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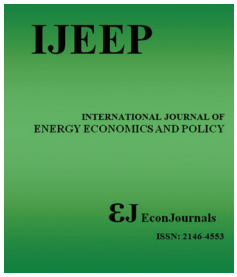

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Diversification of Russian Oil and Gas Upstream Companies

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ABSTRACT

The quantitative assessment of the degree of company's diversification as the basis of strategic planning becomes relevant in the context of instability of world oil prices. The largest companies of the oil and gas industry develop their strategies taking into account diversification of both activities and sales markets. The need for diversification is confirmed by the carried-on qualitative analysis of the activities of Russian and foreign companies in the oil and gas industry. The authors propose indicators of quantitative assessment of the degree of diversification, which can be applicable for companies of the energy sector: entropy index and indicator of geographical diversification. The study concluded that it is advisable to use the entropy indicator of diversification for strategic planning due to the need to optimize activities; focus on the production of high value-added products; relevance of risk reduction in case of instability of world energy prices volatility; strengthening the position of a multi-industry company. An indicator of geographic diversification may be used when there is a necessity of market control; access to new markets; strengthening positions in current markets. The practical application of the results of this study is possible in the field of strategic planning for oil and gas upstream companies.

Keywords: Russian Oil and Gas Upstream Companies, Diversification, Indicators of Diversification, Geographical Diversification, Energy Companies, Entropy Index
JEL Classifications: Q32, L25, Q35

1. INTRODUCTION

The different companies including oil and gas, gradually exhaust the opportunities of development of production. There comes the moment when it is necessary to think both of performance improvement of the available production factors, and of extensive development in order to form the competitive advantages.

Now the oil and gas industry faces threats both from products substitutes and from new entrants. The threats from products substitutes are following (Kirichenko, 2019):

1. The desire of residents of European countries to receive more environmentally friendly products
2. The development of renewable energy sources (Nazarova et al., 2017)
3. New technologies in the energy sector.

There are following threats from new players:

1. The desire of residents of the United States and China to increase the energy independence of the economy
2. Economic support of the development of new technologies and a gradual increase in their economic efficiency.

Under current threats and risks, such as a decrease in the prices of the oil and gas industry, instability of production indicators of oil exporting countries, a tendency to increase operating costs, the urgency of diversifying the existing activities of oil and gas companies is increasing. A steady tendency of reduction of the net profit in the oil and gas industry was acknowledged, primarily among gas companies, due to a threefold drop in gas prices in the

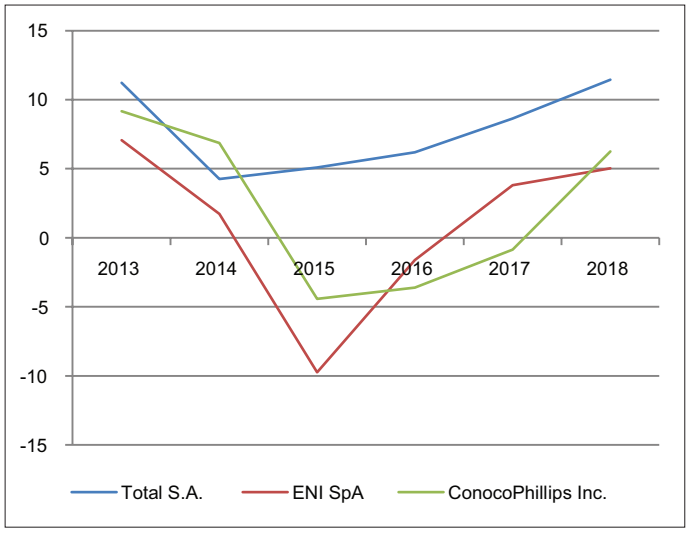
European market (Filimonova et al., 2019). The analyzed statistics for the largest oil and gas companies in the world indicate that a significant drop in net profit was recorded in 2014. At the same time, as can be seen from Figures 1 and 2, starting in 2015, most companies are characterized by a return to the values of net profit of the pre-crisis level of 2013.

In crisis situations the choice of possible strategic decisions comes to the following: development of new products, search for new sales markets that are secured by demand and bring additional profit to companies, which is achieved through diversification.

