CAUSALITY AND DETERMINISM IN THE TRINOMIAL PRODUCTIVITY - COST - PROFIT RELATIONSHIP AND ITS UTILIZATION IN THE ECONOMIC - FINANCIAL ANALYSIS OF A COMPANY

Ph.D. **Dumitru MĂRGULESCU**
„Athenaeum" University

Ph.D. **Serghei MĂRGULESCU**
„Nicolae Titulescu" University

Abstract:

A special role in the analysis and evaluation of the functionality of microsystems (firms, organizations) is attached to the logical-economic format involving causality and determinism to explain certain conditions reflected the fundamental variables such as trinomial relationship between productivity, cost and profit. Obviously in this approach the labor productivity is seen as the basic informational aggregate of the system assessment, through the demonstrated impact on costs and profits substantially by the effect of correlation between labor productivity growth and average wage growth. Networking and measuring such an impact is exemplified in figures.

Keywords: causality, determinism, overall and partial labor productivity, productivity - average wage correlation, rate of labor costs, profit on the turnover, rates of commercial profitability and consumed resources.

JEL Classification: G31, D24.

The study is aimed at achieving a logical- economic format involving the causality and determinism of phenomena, but with a stop at the aggregate level of such fundamental variables in assessing the functionality of a company, like the trinomial relationship between productivity, cost and profit.

In this regard, within the space of this study, brief references are made to:

1. Causality and determinism - the defining elements in the analysis of the business system functions;
2. Labour productivity - the basic informational aggregate of the evaluation of company functioning.
3. Causal-deterministic mechanism of labor productivity reflection in the company's costs and profits.

1. Causality and determinism - the defining elements in the analysis of the business system functions

Generaly speaking, causality is a category of connections, which expresses the correlation between cause and effect.

Along with other categories of connections, mainly of those of necessity and regularity, causality is underlying deterministic design of the structure and dynamics of phenomena in nature and society.

The concept of causality must be addressed not only ontically but also epistemically, causality being not only a type of objective connection but also a principle of knowledge. Fr. Bacon was right stating: "Vero scire per causas scire".

Every phenomenon has a cause. There is no non-cauzal phenomenon. The unity and complementarity with causality determinism defines itself.

In integrative and complex systems the shift from possible to real has a probabilistic way due to the correlation of the necessary and accidental factors, of casual and random parameters, which gnosiologically means a relative certainty.

In this sense of understanding the objective liasons between causes and conditions and between necessity and chance, events can be roughly forseen (estimated) and thus the steps taken have roughly to a lesser or greater extent a probabilistic nature.

Therefore, determinism must be designed not only as a theory of objective connections but also as an method (principle) of their knowledge, as a methodological basis of the explanations with which sciences and human knowledge in general operate.

Obviously, causality and determinism are complex categories in terms of content and connections, and the study is not intended to explain them, but to mention the defining issues, while recognizing it in an applied phenomenological case, circumscribed by the tri-faceted productivity - cost – profit relationship.

So it is about revealing the ways of highlighting the specific apparences of causality and determinism in which phenomena are expressed by variables, informationally aggregated, and thus the analysis and knowledge is not carried out to the root cause, but for an expert in unfolding events it leads the assumption to them (obviously this would require a detailed causal –deterministic analysis).

2. Labour productivity - the basic informational aggregate of the evaluation of company functioning.

In economic theory and practice productivity is addressed in a broad spectrum such as[1]: productivity of factors of production, overall productivity, partial productivity, capital productivity, labor productivity, etc.

Without even essentially presenting each of them, we will make a bracket on one of them. For instance, in Romanian and foreign literature we find the use of

---

[1] Dicționar de Economie Politică, Editura Economică, 2001

the overall productivity indicator, understanding the productivity of factors of production, based on relationships:

$$\frac{turnover}{means} \quad or \quad \frac{turnover}{assets},$$

which in our opinion requires two observations, namely:
a) none (in fact, both express the same thing) is referring to the factor "labor" which is participating, over the period considered, to the realization of goods and services (turnover);
b) assets, as the denominator in calculating the overall productivity, is not causally - deterministic related in its entirety with that.

For example, financial assets, cash, receivables are not related in the sense mentioned above with the productivity of production factors in time period, does not reflect efforts for that. The same may be assigned and intangible assets.

So "strictu sensu" the above mentioned determination relationship does not accurately reflect the effect – effort relationship, or vice versa. So, effort, broadly defined "asset " needs, on the one hand, few adjustments regarding assets, and on the other, establishing compatible ways of taking into account the quantitative - qualitative size of labour. A solution might be offered right here, but it would be a digression from the topic of the study, namely an approach to labor productivity, a "partial" productivity opposed to the global one, covering the essential production factor triggering the movement (use) of capital.

