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Cluster analysis of Russian oil companies based on tax burden parameters

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ABSTRACT

The oil industry occupies an important place in Russian economy and in the global energy supply system. The industry has recently been facing a number of internal and external problems, for example, the deteriorating quality and structure of the product base and an increase in the share of tight oil reserves. Confronting these challenges will inevitably incur costs, which will directly affect oil companies' financial performance. The Russian government uses taxation to incentivize oil companies to improve their efficiency, which renders the question of tax burden particularly salient. This study aims to analyze the tax burden on the Russian oil industry in the period from 2010 to 2017 and to identify the key factors that shape the structure and dynamics of oil companies' tax payments. The article provides an overview of Russian and international research literature on the problem of tax burden. The role of oil and gas revenues in the structure of the Russian federal budget is shown. The analysis demonstrates that there has been a steady decline in the tax burden on oil companies in recent years due to the changes in the method of calculating the mineral extraction tax and export duties as well as the expanding range of preferential categories of subsurface use objects. The factor analysis combined with quantitative analysis reveals the factors that determine the dynamics and structure of oil companies' tax payments. The method of cluster analysis is applied in this study to compare the performance of Russian oil companies according to a set of tax burden parameters. The companies are divided into three clusters and specific recommendations are provided for each cluster. For example, Gazprom Neft and LUKOIL have a low tax burden and can be seen, therefore, as potential donors of tax revenues; Rosneft, Bashneft and Tatneft need to increase their efficiency through non-tax optimization; a suitable strategy for Surgutneftegaz, RussNeft, and Slavneft, in our view, would be to adjust the structure of their production activities to increase the share of the domestic crude oil market. Based on the results of the cluster analysis, the authors propose guidelines for reforming taxation of the oil industry and describe the main stages of this process.

KEYWORDS

oil industry, tax burden, tax maneuver, oil and gas revenues, cluster analysis

JEL H21, H32, L71, L52

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Кластерный анализ компаний нефтяной промышленности по параметрам налоговой нагрузки

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АННОТАЦИЯ

Нефтяная отрасль занимает важное место в экономике России и мировой системе энергоснабжения. В настоящий момент отрасль столкнулась с рядом внутренних и внешних проблем, например, ухудшение качества и структуры товарной базы, увеличение доли трудно извлекаемых запасов нефти. Затраты, направленные на решение этих и многих других проблем, оказывают воздействие на финансовые показатели нефтяных компаний. Налогообложение является инструментом государственного стимулирования и повышения эффективности работы нефтяных компаний России. Целью исследования является определение налогового бремени российской нефтяной промышленности и выявление ключевых факторов, влияющих на структуру и динамику налоговых платежей нефтяных компаний и деление на кластеры по параметрам налогового бремени. В статье проведен анализ налоговой нагрузки компаний нефтяной отрасли за период с 2010 по 2017 г. и с дифференциацией по видам налогов и крупнейшим компаниям отрасли. Выделены основные этапы совершенствования налогообложения нефтяной отрасли России, цели и главные ориентиры реформирования. Показана роль нефтегазовых доходов в структуре доходов федерального бюджета. Исследованы методические подходы отечественных и зарубежных авторов к определению налоговой нагрузки. Авторами предложена методика определения налоговой нагрузки компаний, учитывающая специфику налогообложения нефтяной отрасли. В результате апробирования методики наблюдается устойчивая тенденция снижения налоговой нагрузки нефтяных компаний в последние годы в следствии изменения метода расчета налога на добычу полезных ископаемых и экспортной пошлины, а также расширения спектра льготных категорий объектов недропользования. В рамках исследования был проведен факторный анализ налоговых платежей компаний и выявлены ключевые факторы, влияющие на их структуру и динамику. Дана количественная оценка влияния этих факторов на изменение налоговых платежей компаний. В заключении на основе выполненных расчетов, нефтяные компании разделены на три кластера по показателям налоговой нагрузки и даны рекомендации. Таким образом, Газпром нефть и ЛУКОЙЛ с низким налоговым бременем являются потенциальными донорами налоговых поступлений. Стратегия роста Роснефти, Башнефти и Татнефти заключается в повышении эффективности за счет неналоговой оптимизации. «Сургутнефтегаз», «РуссНефть», «Славнефть», могут скорректировать структуру производственной деятельности в направлении увеличения доли на внутреннем рынке сырой нефти.

