

Methods of Estimation of Structure Changes of Innovation Development of Chemical Enterprises

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Abstract: Methods for the assessment of structural changes in the development of innovative chemical enterprises were considered. The structural changes of chemical enterprises were detailed described under the influence of an external environment. An optimistic assessment of external environmental factors was put forward and the absolute and relative indicators of structural changes were formulated. Modified quantitative factors were determined and the influence of structural changes on the efficiency of the chemical industry.

Key words: Strategy • Strategic management • Competitive strategies • Diversification • Effectiveness of the Corporation • External environment • Internal environment • Productivity • Costs • Competitiveness • Quality

INTRODUCTION

In accordance with the theoretical concepts of strategic management for the implementation of the tasks facing the corporation it is necessary to develop an appropriate strategy for achieving competitive advantage in the target market. In order to optimize the selection of these solutions the calculation growth areas of the chemical enterprise is used.

The effectiveness of the chemical plant and the selection of goods - these are the main factors meet the needs of consumers. Market needs are generated external market environment, a change which - an important problem of choosing the strategy of the company. The products are in conflict with the changing external environment, which requires a corresponding change in production.

The choice of strategy is proved productivity and efficiency. The first relates to refine production costs. The second is related to the satisfaction of the demand in the market, to increase that takes time. The calculation of the efficiency needed to ensure the survival and success

of the organization and performance is due to the cost. Peter Drucker suggests that " performance allows you to perform all necessary and effective - find it necessary". [1]

However, for many companies, the goal is to achieve high productivity and cost reduction. The essence of the performance is to identify new means of meeting the needs of consumers. In this case, the goal - cost reduction - pointless if there is no demand in the market. The company have to be highly cost effective and only then do the rest : the performance, quality, etc. At the same time, in order to maximize profits and strengthen the position of enterprises in the market, it is necessary to take into account the effectiveness of leveraging resources in the production, distribution of goods and market penetration. In addition, the need to effectively utilize personnel of the company, his skills, ability and skills.

Compliance with the environment and the corporation is determined by its ability to adapt to develop a strategy adequate to the changing environment, continually optimize its innovative strategies and indicators of current activity [2].

In order to increase the competitiveness of the chemical industry, the development of chemical plants will be planned on the basis of innovation, that is, growth will be sustained and the impact of fluctuations in world prices for the products of the chemical potential of the country will be reduced. Therefore, discusses the possibility of increasing the competitiveness of chemical plants and the role of innovation in technology and organization of the corporation [3, p.27].

Main Part: Evaluation of structural changes in the industry, as a result of innovative development of the corporate units is determined based on the indices. (L.S Kazintsev, G.E Edelgauz, V.V. Bessonov) [3, p.27]. There are two forms of the structure parameters : specific gravity and its variation and, changes in the specific weights of the individual parts together as a result of the corporate units of time testify to the change in the structure, ie, about structural changes. There are absolute and relative indicators of structural changes. First show the speed of change in the shares together with the innovative development only during the period and the second - reflect the intensity of the changes in the structure - (densities of individual parts together). Therefore, in this paper we use:

- The composite indicator "absolute" structural change, which was built on the basis of a simple standard deviation, the deviation from the mean values of corporations :(1)
- the relative rate of structural change in the form of a weighted average of the quadratic coefficient of variation :(2)

The ratio between the coefficients of the "absolute" and relative structural changes, is estimated as:

$$\sigma_{f_1-f_0} = \sqrt{\frac{\sum (f_1 - f_0)^2}{n}} \quad (1)$$

- The relative rate of structural change in the form of a weighted average of the quadratic coefficient of variation:

$$\sigma_{\frac{f_1}{f_0}} = \sqrt{\frac{\sum \frac{(f_1 - f_0)^2}{f_0}}{f_0}} \quad (2)$$

$$\sigma_{\frac{f_1}{f_0}} > \sqrt{n} \cdot \sigma_{f_1-f_0} \quad (3)$$

ie coefficient of relative structural changes more than the coefficient "absolute" structural changes over than \sqrt{n} times. Moreover, changes in the structure coefficients reflect the structural changes that are equal to zero only at constant structure. Index of structural changes at constant structure is one and not every change in the structure causes the change in the index of structural change, ie, structural changes do not always have an impact on the change in the average level of the phenomenon in the sample as a whole "[4, p.145]. This is determined by Lasperes:

$$\frac{\sum x_0 \cdot f_1}{\sum x_0 \cdot f_0} = 1 + r_{x_0 i_f} \cdot v_{x_0} \cdot \sigma_{i_f} \quad (4)$$

where $r_{x_0 i_f}$ - the correlation coefficient between the basal levels of the average of a set of separate parts (x_0) indices and densities of these parts together ($i_f = \frac{f_1}{f_0}$);

v_{x_0} - coefficient of variation of the average of baseline levels;

