SOME ASPECTS OF IMPROVING THE METHODOLOGY OF ECONOMIC ANALYSIS

Merab JIKIA
Ivane Javakhishvili Tbilisi State University
merab.jikia@tsu.ge

Abstract
The main methodological peculiarity of economic analysis is that it can not only identify cause-effect relationships, but also provide their quantitative characterization. In other words, it ensures to measure the size of the impact of the factors affecting the performance of a company. This allows us to provide an accurate diagnosis on the conditions of economy and develop proper recommendations based on its outcomes. Therefore, the main purpose of economic analysis is to divide the object of study into fragments. For determining the number of the affecting factors and the size of the impact of each of these factors, the more simple elements the object of the study is represented, the more likely it is to understand the essence of the case and provide more definite conclusions. Obviously, the fragmentation of the analytical object depends on the purpose of analysis and the maximum possibility of its fragmentation. In this regard, in terms of market economy, particular importance is paid to the in-depth analysis of the improvement of production efficiency indicators, like capital productivity and labor productivity.

Keywords: *Capital productivity, labor productivity, modernization, scientific-technical progress, labor organization, non-manufacturing costs, social factors.*

JEL Classification: *D24, O11, O33, O47*

I. INTRODUCTION

There are different indicators used for general characterization of the effectiveness of using core assets: a) capital productivity (the ratio between the cost of commodity goods and average annual cost of core production assets); b) capital-output (inverse indicator of capital productivity); c) profitability (the ratio between profit and average annual cost of core production assets); etc. Capital productivity, which shows the volume of the goods (services) produced per core production assets of the value of 1GEL, is one of the most important among the above indicators.

II. GENERAL ANALYSIS

There are different factors affecting the changes in the level of capital productivity. These factors can be grouped as shown on the figure (see the figure below).

The first level factors, which impact the productivity of core production assets include:

a) Changes in the ratio of active part of core assets in total value of assets;

b) Changes in the productivity of active part of core assets:

$$Ф = Ф^{\alpha} \times K^{\alpha}$$

Where: $Ф$ is the productivity of core production assets;

$Ф^{\alpha}$ is the productivity of active part of production assets;

K^{α} is the share of active part in core production assets.

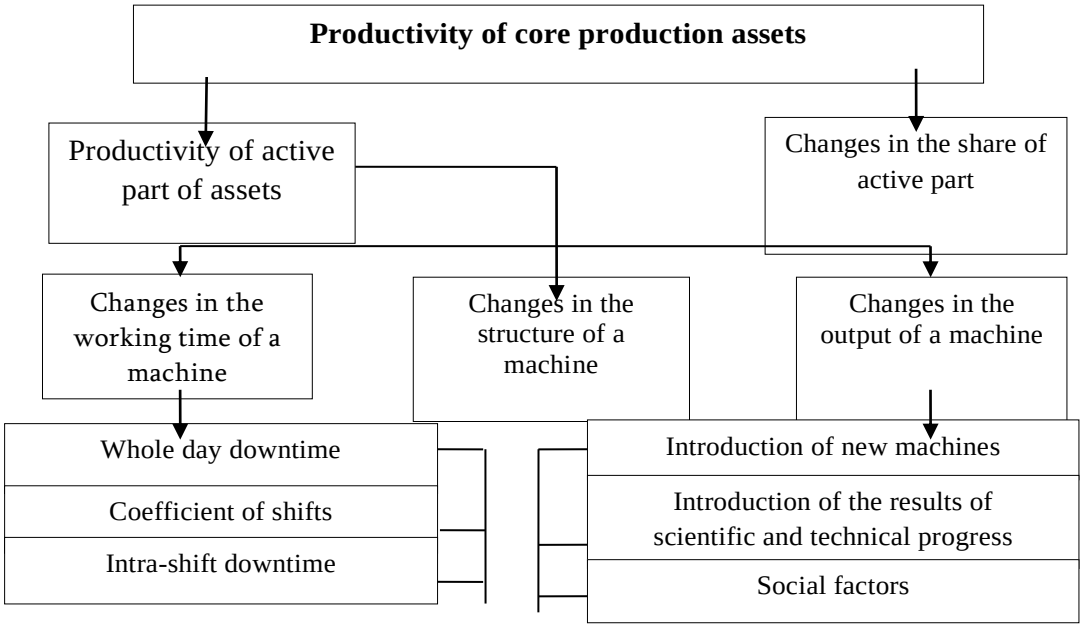
The extent of the impact of an individual factor is determined by using the absolute difference method:

a) $\pm \Delta_1 = \left(K_1^{\alpha} - K_0^{\alpha}\right) \times Ф^{\alpha}$

b) $\pm \Delta_2 = \left(Ф_1^{\alpha} - Ф_0^{\alpha}\right) \times K^{\alpha}$

Where: Δ_n is the extent of the impact of an individual factor;

0 and 1 are planned (basic) and actual size of individual indicators.



Productivity of the active part of core assets (technological machines) depends directly on its structure, working hours and average output per hour. The following factor model can be used for the analysis:

$$\Phi^{\alpha} = \frac{N x T x q}{F^{\alpha}}$$

Where: Φ^{α} is productivity of the active part of core assets;

F^{α} is average annual value of active part of core production assets;

N is average annual number of technological machines;

T is annual machine hours per technological machine;

q is output per machine-hour.

We can further extend the factor model for the productivity of machine assets if we present the working time of each machine as multiplication of the total number of working days throughout the year (d), coefficient of shifts (P) and average duration of shifts (t) and the average annual value of technological machines as multiplication of its quantity (N) and average value per unit (f). In this case, the formula for the factor model of productivity will be as follows:

$$\Phi^{\alpha} = \frac{N x d x P x t x q}{N x f} = \frac{d x P x t x q}{f}$$

The extent of the impact of each factor on the productivity of machines is calculated by chain replacement method and for determining the impact of the above factors on the productivity of core production assets, we need to multiply the value of the impact of each factor by factual share of active part of core assets in total core assets:

$$\pm \Delta \Phi_i = \pm \Phi_i^{\alpha} \times K_1^{\alpha}$$

For determining the extent of the impact of the 3rd level factors on capital productivity, we need to know how the production capacity has changed as a result of modernization or introduction of new machines. For this purpose, the volume of the goods produced after the introduction of new machinery should be compared to the volume of the goods produced during the use of old machinery and divide the difference between them by actual average cost of technological equipment:

$$\Delta \Phi_m^{\alpha} = \frac{\Sigma T_i x q^{II} - \Sigma T_i x q^{I}}{F_1^{\alpha}}$$

Where: T_i is the working time of i-machines after its replacement (modernization) till the end of the reporting period;

q^{II} is the quantity of the goods produced per machine hour after replacement (modernization) of machines;

q^{I} is the quantity of the goods produced per machine hour before replacement (modernization) of machines;

F_1^{α} is the actual average annual value of active part of core production assets;

The same method is used to determine the change in capital productivity as a result of introduction of scientific-technical progress with the purpose to improve production organization and technology:

$$\Delta \Phi_{n}^{\alpha} = \frac{ST_i x q^{II} - ST_i x q^{I}}{F_1^{\alpha}}$$

The extent of change in capital productivity due to the impact of social factors (improving the qualification of workers, improvement of work and recreation conditions, recreational activities, etc.) is calculated using the following formula:

$$\Delta \Phi_{c}^{\alpha} = \Delta \Phi_{q}^{\alpha} - \Delta \Phi_{m}^{\alpha} - \Delta \Phi_{n}^{\alpha}$$

Where: $\Delta \Phi_{q}^{\alpha}$ is the change in capital productivity of active part of core assets caused by the change in the quantity of production in one machine hour;

$\Delta \Phi_{m}^{\alpha}$ is the change in capital productivity caused by the introduction of new machines or modernization of the old ones;

$\Delta \Phi_{n}^{\alpha}$ is the change in capital productivity caused by the introduction of scientific-technical progress.

The impact of the 3rd level factors on the productivity of the core production assets is calculated by multiplying the increase in the productivity of the machines due to the impact of i-factors by actual share of the active part of assets in the total value of assets:

$$\pm \Delta \Phi_i = \pm \Phi_i^{\alpha} \times K_1^{\alpha}$$

Finally, if we want to identify how the impact of the 1st, 2nd and 3rd level factors changed the volume of production, we need to multiply the change in the productivity of core production assets caused by the impact of individual factors by actual average annual value of core production assets:

$$\pm \Delta V_i = \pm \Delta \Phi_i \times F_i$$

Labor productivity shows efficiency of particular labor. It is calculated by the amount of goods produced by the living labor per unit of time. Its increase is an important precondition for increasing production and its efficiency.

