THEORETICAL ASPECTS REGARDING MODELS USED IN THE ANALYSIS OF COMMERCIAL COMPANIES

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Abstract

The issue of the analysis of companies is a particularly important one in the structure of the national economy. We know that companies(companies) operate on the market under competitive conditions. However, each of the enterprises shall contribute to the formation of the production of that entity and, by aggregation, to the formation of gross domestic product.

Unisectoral models refer to micro-scale demand, with detachment to the macroeconomic loop that must always be in close correlation, at least between two factorial elements. Thus, it is primarily about the labour market and the need for employees, and on the other hand about employment and the investments that are made in the national economy.

Estimates of matrix elements in the case of microeconomic entities have a particularly important role, and therefore in any analysis should be started from the production function of Cobb – Douglas, as well as with reference to other works carried out by a number of researchers and economists.

The demand for capital, labor, materials and materials to meet the production needs of society are important, and therefore they must be given the right attention in any production function that tries to identify the trends that companies are trying to keep in the production process.

In order to achieve this objective, to present the importance of the models of the enterprise sector, we have started from the theoretical situation that such an analysis implies, going further methodologically to establish the functions that are important and that we have identified and can constitute an element in microeconomic analyses.

In order to achieve the proposed objective, we used a complex methodology, starting primarily from the synthesis of the vision of some economist researchers regarding the formalization of the business sector *model to the use of data and structural elements that are important for the purpose pursued. We have also used a number of statistical-econometric relationships that give meaning to the theoretical analysis undertaken.*

Keywords: *capital, labor, raw materials, resources, GDP, developments.*

JEL classification: *C10, D20*

Introduction

The article *Theoretical aspects regarding models used in the analysis of commercial companies* starts from the fundamental idea that the modelling of the enterprise sector must be a main way of carrying out an analysis at this level. Starting from the expected demand and taking into account the internal and external conditions, we must reach a level of competitiveness by the analyzed company. In this context, we have identified the unsectoral model expressed in constant prices, in which we have introduced the factorial elements underlying production.

Equation systems created for the enterprise sector are presented in the sense that demand is predominant on the basis of production. The approach to this is a perspective to identify relationships in the production process and beyond, going to production models. In this regard, we have put emphasis on the Cobb-Douglas model (production function).

Macroeconomic models most frequently assume that according to the demand for domestic production to be met, the current production of enterprises could give the results that the owners, the financiers, are pursuing.

It is most commonly assumed that the level of stocks adapts to the level of sales. A brief reference in this regard must be made because by development stocks we mean those finished products or semi-finished products that must be taken into account in order to ensure the continuity of production.

Next, we dealt with the issues of addressing a number of issues relating to equations that explain the demand for inputs and give concrete expression to the structure of the production function. The starting point is the production functions in which the potential production is linked to the inputs of the factors of production, given a particular technology that it is easy to understand that each producer, each firm seeks to improve in order to obtain the most consistent results.

The production functions take several forms, the most common and used being the Cobb – Douglas production function. For the sake of simplicity, in exposing the ideas further we will use the Cobb – Douglas production function transformed by making logins in both members of this equation, thus obtaining the functions we want to analyze.

At the same time, we have stopped at the function of demand for jobs, which has an important form and which explains the way in which employment is employed, the limits of creating unemployment and, above all, it calls into question the extension of the fixed capital demand function, also determined by the way in which the demand for employment can also be met.

Another sub-point of this article is the function of fixed capital demand and business investment which is another important aspect in microeconomic modeling.

The demand for fixed capital is primarily faced with the existing stock, but the demand may also increase as a result of the way in which the unoccupied population (free, unemployed or in retraining) can be an important element in the labour market to be considered by any investor, any owner of companies.

Of course, the demand for fixed capital is also confused with the possibilities of modernization because in the current conditions we are talking about the modernization of the industry and not about re-industrialization. In this way, research, development and innovation are essential elements that must be taken into account.

The impact of employment is important because a technical program must be closely linked to the opportunities offered by the labour market through unemployed, unemployed or retraining people who are looking for employment appropriate to the specificities of those companies.

Literature review

In this article, for illustration, some parameter estimates have been presented, based on studies of a large bibliography. Thus, Anghelache, G.V. and Anghelache, C. (2009) use a series of statistical-econometric methods and models in financial analysis taking into account risk and profitability indicators. Atkeson, A., Kehoe, P. (2005) are concerned with modeling and measuring organizational capital. Bartel, A.P. and others (2014) studied the effects that human growth and productivity have on activity in the health sector. Ciobanu, A. (2006) makes a thorough analysis on the essential elements in achieving the performance of the enterprise. In the same direction are directed the studies of Gheorghiu Al. (2012), who publishes an extensive work on the economic and financial analysis at the microeconomic level. James, S.V. (2018) was concerned about the influence that labor has on the profitability of the enterprise, thus addressing a model of spectral analysis. Newbold, P., Karlson, L.W., Thorne, B. (2010) turned their attention to statistical and mathematical analyses useful for business management, and Robu, V., Anghel, I., Berban, E.C. (2014) turned their attention to the analyses from the economic-financial point of view of the enterprise.

