer pricing operations, 4 milllion transaction records, and 82 million income tax notices with the help of cutting-edge digital technologies: the automated information system "Nalog-3" and the automated system complex "VAT-2".

Konstantin Novoselov[3] presented his paper on the problems and prospects of using cloud technologies in tax administration. He argued that advanced information technologies change the very concept of the controlling function performed by the tax service as they allow tax authorities to consistently reduce the administrative burden on taxpayers. The current focus of tax control is to promote tax compliance. The challenges that need to be addressed in the course of the tax reform are as follows:

(1) building partnership relations with taxpayers;

(2) enhancing their motivation to comply with the tax legislation;

(3) ensuring transition from the controlling function to that of tax evasion prevention;

(4) adopting new analytical methods and tools (AI systems, computer-assisted instruction, neural networks) to work with big data.

The architecture of the information space is now based on the integration of software products and information systems to enable the tax authorities to control and monitor business activities of taxpayers. Tax administration in Russia and other countries should be turned into an on-line "adaptive platform" operating exclusively with digital information sources and digital identities of taxpayers. In the future, tax compliance might well be expected to become a completely automated process.

Prof. **Valentin Vishnevskiy**[4] presented his paper "Economic and Regulatory Implications of the Digital Revolution in Taxation". In his view, the modern stage of socio-economic development is primarily associated with the appearance of a cyber-physical system, which, in its turn, transforms many aspects of social life.

This includes, *first and foremost,* changes of economic entities. Moreover, apart from ordinary legal entities, the tax system will have to deal with "electronic persons": since robots will be involved in decision-making in production, it will be logical to consider them as financially liable and taxable persons.

[2] **Gennadiy Morozov**, 2nd class state councilor of the Russian Federation, Head of the Federal Tax Service in Tomsk region.

[3] **Konstantin Novoselov**, Cand.Sc. (Economics), 2nd class state councilor of the Russian Federation, Deputy Director of the Control Inspectorate of the Federal Tax Service of Russia, and an associate professor of the Department of Tax Policy and Customs Tariff Regulation of the Financial University.

[4] **Valentin Vishnevskiy**, Dr.Sc. (Economics), Head of the Department of Financial and Economic Problems of Use of Production Capacity (Institute of Industrial Economics, National Academy of Sciences of Ukraine).

Second, in the digital age, the new cyber-physical production of hybrid products or product-service hybrids will become more and more widely spread. Such production is self-organized and managed by AI systems, which means that human participation and involvement in production processes will be reduced. In about a fifth of all professions, machines will replace humans (about 400 mln people by 2030).

Third, the emerging reputation-based society and reputation state will mean new power institutions and mechanisms of enforcement. According to the laws of dialectics (the law of spiral development), socio-cultural (civilizational) factors do not disappear in the globalized world but, on the contrary, become even more significant.

Finally, there will appear new taxation institutions linked to manufacturing automation and transformation of the system of economic relations due to the development of the reputation state. Until recently, the solvency (and social status) of physical and legal persons was associated primarily with their financial condition, but now there is one more indicator of solvency – credit scores in reputation systems (a low social credit score renders the person's financial status less significant, at least partially, since it becomes harder to exchange money for commodities and in some cases a person may be even cut off from things they used to be entitled to) [11]. All of the above-mentioned factors lead to objective transformations in the taxation system [12].

Prof. **Bin Zhang**[5] spoke about modernization of tax administration in China, describing in detail the evolution of the Chinese tax administration system since 1950. At the current stage of the reforms, the key goals are to cut the costs of tax administration and to maximize its efficiency, to reduce the amount of unpaid taxes, enhance compliance and satisfaction levels among taxpayers to ensure stable tax revenues [13; 14]. A key role in this respect will be played by the big data combined with advanced analytics and the digital technologies, which will transform the entire taxpayer experience. According to the speaker, by 2020, China is planning to create a modern system of tax administration, merging national and local tax bureaus into one tax service and re-engineering all the key processes of tax collection.

In his paper, Prof. **Yuriy Ivanov**[6] described the Ukrainian experience of using fiscal incentives to stimulate the development of information technologies. He demonstrated the dynamics of the key indicators in this sector and presented the general and simplified tax schemes used by IT companies. He also analyzed the alternatives of taxation of physical persons employed in this sector: normally they pay the personal income tax, which is 18% of the net income, the military levy (1.5%) and the minimal unified social contribution at the basic rate of 22% (calculated on the basis of the minimum wage). According to Prof. Ivanov, the non-rational (when seen from the perspective of public interests) structure of entities within the IT-sector resulted from the unjustifiably liberal tax regime set for individual entrepreneurs who use a simplified tax scheme [15]. Prof. Ivanov presented a critical analysis of different scenarios of tax reforms in the IT sector both for the simplified and general tax schemes. In his presentation, he also shed light on those areas of the tax reforms that are considered top priority by the Office of the President of Ukraine: introduction of a uniform treasury account for the payment of taxes; the so-called zero declaration, tax amnesty and capital amnesty; replacement of the income tax by the distributed profit tax; further liberalization of the unified social contribution, especially for entrepreneurs; and allocation of alternative sources for funding pensions and social benefits.

[5] **Bin Zhang**, Ph.D., Director of the Department of Taxation of the National Academy of Economic Strategy.

[6] **Yuriy Ivanov**, Dr.Sc.(Economics), Deputy Director for Reseach of the Research Centre for Industrial Problems of Development (National Academy of Sciences of Ukraine).

In her presentation, Prof. **Lyubov Goncharenko**[7] focused on the on-line services offered by the Federal Tax Service of Russia. By 2014, all the 193 UN member states had their own national web-sites: 101 of these web-sites enabled their users to create their personal accounts; 73, to submit their income tax declarations online; and 60, to register companies. As for the most widely spread basic administrative systems, 190 states have already introduced automated financial management systems; 179 states are using such systems for customs clearance procedures and 159, for tax administration. The web-site of the Russian Federal Tax Service offers over 57 diverse online services for all categories of users. On-line services for business enjoy most popularity but in the recent years online tax services have been also gaining popularity among physical persons. Compared with other Russian governmental web-sites, the site of the Federal Tax Service is one of the most popular, informative and frequently visited. It was reported that from January to October 2018 there were about 101.9 million visits to this web-site. The service-based model of tax administration means that a larger share of interactions between taxpayers and tax authorities should happen online rather than offline. Apart from enhanced comfort and efficiency, taxpayers' online accounts minimize the number of their personal contacts with tax officials, which reduces corruption in local tax administration [16].

Tax consultant **Ralf Busse**[8] spoke of the European experience of creating an integral system for administration of the VAT on cross-border e-services. He pointed out that in order to charge VAT it is necessary first to determine the location where the electronic (digital) services were supplied. If a client buys electronic services according to the B2B scheme as a VAT payer, the place of service implementation is the place of the customer's activity (business). Otherwise, when the customer is not a VAT payer (B2C), the place of electronic (digital) service implementation is determined as the place of the customer's residence. In the EU and many other jurisdictions, administration of the VAT on cross-border B2B electronic (digital) services in a given country follows the reverse change principle. A buyer considered as a VAT payer in their country is liable to declare and pay VAT. Ralf Busse also emphasized that the EU legislation offers taxpayers a convenient opportunity of accounting for VAT which is due in many EU countries in just one EU country – this simplified scheme is called VAT Mini One Stop Shop (MOSS). According to this principle, a VAT payer who has voluntarily registered for this scheme in one EU member state (usually it is the taxpayer's home country) will be able to submit quarterly VAT declarations providing the data on e-services supplied to non-VAT payers in other EU member states. After that, it is the responsibility of the receiving tax authority to divide the VAT received and transfer it to the relevant member countries of the consumers.

Irina Zhalonkina[9] presented her paper "Anti-Counterfeit Technologies: Digital Identification and Labelling". The Russian government has approved the Concept of a Unified National System of Digital Labelling and Tracing of Goods in the Russian Federation, which requires consistent enforcement of new labelling regulations in different business spheres in order to enhance governmental control over flows of goods and financial flows. For example, by 2018, mandatory labelling had been already introduced for alcohol by applying the Unified State Automated Information System (EGAIS). Since 2019, the mandatory labelling requirement has been extended to tobacco products (since 1 March 2019), perfumes (since 1 December 2019), rubber tyres and tyre casings (since 1 December 2019), outdoor clothing, table linen, toilet linen and kitchen linen (since 1 December 2019), footwear (since 1 July 2019), cameras and flashlights

[7] **Lyubov Goncharenko**, Dr.Sc. (Economics), Director of the Department of Tax Policy and Customs Tariff Regulation of the Financial University.

[8] **Ralf Busse**, Ph.D. (Germany).

[9] **Irina Zhalonkina**, Cand.Sc. (Economics), Deputy Director of the Department of the Federal Tax Service in Tomsk Region.

(since 1 December 2019), pharmaceuticals, dairy products and so on. Starting from 1 January 2020, labelling will be mandatory for pharmaceutical products. Since 2024, Russian business will have to provide labels for all kinds of consumer products. It is estimated that the combined effect from the introduction of labelling for 10 groups of products and more will be over 1 trillion roubles.

Prof. **Jun Ma**[10] presented her paper "Impact of the USSR on the Chinese Economic Thought", which discussed the influence of Marxism on the discipline "Public Finance". According to the speaker, in the last seventy years, there were two "periods of borrowing" in the history of China's financial science. The first period, 1949-1956, was associated with Soviet influence while the second, starting from 1978, with American influence. The speaker outlined the following stages in the development of the socio-economic system and fundamental financial theory in China:

(1) 1949–1978, planned economy and state distribution;

(2) 1970–1990, planned commodity economy, transition period, which involved discussion of the role of the financial system;

(3) 1990–2013, development of the financial theory underpinning the socialist market economy;

(4) since 2013, development of the financial theory from the Chinese perspective.

The speaker argued that even though in the twenty-first century, Western approaches prevail in financial sciences, China has managed to preserve many of the elements characteristic of the Soviet approach. Such situation can be explained by the influence of the ideological factor but also by the educational background of many Chinese officials, who went to study in the USSR. Moreover, in its development, Chinese financial science to a great extent followed the Soviet model.

[10] **Jun Ma**, Ph.D., Deputy Director of the Department of Taxation, National Academy of Economic Strategy.

Prof. **Dehua Wang**[11] in his presentation considered the impact of the 2009 VAT Reform on business investment and employment[12]. On 1 January 2009, China launched a comprehensive VAT reform, which stimulated enterprises to invest into fixed assets such as facilities and equipment. In her talk, Prof. Dehua Wang addressed the following questions: what was the impact of the tax reform on the behaviour of enterprises? Did it stimulate enterprises to invest into fixed assets, especially in the period of global recession? Did the reform affect employment on the level of enterprises? The speaker made a conclusion that the reform led to an increase in the investment in fixed assets but its impact on employment was insignificant. Overall, the reform contributed to structural transformations in China.

5. Round table "Beer Excise Duty Policies: Problems and Potential for Improvement"

On the first day of the symposium, all participants were invited to join a round table discussion. The day before, they had visited the factory "Tomskoye Pivo", where they studied the product range, beer production technologies and problems faced by the Russian brewing industry. The round table discussion was moderated by **Alexander Pogorletskiy**[13] who spoke of the rising excise duties on beer and the trends in beer production and consumption [17]. Regarding the retrospective dynamics of alcoholic drinks consumption, the moderator argued that despite some positive changes in the overall level of consumption in terms of pure alcohol intake, in Russia the trends of alcohol consumption are extremely alarming. The main problem is that in Russia the share of spirits in the general consumption structure is still high (61%). The

[11] **Dehua Wang**, Ph.D., Department of Government Audit, National Academy of Economic Strategy.

[12] This article can be found in the current issue of Journal of Tax Reform.

[13] **Alexander Pogorletskiy**, Dr.Sc. (Economics), Prof., Department of World Economy, St. Petersburg State University.

consumption of beer, however, is falling: from 71 litres per capita in 2013 it dropped to 55 litres in 2017 [18].

The discussion then mostly centred around the question about the economic feasibility of a long-term excise policy in relation to different types of alcoholic beverages. The most debated question was how the negative consumption structure can be changed with the help of fiscal instruments. Most of the participants agreed that it is crucial is to shift customer preferences from spirits to low-alcohol beverages, such as wine and beer. Beer has the most potential for replacing spirits in the consumption structure [20], which was demonstrated by the experience of North European countries (Sweden, Finland, and so on), whose consumption models in the mid-twentieth century were similar to the Russian model (spirits prevailed over other kinds of alcoholic beverages). Participants of the round table also emphasized the problems caused by different excise rates applied in the EAEU member states since such differentiation causes disparities in competition and consumption in transborder regions. Furthermore, suggestions were made that the beer excise duty burden should be lowered to the level of European beer-producing countries, in particular Germany, where the excise duty on beer is more than three times lower than in Russia. Symposium participants also agreed that it is reasonable to adjust the excise rates depending on the strength of the beverage and contended that the EAEU member states should benefit from the European experience of differentiated excise policies. Beer excises in 15 European countries depend on the alcoholic strength of beer (volume fraction of ethyl alcohol); in 12 countries, the excise rate on beer is calculated per hectolitre per degree Plato: the higher is the gravity of the alcoholic beverage, the higher is the percentage of the ethyl alcohol it contains. This measure will make the beer excise policy more effective and change the structure of beer consumption, fostering preference for less harmful low-alcoholic drinks.

6. Conclusion

International symposium "Theory and Practice of Tax Reform" provides an important communicative platform for economists from different post-Soviet countries specializing in the field of taxation. The popularity and continuity of this tradition shows the important role the symposium plays in the life of the academic community. The symposium enables scholars to keep up to date with the current taxation issues, form research teams and collaborations, get access to significant publication projects and present their findings to English-speaking audiences.

The international tax symposium makes a substantial contribution to the improvement of tax systems in post-Soviet countries. Research findings presented by symposium participants are of great theoretical and practical value as they allow governments to adjust the key areas of tax policies in the mid-term.

The specific themes chosen for the symposia enabled the participants to adopt a more detailed and in-depth approach to the problems. This also allowed the symposium organizers to invite highly specialized professionals to participate in the discussion.

The 11th Tax Symposium formulated the following recommendations:

1. Countries need to foster new tax institutions to address the current developments in the sphere of robotization of manufacturing processes and in the system of economic relations caused by the emergence of the reputation state.

2. Digital identification of goods is becoming more and more widely spread, which is a positive factor both from the economic perspective and from the perspective of controlling agencies. Tax exemptions and their feasibility should be analyzed in the context of specific tax systems by taking into account the factors that determine taxation in each particular country.

3. Information technologies have become crucial for the efficiency of tax administration and the quality of tax services. Digitalization of tax administration has a cumulative effect on tax collection

and on the overall efficiency of tax administration.

4. The service-based tax administration model means that a larger share of interactions between taxpayers and tax authorities should happen online rather than offline. Apart from the comfort and efficiency of online interactions, such services minimize the need for personal contacts between taxpayers and tax officials, which reduces corruption risks in the process of local tax administration.

5. Major technological upgrades of tax administration methods can be expected. These will lead to the creation of a system of voluntary compliance based on complete integration of tax services into the business environment of taxpayers, automated tax payments and filings, increased economic transparency and enhanced mutual trust between state agencies and the public.

6. Even though the tax system is now transitioning to model 4.0, the key functions maintained by the tax policy will still remain the same. Some changes in the significance of these functions have to be expected, however. For example, it is likely that the controlling and ecological functions will be reinforced while the social function (redistribution) will become less important. The fiscal, regulatory and stimulating functions will retain their importance.

7. Global digitalization of economy will lead to deep transformations in the principles underpinning interactions between the state and taxpayers, including changes in certain functions of state agencies, as citizens will be delegating powers to the state in exchange for taxes paid. Approaches to the access, storage, exchange and protection of information will be thoroughly revised as a part of a major transformation in the structure of the tax system caused by the introduction of new taxes such as a tax on certain kinds of digital operations withheld at source, an excise tax on digital services and a digital enterprise income tax.

At the 11th Symposium, it was decided that the next event will be devoted to the problems, prospects and possible improvements of consumption taxation. It was also decided that there will be two monographs published for the next symposium in Tumen: "Theoretical and Methodological Foundations of Indirect Taxation" and "Architectonics of Contemporary Consumption Taxation"[14].

Thus, the tradition of conducting tax symposia will be continued. The 12th Symposium "Theory and Practice of Tax Reforms" will take place in Tumen and Tobolsk in early July of 2020. The symposium will be hosted by Tumen State University (Programme Committee's email: 5symposium@mail.ru).

[14] The project road map is available here: http://taxsymposium.ru/index.php?option=com_content&view=article&id=414&Itemid=1194&lang=ru

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Tax Reforms in Ukraine and Georgia: Changing Priorities

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ABSTRACT

The Georgian and Ukrainian tax systems both emerged after the collapse of the USSR, yet the tax reforms in the two countries pursued different trajectories and produced different outcomes. The article systematizes and compares the results of the tax reforms in Ukraine and Georgia. The study applies qualitative methods for historical analysis, for periodization of the reforms and for classifying their key priorities and the factors that influenced them. Quantitative methods are applied to compare the tax burden in Ukraine, Georgia and OECD countries. The success and failure of the tax reforms was measured by the index of economic freedom (including its component – the index of tax burden). The first hypothesis suggested that a reduction in the tax burden had a positive impact on the indicators of economic freedom; the second hypothesis stated that a reduction in the tax burden affected fiscal freedom but did not affect the index of economic freedom. Regression dependences of the average tax burden (including the tax burden resulting from social security contributions) and the index of economic freedom (including the index of tax burden) were built in the R environment. The regression analysis confirmed the first hypothesis for Ukraine and the second, for Georgia. This result can be explained by the fact that, unlike Ukraine, the Georgian tax reforms focused on institutional changes, which determined their success. In 1996–2018, Georgia rose in the ranking of economic freedom and joined the group of economically free countries. Moreover, this country has been steadily improving its position in the ranking. Ukraine, on the contrary, has remained in the group of economically unfree countries. Due to the unbalanced reforms and insufficient structural changes, the country's government failed to ensure the desired effect from the tax burden reduction

KEYWORDS

tax, tax reform, tax-to-GDP ratio, tax burden, index of economic freedom

JEL H20, H21, E62

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Налоговые реформы в Украине и Грузии: эволюция приоритетов

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АННОТАЦИЯ

Становление и развитие налоговых систем Грузии и Украины имели одну отправную точку – распад СССР, но пути реформирования были разными, что повлияло на результаты реформ. Целью статьи является систематизация

и сравнительный анализ результатов налоговых реформ двух стран. Качественные методы исследования применены для исторического анализа и периодизации налоговых реформ в Украине и Грузии. Выявлены факторы и приоритеты налоговых реформ в исследуемых странах. Изменения налоговых систем структурированы в соответствии с выделенными этапами. Количественные методы использованы для аналитического сравнения налоговой нагрузки в Украине, Грузии и странах ОЭСР. В качестве индикатора результатов налоговых реформ выбран индекс экономической свободы, и его составляющая – индекс налоговой нагрузки. Сформулированы две гипотезы: (1) снижение налоговой нагрузки положительно отразилось на показателях экономической свободы; (2) снижение налоговой нагрузки повлияло на фискальную свободу, но не повлияло на индекс экономической свободы. С помощью программной среды R построены регрессионные зависимости средней налоговой нагрузки (включая налоговую нагрузку по взносам на социальное страхование) и индекса экономической свободы (включая индекс налоговой нагрузки). Результаты регрессионного анализа показали, что для Украины подтвердилась первая гипотеза, для Грузии – вторая. Полученный результат объясняется тем, что проводя налоговые реформы, Грузия, в отличие от Украины, сделала акцент на институциональных изменениях в сфере налогообложения. Как результат, грузинские налоговые реформы оказались более успешными, и страна за период с 1996 по 2018 г. в рейтинге экономической свободы смогла подняться в группу экономически свободных стран и ежегодно повышать рейтинг в этой группе. Украина так и осталась в группе экономически несвободных стран, поскольку несбалансированность налоговых реформ, недостаточные институциональные и структурные изменения не дали ожидаемого эффекта от снижения налоговой нагрузки

КЛЮЧЕВЫЕ СЛОВА
налог, налоговые реформы, налоговый коэффициент, налоговая нагрузка, индекс экономической свободы

1. Introduction

The development of Ukrainian and Georgian statehood share one key characteristic: after gaining independence, both countries launched a series of tax reforms. An important part of these reforms was reduction of the tax burden, which was initially seen as a way to enhance economic growth and at later stages, to curb the shadow economy. The reforms involved changes in the number and composition of taxes, in the tax base and tax rates, tax administration and so on.

In Ukraine, scarcely a year went by without some kind of improvements in the sphere of tax legislation or other related fields. Eventually, such lack of stability triggered a public discussion about the need to freeze the tax reform since it was hard for companies to keep up with the changes. It should be noted, however, that although such measure was considered to be necessary and even urgent, it never came to be realized. In the light of the above, the question arises as to how adequate was the choice of the goals and priorities of the Ukrainian reforms, whether they were really needed; whose interests they served; how efficient they were and what determined the change of priorities in the process of reformation. The tax reforms in Georgia can be considered to be more productive in comparison with Ukraine as they followed a more clearly defined set of priorities.

In order to evaluate the outcomes of tax reforms and make conclusions about their success or failure, we should first look at the general state of the country's economy. The tax climate shapes a number of indicators, including the dynamics of business development, investment activity and rates of economic growth. It is practically impossible to analyze the impact of tax reforms on all the above-described indicators within one study. At the same time, the analysis of only one factor is not enough to gain a comprehensive and accurate picture. Therefore, for the purpose of our research we chose to use an aggregate indicator – the index of economic burden.

This article aims to systematize and analyze the results of the tax reforms in Ukraine and Georgia and evaluate their

impact on the countries' positions in the ranking of economic freedom.

The article is structured the following way: the introduction is followed by the review of the research literature on tax reform practices in OECD countries, Ukraine and Georgia. In the third section, we describe our research methodology and hypotheses. The fourth section focuses on the experience of tax reformation in Ukraine and the fifth, in Georgia. The last section contains conclusions and outlines prospects for further research.

2. Literature review

Tax reforms can be considered from a variety of different approaches and angles. The choice of approaches largely depends on the differences in the development of national economies and, therefore, in the specific problems in the fiscal sphere that certain countries have to address.

Western economists mostly seek to identify the weaknesses in the current taxation systems and search for ways of solving the existing problems. It should be noted that the majority of tax reforms in developed countries are aimed at minimizing the negative impact of taxation on the key macro-indicators [see W. Gale and A. Samwick [1]). This study shows that reduced income tax burden can increase the productive capacity of businesses, which means that less government subsidies will be required. The connection between taxation and economic growth is discussed by W. McBride [2]. J. Antos and his colleagues highlight the connection between policy choices regarding state revenues and expenditures and the impact of changes in taxation on economic growth, taking into consideration the time lag [3]. S. Barrios et al. [4] research the impact of taxation on decision-making in international firms concerning the location of their foreign subsidiaries. It should be noted that the problems of profit shifting to low-tax jurisdictions and the resulting tax base erosion are widely discussed by international researchers, who describe the possible reforms of tax systems to tackle these problems more effectively [5]. Another related question concerns the influence of taxation on inequality and the tax reforms needed to reduce inequality and the associated risks. For example, D.R. Agrawal and D. Foremny analyze how tax rates influence the choices of location made by high-income taxpayers [6]. A similar question is raised in the study of K. Schmidheiny and M. Slotwinski [7]. The impact of tax reforms on the international mobility of inventors is considered in the study of U. Akcigit et al. [8]. F. Guvenen and his colleagues research the phenomenon of the tax base erosion caused by offshore profit shifting [9].

Another question that attracts a lot of scholarly attention is the impact of tax reforms on economic growth [10; 11] and the macro-economic equilibrium [12]. I. Ananiashvili and V. Papava [13–15] have demonstrated how taxes influence economic activity and growth by applying the Laffer-Keynesian synthesis. These studies explore the theoretical aspects of the relationship between taxes and economic growth; they also use specific models to provide a comprehensive picture of how taxes affect economic growth through the aggregate supply and aggregate demand. Ananiashvili and Papava also investigate the analytical potential of the production function and of the behavioural approaches to estimating the impact of tax burden on the amount of total output and budget revenues. Such methodology makes it possible to determine the so-called fiscal points corresponding to the maximum production effect and the budget's maximum tax revenues.

The goals pursued by reformers in developed countries are often similar, although there may be different reasons for launching these reforms such as the wish to maintain the macro-economic equilibrium when dealing with political pressures or the search for optimal taxation mechanisms to satisfy the fiscal needs of the state and the public. We should keep in mind that in developed economies, reforms are implemented in a transparent environment, with low corruption levels and high degrees of government accountability.

If we look at the latest publications focusing on the Ukrainian reforms, it be-

comes evident that most of them choose to focus on specific aspects of these reforms. Some studies consider the problem of taxation in the light of Ukraine's integration into the European space: for example, A. Grechko [16], N. Noginov [17] and V. Ilyashenko [18]. Another group of studies considers the anti-crisis aspect of the tax reforms, for example, V. Melnik and T. Koschuk [19], Y. Turyansky [20]. A. Borzenkov [21], T. Paientko and K. Proskura [22], and V. Oparin [23] investigate the outcomes of the reforms. Also notable are the series of fundamental studies on various aspects of taxation published by Y. Ivanov and I. Mayburov [24–26].

As for the reforms in Georgia, Bakhtadzae et al [27], Kemularia [28], Kopaleishvili et al [29] and Meskhia [30] analyze the history of these reforms, their key aspects and the gradual improvements of taxation mechanisms. Chikviladze [31], Terashvili [32], Uridia [33] and Verulidze [34] explore the possibilities for the improvement of the tax administration technology. Bedianashvili [35], Gaganidze [36] and Silagadze [37] investigate the goals of the tax reforms, the institutional transformations of the tax system and the ways of ensuring the compliance of the taxation system with the European standards. Stimulation of economic and entrepreneurial activity are the questions addressed by Bedianashvili [38], Papava [39], Shevardnadze et al [40], Silagadze et al [41; 42], Zubiashvili, et al [43; 44].

Although there is vast research literature on various aspects of tax reforms, little attention has been given to the dominant factors that determined the course of the tax reforms in Ukraine and Georgia. The tax reforms in Ukraine, for example, are impeded by the high level of corruption, low information transparency and the lack of government accountability. These factors create resistance among the taxpayers and curb the reforms' impact on the country's economic performance. The tax reforms in Georgia go hand in hand with the gradual decrease in corruption, higher levels of information transparency and the government's accountability. Thus, in comparison with Ukraine, the Georgian reforms produce more tangible results regarding the relationship between taxpayers and fiscal institutions. They also have a visible positive impact on the key areas of the country's economy.

3. Methodology

The theoretical part of our study employs the historical and systems methods. We apply the historical method to propose a periodization of the tax reforms in Ukraine and Georgia. The systems method was used to describe the structure of the changes in the respective tax systems at specific stages; together with the inference method, it also helped identify the factors and priorities of the tax reforms.

In the empirical part of the study, we compare the tax burden in the given countries and their OECD counterparts and evaluate the impact of the tax reforms on Ukraine's and Georgia's progress in the ranking of economic freedom.

The calculations were made with the help of the R environment. The databases for calculations were downloaded from the OECD[1] and World Bank's[2] official web-sites.

In our study, we considered the following hypotheses:

Hypothesis 1. The reduced tax burden in Ukraine and Georgia had a positive impact on the indices of economic freedom.

Hypothesis 2. The reduced tax burden affected the fiscal freedom but did not affect the index of economic freedom.

At the first stage of our study, we conducted a statistical analysis of the tax burden in OECD countries. OECD countries were included in the sample because their tax systems are relatively harmonized. Due to the lack of data, we didn't include in the sample Australia (no data for 2017) and Japan (no data before 1995). The sample covers the period from 1995 to 2017.

At the second stage, we built regression dependences of the mean tax burden (including social security contributions)

[1] https://stats.oecd.org/viewhtml.aspx?datasetcode=REV&lang=en#

[2] https://data.worldbank.org/indicator/GC.TAX.YPKG.RV.ZS?view=chart

and the index of economic freedom (including the index of tax burden).

We used tax burden as an independent variable since the tax reforms in Ukraine and Georgia prioritized its reduction.

