

**Integral estimation of the competitiveness level of the western Ukrainian gas distribution companies**

**Olena Pavlova<sup>a</sup>, Konstantyn Pavlov<sup>a</sup>, Liliana Horal<sup>b</sup>, Oksana Novosad<sup>a</sup>, Svitlana Korol<sup>b</sup>, Iryna Perevozova<sup>b</sup>, Khrystyna Obelnytska<sup>b</sup>, Nadiia Daliak<sup>b</sup>, Oksana Protsyshyn<sup>c</sup> and Nazariy Popadynets<sup>d\*</sup>**

<sup>a</sup>*Lesya Ukrainka Eastern European National University, Ukraine*

<sup>b</sup>*Ivano-Frankivsk National Technical University of Oil and Gas, Ukraine*

<sup>c</sup>*Drohobych Ivan Franko State Pedagogical University, Ukraine*

<sup>d</sup>*State Institution "Institute of Regional Research named after M. I. Dolishnyi of the NAS of Ukraine", Ukraine*

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Innovative policy and regional management leverages should create the foundations for the “impulse” to form the Ukrainian market of natural gas and its distribution. Efficient and desirable economic reforms in the activity of the gas distribution companies of the Western region of Ukraine will contribute to increasing their competitiveness level by implementing innovative activities. The paper aims to make an integral estimation of the competitive positions of the gas distribution companies that function on the Western Ukrainian market of natural gas distribution among consumers and develop practical recommendations directed at forming and implementing the innovative policy of improving their competitiveness. To achieve the aim, the authors have developed the methodology of calculating the competitiveness level for the gas distribution companies that function on a certain natural gas distribution market of any scale. Based on the results of the conducted research, the paper shows that the competitiveness condition of most gas distribution companies of the Western region of Ukraine is either of critical – I or satisfactory – II levels. Meanwhile, it is worth mentioning that only AT “Chernivtsihaz” is characterized by the highest rate of competitiveness integral estimation among all the companies operating on the market of the natural gas distribution among consumers in the Western region of Ukraine. Therefore, it was identified as level III – “decent” level, which is the average competitive indicator.

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**1. Introduction**

The development and functioning of the Ukrainian gas sector directly depend on the processes of consumption of fuel and energy resources and trends of changes on domestic and external markets. Innovative policy and regional management leverages should become the impetus for forming the Ukrainian market of natural gas and its distribution. Introduction of innovative policy is strengthened by the urgency of improvement of the moral and physical environment of the gas distribution companies’

\* Corresponding author.

E-mail address: [popadynets.n@gmail.com](mailto:popadynets.n@gmail.com) (N. Popadynets)

(GDC) fixed assets, misbalance of the price offers of tariffs against the purchasing power of consumer demand, the use of alternative energy sources, and priority of regional methods of competitiveness stimulation.

Efficient and desirable economic reforms in the activity of the gas distribution companies of the Western region of Ukraine will contribute to increasing their competitiveness level by implementing innovative activities. Yet, the scales and level of impact of the innovative policy elements on competitiveness improvement in scientific and practical aspects are quite limited. The grounds of regional stimulation of the innovative activities implementation at the gas distribution companies and methods of competent and weighted approach to the adaptation of all market participants to the improvement of economic conditions of regional natural gas distribution market aren't developed the proper way. It stipulates the importance and need to deeply analyze the meaning, nature, structure, methods, and ways of conducting the innovative policy to improve the competitiveness level of the gas distribution companies of the Western region of Ukraine and to find the ways for regional governing bodies to stimulate their activity based on specific socio-economic peculiarities of each oblast in Ukraine. Therefore, the issues of the vector innovative policy of a region, forming of respective organizational and economic support for the solution of defined problems of the analysis of current competitiveness conditions for eight largest gas distribution companies that function in the Western region of Ukraine, and methodological and practical aspects of innovative solutions implementation in the gas distribution require systematization and generalization.

## 2. Literature review

Many domestic and foreign scientists address the theoretical approaches to defining the nature, importance, and directions of the companies' innovative activity. Meanwhile, quite a significant input in consideration of the gas distribution networks was highlighted by a range of researchers in their studies. In particular, Halyant et al. (2016; 2020) and Dzyoba and Linchevska (2014) examine the process of investment-innovative development of the gas distribution system in regions, in particular in terms of forming the infrastructure of the gas distribution systems. Yakymchuk et al. (2020) study the issue from the viewpoint of the impact of such companies on the environment abroad and in Ukraine. S. Hrubyak defines methodological approaches to evaluation of the functioning efficiency of the gas distribution systems in Ukraine, Korotia et al. (2020) determine the competitive positions of the gas distribution companies in Ukrainian regions by estimation of their functioning efficiency. Krupchak et al. (2019) define the ways of regulation of regional energy systems in Ukraine. The need for scientific and practical development of the defined problems with obligatory consideration of specific features of socio-economic conditions in Ukrainian regions emphasizes the relevance and timeliness of the research subject for securing the efficiency of the gas distribution companies in solving important and most urgent national tasks. Implementation of further theoretical research, solution of relevant problem aspects, unresolved controversial issues of methodological and applied nature related to the implementation of innovative policy and its impact on the competitiveness of the gas distribution companies have determined the further selection of the goal, tasks, and logic of the research. Nowadays, many different approaches provide the analysis-based determination of the competitiveness level of not only a certain economic entity but also a certain market it functions on within the national or regional scale. For example, the researcher Hrubyak (2013), in her studies, mentions that the price for consumed natural gas shows the functioning efficiency of the gas distribution companies because it is the main indicator. The researcher uses various methodologies, including the "existing methodology of tariffs calculation that is based on the consideration of producers' interests". In our opinion, consumers' dissatisfaction will only grow in case if the mentioned "solution" is applied because the tariffs for gas supply services and natural gas for the population will inevitably grow. Meanwhile, Tarasenko (2018) and Halyant (2020), in their studies, examine the opportunity and feasibility of dividing the process of determining the efficiency of organizations' activity into the following components: "analytical research of the condition at a certain point in time; evaluation of the dynamics of available parameters; analysis-based search for perspective opportunities". Speaking specifically about the functioning of the gas distribution companies, it is worth mentioning the scientific developments of Savko (2013). According to him, the financial condition of an organization shows the most objective values of parameters characterizing the companies' functioning. "Finance is an integral parameter". It requires thorough analytical research of solvency and financial stability parameters. Moreover, it creates the information base for calculation of parameters related to the current and strategic management of financial, material, and organizational resources of the gas distribution companies and their competitiveness parameters (Savko, 2013).