Methodology, resources, results and discussions

Modeling the enterprise sector has a long tradition and as a consequence we will start by describing the modelling process as it is applied in the patterns determined by demand. We will assume that companies (companies) operate in the commodity and labour markets under conditions of imperfect competition. We also believe that the expected demand for those products is predetermined and we take into account the external conditions of the activities, including the availability of labor, loans, the competitiveness of the surrounding firms, etc.

In unisectoral models, the macro-scale demand for goods and services of firms will be obtained from a well-known accounting identity (all variables in constant prices):

$$X_t = C_t + G_t + J_t + AR_t + (E_t - M_t) \quad (1)$$

where: X_t is GDP,

C_t is the personal consumption of the household,

G_t represents the actual expenditure of public institutions,

J_t represents the real gross investment expenditure,

AR_t is the increase in stock,

E_t is the export,

M_t is the import.

In multisectoral models, either the bridge equations will be constructed by linking the final demand components with the sectoral output through the input-output sub-models, or the approximations of the sub-models will be applied. This procedure is usually approached in two steps. In the first step, the gross production demand of *the* Q_{ti} industries is obtained and in the second step the demand for value added (net production) X_{ti} is determined. Therefore, in a matrix notation:

$$Q_t = \Gamma_t^C C_t + \Gamma_t^G G_t + \Gamma_t^J J_t + \Gamma_t^R \Delta R_t + \Gamma_t^E E_t - \Gamma_t^M M_t \quad (2)$$

Where: Q_t , C_t... are the vectors of the components of gross production and final demand,

Γ_t^i is the matrix linking component *i* of final demand with the gross output of certain industries, and

$$X_t = A_t Q_t \quad (3)$$

where: A_t is the matrix of technical coefficients (uniform use of intermediate goods).

Estimates of the elements of the above matrices and vectors can be obtained every two years or once a year. Therefore, they are often considered constant, especially with regard to quarterly models. Otherwise, they are updated, being treated either as Γ^{i}temporary functions or functions of relative prices.

The equation systems created for the enterprise sector will be set out below in detail, assuming a predetermined demand for the output of the sector. The early approach will be demonstrated first, at the starting point, which represents the relationships in the production process in the production functions.

The appropriate reversal of production functions has paved the way for the creation of functions that explain the demand for the main factors of production: fixed capital and employment.

Then the impact of neoclassical concepts will be framed. We will assume that equation systems for the enterprise sector are achieved by solving the problem of optimization under conditions of imperfect competition. The equations will explain the output, the demand for factors of production, i.e. fixed capital (investments), employees and their working time, as well as producer prices and average wages.

As outlined above, macro econometric models most frequently assume that according to equations (1) or (2), domestic production demand is met, taking into account the current production of enterprises. An intermediate step in achieving this demand has been introduced in several models by analyzing adjustments in stocks of finished products.

Suppose that companies planning their production take into account, in addition to the expected demand for their products, the necessary increase (decrease) of existing stocks:

$$X_t = S_t + \Delta V_t \tag{4}$$

where: S_t represents sales

V_t represents the stocks of finished goods

It is most commonly assumed that the level of stocks adapts to the level of sales. Therefore, we can write:

$$\ln V_t = \beta \ln S_t + \xi_t \tag{5}$$

The output request can be approximated by the following nonlinear equation:

$$\ln X_t = \alpha_0 + \alpha_1 \ln S_t + \alpha_2 \Delta \ln V_t = \alpha_0 + (\alpha_1 + \alpha_2 \beta) \ln S_t - \alpha_2 \ln V_{t-1} + \xi_t \tag{6}$$

Expected sales are adjusted here for planned changes in inventories. The above relationships are sometimes extended by an explicit introduction of expectations regarding production and stock. Some authors have suggested introducing adaptive expectations. The expected result will be obtained from the following equation:

$$\ln X_t - \ln X_{t-1} = \lambda(\ln X_t^* - \ln X_{t-1}) + \mu_t \quad (7)$$

where is the expected result determined in (X_t^*6).

