

Contributions Concerning the Operationalisation of Productivity

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Abstract

Purpose – This article presents a theoretical model of firms engaged in a market process, in diverse stages: separately, and by acquisition of the little one by the bigger one.

Method – Being a purely theoretical paper, developments are made in a two steps dynamic model of productivity calculation, with focus on the resulted serviceability.

Results and Conclusions – The article discusses certain basic linkages between firms in a competition market and presents productivity as a dynamic process, considering the effects for the diverse actors involved. It also specifies that the components are depending on the state of the concerned firms. The model provides an analytical framework for other developments, including various simulations on the matter and for more advanced conceptual and applied studies on productivity, in descriptive and analytical line. It also suggests bases for developing management and market policies.

Key words: productivity, serviceability, companies' acquisitions

J.E.L. classification: L11, M21, D24, L19, E20, F20, J23

1. Introduction

Our research paper aims at revealing certain differences in calculating productivity, on diverse steps of evolution and for diverse dimensions.

As a purely theoretical research, it is conceptually grounded on a liberalist approach concerning the economy, trying to use the genuine meaning of productivity (Jivan, 2014). A theoretical model is presented and developed, considering two categories of economic entities that act in independent competition and that also dynamically evolve to the acquisition of the little one by the bigger one. In the topic of acquisition of certain firms by other ones, the literature is very rich; we can refer, for instance, to Roach (2007); this book also speaks about the growth and increasing globalization of modern corporations. Also, concerning especially the foreign direct investment, see, for instance, *Foreign Direct Investment* (2017).

The effects for the two types of actors taken into account are revealed, being calculated with hypothetical data, which start from an equitable state (the physical productivity is, from the very beginning, taken as identical for both categories of production entities). The differences in productivity are made, after the mentioned developing process, by the values got on the market, as consequences of the diverse production and labour prices they negotiate. Diverse variants of productivity in value expression are calculated.

The development on the market proves being consistent with the acquisition we assumed. The analysis on the model is an opportunity for providing ideas for diverse other developing studies on productivity, in purely theoretical way, but also possible openings for management and marketing applied purposes.

2. Analysis on a hypothetic case

Let us take the hypothetic case of two economic entities from two different countries: one with a less developed economy, having an average wage of $w^R = 1,000$ monetary units (m.u.) per month; and a highly developed economy, having an average wage of $w^A = 10,000$ m.u. per month.

The problem of diverse currencies and of the exchange rates between them is a different issue that we are not going to approach for now.

2.1. The average work productivity in physical units

To begin with, we'll start with identical productive forces, so that the productivity expressed in physical units is identical.

We consider first the hypothetic case of a company "R" from Romania, where the registered productivity for the reference period t_0 is $Q_0^R = 4,000$ units (of products/month), obtained with $L_0^R = 100$ workers, computing this way an average work productivity of $W_{L_0^R} = Q_0^R / L_0^R = 40$ pieces/worker. If during the t_1 period of time we get a production of $Q_1^R = 10,000$ units, with $L_1^R = 150$ workers, we'll reach a calculated labour productivity $W_{L_1^R} = Q_1^R / L_1^R$ of 66.67 pieces/worker, it means that for the t_0 - t_1 period, the margin labour productivity will be:

$W_{L_1mgn}^R = \Delta Q^R / \Delta L^R = (Q_1^R - Q_0^R) / (L_1^R - L_0^R) = (10,000 - 4,000) / (150 - 100) = 120$ units of production/worker.

We also consider a hypothetic company "A" from the USA, which produces $Q_0^A = 100,000$ units of that product, with $L_0^A = 1,500$ workers, an average labour productivity $W_{L_0^A}$ of 40 pieces/worker being calculated. We consider that during t_0 - t_1 period, the production and number of workers stays constant ($Q_0^A = Q_1^A$; $L_0^A = L_1^A$), meaning that $W_{L_1^A} = W_{L_0^A}$; but immediately the "A" company will take investment measures on the external markets. For example, it will buy the "R" company of Romania, and thus, in the next period, due to this investment, it will register an increase of production and employees.