2. LITERATURE REVIEW

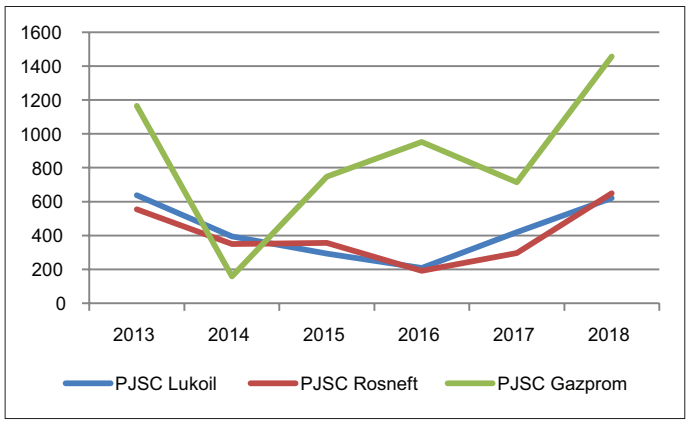
The term "diversification" is characterized by a wide variety of interpretations, that are presented in the variety of works relating to this concept (Maxnushina and Shinkevich, 2014; Gorbunova, 2018). As a formulated definition and concept, "diversification" is firstly used in the 20th century. Markowitz (1952) determined a diversified investment portfolio for the highest profitability. As a business strategy to achieve sustainable development of the company, diversification begins to be considered from the second half of 20th century in the USA, Germany and Japan. This period of time is marked by the works of Ansoff (1957), Boumen (1997) and Porter (2005).

Figure 1: Net profit of world oil and gas upstream companies



Source: Compiled by the authors according to annual reports for the period of 2013-2018

Figure 2: Net profit of Russian oil and gas upstream companies



Source: Compiled by the authors according to annual reports for the period of 2013-2018

The diversification of production is considered in the context of this article, which can be understood as expanding of the range of products and services; reorientation of sales markets; the development of new types of industries in order to increase the economic stability and competitiveness of the company (Pass, 1998; Strahov, 2007). Types of diversification with examples of oil and gas upstream companies are presented in the Table 1.

Oil and gas upstream companies are mainly characterized by associated diversification. Centered and conglomerate diversification are rare and may be associated with the social challenges that are faced by large oil and gas upstream companies. Makarenko and Kornilov (2018) examined the possibility of producing of sports products by OJSC Surgutneftegas. In the conditions of instability of global oil prices, the largest foreign and Russian oil and gas upstream companies are developing their strategies taking into account the diversification of both types of activities and sales markets. Among the companies declaring a diversification strategy there are:

- PJSC TATNEFT - the development of new cost-effective types of products in mechanical engineering
- OMV AG - access to new markets
- OMV Petrom - regional diversification, development of new activities
- Total S.A. - implementation of projects in the areas of liquefied natural gas production, renewable energy sources, biofuels
- Hellenic Petroleum SA - development of the export direction.

According to the strategy of the PJSC LUKOIL, company diversification is shown in the implementation of targeted projects at oil refinery where they change the production structure. The company develops such direction as oil and gas chemistries. The possibility of additional diversification in PJSC LUKOIL is performed through sale of non-fuel goods at the refuel stations belonging to the company. Besides, the company is launching the new products in segments of oils and bitumen.

PJSC Gazpromneft pays special attention to the development of supplementary goods sales, which are one of the most promising areas of the retail business in Russia and the CIS countries and ensure the growth of key performance indicators. The drivers of growth are new items in the cafes, targeted pricing, development of the production of its own bran goods, new coffee machines with an expanded menu and the development of the TV-Media project.

PJSC TATNEFT implements programs to diversify the sources of raw materials at Nizhnekamsk heat power plant in order to increase the operational efficiency of the plant and reduce its dependence on the market conditions.