The expected volume of stocks shall be determined from (4) V_t^* as follows:

$$\ln V_t^* = \beta \ln S_t \quad (8)$$

Therefore, after substitution, the following equation becomes a dynamic extension of equation (6) and will be obtained:

$$\ln X_t = \lambda\alpha_0 + (1-\lambda)\ln X_{t-1} + \lambda(\alpha_1 + \alpha_2\beta)\ln S_t - \lambda\alpha_2 \ln V_{t-1} + (\mu_t + \xi_t) \quad (9)$$

The estimate of = 1,2 that β was obtained for the model (9) indicated that stocks increased more than proportionally compared to the rate of increase in sales. X = 0,68 showed that the differences between expected and actual production in the previous quarter significantly affected the current level of production. An alternative procedure would involve a further dynamization of the above equation and the use of the ECM to estimate the parameters of the equation in the short term.

We will now address a number of issues concerning the nails that explain the demand for inputs and the production function.

In the first macro econometric models, the assumption that production is demand-driven, was followed by the assumption that the next step in shaping the production process should involve a derivation of demand for inputs, i.e. demand for fixed capital, jobs and raw materials, materials and other intermediate inputs, including imported products.

The starting point is the production functions in which the potential output is linked to the inputs of the factors of production, taking into account the particular technology. If the functions are reversed, i.e. resolved for certain factors of production, the functions of that request can be derived. The functions explain the demand for fixed capital and, indirectly, for its growth (investments), the demand for employment and working time, as well as the demand for raw materials, materials and energy (including imports of intermediate products). In multisectoral models, demand will be properly disaggregated.

In the world literature, many forms of production functions have been proposed and discussed. The first is the Cobb-Douglas production function assuming constant elasticities in relation to the factors of production, namely:

$$X_t = BA_tK_t^{\alpha}N_t^{\beta}e^{\varepsilon_t} \qquad (10)$$

where: A_t is the total factor productivity (TFP),

K_t is fixed capital (constant prices),

N_t is the employment rate,

ε_t it is a term of disturbance,

$\alpha > 0$ is elasticity to fixed capital,

$\beta > 0$ is elasticity in relation to employment,

$\alpha + = \beta v$ level of homogeneity; if $v = 1$, then it does not return to scale.

The second is the constant replacement elasticity function (ESC), respectively:

$$X_t = \gamma[\delta K_t^{-P} + (1-\delta)N_t^{-\rho}]^{-v/\rho} \qquad (11)$$

where: γ is the efficiency of the parameter of the production process,

δ is the parameter measuring the intensity of the impact on fixed capital,

$\rho > 0$ is the parameter related to the substitution elasticity, $\delta_{K,N} = 1/(1-)$ if 1, the function is reduced to ($\rho\rho \rightarrow 10$),

v is the level of homogeneity indicating the scale yields.

The functions of demand for a given factor of production will be derived from an appropriate reversal of the production function. For the sake of simplicity, we will use the Cobb-Douglas production function transformed by making logins of both parties:

$$x_t = b + a_t + \alpha k_t + \beta n_t + \varepsilon_t \qquad (12)$$

The function of the fixed capital demand shall take the following form:

$$k_t = c - \gamma a_t + \gamma x_t - \beta\gamma n_t - \gamma\varepsilon_t \qquad (13)$$

where: $\gamma = 1 / \alpha$ and $c = - b / \alpha$.

A direct use of this form in the estimation process has a drawback, since a high collinearity between production and occupation can be expected. If no return to the scale is assumed, i.e. + = 1, then collinearity can be avoided by making appropriate transformations of the above function. They lead to the determination of either the capital/production function ($\alpha\beta K_t/X_t$) or the capital/labour function (K_t/N_t). Thus, the following will be determined:

• capital/production function:

$$k_t - x_t = c - \gamma a_t - \beta\gamma(n_t - x_t) - \gamma\varepsilon_t \quad (14)$$

where the capital-production ratio depends on the labour-production ratio, and the reciprocal of this function represents the productivity of fixed capital which depends on labour productivity.

• fixed capital / labor productivity

$$k_t - n_t = c - \gamma a_t - \gamma(n_t - x_t) - \gamma\varepsilon_t \quad (15)$$

Collinearity between *Xt* output and fixed capital *Kt* can be avoided assuming that there are no yields at scale. With this hypothesis, we can determine the equations that explain either the employment-production ratio (*Nt*/*Xt*) or the employment-fixed capital ratio (*Nt*/*Kt*) that will be used in estimating the number of jobs:

• Occupancy / production function:

$$n_t - x_t = d - \mu a_t - \alpha\mu(k_t - x_t) - \mu\varepsilon_t \quad (16)$$

The employment-production ratio decreases due to the increase in the capital-production ratio and the PTF ratio. The converse of this function defines the function of labor productivity.

