CONSIDERATIONS REGARDING THE CALCULATION AND EVOLUTION OF LABOR PRODUCTIVITY IN TERMS OF COMBINING TECHNICAL FACTOR - CAPITAL

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ABSTRACT: *The efficiency of labor, as evidenced by average productivity indicator is linked to the existence of social conditions which relate to education, qualifications and experience of staff, division of labor employment, labor discipline, but also the existence of objective conditions, technical and technological, as modernization of production and the availability of equipment to employees. The content of the article we will highlight an analysis of the calculation, and the evolution of labor productivity in terms of the elements related to the value of labor used in relation to operational staff of the company. We will also reveal the evolution of labor efficiency and profit when the company capital factor is constant, given the need to increase production*.

KEY WORDS: *labor productivity, efficiency, degree of technical endowment, production, employees*

JEL CLASSIFICATION: *D01, M21.*

1. ANALYSIS CALCULATION LABOR PRODUCTIVITY UNDER ASPECTS DEGREE OF TECHNICAL ENDOWMENT

In economic literature records that the average labor productivity is complex, the size and evolution are determined by a number of factors: economic, technical and technological, natural, social, psychological, etc. [5]

In this context, the average annual labor productivity, labor efficiency as a fundamental expression is directly related to the existence of general factors, valid for any production system (modernization of production, staff qualifications and experience, division of labor, natural conditions, etc) and the specific factors that acts

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only at certain times and under certain circumstances (economic crisis, transition economies, etc).

Thus, labor productivity must be analyzed in terms of factorial after causal links that appear in its evolution.

The contents of this article, we systematize factor analysis the following direction: approaching labor productivity in terms of the degree of technical endowment to employees.

Between labor productivity and changes in the means of labor, production technologies, raise the level of technical equipment there is a direct relationship, resulting from the fact that high-level technical equipment results in relief work, increasing production per unit time and increase quality .

We believe that the relationship can express labor productivity calculation based on the degree of technical endowment, as follows:

$$\overline{W} = \frac{CA}{N} = \frac{F}{N} \cdot \frac{CA}{F} = G \cdot e$$

Where terms have the following meanings:
CA - turnover;
N - total number of staff;
F - average annual value of means of production used for the production;
$e = \frac{CA}{F}$ - the effectiveness of using fixed assets
$G = \frac{F}{N}$ - the degree of technical endowment.

By increasing technicality, increase the value of fixed assets used in the production process, a situation which shows that labor productivity growth should increase the efficiency of fixed assets more, that inequalities are satisfied:

$$i_Q \geq i_e \geq i_g$$

where: i_Q - index of output growth;
i_e - use efficiency index of fixed assets;
i_g - index of the degree of technical endowment.

Thus, to be certain labor productivity growth between the three indices must be faster growth relationship production index to index the efficiency of using fixed assets, and this in turn grow more pronounced compared to the index of technical endowment.

The direct relationship between labor productivity and the the degree of technical endowment can be expressed by the relation:

$$\frac{\frac{CA_1}{N_1}}{\frac{CA_0}{N_0}} > \frac{\frac{F_1}{N_1}}{\frac{F_0}{N_0}}$$

where: $CA_{1,0}$ - turnover in the current period and the base;

$N_{1,0}$ - average number of staff employed in the current period and base;

$F_{1,0}$ - average annual value of means of production used in the current and base period.

The relationship above is actually the same content as follows:

$$\frac{W_1}{W_0} > \frac{G_1}{G_0}$$

which expresses the fact that: $i_w > i_g$ and that is a basic relationship highlights the need for more rapid growth of labor productivity than the availability of equipment.

Expression of the link between degree of technical endowment and labor productivity can be achieved and relations:

$$1)\ \frac{CA}{N_{op}} = \frac{F}{N_{op}} \cdot \frac{CA}{F}$$

where: Nop - Number of operational staff.

This relationship expresses the relationship between productivity, employment, labor endowment degree and effectiveness of using fixed assets, customized for operational staff, as follows:

$$\overline{W_{op}} = G_{op} \cdot e$$

The content of this relationship they express that average labor productivity is calculated for operational staff determined the degree of endowment fixed assets of personnel and efficiency of these assets.

$$2)\ \frac{CA}{N} = \frac{N_{op}}{N} \cdot \frac{F_a}{N_{op}} \cdot \frac{CA}{F_a}$$

where: F_a - value of fixed assets used in the production process.

This means that:

$$\overline{W} = K_{op} \cdot G_{aop} \cdot e_a$$

ie labor productivity is determined by: the share of operational staff in total staff (K_{op}); endowment degree of operational staff with fixed assets (G_{aop}); effectiveness of using active fixed assets (e_a).

$$3)\ \frac{CA}{N_{op}} = \frac{F_a}{F} \cdot \frac{F}{N_{op}} \cdot \frac{CA}{F_a}$$

indicating that: $\overline{W_{op}} = K_{fa} \cdot G_{op} \cdot e_{fa}$

Labour productivity is determined by the following relationship:
- The share of fixed assets in total assets fixed assets (K_{fa})
- The degree of endowment operational staff with fixed assets (G_{op})
- The effectiveness of active fixed assets (E_{fa}).