Table 1: Types of diversification of oil and gas upstream companies

Types of diversification			Example
Associated	Vertical	Descending	PJSC Gazprom operates on the territory of the Russian Federation on the whole production chain: from investigation of fields before processing of natural gas and realization of the electric power
		Ascending	LUKOIL Overseas Holding Ltd. was established by PJSC LUKOIL. The company is an integral part of PJSC LUKOIL – it's 100% subsidiary, which represents interests in the field of international oil and gas production
	Horizontal	Item expansion	PJSC TATNEFT produces a wide range of products: in addition to oil production, large-sized tires are produced, the Digital Gas Station is developing that provides related goods and services, including food
		Geographic expansion	ENI SpA operates on various geographical markets: Italy and other European countries, Africa, Kazakhstan and Asian countries, Australia, America.
Unassociated	Centered		PJSC Gazprom, along with the implementation of investment projects in the oil and gas industry, took part in the construction projects of Sochi Olympic facilities.
	Conglomerative		The Stroygazmontazh group of companies is involved in all gas pipeline construction projects that are strategically important for the Russian Federation, but at the same time it is building cultural, educational and museum complexes, as well as conducting construction of the Crimean bridge

Source: Compiled by the authors

The topic of diversification in the modern economic conditions is discussed in the world scientific literature, but an unambiguous approach to quantitative assessment has not yet been developed.

The main theoretical aspects of diversification are considered by Belik (2017). The author gives the basic definitions of the term, analyzes the existing types of diversification.

Kryukov (2014) analyzed diversification from the point of view of the strategic development of the company and its competitive. The diversification strategy for oil and gas upstream companies is considered in the study of Kim (2015).

The study of Luzgina and Semerkova (2004) is devoted to the diversification of oil and gas upstream companies under declining production at existing fields. The basic theoretical concepts such as types of diversification, development stages of vertically integrated oil and gas upstream companies are under consideration in the article. Besides, the processes of diversification of the activities of PJSC LUKOIL and OJSC Surgutneftegas are examined by them. The problems of oil and gas upstream companies and single-industry towns created on their basis have been identified, also it is noted that in the process of diversification of the activities of oil and gas upstream companies in the Khanty-Mansi Autonomous Region, it is necessary to take into account the features of the territories and established single-industry towns in order to maintain the created social infrastructure.

The study conducted by Yudin (2014) discusses the diversification of the oil and gas upstream companies on the example of PJSC Gazprom. The author reviewed the main directions of diversification of PJSC Gazprom. They are following:

- Implementation of investment projects in the new directions of gas transportation
- Development of sales market of the Asia-Pacific region
- Development of the connected activities (power industry, production and oil refining, liquefied natural gas production).

Oreshin (2012) discusses the problems of organizing production during the diversification of an enterprise. Methods for coordinating the economic parameters of various economic processes of an enterprise are proposed by him. The author identifies six groups of diversification effects: technical and economic; scientific and technical; market; organizational; social; ecological. Each of the groups is characterized by its performance indicators.

Belogurova (2014) illustrates the importance of diversification of export directions of the oil and gas industry under the sanctions. The recommendations for risk management of oil and gas upstream companies are proposed in the article of Lenkova (2018).

Diversification is considered from the point of view of its economic feasibility (Safronov and Pereverzeva, 2013), (Fil' and Artyomova, 2017). The authors analyze the problem of improving the efficiency of investments based on their use of diversification and import substitution of the economy and present a feasibility study for investments in diversifying the organization's production aimed at expanding the market niche. The topic of diversification has gained particular relevance among foreign authors after the decline in hydrocarbon prices in 2014.

The study conducted by Ferraris et al. (2016) discusses the relationship between international diversification and productivity in multinational firms based on data on the world's largest companies obtained from Fortune Global 500. The authors revealed that the productivity of companies at a certain level of diversification is higher; results were also obtained for companies targeting the domestic or international market; specializing in the manufacture of products or the provision of services.

Varouji et al. (2019) showed diversification as a natural defense against adverse economic conditions by the example of an experiment with diversified and highly specialized companies. A similar topic is raised in the work of Garrido-Prada et al. (2019). Spanish companies of the real sector of the economy applied product and geographical diversification during economic crisis. The model developed by the authors confirms the relationship between geographic diversification and productivity, while the positive effect of product diversification is observed only if combined with geographic. The results emphasize that geographic diversification is an important element of a company's strategy in an economic downturn.

A similar topic related to the study of product and geographical diversification is raised in the article of Boehe and Jimenez (2019). A study conducted on the data of 14,000 Colombian exporting companies shows that related geographical diversification leads to product diversification in the future, while related product diversification reduces future geographical diversification, while unrelated diversification increases it.

The impact of diversification on company value is considered in the article of Xiao and Xu (2019). The authors argue that the impact of diversification on the value of conglomerates in the stock market can be positive. Negative trends in assessing the value of a diversified company are not always associated with diversification, but may be caused by other factors, such as the role of the CEO. The study was conducted on data from US public companies.