The paper aims to expand the methodological grounds, make an integral estimation of competitive positions, and develop practical recommendations directed at forming and implementation of the innovative policy of improving the competitiveness of the gas distribution companies that function on the Western Ukrainian market of natural gas distribution among consumers. The following tasks were set to achieve the mentioned goal:

- to research the vectors of forming of innovative policy of the gas distribution companies in combination of the following actions: strategies of innovative business processes; duality of innovative-investment capital;
- to develop the methodology of defining the competitiveness level of the gas distribution facilities functioning within the Western region of Ukraine;

- to synchronize the directions of innovative policy of improving the competitiveness of the gas distribution companies to achieve the “balance” between the entities on the market.

### 3. Materials and Methods

The following methods were applied in the process of the research: scientific abstraction, comparative analysis (to find common and different features of financial, material, organizational, and labor resources of the gas distribution companies of the Western region and its competitiveness); induction and deduction (to examine the impact of the processes of diversification of innovative activities and ways of financial maintenance of the gas distribution companies); statistical method (that researches the dynamics of the activity of the gas distribution companies, tabular and graphic support); methods of analysis and economic modeling (methods to estimate the activity of the gas distribution companies to outline the retrospective analysis of the processes of their competitiveness’s impact on socio-economic development of a region); specific methods (integral estimation of the competitiveness of the gas distribution companies, absolute and relative parameters) with the use of a broad range of coefficients: mobility, operability of fixed assets, depreciation of fixed assets, ratio of fixed and current assets, capital intensity; fixed assets turnover ratio; financial leverage (financial risk), financial dependence, autonomy (financial independence), financial stability, solvency (coverage), self-financing capacity, profitability of services and works, return on assets, return on equity, equity payback period, capital payback period, accounts receivable turnover; accounts payable turnover, current assets turnover coefficient, equity turnover, assets turnover; average duration of accounts payable turnover, average duration of accounts receivable turnover, average duration of equity turnover, average duration of assets turnover. Therefore, based on the results of the research of existing studies and approaches outlined by the leading researchers in the process of comprehensive research of the gas distribution companies as economic entities and their economic activity, we decide on determining the following parameters that, in our opinion, are the major factors of the innovative policy implementation. In the first place, they are designed to mirror *main components and criteria of “integral” competitiveness of the gas distribution organizations*, including the following (State Statistical service of Ukraine, 2020; Palanyuk, 2010; Synkevych, 2018):

#### 1. Absolute value of the indicator of the GDCs’ functioning with the following components:

- *logistical support*. Resource portfolio. Value of fixed assets. Value of capital investment in progress. Availability and size of equity and long-term debt funds of stock forming. Availability of own funds to form reserves. Cost of the gas distribution equipment. Tangible costs;
- *existing labor capacity*. Payroll budget. Average number of employees and average wages at the gas distribution companies. Average wages in gas, energy, conditioned air, and steam supply;
- *energy support (energy capacity)*. Income from the cost of distribution and supply of natural gas. Income from the gas supply works and retail trade. Cost of natural and liquefied gas. Net revenue from the natural gas sales. Volume of distribution and supply of natural gas. Volume of retail trade in natural gas;
- *financial support*. Retained earnings, retained loss. Size of assets, liabilities, and equity. Cost of sold products.

#### 2. Relative value of indicators of the GDCs’ functioning with the following components

- *energy support (energy capacity)*. Growth paces: cost of liquefied and natural gas, net revenues from the sales of liquefied and natural gas, revenues from retail trade in natural gas and volume of retail trade, revenues from the cost of distribution and supply of natural gas;
- *existing labor capacity*. Results of comparison of average monthly wages at an enterprise in the region. Growth pace of the payroll and average number of employed;
- *logistical support*. The value of the indicator is shown in the relative value of the assets status evaluation and efficiency of the use of the gas distribution company’s assets. The methodology and consequence of calculation of the assets status indicator for a gas distribution company and efficiency of its practical use are as follows (Konstantyuk, 2018; NAK “Naftohaz” of Ukraine, 2020; National commission regulating the energy and utilities domain, 2020; Regional gas Company, 2020; TzOV “Y-Kontrol”, 2020).

Mobility coefficient (Cm). It shows the level of assets mobility at a company. The growing coefficient is a positive trend. It is calculated the following way:

$$Cm = \frac{\text{Current assets}}{\text{Assets}}, \quad (1)$$

Fixed assets depreciation coefficient (Cd). It shows the share of the fixed assets value written off for production cost in the previous periods. The growing depreciation coefficient in dynamics is a negative trend. The value <0.5 is recommended. It is calculated the following way:

$$Cd = \frac{\text{Fixed assets depreciation}}{\text{Initial cost of fixed assets}}, \quad (2)$$

Fixed assets operability coefficient (Co). It shows the share of fixed assets that is suitable for use. It is calculated the following way:

$$Co = \frac{\text{Residual value of fixed assets}}{\text{Initial value of fixed assets}}, \quad (3)$$