We chose the index of economic freedom and the index of tax burden as dependent variables. The index of economic freedom is an integral indicator characterizing the level of economic freedom for business development in a given country. To measure the level of economic freedom in a country, we need to look not only at certain characteristics of its tax system (tax burden and fiscal freedom) but also at the institutional characteristics, such as property rights protection, freedom from corruption, investment and financial freedom, and so on. Depending on their scores, countries are assessed and divided into the following groups:

– free countries, with the index values between 80 and 100;
– mostly free, 70–79.9;
– moderately free, 60–69.9;
– mostly unfree, 50–59.9;
– and repressed, 0–49.9.

The index of tax burden characterizes the degree of the tax system's impact on the ease of doing business in a specific country. Values of this index may vary between 0 and 100. The higher is the index, the more attractive this country is for business.

4. Tax reforms in Ukraine

A brief historical overview of taxation in Ukraine is necessary in order to gain a better understanding of the problems Ukrainian reformers were trying to address. Originally, the Ukrainian tax legislation had a two-level structure: there was the General Law on the Taxation System and laws for specific taxes such as the VAT, corporate income tax, personal income tax and so on. The General Law on the Taxation System (revised in 1991, 1994 and 1997) determined the structure of the tax system and defined the general principles of taxation. Since 2011, the tax legislation has been codified. In 2015, the Tax Code was substantially amended.

Such instability of the tax legislation can be explained by the influence of objective and subjective factors. One of the main objective factors was that the country lacked the necessary experience required for the formation of the attributes of its statehood, in particular the tax system. At the current stage of economic development, the structure of tax systems in different countries is more or less the same, which is particularly true for the range of taxes and mechanisms of taxation in EU countries. Therefore, in the absence of its own experience, Ukraine could benefit from the experience of developed countries. Some adjustments had to be made, however, regarding the country's peculiar needs and specificities in order to build an efficient, reliable and stable tax system. Even though tax systems of different countries share the same principles, no two systems are identical. Therefore, it would have been far-fetched to hope for easy solutions when creating a tax system in Ukraine.

The subjective factors included the low quality of the draft laws and the overhasty adoption of these laws. For example, the draft Tax Code was presented for the first reading at the Verkhovna Rada in 2000, after that it got stuck in the approval process which lasted until 2010, when the government had to rush through the third version of the law. According to V. Oparin and T. Paientko, each new government in Ukraine, including the current one, launched its own tax reforms, which invites a supposition that the government's prime concern is not about the efficiency of the tax system and the quality of the tax legislation but about lobbying its own interests [23].

The high tax burden is generally considered to have been one of the major drawbacks of the Ukrainian tax system throughout its development. Therefore, the first question we need to answer here is whether the tax burden in Ukraine is really that high or not. The level of tax burden is measured as a percentage of GDP and by comparing tax rates for the key taxes. Since the question about whether to include social contributions into the tax

burden or not still remains open, we shall compare the tax burden (as a ratio of tax revenues to GDP) in Ukraine and OECD countries (see Tables 1–2, Figure 1). For Ukraine we considered the period starting from 2004, when the necessary information was first made publicly accessible.

The graph in Figure 1 shows that the share of tax revenues in GDP was the smallest in 2004 and the highest in 2012. The mean value in the given period is 36.35%. Table 1 and 2 show the results of the statistical analysis of tax burden in OECD countries.

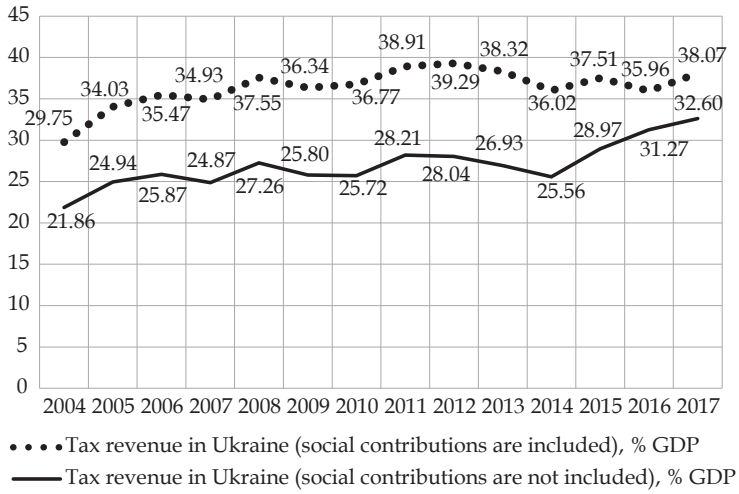

Figure 1. **Share of tax revenues in GDP of Ukraine in 2004–2017, %**

Source: constructed by the authors on the basis of the World Bank data

Table 1

Descriptive statistics on tax revenues in OECD countries in 1995–2017, % of GDP, by year

Year	mean	sd	min	q1	median	q3	max	IQD
1995	33.402	8.543	10.110	29.330	35.136	39.317	46.499	9.988
1996	33.737	8.433	9.912	29.472	34.601	39.226	47.372	9.753
1997	33772	8.351	10.500	30.037	34.690	3.511	48.321	7.474
1998	33953	8.229	10.963	30.933	34.157	37.418	48.426	6.485
1999	34.172	8.157	11.728	31.069	34.505	37.973	48.804	6.904
2000	34.104	7.955	11.462	30.850	33.492	38.109	48.984	7.260
2001	33.594	7.663	12.194	29.583	32.867	37.566	46.832	7.983
2002	33.342	7.563	12.610	29.537	33.239	37.358	45.405	7.822
2003	33.261	7.498	12.671	29.197	33.143	37.441	45.583	8.244
2004	33.187	7.696	11.559	29.227	33.596	37.328	46.393	8.101
2005	33.662	7.756	11.362	29.541	33.791	38.850	48.005	9.309
2006	33.807	7.493	11.588	30.181	34.140	39.718	46.462	9.536
2007	33.853	7.306	12.014	30.119	34.220	39.274	46.425	9.155
2008	33.269	7.208	12.599	29.428	32.597	38.751	44.765	9.323
2009	32.588	7.589	12.467	29.077	31.468	38.760	44.963	9.682
2010	32.682	7.331	12.840	28.238	32.167	37.364	44.756	9.126
2011	32.960	7.255	12.767	28.022	32.768	36.900	44.793	8.878
2012	33.391	7.558	12.649	28.402	32.267	3.384	45.512	9.982
2013	33.673	7.618	13.304	29.043	33.493	38.207	45.888	9.164
2014	33.877	7.684	13.704	29.512	33.344	38.236	48.531	8.723
2015	33.985	7.363	15.933	29.743	33.470	38.094	46.132	8.350
2016	34.779	7.861	16.634	30.601	33.984	39.117	51.595	8.516
2017	34.479	7.258	16.174	30.797	34.304	38.727	46.231	7.930

Source: calculated by the authors on the basis of the OECD data

As Table 1 illustrates, the mean tax burden tended to grow – from 33,402% in 1995 to 34,479% in 2017. The same trend was demonstrated by the minimum values of the tax burden (16.174% in 2017). The maximum value of the tax burden reached its peak in 2016 and in 2017 dropped to 46.231%. The median value of the tax burden is close to the mean value.

Table 2 shows the results of descriptive statistics for the same period and for the same countries included in the sample. We see that Ukraine has no abnormal deviations from the global trend in what concerns tax burden: in the given period its tax burden remained within the range of 21.86–32.06% (net of pension contributions) and 29.75–39.29% (including pension contributions).

The tax burden in Ukraine is below average among OECD countries and is at approximately the same level as that of the Czech Republic, Germany, Iceland, Holland, Poland, Portugal and Slovakia. Therefore, the opinion that the tax burden in Ukraine is high appears ungrounded. Ukraine can thus be described as a country with a medium level of tax burden.

Table 2

Descriptive statistics on tax revenues in OECD countries in 1995–2017, % of GDP, by country

Year	mean	sd	min	q1	median	q3	max	IQD
AUT	42.076	0.991	40.408	41.195	42.233	42.704	43.886	1.509
BEL	43.569	0.788	42.370	43.081	43.451	44.083	45.106	1.062
CAN	33.056	1.605	30.875	31.791	32.766	34.473	35.912	2.682
CHL	19.784	1.310	17.334	18.943	19.591	20.554	22.710	1.611
CZE	33.571	0.795	32.283	33.177	33.454	34.224	34.893	1.047
DNK	46.247	1.028	44.756	45.547	46.189	46.720	48.531	1.172
EST	32.347	1.596	29.969	31.192	31.667	33.519	36.033	2.327
FIN	43.170	1.472	40.788	42.073	43.333	44.138	45.820	2.064
FRA	43.523	1.297	41.528	42.409	43.334	44.304	46.231	1.895
DEU	35.654	1.059	33.860	34.948	35.574	36.316	37.544	1.368
GRC	32.741	3.014	27.890	30.803	31.982	34.901	39.386	4.098
HUN	38.070	1.115	36.250	37.313	37.950	38.828	40.776	1.514
ISL	36.097	4.220	31.187	33.998	35.592	37.142	51.595	3.144
IRL	28.470	2.652	22.837	27.358	28.458	30.796	32.268	3.437
ISR	32.931	1.823	29.834	31.221	33.331	34.308	35.421	3.087
ITA	41.305	1.532	38.583	40.165	41.668	42.228	44.050	2.063
KOR	22.873	2.278	19.118	21.620	23.391	24.617	26.900	2.998
LVA	28.861	1.065	27.466	27.950	28.646	29.470	31.222	1.520
LTU	29.298	1.662	26.966	27.965	29.203	30.152	32.758	2.187
LUX	32.067	1.018	34.850	36.502	37.325	37.632	38.654	1.130
MEX	12.511	1.765	9.912	11.511	12.467	12.803	16.634	1.293
NLD	36.243	1.110	34.804	35.515	36.047	37.027	38.752	1.512
NZL	32.613	1.705	30.055	31.572	32.313	33.816	36.058	2.245
NOR	41.047	1.420	38.228	40.024	41.850	42.059	42.831	2.035
POL	33.404	1.638	31.199	32.010	32.940	34.383	36.617	2.373
PRT	31.601	1.658	29.278	30.290	31.247	30.073	34.708	1.783
SVK	32.185	3.222	28.075	29.258	32.179	33.263	39.562	4.005
SVN	36.878	0.611	36.021	36.406	36.822	37.263	38.360	0.857
ESP	32.944	1.538	29.708	32.014	33.077	33.593	36.358	1.579
SWE	45.269	2.111	42.506	43.588	45.174	46.724	48.984	3.136
CHE	26.819	0.685	25.519	26.507	26.882	27.016	28.456	0.509
TUR	23.368	2.382	16.390	23.104	23.592	25.017	25.899	1.914
GBR	31.966	1.105	29.311	31.504	32.283	32.705	33.258	1.201
USA	25.919	1.464	23.017	24.782	25.975	27.049	28.202	2.266

Source: calculated by the authors on the basis of the OECD data

The tax-to-GDP ratios for the key taxes in Ukraine are also far from being the highest: for instance, the corporate income tax-to-GDP ratio is even lower than in many OECD countries (see Table 3).

The corporate income tax-to-GDP ratio in Ukraine is lower than in Estonia, where the corporate income tax was replaced by the tax on withdrawn capital. It should be noted that the Ukrainian government has been continuously declaring that stimulation of business and attraction of investment are its top priorities, although no significant reduction in the profit tax rates ever ensued. The corporate income tax rate was reduced very slowly and, therefore, had no visible effect either on taxpayers or the country in general.

Effective corporate income tax rates in all the given countries are lower than nominal due to the tax benefits and tax preferences applied for certain transactions. In the majority of these countries both the nominal and effective corporate income tax rates are higher than in Ukraine, which clearly disproves the common misconception about the high level of corporate taxation in Ukraine. The corporate income tax-to-GDP ratio in Ukraine is lower than the average in the OECD sample. In some countries, such as Ireland, Switzerland and Germany, the corporate income tax rates are lower than in Ukraine but the fiscal significance of this tax is higher, which can be related to the mechanisms of providing tax preferences or the level of the shadow economy. In the given countries, this level on average does not exceed 20% while in Ukraine, according to the Ministry of Economic Development and Trade, in the first quarter of 2017, this level was 37%[3]. This indicator is even higher if we look at the estimates of the World Bank, which show that in the last five years the level of the shadow economy in Ukraine hovers around 50–60%. This level has a negative impact on the fiscal efficiency of taxes due to tax evasion.

The situation with the VAT in Ukraine is a bit different (see Table 4).

The Table shows the data on the VAT-to-GDP ratio. As Table 4 shows, in Ukraine the VAT-to-GDP ratio in 2015 was higher than in other countries while in 2016 it was not much different from the mean value in the sample. This can be explained by the fact that the Ukrainian state adopted a more harmonized procedure for refunding the VAT and cut the delays in VAT refunds. The nominal VAT rate in Ukraine is quite moderate, lower than in Germany, Turkey and Switzerland. In

[3] Shadow Economy in Ukraine. Available at http://www.me.gov.ua/Documents/List?lang=uk-UA&id=e384c5a7-6533-4ab6-b56f-50e5243eb15a&tag=TendentsiiTinovoiEkonomiki

Table 3

Corporate income tax-to-GDP ratio in OECD countries in 2010–2016, %

Country	2010	2011	2012	2013	2014	2015	2016	Corporate income tax rate in 2018, %
Austria	9.67	9.67	9.72	9.79	9.97	10.36	9.42	25.00
Czech Republic	2.98	2.98	2.96	3.05	3.13	3.20	3.20	19.00
Estonia	3.37	3.21	3.44	3.75	3.94	4.20	4.17	20.00
Germany	8.03	8.29	8.73	8.78	8.73	8.95	9.32	29.89
Hungary	1.19	1.12	1.19	1.07	1.40	1.57	1.93	9.00
Ireland	8.88	8.87	9.19	9.22	9.37	8.00	8.07	12.50
Italy	10.55	10.14	10.70	10.72	10.20	9.98	9.86	24.00
Latvia	0.98	1.40	1.62	1.62	1.54	1.60	1.70	20.00
Poland	1.95	2.02	2.08	1.77	1.75	1.84	1.85	19.00
Slovakia	2.46	2.41	2.36	2.86	3.28	3.70	3.78	21.00
Switzerland	17.60	17.26	16.39	16.00	15.66	15.84	15.79	21.15
Turkey	1.80	1.94	1.85	1.60	1.58	1.43	1.65	22.00
UK	8.55	8.67	8.16	7.99	7.76	7.83	8.14	19.00
Sample mean	6.00	6.00	6.03	6.02	6.02	6.04	6.07	20.12
Ukraine	3.73	4.18	3.96	3.78	2.57	1.97	2.54	18.00
Georgia	2.88	2.78	3.42	3.25	3.01	2.84	3.22	15.00

Source: calculated by the authors on the basis of the data of the OECD and the World Bank.

Table 4

VAT-to-GDP ratio in OECD countries in 2010–2016, %

Country	2010	2011	2012	2013	2014	2015	2016	VAT rate, %
Austria	6.45	6.28	6.27	6.13	6.07	6.07	6.16	20.00
Czech Republic	6.65	6.86	7.05	7.41	7.41	7.25	7.41	21.00
Estonia	8.54	8.18	8.41	8.23	8.66	9.20	9.36	20.00
Germany	5.62	5.55	5.55	5.41	5.32	5.39	5.42	19.00
Hungary	8.54	8.41	9.13	8.91	9.24	9.64	9.29	27.00
Ireland	5.09	4.72	4.79	4.67	4.83	3.67	3.76	23.00
Italy	4.69	4.57	4.46	4.32	4.40	4.45	4.45	22.00
Latvia	6.70	6.77	7.17	7.40	7.55	7.70	8.15	21.00
Poland	7.59	7.83	7.14	7.04	7.13	6.99	7.05	23.00
Slovakia	6.19	6.67	5.95	6.33	6.60	6.87	6.67	20.00
Switzerland	4.93	4.83	4.71	4.60	4.42	4.24	4.20	8.00
Turkey	5.39	5.64	5.20	5.57	5.02	5.18	5.01	18.00
UK	4.25	4.81	4.74	4.69	4.68	4.71	4.74	20.00
Sample mean	5.33	5.28	5.25	5.12	5.10	4.93	4.97	...
Ukraine	7.97	9.88	9.85	8.82	8.87	9.02	5.88	20.00
Georgia	10.64	11.46	11.60	10.63	11.30	11.02	9.67	18.00

Source: constructed by the authors on the basis of the data of the OECD and the World Bank.

almost all of the given countries, the effective VAT rate is lower than the nominal, which can be explained by the fact that reduced VAT rates are applied to certain groups of commodities. It should be noted that the given countries do not experience any significant fluctuations in the VAT-to-GDP ratio, which signifies a relative stable level of taxation in these countries. An increase in the VAT-to-GDP ratio in the Czech Republic, Estonia and Latvia stems from the gradual increase in the basic VAT rate by 1–2 percentage points.

In order to estimate the tax burden in Ukraine by looking at specific taxes and tax payments, we need to conduct a retrospective analysis of the tax policy. The reduction of the tax burden involved cutting the number of taxes and fiscal charges as well as lowering the tax rates. There is a widely shared misconception about the excessive number of taxes in Ukraine. However, each round of tax reforms in this country included eliminating some of the taxes, which usually happened when the Tax Code was adopted or amended. As a rule, these were the taxes of secondary importance or those that produced little revenue. A really important matter was the cancellation of contributions to different special budget funds, in particular those that created a substantial tax burden such as the "Fund for the Liquidation of the Consequences of the Chernobyl Disaster", "Social Security Fund", "State Innovation Fund", and the "Fund for Road Construction and Repair". These funds were created in large numbers in the first year of Ukraine's independence (apart from the above-mentioned, there were also funds for the development of energy sector, conversion, and so on). Currently the most significant is only the contribution to the Fund of Social Security of the Disabled (the contribution to this fund equals the amount of the annual salary at the rate of the minimum wage per person). Companies have a choice of either hiring a disabled person or paying a fine for failing to fulfil the quota for employment of people with disabilities. Therefore, the contributions to this fund are in fact the fines paid by companies failing to hire disabled people.

At the initial stage in the development of the country's tax system (1991–1997), the key priority was to establish a tax system which would be able to ensure stable budget revenues. Although at this stage the fiscal function prevailed, some steps were taken to reduce the tax burden.

The rates were reduced for the key taxes: first, the VAT rate was lowered from 28% to 20% in 1995, which was a bold decision considering the level of budget deficiency at that time. It should be noted that there was an attempt to set the VAT rate

at 20% in 1993 but it proved too hard to retain the rate at this level and it had to be raised after only four and a half months.

At the same time the rates of the business taxes were lowered: initially the corporate income tax rate (net profit) was set at 35%. In 1992–1994, the system of business taxation changed several times: the income tax (the sum of commercial profit and the wage fund minus gross income) had the rate of 18%; in 1994 it was raised to 22%; later this tax was replaced by the corporate income tax with the rate of 30%. Finally, the government decided to set the profit tax rate at 30%.

During the years of Ukrainian sovereignty, taxation of physical persons also underwent significant changes: at first there was a "citizen income tax" but later it was renamed into the "tax on the income of physical persons"; the tax rates and mechanisms of taxation were also adjusted multiple times. The situation was particularly volatile in the early 1990s. Until 2003, Ukraine had had a progressive tax scale, also changed three times.

The second stage (1997–2000) involved the development of tax regulation and harmonization of the main taxes with international norms. In 1997, the principles of VAT and corporate income tax collection were revised, and the principles of VAT collection were harmonized with those of Western countries. As for the corporate income tax, the reform resulted in the separation of bookkeeping from tax accounting and the object of taxation – profit – started to be calculated differently from the way profit is calculated in bookkeeping.

Introduction of a simplified taxation system for small business, which stimulated entrepreneurship and self-employment, was one of the positive aspects of the tax regulation in this period.

At the third stage of the reforms (2000–2010), policy-makers were searching for the right balance between the fiscal and regulating function of taxes, for example, they liquidated excessive VAT benefits and corporate income tax benefits. In the same period, the progressive personal income tax scheme was replaced by a proportional scheme. From 2004 to 2007, the proportional tax rate in Ukraine was 13%, and in 2007 it was raised to 15%. One of the most significant results of the reforms in this period was the adoption of the law "On the Procedure for Payment of Taxpayers" Liabilities to Budgets and State Purpose Funds' of 21.12.2000 № 2181. This law systematized approaches to tax liability settlement and to application of penalties for violating the tax legislation. Principles of penalizing taxpayers changed considerably, moreover, the grounds for imposing penalties were expanded and the size of penalties became dependent on the type of tax check and the kind of violation.

The fourth stage (since 2011 to present) involved codification of the tax legislation, simplification of the tax system and its further harmonization with the EU legislation. The search for ways to further reduce the tax burden continues.

At this point we should emphasize that among other taxes in Ukraine, the VAT is most harmonized with the EU legislation. If we compare the current VAT rate in Ukraine with that of other countries, we can notice that in general it corresponds to the international norms. Therefore, the debates about the VAT now mostly focus on its administration and collection. It should be noted, however, that all EU countries, except for Denmark, apply reduced VAT rates to some pharmaceutical products, food necessities, public transport fees, periodicals and so on. In Ukraine, the reduced VAT rate is applied only to pharmaceutical products and medical equipment (7%), which does not qualify as a reduction of the tax burden since before it was introduced, medical drugs and equipment had been VAT-free.

Changes in the approaches to the VAT administration in Ukraine raise a number of questions. Overall, however, the introduction of the electronic VAT administration system in 2015 helped the authorities minimize the risks of fictitious tax credits and simplify the process of declaration and payment of the VAT. On the other hand, the majority of firms offering their customers deferred payment terms faced difficulties when they were trying to register their tax invoices in the electronic sys-

tem while shipping the products. In order to register a tax invoice, it is necessary to have the corresponding sum of money on the taxpayer's account in the Treasury Service. For example, if you need to register a tax invoice for the sum of 120,000 hryvnias, including the VAT of 20,000 hryvnias, the remaining amount on the taxpayer's electronic account should be 20,000 hryvnias. This remaining amount consists of the VAT amounts in the tax invoices registered by the company's suppliers, the VAT amount paid to import goods, the money transferred by the taxpayer, and the monthly average of the VAT amounts declared by the taxpayer in the last 12 fiscal months and discharged (or amortized/deferred). If the sum on the taxpayer's account is not enough, the taxpayer has to transfer funds from their current bank account (you cannot, however, withdraw funds back from your taxpayer's account) to avoid paying a fine for delayed registration and losing a customer since without the registered tax invoice, the customer loses their right to the tax credit. The purpose of the electronic system is to prevent VAT fraud and evasion due to fictitious tax credits but this system also hampers efficient operation of companies.

The introduction of the system in 2015–2016 did not help the government solve the problem of timely VAT refunds on exported goods. The situation got better only in 2017, when the register of companies claiming the VAT refund became publicly open. Before 2017, such registers had been closed, which led to high risks of corruption associated with "queue jumping". When the registers became open, the transparency of the "queuing system" also became higher as the companies were now able to keep track of the process.

Another problem taxpayers faced in 2017 was that the system blocked the registration of tax invoices if it detected a high level of risk of a fictitious transaction. Sometimes this mechanism created absurd situations: for instance, tax invoices of a manufacturing enterprise got blocked because the system did not have the information that this production had already been bought by this enterprise before.

The confusion and uproar among taxpayers led to a large number of suits filed against the State Fiscal Service. As a result, the Ministry of Finance had to revise the criteria for blocking tax invoices. The improvement of the electronic system is still a work in progress.

As for the corporate income tax, its rate was gradually lowered: in 2005–2010 the tax rate was 25%. In accordance with the Tax Code of 2010, it was planned to lower the tax rate to 23% in 2011; to 21% in 2012; to 19% in 2013; and to 16% in 2014. These plans were never fully realized and at the moment the corporate income tax rate is at the level of 18%. Thus, since Ukraine became an independent state, the tax rate has been lowered almost twofold. Compared with international experience, this rate is generally on a par with that of other post-Socialist countries but significantly lower than that of developed countries.

In addition to the above, the tax burden was also lowered due to the changes in corporate income taxation: since 2015, taxable income has been defined as the financial result calculated according to the national bookkeeping standards and international accounting standards (depending on the conceptual framework this or that company should apply). Thus, the financial result calculated in the way described above is further adjusted for tax differences defined in Tax Code of Ukraine. The main tax differences are those related to the depreciation of non-current assets; financing transactions; and provisions for incurred and probable expenses. This approach does not contradict the existing international practice but, on the contrary, is methodologically close to it. In Ukraine, however, this change caused conflicts between taxpayers and tax authorities. What in fact happened is that since 1997, tax accounting has prevailed over bookkeeping, which remained relevant only for companies subject to mandatory audits and thus required to publish their financial reports (issuers of securities, financial institutions and public joint-stock companies).

The personal income tax can be considered less harmonized. Since 2007, the rate of the personal income tax was 15% and in

2011, a second rate of 17% was introduced for higher income individuals. In 2016, the unified proportional rate was raised to 18%. At the same time, the unified social security contribution was cancelled for employees. Such instability in tax legislation may signify a lack of the clear strategic and tactical vision behind the tax reforms. There is also a perceptible lack of agreement among the policy-makers as to what direction the reform should take: for example, high-income groups now enjoy a lower level of taxation while disadvantaged groups, on the contrary, have to struggle with higher taxation levels. In comparison with other countries, Ukraine has the lowest level of personal income tax in the world. The majority of countries have fixed progressive tax schedules. In Western Europe, the tax burden on personal income is reduced considerably through tax deductions and tax rebates. First of all, in almost all countries there is a tax-exempt minimum income, which either equals or slightly exceeds the minimum wage. In Ukraine only a limited number of people can take advantage of the full scope of tax benefits.

Secondly, Western states strive to promote self-employment and, therefore, offer self-employed citizens an opportunity to deduct their home office expenses and the expenses of operating their personal vehicles for business against their self-employment income, thereby reducing their income tax. To claim self-employed tax benefits citizens don't have to be registered as entrepreneurs. In Ukraine, however, there is no such option.

The current practice of personal income taxation in Ukraine is inconsistent with the government's intention to stimulate the development of non-state pension schemes. The only incentive available in Ukraine is the right to claim a tax relief and even in this case there is a limit on the amount of pension contributions on which you get a tax relief. In many EU countries, for example, Germany, France and the UK, the governments stimulate contributions to private pension plans by incentivizing the employer and the insured. For instance, in the progressive income tax system, physical persons are entitled to a higher tax threshold or to a tax relief on their pension contributions.

The last step towards reduction of the tax burden in Ukraine was cutting the rate of the unified social contribution for enterprises. While previously it varied between 36.76% to 49.7% of the salary budget depending on the occupational hazard class, in 2016 the rate was reduced by more than a half – to 22%. Much had been said about the need for such a measure long before it was actually taken: one of the arguments was the experience of development countries, where the average rate of social security contributions is 18–20%. Nevertheless, such comparisons are flawed since the majority of the countries where this rate is applied have funded pension systems while in Ukraine there is a PAYG system. As V. Oparin and T. Paientko point out, it is more effective to combine lowering of the unified social tax rate with a more radical reform of the pension system, which, unlike the one of 2017, is more likely to lead to fundamental improvements. Furthermore, many taxpayers had to face a significant expansion of the tax base through the unified social tax, which included most of the compensation payments (for example, compensation for rent payments) [23].

Let us try to evaluate the results of the tax burden reduction in Ukraine. The reform of the mid-1990s, which involved lowering the VAT rate and elimination of contributions to special budgetary funds, brought more or less positive effects. These measures allowed the government to stabilize the decline in the GDP growth rate and ensure some sort of macro-economic stability. In the early 2000s, the country finally achieved economic growth. Undoubtedly, the tax burden reduction made a substantial contribution to this success, even though it was not the sole factor.