The influence of diversification on the risks of the company is investigated in the article of Jafarinejad et al. (2019). A study was conducted on the data for the period of 1998-2016. The authors found that global and manufacturing diversification mitigates the negative effects of individual and global market risks, but has little impact on US domestic market risks.

Another work devoted to diversification studies its correlation with the firm's cash reserves (Atanasova and Li, 2019). The author used a sample of 17,500 companies from 12 countries over the period from 1998 to 2013, which led to the conclusion that the cash reserves of diversified companies are not less than the reserves of highly specialized firms.

3. METHODOLOGY OF THE RESEARCH

Choosing the optimal number of types of business that the company can effectively manage is an important aspect in developing a strategy. The necessary step in this case is to determine the degree of diversification of the company, which allows you to establish the relationship of this indicator with the parameters of the organization's work efficiency and choose the optimal level of diversification.

To assess the effectiveness of diversification in the company, one can use both quantitative indicators: growth in sales, increase in market share, growth in sales revenue, and financial: dividends, increase in the market value of shares and others.

An oil and gas upstream company diversification can be manifested through the following indicators:

1. Sales in various geographic markets
2. The sales of products of different types of activities (refining, oil and gas chemistry).

Given the characteristics of each oil and gas upstream company, it is advisable to consider a single indicator of diversification. The diversification indicators that may be considered for oil and gas upstream companies are presented in Table 2.

In our opinion, the two indicators are most relevant for oil and gas companies: the entropy index and the level of geographical diversification of the oil and gas company.

One of the indicators that gives the most accurate assessment of the degree of diversification of a company is the entropy index, which is based on the classifier of types of economic activity.

The index accepts values from zero to infinity, reflecting the degree of diversification of the oil and gas company. The number of activities that have a significant impact on the value of the index in itself reflects the level of diversification.

The higher the value of this index, the higher the level of diversification of the company. The maximum value of this index is achieved with a uniform distribution of all types of company activities. The minimum value is reached in the case when the company's activity is concentrated mainly on one type of activity.

The most effective measures to respond to the risks of increased competition in the external market for crude oil and petroleum products include geographical diversification, that allows redistributing the flows of products sold from one region to another. Geographic diversification also helps oil and gas companies reduce the negative effects of changes in exchange rates. An indicator that assesses the diversification of markets is the level of geographical diversification of the oil and gas company.

The level of geographical diversification of the oil and gas company shows the company's position in the Russian and foreign markets.

The index accepts values from zero to infinity, reflecting the degree of activity of the company in foreign and domestic markets. The number of markets in itself reflects the level of diversification.

The higher the value of this index, the higher the level of diversification of the company. The maximum value of this index is achieved with a uniform distribution of the company's products in various sales markets, the minimum value tending to zero, the index reaches when the company's activities are concentrated mainly on one market.

4. THE RESULTS OF RESEARCH

The company PJSC LUKOIL was chosen as an example of calculating diversification indicators. The financial statements of the company were used as a basis for calculations.

The calculation of the diversification indicators of PJSC LUKOIL, depending on the revenue from various types of activities, is presented in Table 3.

Assessing the diversification of the company according to these three indicators has a number of disadvantages. So, none of the indicators can be considered as complex for the degree of diversification of the company.

D_{g1} reflects the share of the main activity in the company's revenue. Based on the calculations performed for this indicator, it can be concluded that the share of the main type of activity (sale of petroleum products) has been growing since 2013, but this does