Fixed and current assets ratio coefficient (Ce). The growing coefficient is a positive trend that shows growing accounting liquidity. It is calculated the following way:

$$Ce = \frac{\text{Current assets}}{\text{Fixed assets}}, \quad (4)$$

Capital intensity (Ci). It shows the indicator of fixed assets cost per hryvnya of income. The declining indicator is a positive trend. It is calculated the following way:

$$Ci = \frac{\text{Residual value of fixed assets}}{\text{Net profit}}, \quad (5)$$

Fixed assets turnover (At). It shows the share of income per hryvnya of the cost of the fixed assets. The growing coefficient is a positive trend. It is calculated the following way:

$$At = \frac{\text{Net profit}}{\text{Residual value of fixed assets}}, \quad (6)$$

- *financial support*. This direction is mirrored in the relative indicators of financial stability, profitability, and business activity of a gas distribution company. We suggest considering the methodological approaches to the calculation of these indicators in more detail:

a) relative indicator of financial stability of a gas distribution company. It is no secret that financial stability is one of the most essential features displaying the GDCs' financial condition. It is directly related to the level of dependence on investors and prospective creditors and is characterized based on the debt-to-equity ratio.

Meanwhile, the analysis of financial stability of the gas distribution company aims to research the indicators in terms of correspondence and proportionality of funding sources to form the reserves and cover current and future expenses.

Research and analysis of the parameters of stability dynamics and financial stability of GDCs contribute to determining the trends, evaluating the condition of changes in the financial stability of any type of the company's activity, and predicting perspective reserves for increasing the stability in finances. Methodology and consequence of calculations of relative financial stability indicators of a gas distribution company based on the calculation of a wide range of coefficients and efficiency of their practical use are as follows (Konstantyuk, 2018; NAK "Naftohaz" of Ukraine, 2020; National commission regulating the energy and utilities domain, 2020; Regional gas Company, 2020; TzOV "Y-Kontrol", 2020; Website for natural gas consumers, 2020).

Financial leverage (financial risk) coefficient (Cfl). It shows the debt-to-equity ratio. The use of the coefficient contributes to carrying out the most generalized estimation of GDCs' financial stability indicator because it illustrates the ratio of borrowed funds against a unit of equity.

$$Cfl = \frac{Debt\ capital}{Equity}, \quad (7)$$

Financial dependence coefficient (Cfd). It is inverse to the financial autonomy coefficient. Dynamic growth of the indicator confirms the expansion of the share of debt capital in the funding structure of a gas distribution company or the loss of financial autonomy, to put it another way. The standardized value of the indicator is  $< 2$ . If the value declines to 1, the GDC's owner secures complete funding of its functioning.

$$Cfd = \frac{Total\ assets}{Equity}, \quad (8)$$

Autonomy (financial independence) coefficient (Ca). It shows the share of a GDC's assets formed by equity. The critical value of the indicator is 0.5.

$$Ca = \frac{Equity}{Total\ assets}, \quad (9)$$

Financial stability coefficient (Cfs). It shows the share of assets created by reliable and consistent funding sources.

$$Cfs = \frac{Debt\ capital}{Equity}, \quad (10)$$

Solvency (coverage) coefficient (Cs). It shows the capacity of a gas distribution company to cover the debts by equity.

$$Cs = \frac{Equity}{Debt\ capital}, \quad (11)$$

Self-financing capacity coefficient (Csf). It shows the availability of enough current assets of a GDC to secure the funding of its needs in the process of its current activity.

$$Csf = \frac{Current\ assets}{Total\ assets}, \quad (12)$$

b) relative indicator of the profitability of a gas distribution company. Profitability is a relative indicator by its nature that characterizes the payback or profitability of certain components of total costs and production processes. Calculation of the profitability of a gas distribution company will contribute to characterizing the major indicators that represent it and make respective conclusions. The methodology and consequence of calculation of profitability for a gas distribution company and efficiency of its practical use are as follows (Konstantyuk, 2018; NAK "Naftohaz" of Ukraine, 2020; National commission regulating the energy and utilities domain, 2020; Website for natural gas consumers, 2020). Profitability of services and works (goods) (Psw). It shows the volume of goods received by a gas distribution company per hryvnya of losses sustained in the production process. The lower is the value of the indicator, the better.

$$Psw = \frac{Gross\ profit}{Cost\ of\ goods\ sold}, \quad (13)$$

Profit margin. It shows the profits of a gas distribution company from each hryvnya of sold services and final products. The higher is the value, the better.

$$Pm = \frac{Gross\ profit}{Sales\ revenue}, \quad (14)$$

Return on assets (Ra). It shows the profit per hryvnya of GDC's assets and characterizes the efficiency of the GDC's management. The higher is the value, the better.

$$Ra = \frac{Net\ profit}{Assets\ value}, \quad (15)$$

Return on equity (Re). It shows the volume of profit per hryvnya of equity. The higher is the value, the better.

$$Re = \frac{Net\ profit}{Equity}, \quad (16)$$

Equity payback period (Epp). It shows the time needed to compensate the capital of a GDC by net profit.

$$Epp = \frac{Equity}{Net\ profit}, \quad (17)$$

Capital payback period (Cpp). It shows the time needed to compensate the financial resource invested in assets of a gas distribution company by the net profit of the company.

$$Cpp = \frac{Total\ assets}{Net\ profit}, \quad (18)$$

c) relative indicator of business activity. Assessment of the business activity will contribute to carrying out the analysis of efficiency of the main activity of a gas distribution company that is characterized by the intensity of resource turnover of the organization.

Meanwhile, the efficiency of the gas distribution companies' activity is determined by the paces and acceleration of resources turnover that directly impacts the growth of respective indicators of the organization's activity. Yet, it is worth mentioning that, currently, there aren't any standardized values for the indicators of the activity of the gas distribution companies but there is an understanding that the higher is the intensity of GDCs' resources turnover, the better.