КЛЮЧЕВЫЕ СЛОВА

нефтяная отрасль, налоговая нагрузка, федеральный бюджет, налоговый маневр, налог на добычу полезных ископаемых, экспортная пошлина, кластерный анализ

1. Introduction

The Russian oil industry plays an important role in the country's economy and the global energy supply system; it holds vast potential in terms of resources, production, technology and human capital. In recent years, however, the industry has faced a number of internal and external challenges. These include the deteriorating quality and structure of the resource base; changes in the geography of production which shifted to the Arctic and Eastern regions with harsh climatic conditions; an increase in the share of tight oil reserves; volatility of oil prices; financial and sectoral sanctions; increased inter-fuel and international competition; and so on. Confronting these challenges will inevitably incur costs, which will directly affect oil companies' financial performance and their ability to invest into sustainable development of the industry and economy as a whole.

One of the main incentives used by the Russian government to improve oil companies' efficiency is taxation. Since 2011, tax reforms have been used to encourage the Russian oil industry to develop tight oil reserves, oil fields in remote regions and so on. The variety of tax preferences and the diversity of activities oil companies engage in make it difficult to estimate the tax burden on the industry and analyze its sensitivity to economic financial, industrial, technological, opportunistic and other factors. Yet another difficulty is that there are currently no clear, generally applicable methods of measuring the tax burden on the oil and gas industry.

Therefore, we need to obtain an in-depth understanding of the trends and patterns underlying taxation in the energy sector and use these findings for indicator-based forecasting and policy design.

The purpose of this study is to investigate the methodology of measuring the tax burden on Russian oil companies by taking into account the structure and dynamics of their tax payments.

To achieve this goal, we should address the following tasks: assess the role of the oil industry in federal budget revenues; analyze the structure and dynamics of tax deductions of Russian oil companies; conduct quantitative assessment of the tax burden on Russian oil companies and on the industry as a whole; reveal the factors affecting the dynamics of the tax burden; identify clusters of oil companies according to their tax burden parameters and devise recommendations for optimizing taxation in the oil and gas industry.

This study relies on the analysis of Russian legislative and regulatory documents[1]; the data provided by the Treasury of Russia[2] and the Ministry of Energy[3]; consolidated financial statements prepared in accordance with the International Financial Reporting Standards (IFRS); consolidated financial statements prepared in accordance with the United States' Generally Accepted Accounting Principles (US GAAP) as well as financial and performance reports of the biggest Russian oil companies.

2. Literature overview

Many Russian studies focus on taxation, in particular on the possible ways of optimizing the Russian taxation system [1–3]; dependence of the tax burden on oil and gas prices [4]; MET (Mineral Extraction Tax) and other tax revenues from Russian regions [5–7] or individual sectors of economy, including the oil industry [8]. The question of the feasibility of tax burden in Russia was raised in a number of studies published in the late 1990s and in the 2000s (Y. A. Kirov, M. I. Litvin, A. N. Kadushin, N. M. Mikhailova and others).

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[1] *Interactive report of the Ministry of Energy of the Russian Federation Taxation of the oil industry: the introduction of the NFR*. 2015. Available at: http://docplayer.ru/26270060-Nalogooblozhenie-neftyanoy-otrasli-vvedenie-nfr-moskva-2015-g.html (In Russ.)

[2] *Budget Code of the Russian Federation No. 145-FZ of July 31, 1998 (as amended on December 28, 2017), art. 96.6 Oil and gas revenues of the federal budget*. Available at: http://www.consultant.ru/document/cons_doc_LAW_19702/ (In Russ.)

[3] *Annual reports of the RF Treasury on the execution of the consolidated budget of the Russian Federation for the period 2007–2017*. Available at: http://www.roskazna.ru/ispolnenie-byudzhetov/konsolidirovannyj-byudzhet/ (In Russ.)

A separate group of studies analyzes the tax burden on oil and gas companies. G. A. Nurtdinov [9] examines various approaches to determining the tax burden, assesses its level for a large vertically integrated oil company and comes to the conclusion that it is necessary to optimize the current tax burden and to redistribute profits by applying tax planning methods. L. V. Eder et al. consider the financial and economic performance of the Russian oil and gas industry in 2011, including analysis of the tax burden on oil and gas companies between 2008 and 2011. E. N. Zhavoronkova [10] compares the tax burden per barrel of production of the largest Russian and foreign oil companies from 2010 to 2013.

International studies mostly focus on possible reforms of the energy sector, in particular reduction of the tax burden on companies [11]. Karagianni et al. discuss the causes of the non-linear relationship between tax revenues of the US state budget and GDP before 2008 [12]. A. Datta considers taxation of fuel oil in India as a part of a more general discussion on the abatement of greenhouse gas emissions [13].