Table 2: Diversification indicators for oil and gas upstream companies

Diversification indicator	Formula
The indicator of the share of the total net revenue of the oil and gas company excluding revenue from the main activity (gas sales) (D_{g1})	$D_{g1} = 1 - \frac{U_{h1}}{U_t}$ where U_{h1} - total revenue from gas sales U_t - total amount of net proceeds of PJSC Gazprom of the organization
The indicator of the share of the total revenue of the oil and gas upstream company excluding revenue from the main activity (gas sales) and the second largest revenue sale of oil and gas products (D_{g2})	$D_{g2} = 1 - \frac{(U_{h_1} + U_{h_2})}{U_t}$ where U_{h2} - revenue from the sales of oil and gas products
Absolute indicator of diversification of the oil and gas upstream company (D_{g3})	$D_{g3} = n_i * D_{g1}$ where n_i - the number of types of revenue in which the organization operates
The entropy index *ID* shows the average share of each type of activity in the revenue of an oil and gas upstream company, weighted by the natural logarithm of its inverse	$ID = \sum_{i=1}^{n} P_i x \ln \frac{1}{P_i}$ where n - the number of types of economic activity of the oil and gas company; P_i - the share of revenue attributable to the i-th type of activity.
Level of geographical diversification of the oil and gas upstream company (D_a^{mar})	$D_a^{mar} = \frac{1}{n} * \sum_{j=1}^{i} (\frac{Sal_{ij}}{Sal_i} * \ln(\frac{Sal_i}{Sal_{ij}}))$ where n - the number of geographical sales markets (market segments) in which products of the i-th type of economic activity were sold; Sal_i, Sal_{ij} – the volume of sales of products of the i-th type of economic activity by the organization and the volume of sales of the products of the i-th type of economic activity in the j-th geographical market (market segment) of sales in the analyzed period, respectively

Source: Compiled by the authors

Table 3: Diversification indicators based on the company's revenue

The indicators	2013	2014	2015	2016	2017	2018
Share of the total production of the organization, excluding revenue from the sale of petroleum products (D_{g1})	0,26	0,31	0,33	0,34	0,34	0,39
Share of the total production of the organization excluding the sale of oil and oil products (D_{g2})	0,06	0,05	0,06	0,06	0,06	0,05
Absolute indicator of organization diversification (D_{g3})	1,53	1,86	1,99	2,04	2,04	2,34

Source: Compiled by the authors

not indicate the situation in other segments of the work of PJSC LUKOIL.

In the process of evaluating the D_{g2} indicator, only two main types of activity are taken into account, the choice of the type of activity may be difficult, and, therefore, the values of the indicators may be incorrect. In this case, similarly to the previous indicator, it is impossible to track the trend in other activities.

The absolute indicator of diversification of the organization also reflects the importance of the main activity, taking into account the number of additional segments of work.

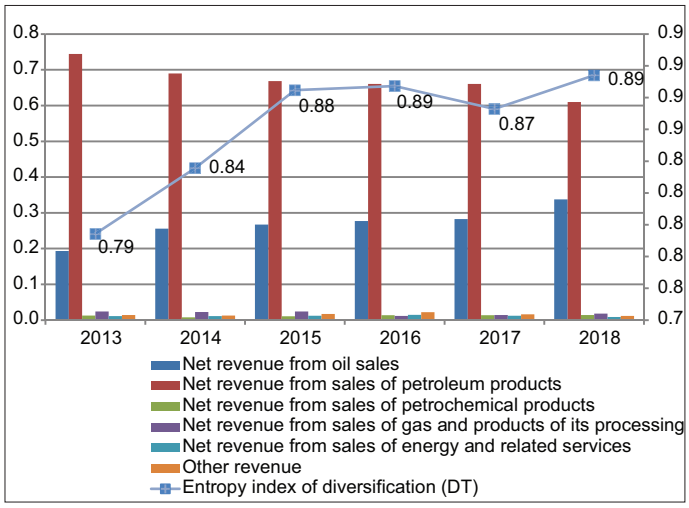
Given the shortcomings of the considered indicators, it most accurately reflects the general level of diversification of the company, since the data on all types of activities is taken into account, even if they have a small share in the total revenue.

The calculation of the entropy diversification index was performed in the context of 2013-2018 and is presented in Figure 3.

The calculations showed that in 2014-2015. The entropy index increased from 0.79 to 0.88 and from 2015 to the present is at the level of 0.87-0.89. The growth of the entropy index in 2014-2015 shows that the company's revenue after the crisis was distributed more evenly across all types of activities. The crisis in the fuel and energy complex has affected the level of diversification of the company.