It is much harder, however, to evaluate the impact of the transition from progressive personal income taxation to proportional taxation. The rationale behind this transition was the need to deal with the problem of unreported income and tax evasion and thus to encourage business to move from the shadow sector to the formal economy. Proponents of this

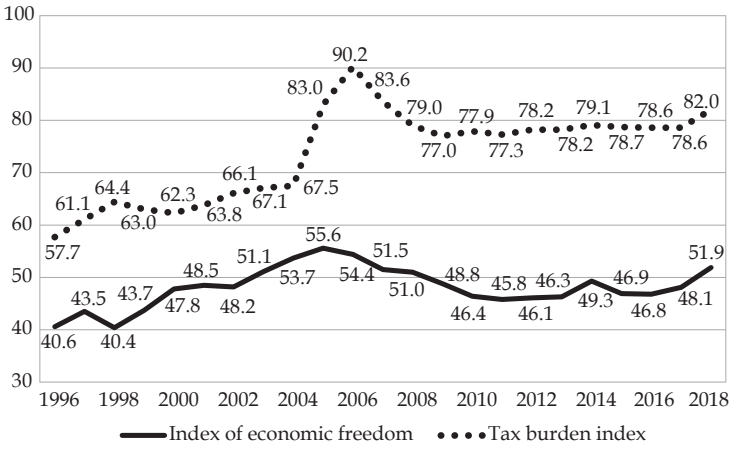

Figure 2. **Dynamics of the index of economic freedom and the index of tax burden for Ukraine in 1996–2000**

Source: constructed by the authors on the basis of the Heritage Foundation data

reform argued that such transition would boost tax revenues even with lower tax rates. As practice showed, however, no breakthrough was made in this respect and the problem of tax evasion remained unsolved and even got worse when the need to replenish the Pension Fund arose. On the other hand, no slump in tax revenues ensued either. In the following two years, the tax revenues grew considerably: from 34800.00 billion hryvnias to 45900.00 billion in 2008. These were the years of economic boom in Ukraine and although we cannot deny the positive impact of the reduced tax burden, the crucial factor was the growth of GDP, which becomes evident if we look at the personal income tax revenues as a percentage of GDP. This figure doesn't change much: in 2003, it was 5.1%; in 2004, 3.8%; in 2005, 3.9%; in 2006, 4.2%; in 2007, 4.8%; and in 2008, 4.8%. Undoubtedly, reduced income tax rates stimulated consumption and thus enhanced economic growth. Not all income groups benefited the same from this reform, though, with the rich gaining the most. Reduced tax rates could be expected to raise investment, which would signify the success of the personal income tax reform. The reform, however, did not bring about the expected investment boom and it is unlikely to happen in the nearest future. The reduction in the corporate profit tax rate was primarily aimed at encouraging investment (at least according to the official version of the previous Ukrainian government). The officials insisted that the proposed tax incentives would result in an unprecedented inflow of investment, which, however, did not happen.

Therefore, it can be concluded that the reform failed to bring the desired result (or maybe it had been doomed to failure from the start). According to the studies of E&Y, PwC, and the World Bank, the main factor in foreign investors' decision-making is not the profit tax rate but the protection of their property rights, the rule of law and the efficiency of the government. According to the Heritage Foundation, in these indicators Ukraine's position remains steadily low. As for the integral indicator, Ukraine ranks among the economically unfree countries[4], such as Afghanistan, Sudan, Angola, Suriname and Bolivia. Therefore, it is essential that the changes in the sphere of taxation should be accompanied by the complementary institutional transformations; otherwise the benefits from the reform will be enjoyed only by a small privileged circle of those who lobby these changes in the first place while the general level of public welfare will remain basically the same. Figure 2 illustrates the dynamics of the index of economic freedom and tax burden.

[4] Index of economic freedom. Available at: https://www.heritage.org/index/

As the graph above shows, the position of Ukraine in the ranking of economic freedom leaves much to be desired. Even though its index grew from 40.6 to 51.9, it is still not enough for Ukraine to move to the next group in the ranking. As Figure 2 illustrates, after 2002, the index of tax burden grew considerably, which means that the tax reforms had a positive impact on the tax climate in the country.

As it was previously noted, the index of economic freedom is one of the integral indicators characterizing the country's economic and institutional development. To evaluate the influence of tax reforms on economic freedom, we constructed two dependences with two dependent variables – the index of economic freedom (integral indicator) and the index of tax burden (component of economic freedom). Tax burden (the share of tax revenues in GDP) was used as an independent variable. The sample covers the period from 2008 to 2018. The results of our calculations are shown in Table 5.

Table 5

Regression statistics results (Ukraine)

Linear Model		
	Dependent Variable	
	IEF index of economic freedom)	TB (Tax burden)
	0.218** (0.073)	0.477** (0.168)
Observations	11	11
R^2	0.499	0.474
Adjusted R^2	0.443	0.415
Residual Std. Error (df = 9)	0.388	0.894
F Statistic (df = 1; 9)	8.952**	8.107**

Note: * p < 0.1; ** p < 0.05; *** p < 0.01

The F-statistic and p-value show the significance of these models. The coefficient of determination (adjusted to take into account the sample size) for the dependence of the index of economic freedom/tax burden is 0.443; for the dependence of the index of tax burden/ tax burden, 0.415. In 2008–2018, the tax reforms targeted at reducing the tax base determined more than 40% of the dynamics of the country's economic freedom index. Therefore, for Ukraine the first hypothesis is confirmed and the second hypothesis is refuted. It should be noted that although in the given period the reduction of the tax burden was one of the priorities of the country's fiscal policy and had a positive impact on the index of economic freedom, Ukraine still remained in the group of economically unfree countries, that is, the impact of the reform was smaller than expected.

5. Tax reforms in Georgia

Although the establishment and development of the tax system in Georgia had the same point of departure as in Ukraine – the demise of the USSR, their tax reforms took different paths and brought different results, which, among other things, affected the general level of tax burden (Figure 3). As Figure 3 shows, tax revenues accounted for the smallest share in GDP in 2010 and the largest, in 2012. Figure 3 shows only one graph because in 2008, social contributions and the personal income tax were united into one tax.

The mean value in the given period is 23.51%. The tax burden in Georgia in the given period is below the average level in

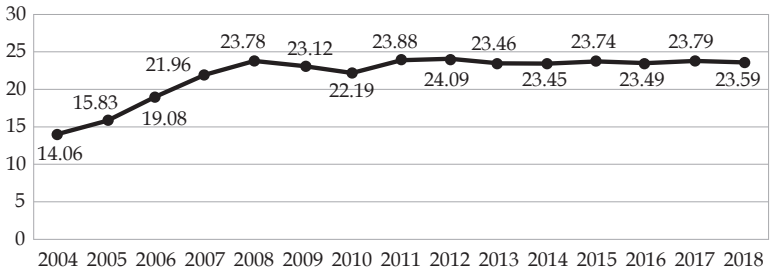

Figure 3. **The share of tax revenues in GDP of Georgia in 2008–2018**

Source: constructed by the authors on the basis of the data of the Ministry of Finance of Georgia

the OECD (Tables 1–2); the average level of tax burden in Georgia is closer to that of Korea, Turkey and the USA. It should be noted that in these countries the level of tax burden is much lower than in the EU.

The same can be said about the corporate income tax- and the VAT-to-GDP ratios (see Tables 3 and 4). While the corporate income tax rate is lower in Georgia (15%), its tax collection efficiency is higher than in Ukraine (which has become particularly evident since 2014) (Figure 4). The situation is similar for the VAT: while the tax rate is lower (18%), the efficiency of the VAT collection in Georgia is higher than in Ukraine (Figure 5).

As Figure 4 illustrates, the corporate income tax-to-GDP-ratio in Ukraine was falling between 2011 and 2015 but went up in 2016. The dynamics of the corporate income tax-to-GDP-ratio in Georgia was less turbulent: in the period between 2012 and 2015, it demonstrated a slight downward trend and in 2016, increased insignificantly.

There were no dramatic fluctuations of the VAT-to-GDP ratio for Georgia in the given period; there was a decrease in 2013 and 2016. Overall, the VAT-to-GDP ratio in Georgia was almost twice the OECD average, which can be explained by the shifting of the tax burden from income to consumption.

Building market economy, Georgia faced a number of political, economic and social problems, which made it necessary to create a robust tax system. Establishing a new tax system that would be suitable for market economy, in its turn, required a legislative foundation. During the transition period, the parameters of the tax system remained largely unclear and there was no proper regulatory framework, which cuased some mistakes in the following tax reforms. In December 1993, the Georgian Parliament passed a legislative package (eight laws) aimed to improve the tax systems by stimulating entrepreneurship and mobilizing state budget resources. The main law in this package was the Law of the Republic of Georgia "On the Principles of the Tax System", which described organization of the tax system, methodological framework for the formation of taxes, levies, duties, and local taxes. The law "On the State Tax Service of the

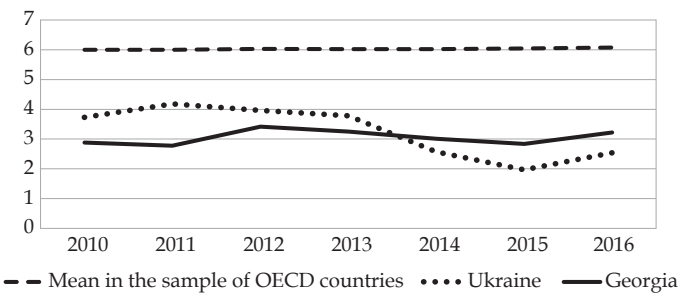

Figure 4. **Corporate income tax-to-GDP ratio in OECD countries, Ukraine and Georgia in 2010–2016**

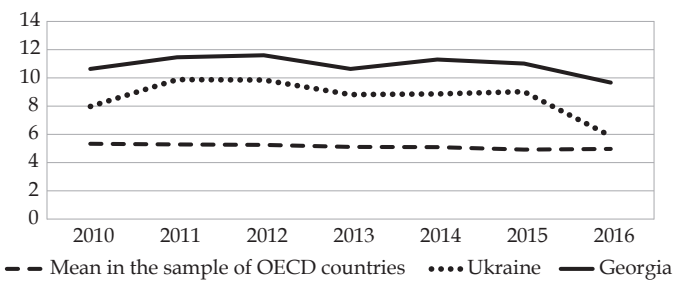

Figure 5. **VAT-to-GDP ratio in OECD countries, Ukraine and Georgia in 2010–2016**

Republic of Georgia" defined the rights and obligations of taxpayers in relation to the corresponding tax bodies. According to this law, tax authorities exercise control over businesses in the sphere of tax compliance to ensure a permanent inflow of funds to the state budget. This law provided a foundation for the development of the state tax structure in Georgia. It stipulates that the integral system of taxation service in Georgia comprises the central tax administration office, state tax inspections in autonomous republics, 120 cities and districts. Units on all levels of this hierarchy represent legal entities with the corresponding attributes. Despite some serious drawbacks, the first Tax Code adopted by the Georgian Parliament on 13 June 1997 played a positive role in establishing the country's tax system. Inconsistencies and incoherences within the Tax Code curbed its effectiveness and its impact on the operation of the tax system. Hundreds of amendments to the Tax Code failed to produce the desired effect either. Neither taxpayers nor tax collectors were willing to take into account the interests of the state and of the national economy. According to T. Kopaleishvili and M. Chikviladze, the Tax Code was not adjusted to the national traditions and not only failed to improve the tax relations but also led to the deterioration of the newly created tax system in Georgia [29].

The first Tax Code defined the applicability of the law, the types of taxes and their corresponding rates, the conditions and deadlines for tax declaration, the rights and obligations of tax authorities and taxpayers. The Code, however, did not define the type of control and the mechanism for ensuring obligations to taxpayers. At later stages, the Tax Code was revised and amended until it was fully replaced by another one. The first Tax Code comprised 21 taxes, which had a negative impact on taxpayers. Moreover, the taxes failed to perform their fiscal function. In fact, the Georgian tax system of this period was typical of countries with transition economies: it was characterized by the diversity of taxes and excessive complexity of tax administration.

The multiple improvements to the Tax Code, however, had no influence on the tax environment. Therefore, a new tax code was created, which came into force on 1 January 2005. It significantly reduced the number of taxes (from 21 to 6 – 5 national and 1 local) and simplified the mechanisms of tax administration. Thus, the Tax Code established a robust legal framework and set mechanisms for maintaining control over taxation, including supervision over taxpayers and guidelines for resolving tax disputes. The Code also described the rights and obligations of tax authorities and taxpayers, measures of service and control, rules of tax administration, and so on.

The main goals of the tax reforms in Georgia were to simplify the tax system and tax administration, reduce the tax burden and ensure a more even distribution of the tax burden, remove the infeasible tax benefits and reduce the tax burden on economy as a whole.

We should emphasize that as the shadow economy was shrining, the tax base was expanded, which compensated for the lost budget revenues due to the lowered tax rates. The tax reform also had some indirect positive effects. For instance, the liberalization and simplification of the tax system together with the enhanced security of taxpayers had a positive influence on the investment climate in Georgia and helped move the capital into the formal sector.

The general view is that the tax reforms in Georgia went through three main stages. At the first stage, in 2004–2007, the tax reform involved profound institutional changes, lifting of bureaucratic barriers, substantial reduction of the tax burden (15 types of taxes were eliminated, and for some taxes, the rates were lowered), and reduction of the government's involvement into the activities of companies. The reform set simple and fair "rules of the game" and the state guaranteed to all economic and business entities that these rules would be observed. In this period, customs and tax bodies became subordinate to the Ministry of Finance [35].

The very concept of the tax reform in Georgia has been thoroughly revised

since 2004: first of all, it was important to ensure the principle of tax neutrality, which means that taxes should not affect the choices made by entrepreneurs concerning their fields of activity and investment. This principle is known to be successfully implemented in developed countries. On the other hand, it soon became obvious that at that stage of its socio-economic development, when Georgia was going through serious structural transformations and was struggling with economic instability, the realization of the neutrality principle was problematic. Georgia was unable to fully adopt the experience of developed Western countries, which differed significantly in their levels of socio-economic development and the amounts of property people had as well as in people's attitudes towards taxation. On the other hand, there was no denying the obvious: any country's economic performance is heavily dependent on its tax system. In Georgia, the fiscal policy and the tax system were primarily oriented towards the fiscal function of taxation as the state budget needed a steady inflow of tax revenues. At first sight such fiscal policy seems to be realistic and acceptable but one has to take into account the fact that if the policy focuses only on the fiscal function of taxes to the detriment of the regulating function (paying attention to optimal tax rates and lowering them in certain sectors of economy), such situation will eventually lead to the shrinking tax base and share of taxes in budget revenues, although an increase in the absolute volumes of tax revenues is also possible [24].

The tax reform in Georgia started bringing positive results from the very first years of its realization. Its main success factor was that special attention was given to the human factor and the incentive scheme applied to the staff of the tax administration. L. Bakhtadzae et al. make a valid point saying that the Georgian government started the reform by transforming the incentive scheme rather than by reducing the tax rates [27]. At the beginning of this stage, the tax service went through some major restructuring, which involved layoffs and staff replacements. At the same time some policy measures were taken to combat corruption in the tax administration and to enhance the expertise and qualification of tax officials. As a result, the tax revenues grew from 1530.2 million lari in 2004 to 3669.0 million lari in 2007. In the same period the VAT revenue rose from 661.4 million lari to 1973.7 million. Along with the growth in the total tax revenue, the share of taxes in the country's GDP increased from 12.1% in 2005 to 21.6% in 2007 (according to the data of the Ministry of Finance of Georgia – www.mof.ge). Remarkably, none of the other post-Soviet states demonstrated such an impressive upward dynamics in the performance of their tax systems in this period. Another important positive aspect of the reform is that at the first stage, the tax burden was reduced by lowering the tax rates, for instance, the VAT rate decreased from 20% to 18%; the income tax rate, from 20% to 12%; and the social tax, from 33% to 20% (and later to 15%). In the following stages, the income and social taxes were united into one unified income tax, with the rate of 25%, later lowered to 20%.

The Georgian tax reform had a comprehensive character as the liberalization of taxes, resulting in tax cuts, continued throughout all its stages. At the second stage between 2007 and 2009, the institutional structure of the tax system was improved and new bodies of the tax administration were formed, causing a reduction in the tax burden. The institutional transformation involved the creation of the Tax Revenue Service and some significant changes in the structure of the tax administration, including modernization of the technical facilities of customs checkpoints of the Central Tax Service. As we observed above, in 2008 the profit tax rate was lowered considerably – from 20% to 15%. The social tax and personal income tax were united into one tax. Industrial zones and warehouses were made exempt from taxes.

The third stage of the reforms, which began in 2010–2011 and apparently still continues, encompasses deep and complex transformations of the tax policy. In this period the customs reform was completed. Moreover, the use of innovative

digital technologies allowed the government to cut the expenses for the protection of the tax legislation. The new tax code adopted at this stage was more compliant with the internationally accepted methodology and standards. New tax regimes for small and medium-sized enterprises were introduced in order to enhance entrepreneurship in the country. Some bureaucratic barriers were lifted. Digitization of customs administration allowed the government to simplify and harmonize customs procedures.

M. Chikviladze points out that as a result of the tax reform, the number of taxes was reduced from 21 to 6 and the tax rates were lowered significantly for all the key taxes. Potential tax revenues of 40–45% of GDP dropped to 28–30% while the level of the actual tax revenues grew from 15.6% to 23.4%. At the same time the extent of compliance with tax obligations increased from 35% to 78–85% [31].

In the recent decades, Georgia has improved its investment climate considerably. The creation of an efficient tax system with low tax rates and convenient and secure payment methods contributed to this process because it encourages tax compliance and stimulates entrepreneurship. The success of the tax reform helped the government combat corruption more effectively, and now Georgia stands out favourably in this respect among other post-Soviet and developing countries. According to the "Corruption Perceptions Index" of 2019, which assessed financial transparency in 180 countries, Georgia ranked 41st in the world and occupied the top position among the 19 countries of Eastern Europe and Central Asia (EECA)[5].

Georgia used tax reforms to lower its tax rates, which was a crucial part of the country's fiscal policy. According to the estimates of international organizations, Georgia now has comparatively low tax rates and offers comfortable conditions for business: in the joint study "Paying Taxes 2018" by the World Bank (WB) and PricewaterhouseCoopers (PwC), Georgia ranks 22nd among 190 countries in terms of the ease of paying taxes. This indicator is calculated by using three parameters – the number of taxes in the country (the number of payments); the average number of hours annually spent by a company to pay the taxes (the time to comply); and the total tax and contribution rate or the cost of all taxes borne as a percentage of the company's commercial profit[6].

The World Bank's report "Doing Business 2019" positively evaluated the outcomes of the Georgian tax reforms[7]. The corporate profit tax scheme adopted on 1 January 2017 exempts from income taxation undistributed profits, which, therefore, can become a source of reinvestment. The reform led to a reduction in the overall tax burden as a percentage of the profit – 9.9%, which is by 6.5 percentage points lower than the level of the previous year. The same can be said about the time to comply, which fell by 49 hours (from 269 to 220), resulting in Georgia's 16th place in this indicator.

As a result of its tax reforms, Georgia managed to move up the ranking of economic freedom (Figure 6).

As Figure 6 illustrates, between 1996 and 2018, Georgia was steadily improving its performance in the ranking of economic freedom and moved from the group of economically unfree countries to the group of economically free countries (since 2013). The index of tax burden in the given period dropped by 5 points, which seems a natural outcome of the tax reform, aimed not only at reducing the tax burden but also at transforming the institutional tax environment.

To evaluate the impact of the tax reforms on economic freedom, we constructed two dependences with two dependent variables – the index of economic freedom (integral indicator) and the index of tax burden (component of economic freedom). Tax burden (the share of tax

[5] Corruption perception index. Available at: https://www.transparency.org/news/feature/corruption_perceptions_index_2017

[6] Paying taxes. Available at: https://www.pwc.com/gx/en/paying-taxes/pdf/pwc_paying_taxes_2018_full_report.pdf

[7] Doing Business. Available at: https://doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf

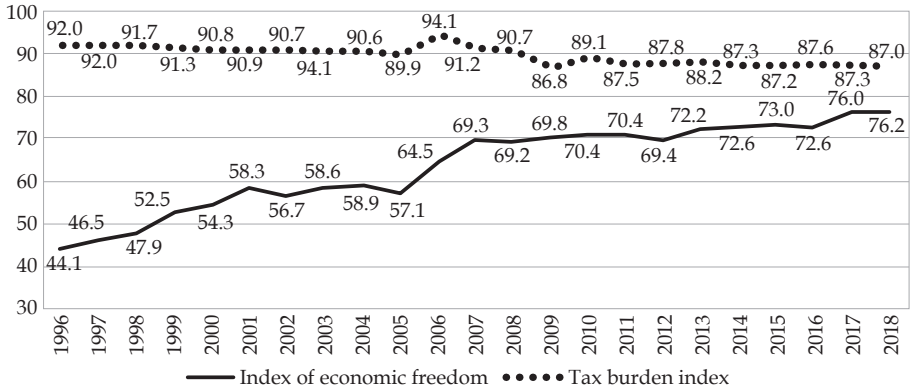

Figure 6. **Dynamics of the index of economic freedom and the index of tax burden in Georgia in 1996–2018**

Source: constructed by the authors on the basis of the Heritage Foundation data

revenues in GDP) was used as an independent variable. The sample covers the period from 2008 to 2018. The results of our calculations are shown in Table 6.

Table 6

Regression statistics results (Georgia)

Linear Model		
	Dependent Variable	
	IEF index of economic freedom)	TB (Tax burden)
	0.411 (0.378)	0.816 (0.602)
Observations	11	11
R^2	0.116	0.170
Adjusted R^2	0.018	0.077
Residual Std. Error (df = 9)	0.607	0.968
F Statistic (df = 1; 9)	1.187	1.839

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

As Table 6 illustrates, the model is statistically insignificant as the F-statistic is 1.187 and 1.839 respectively while the minimum required value is 2 for the given number of degrees of freedom. The coefficients of determination are low for both models, which signifies the absence of relationship between the tax burden and the index of economic freedom. This can be explained by the fact that the tax reforms in Georgia were oriented towards institutional changes, in particular improvement of tax administration. The second priority was the reduction of the tax burden. It should be noted that these priorities ensured Georgia's transition from the group of economically unfree countries to the group of countries with high levels of economic freedom (ranking positions 70–79). Thus, for Georgia the first hypothesis is refuted while the second is confirmed.

6. Conclusion

The results of our study have shown that Ukraine went through four main stages of the tax reforms. At the initial stage (1991–1997), the key priority was to establish a tax system which would be able to ensure stable budget revenues. Although at this stage the fiscal function prevailed, some steps were taken to reduce the tax burden. At the second stage (1997–2000), tax regulation was developed and the main taxes were harmonized with international norms. At the third stage (2000–2010), the government tried to balance the fiscal and regulatory functions of taxes. The fourth, ongoing stage (since 2011) involved codification of the tax legislation, simplification of the tax system and its further harmonization with the EU legislation. The search for ways to reduce the tax burden continues.

In Georgia, the tax reforms comprised three stages. The first stage (2004–2007) was the period of profound institutional changes, lifting of bureaucratic barriers, reduction of the tax burden (15 kinds of taxes were eliminated and some of the tax rates were lowered), reduced government

intervention into business activities. At the second stage (2007–2009), the institutional structure of the tax system was improved and new tax administration bodies were formed, resulting in an actual reduction in the tax burden. At the third, ongoing stage, the tax reform has been completed while the tax policy is still undergoing profound transformations. Moreover, modern digital technologies have enabled the government to cut the spending on the protection of the tax legislation.

In Ukraine, the resulting tax system is characterized by a moderate tax burden (compared with OECD countries), while in Georgia, the tax burden is quite low. The tax burden on corporate profits in Ukraine and in Georgia is lower than in the OECD. Due to the successful institutional transformations in Georgia, its corporate income tax-to-GDP-ratio is higher than in Ukraine although the nominal rate is higher in Ukraine. The VAT-to-GDP ratio in Ukraine and Georgia is higher than in OECD countries while the efficiency of the VAT collection is higher in Georgia than in Ukraine. The tax reforms in Ukraine lacked a clear strategy and tactics, which led to some unpredictable results. Furthermore, in Ukraine institutional changes always tended to recede into the background while the priority was given to the reduction of the tax burden and the struggle against tax fraud and tax evasion. In Georgia, the key priority of the tax reforms was not just to reduce the tax burden but to balance the interests of the state and taxpayers through structural changes in the sphere of tax administration. Therefore, the Georgian tax reforms turned out to be more successful: between 1996 and 2018, the country rose in the economic freedom ranking to the group of economically free countries and has been steadily improving its position. Unlike Georgia, Ukraine has remained in the group of economically unfree countries due to its unbalanced reforms, insufficient institutional and structural changes. Therefore, these factors prevented the country's policy-makers from ensuring the desired effect from the tax burden reduction.

Future research should include a more in-depth comparative analysis of the tax reforms in Ukraine and Georgia, focusing on the key taxes.

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The Impact of Tax Reforms on the Behaviour of Economic Agents (Indirect Taxation in Russia and the USA)

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ABSTRACT

The "turnpike hypothesis" proposed in this article suggests that the trajectory of GDP growth rates is a "turnpike", which attracts tax revenues of any type. A significant deviation of the rates of tax revenue growth from the turnpike means that this tax has grown unresponsive to the dynamics of the global tax base – GDP. To test this hypothesis, the authors introduce the indicators of surplus return and volatility of tax revenues, which leads them to narrowing the definitions of such terms as budget orientation and efficiency of taxes. To analyze the behaviour of economic agents, the authors construct econometric dependencies of three indirect taxes (VAT, customs duties and excise taxes) on the tax rate (tax burden), GDP and the population income. For the VAT, the tax burden was its nominal rate; for excise taxes, the share of excise taxes in the retail turnover; for customs duties, the share of customs duties in the foreign trade turnover. The resulting models were used to calculate the elasticity of tax revenues, GDP and population incomes with respect to the tax burden, which is equivalent to the analytical expression of the way the three participants of the economic system – state (public budget), producers (business) and consumers (population) – react to the tax burden. To analyze the analytical coefficients and econometric models, the authors used the statistical data of Rosstat for Russia and of the OECD for the USA for the period between 1995 and 2017. The calculations show that the Russian and American tax systems contain taxes that are "insensitive" to economic growth. In Russia, these include the natural resource extraction tax, customs duties and contributions to extra-budgetary funds, and in the USA, excise taxes, property tax and customs duties. The study shows that the Russian economic crises in 2008 and 2014 had a remedial effect on the country's tax system and helped it get closer to the turnpike of economic growth. The model calculations of the three kinds of elasticity showed that an increase in the VAT tax rate reduced the activity of the three participants of the economic system while an increase in the excise or customs duty burden, on the contrary, enhanced their activity. The conclusion is made that the turnpike hypothesis is confirmed for the majority of taxes both in Russia and the USA. It is also shown that those taxes for which the hypothesis is confirmed only partially are in urgent need of reformation.

KEYWORDS

tax reform, state budget revenues, economic growth, turnpike principle, economic behaviour

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Влияние налоговых реформ на поведение экономических субъектов (на примере косвенных налогов России и США)

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АННОТАЦИЯ

В статье проверяется гипотеза названная авторами «магистральной». Согласно данной «магистральной гипотезе» траектория темпов роста ВВП является своеобразной «магистралью» и обладает притягивающим свойством для любых видов налоговых доходов. Существенное отклонение темпов роста налоговых доходов от магистрали свидетельствует об отрыве налога от глобальной налоговой базы – ВВП. Для проверки гипотезы введены показатели избыточного дохода и волатильности налоговых доходов. Опираясь на введенные показатели и магистральную гипотезу, авторы дают строгое определение бюджет-ориентированности и эффективности налогов. Для исследования поведения экономических субъектов построены эконометрические зависимости трех косвенных налогов (налог на добавленную стоимость, таможенные сборы и акцизы) от налоговой ставки (налогового бремени), ВВП и доходов населения. Для налога на добавленную стоимость в качестве налогового бремени использовалась его номинальная ставка, для акцизов – доля акцизных сборов в объеме розничной торговли, для таможенных платежей – доля таможенных сборов во внешнеторговом обороте. Построенные модели позволили рассчитать эластичности налоговых доходов, ВВП и доходов населения по налоговому бремени, что эквивалентно аналитическому выражению реакции на налоговое бремя трех участников экономической системы: государства (бюджета), производителя (бизнеса) и потребителя (населения). Для оценки аналитических коэффициентов и эконометрических моделей использовались статистические данные Росстата для России и ОЭСР для США за период 1995–2017 гг. Расчеты показали, что и в России, и в США имеются налоги, крайне слабо реагирующие на экономический рост. Для России это налог на природные ресурсы, таможенные сборы и отчисления во внебюджетные фонды, а для США – акцизы, налог на собственность и таможенные сборы. Показано, что кризисные явления в российской экономике 2008 и 2014 гг. способствовали оздоровлению налоговой системы страны и ее приближению к магистрали экономического роста. Модельные расчеты трех видов эластичности показали, что рост ставки налога на добавленную стоимость снижал активность всех трех участников экономической системы, тогда как рост акцизного и таможенного бремени оказывал на них, наоборот, стимулирующее действие. Сделан вывод, что магистральная гипотеза выполняется для большинства налогов, как в России, так и в США. Обоснован тезис, согласно которому налоги, для которых магистральная гипотеза выполняется в крайне слабой форме, нуждаются в первоочередном реформировании.