The growing pace of GDCs' resources turnover along with the high profitability is the "second" key factor of improving the financial condition of a gas distribution company. Indeed, the low assets turnover of a company shows the low efficiency of production capacities' exploitation, insufficient GDC load, and growing accounts receivable (Strishenets, 2018).

The methodology and consequence of calculation of a gas distribution company's business activity and efficiency of its practical use are as follows (Konstantyuk, 2018; NAK "Naftohaz" of Ukraine, 2020; National commission regulating the energy and utilities domain, 2020; Website for natural gas consumers, 2020).

Accounts payable turnover coefficient (Capt). It shows in numbers the frequency of emergence of GDC's debt in a certain period, which is subsequently paid. The growing value of the indicator can be reflected in the improvement in meeting the payment obligations in the process of relations with budget organizations, creditors, and suppliers or declining deferred purchase volume.

$$Capt = \frac{Cost\ of\ sold\ goods}{Accounts\ payable}, \quad (19)$$

Accounts receivable turnover coefficient (Cart). It shows how much the revenues exceed the accounts receivable. The growing value of the indicator is confirmed by the fact of product sales with deferred payment opportunity by transaction value and according to deadlines, and improving payment discipline. Therefore, the dynamic growth of the indicator is a positive fact.

$$Cart = \frac{Net\ income}{Accounts\ receivable}, \quad (20)$$

Current assets turnover coefficient (Ccat). It shows the turnover of circulating funds in a certain period and total revenues per hryvnya of circulating resources.

$$Ccat = \frac{Net\ income}{Current\ assets}, \quad (21)$$

Equity turnover coefficient (Cet). It shows the intensity of an organization's equity circulation. Growing dynamics is a positive trend.

$$Cet = \frac{Net\ income}{Equity}, \quad (22)$$

Assets turnover coefficient (Cat). The coefficient shows the intensity of an organization's total capital turnover. The growing level of current assets on the condition of the company's profitability is a positive trend.

$$Cat = \frac{Net\ income}{Assets\ value}, \quad (23)$$

The average duration of accounts payable turnover (Adapt). The indicator shows the repayment of accounts payable by a gas distribution company for an "averaging" period.

$$Adapt = \frac{Days\ in\ the\ reporting\ period}{Accounts\ payable\ turnover\ coefficient}, \quad (24)$$

The average duration of accounts receivable turnover (Adart). The indicator shows the "averaging" period of repayment of accounts receivable. The declining coefficient value is a positive trend.

$$Adart = \frac{Days\ in\ the\ reporting\ period}{Accounts\ receivable\ turnover\ coefficient}, \quad (25)$$

The average duration of current assets turnover (Adcat). The indicator shows the "averaging" period of current assets turnover and reflects the number of days necessary to transform them into monetary terms.

$$Adcat = \frac{Days\ in\ the\ reporting\ period}{Current\ assets\ turnover\ coefficient}, \quad (26)$$

The average duration of equity turnover (Adet). The indicator shows the number of calendar days in the period needed to transform an organization's equity into monetary terms.

$$Adet = \frac{Days\ in\ the\ reporting\ period}{Equity\ turnover\ coefficient}, \quad (27)$$

The average duration of assets turnover, calendar days (Adat.cd). The indicator shows the time duration of assets turnover for a gas distribution company needed to transform them into monetary terms.

$$Adat.cd = \frac{Days\ in\ the\ reporting\ period}{Assets\ turnover\ coefficient}, \quad (28)$$

### 3. Value of the risk indicator for the gas distribution companies with the following components:

a) Liquidity risk. Liquidity is among the most important indicators of the financial condition of a gas distribution company or any other. It stipulates the capacity of the gas distribution companies to pay off liabilities at any time by the assets on their balance sheets. Meanwhile, analysis of the liquidity is considerably expanded by the analysis of the gas distribution companies' solvency that represents the capacity of a gas distribution company to completely and timely pay off liabilities on a term basis (Strishenets, 2018).

Versatile analytical research of liquidity and GDCs will contribute to assessing their liquidity and creditworthiness level, etc. In their turn, the following are the major characteristics-indicators of liquidity level for a gas distribution company (Konstantyuk, 2018; NAK "Naftohaz" of Ukraine, 2020; National commission regulating the energy and utilities domain, 2020; Website for natural gas consumers, 2020).

Quick ratio (Rq). The indicator shows the level of possibility and capacity of the gas distribution companies to pay off their current liabilities, including by the accounts receivable and monetary resources. The optimal rate of the indicator is within 0.7-0.8.

$$Rq = \frac{Cash + current\ financial\ investment + notes\ receivable + accounts\ receivable}{Current\ liabilities}, \quad (29)$$

Current ratio (Rc). It shows the availability of enough current assets for the gas distribution companies to pay off their current liabilities. The value of the indicator should exceed – 1.

$$Rc = \frac{Current\ assets + Fixed\ assets\ for\ sale}{Current\ liabilities}, \quad (30)$$

Cash ratio (Rca). It shows the volume (share) of current liabilities that can be reimbursed immediately with the accessible financial resource. The value of the coefficient exceeding 0.2-0.35 is considered a decent rate.

$$Rca = \frac{Cash + Current\ financial\ investment}{Current\ liabilities}, \quad (31)$$

b) Credit risk. This type of risk includes financial instruments that can create essential credit risk in the future. It usually encompasses cash and its equivalents in other material forms and accounts receivable.

Based on the information sources in public access, in particular the “Notes” of the Annual Financial Reporting of the Gas Distribution Companies of the Western Region of Ukraine, we use the indicator the share of cash and its equivalents concentrated in one financial institution, (%).