σ_{i_f} - standard deviation of the index densities of individual parts together [4, p.158].

Exploring the problem of structural change as a result of innovative development of corporate groups in the industry, the author agrees with G.E. Edelgauz, that "... not in the same chain analysis to determine the full impact of the factors and the full impact of structural change " [5, p.133]. Justifying the need for the study of structural changes in the industry by developing innovative corporate groups, the author believes that the uneven development of the individual factors is manifested only in a related factor, enhancing or reducing its impact. Structural changes lead to an additional change in the total result. In this connection it is necessary to build a system of interconnected indices where the action volume and quality of feature should be separated into the influence of factors in the case of a uniform change in the members of the aggregate and the effect of the structural shift.

Professor G.E. Edelgauz first section of the structural shifts in the two species. By the structural shift of the first type refers to a share of the members of the aggregate, have in the base period are different levels of quality trait. The second kind of structural shift - is the total dependence of the dynamics of change in the proportion of members of the population having a different rate of change in the qualitative trait [5, p. 140]. The author proposes a system analysis of the impact of structural changes, which simplifies the existing settlement system:

Table 1: Assessing the impact on the result of non-uniform changes in the volume of individual members of the population.

Factors	Full action	Including:	
		with different levels of quality basic feature (Laspeyres index)	Different rates of change factors (Paashe index)
Volume	$\frac{\sum N_1 V_0}{\sum N_0 V_0}$	$\frac{\sum N_1 V_0}{\sum N_0 V_0}$	-
Quality	$\frac{\sum N_1 V_1}{\sum N_1 V_0}$	$\frac{\sum N_0 V_1}{\sum N_0 V_0}$	$\frac{\sum N_1 V_1 \cdot \sum N_0 V_0}{\sum N_1 V_0 \cdot \sum N_0 V_1}$
Including	change in the basic amount of the aggregate	$\frac{\sum N_0 V_1}{\sum N_0 V_0}$	-
	overall change factors	$\frac{\sum N_1 V_1 \cdot \sum N_0 V_0}{\sum N_1 V_0 \cdot \sum N_0 V_1}$	1,0
	Total	$\frac{\sum N_1 V_1}{\sum N_0 V_0}$	$\frac{\sum N_1 V_0}{\sum N_0 V_0} \cdot \frac{\sum N_0 V_1}{\sum N_0 V_0}$
			$\frac{\sum N_1 V_1 \cdot \sum N_0 V_0}{\sum N_1 V_0 \cdot \sum N_0 V_1}$

a) determined the influence of uniform changes in volume quantities exerted on the overall result and b) assessing the impact of non-uniform changes in the volume of individual members of the population, with a base period are different levels of quality trait, the overall result.

On the basis of Tab. 1 examines the impact of different rates of change in the level of feature and non-uniform change in volume values on the overall result. Determined by the overall effect of the uneven changes in bulk quantities, including the effect of structural change : a) due to the different levels of quality basic feature and b) because of the different pace of growth factors [5, p.141-144]. The sequence of this decomposition is shown in tab. 1 and the general framework for analyzing the average level of quality sign for the factors is presented in Fig. 1.

As a result, different measure determined by three changes in the qualitative factors and the impact of structural change, corporations, investigating its structural changes, as noted in the works of V.A. Bessonova and M. Turyntsevov [6], L.A. Dedov, J. Eisner [7], O.J. Krasilnikova [8], V.M. Ponomarev [9] and other. V.A. Bessonov notes, that " structural changes - a consequence of differences in the rate of growth elements together " [6, p.175]. L.A. Dedov and Y.A. Eisner, exploring the specific structural cycles, just say, " The structure of the economic system or object is

understood in this case as its share structure, each of which is characterized by a uniform internal component" [7, p.229]. Thus, defines the term " structural change " as a transition from one structure to the other of the object of its structure" [7, p.229]. L. A. Dedov shares a common rate of economic growth (N) into two components: the investment growth (n1) and growth, which associated with structural changes (n2) [7, p. 87-88].