КЛЮЧЕВЫЕ СЛОВА

налоговая реформа, государственные доходы, экономический рост, магистральный принцип, экономическое поведение

1. Introduction

Although fiscal systems in almost all countries of the world are relatively stable institutions, at times the need arises to rethink and reform these systems. Such reforms can be more or less large scale but they always have a visible impact on all the participants of the economic system. Therefore, it is necessary to know the focus and intensity of their impact, which makes it crucial to be able to evaluate how the tax burden (tax rates) weighs on the tax base. In many cases this impact is hard to predict even on the qualitative level. For example, depending on the specific situation, an increase in a certain tax rate can be detrimental to economic activity or, on the contrary, enhance it.

In this article we are going to consider an alternative way of evaluating the impact of tax reforms on the economic activity of agents. In doing so, we are trying to address two interconnected tasks – to evaluate the correlation between the national tax system and GDP dynamics and to evaluate the impact of changing indirect tax rates on the behaviour of various economic agents – the state, business and population. Indirect taxes were chosen as the most representative ones due to their close connection with the subject of taxation. The methodology proposed in this article, however, can be applied to direct taxation without any extra adjustments. The proposed approach relies on the idea that an efficient fiscal system should be characterized by more or less synchronous changes in the rate of growth of fiscal revenues and economic growth. The temporal trajectories of the two types of indicators diverge considerably, which reveals the disparity of interests of the state, business and population and, therefore, the inefficiency of the current fiscal policy. Moreover, the divergence of trajectories can be considered as an important element of macro-economic diagnostics.

2. Taxes and economic activity: review of research methods

Changes in budget revenues on different levels are shaped by the fiscal. For example, G. Miles points out that the potential economic growth of any country is determined by the financial resources of the government (budget revenues) and the ways of obtaining and using these resources [1]. An increase in budget revenues can affect the allocation of new state funds, enhance the growth in public spending, contribute to stabilization and intensification of economic activity and the country's economic growth in general.

There is a vast body of research literature analyzing the correlation between taxation and economic growth. Studies of the earlier period used regression models to analyze the impact that the changing tax revenues had on economic growth through public spending in different countries and periods. However, no firm conclusions were drawn about the nature and significance of this correlation. Some studies found no significant correlation between the changes in these indicators [2]; others found a negative correlation between the real GDP growth and public spending [3–5]. E. Engen and J. Skinner analyzed the panel data on 107 developing countries in 1970–1985 and found a negative correlation between the increasing tax revenues and economic growth [6]. There is also evidence showing a negative correlation between the indicators due to an increase in the share of non-production expenses and a positive correlation due to an increase in state investment in the manufacturing sector [7].

Later research, however, has demonstrated the opposite tendencies: for example, J. Andrasic et al. built statistically significant dependencies, which showed that a 1% increase in tax revenues leads to a 0.29% increase in GDP [8]. The study of the relationship between a rise in tax revenues and GDP in Nigeria in 1986–2012 demonstrated a stable positive correlation between these indicators [9]. These findings can hardly be called surprising since the size of the public sector has two opposite effects: on the one hand, higher tax rates can be detrimental to economic activity (Laffer curves), on the other hand, they can also stimulate economic activity by increasing public spending and investment.

Yet another group of studies discussed the impact of taxes on economic growth by focusing on their level or structure (direct vs. indirect). Although the majority of researchers are inclined to agree that the shift from direct taxation (income taxes) to indirect taxation (consumption taxes) enhances economic growth [10], the results acquired so far seem to be quite contradictory: for instance, there is evidence showing that an increase in direct income taxes (personal income tax, property tax, profit tax and so on) has a negative impact on economic growth [11; 12]. Y. Lee and R. Gordon analyzed 70 countries in the period of 1980–1997 and showed that a 10% reduction in the corporate tax rate leads to an increase in the per capita GDP by 0.7–1.1% [13]. Yet another study [14] demonstrated that a reduction in the personal income tax rate results in an increase in the per capita GDP by 1.4–1.8%. There is also evidence of the positive impact of indirect taxes on GDP growth [15; 16].

In [17], however, it is shown that a switch from direct to indirect taxation may have a negative influence on economic growth and exacerbate the economic downturn in EU countries. These findings are based on the results of the aggregative analysis of the EU states for the period of 2000–2014. D.Stoilova and N.Patonov also point out the *greater* economic efficiency of direct taxation for EU countries [18]. J. F. Li and Z. X. Lin analyze the impact of the indirect sales tax on the economic growth in the USA in 1960–2013 and show that, despite certain short-term benefits, in the long run this tax has a negative correlation with economic growth [19]. The negative impact of indirect taxes is also described in [8], showing that a 1% increase in the goods and services tax rate leads to a 0.6% decrease in GDP.

There is also evidence [8; 20] that the application of the direct property tax is conducive to economic growth, although other studies [21] show that this tax has a neutral effect on economic growth.

The analysis of the correlation between taxation and economic growth in Nigeria in 1986–2000 [22] and 1993–2012 [23] demonstrates that the oil tax revenues play a dominant role in the country's economic growth. In Malaysia, the tax structure is prevailed by direct taxes, in particular income taxes, while indirect taxation is less developed [24].

Russian researchers pay much attention to the correlation between taxation and economic growth. For example, it was found that the economic growth in Russia is mostly influenced by the oil prices dynamics (the correlation coefficient is 0.7985) while the correlation between the real GDP and indirect taxes is 0.7937 [25]. The question about the positive or negative impact of indirect taxes (mostly VAT and excises) is directly connected to the problem of social justice and the social effects of taxation. While direct taxes actually reflect the paying capacity of taxpayers and perform a distribution function in society, indirect taxes are regressive in nature and, as a rule, they impose a harsher burden on poorer social groups [26]. It should be noted that this effect is to a greater extent characteristic of flat taxation while progressive taxation has a positive impact on economic growth [27]. On the other hand, an increase in specific indirect taxes, for example, excise duties on tobacco, can contribute to the improvement of public health and enhance state revenues. For instance, an increase in excise taxes in Indonesia by 57% led to a rise in state revenues by 58% and to a reduction in tobacco use by 18% [28]. In Grenada, as a result of a 17% increase in tobacco excise rates, state revenues rose by 8.7% while tobacco consumption fell by 5% [29]. In general, simulation models show that in low- and medium-income countries, a 20% increase in excise taxes on average leads to a 14% rise in state revenues and a 5% drop in tobacco use [30].

Some researchers try to evaluate the outcomes of those tax reform projects that involve substantial adjustments of tax rates. For example, a three-factor model was applied for evaluating the scenarios of the personal income tax reform in Russia, including calculations of the expected impact on budget revenues and social inequality as well as the feasibility of each scenario [31]. The analytical scheme of

this type takes into account the reactions of different economic agents (state and population) to tax stimuli.

Summarizing our literature review, we can make the following conclusions.

First, at the moment there is no agreement about the relationship between taxation and economic growth as it varies depending on the time interval and country.

Second, although researchers tend to consider the impact of tax revenues on economic growth, a considerable body of research focuses on the inverse relationship [32; 33], treating economic growth as the main factor that determines the tax revenue [34].

Third, the analysis of the tax structure shows that indirect taxation is to a greater extent characteristic of developing countries and countries in transition [35] while in EU countries the share of indirect taxes dropped from two thirds to one third in the last hundred years [36]. There is evidence that there is a close connection between the level of a country's development and its tax structure [37], which means that less developed countries are more dependent on foreign trade taxes while developed countries, on income taxes. Russia has also been experiencing the trend of the decreasing importance of indirect taxation: according to Rosstat, the share of indirect taxation was 30.1% in 2017 compared with 38.7% in 2010. This trend is mostly caused by the falling revenues from foreign trade taxes, such as customs duties, due to the sanctions and increased tensions in international relations. Contrary to popular belief in the "stability" of indirect taxes, this situation shows that indirect taxes are subject to external factors.

In view of the above, our further analysis will go in two directions: first, we are going to evaluate the stability and reliability of fiscal instruments by looking at their turnpike properties; second, we are going to analyze their impact on the Russian national economy.

3. Analytical toolkit for the analysis of the turnpike properties of taxes

To study such properties of fiscal instruments as stability, reliability and adequacy we can use a comparatively new concept of efficient fiscal policy described in [38–40]. This concept is underpinned by the idea that a tax system can function efficiently when reactions of taxpayers (production enterprises, businesses) and the state budget all but coincide. The difference in the reactions of the two abovementioned economic agents is estimated by looking at the difference in the values of the Laffer points of the first and second kind. The bigger is the distance between these points, the bigger is the clash of interests of the state and business and the less efficient the fiscal system is.

This principle is applicable to the problem of stability of tax revenues. In this case, we are going to specify our methodological assumptions the following way: *the dynamics of tax revenues should correspond to the dynamics of the tax base*. Therefore, it seems reasonable that the dynamics of the tax base for the whole national economy can be approximated by the dynamics of GDP, which leads us to the following methodological assumption: *the rates of tax revenue growth should correspond to the rates of GDP growth*. In this case, fiscal indicators and GDP will be expressed in current prices, which means that the inflation effect is present in both indicators and can be ignored when comparing them.

Hereinafter we are going to refer to this methodological principle as *the turnpike principle* or the turnpike hypothesis. Such terminology is also related to the fact that the GDP trajectory serves as the turnpike of economic development *while the trajectories of all tax revenues should run parallel to this turnpike*. The deviation degree of the trajectory of tax revenues from the turnpike indirectly reflects how efficient or inefficient the tax is and how sensitive or insensitive is the fiscal system to the activity of economic entities. Although terminology used in this study is not directly connected to the turnpike theory of optimal paths in the models of John von Neumann, some analogy can still be drawn: for example, while Neumann's models consider the optimal paths that parallel the turnpike or the von Neumann

ray, in our case we consider the fiscal trajectories that run near the trajectory of economic growth.

Thus, according to the turnpike principle, all taxes should to a certain extent be connected to the economic activity of the system. The GDP growth rate is the most accurate measurement of economic activity. Even though the tax base is not directly related to GDP, the turnpike principle is still at work here. The only question in this respect is how significant the deviation from this principle should be to remain acceptable. This assumption correlates with the findings of M. Mishustin, who analyzed the factors of tax revenue growth and showed that regardless of the specific factors that affected tax revenues, the latter were still determined by the general geoeconomic situation in the country [41].

Thus, the turnpike principle enables us to build a simple analytical scheme to analyze the turnpike properties of tax revenues. To this end, let us introduce four simple indicators:

$$I = \frac{1}{T}\sum_{t=1}^{T}(\mu_{it} - \lambda_t), \quad (1)$$

$$V = \frac{1}{T}\sum_{t=1}^{T}\left|\mu_{it} - \lambda_t\right|, \quad (2)$$

$$\lambda = \frac{1}{T}\sum_{t=1}^{T}\lambda_t, \quad (3)$$

$$RI = I / \lambda, \quad (4)$$

where λ_t and μ_t are the rate of GDP growth and the *i-th* tax revenue in the *t-th* year respectively; T is the length of the retrospective dataset; l is the mean value of the absolute surplus revenue from the *i-th* fiscal instrument; RI is the mean value of the relative surplus revenue from the *i-th* fiscal instrument; and V is the volatility of the *i-th* tax revenue.

If $RI > 0$, then the trajectory of tax revenues lies above the trajectory of economic growth and there is a surplus tax revenue; if $RI < 0$, then the fiscal trajectory lies below the trajectory of economic growth and in this case we are dealing with the loss of revenue.

The indicator we introduced (4) allows us to classify fiscal instruments according to two turnpike qualities – budget orientation and efficiency. A fiscal instrument is considered *budget-oriented* if it provides positive values of surplus revenue, that is, $RI > 0$; otherwise, a fiscal instrument is called *liberal*. In other words, the rates of growth of a budget-oriented tax exceed those of economic growth. *Efficient fiscal instruments* are characterized by insignificant values of the surplus revenue; otherwise, we shall deem them *inefficient*. To specify this criterion, we shall assume that the value is insignificant if $|RI| = 5\%$. Thus, a tax is considered efficient if it is closely associated with the dynamics of economic growth.

In addition to the classification described above, we can also formulate two criteria of severe inefficiency. The first criterion is that a tax is considered *extremely ineffecient* if the following condition is fulfilled: $|RI| > 20\%$. The second criterion is that a tax is considered extremely inefficient if the following strong or weak condition is fulfilled: $|RI| > V$ or $|RI| \approx V$; this criterion is auxiliary. These criteria are purely empirical but they can still be useful for conclusive diagnostics of the fiscal instruments and their efficiency.

It should be noted that efficiency of a fiscal instrument can be also understood as a manifestation of social justice. For example, if an increase in the tax rate significantly exceeds the growth of the tax base, it is a sign of some ill-considered governmental decision-making in the fiscal sphere, for example, when the government increases the tax burden on economic agents without taking into account the actual situation. Otherwise we are dealing with another kind of injustice, when economic agents are underpaying taxes and the state budget receives less than due.

These concepts are sufficient for our research of the turnpike properties of the current taxes. They also enable us to identify the significant setbacks of the Russian national tax system. Hereinafter we are going to refer to these analytical indicators as turnpike parameters. The properties of the tax system to be studied by applying these parameters will be referred to as turnpike properties.

4. Turnpike properties of fiscal instruments: the case of Russia

To test the methodology described above, we used the annual data provided by the Rosstat for 1995–2018. To calculate the aggregate data on tax revenues and GDP, we used the current prices. The fiscal instruments we are going to consider include ten types of fiscal revenues. Direct taxes include the income tax *(IT)*; personal income tax *(PIT)*; property tax (PT); and natural resource extraction tax *(NRT)*. Indirect taxes include the value-added tax or VAT; excise taxes *(ET)*; customs duties[1] *(CD)*; extrabudgetary payments or contributions to the pension fund (*PC*); health insurance fund (*HIC*); and the social security fund (*SSC*). In our calculations we took into account the functional characteristics of the fiscal instruments. The results are shown in the table below.

Table 1

Turnpike parameters of the Russian tax system

Fiscal instrument	Turnpike parameters	
	***RI*, %**	***V*, %**
Direct taxes		
Income tax	–0.7	17.8
Personal income tax, PIT	7.7	8.6
Property Tax, PT	6.4	17.5
Natural Resource Tax, NRT	42.4	26.4
Indirect taxes		
Value-added tax, VAT	–1.3	9.5
Excise taxes, ET	5.3	18.0
Customs duties, CD	33.7	35.4
Extra-budgetary contributions		
Pension Contribution, PC	–24,8	14.8
Health Insurance Contributions, HIC	58.6	45.2
Social Security Contributions, SSC	–56.5	12.6

Source: Calculated by the authors according to formulae (1)–(4) by using the Rosstat data.

This quantitative evaluation allows us to draw the following matrix to classify the fiscal instruments (see Table 2, the extremely inefficient fiscal instruments are shown in italics).

[1] In Russian statistics, customs duties and levies as well as other revenues from foreign trade constitute one group of revenues – these data are then used for further calculations.

Table 2

Classification of fiscal instruments in Russia

Liberality criterion	Efficiency criterion	
	Efficient	Inefficient
Budget-oriented	–	ET, PT, PIT, CD, NRT, HIC
Liberal	IT, VAT	PC, SSC

Let us now consider these results in more detail.

First, there are no fundamental functional differences between direct and indirect taxes if we apply this approach. For both types of taxes we can distinguish between "efficient/liberal" and "inefficient/budget-oriented". Therefore, from the point of view of their turnpike properties, direct and indirect taxes are virtually equal and neither of the two types is more preferable than the other.

Second, one of the four groups of taxes shown in Table 2 and containing the most productive instruments is empty, which means that at the moment the Russian Ministry of Finance does not have truly efficient instruments for replenishing the state budget. In fact, Russian regulators constantly have to choose between the liberality and efficiency of a fiscal instrument.

Third, Russian tax regulators usually give preference to the budget orientation of taxes rather than their efficiency, which means that they use 20% of the available efficient instruments, and 60%, of the budget-oriented instruments.

Fourth, the Russian taxation system is characterized by an obvious anomaly consisting in two inefficient and liberal payments to extra-budgetary funds. The fact that this structural element accounts for 20% of the given fiscal instruments is alarming.

Fifth, the Russian tax system has already accumulated an extremely large number of inefficient instruments. For example, the share of inefficient instruments in the set we analyzed is 50%, which is a significant figure. All five instruments of this group – the CD, NRT, HIC, PC and the SSC – prove to be extremely unproductive according to both criteria. Furthermore, they are characterized by extremely high

values of the indicator $|RI|$, which means that there is a high level of distortions in the adjustment of the fiscal system to meet the country's actual economic needs. In fact, Russia has several fiscal instruments that are unrelated to the economic activity of the system: CD, NRT and extra-budgetary funds.

Extra-budgetary funds are particularly important in this respect since they reveal the specific characteristics of the Russian tax regulation system oriented towards the "non-economic" ways of replenishing the state budget – through and customs duties. In other words, extra-budgetary funds are no longer connected to the dynamics of economic growth.

In order to understand the drawbacks of the Russian tax system, we need to look at the trajectories of the three groups of fiscal instruments and put them in the context of the country's economic growth (in current prices). Let us look at the following figures.

These diagrams point to the fact that, despite significant deviations of the Russian tax system from the turnpike – GDP – there tend to be less deviations from the turnpike properties. For example, there were two distinct stages in the development of the tax system – before and after the 2008 crisis, both for direct (Figure 1) and indirect (Figure 2) taxes. Before 2008 there were considerable discrepancies between

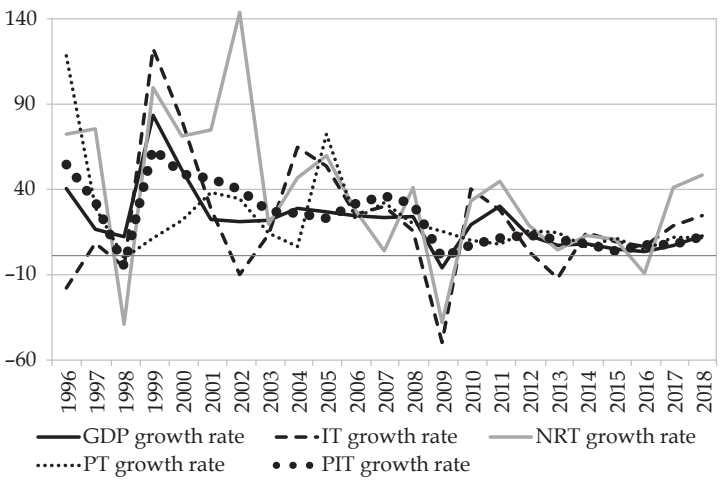

Figure 1. **Trajectories of the rates of growth of direct tax revenues in Russia**

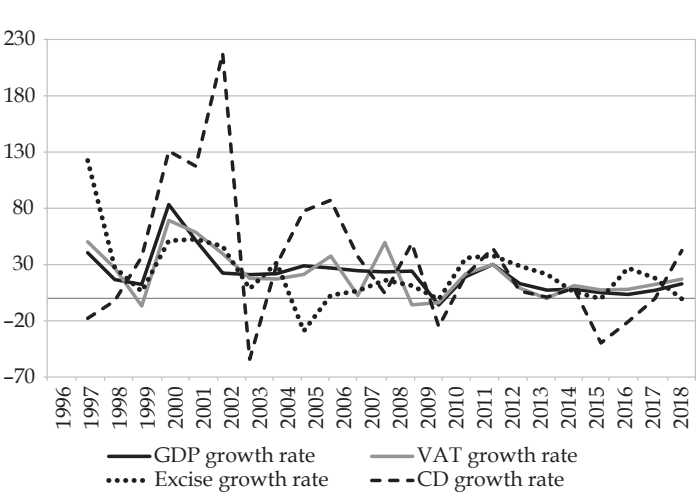

Figure 2. **Trajectories of the rates of growth of indirect tax revenues in Russia**

GDP growth and tax revenues, while after 2008 they tended to synchronize. A similar trend was observed in relation to extra-budgetary funds, although after 2008 the health insurance funds continued to undergo some serious transformations (Figure 3). The tax reforms of 2005–2006 and 2011–2012 disrupted the process of stabilization of extra-budgetary revenues. In general, crises in Russian economy seem to have invigorated the country's fiscal system by improving its turnpike properties.

5. Turnpike properties of fiscal instruments: the case of the USA

In order to gain a better understanding of the turnpike properties of tax systems, let us compare the tax systems of Russia and the USA. First, we are going to calculate the turnpike parameters of the seven taxes applied in the USA for the period from 1995 to 2017. The set of fiscal instruments applied in the USA does not fully coincide with its Russian counterpart but some analogies can still be drawn. We are going to consider the following instruments: the individual income tax (IIT); property tax (PT); corporate profits tax (TPC); sales tax (ST); excise taxes (ET); customs import duties (CID); and social security contributions (SSC).

In our calculations we used the statistical data provided by the OECD (see Table 3).

Table 3

Turnpike parameters of the US tax system

Fiscal instrument	Turnpike parameters	
	***RI*, %**	***V*, %**
Direct taxes		
Corporate profits tax, TPC	4.8	14.0
Individual income tax, IIT	11.6	6.0
Property tax, PT	31.2	3.7
Indirect taxes		
Sales tax, ST	–9.3	1.2
Excise taxes, ET	–74,5	2.7
Customs import duties, CID	–28,6	5.1
Extra-budgetary contributions		
Social security contributions, SSC	–6.5	1.8

Source: Calculated by the authors according to formulae (1)–(4) by using the OECD data.

The results of our calculations lead us to the following conclusions.

First, the turnpike properties of the Russian tax system are generally weaker than those of the USA. For example, the absolute mean value of indicator RI of the tax portfolio in Table 1 is 23.7% while in the USA the similar indicator for the tax portfolio in Table 2 is 25.2%, that is, there is a certain parity in the ways both tax systems are adjusted to react to the dynamics of economic growth. The average volatility (*V*), however, is 20.6% for Russia and 4.9% for the USA, which means that the fluctuations of tax revenues about the

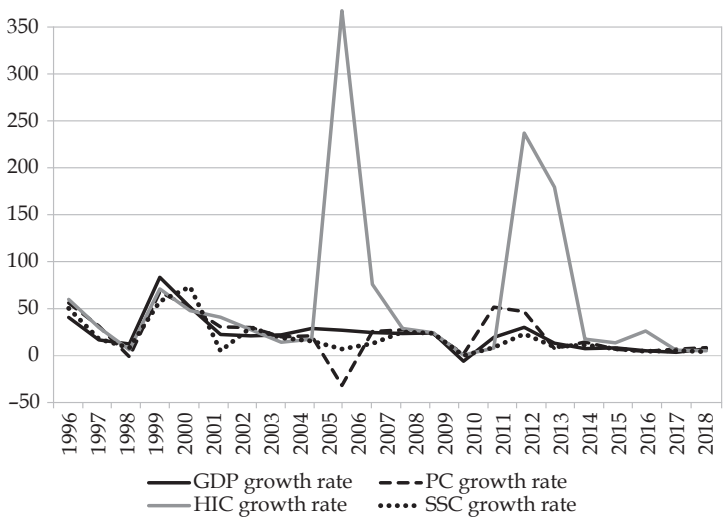

Figure 3. **Trajectories of the rates of growth of extra-budgetary expenses in Russia**

turnpike in Russia is more than five times higher than in the USA.

Second, there is a consistent pattern in the way the turnpike parameters are formed in the USA, while in Russia there is no such pattern. For example, indicator RI in the USA takes positive values for direct taxes and negative for indirect taxes on a regular basis, which confirms the above-mentioned idea that in developed countries direct taxation is preferred to indirect taxation [34]. It should be noted that the USA have broken a local record for indicator RI for excise taxes. This fact means that in the recent decades the US state policy has been aimed towards reducing the burden of indirect taxation and prioritizing direct taxation.

Third, the tax systems of both countries have taxes which are "insensitive" to the economic growth: in Russia, it is the natural resource extraction tax and customs duties while in the USA these are the excise taxes and customs duties. This situation is hardly surprising since these taxes directly depend not only on economic growth but on other kinds of state policy as well. For example, payments for using natural resources are determined primarily by the current economic and environmental situation, excise tax payments – by social imperatives such as the public health imperative and the customs revenues, by global trends in the sphere of foreign trade liberalization and trade wars.

This leads us to an important conclusion that the initial priorities in different kinds of state policy can significantly mitigate the turnpike property of the tax system, which can be considered as natural. In fact, any serious reforms distort the turnpike effects of national taxes.

Table 4

Classification of fiscal instruments in the USA

Liberality criterion	Efficiency criterion	
	Efficient	**Inefficient**
Budget-oriented	TPC	IIT; PT
Liberal	–	ST; SSC; ET; CID

Our classification of the taxes in the USA (see Table 4) shows that few fiscal instruments can be considered efficient, which is true not only for the Russian but also American economy. According to the available data, the only tax that qualifies as efficient/budget-oriented is the corporate profit tax. This conclusion correlates with the results of B.Kalas et al., who showed that in the USA, the TPC is one of the key taxes affecting economic growth [42]. This study also provided evidence that taxes like the IIT do not influence significantly the country's economic growth. In this respect, the ITT is even less important than the SSC, whose share in the US tax structure is considerably smaller.

Similarly, American taxes can be budget-oriented, but this quality is not universal. Thus, tax systems of any countries face a number of problems while trying to maintain a close relationship with economic growth.

6. The VAT reform and its impact on the national economy

The main focus of tax reforms tends to be the changes in the tax burden, in particular, various tax rates. In practice, however, what matters is how the tax reform affects the behaviour of the economic system and its three core components – the budget (state), producers (business) and consumers (population). As it will be discussed below, in certain cases this task has an analytical and numerical solution.

The general approach to this task is to assume that the budget system has a turnpike property, which can manifest itself to a greater or lesser degree. This assumption can be further specified by constructing econometric dependencies of tax revenues on tax rates and tax base. For the latter, we use different statistical aggregates. If the turnpike property of budget and extra-budgetary revenues manifests itself clearly enough, the above-mentioned econometric dependencies can be constructed, which allows us to measure the impact of tax reforms on the national economy. Otherwise, such dependencies cannot be constructed, which, in turn, will make it difficult to evaluate the effect of these reforms. We are going to consider three types of elasticity at a given tax rate – the tax revenues and tax base of physical and

legal entities – as a set of tools used by a tax reform to affect the economy.

For a more accurate picture let us consider the current indirect taxes in Russia, starting with the value-added tax (VAT).

To reveal the connection between the budget revenues from the VAT and the VAT rate we are going to build an econometric model for the interval between 1995 and 2018 based on the Rosstat data (Table 5) in the multiplicative form:

$$T_{VAT} = \beta + \alpha \cdot GDP, \quad (5)$$

where α and β are the parameters of the model.

In its final form, this econometric model looks the following way:

$$T_{VAT} = \underset{(2.393)}{35.092} + \underset{(6.846)}{0.231}(q \cdot GDP), \quad (6)$$

$N = 22$; $R^2 = 0.70$; $DW = 2.00$; $A = 8{,}76\%$,

where T_{VAT} is the annual VAT revenue deflated by the deflator; q is the nominal VAT rate, which, until the end of 2003, was 20% and in 2004 was reduced to 18%; GDP is the annual GDP deflated by the deflator. The *t*-statistics are given in parentheses below the regression coefficients; A is an approximation error (in percentage); the rest of the nomenclature is standard.