4. *Value of the indicator of the natural gas distribution market.* The following indicators were used: length of the gas distribution networks of private, municipal, and public ownership, (km); total length of the gas distribution networks, (km); tariffs for services of natural gas distribution among consumers, (UAH per 1,000 m<sup>3</sup>) (Novosad, 2019).

Meanwhile, we also reasonably use a big range of statistical data: total size of subsidy allocated for the population to reimburse the expenditures on payment for utilities, (thous. UAH); the number of households with allocated subsidies for reimbursement of expenditures on payment for utilities, (thous. UAH); the number of households with allocated subsidies in cash to buy liquefied gas and solid and liquid heating fuel, (thous. UAH); capital investment by industrial activity types, (thous. UAH); the total amount of allocated subsidies in cash to buy gas (liquefied) and solid and liquid heating fuel, (thous. UAH); supply of natural gas, electricity, steam, and conditioned air, (thous. UAH); supply of natural gas, electricity, steam, and conditioned air against the total volumes by oblasts (oblast gas distribution companies), (%), net income and loss per one common stock, (UAH) (AT “National Stock Company “Naftohaz Ukrainy”, 2020; National commission regulating the energy and utilities domain, 2020; TzOV “Y-Kontrol”, 2020).

Therefore, to perform the most objective calculations and implement the unequivocal approach to comparing each of the abovementioned indicators between each other, each of the  $x_j$  indicators should be unified or, to put it another way, normalized to the interval  $0 \leq x_j \leq 1$ , while  $x_j = 1$  corresponds the most to the optimal values of the indicator and  $x_j = 0$  is its most unacceptable value, where  $x_j$  – is the standardized value, as it has been already mentioned. Thus, we suggest considering the value as an “initial indicator” –  $x_j^0$  (Voloshchuk, 2009).

The next step after standardization regarding the values of each initial indicator of financial-economic condition and activity of the gas distribution companies and organizations in the outlined system was to calculate the integral index of the system. The index is calculated as the generalized total of standardized values with certain individually calculated weight coefficients. Yet, it is worth mentioning that the weight coefficients were the same in our calculations:

$$I = \sum_{i=1}^n \sum_{j=1}^m k_j \bar{x}_{ij}, \quad (32)$$

where  $k_j$  – weight coefficients that determine the contribution of the  $j$  indicator to the integrated index for  $i$  period,  $x_{ij}$  – standardized values of indicators  $x_{ij}$  (Voloshchuk, 2009). Therefore, the integral index  $I$  equals 1, while all  $x_{ij}$  acquire “the most optimal” or best values, and 0 if the values are extremely negative. Furthermore, among all statistical values of the change of a given indicator’s value in time we find the minimum value –  $X_{min}$  and maximum value –  $X_{max}$ . The next step stipulates the process of “standardization” by the following formula:

$$\bar{x}_i = \frac{x_i - x_{min}}{x_{max} - x_{min}}, i = \overline{1, n}, \quad (33)$$

where  $n$  – the volume of statistical data or number of time series points (sample length).

An aggregate indicator of estimation of integral competitiveness value of the gas distribution companies in the Western region of Ukraine is given in Table 1 and Fig. 1.

#### 4. Results and discussion



As the result of the conducted research, the detailed analysis of the activity of the largest gas distribution companies functioning in the Western region of Ukraine shows that although the operating conditions and access to raw materials and to financial and labor resources markets are almost the same, the functioning efficiency of the gas distribution networks' operators is quite different. It can be observed based on the analysis of a range of indicators that characterize the economic and financial-economic condition of the gas distribution companies in the Western region of Ukraine and the possible impact of innovative policy implemented to improve their competitiveness, including the relative indicator of property status assessment and property use efficiency; relative indicator of the liquidity analysis, relative indicators of profitability; relative indicators of business activity; relative indicators of financial stability; relative indicator of financial stability assessment; absolute indicators-characteristics of the gas market in the Western region (Table 1).

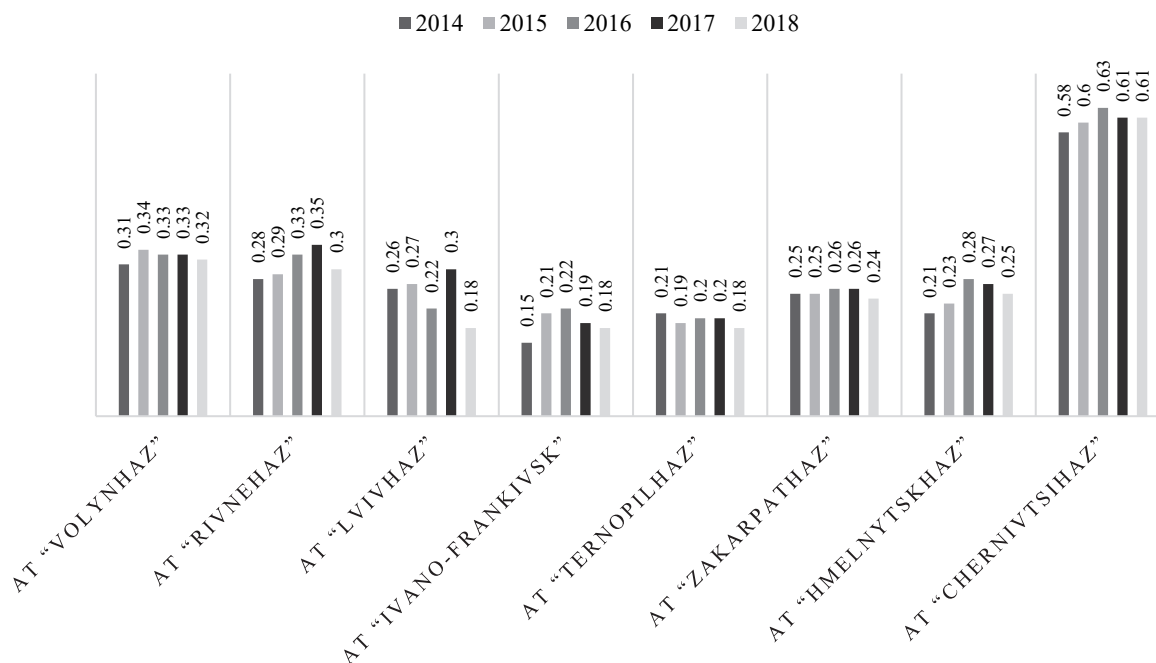
**Table 1**

The end values of calculations of absolute and relative indicators of organizational-economic activity of GDCs in the Western region of Ukraine, calculated by dynamics 2014-2018, as of 1 January 2019

