PECULARITIES OF THE PROGNOSIS ELABORATION OF SOME INDUSTRIAL BRANCHES AND FIELD

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ABSTRACT: *The paper presents the principal indicators of territorial location of industry which are the purpose to realize a general orientation in the foundation of location decision of an enterprise in the analyzed territory. Also the paper proposes the manner in which, using some mathematical functions, we can model the development of some industrial sub-branches. These functions are used in the prognosis studies for the extrapolation of dynamic rows of the industrial production included in the statistic data.*

KEY WORDS: *territorial location of industry, criteria of industry location, indicators of industry location, extrapolation of dynamic rows, the development prognosis, industrial sub-branches and fields.*

JEL CLASSIFICATION: *H68, M29.*

1. INTRODUCTION

The forecast involves the anticipation and probabilistic evaluation of future phenomena and processes in the economic, technical-scientific, technological, social, ecological fields, etc., starting from their previous evolution and using a set of methods and techniques for obtaining information. regarding their perspective tendencies. Forecasting is a scientifically determined assessment, with a high degree of probability, of possible, quantitative and qualitative developments, in a certain area and over a well-determined time interval, called the forecast horizon.

The forecasting instruments in which the forecasting activity materializes are called forecasts.

We include: macroeconomic forecasts, forecasts on synthesis problems, with complex character, forecasts on branches and economic sub-sectors, forecasts in territorial or regional profile, forecasts on basic economic-social units and forecasts on products and product groups. Between these categories of forecasts there are connections

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of mutual conditioning that must be considered in their elaboration. The elaboration process therefore follows a certain logic, starting with the elaboration of the macroeconomic forecast because it provides the general orientations and coordinates in which the other categories of forecast must be designed and drawn up.

Macroeconomic forecasting addresses the overall problems of economic and social development. Within it we study the probable evolution, in several variants, of the main indicators of development, regarding: population and the structure of employment; gross and net domestic and national product and their use for accumulation and consumption; industrial and agricultural production and the structure on the branches; economic efficiency; the volume and structure of imports and exports; priority areas of scientific research and technological development; population incomes, etc.

The forecasts by branches and sub-branches are elaborated in greater or lesser number, according to requirements. The practice emphasized the need for such forecasts to be drawn up at least on the following groups of branches: resources of raw materials and energy; metallurgy and machine building; wood exploitation and processing; the light and food industry; transport and telecommunications; the building materials industry, etc.

Forecasts on complex synthesis problems are developed for priority problems, which are of interest to all branches and fields of activity, such as: developing the raw material base, preparing the staff, scientific research and technological development, population consumption, environmental protection, etc.

The territorial forecasts outline variants of the development of the different areas, that is, they tackle problems of the regional evolution, such as: the dynamics of the production, the evolution of the population and its structure, the resources of labor force and their use, the evolution of the resources of natural raw materials and the possibilities of capitalization.

2. INDICATORS OF TERRITORIAL LOCATION OF THE INDUSTRY

In Romania, the criteria considered to be valid in case of industry location, refer to: the transport expenses, operating expenses and capital expenditure. These criteria allow the calculation of some indicators for 3-4 variants of location.

The location indicators have the target to realize some general orientations in the decision substantiation. The most used indicators are:

a. the transport distance:

- for raw materials and final products the weight represents the transported quantities. This indicator takes into account all the supply sources and merchandising demands, but it doesn’t consider the different freight rates for raw materials and final products.

Even more the indicator doesn’t reflect the different volume of investments and neither operating expenses in each possible variant.

For these reasons, the average distance of transport can’t be used at a time when the other criteria give the contrary indications.

b. the weight coefficient:

$$K_g = \frac{\sum_i G_{m_i}}{\sum_j G_{f_j}}$$

where: G_{m_i} - the weight of raw materials i ;

G_{f_j} - the weight of final materials j.

A too great value of the weight coefficient (K_g) indicates the impossibility of enterprise location in the analyzed territory.

c. the coefficient of two total transport costs (the cost of raw materials and the cost of final products):

$$K_c = \frac{\sum_i C_{m_i}}{\sum_j C_{f_j}} = \frac{\sum_i G_{m_i} \cdot d_{m_i} \cdot tr_{m_i}}{\sum_j G_{f_j} \cdot d_{f_j} \cdot tr_{f_j}}$$

where: C_{m_i} , C_{f_j} - the costs of raw material and final products;

d_{m_i} , d_{f_j} - the distance of transport;

tr_{m_i} , tr_{f_j} - the unitary tariff of raw materials/final products.

d. the complex minimizing indicator:

- quantifies the freight rates, the investments and operating expenses (equivalent expenses).