All the statistical characteristics of model (6) are satisfactory, which means that it can be used for further calculations. We decided to use aggregates expressed in comparable prices because the current prices contain an inflation component, which, when we are dealing with large values, creates unnecessary information noise and makes it difficult to establish the statistical relations between the variables. In Russia, the inflation noise in the given interval was so significant that it prevented us from building an econometric dependency, which is why we used the deflation procedure. As for the multiplicative form of model (6), it should be said that it is quite natural, especially if we take into consideration that fiscal revenues are formed through

Table 5

Initial data for building models (6) and (8)

Years	GDP, bln rbs (current prices)	T_{VAT}, bln rbs (current prices)	INC, bln rbs (current prices)	Deflator (against the previous year), %	VAT rate (*q*)
1996	2007.8	143.9	1357.1	145.8	0.20
1997	2342.5	182.8	1656.4	115.1	0.20
1998	2629.6	170.3	1776.0	118.6	0.20
1999	4823.2	288.2	2908.1	172.5	0.20
2000	7305.6	457.3	3983.9	137.6	0.20
2001	8943.6	639.0	5325.8	116.5	0.20
2002	10830.5	752.7	6831.0	115.6	0.20
2003	13208.2	882.1	8900.5	113.8	0.20
2004	17027.2	1069.7	10930.0	120.3	0.18
2005	21609.8	1472.3	13819.0	119.3	0.18
2006	26917.2	1511.1	17290.1	115.2	0.18
2007	33247.5	2261.7	21311.5	113.8	0.18
2008	41276.8	2132.5	25244.0	118.0	0.18
2009	38807.2	2050.3	28708.4	102.0	0.18
2010	46308.5	2498.6	32498.0	114.2	0.18
2011	60282.5	3250.8	35649.0	115.9	0.18
2012	68163.9	3546.1	39904.0	109.1	0.18
2013	73133.9	3539.4	44650.0	105.4	0.18
2014	79058.5	3940.2	47919.0	107.5	0.18
2015	83094.3	4233.9	53526.0	107.6	0.18
2016	86014.2	4571.4	54117.0	103.2	0.18
2017	92101.3	5137.6	55368.0	105.4	0.18
2018	103875.8	6017.0	n/a	110.3	0.18

Source: Rosstat.

multiplication of the tax rate and the tax base. In this case, we use GDP as the general aggregate, which serves as a proxy variable for the tax base of the national producer. It should be noted that our attempts to build a model in the additive form with a linear division of the effects of the tax rate and the tax base failed to yield any positive results.

Our goal is to identify the impact of VAT liberalization (a one-time reduction in the tax rate by 2 percentage points) on the budget and producers, that is, on state and business revenues. This impact can be measured with the help of standard elasticity indicators such as the elasticity of the VAT revenue at the rate of VAT (E_{VAT}) and the GDP elasticity at the rate of VAT (E_{GDP}). It is not hard to find the elasticity of the tax revenue, which can be calculated in the discrete form as a mean value for the whole period of research $E_{VAT} \approx (\Delta T/T)/\Delta q/q)$. Taking into account the form of this relationship (5) and the fact that a change in the tax rate influences not only the state revenue ($T_{VAT}(q)$) but also GDP ($GDP(q)$), we can write the following expansion for the elasticity of tax revenues:

$$E_{VAT} = (1 - \beta / T_{VAT})(1 + E_{GDP}). \quad (7)$$

If we know the value of elasticity E_{VAT}, we can use equation (7) to get the value of elasticity E_{GDP}.

The results of our calculations of the effect the VAT has on the state and business are shown in Table 6. In our calculations, we used the mean value of T_{VAT} for the given period.

Table 6

Reaction of Russian economic agents to the VAT reform

Economic agent	Activity index	Elasticity parameter	Elasticity value
State	Tax revenue	E_{VAT}	–0.33
Business	Production output	E_{GDP}	–1.45
Population	Monetary income	E_{INC}	–1.47

To show the correlation between the VAT revenue, tax parameters and consumer behaviour, we shall rely on the initial data shown in Table 1 and build an econometric model for the interval 1995–2017 by using the Rosstat data in the previously applied multiplicative form:

$$T_{VAT} = \underset{(3.165)}{38.931} + \underset{(7.478)}{0.346}(q \cdot INC), \quad (8)$$

$N = 22$; $R^2 = 0.73$; $DW = 1.65$; $A = 7.24\%$,

where INC is the annual population income deflated by the deflator while all the other nomenclature remains the same.

Similar to model (6), where GDP is used as a proxy variable for the reaction of producers (business) to the changing tax burden, in model (8) we use the INC as a proxy variable for the reaction of consumers (population). It is quite obvious that the dependence of the VAT on consumers' income is almost the same as the dependence of the VAT on producers' income. The results of our calculations of the population's income elasticity at the rate of VAT E_{INC} according to formula (7) are shown in Table 6.

Our results concerning the reactions of the three economic agents are quite predictable. As our calculations show, businesses and consumers reacted to an increase in the VAT rate in virtually the same way – by becoming less active. The reaction of the state also falls within the depressed scenario but to a lesser degree than for business enterprises and the population. This observation can be interpreted the following way: an increase in rate q leads to a considerable reduction in the tax base, which cannot be compensated by an increase in this rate and results in a fall in state tax revenues.

The values of the elasticities can be used to evaluate the rates of growth of the three aggregates – VAT revenues (μ_{VAT}), GDP volume (λ_{GDP}) and the population income (λ_{INC}) – resulting from the changes in tax rate q. To this end, let us use formula $\mu_{VAT} = E_{VAT}(\Delta q/q)$ and its equivalents for other characteristics related to rates. We can calculate the effect of the VAT reduction by 2 percentage points in 2004 and the effect of its reverse increase by 2 percentage points in 2019. It is worth pointing out that there is a small asymmetry in the results of calculations due to the changing standard tax rate (Table 7).

Table 7

Effect of the VAT reform in Russia, %

Economic agent	Activity index	Reform scenario	
		Reduced tax rate (–2 percentage points)	Increased tax rate (+2 percentage points)
State	μ_{VAT}	0.03	–0.04
Business	λ_{GDP}	0.15	–0.16
Population	λ_{INC}	0.15	–0.16

These results can be explained by the fact that the growth rates of GDP and population income are more than modest. We should also take into account the fact that a certain instantaneous potential effect is implied when we calculate the corresponding effect. For example, potential GDP growth in 2004, when the VAT rate was reduced, was 0.15%. In all likelihood, however, this effect was not realized within one year but took longer. We suppose that it reached its peak the second or the third year after the tax reform and that afterwards it faded gradually. For example, if we suppose that the impact of the tax reform will be evenly distributed throughout the following fifteen years, it will be vanishingly small – just 0.01% a year. Thus, the stimulus it gives to the Russian economy as a result from the reduced VAT rate would not make a big difference. Similarly, a rise in the VAT rate in 2019 is likely to have only a weak recessive effect which takes time to manifest itself.

It should be noted that in accordance with formula (7), as the tax revenues grow, the elasticity of GDP and population income decrease proportionally. For example, in 2004, when the new VAT rate was introduced, elasticity E_{GDP} was 1.46 and in 2018, 1.41, which means that the effect of the tax reform tends to decrease in the course of time.

7. Customs duty burden and its impact on the national economy

Apart from the VAT reform, there have also been significant changes to the system of customs duties. In order to evaluate the impact of these changes, we can use the same analytical scheme described in the previous section with some minor adjustments.

The peculiarity of customs duties is that this fiscal instrument does not have a single rate but instead includes a large number of percentage rates applied for various imported and exported goods. Therefore, first we need to obtain some kind of generalized measure of the customs duty burden. Let us assume that the tax base for the *CD* is the foreign trade turnover *TT* (export and import). Then, if we convert this statistical aggregate into the national currency by using the average annual exchange rate *k*, we can calculate the average customs duty burden q as a ratio of customs duties T_{CD} (foreign trade revenues) to the trade turnover: $q = T_{CD}/k \cdot TT$.

As in the previous section, in this section we are going to assume that the formation of revenues T_{CD} is determined by the two factors – tax burden q and economic activity measured through GDP. We shall try to build the desired dependency in an additive form:

$$T_{CD} = \alpha + \beta q + \gamma \cdot GDP, \qquad (9)$$

where α, β and γ are the parameters of the model.

The peculiar feature of model (9) is that it clearly distinguishes the effects of the tax base and tax burden. It should be noted that since we failed to construct a satisfactory econometric dependence in a multiplicative form, we have decided to use an additive model instead (9).

As a result of our computational experiments based on the data in Table 8, we have obtained the following econometric model for customs duties:

$$T_{CD} = \underset{(7.719)}{-64.559} + \underset{(19.491)}{970.917} \cdot q + \underset{(6.357)}{0.031} \cdot GDP, \qquad (10)$$

$N = 23$; $R^2 = 0.97$; $DW = 1.93$; $A = 8{,}8\%$.

Characteristics of model (10) are satisfactory, which makes it suitable for use in other analytical calculations. Therefore, as before, we are going to calculate the elasticity of customs duties by using customs duty burden E_{CD} in the discrete form (Table 9). Taking into account the form of this relationship (9), the expression of elasticity of GDP will be as follows:

Table 8

Initial data for building models (10) and (12)

Years	T_{CD}, bln rbs	Export, mln dollars	Import, mln dollars	Exchange rate k	Customs burden q
1995	48.3	78 217	46 709	4.559	0.085
1996	39.7	85 189	46 458	5.218	0.058
1997	38.8	85 096	53 123	5.786	0.049
1998	53.1	71 314	43 579	9.700	0.048
1999	122.6	72 885	30 278	24.620	0.048
2000	266.6	103,093	33 880	28.140	0.069
2001	846.8	99 969	41 883	29.170	0.205
2002	388.8	106,712	46 177	31.350	0.081
2003	505.7	133,656	57 347	30.688	0.086
2004	898.2	181,600	75 569	28.815	0.121
2005	1680.9	241,473	98 708	28.286	0.175
2006	2306.3	301,244	137,807	27.185	0.193
2007	2408.3	351,928	199,753	25.577	0.171
2008	3584.9	467,581	267,101	24.855	0.196
2009	2683.3	301,667	167,348	31.723	0.180
2010	3227.7	397,068	228,912	30.369	0.170
2011	4664.4	516,718	305,760	29.387	0.193
2012	4962.7	524,735	317,263	31.093	0.190
2013	5011.0	525,976	315,298	31.848	0.187
2014	5463.7	497,359	287,063	38.422	0.181
2015	3295.3	343,512	182,902	60.958	0.103
2016	2606.0	285,652	182,448	67.035	0.083
2017	2602.8	357,767	227,464	58.353	0.076

Source: Rosstat.

$$E_{GDP} = \frac{E_{CD} - \beta q / T_{CD}}{\gamma \cdot GDP / T_{CD}}. \qquad (11)$$

To estimate the population's reaction, we apply the following econometric model:

$$T_{CD} = \underset{(6.079)}{-65.879} + \underset{(16.984)}{994.543} \cdot q + \underset{(4.791)}{0.044} \cdot INC, \qquad (12)$$

$N = 23$; $R^2 = 0.97$; $DW = 2.04$; $A = 11.2\%$.

The results of our calculations according to formula (11) are shown in Table 9. As this table illustrates, the functional characteristics of the CD and the VAT as fiscal tools are completely opposite. While for the VAT all elasticities in Table 6 are negative, for the CD in Table 9 they are positive. The latter means that an increase in the customs duty burden does not curb economic activity, as we might have expected, but, on the contrary, enhances it for producers and consumers. This anomalous effect raises some questions but it is congruent with our calculations from the previous sections, which showed that the turnpike property of the CD is extremely weak and that they are to a great extent autonomous from economic growth. Thus, when the customs duty burden increases, producers and consumers try to compensate for their losses by becoming more active.

Table 9

Reaction of Russian economic agents to changes in the CD

Economic agent	Activity index	Elasticity parameter	Elasticity value
State	Tax revenue	E_{CD}	1.53
Business	Production output	E_{GDP}	0.93
Population	Monetary income	E_{INC}	0.99

In order to measure the customs duty burden, we need to take into account the fact that it changes constantly and unpredictably, that is, annually, unlike the VAT

burden, which changed once in a discrete and unidirectional way. Therefore, our results do not show any comprehensive effect of the customs policy on the Russian economy. In other words, since the customs duty burden constantly fluctuates, its changes fail to have a comprehensive effect. For instance, in the given period the range of its fluctuations was 5.8–20.5%. The customs duty burden tended to increase from 2001 to 2014. In 2015, there was a reversal of this trend probably due to the international sanctions imposed on Russia.

To estimate the effect caused by the shifts in the customs duty burden, let us consider the period from 2015 to 2016, when the burden decreased by 2 percentage points. Our calculations of the macroeconomic indicators characterizing the reactions of the state, business and population are shown in Table 10.

Table 10

Effect of the CD tax changes in 2015–2016, %

Economic agent	Activity index	Reduced rate of q (–2 percentage points)
State	μ_{VAT}	–0.29
Business	λ_{GDP}	–0.18
Population	λ_{INC}	–0.19

If we compare the data in Table 7 and 10, we shall see that the impact of the VAT and CD on business and the population expressed in absolute values is comparable while their impact on the state budget differs significantly, which can be explained by the already established fact that the VAT is characterized by a strong turnpike property while for the CD this property is extremely weak.

8. Excise burden and its impact on the national economy

Excise taxes (ET) are an important kind of indirect taxes in Russia. The excise burden in the given period changed considerably. Like customs revenues, excise taxes do not have a single rate but instead their rates are expressed as an amount per unit of goods or as an amount per unit of goods and a percentage of the retail price. Therefore, we are going to estimate the excise burden the same way as we did it with the customs burden: we are going to calculate the mean rate of excise taxes q as a share of excise revenues T_{ET} from the volume of the retail turnover RET, that is, $q = T_{ET}/RET$. The rest of the methodology will remain the same as in the case of customs duties.

The initial data for constructing econometric models are provided by Rosstat and are shown in Table 11. It is easy to see that the mean rate of excise taxes varied within the range from 2.5 to 7.8% of the volume of retail trade, which serves as a proxy variable of the excise tax base.

Table 11

Initial data for building models (13) and (14)

Years	Excise duties, bln rbs (current prices)	Retail turnover, bln rbs (current prices)	Rate
1995	24.0	512.0	0.047
1996	53.4	728.9	0.073
1997	68.1	852.9	0.080
1998	72.2	1042.8	0.069
1999	109.1	1797.4	0.061
2000	166.4	2352.3	0.071
2001	243.3	3070.0	0.079
2002	264.1	3765.4	0.070
2003	347.8	4529.6	0.077
2004	246.9	5642.5	0.044
2005	253.7	7041.5	0.036
2006	270.6	8711.9	0.031
2007	314.4	10869.0	0.029
2008	350.0	13944.2	0.025
2009	347.2	14599.2	0.024
2010	471.5	16512.0	0.029
2011	650.5	19104.3	0.034
2012	837.0	21394.5	0.039
2013	1015.9	23685.9	0.043
2014	1072.2	26356.2	0.041
2015	1068.4	27526.8	0.039
2016	1356.0	28240.9	0.048
2017	1599.5	29745.5	0.054
2018	1589.5	31579.4	0.050

Source: Rosstat.

As a result of our computational experiments, we have built the following econometric dependencies:

$$T_{ET} = \underset{(10.016)}{-29.419} + \underset{(23.441)}{649.830} \cdot q + \underset{(17.509)}{0.014} \cdot GDP, \quad (13)$$

$N = 24$; $R^2 = 0{,}96$; $DW = 1{,}61$; $A = 4{,}4\%$.

$$T_{ET} = \underset{(7.486)}{-33.749} + \underset{(16.989)}{687.155} \cdot q + \underset{(12.088)}{0.024} \cdot INC, \quad (14)$$

$N = 23$; $R^2 = 0{,}94$; $DW = 1{,}35$; $A = 5{,}5\%$.

The models we built have enabled us to identify the parameters of the reaction of the state, business and population to changes in the average excise burden (Table 12) and the correlation between the rates of growth of the corresponding variables and the changes in the average excise rate, for instance, by 2 percentage points (Table 13).

Table 12

Reaction of Russian economic agents to ET changes

Economic agent	Activity index	Elasticity parameter	Elasticity value
State	Tax revenue	E_{ET}	2.12
Business	Production output	E_{GDP}	1.33
Population	Monetary income	E_{INC}	1.18

Table 13

Effects of the changes in the ET burden, %

Economic agent	Activity index	Reduced rate of q (–2 percentage points)
State	μ_{ET}	0.85
Business	λ_{GDP}	0.53
Population	λ_{INC}	0.47

We can see that the changes in the excises and customs duties have a stimulating effect on business and the population. Apparently, in both cases the economic agents are trying to compensate for their losses by increasing their activity. What is interesting is that the three groups of economic agents are much more sensitive towards the average excise burden than that of the VAT or CD. For example, for business the GDP growth rate resulting from the 2-percentage points change in excise taxes is three times higher than if we change the VAT or customs duty burden in a similar way. Such effects can be explained by the much bigger "weight" of each percentage point in the rate for the ET in comparison with the VAT and CD.

Interestingly, all the three elasticities are positive for the ET, their sign is the same as the CD but different from the VAT. This corresponds to the previously established turnpike property for the three taxes: $RI_{VAT} < 0$, $RI_{ET} > 0$, $RI_{CD} > 0$ (Table 1). Thus, in our analysis the turnpike effects of taxes are comprehensive in the sense that they manifest themselves in different aspects depending on the given functional property.

9. Conclusion

The turnpike hypothesis discussed in this paper has led us to the conclusion that in fiscal systems of different countries there always are certain fiscal instruments that are "insensitive" to economic growth. Such instruments perform a purely fiscal function and depend primarily on political imperatives. Nevertheless, even these "insensitive" fiscal instruments respond to the dynamics of economic growth and the reaction of national producers. Our calculations show that not only are "insensitive" taxes characterized by an extremely weak turnpike property but the population and business also prove to be insensitive to changes in the rates of these taxes.

"Insensitive" taxes are detrimental to the efficiency of the tax system and their share in the tax system should be minimized. Therefore, the detection of such "insensitive" taxes will help us tackle the problem of their restructurization and thus balance the interests of different economic agents.

The quantitative evaluation of the reactions of the state budget, business and population to tax reforms given in this article can be used as a preparatory step in the decision-making process. In order to elaborate a more detailed model of a tax reform we need to improve the accuracy of our macro-economic evaluations by taking into account the effects of compensation and substitution. For example, an increase in excises on expensive goods can reduce their consumption and stimulate the consumption of other groups of goods. In a similar way customs barriers to certain groups of goods may lead to an increase in the turnover of other goods.

However, a detailed analysis of these effects falls outside the scope of this paper.

Another issue to be discussed is related to the universality of the turnpike principle. For example, if we assume that the environmental taxes will be raised proportionally to the decrease in the share of pollution-intensive industries and, vice versa, decrease even when GDP is growing on the condition that outdated technologies are being replaced by new, environmentally safe ones. It is true that such local deviations in the dynamics of tax revenues and GDP are possible but we can hardly consider it a realistic scenario that such deviations will persist for many years or even decades. Thus, the turnpike principle can be considered universally applicable despite some possible local deviations. This does not contradict the turnpike hypothesis but expands the scope of our analysis as we are now able to identify the periods when the turnpike principle is not fulfilled, which signifies a clash of interests of different economic agents, for example, business and the state.

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Improving the Efficiency of Anti-Tax Base Erosion Regimes through Tax Modelling

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ABSTRACT
This article describes ways to enhance the efficiency of anti-tax base erosion measures aimed at preventing transnational corporations (TNCs) from shifting their profits from home countries to lower-tax jurisdictions. The research methodology comprises a set of mathematical models applied for a comprehensive analysis of tax planning methods used by TNCs and the counter-methods used by national governments. The models with postulated equilibrium consider tripartite financial structures (consisting of a parent company, a subsidiary in a loyal jurisdiction and an affiliate in an offshore jurisdiction) based on the principle of economic equilibrium in the distribution of incomes of different jurisdictions. The models are parametrized by using the data on tax regimes in different jurisdictions. The computational experiment focused on the tax regimes of a parent jurisdiction (Russian Federation), a typical loyal jurisdiction (Laos) and a typical offshore jurisdiction (British Virgin Islands). Thus, we considered the most important cases in international taxation regarding TNCs' economic interests and the national welfare of the parent jurisdiction. The experiment tested the efficiency of different methods of fiscal regulation of international income and capital flows and showed that although the rules of controlled transactions are considered crucial for countering tax planning, they fail to bring the desired results in contemporary economic reality characterized by expanded international network of financial structures and accelerated growth of digital transactions. Based on our research findings, we formulated the following recommendations. The governments of parent jurisdictions are recommended to extend the rules of controlled transactions and controlled foreign corporations not only to offshores but also to loyal jurisdictions. For the Russian government, it may be effective to test and adopt the rules of secondary adjustments in combination with the rules of controlled transactions and controlled foreign corporations, to lower the rate of the tax on foreign dividends and to make the unreturned foreign dividends exempt from the additional tax should they be repatriated to Russia. Enhanced international cooperation in this sphere can maximize the efficiency of these measures.

KEYWORDS
International taxation, mathematical modelling, transnational corporation, tax planning, controlled transaction, controlled foreign corporation, secondary adjustment

JEL F23, H25, H26

УДК 336.02; 339.54 *Оригинальная статья*

Моделирование налоговых режимов, препятствующих утечке доходов и капиталов из национальной экономики

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АННОТАЦИЯ
Целью статьи является обоснование мер налоговой политики, способных успешно противодействовать утечке доходов и капиталов за рубеж и содействовать их возврату в национальную экономику. Методика исследования базируется на комплексе математических моделей международного нало-

гообложения. Это модели с постулируемым равновесием, в которых рассматриваются трёхсторонние финансовые структуры (с участием дочерней компании в лояльной юрисдикции и аффилированной компании в офшорной юрисдикции), построенные по принципу экономического равновесия доходов территорий. Предложены авторские модели, позволяющие анализировать в комплексе, как методы налогового планирования транснациональных корпораций, так и методы противодействия им со стороны правительств, оцениваемые с позиций национального благосостояния. Для практического применения разработанного подхода выполнена параметризация моделей с использованием данных о налоговых режимах, действующих различных юрисдикциях. В вычислительном эксперименте использованы налоговые режимы материнской юрисдикции (Российская Федерация), типичной лояльной юрисдикции (Лаос), и типичной офшорной юрисдикции (Британские Виргинские острова). Эксперименты заключались в анализе наиболее важных ситуаций, возможных в международном налогообложении с позиций экономических интересов ТНК и с позиций национального благосостояния материнской юрисдикции. В рамках экспериментов были проверены эффективность и конечные результаты применения различных методов налогового регулирования международных потоков доходов и капиталов. Результаты математического моделирования, показали, что правила контролируемых сделок – фундаментальные для противодействия налоговому планированию транснациональных корпораций – плохо работают в условиях разветвлённой международной сети финансовых структур и быстрого роста цифровых трансакций. Исходя из полученных результатов, предложено: распространение правил контролируемых сделок и контролируемых иностранных компаний на лояльные юрисдикции, а не только на офшоры; апробация и введение в РФ правил вторичных корректировок в связке с правилами контролируемых сделок и контролируемых иностранных компаний; снижение ставки налога на дивиденды, получаемые из-за рубежа; освобождение от дополнительного налога на невозвращённые дивиденды в случае их возврата в РФ. Кроме того, сделан вывод о том, что повышение эффективности указанных мер требует углубления международного сотрудничества в этой сфере.

КЛЮЧЕВЫЕ СЛОВА
международное налогообложение, математическое моделирование, транснациональная корпорация, налоговое планирование, контролируемая сделка, контролируемая иностранная компания, вторичная корректировка

1. Introduction

National economic development is affected considerably by the movement of funds belonging to transnational corporations (TNCs). The Fourth Industrial Revolution, commonly described as the new era of cyberphysical systems, with augmented reality merging the digital and physical worlds, makes the struggle for profits, capitals and places of capital deployment even more severe. Developed countries seek to move their knowledge-intensive manufacturing activities back home (the so-called "reshoring") [1], while developing countries of the "workshop of the world" try to retain and increase their productive capacities as well as their profits and capitals. Countries involved in trade wars, which often disguise deeper rivalries in technology and innovation [3; 4], resort to fiscal policy methods.

One of the most recent examples is Donald Trump's tax reform [4], which, among other things, included tax cuts to corporate profits with the maximum corporate income rate lowered from 35% to 21%, tax free repatriation of dividends from foreign subsidiaries and a one-time mandatory tax imposed on deferred foreign income, which wasn't previously taxed in the US [5]. These measures are aimed at reducing the benefits of tax planning and encourage companies to bring their overseas earnings back to the United States [6].

Yet another example is the ongoing tariff war between the USA and China [7], which may have a negative impact not

only on these countries' economies but also lead to a 0.5% output decline in the world by mid-2021 [8].

Accelerated development of the digital economy intensifies cross-border activities involving intangible assets, users of computer networks and business functions, which makes companies less dependent on local staff and more flexible in terms of where they place their servers and other elements of infrastructure[1]. All of the above not only leads to an increased risk of tax evasion[2] [9] but can also significantly affect the basic principles underlying the efficiency of public finance systems in general [10].

Fiscal methods have a considerable impact on international flows of capitals and incomes [11–13] and they need to be further improved in order to deal with the problems of tax base erosion and tax avoidance, especially in developing countries and emerging markets.

The alarming recent decline in investment into the Russian economy (the current level of investment is about 20% of GDP while the required minimum is 25%[3]) has rendered the anti-base erosion measures particularly important.

This problem is exacerbated by the increasingly sophisticated techniques of tax planning used by TNCs. The results of TNCs' tax planning efforts, on the one hand, and governments' measures intended to curtail tax base erosion, on the other, are quite unpredictable. The methods of ex-post analysis and statistical analysis are not suitable in this situation and more complex tools of mathematical modelling are required that would enable us to make ex-ante calculations and work out the possible scenarios in this sphere of economic relations [12; 14–18].

One of the seminal works in this field is the fundamental study of the impact of taxes on direct foreign investment conducted by W.S. Clark for the OECD [12]. This study presents a set of mathematical models based on the average and marginal effective tax rates. These models describe various tax planning strategies used by TNCs and show the outcomes of different corporate income reform scenarios, in particular their impact on the flows of direct foreign investment. American economist Harry Grubert, one of the world's foremost experts in the area of international taxation [14; 15], applied mathematical models to show how multinational corporations used intellectual property to avoid taxes through tax planning schemes. He also assessed the impact of royalties on effective tax rates. M. P. Devereux and R. G. Hubbard [16] proposed enhanced versions of the traditional models of taxation of capital income on foreign direct investment, based on the analysis of marginal investment projects and marginal effective tax rates. Q. Hong and M. Smart [18] discuss optimal taxation in the context of tax havens and describe a general equilibrium model to assess the impact of TNCs' tax planning on optimal corporate tax rates and direct foreign investment. Nevertheless, as the OECD experts point out, the problem is so complex that "more work should be done to investigate the implications of tax planning to forward-looking effective tax rate analysis used to infer tax reform effects on FDI, in particular, by developing the ideas of H. Grubert" [12, p. 23].

The currently used tools of mathematical modelling require further development and improvement in order to keep up with the rapid transformations of international economic relations and tax regimes, which is particularly important if we want to handle the problem of TNCs' tax planning practices in the digital economy. Therefore, the aim of this article is to identify the tax regimes capable of efficiently countering tax avoidance and tax base erosion by applying methods of mathematical modelling specially adjusted to account for this new economic reality.

[1] OECD. BEPS Action 1: Address the Tax Challenges of the Digital Economy. Public Discussion Draft / OECD. 2014. 24 March–14 April, pp. 33–34.

2 France Stratégie. Taxation and the digital economy: A survey of theoretical models. Final report. 2015. February 26. 56 p.

[3] President of Russia. President's Address to the Federal Assembly. 2018. Available at: http://kremlin.ru/events/president/news/56957

The article is structured as follows. The next section presents the research methodology and shows the difference between the proposed approach and those applied in previous studies. The third section contains the statement of the research problem and describes the implementation of the proposed set of mathematical models. The fourth section describes the results of mathematical modelling and provides the economic interpretation of the computational experiments. The fifth section is devoted to the discussion of the research results. In the final section of the paper, some recommendations are provided concerning the necessary adjustments to the national fiscal policy in order to maximize its efficiency in countering tax base erosion and profit shifting.

