Journal of Tax Reform

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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Административно-управленческие проблемы налоговых реформ

Original Paper

E-Commerce Taxation in Russia: Problems and Approaches

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ABSTRACT

The purpose of this article is to describe a mechanism for taxing e-commerce profits of multinational corporations (MNCs). Our research hypothesis is that the new economic reality, where digital transactions are on the rise, requires new mechanisms for taxation of MNCs' profits. Our research methodology relies on a systemic approach aimed at embracing the complexity and dynamics of the above phenomena. We analyze the feasibility and possible outcomes of the introduction of the indirect digital services tax in Russia, in particular its potential impact on the tax burden distribution and economic growth. Special attention in the article is given to the definition and criteria of virtual permanent establishment. We propose a definition that emphasizes the non-physical nature of permanent establishments in e-commerce and does not include any subjective criteria. Since the Russian tax system is not sufficiently synchronized with the global digital trends, especially regarding taxation of e-commerce profits of tech giants, which means that the introduction of a digital services tax in Russia may be premature due to its possible negative influence on the tax burden redistribution, competition, business profitability, employment, personal income and innovation. Russia will be able to participate in the process of allocation of MNCs' profits if the mechanism of direct taxation is developed and the institution of virtual permanent establishment is introduced into the national tax legislation. These measures will enable the Russian state to realize its taxing rights in relation to MNC's profits and benefit from the international trends in profit-allocation. Our critical analysis of the OECD's unified approach has shown its weaknesses and led us to the conclusion that a simple and more transparent taxation mechanism is necessary based on the formulary apportionment of MNCs' total revenues rather than residual profits among the relevant jurisdictions. In our view, Russia should move ahead with the unilateral measures for taxation of MNCs in accordance with the mechanism described above. Unlike the majority of research, we propose to use only objective value indicators, which cannot be distorted by subjective interpretations, and exclude the risk degree indicator from the set of allocation keys. It also makes sense to use a formula for allocation of profit among the countries rather than corporate structures, as it will enable tax authorities to take into account the impact of federal and regional tax preferences to investors.

KEYWORDS

tax risks, virtual permanent establishment, significant presence, digital services tax

JEL B41, B49, H32

Оригинальная статья

Налогообложение электронной предпринимательской деятельности в России: проблемы и подходы

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АННОТАЦИЯ

Цель исследования – разработать механизм налогообложения прибыли от электронной предпринимательской деятельности транснациональных компаний,

адаптированный к условиям цифровой экономики. Гипотеза исследования заключается в том, что новая экономическая реальность, которая характеризуется интенсификацией цифровой предпринимательской деятельности, требует адаптации механизмов и инструментов налогового регулирования деятельности транснациональных компаний. Методология исследования основана на теории научного познания, системном подходе к исследуемым проблемам, раскрытии их во взаимосвязи и динамике. Проведен анализ и дана оценка целесообразности введения в России косвенного налога на цифровые услуги транснациональных компаний в аспекте его влияния на распределение налогового бремени и экономический рост страны. Систематизированы критерии и сформирована дефиниция виртуального постоянного представительства. В результате исследования выявлено, что российская налоговая система еще недостаточно синхронизирована с цифровой трансформацией экономики. Не сформирован механизм налогообложения в России прибыли транснациональных корпораций от электронной предпринимательской деятельности. В работе обоснован вывод о преждевременности введения налога на цифровые услуги в России. Раскрыты возможные негативные последствия его влияния на экономику по таким направлениям, как перераспределение налогового бремени, развитие конкуренции, рентабельность бизнеса, занятость и личные доходы населения, инновации. Для включения России в процессы разделения глобальной прибыли транснациональных компаний от цифровых операций обоснована необходимость развития механизма прямого налогообложения. Для этого предлагается ввести в законодательство России институт виртуального постоянного представительства. Его наличие является необходимой правовой основой распространения налоговой юрисдикции России на цифровые компании с учетом изменения международных фискальных подходов в цифровой экономике. На основе имеющихся в научной литературе подходов предложено авторское определение виртуального постоянного представительства. Его отличие в том, что оно отражает свойство нематериальности постоянного представительства в электронной коммерции и не содержит субъективно оцениваемых критериев. На основе критического анализа Единого подхода ОЭСР к налогообложению цифровых компаний обоснована целесообразность более простого и прозрачного механизма их налогообложения. В отличие от идей предшественников, в работе предложено формульное разделение между юрисдикциями всех глобальных доходов транснациональных компаний, а не только «остаточной прибыли» от цифровых операций. Обоснована целесообразность использования предложенного механизма налогообложения в России в одностороннем порядке применительно к виртуальному постоянному представительству. В качестве ключей распределения, что отличает от распространенных научных идей, предлагается отказаться от показателя оценки рисков. Обосновано использование только объективных стоимостных показателей, которые не искажаются субъективным анализом. Предлагается также использовать формулу для распределения прибыли транснациональных компаний между странами, а не между структурами компаний. Это позволит учесть действие федеральных и региональных льгот инвесторам.

КЛЮЧЕВЫЕ СЛОВА
риски налогообложения, виртуальное постоянное представительство, существенное присутствие, налог на цифровые услуги

1. Introduction

At the current stage of digital transformations characterized by rapid development of telecommunications and information technologies, it is difficult to find any aspect of legal or economic relations that would be untouched by these processes, the international tax system being no exception.

In the Digital Economy and Society Index (DESI), the main international ranking of countries' digital performance, Russia now occupies only a modest 43rd position. However, as far as the digital economy's growth is concerned, Russia is in the top ten. In part, this is a result of its federal program 'Digital Economy'. It is predicted that in future, the digital

economy will account for up to 10% of the country's GDP [1].

The digital revolution and rapid development of cyberphysical production systems have led to a dramatic increase in cross-border business activity, in particular with respect to the following: '(i) the intangibles on which the digital economy relies heavily, (ii) users, and (iii) business functions as a consequence of the decreased need for local personnel to perform certain functions as well as the flexibility in many cases to choose the location of servers and other resources'[1].

Companies involved in international trade of goods, services and capitals discover new opportunities of minimizing their tax liabilities. In their turn, countries and international organizations strive to prevent tax base erosion and disruption of competition. In 2013, as a part of its Action Plan on Base Erosion and Profit Shifting (BEPS), the OECD embarked on devising new approaches to taxation in the digital sector, although so far, no universal agreement regarding the OECD's proposals has been achieved[2]. In the absence of uniform international guidelines, national tax systems are developing digital taxation independently of each other.

One of the most popular initiatives is the introduction of the indirect tax on digital services or the so-called *digital services* tax (DST)[3]. This tax provides a simple solution to the problem of how fiscal interests of different states, including Russia, could be met. A certain caution should be exercised, however, as this measure may

negatively affect the participants of fiscal relations and the overall economic development of the country.

Taxation of e-commerce profits of multinational corporations (MNCs) has lately become a focus of discussion, which added urgency to international debates. The recent OECD documents have addressed the problem of virtual permanent establishments while the tax policies of different countries, including Russia[4], have explicitly set the goals of ensuring that profits should be taxed where economic value is created[5]. Currently the international discussion centres around the introduction of new rules that would allow countries to tax digital-service providers in jurisdictions where these companies are not physically present but where their users (clients) are located or, in other words, jurisdictions in which value creation occurs.

The notion of permanent establishment (PE) is used in international taxation practices to denote the connection between a company and a foreign country as its place of business. This connection should be substantial enough to make the latter entitled to taxing this company's profits. In this sense, the PE concept does not have a civil or legal status but is used to justify the rights of the income source state to tax the profits of tech giants from their e-commerce activities in the territory of this state. At the same time the fiscal rights of the residence state are limited [2]. The PE concept serves as a tool for allocating MNCs' taxable profits among the states.

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

[2] Addressing the Tax Challenges of the Digital Economy, Action 1 - 2015 Final Report. OECD/G20 Base Erosion and Profit Shifting Project. Paris: OECD Publishing; 2015. DOI: 10.1787/9789264241046-en; Organisation for Economic Co-operation and Development, Action Plan on Base Erosion and Profit Shifting. Paris: OECD; 2013. DOI: 10.1787/9789264202719-en, supra note 2.

[3] KPMG. Taxation of the digitalized economy. updated Mar. 21, 2020. Available at: https://tax.kpmg.us/content/dam/tax/en/pdfs/2020/digitalized-economy-taxation-developments-summary.pdf

[4] Addressing the Tax Challenges of the Digital Economy. Available at: https://read.oecd-ilibrary.org/taxation/addressing-the-tax-challenges-of-the-digital-economy-action-1-2015-final-report_9789264241046-en#page1; Tax Challenges Arising from Digitalisation – Interim Repory 2018. Available at: https://read.oecd-ilibrary.org/taxation/tax-challenges-arising-from-digitalisation-interim-report_9789264293083-en#page1

[5] Website of the Ministry of Finance of the Russian Federation. Key Areas of the Budget, Taxation and Customs Tariff Policy in 2020 and the Planned Period of 2021 and 2022: Available at: https://www.minfin.ru/common/upload/library/2019/10/main/ONBNiTTP_2020-2022.pdf

The classical definition of *permanent establishment* is specified as a set of criteria in the OECD's Model Tax Convention on Income and Capital[6], in international tax agreements and in the legislation of the majority of countries, including Russia. These criteria include the following: there should exist a fixed place where a company is doing business in a foreign state; the company should own tangible property such as facilities, equipment and so on in this country; and, finally, the company should be engaged in entrepreneurial activity [3].

The existing rules of PE recognition, however, do not allow countries to align taxation with value creation as efficiently as their governments would like to. The problem arises from the fact that digital companies may sell their services in foreign markets, where their physical presence (or the presence of their staff and equipment) is not required. In this paper, e-commerce is understood as buying and selling of goods and services by legal and physical persons through processing and transfer of digital data, including textual, audio- and video-information, via an open network (such as the Internet) or closed networks which can connect to the open network[7]. Thus, MNCs' profits cannot be taxed by countries where their e-services are sold. Digital transformations of the economy have led experts and policy-makers to doubt the effectiveness of the tax regulations which have been in force for the last one hundred years as it has become obvious that these rules are no longer applicable in the digital era.

The OECD Model Convention as well as national legislations (including Russian) still lack a comprehensive definition of virtual PE that would reflect the specificity of e-commerce [4].

Another problem that needs to be addressed is the procedure for taxing virtual PE's profits. At present national tax systems rely on separate entity accounting, which means that in accordance with the arm's length principle, digital multinationals have separate revenue and expense accounts for their entities (PEs or subsidiaries) operating in foreign tax jurisdictions. The arm's length principle determines the allocation of MNCs' taxable profits among the countries and has been for quite a while rightfully criticized in research literature. There are, however, no universal national or international approaches and guidelines regarding taxation of profits from digital services. The unified approach to taxation of such profits proposed by the OECD[8] currently undergoes public scrutiny and its subsequent approval by individual country members is far from imminent.

The absence of the concept of virtual PE from the Russian tax legislation and the corresponding methods of taxing it deprives Russia of the possibilities, grounds and tools for extending its tax jurisdiction to such companies. Thus, Russia is excluded from profit allocation in the digital sphere, which creates considerable risk of tax revenue losses. To avoid this situation, it is necessary to introduce the concept of virtual PE, its definition, criteria and taxation methods into the Russian legislation.

Development of adequate taxation mechanisms and tools that would make the Russian state entitled to some part of the taxable profits of digital multinationals is a task of utmost importance. It is also a crucial factor of tax-risk management.

The purpose of this study is to describe a mechanism of taxing MNCs' profits that would be adequate to the reality of the digital economy.

Our hypothesis is that this new economic reality engendered by the rise of e-commerce requires a thorough revision and adaptation of policies for tax regulation of digital companies.

The article comprises an introduction, literature review, the main part divided into sections, and conclusions. The

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[6] Model Tax Convention on Income and Capital. Committee on Fiscal Affairs; Organisation for Economic Co-operation and Development. Paris: OECD; 2014.

[7] Policy Brief No. 1-1997: Electronic Commerce. OECD; 1997.

[8] Secretariat Proposal for a 'Unified Approach' under Pillar One, Public consultation document. OECD Publishing; Oct. 2019.

introduction outlines the problems of taxation of MNCs' profits, the goal, objectives, research questions and outcomes. The section devoted to literature review summarizes the past research efforts and discussion points related to the topic. The main part of the article contains several subsections that deal with different aspects of the problem and correspond to the objectives set in the introduction. The final part of the paper describes the research outcomes and conclusions and discusses the implications and possible avenues for future research.

2. Literature review

Digitalization of the economy and its impact on taxation became a focus of academic debate in the 1990s. Rapid development of the Internet and telecommunications challenged the existence of the permanent establishment (PE) concept and required national governments to devise suitable tax policies and rules.

As governments of developed and developing states are pushing for a change, the OECD responds to their demands by driving forward the international digital tax agenda. Countries seek to maximize their fiscal revenue or at least maintain its current level, which requires them to define the concept of PE and its characteristics.

At the turn of the millennium, OECD experts split into two groups regarding their understanding of *permanent establishment*: experts of the first group adhered to the view that the existing international taxation norms and the classical understanding of PE are broad and flexible enough to encompass e-commerce. Scholars from the second group, for example, R. Doernberg [5], L. Hinnekens [6], and D. Pinto [7], on the contrary, rightfully argue that e-commerce has special implications for taxation due to the high level of mobility and no or insignificant level of physical presence of digital companies in the countries where they do business. Therefore, new rules and approaches are required to the definition of permanent establishment. At that point, the OECD considered several alternative approaches to taxation

of e-commerce profits: source-based taxation; the 'base-erosion' approach; and formulary apportionment[9].

The concept of a special virtual PE emerged at the end of the twentieth century. A virtual PE appears when a foreign organization gets a website hosted by a server in a foreign state to engage in entrepreneurial activity[10]. For instance, D. Pinto justifies source-based taxation of profits in relation to virtual PEs [7].

The OECD's Committee on Fiscal Affairs supported the view of the first group of scholars that traditional rules of PE taxation can be applied to e-commerce and do not require any radical adjustments of the tax system. This position was described in the 2000 report and included in the commentaries to the OECD Model Tax Convention of 2003, which stated that the server on which a company's web-site is stored or computer equipment which has a specific physical location may constitute a 'fixed place of business' of this company and, therefore, a permanent establishment[11].

In Russian research literature, a similar debate unfolded between proponents of the traditional approach and those who advocated a special approach to the concept of permanent establishment in e-commerce. A.V. Kastelskaya [8], M.A. Danilkevich [9], L.V. Frolova [10], M.E. Ismailov [11], R.E. Khusnetdinov [12] and L.V. Kadyleva [13] accept the approach proposed by the OECD in 2000 and do not see the idea of a virtual PE as pertinent. These authors, however, do point out some challenges connected to the traditional understanding of PE in taxing e-commerce.

The classical definition of PE, which includes physical requirements necessary

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[9] Discussion Draft. Are the Current Treaty Rules for Taxing Business Profits Appropriate for E-commerce? OECD; 2003. Available at: http://www.oecd.org/ctp/treaties/20655083.pdf

[10] Dismantling the barriers to global electronic commerce. P. 26. Available at: http://www.oecd.org/sti/2751237.pdf

[11] Model Tax Convention on Income and Capital / Committee on Fiscal Affairs; Organisation for Economic Co-operation and Development. Paris: OECD; 2004.

for doing business in a local jurisdiction (e.g. a foreign company's web-site hosted by a local server or specialized equipment located in this country's territory), proves to be inadequate in the case of e-commerce, which can be illustrated by the following example. If a foreign company removes the servers which host its website or other equipment from the country's territory, the recognition of its PE will be impossible and so will be the taxation of its e-commerce profits.

We share N.G. Skachkov's view, who rightfully emphasizes the impossibility to apply classical PE criteria to e-entrepreneurship since these criteria require a foreign company's physical presence in the country of business [14].

A special approach is proposed by O.Y. Konnov, who rejects the concept of PE in relation to the digital sphere and argues in favour of source-based taxation of e-commerce profits [15]. In our view, since the Russian taxation system currently lacks the concept of PE, the country has no right to tax profits from e-commerce. O.Y. Konnov's approach, however, shows the crisis of the classical understanding of PE.

An interesting interpretation is offered by A.V. Koren [16], who points out the non-physical nature of PEs in e-commerce and elaborates on the three main criteria of a virtual PE: the registration criterion (registration in the corresponding domain zone); language criterion; and consumer criterion (which territory accounts for the largest share of payments). This author's ideas agree with our arguments about the failure of the classical PE concept to reflect the specifics of the digital economy, which points to the need to devise special 'non-physical' criteria of a virtual PE [17].

In recent years, the European Commission has been actively developing the concept of profit taxation in the digital sphere, which led to debates about the new tax reform and new international rules that would define significant taxable digital presence in a jurisdiction. As a result, the European Commission recommended to supplement the PE concept with virtual (or digital) PE[12]. This new type of PE is going to be included into the Common Consolidated Corporate Tax Base (CCCTB). Such approach agrees with the one proposed in this paper, which centres around taxation of a virtual PE consolidated with the group of companies it belongs to.

In line with the European Commission's recommendations, the OECD reconsidered its earlier approaches to the standard of significant presence. In 2019, the OECD proposed that MNCs' profits' should be taxed predominantly in the countries where users of their digital services are located[13]. The key features of a virtual PE include the following: the profit MNCs make in jurisdictions without being physically present there; MNCs' digital presence in these jurisdictions (for example, through a local domain name or a specific payment method); and, finally, the number of users in these jurisdictions[14].

N.Y. Andreev [18] proposes the following definition of a digital PE: 'a place of business where an enterprise conducts some or all of its activities, including the state or territory of its digital presence where this enterprise has the main source of its customers and which, therefore, is the place where this enterprise earns its main revenue'. In our view, this definition is quite vague and abounds in subjective criteria, which, in turn, require their own definitions to exclude multiple interpretations. It is not quite clear how 'digital presence', 'the main source of customers' or 'main revenue' should be understood and

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[12] Communication from the Commission to the European Parliament and the Counila. Fair and Efficient Tax System in the European Union for the Digital Single Market. EC. Brussels, 21.9.2017 COM (2017) 547 final. Available at: https://ec.europa.eu/taxation_customs/sites/taxation/files/1_en_act_part1_v10_en.pdf

[13] Addressing the Tax Challenges of the Digitalisation of the Economy – Policy Note, OECD/G20 Base Erosion and Profit Shifting Project. OECD; 2019. Available at: https://www.oecd.org/tax/beps/policy-note-beps-inclusive-framework-addressing-tax-challenges-digitalisation.pdf

[14] Bunn D. Tax competition of a different flavor at the OECD. Tax Foundation. March 19, 2019. Available at: https://taxfoundation.org/tax-competition-of-a-different-flavor-at-the-oecd

in the case of the two latter terms, what share of customers or revenue will qualify them as 'main'. Moreover, the phrase 'place of business' appears to contain an assumption that there is some kind of fixed place (a similar assumption underpins the classical definition of PE), which, however, contradicts the reality of a *digital* PE. Moreover, the author does not specify whether this definition should be used in the OECD's Model Convention or whether it is intended exclusively for revised tax legislation of the Russian Federation. We believe that the definition of PE should be formulated more clearly to eliminate any possibility of ambiguity or doubt for participants of legal tax relations.

Taxation of digital multinationals based on the arm's length principle and separate accounting is justly criticized in research literature. The question of how these companies should be taxed, however, still remains open for debate. Proponents of the tax reform advocate the transition to unitary taxation of MNCs' total global revenue. Proponents of the classical arm's length system, on the contrary, argue in favour of the unitary allocation of residual profit generated by digital assets and operations of MNCs in several jurisdictions. At the same time experts of the second group admit that the arm's length methods are not always suitable for taxation of digital companies: for example, J.C. Fleming and R.J. Peroni [19] contend that in the current system of taxation it is difficult to identify the actual source of income of MNCs. Tax-savvy multinationals often shift their incomes to low-tax jurisdictions, despite transfer pricing regulations. Andrew Mold [20] demonstrates that the unitary tax system based on formulary apportionment eliminates the incentives for multinationals to shift their profits to low-tax jurisdictions. In his view, this system is more transparent and allows countries to increase their tax revenues.

S. Picciotto wrote a series of articles on the unitary approach to taxing multinationals [21–24], arguing that the independent entity principle and the arm's length principle are impractical for taxing MNCs

and no longer correspond to the contemporary economic reality. Under unitary taxation, digital multinationals will be taxed 'according to the genuine economic substance of what they do and where they do it. This would be far more legitimate and simpler to implement than the current system', Picciotto argues.

In our previous publications we also addressed this problem [17]: among other things, we showed the feasibility of a consolidated approach to taxing global profits of multinational companies and proposed a profit allocation formula with such keys as weighted profit, costs of labour and capital.

V.N. Zasko and D.Y. Shakirova argue that multinational companies should be considered as a separate group of taxpayers eligible for a special tax regime [25]. Their approach is based on applying different tax regimes to MNCs depending on the country of origin of the capital. This approach, however, does not agree with the principles of taxation. Moreover, the authors do not explain how the imputed income, which plays a key role in their approach, should be calculated, although, quite obviously, it is going to be a quite complicated procedure.

N.S. Milogolov [26] observes that the tax rules devised in the early twentieth century are no longer applicable to the contemporary economic reality, especially in relation to cross-border intangible assets.

Reuven S. Avi-Yonah [27] points out the challenges of the profit split method for regulation of transfer pricing. He believes that this method frequently results in a residual when dealing with intangibles and proposes a formula that he considers as optimal for allocating the residual. This formula is based 'entirely on the destination to which the goods and services that the MNE provides are sold'.

Highlighting the need to reform the taxation system and to tax the profit of MNCs in market/user jurisdictions, the OECD proposed a new three-tier profit allocation mechanism (*Pillar 1 Project*) in November 2019. The so-called *Unified Approach* is partially based on the use of

an formulary apportionment[15]. In this article, we present a critical analysis of the OECD's approach and the accompanying risks of taxation.

Questions related to the introduction of the *digital services tax* (DST) were discussed by G. Kofler and J. Sinnig [28], M. Bauer [29], and W. Richter [30]. They warned that the introduction of the DST may pose a threat to the economic growth of countries, to innovation and digitalization in general.

The proposal to introduce a digital tax, which was put forward by the European Commission in 2018[16], was not followed by any assessment of its impact on the European economy or on the tax burden distribution.

K.A. Ponomareva [31] studied the European model of the DST and reasonably concluded that it resembles a turnover tax much more than an income tax.

One of the recent studies of the DST and the possible consequences of its introduction in Russia conducted by A. Sinitsyn et al.[17] showed that this additional indirect tax could be a feasible solution as it would enable the country to protect its fiscal interests in the absence of international agreement about the unified approach proposed by the OECD[18].

The Federation Council of the Federal Assembly of Russia also supported the introduction of the DST in Russia[19]. The public discussion, however, did not touch upon the question about the impact of such tax on organizations and physical persons as well as on the inducements to produce, invest and consume.

To conclude, our literature review has shown that the majority of researchers and experts agree that a separate type of PE and the corresponding criteria should be defined in relation to e-entrepreneurship and that these definitions could be further used for devising a mechanism of taxation of virtual PEs. There is, however, no commonly accepted definition of virtual PE that would reflect its intangible nature. Likewise, the mechanism of its taxation and taxation of MNCs' global profits has not been yet specified. Neither has been justified the economic feasibility of introducing the DST, similar to the one enacted in European countries, for countries like Russia.

Therefore, we consider it a pertinent task to investigate the possible impact of the DST for economic development and innovation in Russia. It should be noted that this tax would also affect Russian tech companies that contribute to the country's innovative development, which is why in the main part of this paper we are first going to investigate the feasibility of this measure, paying special attention to the issues overlooked in previous research.

3. Rationale for the introduction of the DST in Russia

The digital services tax is a national tax charged on revenues of MNCs from sales of digital services. This tax varies significantly across countries depending on the breadth of the tax base and tax rate (2–7.5%). This tax is usually applied to digital giants whose global profits exceed 750 million euro per year. Some countries have already introduced this tax, others were planning to do so but had to put

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[15] Secretariat Proposal for a 'Unified Approach' under Pillar One, Public consultation document. OECD Publishing; Oct. 2019; Bunn D. Tax competition of a different flavor at the OECD. Tax Foundation. March 19, 2019. Available at: https://taxfoundation.org/tax-competition-of-a-different-flavor-at-the-oecd

[16] European Commission, Proposal for a Council Directive on the common system of a digital services tax on revenues from the provision of certain digital services, COM (2018) 148 final, Brussels, March 21, 2018. Available at: https://ec.europa.eu/taxation_customs/sites/taxation/files/proposal_common_system_digital_services_tax_21032018_en.pdf

[17] Sinitsyn A., Hayrapetyan L., Surkova A. Digital tax in Russia: introduction perspectives. Available at: https://www.csr.ru/upload/iblock/5ef/5ef5a7831553dc062605b281a53e4350.pdf

[18] Secretariat Proposal for a 'Unified Approach' under Pillar One, Public consultation document. OECD Publishing; Oct. 2019.

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[19] Federation Council proposed to introduce a tax on consumers of digital products. RIA. Available at: https://ria.ru/20200520/1571747330.html

it on hold after the US threatened trade sanctions[20].

In Russia, revenues of digital companies are currently taxed through the VAT. According to Article 174.2 of the Russian Tax Code, on-line services subject to VAT include advertising and consulting services[21]. Since 2019, all foreign organizations that have consumers in Russia have been obliged to pay VAT on digital services. Such foreign organizations have to register with the Russian tax authorities and their tax administration relies on voluntary 'virtual' registration and filing a special tax declaration.

To decide whether Russia should move ahead with the DST reform, the following questions need to be addressed:

1. How will the DST burden be distributed and what consequences will this lead to?

It is important to bear in mind that by its nature the DST is a turnover tax, which means that the tax burden will be in fact shifted by providers of digital services – large digital companies – to their clients – SMEs and then to final consumers. There is evidence that indirect taxation may lead to an increase in prices, which will exceed the initial tax rise [32]. The smaller is a specific market and the lower is the competition in this market, the higher will be the price rise caused by the tax. Since companies subject to this tax are actually digital giants and innovative leaders, it is highly probable that a significant part of the DST burden will be shifted to consumers.

The introduction of the DST may have a substantial impact on companies that are highly dependent on digital services provided by tech giants. This measure may also influence the general effective tax burden, in particular the tax burden on companies with low profitability or loss-making companies, which, in its turn, will be detrimental to their paying capacity. The impact of the DST burden transfer is much more important for those companies that will be left with no options but to shift the tax burden to their own consumers.

2. How will the DST affect SMEs in Russia?

Russian small- and medium-sized businesses (SMEs) are interested in selling their products on-line via such platforms as Google and Facebook. SMEs benefit the most from the marketing opportunities offered by these platforms. Moreover, these platforms enable businesses to lower the costs of market entry.

When the tax burden is shifted to consumers of on-line services – consumers in the B2B sector, this usually has a negative influence on corporate clients in other economic sectors and on final consumers of both digital and non-digital goods and services. Services of on-line platforms are mostly in demand among SMEs with weak profitability and few opportunities for shifting the tax burden to consumers. Therefore, these companies are likely to suffer most from this situation as they risk their profitability and paying capacity. For large tech companies it is easier to shift their tax burden to their clients – SMEs, which often find themselves in a weak position when negotiating the cost of services.

Therefore, there is a likelihood that the DST will change the balance in the competition between large and smaller companies in favour of the former.

3. How will the introduction of the DST affect the country's economic growth and innovation?

New digital companies take an active part in the development of different economic sectors. The real economic value produced by Google, Facebook and other companies implementing digital business models are created not only in the countries where these companies are located. The value is also created where their services and innovations are consumed, that is, in the countries of residence of their clients and users. One of the reasons is

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[20] Taxation of the digitalized economy. KPMG; Mar. 21, 2020. Available at: https://tax.kpmg.us/content/dam/tax/en/pdfs/2020/digitalized-economy-taxation-developments-summary.pdf

[21] The Tax Code of the Russian Federation (2 part) dated August 05, 2000 No 117-FZ (add. on December 25, 2018). Available at: http://www.consultant.ru/document/cons_doc_LAW_28165/

that digital multinationals have a positive influence on employment and personal income of people in these countries. The introduction of the DST may lead to a decline in digital business, which, in its turn, will affect employment and tax receipts from companies using digital technologies (for example, SMEs). It may also have a negative influence on revenue from personal income taxes paid in the digital industry and other spheres.

Thus, the obvious question that arises in this respect is whether Russia really needs the DST or not. The DST will supplement VAT on digital services and replace the tax on profits from digital activities. In view of the fact that users of e-services contribute to the value chain of digital companies and, therefore, to the economic growth of Russia as these users' country of residence, a separate digital tax may have a negative influence on this growth.

As for the administration of the DST in Russia, the following should be noted. The Russian tax authorities have accumulated sufficient experience of administration of foreign companies which pay VAT on digital services, provided that the latter agree to register in Russia. This model of administration can be used for the DST as well since only a digital company itself has access to the full data on its users and sources of revenue. A reasonable solution would be to identify a 'responsible taxpayer' in relation to a group of affiliated companies. The role of such responsible taxpayer could be played by an entity which is already VAT registered. The problem of tax administration, especially in what concerns gathering the data on users of digital services and profits of a digital company, can be addressed with the help of the country-by-country reporting, which implies automatic exchange of information between tax authorities on cross-border corporate structures.

Since the DST is an indirect tax, it does not guarantee just allocation of the rights to multinationals' taxable profits and even if this tax is introduced, it still leaves countries wherein digital users reside without adequate taxes on the profits generated by digital companies from these users.

We believe that the problem of profit allocation can be addressed through specific taxation mechanisms. The solution to this problem, however, cannot be merely reduced to the introduction of a turnover tax, whose impact on economic entities is fundamentally different.

The problem of profit allocation, as it was mentioned in the introduction, can be tackled through the concept of permanent establishment, which, in its turn, requires to define exactly what constitutes a virtual permanent establishment, that is, bring to light the specificity of e-commerce. In the following section we will formulate our own definition of virtual permanent establishment and describe its main criteria.

4. The concepts of PE and virtual PE

In Russia, the definition of PE and its criteria based on the physical presence of foreign companies' property and staff in the country of business correspond to the classical understanding described in the OECD Model Tax Convention. The Tax Code of the Russian Federation defines PE as 'an office, branch, department, bureau, agency or any other separate subdivision or another establishment of this organization through which this organization regularly conducts entrepreneurial activity on the territory of the Russian Federation'[22].

This definition is obviously outdated and does not reflect the reality of digital entrepreneurship. Sale of digital services does not require a creation of fixed place of business of a foreign company in Russia. Such classical criteria as the presence of a company's property base or staff in the country are inapplicable in the case of digital companies. Digital trade companies can sell their goods and services overseas and this is where the market for their goods and services is formed. This is where the goods are sold, where Internet consumers are located, where value is created and profits are generated. Therefore, the country where the market of

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[22] The Tax Code of the Russian Federation (2 part) dated August 05, 2000 No 117-FZ (add. on December 25, 2018). Available at: http://www.consultant.ru/document/cons_doc_LAW_28165/

digital services is located has a right to tax profits from digital transactions. In this light, the OECD's 'Pillar one' proposal[23], which stipulates that some types of taxable e-commerce profit can be allocated to market jurisdictions, makes perfect sense.

OECD experts[24] recommend to use the criterion of a provider's significant virtual presence in the country where the consumers of its e-services are located. The presence may be deemed 'significant' depending on the number of Internet users, contracts, the volume of digital sales and so on.

Drawing from the general approaches to the concept of virtual PE described in research literature, we propose the following definition that can be used by tax policy-makers in Russia: a virtual permanent establishment is an entrepreneurial activity such as sale of goods (works, services) to customers on the territory of Russia through digital data processing and transfer via an open telecommunication network (similar to the Internet) (or closed networks that can connect to the open network) conducted by a foreign organization.

This definition highlights the three key criteria of a virtual PE because it connects 1) entrepreneurship with 2) digital activity of a foreign company 3) on the territory of Russia as a country of residence of its consumers. This definition eliminates the dependence between taxation and a foreign company's physical presence in Russia (the requirement that a company should have a particular fixed location from which it operates). In our view, it is important to emphasize the non-physical nature of a PE in e-commerce.