Therefore, within the tri-faceted relationship, this kind of productivity is taken into account, and its usual calculation in practice is the following:

$$\frac{CA}{\overline{N}(T)} \quad or \quad \frac{\sum qvi\overline{p}i}{\overline{N}(T)}, \quad where:$$

CA = turnover in selling prices excluding VAT,
qvi = products (services) sold,
$\overline{p}i$ = average selling price on the product "i"
N = average number of staff
T = total working time.

In order to achieve in this case too a rigorous assessment of what reflects the labor productivity, its productive force, it is necessary to eliminate two motives having a distorting impact, namely:
a) the influence of inflation;
b) the influence of the structure of production and services.

If you have to remove only inflation, the labor productivity in the current period may be based on the actual turnover, determined by the relationship:

$\dfrac{CA_n}{Ip}$, where: Ip = price index.

This means that the actual turnover of the period "N" reflects the structure of production or services from the same period, structure that can be significantly modified compared to the period of comparison in order of increasing or decreasing the share products with higher or less time unit productivity than the average productivity of the same period.

Under these conditions the average productivity (the average production) per unit of time (ultimately per employee) may be higher or lower than that in the period of comparison, which does not mean also a corresponding increase in real labor productivity.

This influence can be also eliminated by operating with the average hourly production recalculated in dependence on the structure of production (services) from the current "N" period and production (services) average values per unit time in the comparison period (usually N-1).

Such an average production is determined by the relationship:

$$^r\overline{w}h = \dfrac{\sum\limits_{i=1}^{n} gi_1 \overline{w}hi_0}{100} \ , \quad \text{where:}$$

gi = share of products in the current period based on standard or norm time;

$\overline{w}h$ = average production per standard unit of time during the reference period.

In examining a case one of the following inequalities can occur: $^r\overline{w}h > \overline{w}h_0$; $^r\overline{w}h < \overline{w}h_0$.

Inequality $^r\overline{w}h > \overline{w}h_0$ shows that modifying the structure of production (services) influences the increase of the gap $\overline{w}h_1 > \overline{w}h_0$, namely that the share of products (services) with higher average production than the average one in the period of comparison has increased.

Inequality $^r\overline{w}h < \overline{w}h_0$ reflects the opposite of those in the previous case.

For explanation we will use the following data:

Indicators	Period		Deviation
	N - 1	**N**	
1 Turnover m.u.	35814500	40500000	+4685500
2. Number of employees	620	600	-20
3. Total working time - hours	1128400	1116000	-12400
4. The average productivity per hour (average hourly turnover) m.u.	31,74	36,29	+ 4,55
5. Recalculated average productivity: $$^{r}\overline{w}h = \frac{\sum_{i=1}^{n} gi_{1}\overline{w}hi_{0}}{100}$$	x	32,35	x
6. Price index	x	1,04	x

Note: m.u. = monetary value units (RON, €)

The calculation of the above mentioned Influences shows:

1. The influence of the structure of production (services)

$^{r}\overline{w}h - \overline{w}h_{0} = 32,35$ to $31,74 = +0,61$ u.m. = 13,4% of deviation

2. The influence of the average hourly productivity:

$\overline{w}h_{1} - {}^{r}\overline{w}h = 36,29$ to $32,35 = +3,94$ m.u. = 86,6% of deviation, including:

2.1. The influence of inflation

$$\frac{\overline{w}h_{1}}{I_{p}} - {}^{r}\overline{w}h = \frac{36,29}{1,04} = 32.35 + 2.54 \text{ m.u., so } 65\% \text{ of } 3.94 = 100$$

2.2. The influence of labor productivity by products

$$\overline{w}h_{1} - \frac{\overline{w}h_{1}}{I_{p}} = 36,29 - \frac{36,29}{1,04} = +1,40 \text{ m.u., so } 35\% \text{ of } 3.94 = 100$$

So the actual labor productivity is only 31% of the average hourly productivity growth, which is used without these adjustments, as labor productivity.

Note: the study is not interested in the assessment (interpretation of the facts, but only in the Mechanism of their revealing).

These influences can be scaled to the very labor productivity per employee (yearly) taking into account also the factor average number of hours worked by an employee, reflecting the use of working time.

In this case $\Delta \overline{w}_a = 67500\text{-}57765 = 9735 +$ m.u.. could be explained by:

1. The influence of the average number of hours per employee:
$(\bar{t}_1 - \bar{t}_0)\ \overline{w}h_0 = (1860\text{-}1820) = 31.74 + 1270$ m.u.