Another group of studies deal with the discussion and controversial tax proposals for the petroleum sector in Norway, Denmark and Australia. The situation in these countries led, for example, to reductions in tax-related depreciation for the Norwegian petroleum industry in May 2013. C. Riis et al [14] have reviewed this tax debate and analyzed the implications of basing tax design on counter-factual investment behavior. P. Osmundsen et al. [15] discuss the effect of tax design on international capital allocation when companies ration capital. The authors analyzed capital allocation and government take for four equal oil projects in three different fiscal regimes: the US GoM, UK upstream and Norway offshore. Wang Chaoyang, Chen Yufeng, Jin Xi [16] explore this problem in the context of China, pointing out that the government should support the development of new energy industry in China by imposing energy taxes and providing subsidies for enterprises.

A separate group of international studies discuss the Russian tax policy in the oil industry. G. Komori [17] analyzes the state of the oil industry in Russia in 2000–2009 and examines the country's energy strategies until 2030, concluding that it is necessary to ease the tax limitations on foreign firms wishing to invest in Russian oil companies.

3. Methodology and research results

3.1. The role of oil companies in Russian economy

Russian oil and gas companies have made up a large share of the country's federal budget Russian oil companies since the early 2000s. It was in this period that high oil prices made it possible for the country to bridge its federal deficit, cover the external liabilities, increase gold and foreign exchange reserves, create a system of specialized funds (Stabilization Fund, Reserve Fund, National Welfare Fund), and pursue a stable social policy by means of household income indexation.

In 2002, a new mineral extraction tax (MET) was adopted for oil companies, and since then the administration of revenues from resource development has become much simpler. In 2008, the term "oil and gas revenues" was introduced, which encompassed the income from the MET (in the form of hydrocarbons – oil and natural gas from all types of hydrocarbon deposits; gas condensate from all types of hydrocarbon deposits) and the export customs duty for crude oil, natural gas as well as petroleum-based products. This measure allowed the government to differentiate between the two types of revenue into the federal budget – oil and gas revenue and non-oil and gas revenue.

In 2017, the share of oil and gas revenues in the federal budget was 40%, including 13% for the export customs duty and 27% for the MET [18] (see Table 1).

Compared to 2016, in 2017, oil and gas tax revenues rose following the increase in revenues from the MET, which, in its turn, resulted from the 27% rise in world oil prices. Since 2015, the proportion of revenues from MET and duties has changed:

if previously the bulk of oil and gas revenues was formed by the export duty, in 2015 the revenues from the MET came first. This happened because of the consequences of the government's "tax maneuver" and the drop in oil prices [19; 20].

Therefore, since 2011, tax legislation in the energy sector has been actively reformed (Table 2). In the beginning, the aim was to reduce and differentiate the oil export duty. The most significant area of reforms was the introduction of the so-called "tax maneuver" in 2014, a system of measures aimed at maximizing the efficiency of the tax system. The "tax maneuver" included, among other things, reduction of the oil export duty rate from 59% in 2014 to 30% in 2017. The export duty on light oil products was also lowered, while the base rate of the MET on oil from 493 rubles per ton in 2014 to 919 rubles in 2017. Along with the growth of the MET rates, tax regulation involved privileges for oil production to stimulate the development of tight oil reserves.

The largest taxpayers of the Russian oil industry are Rosneft (45% of all tax payments in the industry or 2.7 trillion rubles) and LUKOIL (20% or 1.2 trillion rubles). Other large taxpayers are Gaz-

Table 1

The share of oil and gas revenues in the federal revenue structure, 2010–2017

Index	2010	2011	2012	2013	2014	2015	2016	2017
Share of oil and gas revenues	46%	50%	50%	50%	51%	43%	36%	40%
Share of the MET, including	16%	17%	19%	19%	20%	23%	21%	27%
oil production	15%	16%	17%	17%	17%	20%	17%	22%
Share of the export customs duty, including	30%	32%	32%	31%	32%	20%	15%	13%
export of oil and oil-based products	27%	29%	28%	27%	28%	16%	11%	9%

Compiled by the authors using: *Annual reports of the RF Treasury on the execution of the consolidated budget of the Russian Federation for the period 2007–2017*. Available at: http://www.roskazna.ru/ispolnenie-byudzhetov/konsolidirovannyj-byudzhet/ (In Russ.)