Complicating this definition further will only obscure it meaning. We propose to introduce additional criteria in the form of keys for the formula that would be used to apportion the profit of digital multinationals. A mathematical formula based on objective, measurable indicators is much more suitable in this situation than any subjective evaluations and interpretations.

Defining a PE and a virtual PE is but a first step towards taxation of MNCs. In the following section we are going to look at the methods of generation of a virtual PE's taxable profits and the corresponding tools that can be applied by the Russian state to realize its taxing rights.

5. Fiscal potential of the OECD's unified approach to taxation of digital companies in Russia

In this section, we are going to start with a brief overview of the new rules for taxation of MNCs proposed by the OECD.

According to the classical approach, a PE does not have a civil law status but is considered as a part of a foreign company operating on the territory of another state. For taxation purposes, however, it is considered as an independent entity operating in accordance with market rules. Thus, in the majority of countries that adhere to the concept of permanent establishment, PEs' profits are understood as a diffe-rence between income and expenditures attributed to this or that PE on the basis of separate entity accounting and the arm's length principle.

The OECD's 'unified approach' presented in November 2019[25] follows the arm's length principle and proposes a three-tier profit allocation mechanism. These rules will allow the jurisdictions where users of e-services are located to claim a part of MNCs' profits regardless of their physical presence in these jurisdictions:

1) a share of multinationals' profits generated through digital assets and operations in several jurisdictions. These profits are determined by applying the criterion of remote taxable presence and through calculations of residual profits. The supernormal (or residual) profit, according to the OECD, is the profit generated in excess of the normal profit. The normal (or routine) profit is calculated as the required rate of return on business in-

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[23] Secretariat Proposal for a 'Unified Approach' under Pillar One, Public consultation document. OECD Publishing; Oct. 2019.

[24] Ibid.

[25] Secretariat Proposal for a 'Unified Approach' under Pillar One, Public consultation document. OECD Publishing; Oct. 2019.

vestments. Profits are considered to meet the normal rate of return when the revenues from the company's investments in products and sales cover their costs and meet the minimum level of profitability. Residual profits will be allocated among countries on the formulary basis by using a set of allocation keys. These keys can include several indicators, such as the company's investment into marketing its product among the clients in another jurisdiction or the company's global profitability. Profits can be also allocated by using the data on users and their participation in value creation (users of free services can generate value, for example, for advertisers) [33].

2) a fixed remuneration for baseline marketing and distribution functions that take place in the market jurisdiction and are determined by using the baseline profit from the company's market transactions (marketing, sales, number of users, etc.);

3) any additional profit gained by digital companies through the use of arm's-length methods and dispute settlement mechanisms, when in-country functions exceed the baseline marketing and distribution activity.

As MNCs are expanding to the Russian market, their profits are bound to grow and if the OECD's unified approach comes into force, Russia will be able to claim its share in the multinationals' profits generated by Russian users.

In this paper, we propose an approach to quantitative evaluation of additional tax revenue that would be gained by Russia if all the countries endorse the unified approach.

The statistics show the growing profits of foreign IT-companies in Russia (Fig. 1).

The above ranking shows the profits of foreign IT-companies (e.g. Apple, Huawei and Microsoft) selling such goods as smartphones and other devices, software and so on in the Russian market. These data possibly do not include profits from selling specific digital services (such as Apple Music subscription and subscriptions for specific apps, for cloud storage services of Google and Microsoft) be-

cause these services are usually provided by foreign groups affiliated with these companies.

After the residual profits are allocated, a part of the revenue from these services will be subject to taxation in Russia because they are bought by Russian consumers, which creates an additional tax nexus of the group in Russia. For example, if we build a simplified model by using the 2018 data on Apple's sales in Russia, the company's profit from selling the services to Russian users will be as follows[26]:

$$RS_{Rus} = \frac{RP_{Rus} \cdot RS_{Glob}}{RP_{Glob}} = \frac{3000 \cdot 9981}{52919} =$$

$= 566$ mln dollars US (≈ 41318 mln rbs),

where RS_{Rus} is the profit of *Apple's* services sales; RP_{Rus} is the profit of *Apple's* product sales in Russia; RS_{Glob} is the global profit of *Apple* from services sales; and RP_{Glob} is *Apple*'s global profit from product sales.

In all likelihood, the resulting figure is the minimum value since *Apple* also sells its products to the Russian market via distributors. It should be noted, however, that not all of these profits will be taxable in Russia but only residual profits, that is, the profits generated in excess of the 'normal' level of profitability (it is planned to set this level at 10–20%) and after the residual profit is allocated according to the formula, for example, based on intangibles, capital and the corresponding risks[27].

The OECD[28] forecasts that tax revenue will be mostly allocated to countries with low and middle income (according to the World Bank's classification of countries), Russia included. Therefore, the unified approach to taxation of MNCs will allow Russia to obtain very significant tax receipts for the public purse.

As Förster et al. [34] reasonably argue, the unified approach calls for a new

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[26] Apple Inc. 2018. Q4 2018 Unaudited Summary Data. Available at: https://www.apple.com/newsroom/pdfs/Q4-18-Data Summary.pdf

[27] Secretariat Proposal for a 'Unified Approach' under Pillar One, Public consultation document. OECD Publishing; Oct. 2019.

[28] Economic Analysis & Impact Assessment. Available at: https://www.oecd.org/tax/beps/webcast-economic-impact-assessment-february-2020.htm
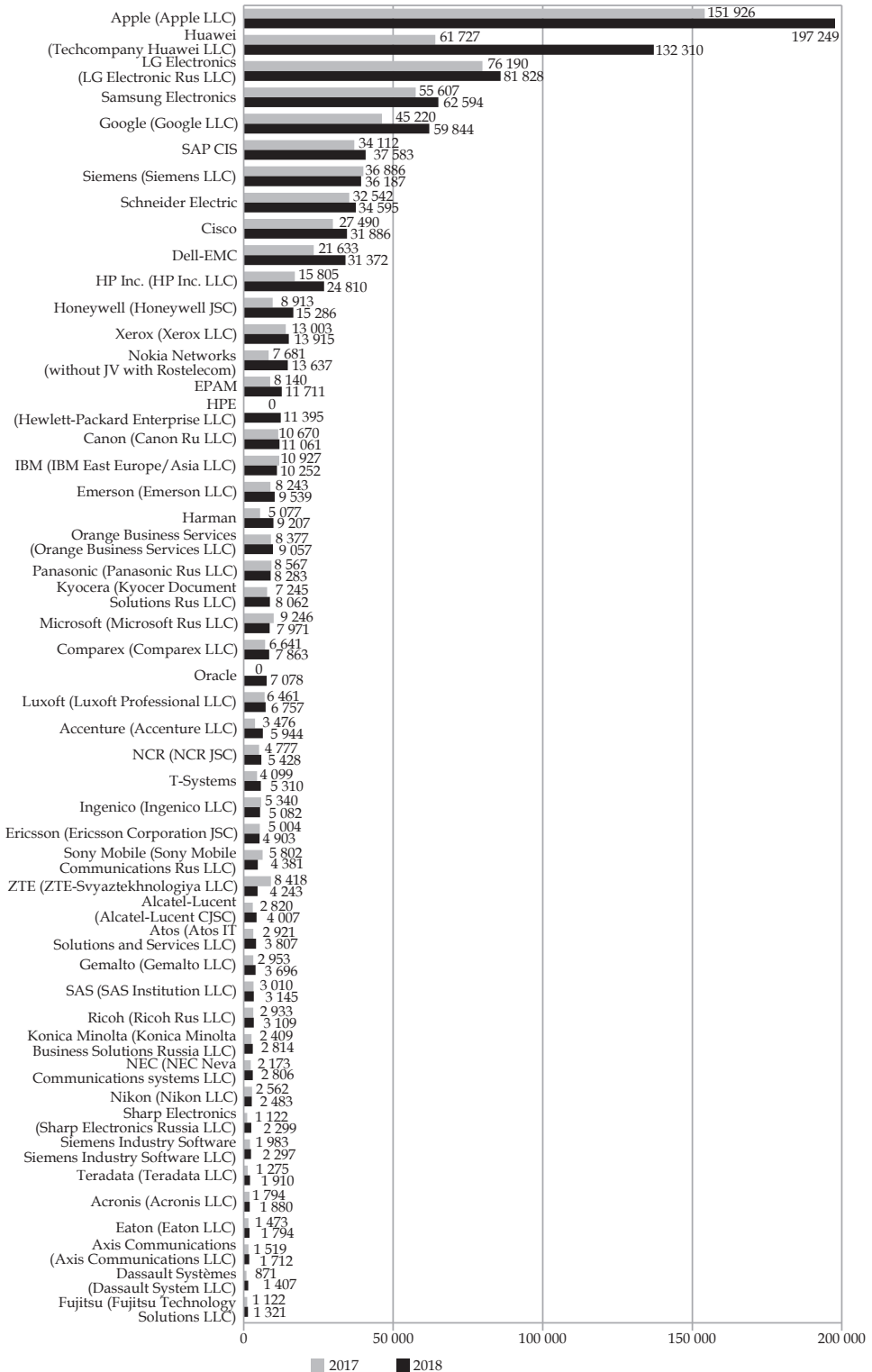
Fig. 1. Profits of Russian representative offices of foreign IT companies (mln rbs)

Compiled by the authors based on the data of Ranking TAdviser: 50 most profitable representative offices of foreign IT companies in Russia. 2019. Available at: http://www.tadviser.ru/index.php

understanding of the notion of *tax nexus* in the tax legislation: in other words, a new nexus rule should be envisaged that would not depend on physical presence of companies in the countries where they sell their products and services. Thus, regardless of whether Russia decides to join the OECD's 'unified approach' initiative or not, its policy-makers would still have to consider the possibility of introducing the concept of virtual PE into the country's Tax Code and develop the rules of its taxation. These measures will enable Russia to gain the status of a jurisdiction of Internet users' residency and tax the profits of foreign digital companies.

A comprehensive evaluation of the unified approach should focus not only on its advantages but also predict the negative implications of this approach for the tax system of Russia and other countries. In the following section, we are going to conduct a critical analysis of the OECD's unified approach, describe and systematize the practical impediments to its introduction and implementation.

6. Critical analysis of the unified approach and impediments to reaching international consensus on this matter

The changes that the implementation of the unified approach will bring about involve a number of tax risks for Russia. These changes will also lead to dramatic transformations of the international system of profit taxation. The key elements of the new regulations should be agreed upon by more than 130 member countries of the BEPS project, including Russia[29].

A failure to arrive at a consensus regarding the taxpayers to whom the new rules will apply can lead to tax revenue losses. This will happen if the agreed threshold values exceed those reflecting the companies' actual performance in the Russian market. The OECD's initiative may cause an outflow of investment from Russian digital companies because they may be caught by the new rules and

it would increase their tax burden in other countries.

One of the key goals of the OECD's initiative is to minimize the costs of tax administration resulting from the introduction of the new rules. There is, however, a lack of clarity as to how this can be achieved because some elements of the new rules include complex and at times ambiguous concepts, parameters and implementation mechanisms.

The unified approach requires a thorough revision of the tax system where the arm's length principle is applied to some parts of the taxable income and other parts are handled differently. The approach proposed by the OECD means that supernormal profit cab be allocated differently so that market jurisdictions could also benefit from it. There are murky areas even in the existing rules concerning the calculation of taxable profit, for example, it may be difficult to determine which profit is normal and which is supernormal. There are disagreements between tax authorities and companies concerning the current taxation methods, leading to disputes and, therefore, adding to the complexity of tax liability determination in each particular country[30].

The debates surrounding transfer pricing show how complicated and costly may be the existing system. The new methods proposed by the OECD are likely to deepen the disagreements between the states concerning the profits that should be taxed and in which jurisdictions. The OECD's initiative will thus aggravate the uncertainty in the international tax sphere.

The unified approach will make fiscal accounting and administration even more complicated not only during the transition period but also in the ensuing years. Companies will have to revise their approaches to transfer pricing, which have already been adjusted in view of the BEPS plan. In addition, companies will also have to bear extra administrative burden and ensure compliance with the rules of the unified

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[29] OECD Members of the OECD/G20 Inclusive Framework on BEPS. Available at: https://www.oecd.org/tax/beps/inclusive-framework-on-beps-composition.pdf

[30] OECD, Mutual Agreement Procedure Statistics for 2017, 2018. Available at: https://www.oecd.org/tax/dispute/mutual-agreement-procedure-statistics.htm

approach. All of the above may lead to revision of the preliminary pricing agreements and re-organization of the new system of tax administration.

In the OECD project, financial accounting is expected to provide a starting point for determining how the profit will be split among countries, which is a significant deviation from the current practice. The difference between taxable and accounting income can be quite substantial. For instance, the pre-tax income does not include the net operating losses and capital investment, which are recognized by countries for taxation through a wide range of methods[31]. Moreover, the differences in the US and European financial accounting standards may pose a real challenge when it comes to measuring profitability.

Broadly speaking, any kind of international consensus regarding the unified approach will require countries to give up some of their tax sovereignty. Not only will this situation create new levels of distortions but it will also undermine the progress which has already been achieved by many countries, including Russia, engaged in fierce tax competition and pursuing business-attraction policies and programs.

Furthermore, the new rules will require new efficient tools for avoiding double taxation. So far no such tools have been chosen. It also remains unclear whether the OECD's proposal can be realized through the Multilateral Convention to Implement Tax Treaty Related Measures to Prevent BEPS[32] or they will require a new solution such as an intergovernmental platform for collaboration on tax [35].

In its current state, the unified approach is unlikely to be supported by the US, which came up with a 'safe harbor'

proposal of its own, meaning that companies should be able to opt into or out of the 'unified approach'. This proposal still remains in discussion stages[33]. We believe that the safe-harbor approach will exacerbate the problem of double taxation and the problem of distortion of business investment and tax decisions by the corporate tax.

The analysis of the relevant US experience can shed light on the possible consequences of this measure for international tax competition as well as on the consequences of the introduction of the formulary approach to profit split. The states being autonomous in their choice of corporate taxation policies, the application of the formulary apportionment method has brought to light tax receipts' sensitivity to such choice. The autonomous approach thus intensified tax competition between the states [36]. Thus, the American experience shows that if the formulary approach is applied on a global scale, coordination in the choice of harmonized formulae and other aspects of tax policies becomes crucially important. Therefore, complete consensus is essential for the success of the OECD's initiative.

7. Taxation of digital multinationals in Russia

The development of e-commerce, which is mostly understood as transactions conducted over the Internet, makes it difficult to determine the specific territory which this or that transaction can be attributed to [18] or the actual source of income [19]. In this light, separate accounting and taxation of tech giants' profits (especially, of their virtual PEs) through the arm's length principle have proven to be all but impossible. A viable alternative in this case would be a formulary apportionment method, like the one in the OECD's

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[31] Kaeding N. Taxable income vs. book income: why some corporations pay no income tax. Tax Foundation. May 2, 2019. Available at: https://taxfoundation.org/why-corporations-pay-no-income-tax

[32] Multilateral Convention to Implement Tax Treaty Related Measures to Prevent BEPS. OECD. Available at: https://www.oecd.org/tax/treaties/multilateral-convention-to-implement-tax-treaty-related-measures-to-prevent-beps.htm

[33] Statement by the OECD/G20 Inclusive Framework on BEPS on the Two-Pillar Approach to Address the Tax Challenges Arising from the Digitalisation of the Economy. OECD; 2020. Available at: https://www.oecd.org/tax/beps/statement-by-the-oecd-g20-inclusive-framework-on-beps-january-2020.pdf

unified approach. As our critical analysis of the latter has shown, however, a more simple and transparent taxation mechanism is needed and this is the task we are trying to address in this article.

We believe that it would make sense to move away from the three-tier unified approach, where different taxation methods are applied to specific fractions of profit. A broader look should be taken at the problem of the common dissatisfaction with the arm's length principle in taxation of MNCs' profits.

If we take a somewhat broader perspective, it becomes apparent that these companies can be treated as consolidated taxpayer groups. Thus, instead of applying the formulary apportionment strategy only to deemed residual profit from digital transactions, we can apply it to MNCs' total global revenue. In this case the presence of a company's branches or offices in a certain country, including its virtual PEs, is bound to draw a share of the company's global profits to this country.

To determine the global profits of digital multinationals, financial accounting can be used, provided that it is standardized in accordance with the established international rules and procedures. The basic criteria or allocation keys used to split the profits should only be objective value indicators since such indicators are commonly used in register records and similar documents and cannot be distorted by subjective interpretations in the course of a functional or factual analysis. The set of indicators (with the corresponding weights) could include labour costs, the cost of tangible or intangible assets, profit, or the number of Internet users.

We do not support the widely spread argument that the risk factor plays the key role in any profit distribution system (including the methods of transfer pricing regulation). In our opinion, this factor should not be included in the formula. In the corporate context, risk can be seen as dependence on the possible loss of financial or economic assets (gains). Risk can be also seen as stemming from the decision to follow a particular course of action or not.

In general, risk is determined by the negative impact that several obvious sources of uncertainty have on profitability. Even if it is possible to determine which part of the enterprise is most likely to take the most risk, accurate assessment of the degree of such risks is impossible.

MNCs' global profits allocated to countries (or regions of federal states) can be reduced by the amount of tax preferences and taxed at the rate set by the national legislation.

Since the digital economy now pervades all spheres of life and business models, the above-described approach will provide a sensible and viable solution not only for taxation of digital companies but to other types of multinationals as well.

The formulary (or unitary) approach to profit allocation can serve as an alternative to the arm's length principle, which is inapplicable in the conditions of the digital economy.

Like the OECD's unified approach, the proposed mechanism of taxation will be more effective if it is adopted by the majority of countries and common financial accounting standards are agreed upon. However, it is worth remembering that consensus decision-making is a time-consuming process.

In Russia, taxation of a virtual PE based on the above-described mechanism may be possible and feasible on a unila-teral basis. This measure will satisfy the country's fiscal interests and at the same time ensure that taxes adequately reflect the actual economic profits of digital companies.

In anticipation of the possible counterarguments, it has to be mentioned that similar approaches to determining PEs' profits were used in Russia until 1 January 2002[34]. These approaches were also described in Article 7 of the OECD Model Convention (until 2010). They can still be found in several international agreements following the UN Model Convention and in some countries' legislation.

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[34] Instruction of the State Tax Service of Russia of 06.16.1995 No. 34 'On Taxation of Profits and Income of Foreign Legal Entities'. *Bulletin of Normative Acts of the Ministries and Departments of the Russian Federation*. 1995;(12).

8. Conclusions

With the advent of the digital era, the international community has faced the need to reconsider the principles behind the allocation of MNCs' profits. The lack of the necessary instruments for taxation of such companies in the Russian tax system is fraught with risks for the participants of tax relations. Our study has brought to light a number of important economic problems and their possible solutions, showing the need to introduce a new indirect tax on digital services in addition to VAT, the concept of virtual PE and the corresponding tools for taxing digital companies in Russia.

This measure, however, should not be taken prematurely and should be preceded by a thorough analysis of its implications for the country's economic growth, in particular such aspects as the tax burden redistribution, competition, business profitability, employment and personal income.

We propose to develop instruments of direct taxation to enable Russia to benefit from the allocation of the global tax base of digital companies. In our view, it is necessary that the Russian legislation should include the concept of virtual PE, for which end we proposed our own definition and criteria.

The critical analysis of the OECD's unified approach has shown that a simpler and more transparent mechanism of taxation would be a better solution. In a broader perspective, the much-discussed problem of the arm's-length method crisis can be solved by identifying digital multinationals as consolidated taxpayer groups. A viable approach would be to adopt the formulary apportionment strategy, dividing MNCs' total global revenue rather than their residual profits between the jurisdictions. For allocation keys, we propose to apply objective value criteria, which are commonly used in register records and accounts, instead of subjective criteria. We believe that Russia should move forward with the unilateral national initiative for taxation of virtual PEs in accordance with the mechanism described above.

To be taken to an international level, our approach requires a multilateral consensus and, therefore, involves the same problems as the OECD's unified approach. Our approach, however, has a number of theoretical and practical advantages because it helps address the tax challenges arising from digitalization and establish fiscal control over the changes in the global revenue of tech giants. Moreover, the proposed approach will help reduce the stimuli to minimize tax liabilities. Not only does this approach facilitate tax administration but it can also be efficiently implemented in the future by using blockchain and big data technologies. In the future, the proposed measures will lead to increased certainty and transparency of taxation and minimization of risks for the participants of legal relations.

The evidence presented in this study can be used by policy-makers to improve the current Russian tax legislation in relation to digital multinationals. Our conclusions and proposals can be used for further research, including quantitative and qualitative studies of the DST's impact on the Russian economy; the concept of virtual PE, and methodological approaches to taxation and tax administration of digital companies.

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Информация о статье

Prospects and Problems of Realization of the VAT Neutrality Principle in Russia and China

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ABSTRACT

The principle of neutrality lies at the core of the European VAT model. In other models, this principle is deemed less important. The most illustrative in this respect is the Chinese VAT system, in which the government has departed from the neutrality principle in order to be able to regulate export structure more efficiently. Since Russia with its resource-oriented export structure is now facing a similar challenge, it may benefit from adopting some of the relevant Chinese experience and thus improve the export potential of its non-resource industries, which is the question this paper seeks to explore. Our hypothesis is that differentiated export VAT refund rates, which signifies a deviation from the VAT neutrality principle, can be used for export regulation. The research relies on the comparative analysis method and the method of analogy. We conducted a detailed analysis of VAT neutrality by focusing on the constitutive elements of the VAT (object of taxation, subject of taxation, tax rates and tax period) and the corresponding types of neutrality. We also compared realization of different neutrality types in China and Russia and the resulting distortionary effects. Our analysis has shown that significant distortions of the VAT neutrality principle are observed in both systems. Some of the elements from the Chinese model can be adopted in Russia, for example, the system of incomplete VAT refunds to exporters. In order to evaluate exporters' credibility, two criteria may be applied. First, their credibility may be assessed with the help of the Automated System for Monitoring VAT Refunds. Second, companies participating in industrial charters and associations can be deemed more credible than those that don't. These two criteria could underpin the application of reducing coefficients. The algorithm for setting the values of these coefficients is described. For the second criterion, we calculated the effect that would be achieved if the export coefficients are introduced. Our study has shown that in the Russian context, differentiated export VAT refund rates could open new opportunities for regulation of the export structure and enhance tax compliance of exporting companies.

KEY WORDS

neutrality principle, tax elements, types of neutrality, distortions of neutrality, export coefficients, differentiation of VAT refund rates

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Проблемы и перспективы реализации принципа нейтральности налога на добавленную стоимость в России и Китае

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АННОТАЦИЯ

Принцип нейтральности является базовым принципом построения европейской модели налога на добавленную стоимость. В иных моделях следование

принципу нейтральности не является столь строгим. Наиболее ярким примером отступления от принципа нейтральности является китайская модель НДС. Такой подход позволил усилить влияние государства на регулирование внешнеэкономических процессов. Данная задача актуальна для России, имеющей однообразную структуру экспорта с ярко выраженной сырьевой направленностью. Целью данной работы является исследование возможности адаптации некоторых элементов практики налогообложения добавленной стоимости в Китае к российским задачам существенного наращения экспортного потенциала несырьевых отраслей экономики. Гипотеза исследования заключается в предположении, что определенные искажения принципа нейтральности в налоге на добавленную стоимость в части дифференциации возмещения налога при экспортных поставках для разных видов экономической деятельности будет иметь регулирующий потенциал воздействия на структуру экспорта. Методология исследования основана на применении методов анализа, сравнения и аналогии. Детализированный анализ нейтральности проводился на основе декомпозиции налога по основным элементам и видам нейтральности (объектной, субъектной, ставок и налогового периода). Был также проведен сравнительный анализ реализации разных видов нейтральности и формируемых искажений в налоге на добавленную стоимость в России и Китае. Сравнительный анализ показал, что значительные искажения принципа нейтральности налога присутствуют в обеих системах. В российских условиях представляется возможным заимствование некоторых элементов китайской модели, а именно применение системы неполного возмещения НДС компаниям-экспортерам. Авторами рассмотрено два критерия для введения понижающих экспортных коэффициентов: в рамках автоматизированной системы контроля за возмещением налога на добавленную стоимость и в рамках действия отраслевых хартий (ассоциаций). Оба критерия были подробно проанализированы в процессе исследования. Предложен алгоритм установления значений экспортных коэффициентов. Для второго критерия проведен расчет, демонстрирующий эффект от введения экспортных коэффициентов для компании. В исследовании показано, что при внедрении в действующую на территории России модель НДС элементов дифференциации объема возмещения налога при экспорте могут быть открыты новые возможности по регулированию видовой структуры экспорта и повышения уровня благонадежности экспортеров.

КЛЮЧЕВЫЕ СЛОВА
принцип нейтральности, элементы налога, видовая нейтральность, искажения нейтральности, экспортные коэффициенты, дифференциация возмещения НДС

1. Introduction

The classical European model of value-added taxation is based on two principles: the principle of generality (general consumption tax) and neutrality (neutral tax) [1]. The principle of generality is established in Article 2 of the First VAT Directive, which stipulates that the principle of the common system of value-added tax requires the application to goods and services of a general tax on consumption [2]. Although contemporary European legislation provides for certain exceptions regarding value-added taxation, it is, nevertheless, considered that the first principle is sufficiently observed [3].

The second basic principle – the principle of neutrality – has been much discussed in research literature. First, there is no universally accepted definition of neutrality, which could be further used to develop criteria and evaluate how this principle is observed in different countries. Moreover, the second principle is harder to observe due to exceptions from the first. Finally, the question remains open as to whether there is a fundamental need to adhere to the neutrality principle or not [4].

The most illustrative in this respect is the Chinese VAT system. It should be noted that originally, this system was based on the European model. As the system was adopted to the country's specific conditions and development challenges, many of the tax's structural features un-

derwent considerable transformations [5]. Nevertheless, VAT has remained one of the most significant taxes in China because it provided the government with new opportunities for controlling the commodity structure of exports. Since Russia with its resource-oriented export structure is now facing a similar challenge, it may benefit from adopting some of the Chinese experience and thus improve the export potential of its non-resource industries, which is the question this paper seeks to explore. To this end, we are going to address the following tasks:

– investigate the possible areas for the application of the VAT neutrality principle;

– develop a typology of types of neutrality;

– analyze to what extent the Russian VAT system adheres to the neutrality principle and consider the distortions of this principle peculiar to the Chinese system;

– study how the neutrality principle can be modified and how the elements of the Russian VAT model can be transformed.

Our hypothesis is that differentiated export VAT refund rates, which means a deviation from the VAT neutrality principle, can be used for export regulation.

Our study comprises three main stages.

First, we are going to consider the theoretical premises of the VAT neutrality principle. As we said above, there is currently no universally agreed definition of neutrality. In this section, we are going to describe our own vision of the neutrality principle and propose a universal model for assessment of adherence to this principle in different countries. This model is further applied to analyze the cases of Russia and China.

Second, we are going to describe the Chinese VAT model and compare it with the Russian model. Special attention will be given to the most peculiar distinctions of the former, such as the application of differentiated VAT refund rates for exporters.

Third, we are going to consider the possibility of adopting certain elements of the Chinese VAT model which make it export-oriented in Russia. In particular, we are going to focus on the idea of applying reducing export VAT refund coefficients depending on various economic conditions and factors.

In the conclusion, we are going to the potential of applying differentiated export VAT refund rates in Russia in order to encourage companies in non-resource sectors to export their production.

2. Literature review

In this section, we are going to provide an overview of the European, American, Chinese and Russian research literature on different aspects of the VAT neutrality principle.

The concept of this new indirect tax emerged practically simultaneously in the first quarter of the twentieth century both in Europe and America. Thomas S. Adams was one of the first to articulate the concept that could be described as 'proto-VAT' and is thus often referred to as the 'intellectual godfather of the VAT' [6]. The European model of VAT is attributed to Wilhelm von Siemens [7]. Interestingly, in the US, the new indirect tax was considered as a system of business taxation while in European countries, on the contrary, it was seen as an 'ennobled turnover tax' [8]. In different countries, VAT neutrality is interpreted differently.

American researchers predominantly focus on the economic aspect of VAT neutrality. Paul Studenski wrote that VAT is neutral because it is uniform for all factors of production [9]. Studenski also created the general ethical philosophical foundation for the use of VAT. He developed the cost-of-service variant of the benefit principle of taxation justice and related it to VAT.

D. Smith posited that VAT neutrality is neutrality between costs and profits [10]. W. Missorten pointed out that VAT has 'internal and external neutrality at the retail level' [11]. Neumark Committee[1] and M. Moller [12] considered neutrality

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[1] Neumark Committee. Report of the Fiscal and Financial Committee, in The EEC Reports on Tax Harmonization, Amsterdam: International Bureau of Fiscal Documentation, 1963.

on the international level and defined it as harmonization of national tax systems to prevent the making of economic decisions that are dictated by tax considerations. B. Herber argued that neutrality means primarily the avoidance of any change in relative well-being of economic entities caused by the collection or introduction of a tax [13].

R. Musgrave proposed a two-component concept of VAT neutrality, consisting of the capital import neutrality (CIN) and the capital export neutrality (CEN) [14]. In other words, the tax should not prevent taxpayers from capital import (inbound investment) and from capital export (outbound investment). In order to decide whether a tax system is neutral or not, it is necessary to compare the actual situation with the situation as if no tax was levied [15].

J. Reugebrink, renowned as the leading figure behind the introduction of VAT in the Netherlands, wrote that at the initial stage, VAT neutrality can be maintained, but secondary effects of its use can distort the neutrality principle [16]. According to Reugebrink, a connection should be established between the amount of tax and the amount of expenditures. In practice, however, it is quite difficult to compare the amount of tax collected on different objects of taxation. At this point a question arises as to what extent VAT should be neutral.

European studies tend to take a more general perspective on the neutrality principle: for example, the IBFD (The International Bureau of Fiscal Documentation) distinguishes between internal and external neutrality of VAT [17]. The OECD (Organisation for Economic Co-operation and Development) in its International VAT Neutrality Guidelines points out that external international neutrality is the most important[2]. Depending on the specific topic this or that study seeks to address, they

may focus on such questions as economic neutrality [18] or legal neutrality [19].

A comprehensive study of the neutrality principle was conducted by C. Herbain. In her book, she considers the necessary conditions for the existence of VAT neutrality and provides an overview of the VAT mechanism. She points out that the concept of neutrality is built into VAT in such a way so as to ensure the natural functioning of the market [20].

Among Russian researchers, the problem of VAT neutrality inspired little interest. One of the few exceptions is the study of A. Shelkunov, who formulates his own definition of the neutrality principle, develops the theoretical foundation of this principle and its aspects and shows its significance in the mechanism of value-added taxation [21]. Shelkunov, however, focuses almost exclusively on the legal aspects, leaving other aspects underexplored.

More attention is given to VAT neutrality by Asian researchers. For example, S. Mukhopadhyay considers the VAT neutrality principle from the critical perspective, arguing that in practice, in developing countries it is impossible to adhere to this principle [4]. Mukhopadhyay discusses the classical concept of European VAT and concludes that the rigorous adherence to this principle may be detrimental to Asian countries.

According to Xu Yan, unlike European countries, in China, VAT is not neutral because exporters do not get complete refunds of the domestic VAT paid on their inputs [5]. Similar opinion is expressed by Jinyan Li [22] and Shenggen Fan, Ravi Kanbur, Shang-Jin Wei, Xiaobo Zhang [23]. China's experience is relevant to another field of studies connecting VAT neutrality and transformations of its key characteristics. If the neutrality principle is followed loosely, there is a possibility that there will be more rigorous state regulation targeting companies and entrepreneurs engaged in international trade.

M. Feldstein and P. Krugman [24] demonstrated the direct relationship between incomplete VAT rebates and international trade flows, making a conclusion

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[2] OECD International VAT/GST guidelines on neutraliry. CENTRE FOR TAX POLICY AND ADMINISTRATION. Available at: https://www.oecd.org/tax/consumption/guidelinesneutrality2011.pdf

that incomplete VAT rebates to exporters can be considered as equivalent to export taxes and lead to a decline in the export volume. The immediate effect of cuts in VAT rebates if not passed on to prices is the declining profits of exporters. This fact may lead manufacturers to change the structure of production and reorient their sales towards domestic consumers. In this case importers are likely to look for alternative sources of supply, which will be also cause a decline in export production. On the other hand, if the VAT rebate rates are increased, it is likely to boost exports.