2. The influence of the average hourly productivity:
$\bar{t}_1 (\ \overline{w}h_1 - \overline{w}h_0) = 1860\ (36.29\ \text{to}\ 31.74) = + \text{um}\ 8463$, in which:

2.1. The influence of the structure of production (services):
$\bar{t}_1 (^r\overline{w}h - \overline{w}h_0) = 1860\ (32.35\ \text{to}\ 31.74) = 1134.6 +$ m.u.

2.2. The influence of average hourly labor productivity:
$\bar{t}_1 (\ \overline{w}h_1 - {}^r\overline{w}h)= 1860\ (36.29\ \text{to}\ 32.35) + = 7328.4$ mu, of which:

2.2.1. The influence of inflation:
$$\bar{t}_1\ (\ \frac{\overline{w}h_1}{I_p} - {}^r\overline{w}h) = 1860 \left(\frac{36,29}{1,04} - 32,25 \right) = + 4724,4\ \text{m.u.}$$

2.2.2. The influence of labor productivity by products:
$$\bar{t}_1\ (\ \overline{w}h_1 - \frac{\overline{w}h_1}{I_p}) = 1860 \left(36,29 - \frac{36,29}{I_p} \right) = + 2604,0\ \text{m.u.}$$

It follows that, in the spread of the average production per employee of 9735 (usually labor productivity), the influence of the actual labor productivity is only 2604.4 m.u. i.e. 26.8% and the labor productivity per employee index commonly used would be of 1,045 and not 1,169 , reflecting an increase of 4.5% and not 16.9%.

Although some of the "methodological approaches" to ensure the "accuracy" of the phenomenon we've done also in other papers (the last being "Analiza economico-financiară", Editura Bren, 2008), the need was felt for more accurate understanding, through some calculations, of the causality and determinism in the tri-faceted productivity - cost – profit relationship.

3. Causal-deterministic mechanism of labor productivity reflection in the company's costs and profits.

So, considering labor productivity as a "incentive" in the causality and determinism, vis à vis the costs and profits, we continue to reveal the mechanism by which this effect is reflected in the two complex effects.

The determinism line is: productivity (as the causal aggregate), costs, profits. Synthetically, the labor productivity is reflected in costs by the correlation between its dynamic and the dynamic of the average wages or average wage costs per person.

We will take for example the following case:

Indicators	N-1	N	N / N-1
1. Labour productivity (average output per employee)	57625	67500	1,169
2. Average annual salary m.u.	19640	21600	1,10
3. Index of correlation $\dfrac{\overline{Is}}{\overline{Iw}}$	x	0,941	x
4. Rate of wage costs % $\left(\overline{R}cs\right)$	34	32	0,9412

Within the decreasing rate of wage costs by 2%, labor productivity meaning average annual turnover per employee is reflected downwards by:

$$\frac{Rcs_0}{\overline{Iw}} - Rcs_0 = \frac{34}{1,169} - 34 = 29,08 - 34 = -4,92\ \%$$

And the average wage growth:

$$Rcs_1 - \frac{Rcs_0}{\overline{Iw}} = 32 - \frac{34}{1,169} = +2,92\ \%$$

As can be seen for the synthetic expression that labor productivity growth has outpaced the average wage dinamics, the correlation index was used.

Case Ic < 1 denotes this.

The opening of this "scissors" was not established or recommended by anyone in respect of its optimal limits.

Therefore, in our opinion, in assessing the labor productivity growth it should be taken into account on one hand the volume, quality and capital consumption, in this case embodied in techniques and technology, and on the other hand, the volume, quality and the motivational system of labor.

In these circumstances, the law-like and logical, no one can claim linearity, i.e. direct proportionality between productivity and average wage.

Further, the extension of the causal – determinism mechanism of labor productivity through costs (rates of wage costs) is effactually converted into the profit from turnover and rates of return.

As such, regarding the amount of profit on turnover, the increase of labour productivity through the effect of correlation between its dynamics and wage growth can be revealed by the relationship:

$$-\left(\frac{Rcs_0}{\overline{Iw}} - Rcs_0\right)\frac{CA_1}{100}$$

Where: CA = turnover in selling prices excluding VAT.