O. Krasilnikov notes, that "measure the degree of relationship of various structural changes in the system is possible using correlation coefficient... given that the relationship between the structural changes in the corporation is non-linear" [8, p.69]. As a quantitative measure, he introduces the "coefficient of interaction between structural shifts (K) - a number that indicates the ratio of the quantitative characteristics of interacting shifts (the creation of innovative corporations):

$$K = \frac{I_r}{I_1 + I_2 + \dots + I_n} \tag{5}$$

where

K - interaction rate of structural change in the corporation, I_r - index of the resulting structural shift in the corporation,

I₁, I₂, ..., I_n - interacting codes shifts corporate structure [8, p.71].

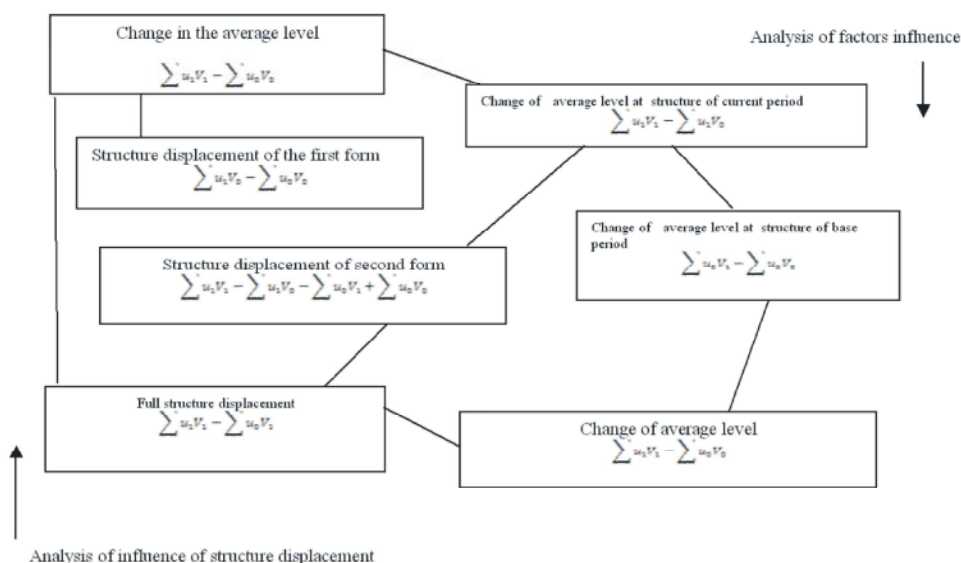


Fig. 2.1: Analysis of the average level of quality feature on the factors [5, p.149 - 151]

Investigation of the dynamics of individual (private) shares - chemical industry (production) entering into a corporate bond on the basis of innovation is defined as:

$$W_t^i = \frac{W_t^i}{\sum_i W_t^i} \text{ where } i = \overline{1, n} \quad (6)$$

However, the measurement of the dynamics of a particular share does not give us the idea of changing the structure of the totality of the industry as a whole. Therefore, V.A Bessonov notes the need for "the use of indicators of structural changes, which are analogous to the summary economic index" [9, p.176]. In the statistics of the stochastic approach to the construction of collective economic indices, in which the composite indicator of structural change is obtained as a measure of the scattering distribution of individual indexes (as an indicator of structural changes) as follows:

$$D_{t_1, t_2} = \left(\sum_i w^i (r_{t_1, t_2}^i - \bar{r}_{t_1, t_2})^2 \right)^{1/2} \quad (7)$$

where

w^i - weight, $w^i > 0$ $\sum_i w^i = 1$;

r_{t_1, t_2}^i - logarithm of the price index of goods i in time t_1 and t_2 ;

\bar{r} - corresponding to the weighted average of the basket.