There are studies dealing with the question of whether exporters' response to changes in VAT rebates will be the same in the long term or not, which is of particular relevance to our research. For example, Ch.-H. Chen et al. used the statistical data of China from 1985 to 2002 to show that its export tax rebate policy has a significant positive correlation with its exports, final domestic consumption, and foreign exchange reserve [25]. P. Chandra and Ch.-X. Long used firm-level panel data for 2000–2006 to demonstrate a positive relationship between the amount of exports and the average VAT refund rates [26].

Thus, different approaches and perspectives are adopted to study the VAT neutrality principle and its realization in various countries. At the same time the transition from the VAT neutrality model to what can be called 'partial VAT neutrality model' still remains a murkier area of research.

3. Methodology

Methodologically, our research is based upon the use of comparative analysis and the method of analogy. In the following section, we are going to analyze the EU VAT Directive and consider different types of VAT neutrality to formulate our own definition of this concept and draw a classification of neutrality types. For each of these types a detailed analysis can be conducted in the context of this or that country.

We use the method of comparative analysis to describe the compliance with the neutrality principle in China and Russia. Our analysis comprises several stages. First, we compare how each type of neutrality is realized in Russia and China. Next, we identify those types of neutrality in which the Russian and Chinese VAT systems do not fully comply with the principle, that is, this principle is realized only partially. Then, we analyze the structural features of the Chinese VAT and in particular the system of export VAT refund rates, which accounts for most deviations from the neutrality principle.

We apply the method of analogy to consider the possibility of adopting the Chinese system of differentiated export VAT refund rates in the Russian context. We propose a system of reducing coefficients and a set of criteria for the differentiation of these coefficients. In our view, such criteria may include, first, credibility of an exporter assessed within the framework of the risk management system (Automated System for Monitoring VAT Refunds) and, secondly, credibility of an exporter determined by the membership in industrial charters and associations.

4. Research and Results

4.1. VAT neutrality and neutrality types

There is currently no universal theoretical understanding of what constitutes the VAT neutrality principle. The European model distinguishes between internal and external neutrality. Internal neutrality can be divided into legal neutrality, neutrality in competition and economic neutrality [17]. For each of these types there are compliance criteria, which are used to assess the neutrality of each country's VAT system.

In our view, neutral VAT is a tax that does not have a significant impact on business decisions of economic entities. The process of decision-making tends to be distorted by national modifications of specific VAT elements, such as the objects and subjects of taxation, tax rates and tax base. The combination of these elements determines the specificity of this or that national VAT model and the general level of neutrality in this model. For a more de-

tailed analysis of the neutrality principle, we need to look at the specific elements of VAT and the corresponding types of neutrality. We believe that such analysis will present a more nuanced picture since it reveals the reasons for distortions of the neutrality principle in specific VAT systems. At the same time it should be noted that the analysis of internal and external VAT neutrality can bring to light the consequences of distortions resulting from specific characteristics of national VAT models.

Neutrality for each specific element of VAT will be referred to as a type of neutrality. Our analysis will focus on four elements of VAT and four types of VAT neutrality (Fig. 1).

1. *Objective neutrality* means that a unified procedure for VAT calculation and payment is applied to all objects of taxation in the country. If some goods, works and services are VAT exempt or if different procedures and tax calculation algorithms are applied, then it can be said that the principle of objective neutrality is not fully met.

2. *Subjective neutrality* means that a unified procedure of meeting tax liabilities is set for all VAT payers and that they have equal rights regardless of their characteristics. If a special procedure of VAT payment is set for certain taxpayer categories, including differences in the periods for tax payment and refund, and/or if some VAT exempt categories of taxpayers are introduced, then it can be said that the principle of subjective neutrality is not fully met.

3. *Neutrality of tax rates* means that a uniform VAT rate is set for all types of goods, works and services (the 'classical' VAT system has one VAT rate and zero-rated exports). If reduced VAT rates are applied to certain categories of goods and services, multiple VAT rates are introduced and/or a special procedure of VAT payment is set depending on the rates, then it can be said that the principle of neutrality of tax rates is not fully met.

4. *Neutrality of tax period* means that there is a tax period (reporting period) for all VAT payers and that taxpayers are not divided into groups or categories. If different tax periods are applied depending on a taxpayer's revenue and category, then this principle is not fully met.

This breakdown of VAT into specific elements and the corresponding types of neutrality will be further used to compare how the neutrality principle is realized in Russia and China (Table 1).

The Russian and Chinese VAT systems demonstrate a similar picture of adherence to the neutrality principle: for almost all types of neutrality, certain distortions were detected. Moreover, we found that in both systems the deviations from the 'ideal' VAT (multiple tax rates, tax preferences, etc.) create loopholes that can be exploited by dishonest taxpayers.

4.2. Partial realization of the VAT neutrality principle in China

In China, the VAT was introduced in 1994 [28]. The main peculiarity of the Chinese model is that its VAT is not neutral [28]: for example, differentiated export VAT refund rates are applied [29]. Thus, it can be said that in the Chinese model, much attention is given to the tax's regula-
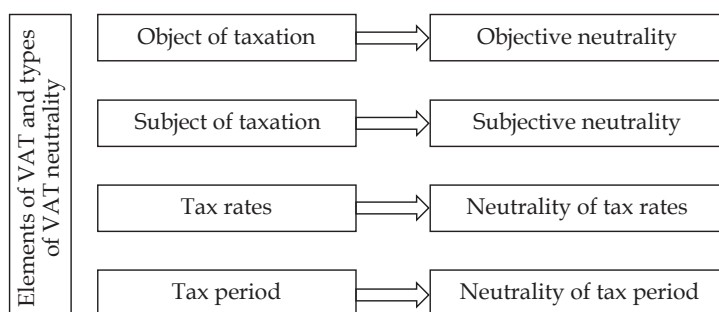
Fig. 1. **Elements of VAT and types of VAT neutrality**

tory function, which is no less important than the fiscal one. China's experience demonstrates that it is possible to use VAT as an effective tool to regulate the commodity structure of exports.

The VAT refund rates applied for exporters are called export VAT refund rates in China. Therefore, hereinafter we are going to use the term 'export VAT rebate rates'.

Export VAT refund rates were for the first time applied a year after the introduction of the VAT. The main reason behind this measure was the unscrupulous behaviour of taxpayers themselves. One of the typical schemes of fraud was VAT refund abuse, when VAT was paid at a reduced (preferential) rate, then invoices were forged and a refund for VAT paid at a standard rate was claimed. As a result, the total amount of refund claims was so

high that the central government struggled to meet them [25]. As a result, the government had to lower the export VAT refund rates in 1995 and 1996. There is no doubt that lower refund rates helped mitigate the pressure on the government but it also had a negative impact on Chinese exports, which in 1996 grew only by 1.5%.

To counteract the negative consequences of the 1997 Asian financial crisis and to stimulate exports, from the beginning of 1998 and till the end of 1999, the Chinese government raised significantly the export VAT refund rates for the key groups of commodities (light industrial products, heavy engineering products and so on) [30]. The State Taxation Administration (STA) in 1999 increased the budget quota for VAT refunds from 57.0 to 63.6 billion yuan. As a result, in 2000, Chinese exports grew by 27.8%.

Table 1

Realization of different types of neutrality and the corresponding distortions of the principle in Russian and Chinese VAT systems

Neutrality type	Russia	China
Objective neutrality	Distortions detected. Different VAT refund procedures may be applied to different objects of taxation, for instance, in the case of construction being conducted for the company's own use and by using its own resources. Significant number of goods, works and services are exempt from the object of taxation.	Considerable distortions. The distortion manifests itself when the export VAT rebates are calculated. For each type of goods (services) a specific rate is applied for calculating VAT payable (export VAT rate). If different export rates are applied to different goods, the company should maintain separate accounting. For domestically sold goods and exported goods, different algorithms of claiming VAT rebates are used.
Subjective neutrality	Distortions detected. Foreign companies providing e-services in Russia are obliged to register as VAT payers. Enterprises that use special tax regimes are not considered VAT payers. Small-scale businesses may be exempt from VAT.	Distortions detected. The VAT law distinguishes between two categories of taxpayers: general and small taxpayers [27]. The taxpayer category determines the tax rate and the procedure of tax payment.
Neutrality of tax rates	Distortion detected. Since the VAT was introduced, there has been three VAT rates, including a reduced rate for socially significant goods, works and services.	Considerable distortions. Since the tax was introduced, the number of VAT rates and their values have been changed many times. The 2019 reform introduced seven VAT rates*.
Neutrality of the tax period	No distortions detected. No groups or categories are distinguished; there is only one tax period for all VAT payers.	Distortion detected. For general taxpayers, the tax period is one month; for small taxpayers, it is one quarter.

Source: compiled by the authors.

*   https://www.avalara.com/vatlive/en/country-guides/asia/china/chinese-vat-rates.html Chinese VAT rates

The system of differentiated export VAT refund rates for different categories of goods is still relevant at the current stage. Between 2013 and 2019, there were several reductions in the export VAT refund rates, for example, they were lowered for such categories of goods as natural resources and polluting substances.

In China, an exporter has to obtain the value-added tax general taxpayer status in accordance with the Temporary Norms and Rules of the PRC on Value Added Tax A taxpayer may claim a VAT refund within a specific timeframe – 90 days since the export declaration has been filed. If a taxpayer fails to do so, export is deemed as local supply and, therefore, the company will have to pay VAT [31].

China's export refund policy is quite complicated and changes frequently [32] but the logic behind VAT calculations remains more or less the same [33]. To manufacture export products, a company may use imported materials as well as domestically produced materials or a combination thereof. According to Circular No. 7 (2002), the official formula used to calculate VAT payable for general trade and processing exports with purchased imported materials ($VAT_{payable}$) looks the following way:

$$VAT_{payable} = \underbrace{(DS \cdot DR_{VAT})}_{\text{Output VAT}} - \underbrace{(DG \cdot DR_{VAT})}_{\text{Input VAT}} +$$
$$+ \underbrace{(E - I) \cdot (DR_{VAT} - ER_{VAT})}_{\text{Export VAT}}, \qquad (1)$$

where DS stands for domestic sales; DR_{VAT}, for the domestic VAT rate; DG, for goods and components purchased in the domestic market; E, export; I, import; and ER_{VAT}, for the export VAT rate.

The amount of VAT recoverable (VAT_{rec}) is calculated according to the following formula:

$$VAT_{rec} = (E - I) \cdot ER_{VAT}. \qquad (2)$$

All export VAT rates are divided into groups according to the commodity codes specified in the Commodity Nomenclature of Foreign Economic Activity of the Customs Union (FEACN). It is easy to find the export VAT rate, VAT rate in the domestic market and other relevant information for an export declaration about the goods being shipped by using the code for this type of goods.

Let us consider several examples of how VAT refunds are calculated in China.

Example 1. Company A manufactures patterned cotton fabric. For production only locally sourced materials are used. The company bought goods (components) worth 70 thousand yuan in the domestic market and the rate of VAT in the domestic market is 13%. The company exports 100% of its production and does not supply to the domestic market. The FEACN code for the company's goods is 5212250000, which means that the export VAT rate is 9%. The export value is 100 thousand yuan.

The data are shown in Table 2.

Table 2

Calculation for company A

Indicator, ths yuan	Indicator value
Goods and components bought in the domestic market (DG)	70 thousand yuan
Domestic VAT rate (DR_{VAT})	13%
Import (I)	0 thousand yuan
Domestic sales (DS)	0 thousand yuan
Export (E)	100 thousand yuan
Export VAT rate (ER_{VAT})	9%

Let us first calculate the amount of export VAT (VAT_{exp}):

$$VAT_{EXP} = (E - I) \cdot (DR_{VAT} - ER_{VAT}) =$$
$$= (100 - 0) \cdot (13\% - 9\%) = 4 \text{ ths. yuan.}$$

The amount of VAT payable is calculated by using formula (1):

$$VAT_{payable} = (0 \cdot 13\%) - (70 \cdot 13\%) + 4 =$$
$$= 0 - 9.1 + 4 = -5.1 \text{ ths. yuan.}$$

The amount of VAT recoverable is calculated the following way:

$$VAT_{rec} = (E - I) \cdot ER_{VAT} = (100 - 0) \cdot 9\% =$$
$$= 9 \text{ ths. yuan.}$$

Since the amount of VAT payable is negative (–5.100 yuan), the amount of VAT refund will be limited to the smaller value of 'VAT refundable' and the sum of VAT payable. In this case, the maximum possible amount of VAT recoverable is 9 thousand yuan while the amount of VAT

payable is 5.1 thousand yuan. Thus, the amount of VAT recoverable exceeds that of VAT payable. In this case, the smaller value is chosen for the company's VAT refund, that is, 5.1 thousand yuan.

Example 2. Company B manufactures LCD panels. For production it uses both Chinese and imported components. The company bought goods (components) worth 40 thousand yuan in the domestic market and the rate of VAT paid in the domestic market is 13%. Components worth 10 thousand yuan were imported. To import components, the company also paid VAT at the rate of 13%. The company exports 100% of its production and does not supply to the domestic market. The FEACN code for the company's goods is 9013803010, which means that the export VAT rate is 13%. The export value was 100 thousand yuan. In this case we are not going to consider the domestic VAT refund.

The data are shown in Table 3.

Table 3
Calculation for company B

Indicator, ths yuan	Indicator value
Goods and components bought in the domestic market (*DG*)	40 thousand yuan
Domestic VAT rate (*DR$_{VAT}$*)	13%
Import (*I*)	10 thousand yuan
Domestic sales (*DS*)	0 thousand yuan
Export (*E*)	100 thousand yuan
Export VAT rate (*ER$_{VAT}$*)	13%

Let us calculate the amount of export VAT (*VAT$_{exp}$*):

$$VAT_{EXP} = (E - I) \cdot (DR_{VAT} - ER_{VAT}) =$$
$$= (100 - 10) \cdot (13\% - 13\%) = 0 \text{ ths. yuan.}$$

The amount of VAT payable is calculated by using formula (1):

$$VAT_{payable} = (0 \cdot 13\%) - (40 \cdot 13\%) + 0 =$$
$$= -5.2 \text{ ths. yuan.}$$

The amount of VAT recoverable:

$$VAT_{rec} = (E - I) \cdot ER_{VAT} = (100 - 10) \cdot 13\% =$$
$$= 11.7 \text{ ths. yuan.}$$

Similar to Example 1, the amount of VAT refund is the smaller of the sums of 'VAT payable'. Therefore, the amount of VAT refund will be 5.2 thousand yuan.

Example 3. Company C manufactures bags. To produce them, it uses only imported components and parts. The company has imported materials worth 70 thousand yuan. To import components, the company also pays VAT at the rate of 13%. The company exports 100% of its production and does not supply to the domestic market. The FEACN code for the company's goods is 4202910090, which means that the export VAT rate is 0%. The export value was 100 thousand yuan.

The data are shown in Table 4.

Table 4
Calculation for company C

Indicator, ths yuan	Indicator value
Goods and components bought in the domestic market (*DG*)	0 thousand yuan
Domestic VAT rate (*DR$_{VAT}$*)	13%
Import (*I*)	70 thousand yuan
Domestic sales (*DS*)	0 thousand yuan
Export (*E*)	100 thousand yuan
Export VAT rate (*ER$_{VAT}$*)	13%

Let us calculate the amount of export VAT (*VAT$_{exp}$*):

$$VAT_{EXP} = (E - I) \cdot (DR_{VAT} - ER_{VAT}) =$$
$$= (100 - 70) \cdot (13\% - 13\%) = 0 \text{ ths. yuan.}$$

The amount of VAT payable is calculated by using formula (1):

$$VAT_{payable} = (0 \cdot 13\%) - (0 \cdot 13\%) + 0 =$$
$$= 0 \text{ ths. yuan.}$$

The amount of VAT recoverable:

$$VAT_{rec} = (E - I) \cdot ER_{VAT} = (100 - 70) \cdot 13\% =$$
$$= 3.9 \text{ ths. yuan.}$$

In this case, the exporting company is unable to obtain a VAT refund because the sum of VAT payable is 0 thousand yuan.

The above situations show that the amount of VAT exporting companies can reclaim depends on many factors such as the company's volume of production, export and import volumes, origin of the raw materials used in production and so on. D. Gordon et al. describes the most typical situations [34]:

1. Domestic sales. The goods were manufactured by using imported components and parts. The company has to pay input VAT.

2. Domestic sales. The goods were manufactured by using domestically produced components and parts. The company has to pay input VAT.

3. The customs procedure of inward processing is applied, which means that certain goods can be brought into China Customs territory for manufacturing or processing with subsequent exportation. Exemption or partial exemption from VAT.

4. Export. The goods are manufactured by using only domestically produced components and parts. Export is VAT exempt, input VAT is fully or partially refunded.

Thus, though in China the neutrality principle is not always adhered to, an individual approach to taxation of companies is applied. Such approach helps the government increase the effectiveness of state support to exporters.

The list of reasons behind the Chinese government's decision to introduce differentiated export VAT refund rates is not limited to the need to relieve financial pressure on the government or to stimulate exports of specific commodities. In our view, there are other reasons that are still important for the country today:

1. Manipulation of the terms-of-trade. If a country is a leader in one of the world markets, then any restrictions placed on its exports will lead to a rise in global prices and improve the conditions of trade.

2. Food security. State authorities can reduce consumer prices for certain goods by redirecting the foodstuff supply towards the domestic market [34] In the 1980s, Chinese authorities set the rates of VAT refund quite low, mostly with the aim to curb raw commodity exports and exports of agricultural products.

3. Maintaining environmental sustainability. This factor has gained relevance in the recent decades when industrial discharges started to take a heavy toll on urban dwellers' health. In 2016, VAT rebates were cancelled for some natural resources and primary products and were reduced for those goods whose manufacturing is energy intensive and has a heavy environmental impact.

Yan Xu points out that China uses the VAT as a tool to manage export flows [28], which is why the mechanisms of differentiated rates of VAT refunds for exporters are actively used. In the global practice, this approach is unique, which makes it particularly interesting to consider the possibilities of adapting it to Russian conditions.

4.3. Description of export coefficients

In order to adapt the Chinese system of export VAT refund rates to Russian conditions, we should address two key questions: first, what should be the formula for calculating VAT refunds and, second, what should be the criteria for applying differentiated VAT refund rates. The choice of criteria is the most significant: on the one hand, they should be clearly defined and easily understandable for taxpayers, on the other, they should correspond to the priorities of the state policy.

We believe that export coefficients (C_{exp}) are the most suitable for this purpose. First and foremost, it is necessary to establish a formula to calculate the amount of VAT refund with the help of C_{exp}.

The amount of VAT payable is computed as a difference between the sum of VAT on goods sold in the domestic market $VAT_{domsales}$ and the sum of VAT refund VAT_{refund} with the addition of VAT recovered VAT_{rec}

$$VAT_{payable} = VAT_{domsales} - VAT_{refund} + VAT_{rec}. \quad (3)$$

In this formula we are most interested in indicator VAT_{refund}. An exporting company can sell some part or all of its products to overseas markets. Thus, the amount of goods sold can be taken as 1, then the amount of goods realized in the domestic market will be a, while b will stand for the share of exported goods. The export coefficient will be applied only to VAT refunds on exported goods.

$$VAT_{payable} = VAT_{sales} - (a \cdot VAT_{refund} + b \cdot VAT_{refund} \cdot C_{exp}) + VAT_{rec}. \quad (4)$$

The total amount of VAT refundable (VAT_{refund}) will be calculated by taking into account the reducing coefficient ap-

plied to VAT refunds on exported goods. This share will be calculated by using the shares of goods sold to overseas markets or domestically. For example, if 60% of goods are exported, then the coefficient will be applied only to 0.6 from the total amount of VAT refunds.

4.4. Differentiated export coefficients and criteria for their application

The application of reducing coefficients to VAT refunds claimed by companies can be used in the interests of the state as well as in the interests of companies themselves. Like other taxes, VAT is vulnerable to fraud. Dishonest taxpayers may use illegal schemes to claim VAT refunds through dummy companies and forged documents. To tackle such fraud schemes, the state increases its presence in the economic activities of taxpayers by introducing specialized software. In the most 'complicated' spheres, industrial charters are introduced to encourage responsible tax behavior. By signing them, taxpayers undertake certain responsibilities.

Let us now consider two possible criteria that may be applied for setting different export coefficients.

Criterion 1 is based on the assessment of a company's credibility with the help of the Automated System for Monitoring VAT Refunds (ASM-VAT-2) [35]. This software can automatically analyze the input data and assign export coefficients.

The ASM-VAT-2 incorporates a risk management system, which assesses and classifies companies in accordance with 84 criteria. Depending on their results, companies are assigned to one of the three risk areas (red, yellow, green). Unfortunately, the access to the information of what constitutes the assessment criteria is restricted. However, there are 12 criteria that taxpayers can use for self-assessment that is, a taxpayer can independently analyze their organization's activity and determine its non-compliance risk level. These criteria are also used by tax authorities when deciding whether it is necessary to conduct an on-site tax audit of this or that company or not.

Justification of computations. The criteria presented in the assessment table (see Table 5 below) are listed in the above-mentioned decree[3]. Some of them correspond to specific risk areas depending on the frequency of non-compliance incidents, that is, a company that has been caught abusing the tax system still has a chance to remain in the 'green' area but if it happens more often, such company will be considered as presenting a higher risk of non-compliance.

The level of tax risk for each company is determined as a sum of all scores. Taxpayers in the green area are eligible for the maximum level of C_{exp}; in the yellow area, for the medium level; and for the red area, the minimal level.

Criterion justification. The application of this criterion can have a significant economic effect by making state support target the most credible and reliable companies.

Challenges and setbacks. The main difficulty lies in the fact that the application of this criterion will require more effort on the part of exporters to claim their VAT refunds. Exporting companies will have to constantly monitor their credibility level and work hard to enhance it. It also makes the whole process more painstaking and time-consuming for the tax authorities. Moreover, since there is a lack of available data for some of the risk assessment criteria, it is hard to predict how much potential this criterion actually holds.

Criterion 2 is based on companies' engagement in industrial projects. This criterion can be applied within specific economic sectors since it takes into account the degree of companies' engagement in projects aimed at enhancing accountability and transparency in VAT refund claims [36].

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[3] Approval of the Conceptual Framework for the On-Site Tax Audit Planning System: Decree of the Federal Tax Service of Russia № MM-3-06/333@ of 30 May 2007 (version of 10 May 2012). ConsultantPlus: legal reference guide. Available at: http://www.consultant.ru/document/cons_doc_LAW_55729/ (Accessed: 29.04.2020).

Criterion justification. This criterion allows us to assess an exporting company's credibility and reliability in the long term in relation to taxation and to other companies in this sector. However, since this criterion relies on an individual approach to taxpayers, the whole procedure of company assessment becomes quite complicated.

The values of export coefficients can vary depending on whether this or that company fits a certain set of criteria. Let us consider the possible applications of C_{exp} in relation to one of the industrial charters in Russia, namely, the Charter of the Agro-Industrial Complex.

The Federal Tax Service takes active measures to stimulate the creation of industrial charters, considering them a key tool in the struggle against fraud schemes. The Charter of the Agro-Industrial Complex was established in 2017 and initially was intended only for grain manufacturers. At present, the Charter's participants are companies engaged in manufacture and sales of a wide range of agricultural products.

Table 5

Assessment of a company's credibility

Criterion	Risk areas		
	Green	**Yellow**	**Red**
The company's tax burden is lower than the average in the industry (type of economic activity)	no	Marginally lower	Considerably lower
The company's accounting and tax reports show losses in several consecutive tax periods	no	No more than two periods in succession	More than two periods in succession
The company's tax reports show large sums of VAT refunds in a specific period	no	Slight deviation	Considerable deviation
The growth in losses exceeds the growth in revenues from sales of goods (works, services)	no	Slightly exceeds	Considerably exceeds
The average monthly salary per employee is below the average level for this economic sector in this Russian region	no	no	yes
The figures reported by the company approached the threshold values set for the indicators used to determine eligibility for a special tax regime	no	Once	More than once
The amount of expenses specified by an independent entrepreneur in their accounting and tax reports is close to the amount of revenue received in the calendar year	no	Once	More than once
The company's financial and economic activities are based on contracts with subpurchasers or intermediaries ('chain of contractors') for no significant economic or other reasons (business purpose)	no	no	yes
The taxpayer has failed to provide explanations after receiving a notification from the tax authorities on non-conformity revealed and/or failed to provide documents requested by the tax authority and/or notify about the loss or destruction of such documents, etc.	no	no	yes
The taxpayer on multiple occasions applied for a registration and deregistration with a tax authority due to relocation ('migration' between tax offices)	no	Once	More than once
The company's level of profitability according to its accounting reports deviates considerably from the level of profitability for this sphere of economic activity determined by the official statistics	no	Slight deviation	Considerable deviation
The company engages in financial and economic activities deemed high tax risk	no	no	yes
Possible value of C_{exp}	1.00	0.75	0.50

Source: compiled by the authors.

The Charter requires its participants to be careful in the choice of their contractual partners, avoid using fraud schemes of VAT optimization and use commission agreements when dealing with suppliers. At present, 5,301 organizations from 76 regions participate in the Charter. The Charter also unites 20 industrial associations such as the Association of Responsible Participants of the Agricultural Market (hereinafter Association), which was founded in 2018 and is aimed at implementing the system of tax secrecy disclosure. In other words, this association strives to increase the level of tax transparency in the market. The Association enables companies to gain access to the information about their contractual partners, in particular the information concerning tax gaps detected by the ASM-VAT-2 system. So far, 17,425 companies have agreed to disclose their tax information and the information about 412 companies with high tax gaps was released. Thus, even if an exporting company is not a participant of the Charter, it can join the system of tax secrecy disclosure.

Justification of computations. All companies exporting agricultural production are required to register with Cerberus system, which had 6,586 registered companies at the beginning of 2020[4]. These include participants of the Charter, members of the Association and other industrial associations as well as companies that are not members of any such organizations. Table 6 illustrates the system of exporter ranking assessment.

A company's score may depend on the level of the association of which it is a member. If a company is a member of several associations, then its score is calculated as progressive total and thus determines which C_{exp} should be assigned. The more open this company is, the higher is the value of its export coefficient. The possible values of C_{exp} are shown in Table 7.

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[4] Register of Enterprises of the Customs Union. Cerberus. Register of Objects Under Surveillance. Available at: https://cerberus.vetrf.ru/cerberus/certified/pub (Accessed: 29.04.2020).

Table 6

Ranking assessment of exporters

Indicator	Score
The company is a member of an industrial association	1
The company is a participant of the Charter of the Agro-Industrial Complex	2
The company is a member of an industrial association and the Charter of the Agro-Industrial Complex	2 + 1
The company is not a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected)	3
The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps are detected)	1
The company is a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected) and an industrial association	3 + 1
The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps detected) and an industrial association	1 + 1
The company is a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected) and of the Charter of the Agro-Industrial Complex	3 + 2
The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps detected) and of the Charter of the Agro-Industrial Complex	1 + 2
The company is a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected), an industrial association and the Charter of the Agro-Industrial Complex	3 + 1 + 2
The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps detected), an industrial association and the Charter of the Agro-Industrial Complex	1 + 1 + 2
The company does not participate in any of the above-mentioned organizations	0

Source: compiled by the authors

Therefore, there can be seven export coefficients to choose from. $C_{exp} = 1$ is assigned to the most credible companies, that is, those that agree to disclose their tax information and are participants of the Charter, members of the Association or a similar organization. These companies will be entitled to full VAT refunds. Companies deemed least credible will be entitled only to a quarter of all the possible VAT refunds on exported goods. A recommended period when coefficients should be in force is 1 year, afterwards they should be revised.

To illustrate the possible effect of this system, let us consider the case of a hypothetical agricultural export company. Since Criterion 2 implies that a company can influence which C_{exp} will be applied to its VAT refunds by adjusting its development strategies, we can calculate its VAT refund for all coefficient values and estimate what benefits a company can get from its participation in industrial charters and associations. It would be reasonable to compare the data of export-oriented companies with companies that export a smaller share of their production (see Table 8).

Table 7

Possible values of export coefficients

Score	Condition	C_{exp}
0	The company does not participate in any of the above-mentioned organizations	0.4
1	The company is a member of the industrial association *or* The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps are detected)	0.5
2	The company is a member of the Charter of the Agro-Industrial Complex *or* The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps detected) and an industrial association	0.6
3	The company is a member of the industrial association and the Charter of the Agro-Industrial Complex *or* The company is not a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected) *or* The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps detected) and of the Charter of the Agro-Industrial Complex	0.7
4	The company is a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected) and an industrial association *or* The company is a member of the Association of Responsible Participants of the Agricultural Market (tax gaps detected), an industrial association and the Charter of the Agro-Industrial Complex	0.8
5	The company is a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected) and of the Charter of the Agro-Industrial Complex	0.9
6	The company is a member of the Association of Responsible Participants of the Agricultural Market (no tax gaps are detected), an industrial association and the Charter of the Agro-Industrial Complex	1.0

Source: compiled by the authors

Table 8

Exporting companies' data and their VAT payable calculated by taking into account C_{exp}

Company	Share of export in total production output, %	Sum of VAT refunds, monetary units	Sum of VAT recovered, monetary units	VAT on sales and purchase transactions, monetary units
A	80	90	0	150
B	50	90	0	150
C	10	90	0	150

Table 9

VAT payable with regard to coefficient C_{exp}

C_{exp}	Company A (export share 80%)		Company B (export share 50%)		Company C (export share 10%)	
	VAT payable, monetary units	Increase, %	VAT payable, monetary units	Increase, %	VAT payable, monetary units	Increase, %
1	60.00	–	60.00	–	60.00	–
0.9	67.20	+12.0	64.50	+7.5	60.90	+1.5
0.8	74.40	+24.0	69.00	+15.0	61.80	+3.0
0.7	81.60	+36.0	73.50	+22.5	62.70	+4.5
0.6	88.80	+48.0	78.00	+30.0	63.60	+6.0
0.5	96.00	+60.0	82.50	+37.5	64.50	+7.5
0.4	103.20	+72.0	87.00	+45.0	65.40	+9.0

VAT payable will be calculated according to Formula (4). The results of our calculations are shown in Table 9.

All of the above leads us to the following preliminary conclusions.

1. Large- and medium-sized exporters benefit the most from membership in industrial associations.

2. C_{exp} can considerably increase VAT refunds paid to large and medium-sized exporters while for smaller companies the role of this coefficient is much less significant.

Such differentiation of export coefficients may incentivize exporters to join industrial charters and associations; it will encourage them to be more scrupulous in the choice of their contracting partners. In the future, these coefficients may be applied to participants of other charters and associations (for example, the charter of wood processing companies).

Challenges and setbacks. Criterion 2 is sector-specific and, therefore, requires a careful adjustment for each particular sector. There is a problem of how scores should be assigned depending on companies' membership in industrial associations because there is no universal agreement concerning which of these associations should be deemed more significant than others.

5. Conclusion

Our study has shown that in practice, it is not always possible to adhere to the VAT neutrality principle. What complicates the problem even further is that the theoretical side of VAT neutrality also remains elusive. Therefore, approaches to the neutrality principle may vary across countries.

In this paper, we broke down VAT into separate elements and identified the corresponding neutrality types: objective, subjective, rates and tax period. We also compared realization of different neutrality types in China and Russia and the resulting distortionary effects. Our comparative analysis has shown that significant distortions of the VAT neutrality principle are observed in both systems. The scale of regulation can be increased by lowering the extent of VAT neutrality.

We considered the Chinese approach to VAT neutrality and showed that in this country, the VAT has a considerable impact on commercial decision-making. The Chinese system of differentiated export VAT refund rates was originally introduced to cover the state budget deficit. At present this system performs a variety of functions: the rates depend on the environmental impact of manufacturing companies, the country of origin for raw materials and so on. The three cases we considered demonstrate the effect of export VAT refund rates and show that even the minimum rates can have profound consequences for exporters.