Operating with previous values it means:

$$-\left(\frac{34}{1,169} - 34\right)\frac{40500000}{100} = -(29,08 - 34)\frac{40500000}{100} = +1992600 \text{ m.u.}$$

So to the deviation of the profit on turnover from the reference level, labor productivity has contributed with the above mentioned amount. In its unity, the correlation between labor productivity and average wage growth would have been reflected in the deviation of the profit on turnover amount by:

1. The influence of labor productivity (average output per employee):

$$-\left(\frac{\overline{R}cs_0}{\overline{Iw}} - Rcs_0\right)\frac{CA_1}{100} = -\left(\frac{34}{1,169} - 34\right)\frac{40500000}{100} = +1992600 \text{ m.u.}$$

2. The influence of average salary:

$$-\left(\overline{R}cs_1 - \frac{Rcs_0}{\overline{Iw}}\right)\frac{CA_1}{100} = -\left(32 - \frac{34}{1,169}\right)\frac{40500000}{100} = +1182600 \text{ m.u.}$$

As pointed out before, the assessment of the case is not our approach here, as it is synthetically summarized by the trinomial components. Otherwise, the impact would have been observed in all indicators of efficiency of factors of production like volume and utilization, such as: profit per employee or unit of time, the efficiency of fixed, circulating, own, permanent capital etc.

At the level of cost by products and of commercial efficiency rate by products, the effect of labor productivity can be determined by inverse dynamics of the working time, which can be expressed as:

$$\left(ti_1 - ti_0\right)csi_0 \text{ as absolute changes, and}$$

$$\frac{qi_1\left(ti_1 - ti_0\right)csi_0}{qi_1\overline{p}i_1} \times 100 \text{ as change in the rate of wage costs on products, where:}$$

ti = time employment per unit of product "i";
csi = wage costs per unit of time;

qi = volume of product "i", and

pi = average sales price (excluding VAT) per unit of product "i".

Chasing the impact on profit per unit or on volume of product "i", it would be revealed by the relationship:

$- (t_1 - t_0) cso_1$ or, $- qi_1 (ti_1 - ti_0) cs_0$

The impact on the commercial rate of return would result from the relationship:

$$\left\{ \frac{-[qi_1(ti_1 - ti_0)]csi_0}{qi_1 \overline{pi}_1} \right\} \times 100$$

In the case of the rate of return of resources consumed, the relationship becomes:

$$\left\{ \frac{-[qi_1(ti_1 - ti_0)]csi_0}{qi_1 ci_1} \right\} \times 100$$

On a product "i", the demonstration can be based on the following figures:

Indicators	N-1	N
1. Product volume - pc	500	570
2. The total cost per unit of product m.u.	27500	28500
3. Labor costs per unit of product	11529	11836
4. Working time per unit of product (h)	1123	1060
5. The average selling price per unit of product (excluding VAT) m.u.	36029	39452
6. Rates of total product costs (compared to turnover) %	76,33	72,24
7. Wage costs per product rate (compared to turnover)	32	30
8. Profit per product m.u.	8529	10952
9. Commercial return per product %	23,67	27,76
10. Rate of return of resources consumed per product %	31,0	38,43

Application means:

a) The impact on the rate of wage costs per product (sales prices, excluding VAT);

$$\frac{-[570(1060 - 1123)] \times 1027}{570 \times 39452} \times 100 = -\left(\frac{368796}{22487640} \right) \times 100 = -1,64\%$$

b) The impact on the amount of profit per product;

- [570 (1060 - 1123) x 10.27] = + 368 796 m.u.

c) The impact on the commercial rate of return;

$$\frac{-\left[570(1060-1123)\right]\times 10,27}{570\times 39452}\times 100 = +1,64\,\%$$

d) The impact on rate of resource consumption;

$$\frac{-570\left[(1060-1123)\times 10,27\right]}{570\times 28500}\times 100 = +2,27\,\%$$

Using the methodology of reflecting the labor productivity in profits, one can determine the impact on economic rate, financial ratios, paid capital rate , as well as the efficiency of any forms of expressing production factors, using profits as a result.

REFERENCES:

1. Margulescu, Dumitru; Serban, Claudia; Vasile, Emilia - *Analiza economico – financiară*, Editura Bren, Bucharest, 2008;
2. Margulescu Dumitru etc. - *Diagnostic economico – financiar, Concepte, metode, tehnici*,Romcart House, Bucharest, 1994;
3. Thibaut, J.P. - Le diagnostic d'entreprise, Les Edition d'Organisation, Paris, 1989;
4. Dervaux, Bernard Coulaud, Alain - *Dictionaire de management et de contrôle de gestion*, , Dunod, 1986;
5. *** - *Dicționar de economie*, Editura Economică, Bucharest, 2001;
6. *** - *Dicționar de filozofie*, Editura politică, Bucharest, 1978.