• The function of employment / fixed capital:

$$n_t - k_t = d - \mu a_t - \mu(k_t - x_t) - \mu\varepsilon_t \quad (17)$$

The number of jobs increases, if the capital-production ratio and PTF increase. The reversal of the function allows for an alternative derivation of the ratio of fixed capital to employment, then comparing this ratio with the capital-to-production ratio.

In the above discussion, only the technological properties of the production process were taken into account. However, it is already recognized in the early models that entrepreneurs who make decisions about a production process, including generating demand for inputs, pursue the results of optimization, that is, of maximizing profit (or minimizing costs), under conditions of imperfect competition.

The profit maximization process can be presented simply as:

$$max \sum_{t=0}^{\infty} \beta^t (P_t X_t - WP_t N_t - R_t K_t) \quad (18)$$

where: X_t is determined from the production function (10),
P_t is the production price,
R_t is the fixed capital price,
WP_t is the average nominal salary.

Solving this optimization problem results from the specifications of the long-term equations, which explain the demand for inputs that additionally takes into account the impact of prices. The function of the fixed capital demand now takes the following form:

$$k_t^* = c - \gamma a_t + \gamma x_t - \beta\gamma n_t - v(r_t - p_t) - \varepsilon_t \quad (19)$$

where the additional explanatory variable is the actual price of fixed capital R_t / P_t. Its higher level is associated with lower demand.

The function of the job application shall take the following form:

$$n_t^* = d - \mu a_t + \mu x_t - \alpha\mu k_t - v(wp_t - p_t) + \xi_t \quad (20)$$

where the additional explanatory variable is the real salary, and its increase reduces the demand for employment.

Conclusions

From the study of this article emerges a series of conclusions that are worthy of consideration in the proper management of a company (enterprise). First of all, the production programming must, in fact, take into account the way in which the correlation of the three factors of production, namely capital, labor and resources, is ensured. The three capital items must be set at an appropriate level, which will ensure the possibility of carrying out the activity without contradictory aspects, leading to losses.

Microeconomic models are just as important as those at the macroeconomic level. In many circumstances, from the microeconomic models we detach the structural aspects of the national economy and, as a consequence, we can identify the trend of evolution of the result of the evolution of the global macroeconomic result, the Gross Domestic Product. At the same time, however, from the macroeconomic strategy we can draw the necessary elements for each company regarding the trend and prospects of further evolution.

The direct use of these models is important for companies because the parameters on the basis of which the company's activity can be forecasted for the following year or a longer period of time are obtained.

It is true that, in all those circumstances, account must be taken of the possibility of anticipating the way in which the economy in general and the economy of a commercial company in particular evolve.

Bibliography

1. Anghelache, G.V. and Anghelache, C. (2009). *Risk and profitability – Basis of the financial analysis*, Metalurgia International, XIV (12), Special Issue, 120-121
2. Atkeson, A., Kehoe, P. (2005). *Modeling and Measuring Organization Capital*, Journal of Political Economy, no. 113 (5), 1026-1053
3. Bartel, A.P., Beaulieu, N., Phibbs, C., Stone, P. (2014). *Human Capital and Productivity in a Team Environment: Evidence from the Healthcare Sector*, American Economic Journal: Applied Economics, no. 6 (2), 231–259
4. Ciobanu, A. (2006). *Analiza performanţei întreprinderii*, București: Editura ASE
5. David-Sobolevschi, I.M. (2015). *Analiza cheltuielior, veniturilor și rentabilităţii firmei*, Editura Universitară, București
6. Gheorghiu Al. (2012). *Analiza economico-financiară la nivel microeconomic*, Editura Economică, București
7. Iacob, Ș.V. (2018), *The Spectral Analysis of Labor Force and Profit of Construction Materials Distribution Companies in Romania Analogue Spectrum of Light in Physics*, International Journa l of Academic Research in Accounting, Finance and Management Sciences 8 (3), 53-62
8. Newbold, P., Karlson, L.W., Thorne, B. (2010). *Statistics for Business and Economics*, 7th ed., Pearson Global Edition, Columbia, U.S.
9. Robu, V., Anghel, I., Berban, E.C. (2014). *Analiza economico–financiară a firmei*, Editura Economică, București
10. MINA-RAIU, Laura, BUCURA, Isabelle-Alexandra, RAIU Cătălin Valentin, ”Transposing good practices in the field of Quality Management in Japan, within Romanian Public Administration”, Romanian Statistical Review, nr. 2 /2021, ISSN/eISSN: 1018-046X / 1844-7694, pp. 62-74.
11. RAIU Cătălin Valentin, JUKNEVIČIENĖ, Vita, ”The Science of the State. A Comparative analysis of Statistical National Offices in the European Union”, Romanian Statistical Review, nr. 2/2021, pp. 14-28, ISSN/eISSN: 1018-046X / 1844-7694.