Some of the elements from the Chinese model can be adopted in Russia, for example, the system of incomplete VAT rebates to exporters. We have also described two criteria for application of reduction coefficients: exporters' credi-

bility assessed through the Automated System for Monitoring VAT Refunds and exporters' credibility determined by companies' participation in industrial charters and associations. We have proposed an algorithm for setting the values of reduction coefficients. For the second criterion, we also describe the effect that can be achieved if the export coefficients are introduced.

The system of differentiated export VAT refund rates in Russia will open new opportunities for regulating the commodity structure of exports and for encouraging responsible tax behavior among exporting companies.

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Econometric models of tax reforms

Экономико-математические модели налоговых реформ

Analytic Hierarchy Process in Czech Taxpayers' Decision-Making Regarding their Tax Liability

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ABSTRACT

The article deals with taxation of the earned income of natural persons in the Czech Republic in 1993–2017. The goal is to select the year when the tax burden on the earned income of natural persons was the lowest depending on the taxpayers' preferences, their income level and the number of tax deductions they were entitled to. Based on their income levels, taxpayers analyzed the elements constituting their tax liability and decided whether it became smaller or larger in the given periods. The research methodology includes methods of description, comparison, analysis and synthesis and methods of multi-criteria decision-making. The decision-making analysis focuses on model situations which differ from each other in terms of the amount of gross wage and the number of deductions applied. It is concluded that in most cases, the replacement of the progressive tax rate by the linear rate in 2008 lead to a reduction in the tax burden. The highest decrease of tax liability was observed among taxpayers with below-average incomes. Taxpayers with above-average incomes were subject to a higher tax liability when the nominal tax rate was progressive. Tax credit is yet another factor that influences tax liability; for taxpayers whose income is less than average it takes a form of tax bonus. The most significant change in the legislation regulating income taxation occurred between 2007 and 2008. According to the evaluated criteria weights, the most import criterion for Czech taxpayers is the effective tax rate. The weights of criteria in multi-criteria decision-making analysis were established by using the results of the questionnaire survey conducted by the author among 189 respondents at a manufacturing company in Zlin region.

KEYWORDS

analytic hierarchy process, AHP, consistency, personal income tax, effective tax rate, variant, social security contribution

JEL H240

Метод анализа иерархий в принятии решений налогоплательщиками Чешской Республики в отношении их личной налоговой нагрузки

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АННОТАЦИЯ

В статье рассматривается налогообложение доходов физических лиц в Чешской Республике в 1993–2017 гг. Цель настоящего исследования – определить год, когда налоговая нагрузка на трудовой доход физических лиц была самой низкой с точки зрения налогоплательщиков, то есть в зависимости от их уровня доходов и количества налоговых вычетов, на которые они имели право. Иными словами, налогоплательщик в зависимости от уровня своего доходов анализи-

ровал компоненты своей налоговой нагрузки и определял, стала ли его или ее личная налоговая нагрузка выше или ниже в указанный период. Методология настоящего исследования включает в себя сравнительный и описательный методы, метод синтеза, а также метод мультикритериального анализа решений. В фокусе анализа иерархий оказываются модели различных ситуаций, которые могут различаться по брутто-заработной плате и количеству налоговых вычетов, применяемых к тому или иному налогоплательщику. В заключение делается вывод о том, что налоговая реформа, в результате которой в Чехии в 2008 г. прогрессивная шкала ставок налогообложения была заменена плоской, привела к снижению налоговой нагрузки. Наибольшее уменьшение налоговых обязательств наблюдалось для налогоплательщиков с доходом ниже среднего. Налоговые обязательства налогоплательщиков с уровнем дохода выше среднего росли, когда применялась прогрессивная номинальная ставка налога. Еще одним фактором, который влияет на налоговые обязательства, является возможность получить налоговый кредит, который для налогоплательщика с доходом ниже среднего является формой налогового бонуса. Наиболее существенное изменение в законодательстве, регулирующем подоходное налогообложение, произошло между 2007 и 2008 гг. Как показала оценка веса критериев, наиболее важным критерием в решениях налогоплательщиков оказалась эффективная ставка налога. В рамках последнего вес критериев устанавливался в соответствии с результатами опроса 189 сотрудников производственной компании, проведенного автором в Злинском крае.

КЛЮЧЕВЫЕ СЛОВА

метод анализа иерархий, налог на доходы физических лиц, эффективная ставка налога, вариант, взнос на обязательное социальное страхование

1. Introduction

Any taxpayer seeks to optimize their tax payments to pay less in taxes and to minimize the difference between their gross and net wage. An employee's net wage depends not only on the income tax, but also on social insurance contributions. As is the case with tax liability, social security contributions are deducted from the gross wage when calculating the net wage. This article analyzes not only the aspects related to personal income but also those linked to social security contributions. In taxation theory, for example, within the framework of the OECD classification of taxes, social insurance payments are considered to be direct tax payments.

The aim of this study is to select the year when the tax burden on natural persons' earned income was the lowest. The results of decision analysis will show when the conditions of personal income taxation were better for taxpayers with an average, above-average or below-average income, entitled or not entitled to child tax benefits. The results of our decision analysis may be used in the future by state authorities to devise new elements of the personal income tax: for example, these results can be compared with the revenue from the personal income tax.

The decision-making situations in the sphere of taxation depend on the amount of income and the number of deductions applied. In this article, we are going to analyse the situation where a Czech taxpayer's income was at the average level, below average or above average between 1993–2017[1]. In some cases, the starting point of decision-making situations was the application of tax deductions for children, in addition to the tax deductions for the taxpayers themselves. Thus, our study focuses primarily on the taxpayer – an employee of a manufacturing company – and on their tax liability.

There are several hypotheses whose validity will be accepted or rejected depending on the results of the study:

– the effective tax rate is the most important criterion for tax liability evaluation;

– a taxpayer with an above-average income had higher tax liability during the period when the nominal tax rate of the progressive type was applied;

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[1] *Average Wage*. Prague: Czech Statistical Office, 2018. Available at: www.czso.cz/csu/czso/prumerne-mzdy

– a taxpayer's tax liability hasn´t changed significantly in the comparison with the first and last analysed year;

– for a taxpayer whose income is above average, it is better when the nominal tax rate is linear and the tax deduction for children takes the form of a tax credit;

– the most significant change in the taxpayer's tax burden was observed after 2007.

The legislation regulating personal income taxation in the Czech Republic – the Income Tax Law – has undergone a number of amendments. In this respect, the question arises as to in which period the parameters of the personal income tax were as favourable as possible for the taxpayer. Similarly, there were changes in the rates of compulsory social security contributions and these changes did not have the same impact on all the taxpayers.

The structure of the paper is as follows: the second part, following the introduction, provides an overview of research literature in this field. The third part contains the formalization of the applied methodology in the application section of the article. The fourth and the most important part describes the application of the AHP method in order to select the year, when, according to taxpayers' preferences, their income and the number of deductions they were entitled to, their tax liability was optimal. In conclusion, the main results of the study are summarized and the limitations and future research possibilities are outlined.

2. Taxation of natural persons' earned income: literature review

Personal income tax is a universal income tax which consists of five particular tax bases in the Czech Republic, the most important of which is the employment income tax base. Taxes have many functions in economy, one of which is the redistributive function. J.R. Aronson et al. [1] found that the redistributive effect depends on four factors: the average tax rate, the progressivity of the tax, the unequal treatment of households with similar incomes and the extent of any re-ranking in the move from the pre-tax income distribution to the post-tax income distribution.

The personal income tax was introduced for the first time in Great Britain in 1799 and it shared many attributes with today's income tax, e.g. citizens had to file a yearly tax return stating their gross income from all sources [2]. Tax allowances that either take the form of the non-taxable part or tax reliefs are applied before the calculation of the tax liability. The non-taxable part reduces the tax base, while tax reliefs reduce the calculated tax.

One of the basic features of the personal income tax in any tax system is progressiveness. As the taxpayer's income increases, the tax burden increases too; unlike the income, however, the tax burden increases more quickly [3]. Progression ensures a better redistribution of taxes [4]. General aspects of tax progressivity measurement are described, for example, by U. Jakobson [5], C. Kakwani [6], B. Suits [7] and W. Kiefer [8].

Legislation regulating personal income taxation tend to change quite frequently for political or economic reasons; the changes may also be linked to preferences of interest groups, but the true driver behind tax reforms is political constraints and incentives [9]. K. Peter et al. [10] analyzed the personal income tax reforms that took place in 1981–2005 in 189 countries and found that the tax rates at higher income levels and structural progressivity declined significantly. Schedules with statutory rates, tax brackets, country-specific tax formulas, basic allowances, standard deductions, tax credits, multiple tax scales were analyzed. All these parameters of the personal income tax system changed almost every year.

One of the major tax reforms was realized in the USA in 1986. M. Feldstein [11] uses a sample of 4,000 taxpayers and demonstrates that the income to high-income workers of lower marginal tax rates after the Tax Reform Act of 1986 were partially offset by the declines in the pre-tax wages of workers in high-income occupations. This research confirms the elasticity of taxable income with respect to the marginal net-of-tax rate. From the state's perspective, it is desirable to set the tax rate in the legislation at the level that would allow

to maximize tax revenue [12]. Similar reforms were conducted in Italy, which also had an impact on tax revenue [13] and changed the nominal tax rate or conditions for applying of tax advantages.

Studies of personal income taxation were also carried out in the Czech Republic. J. Večerník [14] found that personal income tax reforms affect redistribution flows only to a very limited degree. A significant tax reform which replaced the progressive tax rate with the linear tax rate took place in 2008. This reform affected the tax structure and tax progressivity. Tax burden was shifted from labour income to consumption, which is also typical of other countries, for example, Germany [15]. V. Friedrich et al. [16] and M. Gencev et al. [17] demonstrate that the income tax has remained progressive even after 2008. Two years earlier, in 2006, selected tax-free income allowances were replaced by the tax relief. Since in the Czech system deductions were made from the tax base, not from the tax due, tax deductions were less effective in terms of redistribution to poor households [18]. Nowadays there are discussions concerning the type of the tax rate: instead of the linear rate, progressive rates could be applied in the future. L. Lykova, for example, discusses this question in relation to the situation in Russia [19]. H. Yilmazkuday [20] doesn´t recommend to increase the personal income tax burden while J. Vlachý [21] points out that the existing assumptions about the detrimental effect of progressive tax systems should be reconsidered. One of the ways to get more tax revenues may be to increase the rates of other taxes, e.g. environmental taxes [22].

The tax reform which fundamentally changed the taxation of employment income was planned for 1 January 2015 [23]. Using the TAXBEN model, the impact of the tax reform on taxpayers and households was assessed and it was shown that the planned reform would not significantly change labour taxation, but the differences in the tax burden on employees and sole traders would increase more significantly. A more detailed description of tax relations in the Czech Republic can be found in S. Kuznetsova et al. [24]. These authors also emphasize that the effective tax rate is more important than the nominal tax rate.

Compulsory social and health insurance was re-introduced in the Czech Republic in the early 1990s [25]. While the personal income tax rate is progressive, the rate for social security contributions is linear. Social security contributions paid by employees include sickness insurance, pension insurance and a contribution to the state employment policy [26]. The social security contribution is often blamed for having a negative effect on employment [27]. Social security contributions increase the cost of work, which is confirmed by I. Nielsen and R. Smyth [28] or J. Vlachý [29]. These authors examined the extent to which employers shift the burden of compliance with social security obligations back to employees in the form of lower wages. Contributions to these insurances are shared by employers and employees and the proportion of the share is regulated by the government. K. Komamura and A. Yamada [30] found that in Japan, the majority of employers shift health insurance contributions back to employees by reducing their wages.

On the other hand, employers and employees do not shift their contributions in the Netherlands [31]. Similar results were obtained by U. K. Müller and M. Neumann [32], who found out that neither employers nor employees shift a substantial part of their social security contribution burden.

M. Feldstein [33] discusses the changes in taxation and social security contributions in more detail. The existence of compulsory social security contributions and personal income tax creates a situation where the average tax rate on wage income in the Czech Republic is 37.4% [34] in spite of the fact that the nominal tax rate is 15 %. Employees not only need to take into account the effective tax rate but also the rate of social security contributions. Social security contributions influence the cost of labour and employment [35]. Thus, it was found that the nominal tax rate has changed quite often. A similar picture is

characteristic of the social security contribution rate.

Unlike the previous studies described above, in this paper, multiple factors are analysed over a longer period of time (25 years). This type of study hasn´t been done yet. As our literature review has shown, tax reforms often change the non-taxable part or tax reliefs by adding a new type of tax relief or changing the rules regulating tax reliefs. In our study, we relied on the previous findings to formulate the criteria for decision-making process.

3. Methods

We used a standard positivist economic methodology, including such methods as description, deduction, and comparison as well as the study of legal sources and synthesizing methods. To choose the best variant, we applied the method of multi-criteria decision making, i. e. to determine the *j*-th variant – the year – when the taxation of income was optimal, taking into account the weight of the *i*-th criteria.

The analytic hierarchy process (AHP) method is widely applied nowadays [36]. The method was proposed by Prof. Saaty [37] and its goal is to find an alternative which will meet all the criteria that were selected and evaluated as the best [38].

Standardized criterion weight υ_i (1) is determined by geometric mean (2) proportion of the *i*-th criterion and the sum of the geometric mean of all criteria

$$\sum\nolimits_{i=1}^{n} G_i,$$

$$\upsilon_i = \frac{G_i}{\sum\nolimits_{i=1}^{n} G_i}, \qquad (1)$$

$$G_i = \sqrt[n]{s_{i1} \cdot s_{i1} \cdot \dots \cdot s_{ij}}, \qquad (2)$$

where s_{ij} are elements of Saaty´s matrix. The weight reflects the importance of all criteria [39]. For relevant evaluation of the criteria it´s necessary to verify consistency using consistency coefficient *CR* (3),

$$CR = \frac{CI}{RI}, \qquad (3)$$

where *RI* is the random index. *CI* is consistency index (for more about consistency, see [40]).

The final weight for the *j*-th variants is determined by using (4),

$$FW = \sum\nolimits_{j=1}^{n} \upsilon_{gi}, \qquad (4)$$

where *FW* is the final weight and v_{gi} is the general weight of the *j*-th variant.

The data for the analysis were obtained from a questionnaire survey. It should be noted that for a survey questionnaire it is essential to determine the correct sample size. According to L.W. Neumann [41], it is difficult to obtain data from all the subjects. The sample is determined by (5),

$$n = \frac{z^2.N.r.(1-r)}{(d^2.N) + \left[z^2.r.(1-r\acute{u}\right]}, \qquad (5)$$

where *N* is the size of the basic set, *z* is the reliability coefficient, *d* is the permitted margin of tolerance and *r* is the expected margin of tolerance.

The degree of certainty is determined according to P. Newbold et al. [42] at 95%, the coefficient value of reliability for this degree of certainty is 1.96, according to statistical tables. The expected margin of tolerance *r* is 2%, the permitted margin of tolerance is 5% (*d* = 0.05), according to the recommendations of the Chamber of Auditors of the Czech Republic[2].

The base set is analyzed for particular subgroups. Statistical credibility is ensured if Moivre-Laplace's theorem conditions (6) are met,

$$n.P(1-P) > 9, \qquad (6)$$

where *P* is the relative representation of the phenomenon. P. Newbold et al. [42] recommend that 0.5 should be inserted into *P* value. After being inserted into relation (6), *n* equals 36. It follows that the data from at least 36 respondents are needed within each analyzed subgroup.

Taxpayers cannot influence the tax rate, social security contribution rate or the number of deductible items. However, they can influence how many deductible items they claim (e.g. whether it is preferable to save money for pension insurance,

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[2] *International Standard on Auditing ISA 530.* Chamber of Auditors of the Czech Republic. 2018. Available at: www.kacr.cz/data/Metodika/Auditing/Handbook%202010/17_ISA%20530.pdf

for gifts or for public benefit purposes). For this reason, the multi-criteria decision making is applied.

4. Application of the multi-criteria decision-making method

4.1. Characteristics of variants, criteria and decision-making situations

The context of tax and social security contributions payments may change very often. The taxpayer or the subject of decision-making tries to optimize their tax liability by making tax and insurance payments as low as possible. Within the decision-making analysis, the optimal variant will be chosen from a set of 25 variants, i.e. income taxation according to the legislation valid in 1993–2017. 1993 is the year of the Czech Republic's foundation, 2017 is the last analyzed year for which it is possible to quantify the criteria laid down below. For more detailed information on each variant see Table 1 below.

Table 1

Variants

Variant according to the legislation valid in the given year	Description of variants and changes
V_1 – 1993	Progressive tax rate from 15% to 47%; the tax base was the gross wage reduced by social security contributions (SSC) by an employee at 13.5%. Existence of non-taxable parts.
V_2 – 1994	Progressive tax rate from 15% to 44%; the tax base was the gross wage reduced by SSC at 13.25%. New non-taxable part for students.
V_3 – 1995	Progressive tax rate from 15% to 43%; the tax base was the gross wage reduced by SSC at 13.25%.
V_4 – 1996	Progressive tax rate from 15% to 40%; the tax base was the gross wage reduced by SSC at 12.5%.
V_5 – 1997	No significant changes compared with 1998.
V_6 – 1998	New non-taxable part for interests paid on a loan for financing housing needs.
V_7 – 1999	No significant changes compared with 1998.
V_8 – 2000	New non-taxable part for contributions paid by the employer for life insurance.
V_9 – 2001	Progressive tax rate from 15% to 32%. New non-taxable part for contributions paid by the employer for the supplementary pension.
V_{10} – 2002	No significant changes compared with 2001.
V_{11} – 2003	No significant changes compared with 2002.
V_{12} – 2004	No significant changes compared with 2003.
V_{13} – 2005	The non-taxable part for a dependent child was replaced by a tax credit, which can have a character of a tax bonus.
V_{14} – 2006	Progressive tax rate from 15% to 32%. Other non-taxable parts (for taxpayers, students) were replaced by tax reliefs.
V_{15} – 2007	New non-taxable part for results verifying further education.
V_{16} – 2008	The nominal tax rate at 15%; the tax base is the so-called super-gross wage, which is a gross wage increased by SSC paid by the employer.
V_{17} – 2009	No significant changes compared with 2008.
V_{18} – 2010	Tax credit for children was increased.
V_{19} – 2011	No significant changes compared with 2010.
V_{20} – 2012	SSC paid by employees was reduced by 1.5%. Tax credit for children increased.
V_{21} – 2013	The second tax rate – solidarity rate of 7% – was added.
V_{22} – 2014	Tax relief for the taxpayer was temporarily reduced by 1 200 CZK.
V_{23} – 2015	Tax credit which was newly graduated according to the number of children in the household; tax reliefs were at the same level as in 2013.
V_{24} – 2016	Tax credit for children was increased.
V_{25} – 2017	Tax credit for children was increased.

Several criteria with different weights are taken into account to select the optimal variant. The taxpayer wants the effective tax rate (ETR) and the social security contributions rate to be as low as possible and the amount of deductions as high as possible. For criteria K_4 and K_5, it is not possible to clearly determine the type of criterion that derives from the amount of incomes and from the fact of whether or not the taxpayer is entitled to a tax advantage.

The resulting optimal variant is influenced by the following criteria:

K_1 – ETR;

K_2 – social security contribution rate – employee;

K_3 – the number and amount of deductions in the form of the non-taxable part or tax reliefs;

K_4 – the existence of the progressive tax rate;

K_5 – a form of deduction for the taxpayer and children (tax reliefs and credit vs. the non-taxable part).

The AHP method is applied in several decision-making situations that differ in terms of the taxpayer's income and the extent of the deductions applied,

S_1 – a taxpayer with an income equal to the average yearly wage with a deduction for the taxpayer;

S_2 – a taxpayer with an income below the average yearly wage (0.5 times) with a deduction for the taxpayer;

S_3 – a taxpayer with an income above the average yearly wage (2.0 times) with a deduction for the taxpayer;

S_4 – a taxpayer with an income equal to the average yearly wage with a deduction for the taxpayer and 2 children;

S_5 – a taxpayer with an income of 0.5 average yearly wage with a deduction for the taxpayer and 2 children;

S_6 – a taxpayer with an income of 2.0 average yearly wage with a deduction for the taxpayer and 2 children.

Since the number of taxpayers whose income corresponds to the multiple of the average wage would be small and statistically unreliable, we are going to consider taxpayers whose average income is 0.85–1.15 times the average wage as taxpayers with an average income; simi-larly, taxpayers whose income is 0.35–0.65 times the average wage, as taxpayers with below-average income; and those with the income 1.70–2.30 times the average age, as taxpayers with above-average income. Taxpayers with the income that falls between the analyzed intervals are not included in the analysis. The intervals were chosen to cover the most typical wage levels at a given company according to the available internal information about wages.

4.2. Input data for analysis and sample size determination

The input data for quantification of criteria weights were obtained from the questionnaire survey carried out among the employees of a manufacturing company in Zlín Region of the Czech Republic. According to the classification of Czech-Invest agency or Commission Regulation EC 800/2008[3] [44], this company falls within the category of large enterprises. The subject of the decision-making process is the taxpayer, that is, an employee of this company.

The data in Table 2 below indicate the number of payers *N* meeting the criterion in terms of their gross wage and the number of deductions applied for decision-making situations S_1, S_2, S_3, S_4, S_5 and S_6. Column *n* shows how many respondents are needed to determine the weighing criteria. The total *N* set size is 454 respondents. M. Katriak and S. Milly [43] point out that with the base population of up to 1,000 units, the size of the sample should be 40% of the base population, which is, in this case, 182 respondents. In the decision-making analysis, the decision is not made for the whole group of respondents, but for the respondents in selected S_n decision situations. The size of the selective sample is determined by (5); at the same time the relation (6) indicates that the number of respondents in each subgroup should be 36 (excluding decision-making situations

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[3] *Definice malého a středního podnikatele. Czech Invest.* CzechInvest. 2018. Available at: www.czechinvest.org/cz/Sluzby-pro-male-a-stredni-podnikatele/Chcete-dotace/OPPI/Radce/Definice-maleho-a-stredniho-podnikatele

S_3 and S_6, where the size of the base population N does not reach the stated number of 36). Therefore, the total sample should consist of 189 respondents.

Table 2

Sample size

Situation	N	n	n'	Situation	N	n	n'
S_1	52	20	36	S_4	84	23	36
S_2	116	24	36	S_5	157	26	36
S_3	26	14	26	S_6	19	12	19

Source: the author's own calculations

The questionnaire was carried out by the author of this paper in 2018 in the Czech Republic in Zlin region, at an industrial company. This region was chosen because it ranks 8th among the 14 regions of the Czech Republic in terms of its share in gross domestic product. The limitation on the study is that the questionnaire survey was conducted only within one region. However, the region's economic performance corresponds to the average level, which makes it representative of the whole of the Czech Republic[4].

The questionnaire consisted of closed questions, which required the respondents to compare the significance of criteria given in pairs by using a scale from 1 to 9. There were five criteria, which means that the respondents had to make 10 comparisons. The questionnaire survey involved 189 employees of the manufacturing company. The utility (resulting weight) of the selected variant, taking into account the weight of the criterion, was determined with regard to the applicable legislation

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[4] *Description of Zlin Region*. BusinessInfo. 2018. Available at: www.businessinfo.cz/cs/clanky/charakteristika-zlinskeho-kraje-2261.html

governing the tax burden in the relevant year (the input data are given in Table 4).

4.3. Weight of criteria

Criteria weights are determined by applying Saaty's method by using relation (1). In total, 6 decision-making situations are analyzed, and in each case the weight of the i-th criteria is different. As it is apparent from the results shown in Table 3, the most important criterion is K_1 – the ETR. K_2 criterion, which expresses the amount of social security contributions, is the second most significant in most cases (except for situation S_4). The taxpayer does not have to pay any tax, but instead he/she receives the money from the state in the form of a tax credit. On the other hand, K_3 criterion – the number and amount of deductions – is the least significant. In all cases, consistency was verified with the help of *CR* index (3), which takes the value less than 0.1.

4.4. Decision analysis according to the AHP method

For criterion K_2, there is no need to calculate the effective rate as the nominal social security contributions rate corresponds to the actual levy burden. As for criterion K_3, we can observe that the number of deductions (whether tax-free income allowances [in Table 4 identified as *A*] or tax reliefs or tax credit [in Table 4 identified as *C*]) is increasing. Between 1993 and 2006, incomes were taxed by applying the progressive rate (in Table 3 identified as *P*). Since 2008, the nominal tax rate has been linear (in Table 4 identified as *L*), which is expressed by criterion K_4. Criterion K_5 evaluates the type of de-

Table 3

Weight of criteria and consistency test

Situation	v_i					CR				
	K_1	K_2	K_3	K_4	K_5	K_1	K_2	K_3	K_4	K_5
S_1	38.27	34.95	12.11	3.65	11.02	0.069	0.084	0.078	0.057	0.009
S_2	47.09	24.42	8.83	11.00	9.16	0.026	0.003	0.058	0.055	0.076
S_3	42.00	24.12	8.23	13.86	11.78	0.087	0.049	0.054	0.058	0.076
S_4	34.4.	18.66	7.31	11.35	28.28	0.017	0.016	0.020	0.026	0.026
S_5	40.15	23.06	11.53	10.04	15.22	0.012	0.089	0.096	0.053	0.056
S_6	42.57	28.08	10.64	8.07	10.64	0.017	0.081	0.039	0.085	0.039

Source: the author's own calculations

duction available to the taxpayer – either as a non-taxable part or as a tax relief. Criteria K_1 and K_2 are the minimization criteria (it is desirable to have the lowest ETR and the lowest rate of social security contributions), K_3 is the maximization criterion (the taxpayer prefers as many options as possible to optimize tax liability). As for criteria K_4 and K_5, it is irrelevant for a taxpayer with an income corresponding to the average wage level whether they

have a tax relief or a tax-free threshold or whether the tax rate is progressive or linear [16]. For that reason, the same local weight is assigned to these criteria.

The year when the earned income was optimal is determined by the AHP method. In addition to weighting of the *i*-th criteria, the data in Table 5 are necessary to quantify the general weight. The optimal variant is the one whose final weight (*FW*) determined by (4) is the highest.

Table 4

Input data for situation S_1-S_6 (taxpayer with an average wage)

Situation	Criterion									
	K_1						K_2	K_3	K_4	K_5
	S_1	S_2	S_3	S_4	S_5	S_6	$S_1, S_2, S_3, S_4, S_5, S_6$			
V_1 (1993)	8.64	4.32	12.29	4.83	0	9.75	13.5	7	P	A
V_2 (1994)	9.16	5.28	13.12	5.30	0	10.42	13.25	8	P	A
V_3 (1995)	9.51	5.78	14.16	5.78	0	11.15	13.25	8	P	A
V_4 (1996)	9.76	6.39	14.24	6.40	0	11.44	12.5	8	P	A
V_5 (1997)	9.81	6.46	14.23	6.46	0	11.46	12.5	8	P	A
V_6 (1998)	9.74	6.33	14.19	5.91	0	11.08	12.5	9	P	A
V_7 (1999)	9.71	6.29	14.05	5.49	0	10.75	12.5	9	P	A
V_8 (2000)	9.82	6.51	14.29	5.73	0	10.96	12.5	10	P	A
V_9 (2001)	9.92	6.5	14.37	5.72	0	10.98	12.5	11	P	A
V_{10} (2002)	10.48	6.99	14.92	6.27	0	11.77	12.5	11	P	A
V_{11} (2003)	10.86	7.33	15.30	6.65	0	12.32	12.5	11	P	A
V_{12} (2004)	11.26	7.67	15.70	6.74	0	12.65	12.5	12	P	A
V_{13} (2005)	11.56	7.93	16.24	6.11	–2.97	13.52	12.5	12	P	A
V_{14} (2006)	9.94	4.36	16.92	4.82	–5.87	14.36	12.5	12	P	C
V_{15} (2007)	10.42	4.77	17.66	5.65	–4.77	15.27	12.5	13	P	C
V_{16} (2008)	11.08	1.91	15.67	3.20	-13.84	11.73	12.5	13	L	C
V_{17} (2009)	11.23	2.36	15.67	3.60	–12.89	11.85	12.5	13	L	C
V_{18} (2010)	11.42	2.74	15.76	3.32	–13.46	11.71	12.5	13	L	C
V_{19} (2011)	12.04	3.99	16.07	4.13	–11.83	12.12	12.5	13	L	C
V_{20} (2012)	11.84	3.58	15.97	2.93	–14.24	11.51	11.0	13	L	C
V_{21} (2013)	11.83	3.56	15.97	2.90	–14.29	11.50	11.0	13	L	C
V_{22} (2014)	12.06	4.03	16.08	3.39	–13.31	11.75	11.0	13	L	C
V_{23} (2015)	12.42	4.73	16.26	3.38	–13.33	11.74	11.0	13	L	C
V_{24} (2016)	12.64	5.19	16.37	3.52	–13.07	11.81	11.0	13	L	C
V_{25} (2017)	13.08	6.06	16.59	3.81	–12.48	11.95	11.0	14	L	S

Source: the author's own calculations

Table 5

Rank of decision-making situation S_1

V_n	V_1 (1993)	V_{22} (2014)	V_{23} (2015)	V_{25} (2017)	V_{24} (2016)	V_{21} (2013)	V_{20} (2012)	V_2 (1994)	V_7 (1999)
FW	0.0573	0.0570	0.0561	0.0560	0.0557	0.0527	0.0527	0.0465	0.0398
V_n	V_6 (1998)	V_3 (1995)	V_{14} (2006)	V_4 (1996)	V_8 (2000)	V_5 (1997)	V_9 (2001)	V_{15} (2007)	V_{10} (2002)
FW	0.0393	0.0390	0.0388	0.0387	0.0383	0.0375	0.0375	0.0356	0.0301
V_n	V_{16} (2008)	V_{17} (2009)	V_{18} (2010)	V_{19} (2011)	V_{11} (2003)	V_{12} (2004)	V_{13} (2005)		
FW	0.0300	0.0291	0.0280	0.0279	0.0268	0.0257	0.0241		

Source: the author's own calculations

These results show that the largest weight results from *decision-making situation* S_1 for variant V_1, i.e. 1993 (Table 5). In this year, although a taxpayer with an average wage could apply for a smaller number of deductions, the ETR reached 8.5%. This variant appears to be the best despite the highest rate of social security contributions. 2014 is the second best year. Similarly, the years when the rate of social security contributions were the lowest (2012–2017) are at the forefront. What further increases the general weights of these variants is the high number of deductions which the taxpayer can use to optimize their tax liability when the conditions are met.

The variants with the lowest weights correspond to the period of 2003–2005. The reason is the relatively high ETR as well as the high rate of social security contributions. Thus, a taxpayer with an average-level income who applied for the basic deduction had the most optimal situation in 1993 while the worst conditions were observed in 2005.

Decision-making situation S_2 means that the taxpayer's income is 0.5 times the average wage. The taxpayer prefers the progressive tax rate, because to have a tax relief is more advantageous than the non-taxable part (criterion K_5), which is also shown by the ETR since 2006, when, compared to previous years, it reduced significantly.

Table 6 illustrates that the taxpayer had their tax burden set in legislation in the most advantageous way in 2008. We can also observe that in the first half there are the years when the taxpayer's deduction took the form of a tax relief. At the opposite end of the sequence, similar to decision-making situation S_1, there is a variant based on the conditions of 2005. For a low-income taxpayer, the progressive tax rate is advantageous. On the other hand, the deduction takes the form of the non-taxable part, which reduces the ETR less than when the deduction is in the form of a tax relief. In addition, in 2005 the ETR is the highest for the entire time series.

If a taxpayer's income is 2.0 times the average wage (**decision-making situation S_3**), the linear tax rate is more preferable, as they enter the higher tax rate bracket due to the level of their income. Therefore, the taxpayer saves more in tax if the deduction is in the form of the non-taxable part. The lowest ETR is in 1993, which ranks this variant as the first due to the highest weight of this criterion, as shown in Table 7. 2006 corresponds to the variant with the lowest weight.