№	Indicators	AT “ Volynhaz”	AT “ Rivnehaz”	AT “ Lvivhaz”	AT “ Ivano- Frankivskhaz”	PrAT “ Ternopilhaz”	AT “ Zakarpathaz”	AT “ Hmelnyshkzhaz”	AT “ Chernivtsihaz”
<b>Relative indicators of property status assessment and property use efficiency</b>									
1	Fixed assets operability coefficient (Co)	0.599	0.532	0.492	0.502	0.492	0.534	0.632	0.525
2	Fixed assets depreciation coefficient (Cd)	0.401	0.468	0.000	0.498	0.000	0.466	0.368	0.475
3	Mobility coefficient (Cm)	0.586	0.663	0.729	0.224	0.729	0.752	0.196	0.296
4	Fixed and current assets ratio coefficient (Ce)	1.414	1.964	2.688	0.288	2.688	2.203	0.244	0.425
5	Fixed assets turnover (At)	5.150	7.696	8.845	1.452	8.845	10.338	0.854	7.843
6	Capital intensity (Ci)	0.194	0.130	0.113	0.689	0.113	0.097	1.171	0.127
<b>Relative indicators of the liquidity analysis</b>									
7	Current ratio (Rc)	0.425	0.589	0.490	0.230	0.490	0.195	0.413	0.164
8	Quick ratio (Rq)	0.409	0.596	0.477	0.194	0.477	0.192	0.408	0.138
9	Cash ratio (Rca)	0.010	0.029	0.009	0.037	0.009	0.007	0.047	0.012
<b>Relative indicators of profitability</b>									
10	Return on assets	-0.284	-0.255	-0.435	-0.409	-0.435	-0.237	-0.175	0.961
11	Return on equity	0.574	1.107	0.825	2.905	0.825	0.449	-1.030	-1.042
12	Profit margin	-0.057	-0.046	-0.041	-0.270	-0.041	-0.132	-0.244	-0.069
13	Goods profitability (works, services)	-0.137	-0.106	-0.196	-0.321	-0.196	-0.247	-0.231	0.182
14	Capital payback period	-3.522	-3.924	-2.299	-2.448	-2.299	-4.223	-5.703	1.040
15	Equity payback period	1.744	0.904	1.212	0.344	1.212	2.226	-0.971	-0.959
<b>Relative indicators of business activity</b>									
16	Assets turnover coefficient (Cat)	1.963	2.300	2.128	1.004	2.128	0.845	0.609	4.929
17	The average duration of assets turnover, days	183.405	156.516	169.147	358.652	169.147	425.944	590.693	73.042
18	Equity turnover coefficient	-3.964	-9.990	-4.037	-7.137	-4.037	-1.603	3.578	-5.343
19	The average duration of equity turnover	-90.807	-36.038	-89.182	-50.441	-89.182	-224.577	100.606	-67.374
20	Current assets turnover coefficient	3.351	3.471	2.920	4.491	2.920	2.922	3.106	16.644
21	The average duration of current assets turnover	107.417	103.717	123.277	80.167	123.277	123.194	115.896	21.629
22	Accounts receivable turnover coefficient (Cart)	3.571	3.608	3.063	6.604	3.063	3.069	3.551	21.584
23	The average duration of accounts receivable turnover	100.800	99.786	117.531	54.509	117.531	117.312	101.373	16.679
24	Accounts payable turnover coefficient (Capt)	1.518	2.224	1.496	1.388	1.496	0.646	1.682	2.948
25	The average duration of accounts payable turnover	0.004	0.006	0.004	0.004	0.004	0.002	0.005	0.008
<b>Absolute indicators of assessment of financial stability</b>									
26	Total reserves	26043	22943	64833	17638	64833	14403	1307	17198
27	Available equity to form reserves	-847446	-494026	-223773	-461729	-223773	-1845741	-461290	-602408
28	Available equity and long-term debt funds to form reserves	-737536	-401937	-2122696	-376352	-2122696	-1730664	-203242	-559607
29	Total volume of main sources to form reserves	-737536	-401937	-2122696	-376352	-2122696	-1730664	-203242	-559607
30	Excess or lack of equity to form reserves	-873489	-519699	-2302606	-479367	-2302606	-1860144	-462597	-619606
31	Excess or lack of equity and long-term debt funds to form reserves	-763579	-424880	-2187529	-393990	-2187529	-1745067	-204549	-576805
32	Excess or lack of total volume of main sources to form reserves	-763579	-424880	-2187529	-393990	-2187529	-1745067	-204549	-576805
<b>Relative indicators of financial stability</b>									
33	Financial independence (autonomy) coefficient	-0.495	-0.230	-0.527	-0.141	-0.527	-0.527	0.170	-0.922
34	Financial dependence coefficient	-2.020	-4.343	-1.897	-7.110	-1.897	-1.897	5.871	-1.084
35	Financial risk (financial leverage) coefficient	-3.020	-5.343	-2.897	-8.110	-2.897	-2.897	4.871	-2.084
36	Coverage (solvency) coefficient	-0.331	-0.187	-0.345	-0.123	-0.345	-0.345	0.205	-0.480
37	Self-financing capacity coefficient	-0.791	-0.462	-0.757	-0.748	-0.757	-0.617	-0.279	-1.504
38	Financial stability coefficient	-0.377	-0.124	-0.486	0.029	-0.486	-0.486	0.525	-0.807
<b>Absolute indicators on the gas market</b>									
39	State ownership of capital, %	0	0	0	0	0	0	0	0
40	Total length of gas distribution networks, km	7308	8304	18333	14147	18333	7467	17860	7197
41	Length of gas distribution systems (of public property), km	6268	4782	17262	9317	17262	3725	5554	3542
42	Length of gas distribution systems (of municipal ownership), km	754	3252	626	28	626	1664	8470	3389
43	Length of gas distribution systems (of a GDC operator's ownership), km	232	270	402	4751	402	136	1261	65
44	Length of gas distribution systems (of other property type), km	54	0	44	50	44	1941	2575	201
45	Tariffs for services of natural gas distribution, UAH per 1,000 m <sup>3</sup> excluding VAT	713.5	725.5	722.1	713.1	722.1	711.5	595.2	723.7