It has a special structure which reflects separately the freight rates of all the component factors according to the relation*:*

$$C_r = \sum G \cdot t'_r \cdot d + \sum c'_{loc} \cdot Q = \sum \left(V_t \cdot t'_r\right) + \sum c'_{loc} \cdot Q = \sum c'_t \cdot d + \sum c'_{loc} \cdot Q$$

where: G - the weight of the materials / transported products / number of workers / energy quantity;

V_t - the transport volume in t+km / travelers –km (it results from the multiplication of the annual volume of transport with the distance). In the transport volume are included: the quantity of materials, fuel, energy, final products and mass of workers;

t'_r - the tariff of transport on unity of volume;

d - the distance of transport for each kind of transported resources;

Q - the value of annual production;

c'_{loc} - the equivalent unitary expenses of product (without expenses of afferent transport). It indicates that in the cost are comprised also the proper investments under the form of losses due to annual assets, on the basis of correction of the normalized coefficient of efficiency

$$C_r = \underbrace{\left[\sum (G \cdot d)(Inv_t \cdot q + t_r)\right]}_{A} + \underbrace{\underbrace{\left[\sum (Inv_m \cdot q + C_m) M\right]}_{B} + \underbrace{\left[\sum (Inv_q \cdot q + C_{pr}) Q\right]}_{C}}_{D}$$

where: A - the equivalent transport expenses;
B - expenses for materials;
C - operating expenses;
D - the equivalent expenses of location place;
Inv_t - the specific afferent investments for enlargement of transportation means and ways;
Inv_m - the specific investments afferent to the materials;
Inv_q - the global specific investments (direct and collateral) on the unit of product, at the location place;
Q - coefficient of efficiency normalized on the economy (0,1 or 0,15);
t_r - the non-equivalent tariff of transport on the unit of volume of transport (for raw materials, products and workers);
C_m - the unitary costs f materials (inclusively fuel and energy), without the expenses of transport;
C_{pr} - the operating expenses on product at the location place;
M - the quantity of transported materials.

The global specific investments(Inv_g) are determined according to the relation:

$$Inv_g = \frac{(Inv_d + Inv_{rc} + Inv_m + Inv_{ag} + Inv_{oc}) \cdot q - C_h}{Q}$$

where: Q - the value of annual production;
Inv_d - the total direct investments in fixed capital and circulating capital (without investments in workers residences and acquisition of building ground);
Inv_{rc} - investments in residences built by the enterprise;
Inv_{oc} - the communal and urban investments afferent to building of industrial unit;
Inv_{ag} - the assimilated cost of cultivated land established on the basis of losses agricultural products (annual net income during 20 years) as a result of with drawing from the circuit of the cultivated land. It is calculated on the basis of capitalized rent:

$$Inv_{ag} = \frac{V_n}{i}$$

where: V_n - annual income;
i - interest rate.
Inv_m - immobilized investments during the building period;

$$Inv_m = \sum Inv_a (n_i - 0{,}5)$$

where : Inv_a - investments made annually.
C_h - annual rent from workers residences.

3. EXTRAPOLATION OF DYNAMIC ROWS OF THE DEVELOPMENT PROGNOSIS OF THE VARIOUS INDUSTRIAL SUB-BRANCHES AND FIELD

The development of some industrial sub-branches can be modeled with the help of some mathematical functions.

Afterwards these functions were used in the prognosis studies for extrapolation of dynamic rows of the industrial production comprised in statistical data.

The mathematical functions describe the relation formed between two economic dimensions of industrial sub-branches considered as mathematical variables, on the basis of whose the evaluation of the levels proved in expectation can be permitted

The mathematical modeling, through the functions, starts from the idea of maintaining of some real relations (non-existence of perturbations) between the analyzed indicators.

The most frequent used method of prognostication is the method of ***extrapolation***.

Extrapolation of dynamic rows, as prognosis method, has the disadvantage that it can't take into account the changes which can appear in future, the relation between the economic dimensions and the appearance of new influence factors.

However, this method has a wide use because it allows a first evaluation upon the future evolution of an economic process which, evidently, must be associated with the results obtained by the using of other methods.

The extrapolation can be realized also with the help of mathematical functions, whose using acquires an economic signification, in the conditions when the considered dimensions represent a real interdependence.

In case of a simple correlation between two economic variants (for example: production and investments) is used a function $y = f(x)$ (when the variable y depends on variable x).

Mathematically, x is an independent value (investments) and y – dependent variable (production); f(x) has denomination of ***function of correlation.***

Often the dependent value is the time, the function of correlation becoming in this case $y=f(t)$. As a result, the industrial production (y) is forecasted in the future only in function of past evolution, f (t) becoming a ***function of trend*** (tendency).

$$y = f(x_1, x_2, K, x_n)$$

where one of the variables can be the time.