Table 2

Stages of the tax reform in the oil industry

Key areas	Goals
SYSTEM "60-66-90" since 01.10.2011	
Reduction in the oil export duty; Reduction in the export duty on light oil products; Increase in the export duty on dark oil products.	Stimulate and maintain production at the existing fields; Increase investment in the depth of oil refining; Decrease the export economy of dark oil products
"SMALL TAX MANEUVER" since 01.01.2014	
Small reduction in the oil export duty; Small reduction of the export duty on diesel fuel; Increase in the MET on oil.	Increase budget revenues; Protect the margin and maintain the attractiveness of deposits for development and the attractiveness of oil refining; The first stage of shifting the tax burden from exports to oil production.
"BIG TAX MANEUVER" since 01.01.2015	
Significant reduction in the oil export duty; Significant reduction in the export duty on light oil products; Significant increase in the MET on oil and gas condensate.	Compensate for budget revenue losses by increasing the MET tax burden; Increase incentives for deep oil refining; The second stage of shifting the tax burden from exports to oil production; Reduce the risks of subsidizing CU countries within the framework of the CES creation.

Compiled by the authors using: *Interactive report of the Ministry of Energy of the Russian Federation Taxation of the oil industry: the introduction of the NFR*. 2015. Available at: http://docplayer.ru/26270060-Nalogooblozhenie-neftyanoy-otrasli-vvedenie-nfr-moskva-2015-g.html (In Russ.).

prom Neft (12% or 0.69 trillion rubles) and Surgutneftegaz (11% or 0.67 trillion rubles). Thus, the four largest oil companies account for almost 90% of the industry's tax revenues (Table 3).

In 2017, oil companies paid more than 6.0 trillion rubles to the Federal Budget. In the structure of the taxes paid, the largest share is that of the mineral extraction tax (54% or 3.3 trillion rubles) and export duties (22% or 1.3 trillion rubles). Other taxes (income tax, excise taxes, property tax, personal income tax and insurance payments, etc.) account for 24% – about 1.5 trillion rubles (Table 4).

In addition to the so-called specialized tax payments, which include mineral extraction tax and export duty, oil companies pay general economic taxes and make other payments – income tax, property tax, social contributions, land tax, excises and others. The share of these taxes is not subject to significant changes, because it does not depend on the conjuncture of world energy markets and active legislative regulation.

Oil companies occupy the leading position in the country's economy, while the tax system of the oil industry is being constantly reformed and is also facing new internal and geopolitical challenges, which makes it crucial to study the tax burden and the key factors affecting the structure and dynamics of Russian oil companies' tax payments into the federal budget.

3.2. Methodology for measuring tax burden

Choosing an adequate method for measuring tax burden is one of the main problems in taxation theory and practice. Despite the vast research on this problem, it still continues to be relevant today [21]. The approaches currently applied in Russia do not reflect the specificity of the tax burden on the oil industry (Table 5). When comparing the most widely used ap-

Table 3

Structure of the Russian oil industry tax deductions by company, 2011–2017, bln rbs

Company	2011	2012	2013	2014	2015	2016	2017	
							Bln rbs	%
Rosneft	1,374	1,641	2,487	3,006	2,306	2,067	2,675	45%
LUKOIL	1,129	1,222	954	1,366	1,194	992	1,172	20%
Surgutneftegaz	739	762	808	982	781	543	675	11%
Gazprom Neft	510	574	592	645	570	581	693	12%
Tatneft	321	312	326	313	274	246	325	5%
Bashneft	200	227	246	291	229	214	277	5%
Slavneft	83	101	97	96	106	95	121	2%
RussNeft	108	107	86	90	61	52	67	1%
Oil industry	**4,464**	**4,946**	**5,596**	**6,789**	**5,521**	**4,790**	**6,005**	**100%**

Compiled by the authors by using the data from consolidated financial statements prepared under IFRS, US GAAP.

Table 4

Structure of the Russian oil industry tax deductions by payment type, 2011–2017, bln rbs

Index	2011	2012	2013	2014	2015	2016	2017	
							Bln rbs	%
Export duties	2,358	2,543	2,699	3,390	1,906	1,337	1,325	22%
Mineral extraction tax	1,390	1,612	2,001	2,272	2,519	2,270	3,267	54%
Excises	308	370	441	499	462	675	815	14%
Income Taxes	297	294	295	447	431	289	357	6%
Property tax	46	45	60	70	76	82	87	1%
Other	65	82	100	111	127	137	154	3%
Oil industry	**4,464**	**4,946**	**5,596**	**6,789**	**5,521**	**4,790**	**6,005**	**100%**

Compiled by the authors by using the data from consolidated financial statements prepared under IFRS, US GAAP.

proaches, we identified whether they took into account specialized taxes applied in the energy sector (+) or not (–).