The remaining decision-making situations assume that, in addition to the basic deduction for the taxpayer, the taxpayer applies a deduction for two dependent children, which results in a lower ETR compared to situations S_1, S_2 and S_3. Tax

Table 6

Rank of decision-making situation S_2

V_n	V_{16} (2008)	V_{17} (2009)	V_{21} (2013)	V_{20} (2012)	V_{22} (2014)	V_{18} (2010)	V_{23} (2015)	V_{24} (2016)	V_{25} (2017)
FW	0.0818	0.0726	0.0699	0.0695	0.0663	0.0653	0.0579	0.0539	0.0492
V_n	V_{19} (2011)	V_{14} (2006)	V_{15} (2007)	V_1 (1993)	V_2 (1994)	V_9 (2001)	V_7 (1999)	V_6 (1998)	V_8 (2000)
FW	0.0465	0.0377	0.0355	0.0335	0.0248	0.0227	0.0225	0.0223	0.0220
V_n	V_4 (1996)	V_3 (1995)	V_5 (1997)	V_{10} (2002)	V_{12} (2004)	V_{11} (2003)	V_{13} (2005)		
FW	0.0218	0.0216	0.0215	0.0211	0.0209	0.0203	0.0189		

Source: the author's own calculations

Table 7

Rank of decision-making situation S_3

V_n	V_1 (1993)	V_2 (1994)	V_{22} (2014)	V_{23} (2015)	V_{24} (2016)	V_{25} (2017)	V_{20} (2012)	V_{21} (2013)	V_7 (1999)
FW	0.0743	0.0583	0.0501	0.0492	0.0487	0.0486	0.0473	0.0473	0.0439
V_n	V_6 (1998)	V_4 (1996)	V_5 (1997)	V_8 (2000)	V_9 (2001)	V_3 (1995)	V_{10} (2002)	V_{16} (2008)	V_{17} (2009)
FW	0.0422	0.0418	0.0413	0.0410	0.0403	0.0397	0.0334	0.0310	0.0310
V_n	V_{18} (2010)	V_{19} (2011)	V_{11} (2003)	V_{12} (2004)	V_{13} (2005)	V_{15} (2007)	V_{14} (2006)		
FW	0.0303	0.0300	0.0299	0.0279	0.0253	0.0240	0.0231		

Source: the author's own calculations

reliefs are more preferable in comparison with the non-taxable part.

A taxpayer with an average income (**decision-making situation S_4**) had the most favourable situation in 2013. In the first half of the sequence there are the years following the significant public finance reform in 2008, which significantly reduced the tax burden for a number of population groups. The period up to 2008, on the contrary, shows lower weights (see Table 8).

A similar order as in **situation S_4** is characteristic of situation S_5 (see Table 9): a more preferable situation for a taxpayer with an income below average would be to have a tax credit and tax reliefs together with the progressive tax rate. For the analyzed period, a taxpayer with a deduction for 2 children has a zero-tax liability and the introduction of the tax credit makes him or her also entitled to a tax bonus.

While for a taxpayer with above-average income, 2013 was the best from the perspective of preferences, for a low-income taxpayer with 2 children, 1993

had the lowest resulting effect. The low effect is shown by the variants until the introduction of the child tax credit, i.e. up to 2005. The reason is that the number of deductions that could optimize tax liability throughout the analyzed period of 1993–2017 increased, no deductions were cancelled and a few new ones were added, which resulted in a situation that was favourable for taxpayers.

In **decision-making situation S_6,** a taxpayer with an income of 2.0 times the average wage is entitled to a deduction for 2 children. As Table 10 shows, in the years when the deduction for children took the form of a tax credit, this effect was stronger. At the same time, the rate of social security contributions was lower in these years.

On the other hand, the smallest resulting weights are in 2002, 2003 and 2004. This is partly due to the fact that in these years there were fewer deductions and there was no tax credit or progressive tax rate, which was against the interests of taxpayers with an above-average income.

Table 8

Rank of decision-making situation S_4

V_n	V_{21} (2013)	V_{20} (2012)	V_{23} (2015)	V_{22} (2014)	V_{24} (2016)	V_{25} (2017)	V_{16} (2008)	V_{18} (2010)	V_{17} (2009)
FW	0.0854	0.0847	0.0771	0.0770	0.0743	0.0708	0.0642	0.0615	0.0553
V_n	V_{19} (2011)	V_{14} (2006)	V_{15} (2007)	V_{13} (2005)	V_1 (1993)	V_7 (1999)	V_9 (2001)	V_8 (2000)	V_6 (1998)
FW	0.0502	0.0412	0.0385	0.0299	0.0183	0.0173	0.0170	0.0164	0.0161
V_n	V_2 (1994)	V_{12} (2004)	V_{10} (2002)	V_{11} (2003)	V_5 (1997)	V_4 (1996)	V_3 (1995)		
FW	0.0159	0.0158	0.0156	0.0149	0.0146	0.0142	0.0139		

Source: the author's own calculations

Table 9

Rank of decision-making situation S_5

V_n	V_{21} (2013)	V_{20} (2012)	V_{23} (2015)	V_{22} (2014)	V_{24} (2016)	V_{25} (2017)	V_{16} (2008)	V_{18} (2010)	V_{17} (2009)
FW	0.0822	0.0818	0.0782	0.0767	0.0767	0.0745	0.0611	0.0582	0.0542
V_n	V_{19} (2011)	V_{15} (2007)	V_{14} (2006)	V_{13} (2005)	V_{12} (2004)	V_9 (2001)	V_{10} (2002)	V_{11} (2003)	V_8 (2000)
FW	0.0501	0.0329	0.0315	0.0249	0.0215	0.0199	0.0199	0.0199	0.0190
V_n	V_6 (1998)	V_7 (1999)	V_4 (1996)	V_5 (1997)	V_2 (1994)	V_3 (1995)	V_1 (1993)		
FW	0.0184	0.0184	0.0180	0.0180	0.0149	0.0149	0.0143		

Source: the author's own calculations

Table 10

Rank of decision-making situation S_6

V_n	V_{23} (2015)	V_{22} (2014)	V_{21} (2013)	V_{24} (2016)	V_{20} (2012)	V_{25} (2017)	V_1 (1993)	V_2 (1994)	V_{18} (2010)
FW	0.0650	0.0649	0.0642	0.0642	0.0641	0.0636	0.0549	0.0414	0.0400
V_n	V_{16} (2008)	V_7 (1999)	V_{17} (2009)	V_{19} (2011)	V_9 (2001)	V_8 (2000)	V_6 (1998)	V_{15} (2007)	V_5 (1997)
FW	0.0398	0.0388	0.0384	0.0379	0.0343	0.0338	0.0328	0.0284	0.0274
V_n	V_3 (1995)	V_{14} (2006)	V_4 (1996)	V_{13} (2005)	V_{10} (2002)	V_{11} (2003)	V_{12} (2004)		
FW	0.0272	0.0264	0.0261	0.0259	0.0233	0.0186	0.0185		

Source: the author's own calculations

5. Conclusion

The selection of the year when the tax burden was optimal from the taxpayer's point of view was influenced by a number of criteria. The weights of the criteria were determined on the basis of the results of the questionnaire survey carried out in a large manufacturing enterprise among 189 respondents. The sample size was chosen in such a way as to make it statistically credible. Regardless of further specification of the decision-making situation, the ETR indicator is the most important for all groups of taxpayers. The hypothesis that the most important criterion is the tax rate, which shows the real tax burden for the taxpayer, was confirmed.

Out of 25 possible variants, i.e. out of 25 possible years, 1993 is considered to be the most advantageous for a taxpayer with an average earned income. A similar effect is also characteristic of the period of 2012–2017. On the other hand, the least favourable situation was in 2005. The same conclusion of the worst-case scenario is for the taxpayer with an income below average. On the other hand, the year which was the most favourable for the taxpayer with such income in terms of tax and social contributions was 2008, when one of the most significant reforms of public finance took place in the Czech Republic. For a taxpayer with an above-average income, the optimal variant was in 1993, which may seem paradoxical since in this year social security contributions were at the highest level. Moreover, taxpayers with an above-average income had the lowest resulting effect in 2005. The initial hypothesis was based on the assumption that the taxpayer with an above-average income had a higher tax liability during the period when the nominal tax was progressive, but it was not confirmed under the condition that the taxpayer would apply only the tax deduction for themselves.

As for those decision-making situations where the taxpayer was entitled to deductions for 2 children, the best years were 2013 and 2012, regardless of the level of income. The reason is the lowest insurance rate and the existence of the tax credit that reduces the ETR. A taxpayer with an average income has the lowest effect after considering the weights of all the criteria and utility resulting from the implementation of the *j*-th variants in 1995. A taxpayer with an income below average, this is the second worst variant. 1993 has the lowest effect for a taxpayer with a below-average income. On the contrary, for a taxpayer with an average income without deductions for children, this year was optimal. These findings confirm the hypothesis that during the period when the nominal tax was linear and the taxpayer applied tax relief for children, the situation had more utility than during the period when the nominal tax was progressive.

The situation in the sphere of personal income taxation is subject to yearly changes. For the taxpayer, the amount of gross wage is not a decisive factor, but the tax burden on their earned income is. Changes in legislation do not always have a uniform impact on all the taxpayers. It all depends on the amount of the taxpayer's income and the number of deductions the taxpayer can use to optimize their tax liability. The input data for our analysis of the ETR confirm the hypothesis that the most significant change occurred between 2007 and 2008. Therefore, when assessing the impact of the tax reforms, this impact can´t be expressed generally, but it is necessary to assess the specific income ratios of this or that taxpayer or household. Changes, for example, changing tax rates or deductions can be beneficial for some taxpayers and lead to a decrease in their tax burden. On the other hand, the same kind of changes may cause an increase in the tax burden on other taxpayers, who are different in terms of their income ratio. Thus, the question of whether the situation in the first or in the last analyzed year is more advantageous for the taxpayer cannot be answered unequivocally and the answer depends on the amount of income and deductions applied by the taxpayer. In the case of situation S_3, where the taxpayer has an average income and applies only the deduction for the taxpayer, 1993 shows the highest weight. On the other hand, in the case of situation S_5, where the taxpayer's income is below average

and the taxpayer applies a deduction for 2 children, this year has the lowest weight.

The decision analysis has led us to the conclusion that not only the nominal or effective tax rate is decisive in the choice of the optimal method of income taxation. It is also important to assess the significance of other criteria and comprehensively evaluate the legislation, the amount of income or social factors that may significantly affect one's tax liability.

There are, however, several limitations of this research and findings. The data used in this study were obtained with the help of a questionnaire survey conducted in the region of the Czech Republic that is average in terms of the wage level in comparison with other regions [43]. Making similar research in a region

with above-average or below-average wages may lead to other results, that is, other criteria can be considered more significant.

Personal income tax is constantly changing, which makes it an interesting subject for further research. If the supergross wage and the change in the tax rate were abolished from 2021 onwards, this change will affect the weight of the criteria as well as the value of the indicators of specific options, taking into account the weight of the i-th criterion. Another avenue for future research may be to carry out a similar study in another country – in a country where the rate is linear as in the Czech Republic or progressive as in many European countries. These results could be used for comparative analysis.

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Для цитирования

Информация о статье

Original Paper

Evaluation of Russian Economic Sectors' Sensitivity to Tax Burden

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ABSTRACT

This study tests the hypothesis that Russia's economic sectors have different sensitivity to tax burden. Econometric models are built to explore the relationship between production in different sectors and the tax burden on these sectors. We use employment growth, labour productivity growth and world oil prices growth as control variables; to neutralize crisis effects we introduced a binary dummy variable. A peculiar feature of our models is that we build a certain *a priori non-linear fiscal aggregate*, which appears as one variable in an econometric dependency and comprises one or two exogenous parameters. This enables us to test the hypothesis about the non-linear impact of tax burden on production and to avoid the multicollinearity problem. The parameter of the *non-linear fiscal aggregate* can take different values as we build the econometric dependency, which means that we can conduct a lot of computational experiments to choose the most adequate model. The econometric models use statistical data of Rosstat and the Federal Tax Service of Russia for the period of 1996–2019 for the whole economy and for the period of 2006–2019 for specific sectors. For this study we have chosen the manufacturing and extractive industries, manufacture of coke and refined petroleum products, chemical industry and electrical engineering. To gain a bigger picture, we have also considered the public service sector – education and health care. Model calculations have shown that the main indicator reflecting the sectors' sensitivity to tax regulation is the width of the corridor of permissible values of the tax burden in the parabolic dependency (permissible in the meaning that such tax burden provides a positive production growth in the sector): $\Delta q = q_{00} - q_0$. The lower is Δq, the more sensitive is this sector to any tax increase. The use of additional indicators – q (effective tax burden), q^* (optimal tax burden) and l^* (potential production growth if the tax burden is optimal) – has shown that the more technologically advanced is the sector, the more sensitive it is to the tax burden. Moreover, the more technologically advanced is the sector and the more sensitive it is to fiscal regulation, the faster its development can be, provided that the tax rates are optimal. Thus, a possible solution is to apply a differentiated taxation system for economic sectors. All developed countries apply progressive personal income tax scales, which shows awareness of the differences in income groups' sensitivity to taxes. Theoretically, nothing could be said against applying a similar principle to economic sectors with different levels of technological intensity and innovation and with a different sensitivity to tax burden. A differentiated tax system can be applied for economic sectors if certain conditions are met and specific procedures are established and followed.

KEYWORDS

Tax burden, economic growth, Laffer curve, sector-specific analysis

JEL E62, H21

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Оригинальная статья

Оценка чувствительности отраслей промышленности России к налоговой нагрузке

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АННОТАЦИЯ

В статье проверяется гипотеза, согласно которой чувствительность разных отраслей российской экономики к налоговой нагрузке неодинакова. В этих целях были построены эконометрические модели, в которых темпы роста отраслевого производства объясняются уровнем отраслевой налоговой нагрузки. В качестве контрольных переменных использовались темпы роста занятых, производительности труда и мировых цен на нефть; для нивелирования кризисных эффектов вводилась бинарная фиктивная переменная. Своеобразие конструируемых моделей состоит в построении некоей априорной нелинейной налоговой конструкции, которая в эконометрической зависимости выступает в качестве одной переменной и содержит один или два экзогенных параметра. Это позволяет, прежде всего, проверить гипотезу о нелинейном характере влияния налоговой нагрузки на динамику производства и избавиться от проблемы мультиколлинеарности переменных. Величина параметра нелинейной налоговой конструкции варьируется в ходе построения эконометрической зависимости, что позволяет проводить множество вычислительных экспериментов для выбора наиболее адекватной модели. Эконометрические модели базируются на статистических данных Росстата и Федеральной налоговой службы России за период 1996–2019 гг. для всей российской экономики и за период 2006–2019 гг. для отдельных отраслей. В качестве экономических секторов изучались обрабатывающая и добывающая промышленность, производство кокса и нефтепродуктов, химическая промышленность и электроника; для сравнения были также рассмотрены такие отрасли бюджетного сектора услуг, как образование и здравоохранение. Модельные расчеты показали, что главным показателем чувствительности отраслей к налоговому регулированию выступает ширина коридора эффективных значений налогового бремени параболической зависимости, при которых обеспечивается положительный рост производства: $\Delta q = q_{00} - q_0$; чем меньше величина Δq, тем чувствительнее отрасль к любому повышению налогов. Использование дополнительных индикаторов q (фактическая налоговая нагрузка), q* (оптимальная налоговая нагрузка) и I* (потенциальный темп роста производства при оптимальном налогообложении) позволило сделать ряд содержательных выводов. В частности, была установлена важная закономерность: чем выше уровень технологичности отрасли, тем выше ее чувствительность к налоговой нагрузке. Другая, не менее важная, закономерность состоит в том, что чем выше технологический уровень отрасли и ее чувствительность к налоговому регулированию, тем более динамичной может быть ее развитие при оптимальном налогообложении. Полученные результаты подводят к идее построения дифференцированной по отраслям системы налогообложения. Если во всех развитых странах действует прогрессивная шкала подоходного налога, основанная на понимании разной чувствительности разных доходных групп населения к фискальным изъятиям, то теоретически нет причин против введения аналогичного принципа для отраслей, имеющих несопоставимый технологический уровень и разную уязвимость относительно налогов. Рассмотрены условия и процедуры, позволяющие использовать в ограниченных масштабах дифференцированную систему налогообложения для отраслей.

КЛЮЧЕВЫЕ СЛОВА

налоговая нагрузка, экономический рост, кривая Лаффера, отраслевой анализ

Introduction

The humanity is now going through the post-industrial stage of technological development. The post-industrial economy implies radical transformations not only of manufacturing but also of extracting industries. In all likelihood, the disparities between economic sectors regarding the degree of processing, automation and staff qualification levels will continue to grow. Tax regulation tools that are currently applied will be still in use although it seems quite possible that the degree of differentiation in this sphere will also increase.

To predict the future of tax regulation, it is necessary to consider how sensitive are different sectors to the current level of tax burden. Our main hypothesis is that industries with higher degrees of processing and, consequently, higher levels of technological intensity and complexity of production are more sensitive to taxation. Therefore, extractive industries, which rely on exploitation of natural resources and rental income, should be much less susceptible to tax. Thus, the purpose of this study is to model the relationship between production in different sectors of the Russian economy and taxation. To this end, we are going to build econometric dependencies of production growth on tax burden in the 2000s and 2010s.

Tax burden and production growth: literature review

It is generally accepted that that potential economic growth of different countries is to a significant extent determined by their financial resources [1]. Since governments raise financial resources through taxes, increasing tax revenue contributes to the general prosperity of society and to economic growth.

However, the influence of taxes on economic activity is far from being simple or straightforward. Some studies show that this influence is generally positive [2; 3] while others demonstrate a negative relationship between economic growth and the increasing tax burden [4]. This is no surprise since taxes can have two op-posite effects: on the one hand, they can stimulate economic activity by increasing state revenue and investment and, on the other, taxes can have an adverse impact on economic activity if the tax burden proves to be excessive.

Originally, the idea that there is a certain level of tax rates beyond which taxes will stifle economic growth instead of spurring it appeared in the US. This idea belonged to Arthur Laffer, who proposed his famous *'Laffer curve'*. This term was coined by Laffer's friend American economist and journalist Jude Wanniski. In his article Wanniski told the story of a fabled restaurant dinner where Laffer drew the dependency of tax revenue and tax rate on a napkin [5]. Laffer himself later elaborated this theory in a series of works [6–8].

Laffer's concept was widely discussed in research literature. Canto et al. [9] were among the first who used the Laffer curve to calculate the tax rate that would maximize tax revenue. Afterwards, this methodology was often used to estimate the impact of tax burden on tax revenue and economic growth. There were also studies that tested its applicability in other areas, for instance, in relation to countries' debt [10] or in the conditions of post-Communist transformations of economy [11]. |Stuart used the Laffer curve to calculate that the optimal marginal tax rate on labour income for the 'representative' Swede was at the level of 70%. In reality, the effective marginal tax rate grew from 50% in 1959 to 80% in the early 1980s, which explains up to 75% of the decline in the growth rate of the Swedish GNP [12]. The average effective tax rate, maximizing the volume of output, for Sweden in 1979 was computed to be 54–62% of total national income [13]. In the Netherlands, the marginal income tax rate was 70% in 1985 while its actual value was nearing the limits and was at the level of 67% [14].

The optimal marginal tax rate, maximizing tax revenue, for twelve OECD countries in 1996 varied between 53 and 60% of GDP [15]. For the US, Strulik and Trimborn [16] found a very flat Laffer curve for all capital taxes and calculated that total tax revenue could increase by

about 0.3–1.2% after abolishment of the tax on capital gains. Laffer curves for the US, the EU-14 and individual European countries have shown that tax burden does not peak and can be increased in the US by 30% with labor taxes and 6% with capital taxes. For the EU-14 these figures are 8% and 1% respectively [17]. Tax burden in China has not reached its optimal level so far, which, according to Lin and Jia, is 40% of GDP [18]. Analysis of the Ukrainian economy in 1996–2011 has shown that the optimum point for economic growth was 38.2% [19]. Similar calculations have been carried out for the Russian economy in 1989–2000 and showed the optimal tax burden at the level of 36.5% [20].

Some economists criticized the Laffer theory for the lack of empirical evidence to support it [21; 22]. In a general equilibrium model, some properties of the Laffer curve do not necessarily hold [23]. Moreover, results of the Laffer curve may be unreliable for the labor supply elasticity [24]. Doubts were voiced about the very existence of the optimal tax rate and the possibility of calculating it [25].

Opposed to this skeptical view is the view shared by many Russian, Ukrainian and Georgian economists (Y. Ananiashvili, E. Balatsky, B. Bukach, V. Vishnevsky, A. Gusev, M. Kakaulina, G. Loladze, S. Londar, I. Mayburov, T. Merkulova, S. Movshovich, V. Papava, A. Sokolovskaya, L. Sokolovsky, S. Chugunov and others). They believe that the Laffer curve can be a useful tool of analysis. Gusakov, Zhak and Balatsky introduced the notion of the Laffer points of the first and second kind with the corresponding production and fiscal curves [20; 26]. Such modification of the Laffer theory implies two levels of analysis and two dependencies. This, in turn, has led Mayburov and Sokolovskaya to propose the notions 'area of fiscal controversies' and 'additional tax trap' [27]. Georgian and Ukrainian economists have made a considerable contribution to the methodology of computing Laffer points [28; 29]; analysis of the impact of tax burden on technology of production and amount of resources used [30] and aggregate demand [31]. They also worked to improve the methodology of calculating effective tax rates [32].

The graphic visualization of the production and fiscal curves has been demonstrated to change depending on the initial assumptions [33]; on such factors as the shadow economy [34], people's preferences [35], mechanisms of resource use to balance the budget [36], the macroeconomic situation in the country [37], and tax 'migration' [38]; and on the choice of a specific tax [39; 40]. Ananiashvili and Papava propose an approach based on Laffer-Keynesian synthesis, but so far this idea has made little progress [29].

Even though there is a vast body of research on the relationship between tax burden and economic growth, it should be noted that such estimates are usually rather general and do not take into account the specifics of regions or economic sectors, which limits the practical applicability of these results. Sensitivity of sectors and regions to tax burden can be affected by various factors and differ severalfold. In recent years, among Russian economists, there has been a surge of interest in the effects of tax burden, especially regarding specific sectors of economy and regions.

For example, Kakaulina calculated the critical values of the optimal tax burden in regions with different resource potential [41]. In another study, she identified the general quantitative patterns in the way tax burden influences economic growth in regions with different industrial profiles and calculated the optimal tax burden for these regions [42]. Her calculations have shown that for Russian regions specializing in retail trade (e.g. Moscow region), the values of the 'area of fiscal controversies' (difference between the values of Laffer points of the first and second kind) are considerably higher than for regions specializing in agriculture (Krasnodar region), mining and metallurgy (Sverdlovsk region), education and R&D (Novosibirsk region): 22.1–34.9% against 15.6–21.2%, 17.5–20.5%, 18.9–22.6% respectively [42].

Other studies in this field revealed a number of drawbacks of the Russian tax regulation system and led the researchers

to formulate recommendations on how it can be improved. For example, it was shown that the differences between the Russian and international methods of calculating the tax burden for specific sectors result in underestimation of the effective tax burden in Russia [43]. Moreover, tax burden is distributed unevenly across sectors: it is higher in the manufacturing sector, which means that it is necessary to incentivize innovation in manufacturing enterprises, for example, through differentiated corporate tax rates [44]. Kakaulina analyzes the tax burden for types of economic activity in 2009–2017, measured as the ratio of the sum of tax payments (free of personal income tax) and social security contributions to net value added of enterpises involved in a certain type of economic activity [45]. She also points out the fact that the heaviest tax burden is borne by extractive and manufacturing industries and describes a general methodological approach to calculation of tax burden that would ensure accuracy and comparability of results [45].

Our article continues this line of research and seeks to improve the instruments that can be used to estimate economic sectors' sensitivity to tax burden.

Methodology

To build econometric dependencies, we are going to use a traditional method based on revealing the connection between the volume of output generated by industrial sectors and tax burden understood here as the share of total turnover in an industry collected in different forms of tax and constituting tax revenue to the country's consolidated budget. We use as a point of departure the assumption that the taxes paid by enterprises are of equal status and, therefore, it does not matter which specific tax rates rise or fall. What matters is the amount of revenue that the producer is left with after all the obligatory payments have been made.

As mentioned earlier, such analysis is commonly referred to in research literature as 'Laffer's analysis'. This approach usually implies that we need to build a non-linear *production curve* dependent on

the average tax burden and a *fiscal curve*, which is the dependency of tax revenue on the average tax burden multiplied by the production output (taxable base). Although this approach has been productively applied in some studies, it has not been widely used to date.

Balatsky and Ekimova attempted to apply Laffer's approach a bit differently and built econometric dependencies of production growth rates and the average tax burden [46]. This is a *dynamic* dependency since the production growth rate in percentage points is in the left-hand side of the equation and the tax burden in percentage points is in the right-hand side. In a traditional *static* dependency, production growth in the left-hand side is given in absolute cost values while in the right-hand side, labour productivity is expressed in absolute natural values; capital, in absolute cost values; and tax burden, in relative values (percentage points). Although this approach holds some promise, in its original version it is not without certain faults and is suitable only for a first experiment in a series of such analytical computations. The drawbacks that need to be addressed are as follows.

First, no control variables were used in models, which means that the dynamics of production could not be considered separately from the general trend. Second, the authors used a quadratic dependency on tax burden, which, strictly speaking, is not correct since explanatory variables should not be multicollinear while it was initially known that in the resulting models they would be functionally (!) connected. Third, to evaluate the econometric dependency, the intercept term was nullified, which shifted the estimates and lead to less accurate and reliable results.

Our study seeks to remedy these drawbacks. The peculiarity of the procedure we are going to apply is that we are going to construct an explanatory variable in the form of an a priori non-linear fiscal aggregate with a predetermined parameter. After conducting a series of computational experiments, we expect to find significant econometric dependencies by increasing the value of the parameter in

the fiscal aggregate. This procedure will allow us, on the one hand, to avoid multi-collinearity of explanatory values and, on the other, to keep the initial assumption that there is a non-linear relationship between production and tax burden.

Thus, through the resulting models we will discover parabolic and quasi-parabolic dependencies and will be able to apply Laffer's analysis to identify the most significant – optimal and critical – points of tax burden. These points can be used as a kind of markers for tax regulation and prediction of industries' responses to changes in their tax burden.

Fiscal profile of the Russian economy as a whole

To shed light on the general situation in the Russian economy, we are going to build a model of the dependency between GDP growth rates and tax burden $q = T / Y$, where Y is GDP in current prices and T is tax revenue in current prices. In this case, parameter q

characterizes tax burden borne by producers as a share of GDP.

In this section, we will consider the period from 1996 to 2019. The statistical input data were provided by the official reports of Rosstat and the Federal Tax Service (FTS) (Table 1). For other models we used the same sources of statistical data but the period was different.

We use GDP growth rates (I) as an output variable and employment growth rates (J) as a control variable. With the help of this variable, we can 'neutralize' the general trend of expanding/shrinking economy and use the fiscal aggregate as an instrument for adjustment of the regulation regime. As we mentioned above, our intention is to build a certain *a priori non-linear fiscal aggregate*, which is going to serve as one variable in an econometric dependency. This will allow us to test the hypothesis about the non-linear impact of tax burden on production. In relation to the Russian economy, this fiscal aggregate takes the form of a quadratic

Table 1

Input data for model (1) for the Russian economy as a whole

Years	Index of physical volume of GDP, %	GDP in current prices, bln rbs	Tax revenue in current prices, bln rbs	Number of employed persons, ths people
1996	96.4	2007.8	473.0	62928.0
1997	101.4	2342.5	594.1	60021.0
1998	94.7	2629.6	564.6	58437.0
1999	106.4	4823.2	1007.5	63082.0
2000	110.0	7305.6	1707.6	65070.4
2001	105.1	8943.6	2345.0	65122.9
2002	104.7	10830.5	3136.8	66658.9
2003	107.3	13208.2	3735.3	66339.4
2004	107.2	17027.2	4942.1	67318.6
2005	106.4	21609.8	4632.6	68339.0
2006	108.2	26917.2	4482.5	69168.7
2007	108.5	33247.5	5149.8	70770.3
2008	105.2	41276.8	6098.5	71003.1
2009	92.2	38807.2	4713.1	69410.5
2010	104.5	46308.5	5876.7	69933.7
2011	104.3	60114.0	7419.9	70856.6
2012	104.0	68103.4	8653.8	71545.4
2013	101.8	72985.7	8598.9	71391.5
2014	100.7	79030.0	9631.6	71539.0
2015	98.0	83087.4	10723.4	72323.6
2016	100.2	85616.1	13287.4	72392.6
2017	101.8	91843.2	16671.5	72142.0
2018	102.5	104629.6	20521.7	72354.4
2019	101.3	110046.1	22503.4	71764.5

function, which looks the following way: $W = (q - kq^2)$, where $k > 0$ is the coefficient that takes different values in the process of building the econometric dependency. This approach enables us to conduct many computational experiments with different k values. The resulting model based on the data shown in Table 1 looks the following way:

$$I = -452.271 + 119.135 \ln J +$$
$$\underset{(-3.168)}{\quad} \underset{(3.849)}{\quad}$$
$$+ 0.440(q - 0.013 q^2),$$
$$\underset{(1.751)}{\quad}$$
$$N = 24; \; R^2 = 0.46;$$
$$DW = 1.88; \; E = 2.61\%,$$

(1)

where N is the number of observations; R^2, the determination coefficient; DW, the Durbin Watson statistic; E, the average approximation average (in %); and t-statistics are given in parentheses for all regression coefficients. The resulting model satisfies the main statistical tests and has a high approximation accuracy; the fiscal aggregate is significant at the level of 10%.

Thus, there is a parabolic dependency between economic growth and tax burden, which confirms the classical hypothesis about the non-linear impact of taxes on production activity.

If we take $\ln J$ as the average value in the whole observation period, then $\ln J = 4.61$. Then, as the calculations show, the optimum tax burden point is $q^* = 38.5\%$; if $\ln J$ is taken for each year, then point q^* will float in time, which is why, for the sake of simplicity, we are going to use average values. The optimum point corresponds to the economic growth index $I^* = 105.4\%$. Thus, provided that the tax system is perfectly adjusted, the yearly GDP growth in Russia will be 5.4%.

Special attention should be given to those two points of the tax burden where GDP growth index is 100%, which corresponds to the simple reproduction mode. We need fairly straightforward calculations to show that this value can be reached if the tax burden is $q_0 = 7.7\%$ and $q_{00} = 69.2\%$. This is an optimistic result, since the upper limit beyond which the national economy will plunge into recession is quite far from the effective tax burden. We may even say that the value of the upper limit q_{00} is unrealistic. Furthermore, the effective tax burden is significantly below the optimum point $q^* = 38.5\%$, that is, the Russian economy is on the rising arc of the parabolic curve (Fig. 1).

Model (1) shows that the Russian economy as a whole has low sensitivity to tax burden while the current figures do not give us any indication of excessive tax burden on Russian enterprises. We are going to return to this paradoxical fact in the final section of our paper.