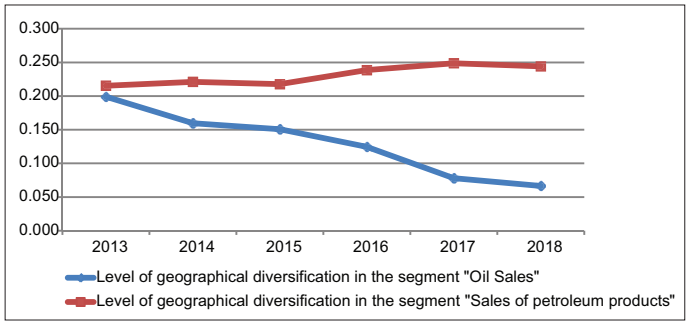
The calculation of the level of geographic diversification was made for the main activities of PJSC LUKOIL and is presented in Figure 4. Since the main revenue of this company consists of two types of activity: sale of petroleum products and sale of oil, the calculation was also performed for them.

Figure 3: Calculation of the entropy diversification index for PJSC LUKOIL



Source: Compiled by the authors

Figure 4: Level of geographical diversification for PJSC LUKOIL



Source: compiled by the authors

As it can be seen from Figure 4, the level of geographical diversification in the Oil Products Sales segment after 2015 increased from 0.21-0.22 to 0.24-0.25, which is associated with an increase in oil products sales in Russia.

In the Oil Sales segment, the level of geographical diversification is steadily decreasing due to an increase in oil sales in foreign markets. So, if in 2013 the share of oil sales to non-CIS countries was 81.8%, then by the results of 2018 it reached 95.9%.

Based on the analysis of data on the entropy index and on the level of geographical diversification, we can draw the following conclusions:

1. The crisis of 2013-2014 was a catalyst for diversification processes in the activities of PJSC LUKOIL in favor of non-core activities
2. The level of geographical diversification is quite low and is characterized by different trends depending on the segment under consideration. While the share of petroleum product sales in Russia is increasing, the opposite trend is noticeable for oil.

5. DISCUSSION

The proposed indicators have their disadvantages which can be minimized by the participation of experts in the calculations and analysis.

The entropy index measures the degree of diversification either in dynamics or in comparison with another diversified organization. Thus, the calculation of the entropy index is insufficient to assess the degree of diversification of the company and should be accompanied by detailed benchmarking with a reasonable choice of peer companies in terms of revenue, company size, and main business. Nevertheless, the entropy index better than other indicators reflects the distribution of revenue flows in the organization.

The indicator of geographical diversification will not be able to answer questions about the need to enter a particular geographical region or industry, and also to assess the need for further expansion, taking into account available resources and the competitive situation in the new market. For these purposes, additional pre-investment studies are necessary.

An additional consideration is required for the determination of regulatory indicators for oil and gas companies, both by the entropy index and by the indicator of geographical diversification, which will make it possible to more accurately assess the degree of diversification of the organization.

6. CONCLUSIONS

One of the main advantages of diversification for oil and gas companies is the increase of the competitiveness of business and the efficiency of the company through the rational redistribution of financial and production resources, and the conquest of new market segments. Each type of diversification can lead to lower risks and synergistic effects. This is achieved by risk sharing due to: output of products from various industries; increase in sales of new products in connection with the use of new sales areas; reduce costs for production, sales of products and the provision of services.

It should be borne in mind that diversification is associated with additional investment costs. At the same time, the company's costs for the development of a new line of business should not exceed the possible profit from it, since this reduces the potential profit and the value of the shares of a diversified company. Also, after a certain period of time, the effectiveness of the chosen direction of diversification may decrease, therefore, the company should be sensitive to changes in the external environment and changing needs of sales markets. Unrelated diversification is characterized by increased risks of working in a new industry for the company.

The disadvantages of diversification include the following:

- A new activity may require skills from staff that have not yet been developed and used in the existing company (for example, technological skills)
- In this strategy, insufficient attention is paid to the behavioral aspects of diversification (for example, problems of team collaboration)
- The strategy requires significant reserves
- There is a probability of an undesirable transfer of efforts from an existing enterprise to a new one may begin

- Significant investments in new technology may be required
- This is a growth strategy - it takes time to make a profit.

The calculations showed that it is advisable for oil and gas companies to use the entropy indicator of diversification and the indicator of the level of geographical diversification.

The use of the entropy indicator of diversification for strategic planning should be used when:

1. The necessity to optimize activities
2. Focus on the production of products with high added value
3. The relevance of risk reduction in case of instability of global energy prices
4. Strengthening the competitiveness of a multi-industry company.

The use of an indicator of geographical diversification may be applicable to:

1. control of sales markets
2. access to new markets
3. strengthening competitiveness in current markets.

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