Within the methodological framework applied by the Ministry of Finance of the Russian Federation, tax burden is calculated as the ratio of all taxes paid by the organization to the total revenue, including the revenue obtained from other sales. According to the approach proposed by M. N. Krejinina, the total amount of taxes is correlated with the financial performance of the company, showing how many times the amount of tax paid differs from the net profit remaining at the disposal of the company [22]. In accordance with the methodological approach of E. A. Kirova, tax burden is measured through the ratio of accrued payments and the newly created value [23]. M. I. Litvin suggests calculating the tax burden as the ratio of all taxes to the number of the sources of funds for tax payment [24]. A. N. Kadushin and N. M. Mikhailov propose to define the tax burden as a share of the value added to the state, while correlating taxes with the source of funds for their payment [25]. O. F. Pasko's methodology is similar to the approach of A. N. Kadushina and N. M. Mikhailova described above; however, it takes into account land and property taxes as well as the tax on natural resources [26].

In this study, we analyze the existing methodological approaches to measuring tax burden to identify the advantages and disadvantages of each approach and to show the differences and similarities between these approaches. In doing so, we focus on the following aspects:

– the structure and amount of taxes included in the calculation when determining the tax burden, since there is a divergence of views on the advisability of

Table 5

Methodological approaches to measuring tax burden

Methods	Formula for calculating the tax burden	Explanation	MET / Export duty
RF Ministry of Finance	$\frac{TP}{(TR+NonOI)}\cdot 100\ \%$	*TP* is the total amount of all taxes paid; *TR* are the proceeds from the sale of products; *NonOI* is the non-operating income	+/–
M. N. Kreinina	$\frac{TR-OPEX-\Pr}{TR-OPEX}\cdot 100\ \%$	*TR* are the proceeds from sales; *OPEX* are the operating expenses without taxes; *Pr* is the actual profit remaining at the disposal of the enterprise after the deduction of taxes	+/–
E. A. Kirova	$\frac{TP+obP+AR}{NCV}\cdot 100\ \%$	*TP* are the tax payments of the organization; *obP* are payments made to off-budget funds; *AR* are arrears in payments; *NCV* is the newly created value	+/+
M. I. Litvin	$\frac{TP+obP}{VA}\cdot 100\ \%$	*TP* + *obP* is the sum of the charged tax payments (including personal income tax) and payments in off-budget funds; *VA* is the value added	+/–
A. N. Kadushin and N. M. Mikhailova	$\frac{S+obP+D}{VA}\cdot 100\%$	*S* is the salary; *obP* are payments made to off-budget funds; *D* is depreciation; *VA*, value added	+/–
O. F. Pasko	$\frac{S+obP+D+CT+NOT}{VA}\cdot 100\%$	*CT* are the taxes attributable to cost; *NOT* are the taxes attributable to non-operating expenses	+/+

Compiled by the authors.

including in the calculations the personal income tax and indirect taxes;

– the definition of the base indicator which the amount of taxes correlates with as there is no general agreement as to the choice of base indicators, which means that different approaches use profit, value added, newly created value, or revenue.

Many approaches, including the one used by the Ministry of Finance, share one key drawback – they do not take into consideration export duties.

With regard to the above-described considerations, we have modified the general formula to calculate the tax burden on oil companies:

$$TB = \frac{\begin{array}{c}Direct\ taxes + Export\ duties + \\ + Payments\ to\ off - \\ - budget\ funds\end{array}}{Revenues\ from\ sales} \cdot 100\%. \quad (1)$$

The following taxes and payments should be included in calculating the tax burden:

– all taxes paid by the company (mineral extraction tax, income tax, property tax, land tax and others);

– export duties that are not taxes but refer to mandatory payments as they are a part of the revenues from the oil industry to the federal budget and represent a significant burden on oil companies;

– payments to off-budget funds.

In view of the economic content of indirect taxes as surcharges to the goods price, they are not included in the calculation of the tax burden, since the payer is the buyer and the company only acts as a tax agent for VAT and excises. The same can be said about the personal income tax: in this case, the taxpayers are employees themselves and companies act only as intermediaries that transfer the personal income tax to the budget. Only when the tax burden is calculated based on the data on the company's cash flows, the inclusion of indirect taxes and personal income tax would be justified.