To illustrate the determination of labor productivity relations based on the availability of equipment to staff, we use the data for one year of activity, a company producing domestic refined oil as follows (Table 1):

Table 1.

Nr.crt	Economic categories	UM	Amounts
1.	Turnover - *CA*	mii lei	4.000
2.	Total number of staff - N_t	pers.	100
3.	Of wich: operational staff - N_{op}	pers.	86
4.	The total value of fixed assets- F_t	thousands lei	4.500
5.	Value of fixed assets- F_a	thousands lei	3.000
6.	The average productivity per employee- *W*	thousands lei/pers.	40
7.	The average productivity per worker force- W_{op}	thousands lei/pers	46,51
8.	The degree of an employee endowment assets- *G*	thousands lei/pers.	45
9.	The degree of endowment assets operative worker- G_{op}	thousands lei/pers	52,32
10.	The degree of endowment of an employee with fixed assets- G_a	thousands lei/pers	30
11.	The degree of a worker operating endowment with fixed assets- G_{aop}	thousands lei/pers	34,88
12.	The efficiency of fixed assets- E_f	e_f	0,888
13.	he efficiency of active fixed assets- E_{fa}	e_{fa}	1,333

1) For the basic relationships:

$\overline{W} = G \cdot e_f = 45 \cdot 0{,}8888 = 39{,}99$ thousands lei/pers.

2) $\overline{W_{op}} = G_{op} \cdot e_f = 52{,}32 \cdot 0{,}888 = 46{,}5$ thousands lei/pers

3) $\overline{W} = K_{op} \cdot G_{aop} \cdot e_{fa} = \frac{86}{100} \cdot 34{,}88 \cdot 1{,}333 = 39{,}99$ thousands lei/pers.

4) $\overline{W_{op}} = K_{fa} \cdot G_{op} \cdot e_{fa} = \frac{3000}{4500} \cdot 52{,}32 \cdot 1{,}333 = 46{,}5$ thousands lei/pers.

2. THE CORRELATION BETWEEN PRODUCTIVITY GROWTH AND PROFIT DEVELOPMENT, IN COMBINATION WITH THE TECHNICAL FACTOR – CAPITAL

The combination of production factors is significantly influenced by the limited productive resources and essential criterion for assessing the effectiveness of the combination is the very nature of economic activity. Moreover, the combination of production factors, the developer based on the following two premises: the limited factors and their properties.

In a short time, the volume of certain factors of production can not be changed or adapted quickly to the needs of production of goods, due to changes in their market. By their nature, these resources (factors) have a fixed character, their short-term demand is very inelastic. In this category we include: buildings, land, buildings, facilities, equipment manufacturing and generally any other economic resource whose amount cannot be changed immediately when the market requires an increase (decrease) in production.

There are other economic resources, which is of a variable, such as certain categories of staff, materials, equipment, fuel, electricity etc. and the volume of which can be quickly adjusted according to production needs change. It is assumed that the factor most often variable light, short, is the work (labor). This assertion does not correspond to the theoretical needs, but an empirical findings: in general, an enterprise can adjust the volume of work faster than that of capital (it is easier to resort to hours or additional employment, temporary work, technical unemployment or even layoffs, only to change production equipment and tools used in the enterprise).

The combination of production factors (short term) is governed by a regular, known in economic literature as the law of diminishing marginal productivity (yields disproportionate Act), under which, when combined fixed inputs with variable inputs average productivity and the marginal increase to a peak and then begin to decline gradually.

In other words, when using a fixed set of factors (capital, land) in combination with a growing amount of a variable factor (labor), the marginal productivity of this factor will have an increasing trend at the beginning and then, after will have reached a point of maximum development will be decreasing. Here it should be noted that the number of workers increases due to the need to increase production.

In the combination, we can distinguish synthesize and thus four stages (stages) of the evolution of production (see figure no.1):

- Phase I, which is an increase of total production, media production and the marginal, the latter being higher than average; at the end of this phase, the maximum output is marginal;

- Phase II, where total and average production increase, but decreasing increases as the marginal productivity begins to decrease, but maintaining higher than

average; This phase ends when the marginal productivity is equal to the average, the latter thus achieving maximum;

- Phase III, corresponding to increasing developments still to total production and decreasing productivity developments and marginal environments, the latter becomes lower than average, but maintaining positive; at the end of this phase marginal productivity is zero, at which total output is maximum;

- Phase IV, called irrational phase, where total production is reduced due to negative marginal productivity, ie the use of additional units of a variable factor not result in an increase in production, but with a drop of it.