Fiscal profile of the manufacturing sector

As is often the case, the situation in the economy as a whole can be quite different from the situation in individual sectors. Therefore, in the following sections we are going to look at how different sectors respond to taxation tools.
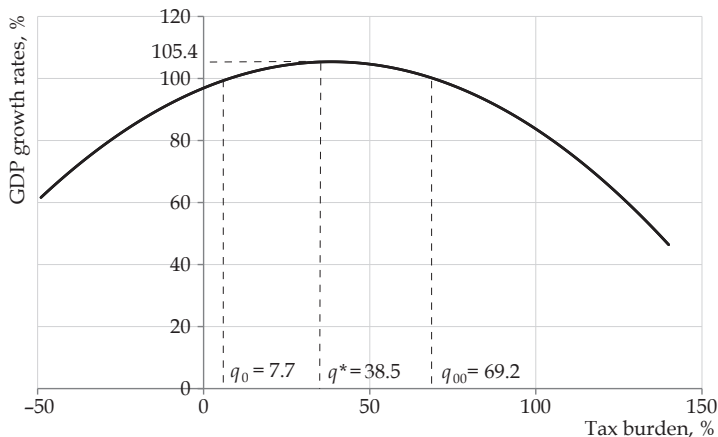

Fig. 1. **Geometrical interpretation of function (1) for the Russian economy as a whole**

First, let us concentrate on the manufacturing industry. Unlike the previous case, this time the fiscal aggregate takes the form of the following functional dependency: $W = [q - k*\ln(q)]$, where $k > 0$, as before, is a varying coefficient. Like in model (1), in equation (2), employment in the sector is a control variable and there is dummy variable F, which takes value $F = 1$ for 2009 and 2015 and $F = 0$ for the other years. This dummy variable is also used as a control variable to distinguish between growth phases ($F = 0$ if $I > 100\%$) and decline phases ($F = 1$ if $I < 100\%$) in production. Variable I corresponds to turnover growth in the manufacturing sector. We should put particular emphasis on this fact because in model (1) we used a 'cleaned' indicator of domestic production – GDP. Moreover, we have an extremely short time series (2006–2007), due to the lack of data for other years because the web-site of the FTS provides sector-specific information only starting from 2006. The resulting model based on the data shown in Table 2 looks the following way:

$$I = -485.116 + 117.669 \ln J - \\ {\scriptstyle(-2.627)} \quad {\scriptstyle(3.019)}$$
$$-14.070 F - 12.065 (q - 5.70), \\ {\scriptstyle(-5.071)} \quad {\scriptstyle(-2.220)}$$
$$N = 14; R^2 = 0.79;$$
$$DW = 1.91; E = 2.04\%.$$

(2)

Model (2) was found to be satisfactory and can be used for analytical calcu-

lations. Function (2) is a quasi-parabolic dependency with a maximum point, which corresponds to $I^* = 107.1\%$ with tax burden $q^* = 5.7\%$ (like before, we are going to use the average value for the whole period $\ln J = 4.60$). Thus, provided that the tax system is perfectly adjusted, the potential yearly production growth in the manufacturing industry will be quite substantial – over 7%.

For model (2), the critical points where the production growth rate is 100% take the following values: $q_0 = 3.5\%$ and $q_{00} = 8.7\%$ and we take into account the growth phase ($F = 0$). The decline phase ($F = 1$) is described by a similar curve, though shifted slightly downwards. This fact signifies that when the industry is in the decline phase, it is less sensitive to tax regulation. For instance, even when the tax burden is optimal (5.7%), the production rate is only 93.0%, that is, tax regulation alone is unable to pull the industry out of its slump and there is a need for other factors and stimuli.

In its growth phase, the manufacturing industry demonstrates a higher sensitivity to tax burden, which can be explained by the fact that the effective tax burden in the given period varied between 6.0 and 8.6%. This leads us to at least two important conclusions: first, the Russian manufacturing sector is on the descending branch of the non-linear production

Table 2

Input data for model (2) for the manufacturing industry

Years	Index of production, %	Volume of shipped goods in actual prices, bln rbs	Tax revenue in current prices, bln rbs	Number of employed persons, ths people	Dummy variable
2006	108.4	11185.4	676.3	11359.0	0
2007	110.5	13977.8	1 003,0	11368.0	0
2008	100.5	16864.0	1 065,7	11191.0	0
2009	84.8	14352.0	818.2	10401.0	1
2010	110.6	18872.0	1 127,4	10292.0	0
2011	108.0	22802.0	1 404,4	10281.0	0
2012	105.1	25111.0	1 687,6	10170.0	0
2013	100.5	27133.0	1 818,7	10065.0	0
2014	103.2	29661.0	2 098,1	9872.0	0
2015	98.7	35090.0	2 098,1	10295.0	1
2016	102.6	34967.0	2 855,6	10247.0	0
2017	102.5	38712.0	3 324,8	10173.0	0
2018	102.6	44600.0	3 470,5	10067.0	0
2019	101.3	45179.8	3 717,5	10286.4	0
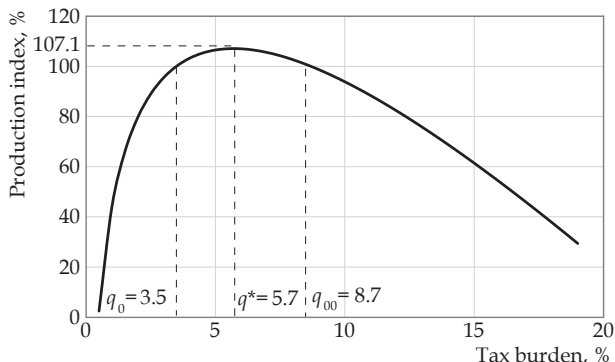
Fig. 2. Geometrical interpretation of function (2) for manufacturing

dependency (2) ($q^* = 5.7\% < q = 6.0 - 8.6\%$) (Fig. 2). Therefore, such tax regime slows down the growth in the sector and even at this moment impedes it from realizing its production potential. Second, in some years the effective tax burden came close to the right critical point ($q = 6.0 - 8.6\% < q_{00} = 8.7\%$). In this case, a more rigorous tax regime for this sector may provoke a slump in production. In other words, by setting the tax burden at its current level, fiscal policy-makers are walking a fine line since tax regulation is now quite close to triggering a full-blown recession.

Thus, our calculations have brought to light an interesting asymmetry in the manufacturing industry's response to the tax burden: in its growth phase, the sector appears to be highly sensitive to taxation while in the recession phase, the taxes lose their stimulting effect.

Fiscal profile of the extractive industry

As it will be clear from our subsequent calculations, specific characteristics of economic sectors determine the degree of their sensitivity to tax burden. This is particularly evident in the extractive industry. Like in the preceding model (2), variable I reflects gross revenue growth in the sector. We use employment growth as a control variable and introduce dummy variable F, which takes value $F = 1$ in 2008 and 2014, which were officially recognized as recessive years, for other years the variable takes value $F = 0$.

Our computational experiments based on the data from Table 3 have resulted in

Table 3

Input data for model (3) for the extractive industry

Years	Index of production, %	Volume of shipped goods in current prices, bln rbs	Tax revenue in current prices, bln rbs	Number of employed persons, ths people	Dummy variable
2006	102.8	3720.9	1688.5	1043.0	0
2007	103.3	4488.9	1613.8	1040.0	0
2008	100.4	5272.0	2162.7	1044.0	1
2009	97.2	5091.0	1377.0	1067.0	0
2010	103.8	6227.0	1794.9	1057.0	0
2011	101.8	8031.0	2623.1	1063.0	0
2012	101.0	8950.0	3046.4	1080.0	0
2013	101.1	9748.0	3141.4	1075.0	0
2014	101.7	9691.0	3637.1	1064.0	1
2015	100.7	11260.0	4194.1	1096.0	0
2016	102.3	11730.0	3732.4	1119.0	0
2017	102.1	13916.0	5018.7	1127.0	0
2018	104.1	18194.0	7808.6	1142.0	0
2019	103.1	18758.0	7489.2	1149.4	0

the following econometric dependency for the extractive industry:

$$I = 334.645 - 76.383 \ln J -$$
$$\quad {}_{(2.339)} \quad\quad {}_{(-2.610)}$$
$$- 2.599\, F - 1.088\,(q - 40.900 \ln q),$$
$$\quad {}_{(-2.453)} \quad {}_{(-2.708)}$$
$$N = 14;\ R^2 = 0.61;\ DW = 2.45;$$
$$LM1 = 1.24;\ KM2 = 1.35;$$
$$LM3 = 2.35;\ E = 0.80\%.$$

(3)

In model (3), the results of the Durbin–Watson (DW) test were inconclusive as the *DW* statistic fell within an uncertainty area, which is why we additionally used the Breusch-Godfrey serial correlation *LM* test. It showed that in model (3) there are no first-, second- or third-order autocorrelations. Model (3) satisfies all the diagnostic tests. Function (3) is completely the same as function (2): it is a convex dependency with the maximum point $I^* = 103.1\%$ and the optimal tax burden $q^* = 40.9\%$ (as before, for simplicity we take the average of $\ln J$ for the whole period: $\ln J = 4.61$) (Fig. 3). For model (3), the critical points where the production growth index is 100% for the growth phase ($F = 0$) take the following values: $q_0 = 27.5\%$ and $q_{00} = 58.2\%$.

If we compare the models for the manufacturing and extractive industries, we can see a whole range of differences between them.

First, the factor of employment in the extractive industry has a negative value, which contradicts the classical premises of production functions. This paradox can be explained the following way: the extractive industry's performance is determined by global oil prices and oil demand rather than by its human capacity.

In other words, the number of employees in this industry depends on the level of oil production. If the market conditions are adverse, workers retain their jobs but turn into a dead weight for their enterprises, which is what signifies the negative value of the coefficient in model (3) with the logarithm of the employment index. Apparently, the use of rotation shiftwork cannot fully resolve this issue. It is also possible that an increase in labour productivity and modernization in the sector contribute to the paradox described above.

Second, for the extractive industry, the width of the corridor of the tax burden values, within which the industry does not risk slipping into recession, far exceeds the similar figure for the manufacturing industry: 27.5–58.2% against 3.5–8.7%. In other words, the areas of a relatively safe variability of the tax burden for the extractive industry is 30.7 percentage points while for the manufacturing industry it is 5.2 percentage points, that is, we are dealing with an almost 6 times difference. Thus, the manufacturing industry's sensitivity to tax regulation is considerably higher than that of the extractive industry.

Third, the effective average yearly tax burden on the extractive industry was 36.3%, while the optimum tax point, $q^* = 40.7\%$. The effective tax payments exceeded the optimum point only in 2006, 2008, 2014 and 2018. Therefore, most years the extractive industry was on the rising arc of curve (3) and never closely approached the right critical boundary.

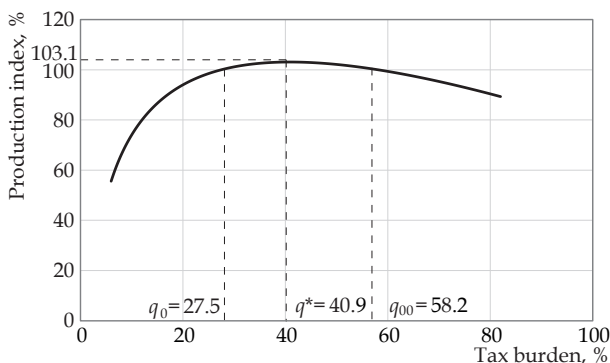Fourth, there is a huge difference between the tax burden on the extractive

Fig. 3. Geometrical interpretation of function (3) for the extractive industry

and manufacturing industries. While the average tax burden of the former is 36.3%, for the latter this figure is 6.9%, that is, the difference can be up to 5.3 times. This may seem strange but in fact it is quite natural if we take into consideration the technological characteristics of each sector. The fact is that the extractive industry uses raw materials at a minimum extent and benefits from the natural resource rent while intermediary consumption (raw materials, semi-finished goods, etc.) makes up a considerable proportion of the prices in the manufacturing industry. Moreover, unlike the manufacturing industry, the extractive industry is dominated by natural monopolies. Hence, the extractive industry occupies a privileged position, which is why it can bear a heavier tax burden.

Our calculations have shown that applying the same tax policy in different sectors is not the optimal solution because it does not take into consideration their technological characteristics and market positions.

Fiscal profile of manufacture of coke and petroleum products

Let us now go back to manufacturing and focus on such 'intermediate' sector as manufacture of coke and petroleum products. The methodology and statistical base remain the same. As in previous cases, variable *I* demonstrates gross revenue growth and variable *G*, price growth on the global oil market (prices are given in dollars) (control variable). The result of our computational experiments based on the data from Table 4 is the following econometric dependency, which is similar in structure to the two previous ones:

$$I = 77.690 + 5.703 \ln G - $$
$$\underset{(9.262)}{} \quad \underset{(3.071)}{}$$
$$- 2.632 (q - 2.950 \ln q),$$
$$\underset{(-2.304)}{}$$
$$N = 14; R^2 = 0.54;$$
$$DW = 2.08; E = 2.43\%.$$

(4)

Model (4) satisfies all the statistical tests. Function (4), like previous dependencies, is quasi-parabolic with a maximum point that takes the value $I^* = 104.7\%$ with the optimal tax burden $q^* = 2.9\%$ (we take the average value of $\ln G$: $\ln G = 4.62$). For model (4), the critical points where the productions growth index is 100% take the following values: $q_0 = 0.8\%$ and $q_{00} = 7.5\%$ (Fig. 4).

Importantly, to build model (4), we didn't have to use a dummy variable, which shows that this sector is relatively recession-proof and that the role of the control variable is played by the oil price indices. The employment index of the sector was insignificant in all combinations. Apparently, the sector is more dependent on global oil prices than the size of the workforce.

Table 4

Input data for model (4) for manufacture of coke and petroleum products

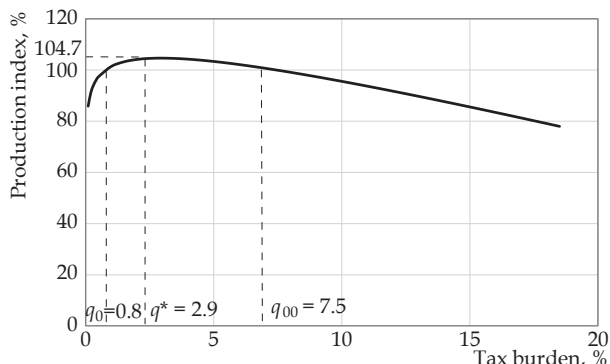| Years	Index of production, %	Volume of shipped goods in current prices, bln rbs	Average annual Brent crude oil price, in US dollars per barrel	Tax revenue in current prices, bln rbs
2006	106.6	2002.0	61.00	72.3
2007	102.8	2277.0	69.04	160.4
2008	102.8	2984.0	94.10	184.9
2009	99.4	2662.0	60.86	158.5
2010	106.0	3522.0	77.38	195.8
2011	103.8	4554.0	107.46	319.3
2012	103.1	5219.0	109.45	366.6
2013	102.3	6031.0	105.87	376.4
2014	106.1	6848.0	96.29	311.2
2015	100.9	7043.0	49.49	227.0
2016	96.8	6818.2	40.68	434.5
2017	101.1	8203.0	52.51	545.6
2018	101.8	10397.4	69.42	519.8
2019	101.4	9497.2	64.19	551.8

Fig. 4. **Geometrical interpretation of function (4) for manufacture of coke and refined petroleum products**

Our calculations show that the average tax burden throughout the whole period was 5.7%, which is slightly above the optimum point $q^* = 2.9\%$. Thus, the sector was on the descending arc of the non-linear dependency on tax burden. At the same time the effective tax burden never exceeded the right critical point ($q < q_{00} = 7.5\%$), although in 2011 and 2012 it came close to this point.

Thus, the situation in the sector is quite similar to that of the whole extractive industry. The difference is only that for the oil processing sector the optimum point is much lower: $q^* = 2.9\%$ against $q^* = 5.7\%$. Therefore, manufacture of coke and petroleum products is even more sensitive to taxation than the manufacturing industry and, consequently, even more sensitive to this type of regulation.

Fiscal profile of the chemical industry

Let us now look at the sector with more extensive processing – the chemical industry. The methodology and statistical base remain the same. Variable I shows the sector's gross revenue growth and variable *P*, labour productivity growth (control variable). Dummy variable *F* takes value $F = 1$ for 2009 and 2014 and $F = 0$ for the other years. The result of our computational experiments based on the data from Table 5 is the following econometric dependency, which is quite similar in structure to the previous models but is a little more complex for the control variable:

Table 5

Input data for model (5) for the chemical industry

Years	Index of production, %	Volume of shipped goods in current prices, bln rbs	Tax revenue in current prices, bln rbs	Number of employed persons, ths people	Dummy variable
2006	104.7	754.0	17.7	550.4	0
2007	106.6	945.0	34.1	511.9	0
2008	95.4	1312.0	60.9	488.2	0
2009	94.6	1062.0	22.3	441.2	1
2010	110.6	1427.0	31.1	431.4	0
2011	109.5	1813.0	49.3	415.8	0
2012	104.1	1942.0	50.4	398.2	0
2013	105.4	1886.0	44.9	390.2	0
2014	100.1	2102.0	37.3	380.6	1
2015	106.3	2767.0	77.0	390.2	0
2016	105.3	2971.0	90.2	401.5	0
2017	106.3	3243.0	87.9	445.4	0
2018	103.5	3824.0	101.4	441.8	0
2019	106.1	3862.0	129.2	454.2	0

$$I = 2461.798 - \underset{(2.679)}{6.008}\, F + $$
$$+ \underset{(2.561)}{6.409}(P - 101.500 \ln P) - $$
$$- \underset{(-3.433)}{15.780}(q - 2.600 \ln q), \tag{5}$$
$$N = 14;\ R^2 = 0.80;$$
$$DW = 1.93;\ E = 1.59\%.$$

with numbers (2.679) and (−3.219) under the first line.

Model (5) satisfied all the statistical tests and is suitable for further analysis. Like the previous models, dependency (5) is quasi-parabolic with $I^* = 106.5\%$ as the maximum point, with the optimal tax burden $q^* = 2.6\%$ (average value $P = 105.8$). For model (5), the critical points, where the production increase index is 100%, take values $q_0 = 1.4\%$ and $q_{00} = 4.4\%$ (Fig. 5).

Our analysis shows that for five years the sector was on the left (rising) arc of function (5) and for nine years, on the right (downward) arc. In general, the average effective tax burden $q = 2.8\%$ was below the optimum point $q^* = 2.6\%$.

What distinguishes the model built for the chemical industry is that it has an extremely narrow *corridor of acceptable tax burden values* $\Delta q = q_{00} - q_0$, which is only 3.0 percentage points and is the record low among the other sectors in question (Table 7). This signifies that the chemical industry is highly sensitive to fiscal regulation and, therefore, requires a specially tailored approach.

Yet another peculiarity of model (5) is a convex quasi-parabolic dependency of the sector's turnover growth on labour productivity growth. For the average tax burden in the whole period $q = 2.8\%$, the optimal level of labour productivity growth is 101.5%, with the production growth

rate of 103.1%. Thus, here we are dealing with an interesting effect: modernization in the industry should be thoughtfully and carefully dosed, otherwise, its production growth will decline. The lack of data prevents us from offering a more detailed explanation to this phenomenon. We can suppose, however, that the chemical industry is quite sensitive to any modernization attempts, to which it may react by reducing output. There is logic in this since any serious modernization implies that the enterprise will have to pause its production (or a part of it) in order to change, modify or re-engineer equipment and thus possibly fall behind its production schedule.

In sum, to avoid reduced production in the chemical industry, which is one of the country's most efficient sectors, a carefully adjusted tax policy is necessary, which also applies to technological innovation in the industry. All of the above shows that there are natural limits to the speed of the sector's development.

Fiscal profile of electrical engineering

At the next stage of our analysis we are going to consider the sector in the avantgarde of technological progress – electrical engineering. The methodology and statistical base remain unchanged. Variable I corresponds to gross revenue growth in the sector and variable P, to labour productivity growth (control variable). This time the fiscal aggregate includes a control variable: $W = [\ln P - (q - k^* \ln(q))]$. The result of our computational experiments based on the data from Table 6 is the following model:
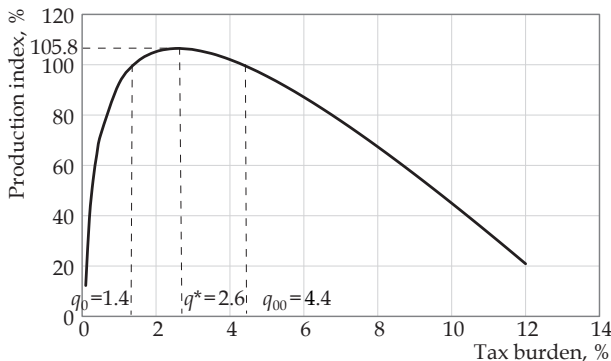

Fig. 5. **Geometrical interpretatation of function (5) for the chemical industry**

Table 6

Input data for model (6) for electrical engineering

Years	Index of production, %	Volume of shipped goods in current prices, bln rbs	Tax revenue in current prices, bln rbs	Number of employed persons, ths people
2006	115.0	600.0	39.9	868.8
2007	110.9	829.0	55.0	905.7
2008	92.6	910.0	57.9	912.1
2009	68.4	817.0	60.5	824.2
2010	118.9	1132.0	76.4	759.6
2011	111.9	1329.0	84.2	771.4
2012	106.4	1462.0	99.3	762.9
2013	99.0	1536.0	102.3	758.4
2014	99.5	1716.0	121.8	749.4
2015	92.1	2209.0	145.0	760.2
2016	107.4	2369.0	199.1	695.3
2017	99.9	2521.0	222.6	686.0
2018	101.1	2677.0	232.7	662.4
2019	105.3	2697.0	251.3	648.5

$$I = -929.719 + 84.403[\ln P - (q - 7.520\ln q)], \tag{6}$$
$$\underset{(-5.708)}{} \quad \underset{(6.334)}{}$$
$$N = 14;\ R^2 = 0.77;\ DW = 1.95;\ E = 4.73\%.$$

Model (6) satisfies all the necessary statistical tests and can be used for further analysis. The function this model is based on is quasi-parabolic with the maximum point corresponding to value $I^* = 107.8\%$ with optimal tax burden $q^* = 7.5\%$ (average value $P = 104.3$). For function (6) the extreme tax points have the following values: $q_0 = 6.4\%$ and $q_{00} = 8.8\%$ (Fig. 6).

Table 6 shows that for 10 years, production in the electrical enginering sector was on the left (rising) arc of function (6) and in the last 4 years (2016–2019), on the right (descending) arc. In general, the average effective tax burden $q = 7.3\%$ was slightly below the optimum point

$q^* = 7.5\%$, which leads us to the conclusion that electrical engineering is the most sensitive sector of those we considered above. The width of the fiscal corridor Δq for this sector even exceeds that of the chemical industry (see Table 9). If the tax system is perfectly adjusted, the potential growth in this sector is the most impressive – 7.8%.

Fiscal profile of education: inversion in the public sector

In the Russian economy, public sector-dominated industries prevail and this, in its turn, may have a distorting effect on the general macro-economic picture. Therefore, it makes sense to compare the results we obtained in the previous sections with the situation in other spheres, for example, education or health care. In fact, edu-
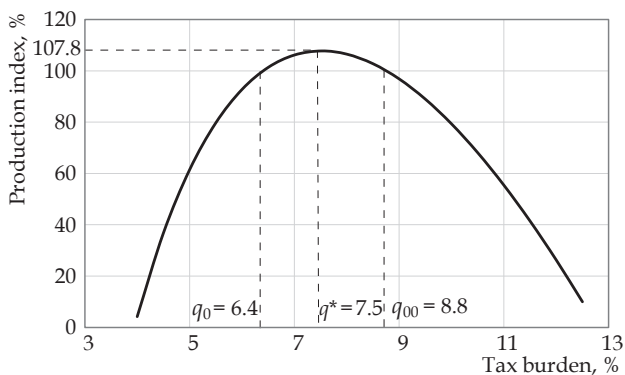

Fig. 6. **Geometrical interpretation of function (6) for electrical engineering**

cation can be considered a 'typical representative' of the whole sphere of public services. The methodology and statistical data are the same. Variable *I* corresponds to the sectors' gross revenue growth; variable *J*, employment growth (control variable); and variable F is a dummy variable, which takes value *F* = 1 in 2009 and *F* = 0 in the other years. The result of our computational experiments based on the data from Table 7 is the following model:

$$I = -185.313 - 1.857\,F +$$
$$\underset{(-1.908)}{} \quad \underset{(-3.537)}{}$$
$$+ 62.262\ln J + 0.686(q - 4.000\ln q)],$$
$$\underset{(2.947)}{} \quad \underset{(2.153)}{}$$
$$N = 14;\ R^2 = 0.76;$$
$$DW = 1.85;\ E = 0.48\%.$$

(7)

Model (7) satisfies all the necessary statistical tests, the intercept term is significant at the level of 8.5%. Unlike the previous models, dependency (7) is quasi-parabolic but has a minimum point, which takes value $I^* = 100.7\%$ with the optimal tax burden $q^* = 4.0\%$ (average value $\ln J = 4.60$). For this function, the extreme critical points where the output growth index is 100% are economically meaningless (Fig. 7). Even in case of the most extreme tax burden, the sector will not fall into recession but will instead remain on an upward trend. In the last four years, since 2016, when the Russian government's roadmap of tuition fee rise

was launched, the effective tax burden has been on the right (rising) arc of function (7). This means that a heavier tax burden does not slow down growth but actually stimulates it.

This paradox can be interpreted the following way: when a state institution, for example, a university, receives more budgetary and extra-budgetary funds, this inevitably leads to an increase in the cost of its services, which, in its turn, raises the amount of taxes paid. If a university's revenue exceeds a certain minimal level provided by budget funding, this will fuel tax revenue growth and result in a higher tax burden. Thus, it can be concluded that the increasing cost of universities' services results in increasing tax burden. It can be said that there is a reversal of cause and effect: it is not tax burden that influences organizations' activity but, vice versa, their growing activity creates a heavier tax burden. If we take into consideration the fact that state universities are non-profit organizations, we can assume that their whole revenue is distributed to cover the expenses and pay taxes, which causes a faster growth in tax revenue in the growth phase. In any case, changes in the tax burden on universities and schools do not influence their activity, which is mostly determined by the situation on the market.

Table 7

Input data for model (7) for education

| Years	Physical volume of output, %	Production output in current prices, mln rbs	Tax revenue in current prices, mln rbs	Number of employed persons, ths people	Dummy variable
2006	100.6	888177.0	16930.7	6009.0	0
2007	101.2	1118839.0	23508,4	6016.0	0
2008	100.0	1398968.0	32408.6	5980.0	0
2009	98.6	1534347.0	36318.6	5979.0	1
2010	98.2	1683393.0	41199.2	5902.0	0
2011	99.1	1923722.0	33602.7	5789.0	0
2012	98.9	2087897.0	51925.0	5697.0	0
2013	100.1	2304468.0	56710.7	5570.0	0
2014	101.1	2830134.4	60866.3	5520.0	0
2015	101.5	2962626.7	68143.0	5574.0	0
2016	100.1	3125656.0	225164.4	5552.0	0
2017	101.8	3255618.7	305651.5	5525.0	0
2018	101.5	3626391.8	342765.2	5456.0	0
2019	100.5	3998835.8	369905.6	5412.4	0
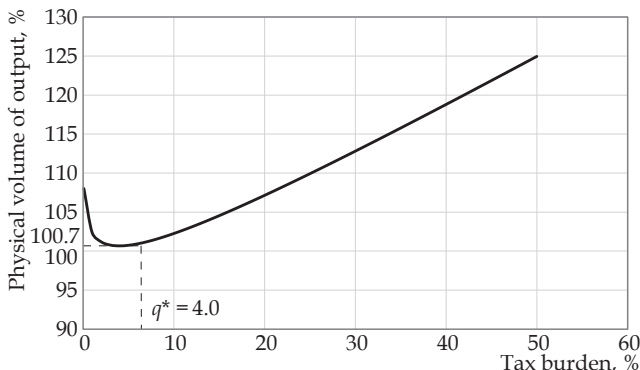
Fig. 7. Geometrical interpretation of function (7) for education

All the above-said points to the fact that the sphere of education in Russia is unresponsive to tax changes. A rise in the tax burden in this sector neither affects organizations' activity nor makes them increase their turnover to compensate for tax payments. In general, the anomalous form of function (7) signifies that budget-funded organizations of the country's education sector resist standard tax regulation.

Fiscal profile of the health care and social services sector

For a better understanding of the role that the public service sphere plays in the Russian economy, we are going to consider another sector – health care and social services. The procedure is the same as for education. The notation remains the same: *F* is a dummy variable that takes value *F* = 1 in 2008 and 2016 and in the other years, *F* = 0. The result of our computational experiments based on the data from Table 8 is the following model, which is quite similar to model (6) for electrical engineering:

$$I = 164.697 - 0.932\,F -$$
$$\underset{(5.685)}{}\ \underset{(2.273)}{}$$

$$-\,13.711[0.035(q - 0.100q^2) + \ln J],$$
$$\underset{(-2.200)}{} \tag{8}$$

$$N = 14;\ R^2 = 0.63;$$
$$DW = 2.19;\ E = 0.33\%.$$

Model (8) satisfies all the required statistical tests. What distinguishes this model is that the initial fiscal aggregate has a

Table 8

Input data for model (8) for health care and social services

| Years	Physical volume of output, %	Output in current prices, mln rbs	Tax revenue in current prices, mln rbs	Number of employed persons, ths people	Dummy variable
2006	101.4	1264123.0	14132.2	4574.0	0
2007	101.3	1559219.0	19558.1	4644.0	0
2008	100.0	1978578.0	25954.5	4666.0	1
2009	100.5	2189465.0	25164.1	4717.0	0
2010	100.6	2381500.0	30340.5	4621.0	0
2011	101.1	2805642.0	27152.3	4604.0	0
2012	101.7	3178082.0	34750.0	4573.0	0
2013	100.8	3472310.0	42279.2	4523.0	0
2014	102.0	3520527.5	43795.5	4496.0	0
2015	100.6	3761153.7	46587.9	4529.0	0
2016	99.2	3835217.8	183575.3	4606.0	1
2017	100.8	4077663.8	244411.1	4450.0	0
2018	100.3	4752729.7	293815.2	4404.0	0
2019	100.4	5310359.2	324543.0	4395.2	0
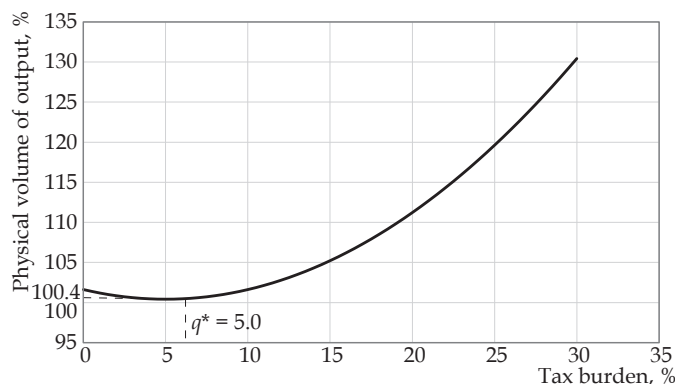
Fig. 8. Geometrical interpretation of function (8) for health care and social services

complex form and includes two varying coefficients: $W = [\ln J + k^*(q - kq^2)]$, where k and k^* are varying constants. Dependency (8) is parabolic but is inverted, like function (7). Its maximum point is $I^* = 100.4\%$ with the optimal tax burden $q^* = 5.0\%$ (average $\ln J = 4.60$). For this function, the extreme critical points are economically meaningless (Fig. 8). Like education, health care is unlikely to plunge into recession due to increased tax burden. The development of education and health care share the same logic.

Thus, the initial hypothesis that the public service sector will distort the general picture was fully confirmed: in Russia, there are sectors that are either independent of the tax burden or their dependence on the tax burden is anomalous, that is, it cannot be explained from the economic perspective. Therefore, the steady growth of the tax burden in education and health care in the given period does not hold any threat: it is unlikely that they would lapse into a period of stagnation or even recession.

Preliminary conclusions: integral fiscal profile of sectors

The above-described calculations lead us to the conclusions systematized in Table 9.

First, the main indicator that reflects the sectors' sensitivity to tax regulation is the width of the corridor of acceptable tax burden values (that is, the ones that provide positive production growth): $\Delta q = q_{00} - q_0$. The lower is the value of Δq, the more sensitive is this or that sector to tax increases. If this is not the case, the degree of the sector's resilience to the increasing tax burden is much higher.