Improving labor productivity is the most important factor for increasing the volume of production and reducing the cost of production. It leads to the systematic improvement of the material welfare of manufacturing workers and increasing their salaries. In addition, labor productivity should be improved before the salaries increase, as this is the a precondition for reducing cost of production.

The most common indicator of labor productivity is the average annual output per worker. For calculating this indicator, the volume of product (services) should be divided on the average number of workers by comparable prices:

$$W = \frac{V}{N}$$

In the process of the analysis, it should be determined what was the impact of changes in the average number of workers and the average output of one worker compared to the planned indicators or the previous corresponding period on the volume of products (services). Chain replacement method or absolute difference method can be used to calculate the impact of the above factors on the volume of the goods produced:

$V_0 = W_0 x N_0 V_1 = W_1 x N_1$
$\Delta V = V_1 - V_0$

First factor – the impact of changes in the average number of factory workers:
$\Delta_1 = (N ¿¿1 - N_0) x W_0 ¿$

Second factor – the impact of changes in the average annual output of one worker:
$\Delta_2 = (W ¿¿1 - W_0) x N_1 ¿$

The sum of the both factors shows the overall deviation:
$\Delta V = V_1 - V_0 = \Delta_1 + \Delta_2$

Average annual output of one worker depends not only on the output of workers, but also on the share of workers in the total number of manufacturing personnel, the number of the days worked by them, the duration of the working day and the average hourly output. Therefore, the average annual output of one work can be presented as a derivative of the following factors:

$W = K x d x t x q$

Where: W is average annual output per worker;
K is the share of workers in total number of employees;
d is the number of days worked by one worker during the year;
t is average duration of a working day;
q is average hourly output.

The impact of individual factors on the change in the labor productivity of one worker is calculated by using chain replacement method or the absolute difference method.

At the next stage of the analysis, we should determine the impact of the factors affecting average annual output of a worker on the volume of the goods produced. For this purpose, we need to multiply the extent of the change in average annual output of one worker by actual number of the factory personnel by affecting the X_i factor:

$\Delta V_{xi} ¿ W_{xi} x N_1$

In the process of the analysis, special attention is paid to the study of changes in the average hourly output, which is one of the main indicators of labor productivity and the factor, on which average daily and average annual output depends. The average hourly output depends on the factors related to its changes in labor intensity and value of the goods. The factors of the first group include production organization, technical level of production, non-productive time costs related to the production of defective products, that cannot be repaired or to repairing defective products. The second group combines the factors related to the changes in the value of the volume of products caused by structural shifts in production. Chain replacement method is used for determining the extent of the impact of the above factors on the indicators used for the study. In addition, besides the planned and actual level of average hourly output, three conditional indicators of this value need to be calculated.

The first conditional indicator of average hourly output should be calculated in comparison to the planned data. For this purpose, actual volume of the output of commodity products should be adjusted by the size of structural shifts and the amount of time worked adjusted by non-productive time costs and by saving of time above the planned level as a result of the introduction of scientific-technical progress, which should be previously determined.

The calculation algorithm will be as follows:
$q_{p1} = (V ¿¿1 \pm \Delta V_s)/(T_1 - T^{I} \pm T^{II}) ¿$
$q_{p0} = V_0 / T_0$

1st factor – the impact of the changes in production and labor organization;
$\pm \Delta_1 = q_{p1} - q_{p0}$

2nd factor – the impact of the introduction of scientific and technical progress;
$\pm \Delta_2 = q_{p2} - q_{p1} = (V ¿¿1 \pm \Delta V_s)/(T_1 - T^{I}) - (V ¿¿1 \pm \Delta V_s)/(T_1 - T^{I} \pm T^{II}) ¿¿$