As the V.A Bessonov, "Chain index of structural changes $d_t = D_{t-1,t}$, resulting ratio of the indices of neighboring periods, quantifies the change in the structure at each time step and allows you to specify which of the successive intervals of time structure of the population exposed to a significant change and in which - at least. On the other hand, basic index of structural shifts $D_{1,t}$, allows to establish, in what measure at the heart of structural shifts the tendency lies and in what measure they are only result of irregular fluctuations» [9, p. 180,181]. «The solution of a task of the analysis of an orientation of structural shifts requires attraction of the additional information, for example, planning of new corporate structure that will allow to analyze dynamics of structural distinctions between the flowing and allocated structure» [9, p. 182].

According to the author, such statement of a question of need of distinction of processes «intensity and change of structural shifts» is objective and allows to carry out the quantitative and high-quality analysis of occurring economic processes.

As the generalizing characteristic of structural changes which quantitatively in pairs reflects degree of discrepancy of shares of separate chemical corporations, is offered «the indicator not compliance»; which is measured by the amount of absolute values of differences between, for example, two shares of chemical corporations in a chemical complex of the region, the country:

$$d^{1,2} = \sum_{i=1}^n \left| \lambda \frac{1}{i} - \lambda \frac{2}{i} \right|, \quad (8)$$

where λ_i^1 and λ_i^2 - shares of i -th chemical corporation of an industry in the region, country.

So, there were researched both structural shifts and their interrelation with economic growth therefore, the following indicators were offered: «measure of structural changes - δ » и «economic growth - Eg» [10, p. 1-11]:

$$\delta = \frac{1}{t_2 - t_1} \sum_n \left[\omega_{t_2}^n - \omega_{t_1}^n \right]^2, \quad (9)$$

where ω_n - share of the n -th sector in release during the t -th period of time.

$$Eg = \frac{1}{t_2 - t_1} \cdot \frac{\sum_n y_{t_2}^n - \sum_n y_{t_1}^n}{\sum_n y_{t_1}^n} \quad (10)$$

where y_n - release of the n -th sector in release during the t -th period of time.

By results of calculations on the basis of data for the researched period, an indicator $\delta=0,0012$, a $\ominus p=0,0011$, т.е. that is fall of rates of economic growth was observed. As a result:

- There is no accurate interrelation between changes of structure and cycles in the short-term periods;
- Long-term structural changes have positive correlation with economic growth.

On the basis of these conclusions the author considers that it doesn't contradict provisions of the neoclassical economic theory on short-term intervals of time and to Shumpeter's views at long-term processes. So, on short-term intervals of time, influence of structural changes on economic growth is impossible as at macroeconomic level it has cumulative nature of this process. Exception are options of shock changes in group of the chemical organizations.

In addition to *structural models* the author considered also *spatial models* of an assessment of industry structural changes as a result of innovative development of chemical corporate forming. So, if measurement of structural changes in a chemical industry, as a result of innovative development of corporate forming on the basis of index models for objects of microeconomics has wide nature, the solution of a similar task for macroeconomic level requires use of other mathematical tools and research methods that is connected with a number of features of objects of the macroeconomic nature: It is connected with a number of

features of objects of the macroeconomic nature 1. in large volume and complexity of solved tasks; 2. availability of cumulative effect of factors of the various economic nature; 3. synergistic effect of macroeconomic systems.

Problems of structural shifts were considered at macroeconomic level, in case of change of structure of an industry in connection with the innovative growth and development of corporate forming. The indicator of growth of a public product is provided in the form of an index of an index of Laspeyres on products amounts:

$$I = \frac{\sum g_1 \cdot P_0}{\sum g_0 \cdot P_0} \quad (11)$$

(here g – amounts of products of the corresponding periods and p – basic prices).

For a quality evaluation of structure and the factors determining structural shifts a chemical complex, the author offered Fischer's index:

$$K = \frac{1}{2} \left(\frac{\sum_j b_{ij}^{\circ} y_j^{\circ}}{\sum_{i,j} b_{ij}^{\circ} y_i^{\circ}} - \frac{\sum_j b'_{ij} y_j^{\circ}}{\sum_{i,j} b'_{ij} y_j^{\circ}} \right) + \left(\frac{\sum_j b'_{ij} y_j^{\circ}}{\sum_{i,j} b'_{ij} y_j^{\circ}} - \frac{\sum_j b'_{ij} y'_j}{\sum_{i,j} b'_{ij} y'_j} \right) \quad (12)$$

(here b_{ij} - coefficients of complete costs and y_j - an end product; the upper indexes specify year to which these indicators belong).