As a basis for comparison, we chose revenue from sales as the main revenue element. Revenues from non-operating activities should be taken into account when calculating the company's tax burden.

3.3. Tax burden quantification

The level of the oil industry tax burden differs considerably depending on the method of calculation (Table 6), which is due, first, to the different tax amounts used and, secondly, to the choice of the base which the tax payments in absolute terms are correlated with [27; 28]. In addition, some methods do not take into account the specifics of the oil industry taxation, primarily the export duty.

The indicators of the tax burden on some companies, which was calculated differently in certain years, are absent because of the company's unprofitable activity or the ratio of the financial indicators of the company's performance that the calculation of the tax burden in a separate methodology was incorrect due to the presence of negative values.

Table 7 illustrates the results of measurements made by applying the modified methodology described in the previous section.

The tax burden on the Russian oil industry in 2017 was 38%, which is three percentage points above the level of the previous year, but significantly inferior to the level of taxation in the period until 2014. In general, during the given pe-

Table 6

Oil industry tax burden, calculated by applying various methods, 2011–2017

Methodology	2011	2012	2013	2014	2015	2016	2017
Ministry of Finance	19%	19%	20%	20%	21%	22%	25%
M. N. Kreinina	69%	68%	69%	63%	58%	81%	65%
E. A. Kirova	438%	515%	350%	380%	312%	502%	346%
M. I. Litvin	48%	48%	47%	50%	54%	79%	58%
A. Kadushin and N. Mikhailova	27%	26%	26%	20%	23%	25%	24%
O. F. Pasko	**44%**	**49%**	**45%**	**55%**	**47%**	**44%**	**46%**

Calculated by the authors.

Table 7

Tax burden calculated with the help of the modified methodology, 2011–2017

№	Company	2011	2012	2013	2014	2015	2016	2017
1	Rosneft	49%	51%	50%	52%	43%	37%	39%
2	LUKOIL	25%	24%	17%	21%	16%	13%	15%
3	Surgutneftegaz	91%	88%	95%	109%	77%	43%	48%
4	Gazprom Neft	35%	33%	34%	33%	30%	28%	28%
5	Tatneft	52%	50%	50%	48%	41%	35%	41%
6	Bashneft	35%	36%	37%	40%	33%	29%	34%
7	Slavneft	53%	51%	50%	49%	48%	44%	50%
8	RussNeft	66%	81%	64%	79%	59%	49%	52%
Oil industry		**45%**	**46%**	**45%**	**47%**	**38%**	**35%**	**38%**

Calculated by the authors.

riod, there was a general decline in the tax burden on the oil industry. This happened primarily due to the expansion of categories of preferential oil as companies were expanding their operation to remote regions with poorly developed transport infrastructure and harsh climatic and mining conditions [29; 30].

The tax burden on Rosneft, Surgutneftegaz, Tatneft, Slavneft, and Russneft was higher than the industry average. The tax burden on LUKOIL, Gazprom Neft, and Bashneft was below the industry average. The division of companies relative to the industry average did not change during the given period.

As of 2017, Slavneft and Russneft had the highest tax burden (50% and 52% respectively). LUKOIL stands out among other companies as it has the lowest tax burden indicators over the entire period (15% in 2017). Until 2016 Surgutneftegaz had the highest burden in the industry. In addition, it is the only company whose tax burden turned out to be above 100%, since the total tax payments exceeded the revenues from the main activity (109% in 2014).

3.4. Clustering of companies according to tax burden parameters

Production, institutional and conjuncture factors can have diverse influence on the tax burden on companies, which makes it particularly important to investigate this influence and use these findings for further forecasting and analysis [31–34]. In this paper, cluster analysis is used to divide oil companies into groups with similar parameters. Within each cluster, there should be objects more similar to each other than to those from different clusters.

Following the traditional approach to cluster analysis, we have devised an algorithm for clustering eight Russian oil companies on the basis of a set of tax burden parameters. Thus, at the first stage, we constructed a database in the form of a table containing values of the variables (X_{ij}, where i is the number of an oil company and j is the parameter of the tax burden) (Table 8).

Table 8

Database layout

Company	Parameter		
	$\boldsymbol{X_{i1}}$	$\boldsymbol{X_{i2}}$	X_{i3}
X_{1j}	X_{11}	X_{12}	X_{13}
X_{2j}	X_{21}	X_{22}	X_{23}
X_{3j}	X_{31}	X_{32}	X_{33}
X_{4j}	X_{41}	X_{42}	X_{43}
X_{5j}	X_{51}	X_{52}	X_{53}
X_{6j}	X_{61}	X_{62}	X_{63}
X_{7j}	X_{71}	X_{72}	X_{73}
X_{8j}	X_{81}	X_{82}	X_{83}

Compiled by the authors.