3rd factor – the impact of the changes in non-manufacturing costs;

$$\pm\Delta_3 = q_{p3} - q_{p2} = (V ¿¿ 1 \pm \Delta V_s)/T_1 - (V ¿¿ 1 \pm \Delta V_s)/(T_1 - T^{l}) ¿¿$$

4th factor – the impact of the structural changes in production of goods;

$$\pm\Delta_4 = q_1 - q_{p3} = \frac{V_1}{T_1} - (V ¿¿ 1 \pm \Delta V_s)/(T_1 - T^{l}) - (V ¿¿ 1 \pm \Delta V_s)/T_1 ¿¿$$

$$\Delta q = q_1 - q_0 = \pm\Delta_1 \pm \Delta_2 \pm \Delta_3 \pm \Delta_4$$

III. CONCLUSION

Third level economic analysis of the capital productivity and labor productivity allows us to determine and provide quantitative description for the impact of the following factors on the efficiency of production:

1. Determination of the impact of the 3rd level factors on the capital productivity:
   a) The impact of applying (modernizing) new equipment on the return on active part of fixed assets;
   b) The impact of introduction of scientific and technical progress on the productivity of machines;
   c) The impact of changes in social factors on the productivity of machines.
2. Determination of the impact of 3rd level factors on labor productivity:
   a) The impact of improving organization of labor and production;
   b) The impact of introduction of scientific and technical progress;
   c) The impact of non-productive time costs;
   d) The impact of structural changes in production.

IV. REFERENCES

1. Jikia, M., (2017). Reserves of Cost Reduction of Goods in the Production of Essential Oils in Georgia. International Journal of Social Science and Economic Research Volume:02, Issue:08. pp. 4003-4008;
2. Jikia, M., Kharabadze, E., (2018). Analyzing Decisions under Inflation. International Journal of Advances in Management and Economics Available online at: www.managementjournal.info;
3. Jikia, M., Kharabadze, E., (2018). DETERMINING RELEVANT AND ALTERNATIVE COSTS WHILE DECISION MAKING. International Journal of Social Science and Economic Research, Volume:03, Issue:05;
4. Jikia, M., Kharabadze, E., (2018). Certain Aspects of Accounts Receivable and Payable Analysis. Archives of Business Research – Vol.6, No.6;
5. Jikia, M., Kharabadze, E., (2018). Evaluation and Analysis of the Rational Structure of Sources for Assets Formation. Archives of Business Research – Vol.6, No.7.
6. Jikia, M., Kharabadze, E., (2017). Analysis of the Indicators Characteristic for Creating Value of a Company's Capital. V МЖНАРОДНОЇ НАУКОВО-ПРАКТИЧНОЇ КОНФЕРЕНЦІЇ, UDC 330, pp. 81-89;
7. Silagadze A, Tvalchrelidze A, Zubiashvili T, Atanelishvili T. Aspects of China's Economic Development. Refereed International Journal Ecoforum. Vol. 5. №1, 2016, pp. 47-64. http://www.ecoforumjournal.ro/index.php/eco/article/view/321
8. Silagadze A, Zubiashvili T. (2016) Foreign Direct Investment in Georgia. International Journal of Arts and Sciences. Vol. 09. Number 02, USA. pp. 63-71. http://www.universitypublications.net/ijas/0902/index.html
9. Silagadze, A., Zubiashvili, T., (2016). Georgia's Economy Against the Background of the Associate Agreement with the European Union. Refereed International Journal of Business and Management Studies. Vol. 05, Number 02. USA. pp. 533-540. http://www.universitypublications.net/ijbms/0502/html/V6Z43.xml
10. Zubiashvili, T., (2017). Aspects of Post-Soviet Economy Against the Background of the Associate Agreement With the European Union. Refereed International Journal Ecoforum. Vol. 6. №1. http://www.ecoforumjournal.ro/index.php/eco/article/view/560
11. Zubiashvili T, Chikviladze M, Silagadze N. (2018) Some Aspects of State External Debt. Refereed International Journal Ecoforum. Vol. 7. №2, http://www.ecoforumjournal.ro/index.php/eco/article/view/821
12. Zubiashvili T, Atanelishvili T. Some Aspects of National Economic Doctrine. Refereed International Journal Ecoforum. Vol. 6. №1, 2017 http://www.ecoforumjournal.ro/index.php/eco/article/view/540