2. Research methodology

There is a variety of mathematical models to choose from depending on the research question one needs to address: for instance, to evaluate the efficiency of different alternatives of economic policy.

For the purpose of this study, mathematical models can be divided into the following categories:

– according to the way of approaching economic equilibrium – models with computable[4] [12, pp. 155–181; 16; 19] and postulated equilibrium [14; 17; 20; 21];

– according to the types of financial structures – models of bipartite or direct, non-intermediated holding structures [12, p. 123; 20; 21]; models of tripartite structures (involving intermediaries, usually registered in a tax haven)[5] [12, p. 129];

– according to the types of economic equilibrium – models of tax rate equilibrium [20; 21], models of corporate income equilibrium [14; 19]; and models of equilibrium in jurisdictions' incomes [19].

In order to solve our research problem – to describe the national taxation regime which will be able to deal efficiently with the problem of tax planning and the tax base erosion – we are going to use the models with postulated equilibrium that consider tripartite financial structures, that is, the structures including affiliates in offshores (Fig. 1), and equilibrium in the distribution of incomes across different jurisdictions.

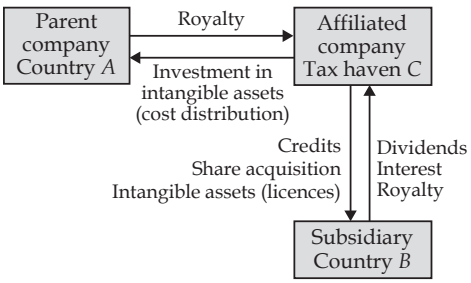

Figure 1. **Illustration of a tripartite TNC structure with a subsidiary and a tax haven affiliate**

Source: OECD (2007). Tax Effects on Foreign Direct Investment. Recent Evidence and Policy Analysis. OECD Tax Policy Studies, No. 17, p. 129.

We have chosen this model type because in this study we don't aim to justify investment decisions and tax optimization from the standpoint of economic entities. Otherwise we would have to take into account such factors as time and place, which are crucial for their decision-making. This study focuses on the general principles of national policy-making in the sphere of international taxation of TNCs and thus is aimed at tackling the problem of tax base erosion and profit shifting. The new tax regime should be well adapted to the "new normalcy" of international economic relations, that is, increased competition for capitals and a wider range of ways of tax avoidance due to the proliferation of cross-border transactions involving digital goods and services.

The proposed approach draws from the ideas and mathematical models developed by renowned specialists in this sphere (D.W. Jorgenson [22; 23], J. Whalley [20; 24], M.P. Devereux [16; 25]; and H. Grubert [14; 15; 26; 27]). The main difference between the proposed approach

[4] OECD. Addressing Base Erosion and Profit Shifting (Russian version). OECD. OECD Publishing; 2013. DOI: 10.1787/9789264201262-ru

[5] OECD. Addressing Base Erosion and Profit Shifting (Russian version). OECD. OECD Publishing; 2013, pp. 91–100. DOI: 10.1787/9789264201262-ru

and its counterparts (see, for example, [14; 20; 21]) is that it considers not only the methods of tax planning applied by TNCs but also the methods of counteracting tax planning applied by national governments (including secondary adjustments)[6] [25]). Furthermore, the outcomes of different policies are assessed not only regarding the interests of economic entities and tax authorities but also the interests of national economies in general (by taking into account the movement of capitals and revenues) and national welfare.

3. Description of the models

To realize the above-described methodological approach, we propose a set of models ranging from the simple to complex ones: we shall start from the mathematical description of the economic relations of ordinary companies belonging to two jurisdictions and finish with complex schemes of interactions of resident companies belonging to jurisdictions of three different types (ordinary, loyal and offshore). In doing this, we are going to take into account the diverse methods of tax planning applied by TNCs and the methods of counteracting tax planning applied by national governments. Tax evasion schemes involving corruption, smuggling and other criminal offences are not going to be considered or modelled in this study.

3.1. Statement of the research problem

There are three tax jurisdictions (three countries): a parent jurisdiction, *A*; a loyal jurisdiction (with liberal anti-offshore legislation), *B*; and a tax haven (offshore jurisdiction), *C*.

There is also a certain TNC – a parent company and a resident of territory *A* (*rA*)(which is, by default, the territory of the given country), where this company operates.

This parent company has a subsidiary (the parent controls more than a half of the subsidiary's stock) on the territory of loyal jurisdiction *B* and an affiliated company on territory *C*. The subsidiary also has an affiliate on territory *C*. Territory *C* is used for concealing income and tax evasion by the residents of jurisdictions *A* and *B* rather than for any real economic activities.

Proceeding from this assumption, we have built a range of scenarios: from the simplest (basic) to more realistic ones, taking into consideration various methods of tax planning and the corresponding countermeasures. The basic scenario involves a bipartite financial structure while more complex and, therefore, more realistic scenarios, tripartite financial structures.

3.2. Basic scenario. Model of a bipartite financial structure investing in fixed assets

The parent company has invested in fixed assets of its subsidiary by purchasing its shares (*S*). The profit obtained by the subsidiary on territory *B* is repatriated in the form of dividends to territory *A*.

Scenario description:

a) The profit of the parent company in territory *A* is subject to taxation with the effective tax rate t_{AA} applied in territory *A*.

b) The profit of the subsidiary in territory *B* is taxed at the effective tax rate t_{BB} applied in territory *B*.

c) The profit of the subsidiary left once the taxes on territory *B* are paid is repatriated in the form of dividends to territory *A* and is subject to the repatriation taxes on dividend payments at the rate $t_{S_{BAB}}$ applicable in jurisdiction *B*.

d) The profit repatriated in the form of dividends to territory *A* is subject to the repatriation taxes on dividend payments at the rate $t_{S_{BAA}}$ applicable in parent jurisdiction *A* (in cases when *A* applies the residence principle).

e) If jurisdiction *A* applies the territoriality principle, then $t_{S_{BAA}} = 0$ (but in this case royalty and interest are usually taxed).

f) If the dividends are not repatriated, then $t_{S_{BAB}} = 0$ (but jurisdiction *A*, according to the residence principle, can charge a tax at the rate of $t_{S_{BAA}}$ on the profit remaining in jurisdiction *B* in order to stimulate the repatriation of dividends).

[6] EY. Transfer pricing secondary adjustments. HMRC consultation. London: Ernst & Young LLP; 2016.

The above-described and following notations are based on the principles described below (Fig. 2):

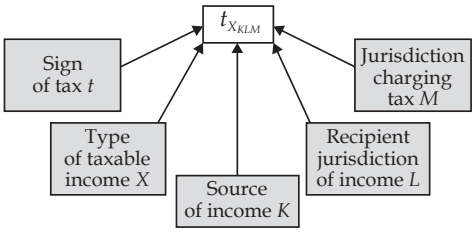

Figure 2. **The general format of notations in the formulae (tax rates are used here as an example)**

The main formula of the basic scenario is as follows:

$$D_A(1-t_{AA}) = D_B(1-t_{BB}) - \\ -D_B(1-t_{BB})t_{S_{BAB}} - D_B(1-t_{BB})t_{S_{BAA}} = \\ = D_B(1-t_{BB})(1-t_{S_{BAB}} - t_{S_{BAA}}). \quad (1)$$

This expression allows us to assess the impact of national tax policies on the behaviour of TNCs. When we plug the actual tax rates of different jurisdictions into formula (1), we can find in which jurisdiction (in this case *A* or *B*), the company's income net of taxation will be higher and, therefore, which jurisdiction will be more profitable for this company's business. If governments do not interfere into activities of economic entities (tax rates are 0%), then we are dealing with a situation of economic equilibrium – investment is equally beneficial in any of the jurisdictions ($D_A = D_B$).

3.3. Complex scenario. Model of a tripartite financial structure shifting profits into a tax haven

This is an expanded model taking into account tax planning methods (transferring a part of the income to tax haven *C* through a resident company in loyal jurisdiction *B*) and counter-measures: controlled transactions (CT) and application of the arm's length principle; controlled foreign corporations (CFC); and secondary adjustments (SA) (for more on secondary adjustments[7]).

[7] EY. Transfer pricing secondary adjustments. HMRC consultation. London: Ernst & Young LLP; 2016.

Its general formula (in a compressed form) looks the following way:

$$D_A^a + D_{CA}^p + D_{S_{AB}}^p + F_{AC} = \\ = D_{S_{BA}}^a + D_{BA}^p + D_{S_{CB}}^p + F_{BC}, \quad (2)$$

where $D_A^a, D_{S_{BA}}^a$ are the net of tax incomes from the active business operations of the parent and its subsidiary on territories *A* and *B* respectively;

D_{CA}^p, $D_{S_{CB}}^p$ are the net passive incomes (presented separately due to the peculiarities of their taxation) of the parent and its subsidiary from affiliates in jurisdiction *C*;

D_{BA}^p, $D_{S_{AB}}^p$ are the net passive incomes obtained by the parent and its subsidiary from each other;

F_{AC}, F_{BC} are the total "grey" incomes (both active and passive) shifted by the parent and its subsidiary to offshore jurisdiction *C* net of taxes on repatriation of passive incomes.

Each element of formula (2), in its turn, has its expanded expression:

1. Net incomes from active business operations of the parent company and its subsidiary in territory *A* (D_A^a) includes the income from territory *C* (D_{AC}^a) net of the "grey" income shifted to offshore jurisdiction *C* (F_{AC}^a) and the taxes paid in territory *A* (T_{AC}^a) plus the money saved through tax planning (T_{AC}^{a+}), with consideration to the counter-measures taken by the national government ($\Delta\varphi_{ACA}$, $\Delta\varphi_{R_{ACA}}$, $\Delta\varphi_{I_{ACA}}$):

$$D_A^a = D_{AC}^a - F_{AC}^a - T_{AC}^a + T_{AC}^{a+} = \\ = \{D_A(1-d_{R_{AB}} - d_{I_{AB}} - d_{R_{CA}} - d_{I_{CA}})\} - \\ -\{D_A\varphi_{AC} + D_A(\varphi_{R_{AC}} + \varphi_{I_{AC}})\} - \\ -\{[D_A(1-d_{R_{AB}} - d_{I_{AB}} - d_{R_{CA}} - d_{I_{CA}})]t_{AA}\} + \\ +\{D_A\Delta\varphi_{ACA}t_{AA} + D_A(\Delta\varphi_{R_{ACA}} + \Delta\varphi_{I_{ACA}})t_{AA}\}, \quad (3)$$

where $d_{R_{AB}}$ is the income (not from active operations) in the form of royalties (*R*) received in territory *A* from territory *B*;

$d_{I_{AB}}$ is the interest income (*I*) received in territory *A* from territory *B*;

$d_{R_{CA}}$ is the income paid in the form of royalties (*R*) from territory *A* to territory *C*;

$d_{I_{CA}}$ is the interest income (*I*) from territory *A* to territory *C*;

φ_{AC}, $\varphi_{R_{AC}}$, $\varphi_{I_{AC}}$ are the "grey" incomes moved by the TNC to jurisdiction *C* by un-

derstating the market cost of goods (transfer pricing), overstating the royalties paid for the use of intangibles and credit interests respectively;

$\Delta\varphi_{ACA} = \varphi_{AC} - \varphi_{ACA}$ are the net "grey" incomes shifted by the TNC to jurisdiction *C* by understating the market cost of goods after country *A* has introduced measures to counter tax planning (φ_{ACA});

$\Delta\varphi_{R_{ACA}} = \varphi_{R_{AC}} - \varphi_{R_{ACA}}$ are the net "grey"' incomes shifted by the TNC to jurisdiction *C* by overstating royalty payments for intangibles after country *A* has introduced measures to counter tax planning ($\varphi_{R_{ACA}}$);

$\Delta\varphi_{I_{ACA}} = \varphi_{I_{AC}} - \varphi_{I_{ACA}}$ are the net "grey" incomes shifted by the TNC to jurisdiction *C* by overstating credit interest payments after country *A* has introduced measures to counter tax planning ($\varphi_{I_{ACA}}$).

2. The net (of tax) income from active business operations of the parent and its subsidiary in loyal jurisdiction *B* looks the following way:

$$D^a_{S_{BA}} = D^a_{BC} - F^a_{BC} - [T^a_{BC} - T^{a+}_{BC}] -$$
$$- [T^a_{S_{BAB}} - T^{a+}_{S_{BAB}}] - [T^a_{S_{BAA}} - T^{a+}_{S_{BAA}}] =$$
$$= \{D_B(1 - d_{R_{BA}} - d_{I_{BA}} - d_{R_{CB}} - d_{I_{CB}})\} -$$
$$- \{D_B\varphi_{BC} + D_B\varphi_{R_{BC}} + D_B\varphi_{I_{BC}}\} -$$
$$- \{[D_B(1 - d_{R_{BA}} - d_{I_{BA}} - d_{R_{CB}} - d_{I_{CB}})t_{BB}] -$$
$$- [D_B\Delta\varphi_{BCB}t_{BB} + D_B\Delta\varphi_{R_{BCB}}t_{BB} + D_B\Delta\varphi_{I_{BCB}}t_{BB}]\} -$$
$$- \{[D_B(1 - d_{R_{BA}} - d_{I_{BA}} - d_{R_{CB}} - d_{I_{CB}})(1 - t_{BB})t_{S_{BAB}}] -$$
$$- [D_B\Delta\varphi_{BCB}(1 - t_{BB})t_{S_{BAB}} + D_B\Delta\varphi_{R_{BCB}}(1 - t_{BB})t_{S_{BAB}} +$$
$$+ D_B\Delta\varphi_{I_{BCB}}(1 - t_{BB})t_{S_{BAB}}]\} -$$
$$- \{[D_B(1 - d_{R_{BA}} - d_{I_{BA}} - d_{R_{CB}} - d_{I_{CB}})(1 - t_{BB})t_{S_{BAA}}] -$$
$$- [D_B\Delta\varphi_{BCB}(1 - t_{BB})t_{S_{BAA}} + D_B\Delta\varphi_{R_{BCB}}(1 - t_{BB})t_{S_{BAA}} +$$
$$+ D_B\Delta\varphi_{I_{BCB}}(1 - t_{BB})t_{S_{BAA}}]\}. \quad (4)$$

3. The net passive income obtained by the parent from its affiliate in an off-shore jurisdiction *C* is as follows:

$$D^p_{CA} = [D^p_{CA} - F^p_{CA} - T^p_{CA}] =$$
$$= [D^I_{CA} + D^R_{CA}] - [F^I_{CA} + F^R_{CA}] -$$
$$- [T^I_{CA} + T^R_{CA}] + [T^{I+}_{CA} + T^{R+}_{CA}] =$$
$$= \{D_{R_{CA}} + D_{I_{CA}}\} - \{D_{R_{CA}}\varphi_{R_{CA}} + D_{I_{CA}}\varphi_{I_{CA}}\} -$$
$$- \{D_{I_{CA}}t_{I_{CA}} + D_{R_{CA}}t_{R_{CA}}\} +$$
$$+ \{D_{I_{CA}}\Delta\varphi_{I_{CAA}}t_{I_{CA}} + D_{R_{CA}}\Delta\varphi_{R_{CAA}}t_{R_{CA}}\}. \quad (5)$$

4. The net passive income obtained by the subsidiary from the affiliate in an off-shore jurisdiction *C* is as follows:

$$D^p_{S_{CB}} = D^I_{CB} + D^R_{CB} - [F^I_{CB} + F^R_{CB}] - [T^I_{CB} + T^R_{CB}] +$$
$$+ [T^{I+}_{CB} + T^{R+}_{CB}] - [T^{I_{CB}}_{S_{BAB}} + T^{R_{CB}}_{S_{BAB}}] + [T^{I_{CB}+}_{S_{BAB}} + T^{R_{CB}+}_{S_{BAB}}] -$$
$$- [T^{I_{CB}}_{S_{BAA}} + T^{R_{CB}}_{S_{BAA}}] + [T^{I_{CB}+}_{S_{BAA}} + T^{R_{CB}+}_{S_{BAA}}] =$$
$$= D_{I_{CB}} + D_{R_{CB}} - \{D_{I_{CB}}\varphi_{I_{CB}} - D_{R_{CB}}\varphi_{R_{CB}}\} -$$
$$- \{D_{I_{CB}}t_{I_{CB}} + D_{R_{CB}}t_{R_{CB}}\} +$$
$$+ \{D_{I_{CB}}\Delta\varphi_{I_{CBB}}t_{I_{CB}} + D_{R_{CB}}\Delta\varphi_{R_{CBB}}t_{R_{CB}}\} -$$
$$- \{[(D_{I_{CB}} - D_{I_{CB}}t_{I_{CB}} - D_{I_{CB}}\Delta\varphi_{I_{CBB}})t_{S_{BAB}}] +$$
$$+ [(D_{R_{CB}} - D_{R_{CB}}t_{R_{CB}} - D_{R_{CB}}\Delta\varphi_{R_{CBB}})t_{S_{BAB}}]\} +$$
$$+ \{[(D_{I_{CB}}\Delta\varphi_{I_{CBB}}t_{I_{CB}})t_{S_{BAB}}] +$$
$$[(D_{R_{CB}}\Delta\varphi_{R_{CBB}}t_{R_{CB}})t_{S_{BAB}}]\} -$$
$$- \{[(D_{I_{CB}} - D_{I_{CB}}t_{I_{CB}} - D_{I_{CB}}\Delta\varphi_{I_{CBB}})t_{S_{BAA}}] +$$
$$+ [(D_{R_{CB}} - D_{R_{CB}}t_{R_{CB}} - D_{R_{CB}}\Delta\varphi_{R_{CBB}})t_{S_{BAA}}]\} +$$
$$+ \{[(D_{I_{CB}}\Delta\varphi_{I_{CBB}}t_{I_{CB}})t_{S_{BAA}}] +$$
$$+ [(D_{R_{CB}}\Delta\varphi_{R_{CBB}}t_{R_{CB}})t_{S_{BAA}}]\}. \quad (6)$$

5. The net passive income obtained by the parent from its subsidiary:

$$D^p_{BA} = D^I_{S_{BA}} + D^R_{S_{BA}} -$$
$$- [T^I_{I_{BAB}} + T^R_{R_{BAB}}] - [T^I_{I_{BAA}} + T^R_{R_{BAA}}] =$$
$$= D_{I_{BA}} + D_{R_{BA}} - \{D_{I_{BA}}t_{I_{BAB}} + D_{R_{BA}}t_{R_{BAB}}\} -$$
$$- \{D_{I_{BA}}t_{I_{BAA}} + D_{R_{BA}}t_{R_{BAA}}\}. \quad (7)$$

6. The net passive income obtained by the subsidiary from its parent:

$$D^p_{S_{AB}} = D^p_{S_{AB}} - T^p_{ABA} - T^p_{ABB} - T^{p_{AB}}_{S_{BAB}} - T^{p_{AB}}_{S_{BAA}} =$$
$$= [D^I_{S_{AB}} + D^R_{S_{AB}}] -$$
$$- [T^I_{I_{ABA}} + T^R_{R_{ABA}}] - [T^I_{I_{ABB}} + T^R_{R_{ABB}}] -$$
$$- [T^I_{S_{BAB}} + T^R_{S_{BAB}}] - [T^I_{S_{BAA}} + T^R_{S_{BAA}}] =$$
$$= \{D_{R_{AB}} + D_{I_{AB}}\} - \{D_{I_{AB}}t_{I_{ABA}} + D_{R_{AB}}t_{R_{ABA}}\} -$$
$$- \{D_{I_{AB}}t_{I_{ABB}} + D_{R_{AB}}t_{R_{ABB}}\} -$$
$$- \{D_{R_{AB}}(1 - t_{R_{ABA}} - t_{R_{ABB}})t_{S_{BAB}} +$$
$$+ D_{I_{AB}}(1 - t_{I_{ABA}} - t_{I_{ABB}})t_{S_{BAB}}\} -$$
$$- \{D_{R_{AB}}(1 - t_{R_{ABA}} - t_{R_{ABB}})t_{S_{BAA}} +$$
$$+ D_{I_{AB}}(1 - t_{I_{ABA}} - t_{I_{ABB}})t_{S_{BAA}}\}. \quad (8)$$

7. The overall amount of the active and passive "grey" incomes shifted by the

parent to offshore jurisdiction *C* net of repatriation taxes on passive incomes:

$$F_{AC} = [(F^a_{AC} - T^p_{ACA} + F^p_{CA})] =$$
$$= [(F^a_{AC} - (T^I_{I_{ACA}} + T^R_{R_{ACA}}) + F^I_{CA} + F^R_{CA})] =$$
$$= \{[D_A\varphi_{AC} + D_A\varphi_{R_{AC}} + D_A\varphi_{I_{AC}}] -$$
$$-(D_A\varphi_{R_{AC}}t_{R_{ACA}} + D_A\varphi_{R_{AC}}t_{R_{ACA}})\} +$$
$$+\{D_{I_{CA}}\varphi_{I_{CA}}\} + \{D_{R_{CA}}\varphi_{R_{CA}}\}. \quad (9)$$

8. The overall amount of the active and passive "grey" incomes shifted by the subsidiary to offshore jurisdiction *C* net of repatriation taxes on passive incomes:

$$F_{BC} = [(F^a_{BC} + F^I_{CB} + F^R_{CB})] =$$
$$= [(F^m_{BC} - (T^I_{I_{BCB}} + T^R_{R_{BCB}}) + F^I_{CB} + F^R_{CB})] =$$
$$= \{[D_B\varphi_{BC} + D_B\varphi_{R_{BC}} + D_B\varphi_{I_{BC}}] -$$
$$-(D_B\varphi_{R_{BC}}t_{R_{BCB}} + D_B\varphi_{R_{BC}}t_{R_{BCB}})\} +$$
$$+\{D_{I_{CB}}\varphi_{I_{CB}}\} + \{D_{R_{CB}}\varphi_{R_{CB}}\}. \quad (10)$$

Unlike the basic model, this model allows us to consider tax planning in all its complexity, including a subsidiary registered in a loyal jurisdiction and having connections with a tax haven. Moreover, with the help of this model we can find out which methods of countering such sophisticated tax planning strategies are likely to be most efficient.

3.4. Complex scenario focused on national welfare. Model of a tripartite financial structure with incomes previously shifted to a tax haven

The above-described scenarios considered models of tax equilibrium regarding the interests of economic entities. However, national economies comprise not only private but also public enterprises financed by taxes. It is obvious that the interests of the states are much wider than those of private economic entities and, therefore, require us to take into account the tax revenues of national governments.

If we formulate our research question in such a way, the logic of mathematical modelling will change: while in the above-described models we focused on corporate income equilibrium regardless of the jurisdiction (and, therefore, regardless of which jurisdiction will benefit from these assets), now we are going to look at the situation from the perspective of the national interests of jurisdiction *A* by taking into account the global incomes of a multinational corporation accumulated within this jurisdiction (including "grey" incomes) as well as tax revenues *T* of jurisdiction *A*.

In this case, the economic equilibrium model will consider the equilibrium of incomes of different territories and the incomes of territory *A* will be calculated the following way:

$$D^c_{ABC} + T =$$
$$= D^a_A + (D^a_{S_{BA}} + D^p_{S_{CB}} + D^p_{S_{AB}} + D^p_{BA}) +$$
$$+D^p_{CA} + T^c_{ABC} - T^{c+}_{ABC}, \quad (11)$$

where D^c_{ABC} is the income from three territories (as distinct from the previous scenarios, which took into account only the company's income from the territory of its registration and tax haven *C*);

$D^a_{S_{BA}}$, $D^p_{S_{CB}}$, $D^p_{S_{AB}}$ are the dividends obtained by the parent from its subsidiary (from active business operations – $D^a_{S_{BA}}$; in the form of passive income – $D^p_{S_{CB}}$, $D^p_{S_{AB}}$).

Taxes *T* charged by state *A* include taxes on incomes from territories *A, B* and *C* and on incomes repatriated to jurisdictions *B* and *C* (T^c_{ABC}), reduced by the sums of payments saved by TNCs as a result of tax planning (T^{c+}_{ABC}):

$$T = T^c_{ABC} - T^{c+}_{ABC} =$$
$$= [(T^a_{AC} - T^{a+}_{AC}) + (T^I_{I_{ACA}} + T^R_{R_{ACA}}) +$$
$$+ (T^I_{I_{ABA}} + T^R_{R_{ABA}})] + [(T^a_{S_{BAA}} - T^{a+}_{S_{BAA}}) +$$
$$+((T^{I_{CB}}_{S_{BAA}} + T^{R_{CB}}_{S_{BAA}}) - (T^{I_{CB}+}_{S_{BAA}} + T^{R_{CB}+}_{S_{BAA}}) +$$
$$+(T^{I_{AB}}_{S_{BAA}} + T^{R_{AB}}_{S_{BAA}}) + (T^{I_{BA}}_{I_{BAA}} + T^{R_{BA}}_{R_{BAA}})] +$$
$$+[(T^I_{CA} + T^R_{CA}) - (T^{I+}_{CA} + T^{R+}_{CA})], \quad (12)$$

where T^a_{AC} signifies the tax revenues of jurisdiction *A* from the active business operations of the parent company;

T^{a+}_{AC} means the losses in tax revenues of jurisdiction *A* from active business operations of the parent company and the passive operations when incomes are shifted from jurisdiction *A* to offshore jurisdiction *C* as a result of tax planning;

$T^I_{I_{ACA}}$, $T^R_{R_{ACA}}$ are the tax revenues of jurisdiction *A* in the form of taxes on re-

patriated passive income (interests and royalties) when the income is paid from jurisdiction *A* to offshore jurisdiction *C*;

$T^{I}_{I_{ACA}}$, $T^{R}_{R_{ABA}}$ are the tax revenues of jurisdiction *A* in the form of taxes on repatriated passive income (interests and royalties) when the income is paid from jurisdiction *A* to loyal jurisdiction *B*;

$T^{a}_{S_{BAA}}$ means the tax revenues of jurisdiction *A* in the form of the tax on dividends from the subsidiary's active business income;

$T^{a+}_{S_{BAA}}$ stands for the losses in tax revenues of jurisdiction *A* in the form of taxes on dividends from the subsidiary's income from active and passive operations when the income is paid from loyal jurisdiction *B* to offshore jurisdiction C as a result of tax planning;

$T^{I_{CB}}_{S_{BAA}}$, $T^{R_{CB}}_{S_{BAA}}$ are the tax revenues of jurisdiction *A* in the form of taxes on dividends from passive operations when the income is paid from offshore jurisdiction *C* to loyal jurisdiction *B*;

$T^{I_{CB}+}_{S_{BAA}}$, $T^{R_{CB}+}_{S_{BAA}}$ are the losses in tax revenues of jurisdiction *A* in the form of taxes on the subsidiary's passive income when the income is paid from offshore jurisdiction *C* to loyal jurisdiction *B* as a result of tax planning;

$T^{I_{AB}}_{S_{BAA}}$, $T^{R_{AB}}_{S_{BAA}}$ are the tax revenues of jurisdiction *A* in the form of taxes on the income from passive operations when the income is paid from jurisdiction *A* to loyal jurisdiction *B*;

$T^{I_{BA}}_{I_{BAA}}$, $T^{R_{BA}}_{R_{BAA}}$ are the tax revenues of jurisdiction *A* in the form of taxes on passive income (interests, royalties) when the income is paid from loyal jurisdiction *B* to jurisdiction *A*;

T^{I}_{CA}, T^{R}_{CA} are the tax revenues of jurisdiction *A* in the form of taxes on passive income (interests, royalties) when the income is paid from loyal jurisdiction *C* to jurisdiction *A*;

T^{I+}_{CA}, T^{R+}_{CA} are the losses in tax revenues of jurisdiction *A* in the form of taxes on passive income (interests, royalties) when the income is paid from offshore jurisdiction *C* to jurisdiction *A*;

$$T^{a}_{AC} = [D_A(1 - d_{R_{AB}} - d_{I_{AB}} - d_{R_{CA}} - d_{I_{CA}})]t_{AA};$$

$$T^{a+}_{AC} = D_A\Delta\varphi_{ACA}t_{AA} + D_A(\Delta\varphi_{R_{ACA}} + \Delta\varphi_{I_{ACA}})t_{AA};$$

$$T^{I}_{I_{ACA}} = D_A\varphi_{I_{AC}}t_{I_{ACA}};\ T^{R}_{R_{ACA}} = D_A\varphi_{R_{AC}}t_{R_{ACA}};$$

$$T^{I}_{I_{ABA}} = D_{I_{AB}}t_{I_{ABA}};\ T^{R}_{R_{ABA}} = D_{R_{AB}}t_{R_{ABA}};$$

$$T^{I+}_{CA} = D_{I_{CA}}\Delta\varphi_{I_{CAA}}t_{I_{CA}};$$

$$T^{R+}_{CA} = D_{R_{CA}}\Delta\varphi_{R_{CAA}}t_{R_{CA}};$$

$$T^{a}_{S_{BAA}} = D_B(1 - d_{R_{BA}} - d_{I_{BA}} - d_{R_{CB}} - d_{I_{CB}})\times$$
$$\times(1 - t_{BB})t_{S_{BAA}};$$

$$T^{a+}_{S_{BAA}} = D_B\Delta\varphi_{BCB}(1 - t_{BB})t_{S_{BAA}} +$$
$$+ D_B\Delta\varphi_{R_{BCB}}(1 - t_{BB})t_{S_{BAA}} +$$
$$+ D_B\Delta\varphi_{I_{BCB}}(1 - t_{BB})t_{S_{BAA}};$$

$$T^{I_{CB}}_{S_{BAA}} = D_{I_{CB}}(1 - t_{I_{ABA}} - t_{I_{ABB}})t_{S_{BAA}};$$

$$T^{R_{CB}}_{S_{BAA}} = D_{R_{CB}}(1 - t_{R_{ABA}} - t_{R_{ABB}})t_{S_{BAA}};$$

$$T^{I_{CB}+}_{S_{BAA}} = (D_{I_{CB}}\Delta\varphi_{I_{CBB}}t_{I_{CB}})t_{S_{BAA}};$$

$$T^{R_{CB}+}_{S_{BAA}} = (D_{R_{CB}}\Delta\varphi_{R_{CBB}}t_{R_{CB}})t_{S_{BAA}};$$

$$T^{I_{AB}}_{S_{BAA}} = D_{I_{AB}}(1 - t_{I_{ABA}} - t_{I_{ABB}})t_{S_{BAA}};$$

$$T^{R_{AB}}_{S_{BAA}} = D_{R_{AB}}(1 - t_{R_{ABA}} - t_{R_{ABB}})t_{S_{BAA}};$$

$$T^{I_{BA}}_{I_{BAA}} = (D_{I_{BA}}(1 - t_{I_{BAB}}))t_{I_{BAA}};$$

$$T^{R_{BA}}_{R_{BAA}} = (D_{R_{BA}}(1 - t_{R_{BAB}}))t_{R_{BAA}};$$

$$T^{I}_{CA} = D_{I_{CA}}t_{I_{CA}};\ T^{R}_{CA} = D_{R_{CA}}t_{R_{CA}};$$

$$T^{I+}_{CA} = D_{I_{CA}}\Delta\varphi_{I_{CAA}}t_{I_{CA}};$$

$$T^{R+}_{CA} = D_{R_{CA}}\Delta\varphi_{R_{CAA}}t_{R_{CA}}.$$

Together the models show the movements of capitals and incomes inside the TNC structure operating in different countries. The company redistributes its incomes among these countries by using methods of tax planning while pursuing its own economic interests. An important factor in the TNC's choice of strategies is the policy of each country in the sphere of international taxation (how efficiently their governments manage to prevent profit shifting). This factor determines changes in the international capital flows and, consequently, the amount and structure of taxes, performance of transnational corporations, and trends in national welfare.