Second, there is a simple but important connection: the more technologically advanced is the sector, the more sensitive it is to tax burden. Table 9 shows that the most vulnerable sector in this respect is electrical engineering, followed by the chemical industry and the manufacturing sector in general, then comes manufacture of coke and petroleum products, with the least vulnerable sector being the extractive industry. It means that tax regulation

Table 9

Fiscal profiles of the economic sectors

Sector	q_0, %	q_{00}, %	Δq, %	q^*, %	q, %	I^*, %
Economy as a whole	7.7	69.2	61.5	38.5	19.0	105.4
Manufacturing	3.5	8.7	5.2	5.7	6.9	107.1
Extractive industry	27.5	58.2	30.7	40.9	36.3	103.1
Manufacture of coke and refined petroleum products	0.8	7.5	6.7	2.9	5.7	104.7
Chemical industry	1.4	4.4	3.0	2.6	2.8	106.5
Electrical engineering	6.4	8.8	2.4	7.5	7.3	107.8
Education	–	–	–	4.0	4.1	100.7
Health care and social services	–	–	–	5.0	2.5	100.4

of new and high-tech industries should be approached with greater care. A possible solution would be to apply lower tax rates to hi-tech industries in comparison with low-tech industries.

Third, there is another interesting pattern: the higher is the technological level of a sector and the more sensitive it is to tax regulation, the more potential it holds in terms of development provided that the fiscal policy is optimal. Table 9 shows that the most impressive growth of production (l^*) can be achieved in the electrical engineering sector (7.8% a year) while the potential of the extractive sector is much lower (only 3.1%). To illustrate the potential of these sectors, it is enough to mention that the electrical engineering sector can develop 2.5 times more intensively than the extractive industry. This fact should not be ignored by policy-makers.

Fourth, in the chemical and manufacturing industries as well as in the oil processing industry, the tax burden exceeds the optimal level and any further rise of the tax burden will be detrimental to the development of these sectors. Recently, a similar situation has been also characteristic of the electrical engineering sector. This fact signifies the need for a certain revision or adjustment of the current tax policy.

Our results for the whole economy are worthy of special attention since its sensitivity to tax burden is record-low. It is enough to say that the whole Russian economy is almost 26 times less sensitive to tax tools than the electrical engineering sector alone. While not claiming to provide an exhaustive explanation to this fact, we think that the reasons for this strange fact could be as follows.

First, in our calculations for the whole economy we used GDP as an indicator while for specific sectors, we used the gross amount of revenue. On the macrolevel, these indicators differ approximately twofold. Therefore, if we switched from value added to gross revenue, all the fiscal parameters of the Russian economy would decrease approximately twofold: $q^* = 19.3\%$; $q_0 = 3.8\%$; $q_{00} = 34.6\%$; $q = 9.5\%$; $\Delta q = 30.8\%$. As a result of such calibration of estimates, the economy's sensitivity to

tax burden turns out to be almost the same as that of the extractive industry. These rough estimates show that the scale of the paradox described above is not as horrendous as it may initially seem.

Second, technologically, the Russian economy is extremely heterogeneous and comprises multiple industries, which vary substantially in terms of their sensitivity to tax regulation. Judging by the results of our calculations, the aggregation of data for all sectors of economy creates a picture of the economy's generally low sensitivity to taxes. The extractive industry and public service sphere (health care, education, etc.) contribute to this situation.

It is quite obvious that an increase in fiscal sensitivity of the Russian economy can be achieved through large-scale restructuring, for instance, by making the country less resource-dependent and, consequently, reducing the share of the extractive industry. Moreover, state clinics and universities should become more economically independent and turn into for-profit institutions partially supported from the public budget.

Discussion: sector-specific differentiated tax burden

The above-described analytical tools enabled us to reveal certain characteristics of development of industries and sectors in relation to their tax burden. Since this is a pilot study, it is aimed primarily at gaining a general understanding of the situation and deals in particular with its qualitative side, that is, the question of whether the tax burden in certain sectors is acceptable or excessive. The idea to apply differentiated tax rates depending on the sectors is highly debatable. Even if we assume that this approach is practically realizable, it would require a variety of conditions to be met. Let us consider some of these conditions in more detail.

The first condition is the reliability of model estimates, which means that the initial input data for a specific industry should be highly accurate. The more detailed this information will be, the better, because this way it will allow us to avoid the one-size-fits-all approach. For exam-

ple, even the above-discussed electrical engineering sector is quite heterogeneous and includes manufacturing of electrical appliances as well as production of computers involving the use of nanotechnologies. Thus, the first key condition is correct disaggregation of the production output data for specific sectors.

Second, it is necessary to choose the methodology of calculating the average tax burden. In our study, we considered only tax payments of industries although, strictly speaking, we should be summing absolutely all fiscal payments of their enterprises, including numerous payments to extrabudgetary funds (social and medical). We believe that the tax burden on an enterprise should be calculated to include the personal income tax payments since, all other things being equal, increased personal income tax will lead employees to put pressure on their employers calling for a pay rise in order to compensate for their losses caused by the tax increase. In some cases, these losses are borne by employees and in some, they can be shifted to the employer (at least partially). At the same time, it would be desirable that the sum of all fiscal payments in the sector should correspond to gross value added amount, that is, the costs of raw materials, different across the sectors, are not taken into account. If we use value added to calculate the tax burden, then in the right part of the model there should be value added growth indices rather than the cost of goods sold. Thus, all variables in the models should be carefully chosen and their choice should be consistent. In practice, however, this requirement is not met due to the lack of the necessary statistical data.

Third, to make such model calculations practically applicable, it is necessary to ensure that the econometric dependencies themselves should be as accurate as possible. To this end we need, on the one hand, long time series (over 20 years) and, on the other, models should be tested for stability. Moreover, it is advisable to exclude those models that only barely satisfy the main statistical tests. Unfortunately, even these conditions are not met due to

the lack of *long time series* with comparable and detailed statistical data

Fourth, modelling-based conclusions should be used to draw qualitative conclusions. In other words, it is necessary to estimate whether the effective tax burden exceeds the optimal or critical level or not and if so, then to what extent. Only in the case when calculations show that the situation is serious, the decision should be made to adjust the tax burden. Consensus regarding such adjustments should be achieved through dialogue between representatives of specific sectors and fiscal authorities (FTS).

Fifth, the average tax burden is a parameter that cannot be regulated directly. To increase or reduce the tax burden, adjustments should be made to specific tax rates (VAT, corporate income tax, social security contributions and so on). Therefore, it can be concluded that if model calculations point unambiguously towards the need to reduce the tax burden, this should be achieved in dialogue between industry experts and fiscal authorities. It is also important to take into account the phase in the life cycle of this or that sector which determines the profitability of production and the sector's ability to withstand the tax burden. Tax preferences should be adjusted depending on the phase the sector is in at a certain moment.

Thus, the above-described method is primarily intended for analytical and indicative purposes. Its practical applicability is quite limited and requires that the above conditions should be met.

Conclusion

Our study has shown that the Russian economy is extremely heterogeneous regarding responsiveness of its sectors to different tax regulation tools. The models we built have shown that the current fiscal regime hinders the development in some sectors, which means that for these sectors the tax burden from specifically chosen taxes should be reduced. The most knowledge-intensive and technologically advanced sectors are usually overburdened by taxes, although this fact remains frequently neglected in state regulation practices.

The level of the tax burden in all the sectors we considered is usually within the range of effective values (q_0; q_{00}) and does not exceed the permissible boundaries (except for certain years in some sectors). Therefore, there is no need for a thorough revision of the Russian tax system. What is required is a more delicate adjustment of the tax regime to meet the needs of specific sectors by taking into account the level of technological innovation in these sectors. In its turn, such adjustment implies the principle of differentiated tax rates across sectors. This principle is now applied only to a limited extent even within sectors and we believe that it can be applied more widely. A fitting analogy in this case would be the progressive scale of the personal income tax, which seems quite natural, since we are well aware that different income groups may be more or less sensitive to changing tax rates. There is no reason why a similar principle should not be applied to economic sectors which may be differ significantly in terms of technological intensity and innovation or may be going through different phases of development and, as a result, respond to changes in the tax burden differently. In any case, however, such decisions should be taken only after consensus has been reached between representatives of these economic sectors and fiscal authorities.

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Factors of Tax Evasion in Greece: Taxpayers' Perspective

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ABSTRACT
The aim of this study is to analyze the causes (criteria and sub-criteria) of tax evasion in contemporary Greece. Within the framework of the analytic hierarchy process (AHP) methodology, the research questions this study seeks to address are as follows: what drives people to avoid or evade taxes? What is the significance of each criterion and sub-criterion and how can they be ranked? The questionnaire survey covered 2,789 respondents (business owners, accountants and tax officers) from 26 Greek prefectures. The main objective of the AHP analysis is to classify the alternatives by making pairwise comparisons of qualitative and/or quantitative criteria (and sub-criteria) based on experts' judgements. The results showed that excessive taxation and impunity for tax evasion are considered to be the main reasons for tax evasion in Greece. Among other significant factors are complexity of the legislation and opacity in public financial management. At the same time respondents did not consider deficient education as a significant factor. We also found differences in respondents' evaluations of the sub-criteria: for instance, businessmen and tax officers disagreed about the significance of such factors as the unfair tax scale and corruption among tax collectors. The results reveal the mutual lack of trust between taxpayers and tax authorities in Greece. The Greek government is required to ensure justice and stability of the tax system; lower the tax rates; and introduce heavier penalties for tax evaders. Moreover, the system of public financial management should become more transparent to foster taxpayers' trust and thus encourage tax compliance.

KEYWORDS
tax evasion, Greece, analytic hierarchy process, excessive taxation, impunity, complexity of legislation, opacity in public financial management, deficient education

JEL H200, H260, K340

Факторы уклонения от уплаты налогов в Греции: взгляд налогоплательщика

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АННОТАЦИЯ
Цель настоящего исследования – провести анализ причин (критериев и подкритериев) уклонения от уплаты налогов в современной Греции. В исследовании применяется метод анализа иерархий и рассматриваются следующие вопросы: что заставляет людей уклоняться от уплаты налогов? Какова значимость каждого критерия и подкритерия по отношению друг к другу? Исследование опирается на результаты анкетного опроса 2789 респондентов (бизнесменов, бухгалтеров и служащих налоговых ведомств) из 26 греческих префектур. Основная цель анализа иерархий состоит в том, чтобы классифицировать альтернативы, обработав последовательности суждений экспертов по парным сравнениям качественных и количественных критериев (и подкритериев). Результаты

показали, что чрезмерное налогообложение и недостаточность наказания за уклонение от уплаты налогов являются основными причинами данной проблемы в Греции. Что касается других факторов, то они включают в себя усложненное законодательство и отсутствие прозрачности в системе управления государственными финансами. Вместе с тем, значимость такого фактора, как недостатки образования налогоплательщиков, оказалась низкой. Мы также обнаружили расхождения в оценках, которые респонденты давали некоторым подкритериям: например, бизнесмены и сотрудники налоговых ведомств по-разному оценивали значимость таких факторов, как несправедливая шкала налогообложения и коррупция среди сборщиков налогов. Исследование выявило взаимное недоверие, существующее между налогоплательщиками и налоговыми органами в Греции. Делается вывод о том, что греческому правительству следует обеспечить справедливость и стабильность системы налогообложения, снизить налоговые ставки и одновременно ввести более суровое наказание за уклонение от уплаты налогов. Для того, чтобы повысить уровень доверия налогоплательщиков и улучшить налоговую дисциплину, необходимо увеличить прозрачность системы управления государственными финансами.

КЛЮЧЕВЫЕ СЛОВА
уклонение от уплаты налогов, Греция, обработка аналитических иерархий, чрезмерное налогообложение, безнаказанность, усложненное законодательство, низкий уровень прозрачности общественных финансов, недостатки образования

1. Introduction

A crucial problem faced by the Greek tax system is the extensive shadow economy and tax evasion, which is one of the most important problems that threatens public revenue. Not only does tax evasion result in the loss of state income but it also creates some serious distortions in the distribution of resources and in the economic activity [1, p. 621]. Figure 1 illustrates the size of the shadow economy in different countries, and Greece is marked with an arrow.

What makes tax evasion an urgent problem is the budgetary issues and those of fundamental social justice. However, one should not think of this problem merely in the light of the need to 'change culture' and ensure the 'moral conversion' of Greek society. Tax evaders behave rationally, that is, pursue their own interests, and there is likelihood that those who do
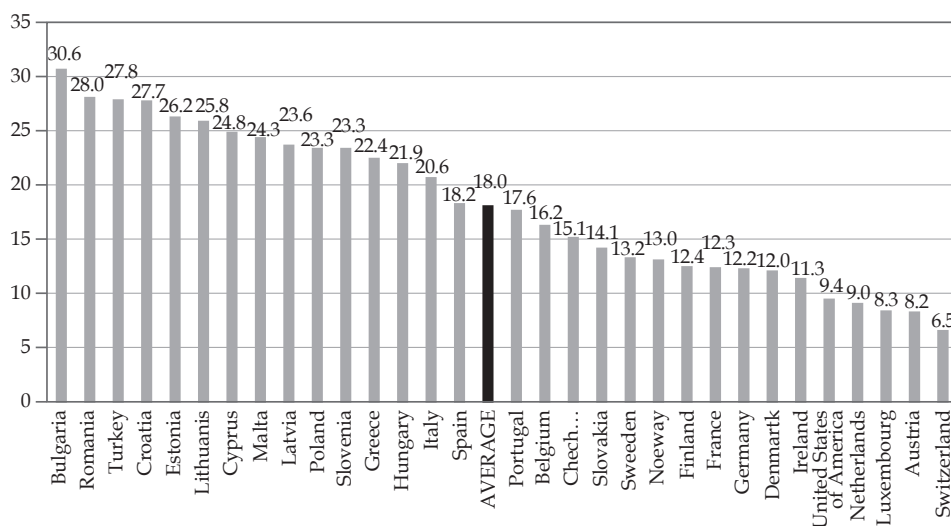

Fig. 1. **The size of the shadow economy in 31 countries in 2015 (in % of GDP)**
Source: [2, p. 4]

not evade taxes are simply unable to do so even though they are generally willing to.

Various statistical surveys conducted by financial analysts and economists as well as the available empirical studies and estimates of tax evasion and the shadow economy show that the problem of tax evasion in Greece is a real one[1], it is chronic and extended [3]. The complexity of the Greek tax system in conjunction with the structure of the Greek economy, which is characterized by a relatively high number of self-employed people, tend to increase the probability and the diversity of the ways of tax evasion. At the same time, organizational weaknesses and other flaws inherent in the mechanisms of tax control and tax collection aggravate the problem.

The causes of tax evasion can be roughly divided into five key categories: a) legislative-political, b) technological, c) bureaucratic-organizational, d) structural, and e) cultural. The legislative-political causes of tax evasion originate in the practiced tax policy and the political environment in the country and include the following factors[2]:

– complexity of the tax legislation system;

– opacity in public financial management, which creates the feeling of insecurity and injustice in taxpayers as well as in employees of tax administration;

– excessive taxation;

– impunity for tax evasion and political will insufficient for addressing the problem efficiently.

The lack of technological and organizational infrastructure of tax administration is one of the factors intensifying tax evasion. The absence of total computerization and systematic registry of electronic files and data creates organizational problems and impedes efficient information processing. The situation is aggravated even more by ineffective control and bureaucratic red tape. At the same time the lack of sufficient and modern techno-logical infrastructure; dysfunctions in the existing data system (slow updating of information on the changing in the legislation) and the lack of access to particular information contribute to the problem of tax evasion.

Bureaucracy is another problem that intensifies tax evasion. This problem is faced not only by the Greek tax system but also by many other countries.

The structural reasons for tax evasion in Greece include a very high number of self-employed people and very small enterprises. These factors are conducive to tax evasion through the following[3]:

1. The high rate of employment (compared with other European countries) in family businesses, with the majority of family members not contributing to social security institutions.

2. Hindrance of tax control due to difficult and complicated auditing process.

3. Self-employment facilitates income concealment.

The lack of adequate education to ensure consistent tax-paying culture constitutes another major factor of tax evasion. There is evidence that when the reciprocity of state in the conscience of citizens is low while the rights and the obligations of tax payers are not evident, tax evasion is blossoming[4] [3].

The economic survey among OECD[5] countries has shown that the increase in tax and actuarial levies together with stricter legislation lead to an increase in tax evasion, black economy, corruption and low tax morale.

The purpose of this study is to analyze the causes of tax evasion in modern Greece with the help of a survey conducted among the key stakeholders – tax officers, business owners and accountants.

The research is based on the analysis of the current and prospective causes of tax evasions (criteria and sub-criteria).

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[1] *Economic Bulletin*. No. 35. Bank of Greece, 2011. https://www.bankofgreece.gr/Publications/econbull201106.pdf

[2] *Annual Reporting in 2016/2017*, September 2017, EY building a better working world, 2016.

[3] *Annual Reporting in 2016/2017*, September 2017, EY building a better working world, 2016.

[4] *Economic Surveys: Greece*. OECD, 2018, p. 24. Available at: http://www.oecd.org/surveys/economic-survey-greece.htm

[5] *Economic Surveys: Greece*. OECD, 2018, p. 24. Available at: http://www.oecd.org/surveys/economic-survey-greece.htm

The research questions the study seeks to address are as follows: what drives people to avoid or evade taxes? What is the significance of each criterion and sub-criterion and how can they be ranked?

To answer these questions, we apply the quantitative research analysis of analytic hierarchy process (AHP), based on the data collected via a questionnaire survey involving key experts, such as tax-officers, business owners and accountants. Our findings are then compared with those of previous studies and thus provide important implications for policy makers.

2. Historical and Literature Review

2.1. Why do we pay taxes?

The typical questions that are usually asked regarding taxes are, 'Why do we pay taxes?', 'Will taxes ever go away?' and 'Do we receive the benefits for which we pay our taxes?'

The history of taxation goes back to ancient societies in Greece, Egypt and Rome: 'The politicians in Ancient Greece strained their ingenuity to discover new sources of public revenue…' [4, p. 66]. In times of war citizens were charged with more taxes. Egyptian pharaohs imposed a tax on specific kind of goods, which was not a type of income tax. They also imposed the "wealth tax", based on the wealth of each citizen, to help finance wars. Financing war through taxation was a common policy in ancient societies. The relevant tax imposed by Athenians for similar purposes was called *eisfora*, which means levy or donation.

The Romans introduced customs duties called *portoria* on imports and exports. Caesar Augustus established a 5% inheritance tax to provide retirement funds for the military. Julius Caesar was the first to implement a 1% sales tax across the Roman Empire, which became 4% at the time of Caesar Augustus.

After the fall of Rome, in Anglo-Saxon England, *danegeld* taxes were levied depending on the value of land and property. The majority of taxes were imposed on wealthier citizens – like clergy, nobles, and merchants, in England's early tax system, while the poor people paid little or no taxes. The excise tax burden was imposed on basic goods such as meat and grain: unlike all the other taxes based on the progressive approach, the excise taxes used the regressive approach. The income tax was introduced in England in 1800 to help finance wars. Americans had to pay taxes to England on imported goods such as molasses, sugar, wine, and so on. All of these taxes, along with the direct tax on all newspapers, commercial and legal documents printed in Colonial America, eventually forced the Americans to revolt against the British.

The newly formed American nation was a tax-free country for many years, confining government revenue from tariffs and duties on certain items like sugar, tobacco, and liquor. The property tax was introduced to finance the war against France while increased duty fees and excise taxes were imposed to finance the war with England. To finance world wars, Americans were charged taxes on estates and business profits. The introduction of sales taxes, income taxes and other types of taxes is a rather modern invention. Nowadays every country has its own taxation system, including income taxes, import and export taxes, payroll taxes etc.

The key questions regarding the effectiveness of contemporary tax systems are, 'Are governments collecting the amount of taxes they anticipated?', 'Are taxes fairly imposed on all citizens?', and 'Why do some persons or businesses not pay the taxes they ought to'?

The history of taxation shows that the result of tax imposition was "a wholesale hiding of wealth and income, evasion became universal, goods were seized, men were thrown into jail. But the wealth still hid itself, or melted away" [4, p. 66]. Tax evasion is as old as the financial transactions between people and in all likelihood, it appeared together with taxation itself. The phenomenon was known in ancient Athens and Sparta as well as in the Roman and later the Byzantine Empire, and there is historical evidence that tax evaders were subject to penalties in Ancient Israel.

The phenomenon of tax evasion has now acquired a global dimension and affects even countries with well-organized tax systems and public administration in the EU and USA. It is difficult or even impossible to calculate precisely the amount of tax evasion, although this can be done by estimating the size of the shadow economy. No country has been able to combat the phenomenon of tax evasion and for many countries this sphere remains virtually unregulated.

The Nobel Prize laureate in Economic Science Maurice Allais [5] has given a definition of tax, emphasizing that it is the price which every citizen pays to a state for the services offered by the state. These services for which the citizen pays taxes are public goods that have no market value. Therefore, taxes are mandatory cash payments of the citizens to the state in which they live.

The characteristic of taxes is their binding nature and the reduction of the disposable income of citizens, who want to enjoy these public goods but do not want to pay for them. However, the state that provides citizens with public services must cover the costs by requiring all citizens to pay a part of these costs. People, however, use various ways to reduce their tax burden. If they succeed to do so, this results in unfair distribution of the tax burden and may alter the objectives of the economic policy.

Combating tax avoidance and tax evasion requires an effective fiscal policy system with control procedures designed to promote healthy fiscal morale and at the same time to include criminal sanctions.

"Intentional or unintentional failure of taxpayers to meet their tax obligations" [6, p. 2] as stipulated by tax laws is commonly referred to as noncompliance. Noncompliance may be considered as tax avoidance, while tax evasion is the deliberate act of noncompliance resulting in underpayment or non-payment of taxes [7, p. 216]. Depending on the categories of taxes, different ways and methods may be used to evade taxes [3; 8].

Although the (cash) incidence of tax evasion on public revenue cannot escape public notice, other negative economic and social implications of this pheno-menon are somewhat less obvious. Evasion accounts for nearly a half of the public sector deficit; it also contributes to subsequent macroeconomic imbalances[6]. A significant reduction of tax evasion would have been enough to gradually decrease the ratio of government debt to GDP [9, p. 431].

Among the most recent studies concerning tax evasion and tax avoidance are those of Alstadsaeter et al. on tax evasion and avoidance in Norway [10]; Çetin et al. [11] regarding the factors affecting taxpayers' perspective on tax administration in Turkey; Kanbiro [12] on the factors influencing voluntary compliance with the tax system in south Ethiopia. Kiow et al. [13] and Razieh et al. [14] focus on Malaysia to examine the determinants of individual taxpayers' compliance and the factors affecting tax evasion [14]. Walsh has examined taxpayers' behavior using Ireland as a case study [15].

2.2. Determinants of tax evasion

The most important factors which influence tax evasion and the success of taxpayers' efforts not to pay their taxes are as follows [16, p. 451; 17, p. 6; 18, p. 129]:

1. *Educational and cultural level of taxpayers.* It has been proved that the lower is people's educational and cultural level, the more pronounced are tax evasion tendencies. In other words, tax evasion is seen as a result of the absence of basic education, ethical values and humanitarian principles. The Ministry of Finance and other state bodies are treated as an enemy by taxpayers. As a result, entrepreneurs seek to move their economic activities to the shadow sector or black economy. Such economic activities are moved from legal economy to the shadow or black economy [19, p. 182].

2. *Distribution of the tax burden. Ceteris paribus*, tax evasion is higher when the distribution of the tax burden is not consistent with the prevailing in the society concept of social justice.

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[6] *Economic Surveys: Greece.* OECD, 2018, p. 24. Available at: http://www.oecd.org/surveys/economic-survey-greece.htm

3. *Tax burden.* The heavier the tax burden is, the greater is tax evasion.

4. *Management of public finance.* The more prudent and rational is the management of public revenues, the less are taxpayers prone to engage in tax evasion.

5. *Structure of the tax system.* The extent of tax evasion largely depends on the structure, functions and internal coherence of the tax system.

6. *Organization and level of tax services.* The proper organization of tax services and their equipment with modern means limit substantially the possibilities for tax evasion and facilitate identification of tax evaders.

7. *Development and organization of the national economy.* In well-organized economies, transactions between taxpayers and economic units are recorded easily and fiscal institutions have at their disposal more reliable material for carrying out their work.

8. *Organization of the market.* If there are many small firms operating in the country, there will be more possibilities for tax evasion.

9. *The structure of national income.* The structure of the national income determines the extent of tax evasion. Tax evasion is limited or even impossible in the case of income from wages and pensions, but it is more difficult to prevent tax evasion in the case of income from professional occupations and rural activities.

Windrobe believes that tax evasion depends on the state's ability to satisfy citizens' needs and the honesty of the government. He describes four different cases [16, p. 3–5]:

– individuals and businesses believe that the government cannot satisfy their needs no matter how honest they might consider the government; taxpayers will attempt not to pay all their taxes;

– citizens and businesses do not trust their government and for this reason they refuse to pay their taxes;

– taxpayers assume that others evade taxes and therefore they think they have a right to do the same;

– individuals and firms believe that the tax system is fair and they are willing to pay their taxes

Alstadsaeter et al. suggest focusing on "cracking down evasion by the wealthy, as an effective way to raise tax revenue, increase tax progressivity, and ultimately reduce inequality" [10, p. 1]. Moreover, they believe that "tax enforcement policies have an important role to play for the sustainability of progressive taxation in a globalized world", which shows "the desirability of fighting tax evasion at the top end of the wealth distribution" [10; 14].

Çetin et al. suggest in their research that "fairness and trust in the administration have a significant impact on taxpayers' perspectives" [11, p. 18]. Furthermore, the results of this study indicate that policy-makers who want to support taxpayers' perspectives on tax administration, should develop strategies based on improving fairness, trust, and taxpayers' rights [11, p. 27].

Razieh et al. found that the "tax burdens, the size of governments and inflation rate have positive effect on tax evasion" [14, p. 1524]. They also believe that the income of the taxpayer, trade openness, inflation rate and, finally, the tax burden are the main factors that affect tax evasion [14, p. 1531]. Kiow et al. conclude that "tax compliance behaviour of individual taxpayers is influenced by ethical perception of individual taxpayers and their ethical perception is affected by public governance and transparency in government operations" [13, p. 38].

Kanbiro found that the variables of "gender, age, lack of tax knowledge, simplicity of tax system, awareness on penalty, probability of being audit" are the key factors influencing taxpayers' voluntary compliance, in contrast with such variables as "education level, tax authority efficiency, peer influence, occupation, income level of taxpayers, perception on government speeding, and perception on fairness and equity which are considered not significant on tax voluntary compliance attitude". [12, p. 2, 105]. Walsh concluded that in Ireland, deterrence is a more traditional tool used by tax administrations. Furthermore, the influence of personal norms and the level of trust in tax administration, perceptions of the

prevailing social norms are also important determinants of taxpayers' compliance [15, p. 451, 470].

3. Methodology

3.1. Methodological framework

This article presents the results of empirical research aimed at identifying the causes of tax evasion (criteria) and describing the hierarchy of these criteria. The methodology we used is illustrated in Fig. 2.

The first step was to identify the key parameters that affect the decision-maker's choices concerning tax evasion. Since the research literature on this specific area is rather scant, a brainstorming session was performed in order to map the total number of factors that could influence this kind of decision (see Fig. 3).

At the next stage, we designed a questionnaire comprising 37 pairwise comparisons on a 9-point Likert type scale. The final stage was the data elaboration and the calculation of the importance of each factor by using the analytic hierarchy process (AHP).

The AHP methodology allows us to measure both objective and subjective factors through pairwise comparisons from which proportional priorities result. Participants are asked to estimate the relative importance of criteria and sub-criteria. These estimates can be impressed numerically, graphically or verbally [20] (Table 1).

Table 1

How to complete the questionnaire

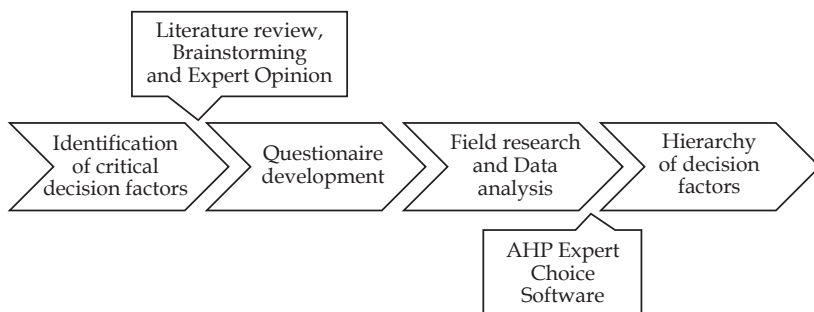| Crite-rion	Intensity of relative importance																	Crite-rion
A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B

Fig. 2. **AHP methodological framework development**
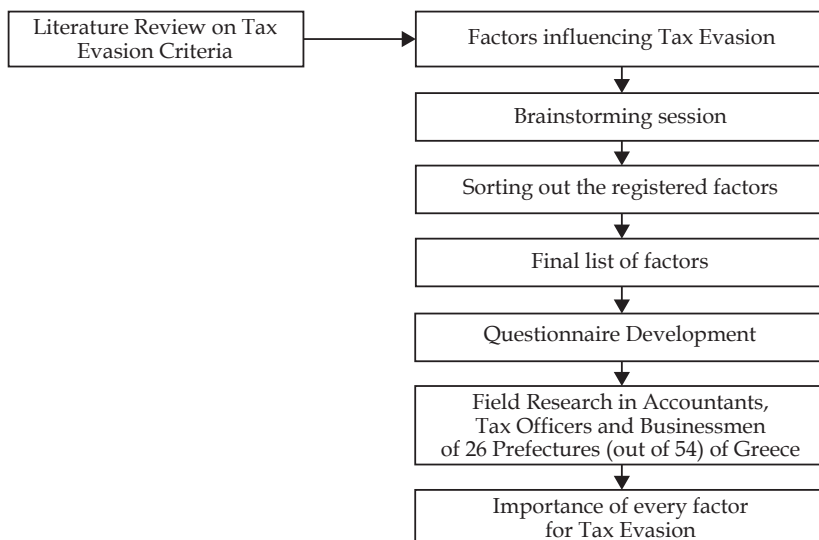

Fig. 3. **Methodological framework**

To express the comparisons of preferences, a nine-point intensity scale ('The Fundamental Scale of Absolute Numbers') was used. This stage ends with paired comparisons of criteria against the goal for importance: for example, if the participant selects 1, it means that both elements, A and B, contribute equally to the goal and are therefore of equal importance. If criterion A is awarded a score of 2–9, it means that criterion A is deemed more important than criterion B, with 2 meaning that the participant is slightly in favour of A, and 9, that A is judged of absolute importance and of highest significance compared to criterion B. All other values express intermediate importance of A over B. If the same situation applies to criterion B, then the explanation of intensity of importance is the same but this time for criterion B over A. Each pairwise comparison is used to generate ratios.

The AHP method has the ability to structure complex, multi-person, multi-attribute, and multi-period problem hierarchically. Pairwise comparisons of the element (usually alternatives and attributes) can be established by using the scale indicating the strength with which one element dominates over another one with respect to a higher-level element. This scaling process can then be translated into priority weights – scores [21, p. 421].

3.2. Mathematical background and functions of the AHP

The analytic hierarchy process uses mathematically based hierarchical decision models. The AHP method relies on the following three commonly accepted stages:

1. Since $i = 1, …, m$ are the criteria of the decision, their respective gravities $W_i, …, W_m$ must be calculated;

2. For each criterion i, alternatives j should be compared, where $j = 1, … n$ and their gravities determined (W_{ij} with respect to criterion i);

3. Finally, the total weight of alternatives r should be determined of W_j options over all criteria through vector equation $W_j = W_{1j}W_1 + W_{2j}W_2 + …. + W_{mj}W_m$.

The alternatives are then categorized by resulting W_j vector, with the predominant option having the largest value W_j. The meaning of the hierarchical decision model must be defined and subsequently the process of decision-making with the use of the model will be explained. The AHP has a successful track record regarding its application in the wider area of business analysis [22, p. 373], following its introduction as multiple criteria decision-making (MCDM) methodology in the late 1970s [23]. The AHP is a multi-criteria method for decision-making and priorities ranking developed by Saaty. This method "*combines subjective and objective estimations or perceptions, in an integrated framework which is based on scale ratios from pair comparison*s" [24]. The judgments from the pairwise comparisons are made by experts or decision-makers; in combination with the AHP algorithm these judgements produce the final outcome.