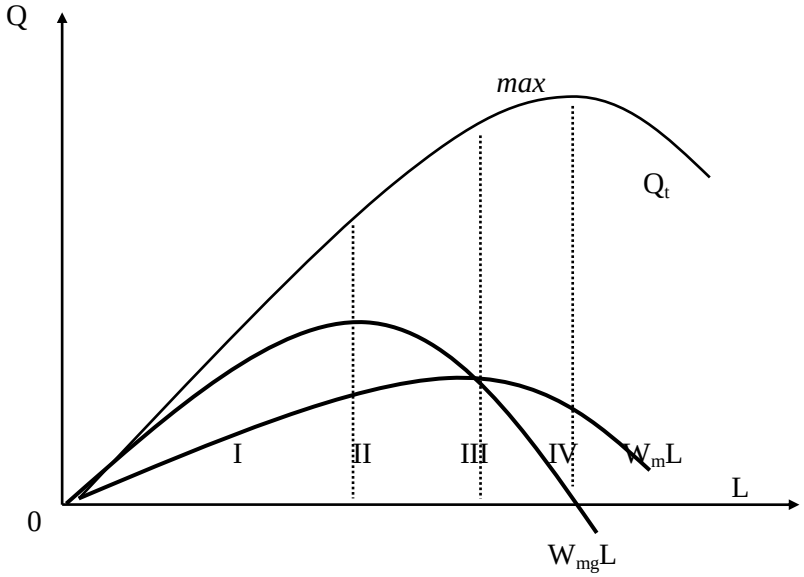

Figure 1.

For better illustration, we use the hypothetical data in Table 2.

Thus, assuming that in an economic activity, a trader has a certain amount of capital (K) - as fixed factor and variable workload (L), microeconomic indicators (total production - Qt; average productivity - Wm; marginal productivity - WMG, total cost - Ct; marginal cost - CMG, marginal income - GMI, marginal profit - Pmg and total profit - Pt) will be the trend evelopments in the table above. It should also be noted that the market unit price of products is 100 um / tonne and the average cost of one unit of labor salary is 2000 um / worker. For ease of analysis, in terms of costs with other factors - land, capital, we considered conventionally, they are void.

The next question is: which of the variants combining shown in the table above provides profit maximization (optimum manufacturer)?

Optimum manufacturer is equivalent to steady state, because in this case he is not forced to seek another solution. Specifically, it is the production version, which provides the biggest difference between the proceeds and costs of production, so a maximum profit.

Table 2.

K	L	Q_t (tone)	W_m (tone)	W_{mg} (tone)	C_t (u.m.)	C_{mg} (u.m.)	V_{mg} (u.m.)	P_{mg} (u.m.)	P_t (u.m.)
10	2	30	15,0	-	4000	2000	-	-	-1000
10	3	53	17,6	23	6000	2000	2300	300	-700
10	4	78	19,5	25	8000	2000	2500	500	-200
10	5	105	21,0	27	10000	2000	2700	700	500
10	6	130	21,6	25	12000	2000	2500	500	1000
10	7	153	21,8	23	14000	2000	2300	300	1300
10	8	175	21,9	22	16000	2000	2200	200	1500
10	**9**	**195**	**21,6**	**20**	**18000**	**2000**	**2000**	**0**	**1500**
10	10	210	21,0	15	20000	2000	1500	-500	1000
10	11	223	20,2	13	22000	2000	1300	-700	300
10	12	233	19,4	10	24000	2000	1000	-1000	-700
10	13	233	17,9	0	26000	2000	0	-2000	-2700
10	14	230	16,4	-3	28000	2000	-300	-2300	-5000
10	15	228	15,2	-2	30000	2000	-200	-2200	-7200

In our case, the best option is the production where combines two units of factor earth (Ha) with 10 units of capital factor (K) and 9 units of labor factor (L). In this case, it is observed that when the marginal cost and marginal revenue variable factor obtained equalize, the total profit of the manufacturer is best. So when the combination is between a variable factor (usually labor) and one or more fixed factors (capital, land), the condition of profit maximization is:

VMG = CMG or VMG - CMG = 0, ie Pmg = 0.

The analysis of the figures in the table allows to formulate some important conclusions on economic behavior (rational) the manufacturer:

- Any increase in total production over the considered optimal (in our case, 195 tons), under the circumstances, it is irrational in economic terms, because it will result in a decrease in profit, leading to losses.
- As long as the marginal cost is lower salary amount from the sale of marginal product (marginal revenue), the manufacturer is interested to increase production by increasing the workload, as each additional unit of labor brings a marginal profit, falling within composition of the total profit.
- When marginal productivity is higher than average, the latter has an upward trend, and when you are equalized (WMG = Wm), average productivity peak. From this level, the marginal productivity falls below average productivity, the latter starting to have a downward trend.
- However, when the marginal productivity becomes invalid, total production is at a maximum, and when the marginal productivity becomes negative, total production begins to decline.

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