3.5. Implementation of the mathematical models

The mathematical models were calculated by using spreadsheet software Microsoft Excel. First, we checked the models for adequacy (whether the model reacts logically to external regulators such as taxes, tax planning and counter-measures). Second, we designed a program of computational experiments (see Table 1) to investigate the efficiency of different policy measures in this sphere.

The mathematical models were then parameterized, that is, we assigned numerical values to variables. For this purpose we chose the countries which are of particular interest to the Russian Federation as trade partners and those that are often used for tax planning – loyal (Laos, Malta, and Cyprus) and offshore (British Virgin Islands, Panama) jurisdictions (Table 2).

Table 1

Description of computational experiments and their variants

No measures are taken to repatriate the incomes shifted to lower-tax jurisdictions	Corporate profits	**Experiment 1** CFC rules are not applied, the corporate income tax rate is nominal	*A*	
			B	
			Δ between countries *A* and *B*	
		Experiment 2 CFC and CT rules are applied, the corporate income tax rate is nominal	*A*	
			B	
			Δ between countries *A* and *B*	
	National welfare	**Experiment 3** Analysis of the effect of CFC and CT rules at nominal rates of the corporate income tax	CFC rules are not applied	*A*
				B
				C
			CFC and CT rules are applied	*A*
				B
				C
			Δ for country *A*	
		Experiment 4 Analysis of the losses in tax revenues if CFC rules are not applied and the tax rates are effective	100% participation	*A*
				B
				C
			20% participation (avoidance of CFC rules)	*A*
				B
				C
			Δ of country *A*	
Measures are taken to repatriate the incomes shifted to lower-tax jurisdictions	Corporate profits	**Experiment 5** CFC and SA rules are not applied, the corporate income tax rate is nominal	*A*	
			B	
			Δ between countries *A* and *B*	
		Experiment 6 CFC, CT and SA rules are applied, the corporate income tax rate is nominal	*A*	
			B	
			Δ between countries *A* and *B*	
	With respect to national welfare	**Experiment 7** Analysis of the effect of CFC, CT and SA rules if the corporate income tax rate is nominal	CFC and SA rules are not applied in country B	*A*
				B
				C
			CFC, CT and SA	*A*
				B
				C
			Δ for country *A*	
		Experiment 8 Analysis of the losses in tax revenues if CFC and SA rules are not applied and the tax rate is effective	100% participation	*A*
				B
				C
			20% participation (avoidance of CFC, CT and SA)	*A*
				B
				C
			Δ for country *A*	

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Table 2

Characteristics of tax instruments used by specific loyal jurisdictions

№	Jurisdiction (form of company registration)	1		2		3		4		5		6	
		nominal	actual*	nominal	actual	nominal	actual	nominal	actual	nominal	actual	nominal	actual
1	Netherlands (BV)	0.47	–	0.25	–	0	0	0.25	0.25	0.25	0.25	0.15	0.05; 0.15
2	Ireland (Resident Privat LTD)	0.26	–	0.125; 0.25	–	0.13	0.03	0.25	0.25	0.125; 0.25	0.125; 0.25	0.2	0.1
3	Switzerland (AG/SA/LTD)	0.288	–	0.12-0.24	–	0; 0.12–0.24	0;0.07–0.09	0.12–0.24	0.12–0.24	0.12–0.24	–	0.35	0; 0.05; 0.15
4	Switzerland (GmbH/SARL)	0.288	–	0.12-0.24	–	0; 0.12–0.24	–	0.12–0.24	–	0.12–0.24	0.12–0.24	0.35	0; 0.05; 0.15
5	Cyprus (BC)	0.227	–	0.125	–	0	0	0; 0.125	0; 0.125	0.125*0.2	–	0	0.05; 0.1
6	Malta (Private LLC)	0.439	–	0.35	–	0; 0.35	–	0.35	–	0.35	0.125*0.2	0	0.05; 0.1
7	Liechtenstein (AG)		–	0.125	–	0	0	0.125	0	0.125	0	0	0.2
8	Luxembourg (SARL)	0.205	–	0.18	–	0;0.18	0;0.13–0.03	0.18	0.18	0.18*0.2	0.18*0.2	0.15	0.05; 0.15
9	Montenegro	0.221	–	0.09	–	0.09	0	0.09	0	0.09	0	0.09	0.05; 0.15
10	Armenia	0.185	–	0.2	–	0.2	0.15; 0.1	0.2	0.1	0.2	0.2	0.1	0.05; 0.1
11	Moldova	0.405	–	0.12	–	0.12	0.02	0.12	0.12	0.12	0.02	0.06	0.1
12	Kirghizia	0.29	–	0.1	–	0.1	0	0.1	0	0.1	0	0.1	0.1
13	Bulgaria	0.271	–	0.1	–	0;0.1	0	0.1	0	0.1	0	0;0.05	0.15
14	Scotland (LP)		–	0*	–	0*	–	0*	–	0*	–	0*	n/a
15	Laos	0.262	–	0.24	–	0	0	0.24	0.14	0.24	0.24	0.1	0.1

Compiled by using the data: Deloitte. Tax guides and highlights, 2018; Tax Foundation. Designing a Territorial Tax System: A Review of OECD Systems, 2017; PwC. World Tax Summaries. Corporate Taxes 2017/18; EY. Worldwide Corporate Tax Guide, 2017.

As a result, for our computational experiments we selected Russia as a parent jurisdiction, Laos as a typical loyal jurisdiction for opening subsidiaries, and the British Virgin Islands (BVI) as a typical offshore jurisdiction. Instead of these countries we could have used any other countries corresponding to the given types of jurisdictions since in this case what matters is not the intricacies of tax legislations of specific countries but the key factors that determine TNCs' behaviour and efficient policies in the sphere of international taxation.

The purpose of our experiments was to analyze the most relevant situations in international taxation, first regarding TNCs' economic interests and then, regarding the national welfare of the parent jurisdiction. The series of experiments also tested the efficiency of such key methods of tax regulation of international capital flows as CT, CFC and SA in different situations and in different combinations.

4. Modelling results and discussion

The results of the computational experiments are shown in Table 3.

This table contains the description of each experiment and the economic interpretation of its results (regarding corporate economic interests and national welfare) as well as the information about the net (of taxes) incomes allocated to different jurisdictions and the difference (Δ), which is used to check the profitability of investment, including the net income, taxes and "grey" incomes shifted to an offshore.

4.1. Efficiency of controlled transactions (CT) rules

When the government resorts to such tough measures as CT rules, it may be detrimental to the economic interests of TNCs (see Experiment 1 in Table 3).

As the results of our computational experiments have shown, when CT rules are not applied to the subsidiary, the net income of the parent in home jurisdiction (39.6 units) is slightly lower than the income of its subsidiary in Laos (46.0 units), which means that the parent company in Russia may be economically motivated to establish a subsidiary in a loyal jurisdiction (Laos) and use it for its economic activities – debit and credit operations. It thus makes sense for the TNC to engage in tax planning and benefit from the opportunities provided by the offshore jurisdiction (BVI) even though the nominal rate of the corporate income tax in jurisdiction *B* (24%) is higher than in jurisdiction *A* (20%).

It should be noted that the more efficiently the rules are enforced, the less income is left to the company in the parent jurisdiction since these funds are redistributed in the form of tax revenues for the benefit of the government. Consequently, the TNC becomes interested in avoiding the CT rules through expanding its activities in the loyal and offshore jurisdictions to the detriment of the parent jurisdiction. For the government, CT rules may turn into a source of problems since instead of the extra tax revenues the result might be the shrinking tax base and tax revenue losses. This result appears even more disappointing from the perspective of national welfare since the country risks losing capitals (which may entail losses of jobs, production outputs and so on) and tax revenues.

There is yet another important point worth considering. As far as intangible assets are concerned, CT rules usually prove to be ineffective since accelerated digitalization has been changing the principles of price-setting, which means that TNCs will always find ways of shifting a part of their income and avoiding taxes through transfer pricing of intangibles.

4.2. Efficiency of controlled transactions and controlled foreign corporation rules (CT+CFC)

For TNCs the introduction of CFC rules in addition to CT rules (Experiment 2 in Table 3) increases the negative effect since, if these rules are imposed on the subsidiary in the loyal jurisdiction, the offshore company will be also subject to these rules. The result is the fall in the subsidiary's income (redistributed in the form of taxes for the benefit of the parent juris-

Table 3

Results of the computational experiments for the cases of Russia (parent jurisdiction *A*), Laos (loyal jurisdiction *B*) and the BVI (offshore *C*)

Scenarios					Total	Total income					
						net incomes		taxes		"grey" incomes	
						total	including dividends	total	including tax saving	total	including repatriated incomes
No measures are taken to repatriate the incomes shifted to lower-tax jurisdictions	Corporate profits	**Experiment 1**	*A*		77.6	39.6	0.0	–22.4	0.0	38.0	–2.0
			B		85.0	46.0	45.6	–24.6	9.6	39.0	–1.0
			Δ between *A* and *B*		–7.4	–6.4	–45.6	2.2	–9.6	–1.0	–1.0
		Experiment 2	*A*		77.6	39.6	0.0	–22.4	0.0	38.0	–2.0
			B		63.1	24.1	23.7	–36.9	0.0	39.0	–1.0
			Δ between *A* and *B*		14.5	15.5	–23.7	14.5	0.0	–1.0	–1.0
	National welfare	**Experiment 3**	without CFC	*A*	63.0	40.0	0.0	23.0	0	38.0	–2.0
				B	60	45.6	45.6	14.4	–9.6	39.0	–1.0
				C	77.0					77.0	
			CT and CFC	*A*	84.9	40.0	0.0	44.9	0.0	38.0	–2.0
				B	38.1	23.7	23.7	14.4	0.0	39.0	–1.0
				C	77.0					77.0	
			Δ for *A*		–21.9	0.0	0.0	–21.9	0.0	0.0	0.0
		Experiment 4	100% participation	*A*	103.8	60.0	39.6	43.8	–0.7	38.0	–2.0
				B	19.2	0.0	0.0	19.2	–12.7	39.0	–1.0
				C	77.0					77.0	
			20% participation (avoidance of CFC rules)	*A*	71.1	28.3	7.9	42.8	–0.1	38.0	–2.0
				B	51.8	35.8	35.8	16.0	–10.7	39.0	–1.0
				C	77.0						
			Δ for *A*		32.7	31.7	31.7	1.0	–0.6	0.0	0.0
Measures are taken to repatriate the incomes shifted to lower-tax jurisdictions	Corporate profits	**Experiment 5**	*A*		79.6	79.6	0.0	–20.4	0.0	0.0	–40.0
			B		85.0	46.0	45.6	–24.6	9.6	39.0	–1.0
			Δ between *A* and *B*		–5.4	33.6	–45.6	4.2	–9.6	–39.0	–39.0
		Experiment 6	*A*		79.6	79.6	0.0	–20.4	0.0	0.0	–40.0
			B		62.5	62.5	62.5	–37.5	0.0	0.0	–40.0
			Δ between *A* and *B*		17.1	17.1	–62.5	17.1	0.0	0.0	0.0
	National welfare	**Experiment 7**	without CFC and SA in *B*	*A*	101.0	80.0	0.0	21.0	0.0	0.0	–40.0
				B	60.0	45.6	45.6	14.4	–9.6	39.0	–1.0
				C	39.0					39.0	
			CFC, CT and SA	*A*	116.9	80.0	0	36.9	0.0	0.0	–40.0
				B	83.1	60.1	60.1	23.0	0.0	0.0	–40.0
				C	0.0						–80.0
			Δ for *A*		–15.9	0.0	0.0	–15.9	0.0	0.0	0.0
		Experiment 8	100% participation	*A*	141.8	100	39.6	41.8	–0.8	0.0	–40.0
				B	19.2	0.0	0	19.2	–12.7	39.0	–1.0
				C	39.0					39.0	
			20% participation (avoidance of CFC and SA rules)	*A*	109.1	68.3	7.9	40.8	–0.2	0.0	–40.0
				B	51.8	35.8	35.8	16	–10.7	39.0	–1.0
				C	39.0					39.0	
			Δ for *A*		32.7	31.7	31.7	1.0	–0.6	0.0	0.0

diction). In this case, the parent's income in home jurisdiction will remain the same and will be 39.6 units while that of its subsidiary in Laos will fall to 24.1, which means that for the parent it is no longer feasible to open a subsidiary in a loyal jurisdiction, that is, CFC rules are effective in this case. Nevertheless, the same way as with CT rules, the "grey" income shifted to an offshore is not affected by these measures and, therefore, in this case the government fails to prevent profit shifting and tax base erosion. Furthermore, if we look at this situation from the perspective of national welfare (see Experiment 4 in Table 3), these rules do not give any advantage to the parent jurisdiction in comparison with the situation when CFC rules are not applied since an increase in tax revenues is compensated by the decrease in the dividends from the subsidiary (reduced by the amount of difference between the tax calculated according to CFC rules and the tax paid by the subsidiary in the loyal jurisdiction and thus making it possible for the TNC to claim tax relief under the double tax treaty).

Moreover, we should remember that there are means and ways of dodging CFC rules. One of the ways widely used by TNCs is to reduce the de jure (on paper) participation of the parent in the subsidiary's equity to the minimal required level (in Russia – 25% or less), which is detrimental to the national welfare of jurisdiction *A* as the dividends are attributed and paid to other affiliates which buy shares of the subsidiary or are residents of other (usually offshore) jurisdictions.

Our calculations (see Experiment 4 in Table 3) have shown that if country *A* imposes CT and CFC rules on the subsidiary while the TNC tries to dodge these rules, the national welfare of *A* (the sum of tax revenues and net incomes) will fall by 32.7 units due to the drop in the net income of the parent company (from 60 to 28.3) in the form of dividends from the subsidiary (from 39.6 to 7.9). Losses in tax revenues are 1.0 units. Thus, the application of CFC rules in combination with CT rules can bring some paradoxical outcomes: instead of enhancing the country's economic development through efficient anti-base erosion measures, the government may fail to increase the tax revenues and at the same time face a massive outflow of capitals (due to increased hidden incomes in off-shore jurisdictions – in this case up to 77 units).

4.3. Efficiency of controlled transactions, controlled foreign corporation and secondary adjustments rules (CT+CFC+SA)

The application of CFC and SA rules in relation to the offshore will push TNCs towards moving back their now taxable "grey" incomes from the parent's operations with an offshore (see Experiment 5 in Table 3). On the one hand, if we look at it from the perspective of national welfare, it is an obviously positive result. On the other hand, such policy encourages TNCs to compensate for their losses by transferring some of their profits to offshores through a loyal jurisdiction. At the end of the day, this will mean that despite all the harsh anti-base erosion measures applied by country *A* in relation to the offshore, the schemes of tax planning will still be effective because the companies will be realizing them through their subsidiaries in loyal jurisdictions. In this situation, if CFC and SA rules are not applied to the subsidiary in a loyal jurisdiction, the net profits of the parent in Russia (79.6) will be considerably higher than the profits of its subsidiary in Laos (46.0 units), which means that by trying to return the hidden income from the parent's operations with the offshore, country *A* increases its net income. From the company's perspective, however, the net income of its subsidiary in jurisdiction *B* (inclusive of "grey" income) is 85,0 units, which makes a slightly larger sum than the income of the parent company. Moreover, about a half of these funds will be accumulated in the offshore. In other words, if there is only one country engaged in the struggle (Russia) and this struggle is directed only against offshores, these efforts are doomed to failure.

As a logical next step, the government of the home jurisdiction can impose CT, CFC, and SA rules on the parent company's subsidiaries in loyal jurisdictions.

Chances are that such scheme would be effective because in this case the TNC will be unable to resort to tax planning as it is bound by the law in all jurisdictions. As Experiment 8 demonstrates, in the situation similar to that of Experiment 4, TNCs can take measures to counter the government's efforts by de jure (on paper) reducing their participation in the capital of the subsidiary in loyal jurisdiction *B* to the level below 25%. Therefore, the government of country *A* won't be able to impose CFC rules and, consequently, SA rules on the subsidiary.

In this case, there will be a considerable decline in the welfare of territory *A* (by 32.7 units) due to the fall in the net income of the parent company (from 100 to 68.3). The losses in tax revenues of the country in question will be 1.0 units (41.8–40.8). Such negative effect can be explained by the drop in dividends paid by the subsidiary in loyal jurisdiction *B* to jurisdiction *A* (from 39.6 to 7.9).

In other words, if higher-tax parent jurisdiction *A* (Russia) has rigorous anti-offshore legislation, the TNC will be tempted to look for loopholes to avoid CFC and SA rules and operate through loyal jurisdictions (in our case Laos) and still enjoy the opportunity of shifting its "grey" incomes to the offshore (39.0).

Thus, in this scenario, a TNC has five main alternatives to choose from:

1) to accept the "inevitable" and play by the fair rules of the parent jurisdiction;

2) to try to partially compensate for the losses incurred from the imposition of these rules, for example, by using tax planning schemes involving transfer pricing of hard-to-value intangibles;

3) avoid these rules by reducing its participation in subsidiaries and affiliates to less than 25%, which is quite a big risk;

4) de facto reduce its participation in the business to less than 25%, that is, all but withdraw from active business;

5) leave this business altogether.

Which alternative the TNC will go for depends on different factors. From the perspective of national welfare, the first and second alternatives are more preferable but they are not very likely to be the TNC's first choice. It all depends on the impact of other factors, in particular how comfortable and convenient it is for companies to operate in the parent jurisdiction, whether the "rules of the game" are short-lived or not, how well protected are companies' property rights, how favourable is the business climate and how low are the transaction costs for companies to remain competitive in the home market and international markets. If the transaction costs are too high and damage the company's performance, it will probably choose alternatives 3–5, which cannot be considered as a positive outcome in terms of national welfare.

5. Conclusion

In the modern globalized economy, measures to counter tax base erosion and profit shifting to lower- or zero-tax jurisdictions can often bring some unpredictable or contradictory results, in other words, some gain may also entail some loss.

Normally, when approaching this problem, scholars justify the application of such measures in relation to TNCs by pointing out the revenue losses incurred by national governments. However, if we assess the efficiency of such measures not from the fiscal perspective but from the point of view of national welfare, it becomes evident that governments should proceed with extreme caution. Reduction of tax avoidance can be accompanied by a decline in business activity and the shrinking national tax base, which will naturally hamper the country's economic growth.

As the results of mathematical modelling and computational experiments have shown, when seen from the perspective of national welfare, CT rules, meant to curtail tax base erosion, fail to provide the anticipated outcomes when applied within the extensive tax planning network, in particular in the conditions of accelerated digitalization. The same can be said about the combination of CT and CFC rules. All of the above casts doubt on the efficiency of the whole system of countering income concealment and tax base erosion used by national governments.

It doesn't follow, however, that any attempts to improve or develop this sys-

tem need to be abandoned. What it means is that punishments and prohibitions are hardly a panacea, especially if there is a lack of coordination in the efforts of national governments on a higher, international level.

Therefore, the policy makers should be concerned not only with improving national mechanisms of countering base erosion and profit shifting (the negative stimuli) but, first and foremost, with creating positive stimuli – favourable conditions for retaining the capital in the long run such as a good investment climate, low business transaction costs, economic incentives for innovation based on territorial and technological principles, and so on.

The Russian government seeks to address these problems by creating stimuli for foreign investors, although there is still a long way to go in this respect since in the Corruption Perceptions Index Russia is at the bottom of the list.

As for international economic relations, the following recommendations can be formulated. An efficient fiscal policy should be aimed at a slow, gradual change rather than at a radical breakthrough.

1. All the key policy measures should be thoroughly tested before being implemented and the reactions of economic entities to these measures should be monitored.

2. Another important requirement is transparency in tax regulation: the lack of transparency creates an atmosphere of distrust and suspicion. In this case, investors will either find ways to avoid taxes or leave the jurisdiction and/or business altogether. Therefore, a fiscal policy, in the way similar to a monetary policy and its forward guidance tool [28], should ensure efficient communication between the central fiscal authorities and taxpayers about the future course it is going to take.

3. It is important to enhance mutually beneficial international cooperation in the sphere of taxation based on the shared understanding of the fact that policies limited to one national territory *cannot be* effective in the modern globalized and digitalized world where cross-border transactions involving digital goods and services are becoming widely spread as well as the use of loyal and offshore jurisdictions.

We would also recommend the Russian government to focus on the following policy areas*:*

1) bring CT rules for digital transactions in accordance with the BEPS requirements[8], since CT are crucial for countering transfer pricing – the core of tax planning;

2) extend CFC and CT rules not only to offshores but also to loyal jurisdictions;

3) test and introduce SA rules in combination with CFC and CT rules in the Russian Federation;

4) lower the foreign dividend tax rate; introduce exemptions from the additional tax on unreturned dividends should they be repatriated to Russia;

5) improve the mechanisms for identifying the real beneficiarity and enhance international cooperation in this sphere.

If such principles and recommendations are implemented, they will stimulate investment into Russian economy and stimulate the country's socio-economic development in general.

[8] OECD. BEPS Action 1: Address the Tax Challenges of the Digital Economy. Public Discussion Draft / OECD. 2014. 24 March–14 April.

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The Impact of 2009 VAT Reform on Enterprise Investment and Employment – Empirical Analysis Based on Chinese Tax Survey Data

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ABSTRACT

The article analyzes the impact of the 2009 VAT reform in China on investment and employment. This reform was a key step in improving the VAT tax system in the long term, and one of the key measures to structurally reduce taxes in response to the global financial crisis in the short term. The data for this analysis were provided by the "National Tax Survey" jointly conducted by the Chinese Ministry of Finance and State Administration of Taxation. We measured the impact of the VAT reform using the difference-in-differences method: we compared the difference between the experimental group and the control group before and after the reform. There were two kinds of organizations in our control group. The first kind consisted of enterprises that did not pay the VAT and small-scale VAT-paying enterprises that did not subtract the input taxes for fixed assets investment. The second kind comprised organizations that had not been included in pilot experiments before 2009 and foreign-invested corporations that were allowed to deduct the input tax for fixed asset investment before and after 2009. The experimental group consisted of ordinary VAT-paying enterprises that had not been included in the pilot study before 2009 and were affected by the 2009 reform. Our estimations lead us to the conclusion that the VAT tax reform of 2009 significantly enhanced the companies' physical investment in machinery and equipment, but had no impact on employment. When comparing physical investment and employment in 2007 with 2008 and 2009, we detected a downward trend, which may reflect the impact of the global financial crisis on Chinese business. The total corporate profits and profit margins have little impact on business investment and employment, while the asset size and the tax burden show a significant positive impact. Thus, the reform significantly increased business investment in fixed assets, but had no obvious effect on employment.

KEYWORDS

value-added tax reform, investment in fixed assets, employment, difference-in-differences method

JEL H22, H25

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Влияние Китайской реформы налога на добавленную стоимость 2009 года на инвестиции и занятость – эмпирический анализ данных Национального налогового исследования

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АННОТАЦИЯ

В статье анализируется влияние реформы налога на добавленную стоимость, проведенной в Китае в 2009 г., на инвестиции и занятость. В долгосрочной пер-

спективе реформа должна была кардинально улучшить налогообложение добавленной стоимости, а в краткосрочной – ответить структурным снижением налогов на глобальный финансовый кризис. Использованы данные «Национального налогового исследования» проводимого совместно Министерством финансов Китая и Государственной налоговой администрацией. Влияние реформы НДС оценивалось методом «разность-в разностях», путем сравнения экспериментальной и контрольной групп до и после реформы. В контрольную группу были включены два вида организаций. Во-первых, неплательщики НДС и мелкие налогоплательщики, не применяющие вычет входного НДС по инвестициям в основной капитал. Во-вторых, организации, включенные в пилотный эксперимент по НДС до 2009 г. и корпорации с иностранными инвестициями, которым было разрешено вычитать входящий налог для инвестиций в основной капитал до и после 2009 г. В экспериментальную группу включены обычные организации – плательщики НДС, которые не были включены в пилотный эксперимент по НДС до 2009 г., на которых реформа НДС оказала свое воздействие. На основе проведенной оценки был сделан вывод, что реформа НДС значительно увеличила объемы инвестиций в машины и оборудование, но не оказала воздействия на занятость. При этом, сравнение физических объемов инвестиций и занятости в 2007 и 2008–2009 гг. показывает тенденцию показателей к снижению, что отражает влияние на китайский бизнес глобального финансового кризиса. Общая корпоративная прибыль и маржинальная прибыль мало повлияли на инвестиции и занятость, в то время как величина активов и налоговая нагрузка оказали на них значительное положительное влияние. Основным выводом исследования является то, что реформа повлияла на существенное увеличение инвестиций бизнеса в основной капитал, но не оказала заметного влияния на занятость

КЛЮЧЕВЫЕ СЛОВА
реформа налога на добавленную стоимость, инвестиции в основные средства, занятость, метод разность-в разностях

1. Introduction

Before 2009, China's value-added tax was different from that in other countries. In brief, China's value added tax (VAT) system was a production-type VAT that did not allow the deduction of input value added taxes for investment in fixed assets. After many years of pilot experiments starting in 2004, China introduced on January 1, 2009 a nationwide VAT reform, which allowed business investment input value added taxes in machinery and equipment to be deducted from output value added taxes, but not in plants, buildings and other real estate.