At the same time is known the fact that the economic processes present extremely variable evolutions: some of them are stationary, the other are increasing, slowly decreasing, they have ***thresholds*** of discontinuity or have limits of saturation (superior/inferior).

Also there are the processes which, after a rigid evolution, mark a process of inflexion, after that the rates of evolution diminish and tend to certain limits of saturation, after that the rates of evolution decrease and tend to some superior or inferior limits of saturation. Such phenomena can be studies with the help of the ***logistics functions.***

The acquirement of some satisfactory results depends on the choice of function which could describe the better the analyzed economic process.

Just for this the determination of kind of function is one of the important stages of the calculations of extrapolation of dynamic rows.

As at present there aren't an universally valid method of choice of kind of function, for the extrapolation of dynamic rows it is necessary to accomplish some helping calculations with statistical and analytical characteristic, which offer the possibility of orientation upon of kind of indicated function.

With the view of realization of this desideratum it is possible to utilize the following methods:

a. the analogy with graphic representation of statistic data:

- in this sense, an indication is obtained on the evolution of economic analyzed dimensions and this allows that, by the analogy with the aspect of known curves, it is possible to find one or more functions which could be utilized for extrapolation.

The graphic representation of statistic evolution offer also an indication upon the modality how is manifested the evolution of economic process (strongly increasing, slowly increasing or of saturation). This representation helps in choosing of the function and on its basis will be modeled the economic phenomenon which will be forecasted.

b. statistic method:

- it allows the choice of best function for extrapolation of economic studies process, in the conditions in which were established more functions whose evolution approximates the dynamic rows.

In this sense, considering – for example – that 3 functions: f(x), g(x) and h(x) were kept, which approximate the statistical series y (t) for t = y_1, y_2.....y_n, then can be calculated, with the help of respective function, the adequate values, written in the following table:

Table 1. Statistical values of function y

	t = 1	**t = 2**	**...**	**t = n-1**	**t = n**
y – statistical values	y_1	y_2	...	y_{n-1}	y_n
y – values calculated with function f	y_1^f	y_2^f	...	y_{n-1}^f	y_n^f
y – values calculated with function g	y_1^g	y_2^g	...	y_{n-1}^g	y_n^g
y – values calculated with function h	y_1^h	y_2^h	...	y_{n-1}^h	y_n^h

The function which will be selected is that one which will ensure, for the data of past period, ***the most high degree of correlation***, the smallest average square deviation expressed percentage or the smallest coefficients of inequality (proposed by H. Theil).

As a matter of fact, these calculations are accomplished on the basis of soft packages on the computer.

c. analytical method:

- starts from the analysis of past evolution of the economic dimensions y and x. for determination of function y = f(x), its associate functions are utilized: absolute and relative derivatives and functions of elasticity.

The growth o fan economic phenomenon is determined by the calculation of the differentials on the point t, according to the relations:

$$\frac{dy}{t} = y_t - y_{t-1}$$

$$\frac{dx}{t} = x_t - x_{t-1}$$

With the help of the finite differences, the points of associate functions are calculated, using the relation of ***place of definition****:*

$$f(x) = \frac{dy}{dx}$$

The values, which the respective functions will have, will be calculated with the help of:

- absolute derivative:

$$(x_2) = \frac{dy}{dx}\Big/ t = 2 = \frac{y_2 - y_1}{x_2 - x_1}$$

M

$$(x_n) = \frac{dy}{dx}\Big/ t = n = \frac{y_n - y_{n-1}}{x_n - x_{n-1}}$$

- relative derivative:

$$(x_2) = \frac{dy \cdot \frac{1}{y}}{dx}\Bigg/ t = 2 = \frac{y_2 - y_1}{y_2(x_2 - x_1)}$$

M

$$(x_n) = \frac{dy \cdot \frac{1}{y}}{dx}\Bigg/ t = n = \frac{y_n - y_{n-1}}{y_n(x_n - x_{n-1})}$$

- function of elasticity:

$$\left(x_2\right) = \frac{dy}{dx} \cdot \frac{x}{y} \Big/ t = 2 = \frac{x_2\left(y_2 - y_1\right)}{y_2\left(x_2 - x_1\right)}$$

M

$$\left(x_n\right) = \frac{dy}{dx} \cdot \frac{x}{y} \Big/ t = n = \frac{x_n\left(y_n - y_{n-1}\right)}{y_n\left(x_n - x_{n-1}\right)}$$

The points obtained for these three associate functions are represented graphically and are compared with the graph of corresponding known functions.

The analytical method is indicated especially for the processes which don't present thresholds of discontinuity.

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