Source: calculated by authors based on (AT “National Stock Company “Naftohaz Ukrayiny”, 2020; AT “Ukrtransgaz”, 2020; NAK “Naftohaz” of Ukraine, 2020; State Statistical service of Ukraine, 2020; National commission regulating the energy and utilities domain, 2020; Regional gas Company, 2020).

Based on the abovementioned and with the view to create proper foundations to from and implement innovative policy and improve the competitiveness level of the gas distribution companies of the Western region of Ukraine, Fig. 1 represents the dynamics of integral estimation indicators of the competitiveness level for the gas distribution companies of the Western region of Ukraine in 2014-2018 as of 1 January 2019.



**Fig. 1.** Dynamics of integral estimation indicators of the competitiveness level for the gas distribution companies of the Western region of Ukraine in 2014-2018 as of 1 January 2019

**Source:** developed by authors.

As it was already mentioned, the integral indicator of competitiveness for each gas distribution company functioning in the Western region of Ukraine was formed with absolute and relative indicators equal in weight and based on its position on the market of natural gas distribution among consumers. It includes the imperative consideration of risks depending on the large range of factors that together more or less promote the processes of functioning and implementation of a complex innovative policy of competitiveness improvement for the gas distribution companies that carry out their business activity within the defined limits. Considering that the value of the integral *competitiveness indicator* for the gas distribution companies of the Western region of Ukraine should reach 1, our calculations show that AT "Ternopilhaz", AT "Lvivhaz", and AT "Zakarpataz" considerably aggravated the indicator of the level of their *integral competitiveness* in 2014-2018. Therefore, taking into account our calculations of the competitiveness level of the gas distribution companies of the Western region of Ukraine, in order to carry out the most optimal ranking of the companies, it is reasonable to use the proportional scale of restrictions formed by the competitiveness level of the gas distribution companies of the Western region of Ukraine, which was suggested by Krayushkin and Kunitsyna (2013) and developed by us. Value I is critical; II – satisfactory; III – decent; IV- excellent (Table 2).

**Table 2**

Characteristics of competitive positions and advantages of the gas distribution companies of the Western region of Ukraine in correspondence with the calculated integral indicator of their competitiveness

Value of integral indicator of competitiveness	Level	Significance	Gas distribution company
0.0-0.3	I	Critical	AT "Lvivhaz" AT "Ivano-Frankivsk" AT "Ternopilhaz" AT "Zakarpataz" AT "Hmelnytskhaz"
0.3-0.6	II	Satisfactory	AT "Volynhaz" AT "Rivnehaz"
0.6-0.85	III	Decent	AT "Chernivtsihaz"
0.85-1.0	IV	Excellent	- // -

**Source:** developed by authors.

Summing up the above mentioned and based on the results of the research given in Table 2, the competitiveness condition of most examined gas distribution companies of the Western region of Ukraine was determined as I – critical and II – satisfactory level, including AT “Lvivhaz”, AT “Ivano-Frankivsk”, AT “Ternopilhaz”, AT “Zakarpathaz”, AT “Hmelnytskhaz”. The value of their integral competitiveness indicator does not exceed 0.3. Meanwhile, it is worth noting that only AT “Chernivtsihaz” among all the companies operating on the market of the natural gas distribution among consumers in the Western region of Ukraine is characterized by the highest rate of competitiveness integral estimation, which was 0.61 in early 2019. Therefore, it was identified as level III – “decent” level, which is the average competitive indicator.

## 5. Conclusion

Based on the abovementioned – the calculation of integral indicator of the competitiveness level of the gas distribution companies that function at the territory of Western Ukraine – the following conclusions can be made. The functioning conditions of the gas distribution companies of the Western region can be improved by raising the level of income of the gas distribution companies or reducing the expenses. Creating a “decent” competitive environment, efficient investment and innovative achievement of set goals, improvement of the regulatory framework, and solution of environmental problems will form the socio-economic effect emerging from adoption of the correct mechanism of pricing on the market of gas distribution among the consumers. Therefore, the conducted research of the competitiveness level of the gas distribution companies confirms the existing considerable restrictions currently peculiar to their activity, especially regarding the forming of their revenues, selection of sources of financial and investment maintenance, and needs for innovative activity, etc. It is also worth noting that nowadays modern methodological approaches to the research and further substantiation of projects on implementation of the innovative policy of competitiveness improvement for the gas distribution companies in the Western region are almost absent. It is especially relevant in conditions of the possible impact of specific technical and technological risks peculiar to regional markets of natural gas distribution. High efficiency level of the system of the innovative policy of the gas distribution companies in the Western region as one of the components of their competitiveness improvement is considerably driven by the dependence on external regulators on part of the state, especially in terms of tariffs setting. In its turn, it affects the implementation of investment attraction processes and innovative policy directed at improvement of competitiveness grounds for the gas distribution companies and prevents the modernization processes in the structure of the gas distribution networks’ operators.