We selected three independent indicators characterizing the activity of the companies as variables:

X_{i1} is the tax burden per 1 ton of oil production, billion rubles / ton. This indicator reflects the value of the specific tax burden, comparing the total tax payments with the result of production activities, namely, the amount produced during the oil period.

X_{i2} is the share of exported oil in total production, %. The structure of oil sales

(domestic or export supplies) for each company is unique, which largely determines the amount of revenue and tax payments.

X_{i3} is the relative tax burden on the company, %. The indicator reflects the unit value of taxes per unit of revenue from core activities.

In the second stage of clustering, the variables were normalized (reduced to a single commensurable form by means of a standard deviation formula conversion), because the variables have different measurement scales.

At the third stage, measures were found pairwise between all companies, where the Euclidean distance was used as a metric:

$$d(i,i') = \left(\sum_{j=1}^{n} (x_{ij} - x_{i'j})^2 \right)^{1/2}, \quad (2)$$

where i, i' is the number of an oil company; j is the tax burden parameter; x_{ij}, $x_{i'j}$ are the characteristic values j for i and i' of companies.

The fourth stage is the creation of clusters. We have chosen the Ward method, since it allows us to construct well separated clusters. This method seeks to optimize the minimum variance within the clusters, which implies the integration of objects, giving the minimum increment of the intragroup sum of squared deviations.

At the fifth stage, we built a dendrogram to illustrate the results of hierarchical clustering, in particular to demonstrate cluster integration and show the degree of closeness between individual companies. The number of dendrogram levels corresponds to the number of clusters.

The last (sixth) stage of clustering describes the clusters obtained, the characteristics of the companies within each cluster and general information confirming the homogeneity of the grouping.

The cluster analysis was carried out by using a specialized package for solving statistical problems Stata 11.1.

3.5. Results of clustering companies according to the level of tax burden

The results of our cluster analysis of oil companies showed that most similarities in terms of tax burden are found between Rosneft and Bashneft, Surgutneftegaz and Russneft, which corresponds to the lowest (first) clipping level in Figure 1.

The highest level of differentiation of companies (the fourth) allows the industry to be divided into two large groups: Rosneft, Bashneft, Tatneft, Gazprom Neft, LUKOIL, on the one hand, and Surgutneftegaz, Russneft, Slavneft, on the other. It is, however, difficult to identify the characteristics that the three latter companies have in common.

The optimal clustering of the companies is that of the third cut-off level with the allocation of three clusters (Table 9).

Table 9

Distribution of companies by cluster according to tax burden parameters

Cluster	1st cluster	2nd cluster	3rd cluster
Company	LUKOIL Gazprom Neft	Bashneft Rosneft Tatneft	Surgut-neftegas Russneft Slavneft
Companies' tax burden	to 30%	30–45%	45–55%
Comparison with the tax burden on the industry (38%)	Below average	Average	Above average

Calculated by the authors.

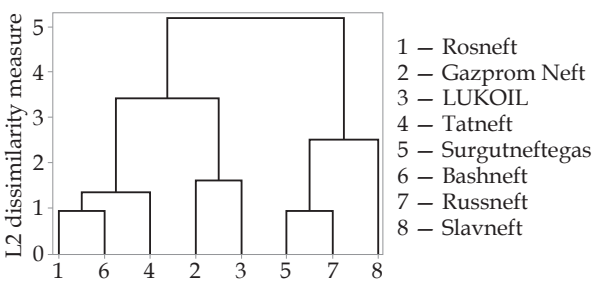

Figure 1. **Dendrogram of cluster analysis results**

The first cluster includes three companies with the tax burden level close to industry one: Bashneft, Rosneft, Tatneft with the tax burden of 34%, 39%, and 41%, respectively. The companies of this group have a high export share in the structure of hydrocarbons sales, however, after the introduction of tax incentives, the tax burden on these companies has remained at the level of the industry average.

The predominant export orientation of raw materials determines relatively low transaction costs, but a high level of taxation and profits.

The companies of the first cluster account for the largest share of tax revenues to the federal budget from the oil industry (57%). The growth strategy for the companies of this group would be to focus on further growth in the company's revenue through non-tax optimization, for example, by investing in technological innovation and expanding the boundaries of oil sales.