The method is based on a series of pairwise comparisons of the existing data to determine so the relative priority of the alternatives. The criteria used to make the comparisons and the resulting hierarchy do not necessarily have to be numerical. It is possible and acceptable to use non-measurable, qualitative factors such as experience and subjective judgment. After the process is completed, the most important factors have the highest gravity coefficients (for more detail, see Saaty [25–27]).

3.3. Questionnaire and research sample

To investigate the causes of tax evasion and tax avoidance in Greece, we conducted an empirical survey among accountants, tax officers and businessmen in various provinces of Greece. The questionnaire consisted of 37 questions divided into five sections. Each section included a criterion with sub-criteria (see Table 2).

The survey involved accountants, tax officers and entrepreneurs from 26 out of 50 prefectures of Greece. The total number of tax officers who completed the questionnaires was 675; entrepreneurs, 1,357; and accountants, 757. The total number of questionnaires completed was 2,789 (for more detail on the sample, see Table 3).

Table 2

Causes of tax evasion and tax avoidance in Greece, according to the key stakeholders

Criteria	Sub-Criteria
Deficient education	Business ethics Taxation conscience[1] Educational level Consistent taxpayers culture[2]
Complexity of legislation	Frequent changes / Not application of laws[3] Law obscurity / 'Legal' exemptions Ignorance of the current tax legislation Bureaucracy
Opacity in public financial management	Wastage of public money Graft among public administrators Maladministration Lack of transparency in tax administration
Impunity for tax evasion	Lenient sentencing for tax evasion Corruption among tax collectors Deletion, tax 'amnesty'[4]
Excessive taxation	High tax factors[5] Presumptive taxation Additional to regular taxation[6] Unfair tax scale

Note: [1] The morality of paying taxes to the public. [2] The culture of being consistent and not avoid or miss topay taxes. [3] Some taxpayers violate the tax laws in order to evade taxes. [4] Tax evasion cases that should lead to tax offender punishment, after some time are deleted, without any penalty. [5] The tax rates are increasing whenever the public believes that is not able to collect the required amount of taxes. [6] The public announces "extra" taxation in order to achieve the required amount of taxes, which cannot be collected with regular taxes.

Table 3

Number of questionnaires by category of respondents and by Greek prefectures

	Tax officers			Businessmen			Accountants	
1	Athens	153	1	Athens	104	1	Athens	113
2	East Attica	10	2	East Attica	12	2	East Attica	12
3	West Attica	7	3	West Attica	118	3	West Attica	56
4	Piraeus	12	4	Piraeus	64	4	Piraeus	13
5	Aetolia-Acarnania	21	5	Aetolia-Acarnania	45	5	Aetolia-Acarnania	21
6	Arta	15	6	Arta	31	6	Arta	22
7	Achaia	50	7	Achaia	50	7	Achaia	30
8	Grevena	13	8	Grevena	57	8	Grevena	20
9	Dodecanese	38	9	–		9	Dodecanese	35
10	Thesprotia	23	10	Thesprotia	51	10	Thesprotia	23
11	Ioannina	54	11	Ioannina	55	11	Ioannina	54
12	–		12	Kastoria	41	12	–	
13	Corfu	10	13	Corfu	45	13	Corfu	30
14	Cafalonia	17	14	Cafalonia	65	14	Cafalonia	31
15	Kilkis	12	15	Kilkis	36	15	Kilkis	15
16	Kozani	54	16	Kozani	182	16	Kozani	53
17	Lakonia	38	17	Lakonia	89	17	Lakonia	53
18	–		18	Corinthia	40	18	–	
19	Lefkada	9	19	Lefkada	52	19	Lefkada	19
20	Magnesia	18	20	Magnesia	34	20	Magnesia	25
21	Messinia	10	21	Messinia	15	21	Messinia	15
22	Preveza	12	22	Preveza	25	22	Preveza	22
23	Rethymno	30	23	–		23	Rethymno	30
24	Trikala	12	24	Trikala	50	24	Trikala	25
25	Pthiotis	19	25	Pthiotis	46	25	Pthiotis	25
26	Chalkidiki	38	26	Chalkidiki	50	26	Chalkidiki	15
	TOTAL	675		TOTAL	1357		TOTAL	757

4. Results

The questionnaires were processed with the help of the expert choice software program and the results are presented in the following tables. The significance of each criterion sub-criterion in relation to the causes of tax evasion is specified. In addition, the prefectures where the maximum and the minimum values were registered are given in Tables 4, 5 and 6.

Table 4

Tax officers' evaluations of the significance of tax evasion criteria and sub-criteria

Causes of tax evasion and tax avoidance	Tax officers (675)				
	MAX	Prefecture	MIN	Prefecture	AVERAGE
Deficient education	0.181	Dodecanese Isl.	0.025	Piraeus	0.120
Business ethics	0.044	East Attica	0.005	Piraeus	0.019
Taxation morale	0.078	Dodecanese Isl.	0.009	Piraeus	0.044
Educational level	0.070	Ioannina	0.006	Piraeus	0.027
Consistent taxpaying culture	0.053	Rethymno	0.006	Piraeus	0.031
Complexity of legislation	0.431	Piraeus	0.102	Trikala	0.199
Frequent changes in legislation / Non-observance of laws	0.165	Piraeus	0.027	Trikala	0.073
Law obscurity / 'Legal' exemptions	0.090	Cefalonia	0.009	Trikala	0.050
Ignorance of the current tax legislation	0.062	Piraeus	0.006	Trikala	0.031
Bureaucracy	0.132	Piraeus	0.015	Lefkada	0.044
Opacity in public financial management	0.312	Piraeus	0.056	Corfu	0.160
Wastage of public money	0.082	East Attica	0.020	Lefkada	0.047
Graft among public administrators	0.124	Messinia	0.008	Trikala	0.041
Maladministration	0.079	Arta	0.015	Corfu	0.041
Lack of transparency in tax administration	0.101	Piraeus	0.007	Corfu	0.031
Impunity for tax evasion	0.333	Corfu	0.094	Piraeus	0.240
Lenient sentencing for tax evasion	0.119	Kilkis	0.016	Piraeus	0.074
Corruption of tax collectors	0.126	Magnesia	0.019	West Attica	0.076
Cases of tax evasion that go unpunished	0.137	Lefkada	0.044	Trikala	0.090
Excessive taxation	0.589	Trikala	0.139	Piraeus	0.281
Tax rises	0.376	Trikala	0.031	Arta	0.098
Presumptive taxation	0.073	Preveza	0.019	Piraeus	0.053
Introducing additional taxes	0.134	Preveza	0.023	Messinia	0.053
Unfair tax scale	0.199	Aetolia-Acarnania	0.021	Piraeus	0.077

Table 5

Businessmen's evaluations of the significance of tax evasion criteria and sub-criteria

Causes of tax evasion and tax avoidance	Businessmen (1.357)				
	MAX	Prefecture	MIN	Prefecture	AVERAGE
Deficient education	0.186	Achaia	0.036	Preveza	0.092
Business ethics	0.048	Achaia	0.008	Trikala	0.020
Taxation morale	0.059	East Attica	0.013	Preveza	0.026
Educational level	0.074	Achaia	0.004	Piraeus	0.023
Consistent taxpaying culture	0.052	Grevena	0.006	Preveza	0.023
Complexity of legislation	0.262	East Attica	0.058	Trikala	0.134
Frequent changes in legislation / Non-observance of laws	0.095	East Attica	0.010	Trikala	0.035
Law obscurity / 'Legal' exemptions	0.083	Achaia	0.012	Trikala	0.037
Ignorance of the current tax legislation	0.063	East Attica	0.004	Trikala	0.023
Bureaucracy	0.116	Preveza	0.018	Corinthia	0.039
Opacity in public financial management	0.291	Corinthia	0.118	Messinia	0.186

End of Table 5

Causes of tax evasion and tax avoidance	Businessmen (1.357)				
	MAX	Prefecture	MIN	Prefecture	AVERAGE
Wastage of public money	0.087	Lakonia	0.027	Chalkidiki	0.052
Graft among public administrators	0.098	Kilkis	0.019	Pthiotis	0.055
Maladministration	0.069	Lakonia / Aetolia-Acarnania	0.022	Athens	0.047
Lack of transparency in tax administration	0.066	Grevena	0.009	Preveza	0.032
Impunity for tax evasion	0.278	Piraeus	0.125	Trikala	0.221
Lenient sentencing for tax evasion	0.093	Pthiotis	0.023	Thesprotia	0.057
Corruption of tax collectors	0.140	Piraeus	0.048	Trikala	0.096
Cases of tax evasion that go unpunished	0.103	Chalkidiki	0.041	Ioannina	0.068
Excessive tax imposition	0.583	Trikala	0.130	East Attica	0.367
Tax rises	0.335	Trikala	0.042	East Attica	0.109
Presumptive taxation	0.105	Corfu	0.028	East Attica	0.068
Introducing additional taxes	0.150	Chalkidiki	0.031	East Attica	0.074
Unfair tax scale	0.179	Piraeus	0.029	East Attica	0.116

Table 6

Accountants' evaluations of the significance of tax evasion criteria and sub-criteria

Causes of tax evasion and tax avoidance	Accountants (757)				
	MAX	Prefecture	MIN	Prefecture	AVERAGE
Deficient education	0.300	Pthiotis	0.064	Messinia	0.111
Business ethics	0.045	East Attica	0.006	Grevena	0.019
Taxation morale	0.112	Pthiotis	0.016	Magnesia	0.034
Educational level	0.074	Pthiotis	0.010	Grevena	0.028
Consistent taxpaying culture	0.077	Pthiotis	0.010	Messinia	0.030
Complexity of legislation	0.251	Lefkada	0.070	Trikala	0.155
Frequent changes in legislation/ Non-observance of laws	0.113	Piraeus	0.002	Magnesia	0.049
Law obscurity / 'Legal' exemptions	0.068	Piraeus	0.010	Trikala	0.037
Ignorance of the current tax legislation	0.062	East Attica	0.004	Trikala	0.027
Bureaucracy	0.057	Achaia	0.019	Aetolia-Acarnania	0.042
Opacity in public financial management	0.246	Rethymno	0.053	Trikala	0.171
Wastage of public money	0.071	Dodecanese Isl.	0.014	Trikala	0.043
Graft among public administrators	0.076	Rethymno	0.009	Trikala	0.051
Maladministration	0.105	Magnesia	0.020	Piraeus	0.045
Lack of transparency in tax administration	0.069	Rethymno	0.003	Trikala	0.032
Impunity for tax evasion	0.405	Magnesia	0.054	Trikala	0.218
Lenient sentencing for tax evasion	0.087	Dodecanese Isl.	0.010	Trikala	0.053
Corruption of tax collectors	0.290	Magnesia	0.037	Trikala	0.093
Cases of tax evasion that go unpunished	0.145	Piraeus	0.007	Trikala	0.072
Excessive taxation	0.656	Trikala	0.142	Magnesia	0.345
Tax rises	0.430	Trikala	0.004	Magnesia	0.119
Presumptive taxation	0.116	Grevena	0.021	Piraeus	0.069
Introducing additional taxes	0.098	Weat Attica	0.010	Magnesia	0.057
Unfair tax scale	0.186	Grevena	0.022	East Attica	0.100

Table 4 shows the significance of the criteria and sub-criteria from the perspective of tax officers. The most significant, in their view, is *'Excessive taxation'* (0.281), followed by *'Impunity for tax evasion'* (0.240). *'Complexity of legislation'* ranks third (0.199), followed by *'Opacity in public financial management'* (0.160) while *'Deficient education'* ranks last (0.120).

The maximum significance was given to the criterion *'Excessive taxation'* in Trikala prefecture (0.589) while in Piraeus it was given the minimum (0.139). The criterion *'Impunity'* reached its maximum significance (0.333) in Corfu and the minimum, in Piraeus (0.094). The criterion *'Complexity of legislation'* was evaluated most highly in Piraeus (0.431) and most lowly in Trikala (0.102). The criterion *'Opacity in public financial management'* received the maximum value in Piraeus (0.312) and the minimum value, in Corfu (0.056); criterion *'Deficient education',* in Dodecanese Islands (0.181) and in Piraeus (0.025) respectively.

Table 5 shows the significance of the criteria and sub-criteria from the perspective of businessmen. *'Excessive taxation'* is considered of highest significance (0.367), followed by *'Impunity'* (0.221). *'Opacity in public financial management'* ranks third (0.186), followed by *'Complexity of legislation'* (0.134) while *'Deficient education'* ranks last (0.092).

The maximum significance was given to the criterion *'Excessive taxation'* in Trikala prefecture (0.583) and the minimum significance, in East Attica (0.130). To *'Impunity'* the maximum value was given in Piraeus (0.278) and the minimum, in Trikala (0.125); to *'Opacity in public financial management',* in Corinthia (0.291) and in Messinia (0.118), respectively. The criterion *'Complexity of legislation'* was deemed most significant in East Attica (0.262) and least significant, in Trikala (0.058). *'Deficient education'* was considered of maximum significance in Achaia (0.186) and the minimum significance, in Preveza (0.036).

Table 6 shows the significance of different criteria and sub-criteria from the perspective of accountants. *'Excessive taxation'* is considered of highest significance

(0.345), followed by *impunity* (0.218). *'Opacity in public financial management'* ranks third (0.171), followed by *'Complexity of legislation'* (0.155) while *'Deficient education'* ranks last (0.111).

'Excessive taxation' was given maximum significance in Trikala prefecture (0.656), and minimum in Magnesia (0.142); the significance of *'Impunity'* was evaluated most highly in Magnesia (0.405) and most lowly in Trikala (0.054). *'Opacity in public financial management'* was considered the most significant by respondents in Rethymno (0.246) and the least significant, in Trikala (0.053). *'Complexity of legislation'* was evaluated most highly (0.251) in Lefkada while in Trikala it got the minimum significance (0.070). *'Deficient Education'* was given maximum significance in Pthiotis (0.300) and minimum, in Messinia (0.064).

Table 4, 5 and 6 illustrate how different criteria and sub-criteria were evaluated by the three groups of respondents. The differences in their evaluations are shown in Table 7 and Figure 4. The biggest differences are found in the evaluations of criterion *'Excessive taxation'* and sub-criterion *'High Tax factors'*: 0.450 and 0.376 among the tax officers, 0.453 and 0.293 among the businessmen, and 0.514 and 0.426 among the accountants, respectively. As far as sub-criteria are concerned, the biggest differences are characteristic of sub-criterion *'Unfair tax scale',* with the difference between the evaluations of businessmen and tax officers, 0.039; accountants and tax officers, 0.023; businessmen and accountants, 0.016. The second sub-criterion with the highest differences in evaluations is *'Frequent changes in legislation / Non-observance of laws'*, with the difference between the evaluations of businessmen and tax officers, 0.038; between the evaluations of accountants and tax officers, 0.024; and between the evaluations of businessmen and accountants, 0.014. Sub-criterion *'Cases of tax evasion that go unpunished'* ranks third in terms of differences: between tax officers and businessmen, 0.022; tax officers and accountants, 0.018; accountants and businessmen, 0.004. Sub-criterion *'Introducing additional taxes'* was more signifi-

Table 7

**Evaluation of sub-criteria and intergroup differences in the evaluation
of sub-criteria's significance**

Sub-Criteria	Tax Officers	Businessmen	Accountants	TO-BU	TO-AC	BU-AC
Business ethics	0.019	0.020	0.019	−0.001	0.000	0.001
Taxation morale	0.044	0.026	0.034	0.018	0.010	−0.008
Educational level	0.027	0.023	0.028	0.004	−0.001	−0.005
Consistent taxpaying culture	0.031	0.023	0.030	0.008	0.001	−0.007
Frequent changes in legislation / Non-observance of laws	0.073	0.035	0.049	0.038	0.024	−0.014
Law obscurity / 'Legal' exemptions	0.050	0.037	0.037	0.013	0.013	0.000
Ignorance of current tax legislation	0.031	0.023	0.027	0.008	0.004	−0.004
Bureaucracy	0.044	0.039	0.042	0.005	0.002	-0.003
Wastage of public money	0.047	0.052	0.043	−0.005	0.004	0.009
Graft among public administrators	0.041	0.055	0.051	−0.014	−0.010	0.004
Maladministration	0.041	0.047	0.045	−0.006	−0.004	0.002
Lack of transparency in tax administration	0.031	0.032	0.032	−0.001	−0.001	0.000
Lenient sentencing for tax evasion	0.074	0.057	0.053	0.017	0.021	0.004
Corruption of tax collectors	0.076	0.096	0.093	−0.020	−0.017	0.003
Cases of tax evasion that go unpunished	0.090	0.068	0.072	0.022	0.018	−0.004
Tax rises	0.098	0.109	0.119	−0.011	−0.021	−0.010
Presumptive taxation	0.053	0.068	0.069	−0.015	−0.016	−0.001
Introducing additional taxes	0.053	0.074	0.057	−0.021	−0.004	0.017
Unfair tax scale	0.077	0.116	0.100	−0.039	−0.023	0.016
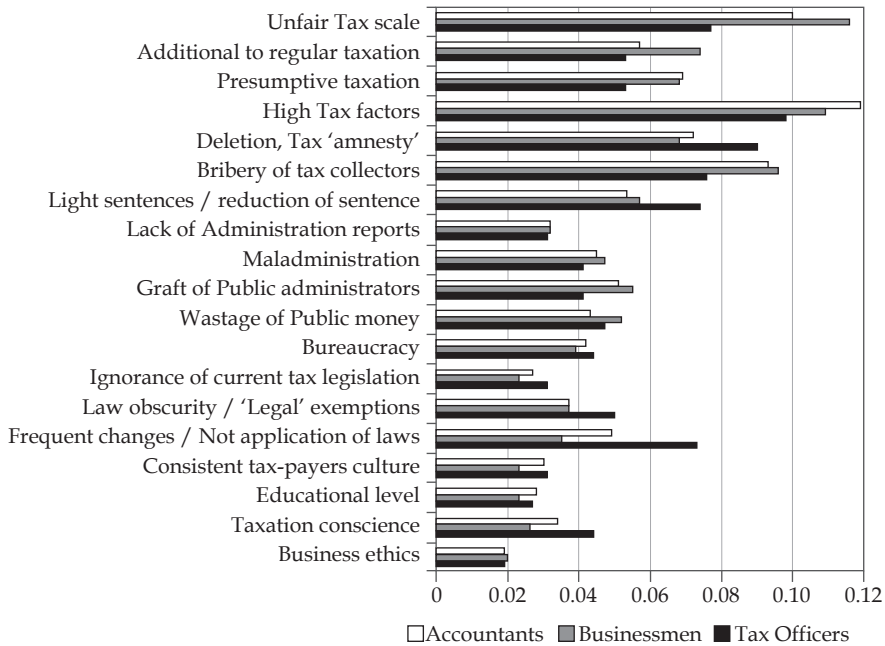
Fig. 4. **Evaluation of sub-criteria and intergroup differences
in the evaluation of their significance**

cant for businessmen than for tax officers (difference 0.021); for accountants than for tax officers (0.004); and for businessmen than for accountants (0.017). Sub-criterion '*Lenient sentencing for tax evasion*' has the same values of differences in significance.

Evaluations of some of the sub-criteria (business ethics, education, taxpayer culture, ignorance of the current tax legislation, bureaucracy and some others) demonstrated very little or non-significant differences between the three groups of respondents; for all of these sub-criteria, the differences were below 0.010.

5. Conclusion

Progressive taxes, which meant that wealthier citizens had to pay more taxes than poorer people, were an English invention. Such tax policies are usually perceived by taxpayers as fairer than other types.

The Greek government should learn from the experience of other countries which had to deal with similar problems in taxation and tax evasion and have managed to achieve positive results.

As our study has shown, most respondents agree that *excessive taxation* is one of the major drivers of tax evasion, followed by *impunity for tax evasion*, *complexity of the legislation* and *opacity in public financial management.* The least significant cause of tax evasion, according to our respondents' opinions, is *deficient education*.

Some intergroup differences in evaluations were found regarding such sub-criteria as '*Unfair tax scale*' (the highest difference between the evaluations of businessmen and tax officers), '*Frequent changes in legislation/Non-observance of laws*', '*Cases of tax evasion that go unpunished*' and '*Corruption of tax collectors*'. This evidence points to the fact that there is mutual distrust between taxpayers and tax authorities.

It is surprising that in the country whose history goes back to Athenian democracy and Sparta and whose culture was influenced by such renowned pioneers in philosophy, art and sciences as Plato and Aristotle, the faults of the education system are deemed insignificant. In our view, it reveals a serious problem faced by the modern Greek society.

The usual ways to restrict and eventually eliminate tax evasion in the world consist in higher penalties, better organization of tax offices and control mechanisms and sometimes lower tax rates. In Greece, however, these measures turned out to be insufficient, which means that we need a new, more effective approach to taxation. There are taxes, such as VAT, which encourage both parties to cooperate in addressing the problem of tax evasion. The solution is to provide incentives for taxpayers to control their fellow taxpayers trying to evade taxes. There are also proposals for complete abolition of the income tax on the grounds that this tax creates incentive problems in the economy, has very high administrative costs and is an ideal field for tax evasion.

Furthermore, the objective criteria of income or real estate objective values constitute effective ways of curbing tax evasion but involve many risks because they lead to injustices.

A revolutionary but controversial proposal could be to let private companies deal with tax collection. This system is old and well-known in Greece. It helps address such problems as the lack of efficiency of the tax system, the lack of taxpayers' motivation, and corruption in the public sector.

International cooperation is also needed to curb tax evasion and tax avoidance. First and foremost, however, we need to establish a new trust between the state and citizens. Citizens must feel that they participate in decision-making and that the state is not distant or hostile towards them. It may also help if the state improves the quality of public services. Taxpayers may derive utility from payment of taxes, when the state returns the tax value in the form of services and social benefits, provided that taxpayers know exactly how their taxes have been spent. Some taxpayers could become responsible for public assets such as schools and hospitals, which would give them satisfaction and improve their tax discipline. Finally, education and different forms of moral encouragement of tax compliance can play an important role.

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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:
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- 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.

2. При наборе необходимо учитывать следующее:
- формат листа — А4;
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Аннотация является источником информации о содержании статьи и изложенных в ней результатах исследований.

1. Аннотация выполняет следующие функции:
- дает возможность установить основное содержание статьи, определить его релевантность и решить, следует ли обращаться к полному тексту статьи;
- предоставляет информацию о статье и устраняет необходимость чтения полного текста статьи в случае, если статья представляет для читателя второстепенный интерес;
- используется в информационных, в том числе автоматизированных, системах для поиска необходимых статей и информации.

2. Аннотация к статье должна быть:
- информативной (не содержать общих слов);
- оригинальной;
- содержательной (отражать основное содержание статьи и результаты исследований);
- структурированной (следовать логике описания результатов в статье и разделенной на подзаголовки: цель исследования, методы, результаты, заключения);
- компактной (укладываться в **объем от 200 до 250 слов**).

3. Аннотация включает следующие аспекты содержания статьи:
- предмет, цель исследования (указываются в том случае, если они не ясны из заглавия статьи);
- метод или методологию проведения работы (целесообразно описывать в том случае, если они отличаются новизной или представляют интерес с точки зрения данной работы. В рефератах статей, описывающих экспериментальные работы, указывают источники данных и характер их обработки);
- 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.

Рекомендации по выбору ключевых слов

1. Ключевые слова выражают основное смысловое содержание статьи, служат ориентиром для читателя и используются для поиска статей в электронных базах,

поэтому должны отражать дисциплину (область науки, в рамках которой написана статья), тему, цель и объект исследования.

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 кавычках (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).

Рекомендации по оформлению ссылок на использованную литературу

1. Нумерация в списке литературы осуществляется по мере цитирования. При повторном цитировании источника ему присваивается номер первоначального цитирования.

2. Ссылки на использованную литературу приводятся в тексте в квадратных скобках с указанием в них номера источника по Списку использованной литературы и страницы цитируемого фрагмента, напр.: [5, с. 115].

3. В оригинальной научной статье необходимо упоминание не менее 25–40 источников, имеющих автора, в научном обзоре — 50–80, в том числе не менее 50 % источников на иностранном языке. Редакционная коллегия рекомендует цитировать статьи из журналов, которые индексируются в международных базах данных (Scopus, Web of Science).

4. Электронные ресурсы, в которых не указан автор материала, статистические сборники, нормативно-правовые акты размещаются в постраничных сносках и в список использованной литературы не выносятся.

5. Самоцитирование автора допускается не более 20 % от количества источников в списке.

Примеры оформления библиографических записей

1. Статьи в журналах:

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

Slemrod J. Lessons for tax policy in the great recession. *National Tax Journal*. 2009;52(3):387–397. Available at: http://webuser.bus.umich.edu/jslemrod/Great_Recession.pdf

Jensen O. W. Transfer Pricing and output decisions: the dynamic interaction. *Decision Sciences*. 1986;17:428–436.

Börner K., Klavans R., Patek M., Zoss A. M., Biberstine J. R., Light R. P., Larivière V., Boyack K. W. Design and update of a classification system:

The UCSD map of science. *PloS one.* 2012;7(7):1–10. DOI: 10.1371/journal.pone.0039464

2. Статьи из сборников научных трудов и материалов конференции:

Reingold I. I. The financial policy of NEP. In: Sokolnikov G. Ya. (ed.) *Fundamentals of the financial system of the USSR.* Moscow: Gosfinizdat; 1930. Pp. 56–61. (In Russ.)

Atkinson A. B. Horizontal equity and the distribution of tax burden. In: Aaron H., Boskin M. (eds) *The Economics of Taxation.* Washington, DC: Brookings Institution; 1980, pp. 3–18.

Börner K., Boyack K. W., Milojević S., Morris S. An introduction to modeling science: Basic model types, key definitions, and a general framework for the comparison of process models. In: Scharnhorst A., Börner K., van den Besselaar P. (eds). *Models of science dynamics, encounters between complexity theory and information sciences.* Berlin: Springer; 2012, pp. 3–22.

Alam S. L., Campbell J., Lucas R. Using social media in government: The Australian taxation office e-Tax facebook page. In: *Proceedings of the 2011 IEEE 9th International conference on dependable, autonomic and secure computing (DASC, 2011), December 12–14, 2011, Sydney, Australia.* Institute of Electrical and Electronics Engineers; 2011, pp. 1002–1009.

3. Монографии, учебники, учебные пособия:

Kormishkina L. A., Koroleva L. P. *Financial security.* Saransk: The National Research Mordovia State University; 2016. (In Russ.)

James S., Sawyer A., Budak T. (eds). *The complexity of tax simplification: experiences from around the world.* London: Palgrave Macmillan; 2016.

Taleb Nassim Nicholas. *The Black Swan. The impact of the highly improbable.* Random House; 2007.

4. Диссертации, авторефераты диссертаций:

Gombozhapova S. V. *Improving tax control in context of historical experience. PhD (Econ.) Thesis.* Irkutsk; 2012. (In Russ.)

Urban I. *Redistributive effects of direct taxes and social benefits in Croatia. Dr. (Econ.).* Slovenia; 2010.

5. Электронные ресурсы, в которых указан автор материала:

Ivanov A. *Strong ruble and cheap loans. How effective are the proposals of Sergei Glazyev.* Available at: http://svpressa.ru/economy/article/156619/ (In Russ.)

Feldstein Martin. *The Case for fiscal stimulus.* Available at: https://www.project-syndicate.org/print/the-case-for-fiscal-stimulus

Предоставление сведений об авторе (ах) статьи

1. В статье в информации об авторах на русском и английском языках указываются следующие данные:
- фамилию, имя, отчество (полностью);
- ученую степень, ученое звание (полностью);
- занимаемую должность;
- рабочее подразделение (кафедра, факультет, институт и др.);
- место работы в соответствии с официальным названием организации;

● почтовый индекс организации — места работы (с указанием почтового индекса);

● адрес электронной почты (e-mail);

● ORCID (Open Researcher and Contributor ID) — уникальный идентификатор ученого, связывающий его исследовательскую деятельность и помогающий идентифицировать ссылки на его научные публикации в международных базах данных (Scopus, Web of Science) (если имеется).

2. Дополнительно указывается информация, которая служит для связи с автором и в журнале не публикуется:

● почтовый адрес для переписки (с указанием индекса);

● телефоны (рабочий, мобильный).

3. Фамилия и имя на английском языке указываются автором в соответствии с их написанием в ORCID или ранее опубликованным в зарубежных изданиях, входящих в международные базы данных (Scopus, Web of Science), либо указанным в заграничном паспорте.

Publication requirements for articles submitted to Journal of Tax Reform

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;
- background of a problem;
- 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.

Format requirements

1. The manuscript files in Microsoft Word format should be converted to .docx. files

2. Technical format of the article has to comply with the following requirements:
- the page size — A4;
- font – Times New Roman; main text – 14-point, supplementary text (abstract, key-words, tables, figures, references) – 12-point, footnotes – 11-point;
- line spacing – 1,0;
- fit to the width;
- indent – 1,25;
- margins – 2.0 cm on all sides;
- page numbers – at the bottom of the page;

3. Article should be 18–25 pages.

4. The article has to contain the following components drawn up in accordance with the journal's requirements (see the sample):
- JEL classification;
- 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.

Guidelines for Abstract writing

An Abstract is a source of information on your paper's content and findings.

1. An Abstract has the following functions:
- allows readers to identify the basic concept of your paper as well as its relevance and decide if the full text paper is of interest to them;

● provides information on your paper and makes it unnecessary to read its full text version if it is of secondary interest to a reader;

● is used in information (including computerized) search systems to find papers and information.

2. An Abstract should be:
● informative (no general words);
● original;
● relevant (reflects your paper's key content and research findings);
● structured (follows the logics of results' presentation in the paper and divided into sub-headings: the purpose of the research, methods, results, conclusions);
● concise **(between 200 and 250 words)**.

3. An Abstract should contain the following content aspects:
● the statement of the object and purpose of your study;
● research methods/methodology;
● results observed;
● the sphere of results application;
● conclusions drawn from your study.
● the object, topic and purpose of the research (if they are not clear from the title of the paper);
● the research methods/methodology if they are original or of interest for this particular research. For papers concerned with experimental work describe your data sources and data process technique;
● the results of research should be described as precisely and informatively as possible. Include your key theoretical and experimental results, factual information, revealed interconnections and patterns. Give special priority to new results and long-term impact data, important discoveries and verified findings that contradict previous theories as well as data that you think have practical value.
● the sphere for implementation the results of the research;
● conclusions could be associated with recommendations, estimations, suggestions, hypotheses described in the paper.

4. Use the language typical of research and technical documents to compile your abstract and avoid complex grammatical constructions. Information contained in the title should not be repeated in the abstract. The abstract should be concise and clearl and reflect only the main information of the original paper. The text of the abstract should include key words of the paper

Guidelines for Keywords

1. Keywords encapsulate the principal topics of the paper. These keywords will be used for indexing purposes as a guide to search the articles in electronic databases, therefore, they should reflect area of science in which the article was written, the subject, the purpose and object of research

2. The keywords can be used as single words and phrases. Key phrase (phrases) should contain no more than three words.

3. Basic principles for keyword selection:
● avoid general and plural terms and multiple concepts (avoid, for example, "and", "of").
● be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.
● each keyword should have its separate meaning.

Guidelines for Reference

1. The list of references should be arranged in the order of the appearance the citations in the text. In case of repeated citation the number is the same.

2. To associate the list of references with the text of the article, you should include a reference as a number (running number of the source from the list) and also the page number in square brackets: [5, c. 115].

3. In the original scientific paper must be not less than 25–40 references, in the scientific review – 50–80 references. The Editorial Board recommends to cite papers indexing in international databases (Scopus, Web of Science).

4. The electronic sources without an author, statistic and regulation materials should not be included in the list of reference, but preferably set as a footnotes at the end of the page.

5. Author's self-citations should not exceed 20 % of the number of sources in the list of references.

Information about the author (s)

1. The information about the authors indicates the following data:
● surname, first name, middle name (in full);
● academic degree, academic title (in full);
● position;
● operating unit (department, chair, institute etc.).
● affiliation (the official name of the organization);
● organization address (including postcode);
● author's e-mail;
● ORCID (Open Researcher and Contributor ID) (if available).

2. Information for communication with the author (not published in the journal):
● post address for correspondence (with post index);
● phone numbers (office, mobile).