## References

- AT “National Stock Company “Naftohaz Ukrainy”. (2020). Official website. Official website. Retrieved from: <http://www.naftogaz.com>
- AT “Ukrtranshaz”. (2020). Official website. Official website. Retrieved from: <http://utg.ua/utg/media/news/2020/01/v-ukrtransgazi-zmineno-strukturu-upravlinnya.html>
- Dzyoba, O. H., & Linchevska, N. M. (2014). New approaches to attraction of innovative-investment capital to the gas transportation infrastructure facilities. *Forming of market relations in Ukraine: collection of scientific papers*, 7 (158), 24-29.
- Halyant, S. R., Pavlova, O. M., Pavlov, K. V., & Novosad, O. V. (2020). Investment-innovative orientation of the gas distribution companies in a region. *International scientific journal "Internauka". Series: "Economic sciences"*, 1. <https://doi.org/10.25313/2520-2294-2020-1-5424>
- Halyant, S., Yanul, S., Pavlov, K., & Korotya, M. (2016). Characteristics of the gas transportation system of Ukraine. *Economic Journal of the Lesya Ukrayinka Eastern European National University : journal. Lutsk : Vezha-Druk*, 1(17), 31-38.
- Hrubyak, S. V. (2013). Methodological approaches to the analysis and evaluation of the functioning efficiency of the gas distribution companies. *Innovative Economy*, 8, 307-313.
- Konstantyuk, N.I. (2018). Methodological recommendations for practical and individual work on academic discipline “Assessment of the results of a company’s functioning” for students of the bachelor educational level for all education forms by specialty 6.030504 “Business economy” and specialty 076 “Entrepreneurship, trade, and stock market”. Ternopil, Ivan Pulyi TNTU.
- Korotia, M., Pavlov, K., Pavlova, O., Horal, L., Ratushniak, I., Semenov, M., Ratushniak, L., Shapovalov, Y., Anastasenko, S., Hryhoruk, I., & Popadynets, N. (2020). Determination and Management of Gas Distribution Companies’ Competitive Positions. In: Mrugalska B., Trzcielinski S., Karwowski W., Di Nicolantonio M., Rossi E. (eds) *Advances in Manufacturing, Production Management and Process Control. AHFE 2020. Advances in Intelligent Systems and Computing*, 1216, 302-309. Springer, Cham. [https://doi.org/10.1007/978-3-030-51981-0\\_38](https://doi.org/10.1007/978-3-030-51981-0_38)
- Krayushkin, V.S., & Kunitsyna N.N. (2013). Development of the methodology of integral estimation of a commercial bank’s competitiveness. *World of Science, Culture and Education*, 2, 303-306.
- Kupchak, V.R., Pavlova, O.M., Pavlov, K.V., & Lahodiyenko, V.V. (2019). Forming and regulation of regional energy systems: theory, methodology, and practice. Lutsk: SPD, publishing house “Volynpolihfar”.
- NAK “Naftohaz” of Ukraine. (2020). Official website. Retrieved from: <http://www.naftogaz.com>
- National commission regulating the energy and utilities domain (2020). Official website. Retrieved from: <https://www.nerc.gov.ua>

- Novosad, O. V. (2019). Methodological and practical approaches to determining the competitiveness level of the gas distribution companies of the Western region of Ukraine. *Ukrainian Journal of Applied Economics*, 4(3), 376-385.
- Palanyuk, N.A., & Petrenko, V.H. (2020). Economic analysis: handbook. Agricultural education.
- Regional gas Company. (2020). Official website. Retrieved from: <https://104.ua/ua/rgc/id/regionalna-gazova-kompanija-9539>
- Savko, O. Y. (2013). Analytics of the trends of gas distribution companies' financial condition. *The Strategy of Economic Development*, 33, 157-166.
- State Statistical service of Ukraine : government website 1998–2019. (2020). Kyiv. Retrieved from: <http://www.ukrstat.gov.ua/>
- Strishenets, O.M., & Novosad, O. V., Korotya, M.I. (2018). Diversification of innovative activities at the gas distribution companies of Ukraine in the context of European experience. *Economic Journal of Lesya Ukrayinka Eastern European National University*, 2(14), 7-12.
- Synkevych, N.I. (2018). "Economic analysis": Lectures program. Ternopil. Ivan Pulyui TNTU.
- Tarasenko, L.O. (2018). Addressing the issues of estimating the functioning efficiency of the gas distribution companies. *Finance, Accounting, Banks.*, 1(23), 170-182.
- TzOV "Y-Kontrol". (2020). Official website. Retrieved from: <https://youcontrol.com.ua>
- Voloshchuk, R.V. (2009). Approaches to standardization of economic indicators. Inductive modeling the complex systems: collection of scientific papers. K.: MNNC ITS and MON of Ukraine, 1, 17-25.
- Website for natural gas consumers (2020). Official website. Retrieved from: <https://104.ua/ua/rgc/id/regionalna-gazova-kompanija-9539>
- Yakymchuk, A., Valyukh, A., Diugowanets, O., Bilyk, R., Pavlov, K., Pavlova, O., Batkovets, N., Popadynets, N., & Hryhoruk, I. (2020). Public Administration and Economic Aspects of Ukraine's Nature Conservation in Comparison with Poland. In: Kantola J., Nazir S., Salminen V. (eds) *Advances in Human Factors, Business Management and Leadership. AHFE 2020. Advances in Intelligent Systems and Computing*, 1209, 258-265. Springer, Cham. [https://doi.org/10.1007/978-3-030-50791-6\\_33](https://doi.org/10.1007/978-3-030-50791-6_33)



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