Companies of the second cluster, LUKOIL and Gazprom Neft, have a low tax burden – 15% and 28%, respectively. The low tax burden of Gazprom Neft is due, first of all, to the lowest share of export sales in the industry, and, therefore, low payments of export duties with fairly high revenues.

The undisputed leader in the industry in terms of its low tax payments is LUKOIL. This situation is explained by the use of transfer costs. Moreover, if we look at the list of the oil fields developed by this company, we shall see that a large number of objects are at the initial or final stage of development, which makes them entitled to for which preferential tax conditions are widely distributed. LUKOIL focuses on the sale of hydrocarbon products in Russia and abroad in the form of petroleum products and petrochemicals. Its high operating costs are due to significant costs in the processing sector and sales of final products. A considerable part of these costs are the costs of oil and oil products delivered to refineries.

A certain focus on the domestic market with processed products largely exempts the company from paying additional taxes, including customs duties. As far as the net profit and revenue are concerned, the company has one of the most balanced indicators in the industry in terms of taxes paid.

The share of tax payments made by companies from the second cluster is 26% of the total industry contribution. The government, which uses maximization of tax revenues as a criterion for optimizing the tax system, sees the companies in this cluster as potential donors of tax revenues, since, given the currently low tax burden on these companies, it is still possible to increase the tax burden on this group to a level comparable to industry one.

The third cluster includes Surgutneftegaz (48%), Slavneft (50%), and Russneft (52%) and is characterized by a high level of tax burden compared with the industry average. Two of the three companies (Slavneft and Russneft) have the lowest rates of oil production and export, some of the tax breaks do not apply to their activities.

Tax revenues from the companies in the third cluster account for 17% of the total industry contribution. The costs of industry taxes for these companies make up

Table 9

Distribution of companies by cluster according to the parameters of the tax burden

Company	Cluster		
	1st cluster	2nd cluster	3rd cluster
	Bashneft Rosneft Tatneft	LUKOIL Gazprom Neft	Surgutneftegas Russneft Slavneft
Comparison with the tax burden of the industry (38%)	Average	Below average	Above average
Tax burden per 1 ton of oil production*, bln rbs / ton	16,0	12,9	9,8
Share of exported oil in total production*, %	62%	36%	28%
Relative tax burden of the company*, %	45%	30%	55%

* Cluster average.

the largest part of their expenses structure, therefore, in order to reduce the tax burden, these companies should change the structure of their production activities and prioritize oil sales in the domestic market focusing on the fields with tax benefits in hydrocarbon production.

4. Conclusion

The Russian oil industry is a key source of federal budget revenue. Only for two specialized taxes (MET and export duty tax), the tax deductions of oil companies account for almost a half of all the state revenues.

In order to enhance the performance of oil companies in the face of negative internal and external factors, in recent years the government has been reforming the tax treatment of the oil and gas industry. As a result of the "tax maneuver", the structure of oil companies' tax payments has changed significantly since 2015, which is associated with a decrease in the share of export duties and an increase in the share of MET. At the same time, the tax burden on the industry has been declining.

Since there is a variety of approaches to measuring tax burden, it is important to choose a method that would take into account industry-specific features. The results of our qualitative and quantitative evaluation have shown that the tax burden on Russian oil companies is highly differentiated. We found that in the last decade the total tax burden on the industry was reduced from 45% in 2011 to 38% in 2017. Slavneft and Russneft are under the highest tax burden (50%) while LUKOIL is under the smallest (15%).

The main factors affecting the rise in tax deductions in absolute terms in recent years have been the increasing dollar exchange rate, the increase in the base MET rate, falling oil prices, and the increasing oil production and exports. The high dependence of the MET and export duties on oil prices and the dollar exchange rate makes companies vulnerable. It also means that there is a significant risk that the tax burden on these companies will increase in the future.

The clustering of companies on the basis of certain tax burden parameters made it possible to single out the general characteristics of production activities and the availability of preferential taxation conditions. Gazprom Neft and LUKOIL have a low tax burden and are, therefore, potential donors of tax revenues. The growth strategy of Rosneft, Bashneft, and Tatneft, whose current tax burden is comparable to the industry average, is to improve efficiency through non-tax optimization. Finally, the companies Surgutneftegaz, Russneft, Slavneft, which are characterized by low oil production compared to other VIOC, can be recommended to adjust the structure of their production activities by increasing the share of oil sales in the domestic market and expanding the geography of oil production in order to apply benefits during production hydrocarbons.

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