On the background of 2009 VAT reform, this paper will figure out how the tax policy change will affect enterprises behavior. From a global perspective, value-added tax has expanded rapidly in just 65 years since its birth in France in 1954 and more than 140 economies have introduced VAT [1, p. 1]. As the currently largest tax category in China, VAT has undergone the process from pilot, establishment to transformation during the 40 years.

After the reform and opening up, in order to establish a main tax system which is compatible with the market economy, China introduced the VAT pilot in 1979 [2, p. 64]. And in the second phrase of "replacement of profit by tax" in 1984, the value-added tax has been separated from industrial and commercial tax. But the tax base was only the sale of some industrial products in the industrial sector.

In 1994, China implemented a tax-sharing reform. At the same time, the VAT tax system was formally established, which expanded the scope of VAT and adopted the system of invoice deduction. This system allowed the raw materials and other intermediate inputs to be included in the VAT deduction chain but excluded the enterprise's fixed asset investment input. However, this production-type VAT was relatively rare in the world. Under the national conditions in 1994, there were two main reasons for the adoption of the production-type VAT tax system [3, p. 37]: one is to dampen the overheating economy by restricting investment expansion;

the other is to guarantee the stability of fiscal revenue.

However, problems such as repeated taxation, uneven tax burden, and suppression of investment in fixed assets of enterprises became increasingly prominent in production-type VAT. It had always been an important task to change the production-type VAT to the internationally accepted consumption-type VAT in China's tax reform. The government followed the way of gradually-advanced reform [3, p. 38]. In 2004, China began the pilot reform of VAT in eight industries of the three northeastern provinces. The specific method was to allow the enterprise machinery and equipment investment in the input tax to be included in the VAT deduction chain. In 2007 and 2008, the "VAT Transformation Reform" program was promoted in 26 old industrial base cities in six provinces of central China, five cities in Inner Mongolia, and severely affected areas by earthquake in Sichuan. It can be seen that during this period, the "VAT reform" pilot was a regional preferential policy. Since January 1, 2009, China has fully implemented the "VAT Reform" in all regions and industries across the country. However, it should be noted that China's VAT reform has not completely changed the VAT tax system to the internationally accepted "consumption-type VAT", which is mainly reflected in the fact that the input tax on fixed assets investment in plants, buildings or other real estates is still not allowed to be deducted. So China's VAT system after the reform can only be called "half consumption-type VAT" [4, p. 43].

After two years, the Chinese government introduced a policy of replacing the business tax with VAT. After the tax reform in 1994, the value-added tax base was mainly limited to the industrial sector, while most service sectors implemented business tax. For the VAT not covering all industries, the breaking of VAT deduction chain and repeated taxation cannot be ignored [5, p. 36]. In 2012, the replacing BT with VAT reform was first piloted in Shanghai's transportation industry. In August 2013, "one (the transportation industry) plus six (six modern service industries)" pilot became a nationwide reform. By the end of 2015, the tax base of VAT covered all the service industries.

For the VAT reform of China, the reform of 2009 was China's most important tax reform in recent years. First, the proportion of VAT tax revenue in China's total tax revenue had been more than 40% [6, p. 18]. Secondly[1], the reform cut so much tax revenue that in 2009 tax revenue was estimated to drop by more than 140 billion, i.e. 2.35% of the total national revenue. Moreover, the reform was a key step in improving VAT tax system in the long term, and one of the foremost measures to structurally reduce taxes in response to the global financial crisis in the short term.

What is the impact of the reform on enterprises' behavior, especially during the global financial crisis? Did the reform promote the enterprises' fixed assets investment? Would it affect employment? All these questions drew the attention of the public and the Chinese decision-makers.

The paper is organized as follows. The next section presents the literature review. And the third section introduces the data and the method of analysis. The forth section of the paper presents the main results and discusses the possible problems. The last part concludes.

2. Literature Review

The impact of tax incentives for business investment is a hot topic in the academic literature. According to the new classical theory [7, p. 392; 8, p. 5; 9, p. 1306], since tax policy changes the marginal cost of fixed-asset investment, it significantly affects business investment. Many people tested this conclusion when some countries changed their tax policies. Cummins et al's [10, p. 237] study on 14 OECD member countries found that the conclusion was valid for almost all countries. Cummins, Hassett and Hubbard [11, p. 5] used aggregate and macro-level data to study the tax reform in the United States

[1] Data source: http://www.gov.cn/2010lh/content_1550075.htm

between 1962 and 1988, and found that tax incentives had a strong impact on the level of business fixed investment. House and Shapiro [12, p. 35] studied the tax incentive policy by price data on 2002 bonus depreciation in the United States, and concluded that the policy noticeably increased investment in types of capital that benefited substantially from bonus depreciation and increase the employment. Cohen, Hansen and Hassett [13, p. 465] also found that the depreciation allowances increases the incentive to invest in equipment significantly. However, in Hassett and Hubbard [9, p. 1338] and Auerbach and Hassett's [14, p. 248] overview the conclusion differed depending on the specific situation. And Yagan [15, p. 3531] used corporate income tax data to test the 2003 dividend tax cut in US but found no promotion effect on corporate investment.

Compared with a focus on the income tax policy such as investment tax credits, depreciation policy changes and additional depreciation, VAT reform in China is to increase business investment deduction in the field of consumption tax. Before 2009, China conducted a pilot VAT reform in three provinces in the Northeast in 2004, and in 28 cities in six central provinces in 2007. Theoretically, this reform should reduce the investment cost of machinery and equipment, and thus promote corporate investment; plant and building investment may be accompanied by machinery and equipment investment but may be replaced under tax incentive, so the impact of the reform on plant and building type investment is depend on the relative size of expansion effect and substitution effect; nevertheless because of the combined income and substitution effects, the reform's impact on employment is controversial. According to the CGE simulation analysis of Chen et al [16, p. 29], the VAT reform in China played a limited role in increasing investment and had a great negative impact on employment. While Li and Li [17, p. 26] researched the 2004 pilot found the tax reform pilot lowered the corporate tax burden and increased the fixed-asset investments. Nie, Fang and Li [18, p. 445] studied the three northeastern provinces and found that there were both a significant increase in the fixed-asset investment and a decrease in the employment after the reform. Nie and Liu's finding [19, p. 1] on the six central provinces revealed a significant promotion on both investment and employment. Cai and Harrison [20, p. 23] came to the conclusion that, while the reform seldom increased investment, it had a great negative effect on employment. Overall, there was a lack of consensus about the impact of the VAT reform.

For the policy of "replacing BT with VAT" in 2012, there are many empirical studies evaluating the effect of the reform recently. Business tax was the most important source of tax for local governments, and the reform of "replacing BT with VAT" would change the tax allocation pattern between central and local governments [21, p. 46; 22, p. 6]). According to the simulation of Input-output table, Li and Fang [23, p. 33] found that the reform will lead to significant reduction in tax revenue of provincial governments if there is no change on VAT sharing proportion. Shi and Lou [24, p. 105] used the model of CGE and concluded that the VAT policy had played a positive role in China's GDP and would reduce energy consumption coefficient. For the tax reform effects on industry, Li and Yan's [25, p. 18] study on the tax reform of the service industry found that the tax cut effect promoted the upgrading of China's manufacturing industry. Chen and Wang [26, p. 36] used the Chinese listed company data to prove that "the replacing BT with VAT" reform indeed promote the specialized division of labor. Tian and Hu [27, p. 29] found that the tax burden of some industries that transformed from business tax to VAT would still rise in the long run. Tong, Su and Wei's [28, p. 14] study showed that company's bargaining power would lead to tax shifting and influence the effect of tax reform on enterprise's actual tax burden.

Contrary to the above studies, this paper evaluates for the first time the effect of the nationwide reform of 2009. Another distinguishing feature of our research is our data source. The previous research was supported by the Chinese National

Bureau of Business survey data, and our data are the joint "national tax survey" data from the Chinese Ministry of Finance and State Administration of Taxation. The data collects more information on corporate investment in fixed assets and can clearly identify the corporations affected by the policy.

3. Data and method of analysis

The data for this analysis come from the "National tax survey" jointly collected by the Chinese Ministry of Finance and State Administration of Taxation. The survey collected information on production and operations, fixed assets investment, taxes, the financial situation and employment. After cleaning, we obtained a balanced panel data from 2007 to 2009 of about 230 thousand corporations a year.

As Nie, Fang and Li [18, p. 450], Nie and Liu [19, p. 5], Cai and Harrison's [20, p. 11], we also use the difference-in-differences method, i.e. we measure the impact of VAT reform by comparing the difference between the treatment group and the control group before and after the reform. There were two kinds of corporations in our control group, one was the non-VAT taxpayers and small-scale VAT taxpayers that were irrelevant to the subtraction of input taxes for fixed assets investment, another was the corporations that had been included in pilot experiments before 2009 and the foreign-invested corporations, which were allowed to deduct input tax for fixed asset investments before and after 2009. The treatment group was the ordinary VAT-paying enterprises that were not included in the pilot before 2009 and were affected by the 2009 reform. The model specification is as follows:

$$y_{it} = \alpha + \beta policy_{it} + \rho Treat_{it} + \\ + X'_{it}\delta + \eta_i + \eta_t + \varepsilon_{it},$$

where y_{it} is the company's investment in fixed assets (FAI) or the annual average number of employees (EMP), $policy_{it}$ is the variable capturing the effect of policies, that is, the product of the year dummy for 2009 and the treatment group dummy. The control variables X'_{it} include the size of enterprise assets (Assets), the total profit (Profit), the profit margin (Profit rate) and the tax burden rate (Tax rate). Among them, the tax burden of enterprises is the sum of all the taxes paid by the enterprise.

Except for fixed asset investment (FAI), which is very special and can only be obtained through complex calculations, the above variables are directly available in the "National Tax Survey" dataset or can be obtained through a simple calculation. The previous papers using the data from National Bureau of Statistics could only get the fixed assets investment data by taking the first differences in the fixed assets balance. Thus we design four fixed asset investment (FAI) indicators. This is the unique character of our paper.

FAI1 covers all the enterprise's fixed assets investment, FAI2 focuses on fixed assets investment on operation, FAI3 and FAI4 are somewhat the same as FAI2, but they are only a part of FAI2, the former pays more attention on machinery and equipment, while the later cares more about housing and building. Because the 2009 VAT reform is to allow enterprises to deduct input tax of machinery and equipment in operation, we can expect that the FAI3 is the most important variable affected by the reform.

Another important point is that the reform itself affects the book value of the fixed assets. According to China's accounting system, relevant taxes and fees are also included in the book value of the fixed assets investment. For the corporation affected by the reform, the book value of the fixed assets investment after 2009 loses the input VAT deduction. Therefore we made an adjustment: the book value in 2008 remains unchanged, the adjusted fixed assets investment of the treatment group in 2009 is calculated as follows: adjusted value = original value + "the input VAT tax on import machinery and equipment" + "the input VAT tax on domestic machinery and equipment purchase".

4. Main results

The main results of the estimation are given in Table 1 and 2. Table 1 uses all the data available, that is, it includes all the en-

Table 1

Full sample estimation (units: thousand yuan for investment and persons for employment)

Variables	FAI1	FAI2	FAI3	FAI4	EMP
Policy effect	–2638.0 (–0.52)	3301.3 (1.50)	3185.4* (1.88)	115.9 (0.10)	–11.40 (–1.48)
Treatment group dummy	–331.6 (–0.16)	–1733.6 (–1.00)	–1523.1 (–0.96)	–210.5 (–0.40)	6.37 (0.98)
Year dummy for 2009	1807.9 (0.39)	–3194.8* (–1.73)	–2644.6 (–1.64)	–550.2 (–0.91)	–11.63 (–1.56)
Year dummy for 2008	–1320.0* (–1.89)	–867.8 (–1.32)	–496.7 (–0.90)	–371.0 (–1.18)	–10.99*** (–5.16)
Profit	0.177 (0.99)	0.0934 (0.71)	0.106 (0.91)	–0.0131 (–0.54)	0.00 (1.45)
Profit rate	–0.0936 (–0.46)	–0.00847 (–0.05)	–0.0321 (–0.23)	0.0236 (0.81)	0.00 (0.03)
Assets	11169.6*** (3.97)	8891.3*** (2.98)	4271.2*** (3.20)	4620.1* (1.93)	59.50*** (5.42)
Tax rate	65.05* (1.87)	51.81* (1.68)	24.02* (1.72)	27.78 (1.38)	0.35** (2.04)
constant	–97302.0*** (–3.49)	–74995.8*** (–.64)	–32904.4*** (–2.72)	–42091.3* (–1.82)	–345.4*** (–3.26)
Number of observations	691469	691469	691469	691469	691469

Notes: Coefficients and *t* statistics are reported. Significance levels of 1%, 5% and 10% are represented by ***, ** and * respectively.

terprises in the control group listed above. As we can see from Table 1, it is only when we use FAI3 to measure corporate investment in fixed assets that the impact of the reform is significantly positive on investment, and the reform has little impact on employment (EMP). Table 2 only includes the enterprises in the industrial department that are subject to VAT tax[2].

As is shown in Table 2, whether we use FAI1, FAI2 or FAI3 to measure corporate investment in fixed assets, the impact of the reform is significantly positive, whereas there impacts on corporate plant and building investment (FAI4) and on employment (EMP) are not significantly different from zero. With the estimation, we get the conclusion that the VAT tax reform in 2009 significantly enhanced the company's physical investment in machinery and equipment but had no impact on employment. The conclusion regarding the impact on investment is almost the same as the findings by Nie, Fang, and Lie [18, p. 460] and Nie and Liu's [19, p. 14] findings, but different from Cai and Harrison's [20, p. 21] study. When comparing physical investment and employment in 2007 with 2008 and 2009, we find a reduction in trend, which may reflect the impact of the global financial on Chinese business. The total corporate profits and profit margins have little impact on business investment and employment, while asset size and the tax burden show a significant positive impact. That the tax burden has a positive effect on investment and employment is counterintuitive. In our opinion, in China, more tax may mean more glorious prospects for the company[3].

Three questions could be raised to put in doubt the positive effect of the VAT reform on physical investment in fixed assets. First, is it because we adjust the book value of the treatment group's fixed assets in 2009 that we get the above conclusions? Second, is it because in the firms of the treatment group investment in fixed

[2] The industrial department includes manufacturing, electricity, gas, steam and air conditioning supply, mining and quarrying, water supply, sewerage, and waste management and remediation.

[3] In our survey, business managers and frontline tax collectors and management staff provided us with this view.

assets just tended to increase in recent years? Are the conclusions affected by the fact that in our sample around 30% of the corporations did not add any new investment in fixed assets?

In response to the first question, Table 3 presents estimates obtained with the data that have not been adjusted for the book value in 2009. We find that the conclusions still hold. In addition, whereas

Table 2

Estimation based on industrial department data (units: thousand yuan for investment and persons for employment)

Variables	FAI1	FAI2	FAI3	FAI4	EMP
Policy effect	4602.6**	4630.1**	3422.0**	1208.0	–1.02
	(2.41)	(2.44)	(2.33)	(1.51)	(–0.22)
Treatment group dummy	–2560.3	–2267.0	–2207.7	–59.36	–1.61
	(–1.26)	(–1.16)	(–1.21)	(–0.17)	(–0.27)
Year dummy for 2009	–5849.0***	–4880.5***	–3503.7***	–1376.8***	–29.36***
	(–4.14)	(–3.42)	(–2.82)	(–3.44)	(–6.51)
Year dummy for 2008	–2671.1***	–1944.4**	–1155.1	–789.3**	–13.47***
	(–2.82)	(–2.09)	(–1.45)	(–2.04)	(–6.15)
Profit	–0.218	–0.224	–0.179	–0.0445	0.00
	(–1.16)	(–1.18)	(–1.19)	(–0.78)	(0.94)
Profit rate	3.581	2.294	1.646	0.648	0.02
	(0.54)	(0.35)	(0.31)	(0.34)	(1.03)
Assets	15793.9***	14235.5***	9872.0***	4363.5**	67.41***
	(5.36)	(4.93)	(6.41)	(2.46)	(9.84)
Tax rate	1914.8***	1799.6***	1254.5***	545.2**	7.47***
	(3.51)	(3.40)	(3.74)	(2.09)	(4.25)
constant	–132899***	–120219.0***	–80944.9***	–39274.1**	–369.5***
	(–4.77)	(–4.41)	(–5.73)	(–2.29)	(–5.47)
Number of observations	405188	405188	405188	405188	405188

Notes: Coefficients and t statistics are reported. Significance levels of 1%, 5% and 10% are represented by ***,**, *

Table 3

Estimation without adjusting the fixed-asset input tax of the treatment group in 2009 (units: thousand yuan)

Variables	Full sample	VAT general taxpayer in industry sector			
	FAI3	FAI1	FAI2	FAI3	FAI4
Policy effect	2614.0	3951.8**	3979.2**	2771.2*	1208.0
	(1.55)	(2.07)	(2.10)	(1.89)	(1.51)
Treatment group dummy	–1543.0	–2541.2	–2247.9	–2188.6	–9.36
	(–0.97)	(–1.26)	(–1.15)	(–1.20)	(–0.17)
Year dummy for 2009	–2633.9	–5807.1***	–4838.6***	–3461.8***	–1376.8***
	(–1.63)	(–4.11)	(–3.39)	(–2.79)	(–3.44)
Year dummy for 2008	–496.0	–2638.6***	–1911.9**	–1122.6	–789.3**
	(–0.90)	(–2.79)	(–2.05)	(–1.40)	(–2.04)
Profit	0.106	–0.215	–0.221	–0.177	–0.0445
	(0.90)	(–1.15)	(–1.17)	(–1.18)	(–0.78)
Profit rate	–0.0319	3.450	2.163	1.514	0.648
	(–0.23)	(0.52)	(0.33)	(0.28)	(0.34)
Assets	4191.8***	15503.6***	13945.2***	9581.7***	4363.5**
	(3.15)	(5.27)	(4.84)	(6.24)	(2.46)
Tax rate	24.19*	1869.2***	1754.0***	1208.8***	545.2**
	(1.71)	(3.46)	(3.35)	(3.67)	(2.09)
Constant	–32118.3***	–130113***	–117433***	–78159.1***	–39274.1**
	(–2.66)	(–4.67)	(–4.31)	(–5.54)	(–2.29)
Number of observations	691469	405188	405188	405188	405188

Notes: Coefficients and t statistics are reported. Significance levels of 1%, 5% and 10% are represented by ***, ** and * respectively.

the coefficient of the tax policy is insignificant for the full sample, it is significant for the sample of the ordinary VAT-paying enterprises and in the industrial department. This shows that the adjustment of the book value of the treatment group in 2009 is not what is generating the result that value-added tax reform promotes business investment.

In response to the second question, we have used the 2007–2008 data to redo what has been done in Tables 1 and 2. Table 4 uses the data that removed the observations in 2009. The policy variable is

Table 4

Estimation with 2007–2008 data (units: thousand yuan)

Variables	Full sample			VAT general taxpayer in industry sector		
	FAI1	FAI2	FAI3	FAI1	FAI2	FAI3
Policy effect	491.2 (0.22)	650.1 (0.28)	1177.1 (0.58)	866.5 (0.33)	200.7 (0.07)	734.6 (0.30)
Treatment group dummy	220.5 (0.11)	224.3 (0.12)	72.67 (0.04)	–333.4 (–0.15)	368.0 (0.17)	–250.6 (–0.13)
Year dummy for 2008	–897.7 (–0.51)	–693.4 (–0.40)	–998.5 (–0.67)	–3669.4 (–1.52)	–2369.8 (–0.96)	–2349.8 (–1.07)
Profit	5135.2 (1.57)	4786.5 (1.46)	2490.6 (0.84)	16665.4*** (6.42)	15253.9*** (5.83)	12787.9*** (5.33)
Profit rate	0.280 (0.87)	0.224 (0.69)	0.191 (0.64)	–0.383* (–1.67)	–0.384 (–1.63)	–0.408* (–1.88)
Assets	–0.213 (–0.86)	–0.170 (–0.70)	–0.145 (–0.64)	14.82 (0.76)	14.40 (0.73)	19.62 (1.00)
Tax rate	277.4 (1.14)	264.8 (1.10)	138.6 (0.73)	1963.5*** (2.93)	1820.5*** (2.85)	1559.2*** (2.78)
constant	–41236.9 (–1.44)	–38905.7 (–1.36)	–18260.8 (–0.71)	–141537*** (–6.04)	–130642*** (–5.57)	–108435*** (–5.05)
Number of observations	452143	452143	452143	265245	265245	265245

Notes: Coefficients and t statistics are reported. Significance levels of 1%, 5% and 10% are represented by ***, ** and * respectively.

Table 5

Estimation with Logit model (units: thousand yuan)

Variables	FAI1		FAI2		FAI3		FAI4	
Policy effect	0.689*** (27.60)	0.690*** (27.61)	0.688*** (29.97)	0.688*** (29.97)	0.723*** (32.52)	0.723*** (32.52)	0.013 (0.51)	0.013 (0.50)
Treatment group dummy	–0.344*** (–9.07)	–0.343*** (–9.07)	–0.298*** (–8.46)	–0.298*** (–8.46)	–0.264*** (–7.72)	–0.264*** (–7.72)	–0.019 (–0.47)	–0.019 (–0.47)
Year dummy for 2009	–0.621*** (–26.62)	–0.622*** (–26.64)	–0.365*** (–17.16)	–0.365*** (–17.17)	–0.0148 (–0.72)	–0.0151 (–0.74)	–0.825*** (–34.41)	–0.827*** (–34.46)
Year dummy for 2008	–0.203*** (–17.85)	–0.203*** (–17.88)	–0.106*** (–9.85)	–0.106*** (–9.87)	–0.017 (–1.63)	–0.017* (–1.65)	–0.224*** (–18.68)	–0.226*** (–18.76)
Assets	0.543*** (30.36)	0.549*** (30.16)	0.501*** (28.90)	0.504*** (28.72)	0.472*** (27.11)	0.474*** (26.97)	0.577*** (25.19)	0.588*** (25.30)
Profit	0.000 (0.71)	0.000 (0.70)	0.000 (1.08)	0.000 (1.08)	0.000 (1.42)	0.000 (1.42)	0.000 (–0.13)	0.000 (–0.17)
Profit rate	0.001* (1.66)	0.001* (1.66)	0.000 (1.56)	0.000 (1.56)	0.000 (1.19)	0.000 (1.19)	0.000 (0.46)	0.000 (0.45)
Tax rate		0.015* (1.79)		0.010 (1.08)		0.009 (1.04)		0.057*** (2.83)
Number of observations	144946	144946	161684	161684	172401	172401	125312	125312

Notes: Coefficients and t statistics are reported. Significance levels of 1%, 5% and 10% are represented by ***,** and * respectively.

now defined as the product of a dummy variable in 2008 and a dummy variable for being in the treatment group. We find that no matter which sample we use and which type of fixed asset investment we consider, the regression results are not significant, some factors are even reversed and become negative. It shows that the second objection does not hold.

For the last question, we use the Logit model to analysis the impact of the 2009 VAT reform on corporate fixed assets investment. If there are newly added corporate fixed assets, FAI is assigned the value 1, otherwise it is 0. The policy regression coefficient in this model represents the impact of VAT reform on the log odds ratio that a corporation will invest in fixed assets. As can be seen from Table 5, the VAT reform in 2009 increased significantly the probability of fixed assets investment but shows no significant effect on the investment on fixed assets such as plant and building (FAI4).

5. Conclusion

In this paper we used "National Tax Survey" enterprise data to evaluate the impact of China's nationwide VAT reform in 2009 on enterprise fixed-asset investment and employment. Our conclusion is that the VAT reform in 2009 significantly increased business investment in fixed assets but had not much effect on employment. Specifically, the reform mainly enhanced the investment in fixed assets for operation such as machinery and equipment, but not the investment in plants and buildings.

According to our study, the VAT reform in 2009 is not only a critical step in improving the Chinese tax system, but it also played an important role in fighting the global financial crisis. Meanwhile, as the renovation of machinery and equipment is an important way for firms in developing countries to achieve technological progress, the VAT reform is also conducive to China's structural transformation.

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Требования к структуре и содержанию статьи

1. Статья, представляемая для публикации, должна обладать новизной, быть самостоятельным, завершенным, характеризующимся внутренним единством исследованием актуальной проблемы, связанной с налоговыми реформами на международном и национальном уровнях.

2. Текст статьи следует структурно разбивать на разделы с заголовками, отражающие:

- актуальность темы исследования;
- степень изученности и проработанности проблемы;
- предлагаемые методы, подходы и их оригинальность;
- анализ полученных результатов;
- основные выводы, обобщающие полученные научные результаты, а также обозначающие направления дальнейших исследований по проблеме.

3. Статья должна содержать иллюстративный материал, демонстрирующий результаты исследований.

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1. Текст статьи набирается в текстовом редакторе Microsoft Word и сохраняются в формате .docx.

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4. Статья должна содержать следующие элементы, оформленные в соответствии с требованиями журнала (см. образец оформления статьи):

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- список использованной литературы (References);
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• предоставляет информацию о статье и устраняет необходимость чтения полного текста статьи в случае, если статья представляет для читателя второстепенный интерес;

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• содержательной (отражать основное содержание статьи и результаты исследований);

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• результаты работы (описываются предельно точно и информативно. Приводятся основные теоретические и экспериментальные результаты, фактические данные, обнаруженные взаимосвязи и закономерности. При этом отдается предпочтение новым результатам и данным долгосрочного значения, важным открытиям, выводам, которые опровергают существующие теории, а также данным, которые, по мнению автора, имеют практическое значение);

• область применения результатов;

• выводы (могут сопровождаться рекомендациями, оценками, предложениями, гипотезами, описанными в статье).

4. В тексте аннотации следует употреблять синтаксические конструкции, свойственные языку научных и технических документов, избегать сложных грамматических конструкций. Текст должен отличаться четкостью формулировок и содержать только значимую информацию. Сведения, содержащиеся в заглавии статьи, не должны повторяться в тексте аннотации. В ней следует применять значимые слова из текста статьи.

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2. В качестве ключевых слов могут использоваться как одиночные слова, так и словосочетания в единственном числе и именительном падеже. Количество слов внутри ключевой фразы (словосочетания) может быть не более трех.

3. Основные принципы подбора ключевых слов:

• применяйте базовые термины вместе с более сложными (бухгалтерский учет основных средств, бухгалтерский учет, основные средства); повторы и синонимы (грузовые перевозки — транспортная логистика, организация перевозок — логистика);

• не используйте слишком сложные слова (словосочетания, в которых приводится больше трех слов, чаще всего можно разбить на несколько ключевых слов (обработка и анализ данных — обработка данных, анализ данных)); слова в кавыч-

ках (ОАО «Иркутскэнерго» — Иркутскэнерго); слова с запятыми (факторы, определяющие качество — факторы качества, определение качества);

• каждое ключевое слово — это самостоятельный элемент. Ключевые слова должны иметь собственное значение (человеческий капитал, его оценка — человеческий капитал, оценка человеческого капитала).

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Pimenov N. A. Fiscal risks in the system of tax security of businesses and State. *Nalogy = Taxes*. 2010;(4):10–13. (In Russ.)

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The requirements for the structure and content of the article

1. The article submitted for publication must contain novelty, must be an independent, complete and internally united research work on a current issue, related to tax reform at international and national levels.

2. The article should be structurally divided into sections with headings, reflecting:

- relevance of the research;
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- proposed research methods and their originality;
- analysis of the study findings;
- main conclusions, the results of the research and further discussion of them, or the problem solution.

3. The article should contain illustration material, showing the results of the research.

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- the page size — A4;
- font – Times New Roman; main text – 14-point, supplementary text (abstract, keywords, tables, figures, references) – 12-point, footnotes – 11-point;
- line spacing – 1,0;
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- title of the article;
- information about the author;
- abstract;
- 5–10 key words;
- the list of references;
- the article should have reference notes given in square brackets provided according to the references.

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