Such representation of a general indicator allowed «to spread out structure shifts to two factors: the shifts determined by technological measurements in case of level of final requirements of base year (the result received in the first bracket) and the shifts determined by changes of level and structure of final public requirements (the second bracket)» [11, p. 43].

As a result the author allocated two groups of problems. The first group is connected with basic prices, when for a comparability of shift of structure and growth rate. The second group of questions is connected with classification of various structures of corporations. Moreover, the assessment of structural changes carried out in one period of time for all elements of researched set. M.A. Butina in work [12, p.687-695] offered an indicator of an assessment of structural shifts, (that is innovative development in the form of merge of a number of the entities in corporate educations), for a row of years in a type:

$$S^t = \sum_{i=1}^n w_i^0 \left| \prod_{\tau=1}^t \frac{g_i^\tau}{G^\tau} - 1 \right| \quad (13)$$

where

G_τ - growth rate of all set in the τ -th year;

g_i^τ - growth rate the i -th components (the enterprises, technologies, the organizations, productions, etc.) in the τ -th year

w_i^0 - specific weight the i -th components at the beginning of the period.

The author offers also other indicator of a tendency of structural shifts, as the ratio $C^t = \sum_{i \in I^*} |w_i^t - w_i^{t-1}|$ to annual shift.

where I^* - set of numbers of a component for which the directions of shifts remains invariable. The author it is offered to estimate the directions of structural shifts by an indicator of monotony of the structural shifts, under review like $M^t = C^t/P^t \in [0,1]$, where

$M^t = 0$, if all w_i^t change the directions;

$M^t = 1$, if all w_i^t keep the directions.

For the characteristic of behavior of structure in the period of $[0,T]$, the author, as well as G. Minasyan, suggests to use an average value of structural shift

$$P_{cp} = \frac{1}{T} \sum_{t=1}^T P^t \quad (14)$$

and an average value of monotony

$$M_{cp} = \frac{1}{T} \sum_{t=1}^T M^t. \quad (15)$$

For convenience of interpretation the indicator of structural shifts will be transformed so that the interval of its change lay in the range from zero to unit:

$$I_{st} = (2/\pi) \cdot \arccos(\varphi_t) \quad (16)$$

Geometrical interpretation of structural shifts extended, in the world since 1985. The single index of structural changes was offered the UN:

$$\cos \theta = \frac{\sum_i S_i(t) \cdot S_i(t-1)}{\sqrt{(\sum_i S_i(t)^2) \cdot (\sum_i S_i(t-1)^2)}} \quad (17)$$

where $S_i(t)$ - share of value added of the i -th industry in the total amount of value added in the t -th year.

θ - corner between two vectors $S_i(t-1)$ и $S_i(t)$, in degrees.

In development of it, the UN was offered also by growth of real value added by one degree of structural change between the periods of $t-1$ and t .

Barkhin G. I. and Chesnokov A.S., offered new approach to measurement of structural changes, especially on long intervals of time [13, p. 251-258], as, possibilities of use of a single index of structural changes are limited as, its use is possible only when researching structural dynamics for the small period of time;

Use of this indicator correctly when studying stable economic structures, with small fluctuations of specific weights of industries during the considered period of time.

These shortcomings the system of indicators, calculated through dispersion and a mean square deviation, precisely estimating structural shifts and having the following appearance is deprived [13, p.251-254]:

$$R(X,Y) = \left(\sum_{i=1}^n (x_i - y_i)^2 \right)^{1/2} \quad (18)$$

CONCLUSION

Thus, the offered system of indicators was approved by the author in case of research of influence of structural shifts as a result of strategic management by innovative development of corporate forming of the chemical Russian Federation complex.

As a result, «Transition of structure occurring during some long period from one condition doesn't go to another on the shortest way and on some curve, extends at the time of economic crises and is narrowed before them; in case of an exit from crises small movement in the opposite direction is observed, in other words, the lifting happening after crisis some reduces a distance between structures at the initial and final moments of the period» [13, p.257]. Analyzing indicator changes the R, author determines that $R > 50\%$ values witness about «lack of a tendency in structure movement that is shown in chaotic and various in the direction oscillatory process and vice versa, values R, witness about focus of structural dynamics» [13, p. 258].

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