It means that at t_2 , for the big company is going to be calculated the medium labour productivity of:

$W_{L_2^A} = Q_2^A / L_2^A = (Q_1^A + Q_1^R) / (L_1^A + L_1^R) = (100,000 + 10,000) / (1,500 + 150) = 110,000 / 1650 = 66.67$ units per worker, meaning a highly increased productivity for company "A";

For t_1 - t_2 , the calculated marginal productivity will be of:

$W_{L_2mgn}^A = \Delta Q^A / \Delta L^A = (Q_2^A - Q_1^A) / (L_2^A - L_1^A) = (110,000 - 100,000) / (1650 - 1500) = 10,000 / 150 = 66.67$ units per worker.

The increase Δ obtained by the company (through the investment) is given by the additional production and personnel ($\Delta Q^A = Q_1^R$; $\Delta L^A = L_1^R$).

We underline that our hypothetic example starts from identical average productivities: 40 pieces per worker. Also, during the next period of time, in both cases, each worker will be able to produce the same quantity: 66.67 pieces. We started from identical, equitable conditions in order not to give a predicted trend to the results to be obtained. The numbers were randomly chosen without trying to obtain a certain result.

One can notice that the marginal calculated productivities indicate a relative disadvantage of company "A" versus company "R", in physical units. It doesn't seem to fit the commonly known reality. But it is just accidentally that this result of the calculations does not fit the expectations. It means that the most intense fight is through marketing. This fight is our concern, in the following subsection.

We underline the resulting difference that e already mentioned: the marginal productivity is smaller for the big company than for the smaller enterprise.

2.2 Computing productivity in value units of production

In order to pass from the physical units to the value ones, we add the *price per unit of product* (p). For the needs of our paper, we'll name this productivity "partial value productivity", for we use the price of production (the numerator of productivity is expressed in value units), but the denominator is expressed in physical expression (in physical units of *labour*). In the next

subsection of the paper we'll pass at the value expression – when we apply, to all data used in the calculus, their price. If the product unit has a selling price of, let's say, 10 monetary units, the resulting productivities (in values) are going to be:

$$W_{L_0}^R = Q_0^R \cdot p / L_0^R = 40 \cdot 10 \text{ m.u.} = 400 \text{ m.u. per worker};$$

$$W_{L_1}^R = Q_1^R \cdot p / L_1^R = 66.67 \cdot 10 = 666.67 \text{ m.u. per worker};$$

$$W_{L_{1mgn}}^R = \Delta Q^R \cdot p / \Delta L^R = (Q_1^R - Q_0^R) \cdot p_1^R / (L_1^R - L_0^R) = (1,000,000 - 400,000) / (150 - 100) = 120 \cdot 10 \text{ m.u. per worker} = 1,200 \text{ m.u. per worker};$$

$$W_{L_1}^A = W_{L_0}^A = Q_0^A \cdot p / L_0^A = 1,000,000 / 1,500 = 1,000,000 / 1,500 = 666.67 \text{ m.u. per worker};$$

$$W_{L_2}^A = W_{L_2}^A = Q_2^A \cdot p / L_2^A = (1,000,000 + 100,000) / (1,500 + 150) = 1,100,000 / 1650 = 666.67 \text{ m.u. per worker};$$

$$W_{L_{2mgn}}^A = \Delta Q^A \cdot p / \Delta L^A = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) = (1,100,000 - 1,000,000) / (1650 - 1500) = 100,000 / 150 = 666.67 \text{ m.u. per worker}.$$

The calculus still shows the same differences that we've noticed in the previous subsection concerning the marginal productivities in physical units: the marginal productivity of the company "A" is not bigger than that of the enterprise "R", but it even is smaller. Such a direction of the differences between the two categories of economic entities seems to be against the usual perception on the economic realities. We'll continue with our investigation – which is going to clarify the apparent un-concordance with the usual perception, in which the productivity of strong economies is considered to be bigger.

2.3 The calculus of productivity when both production and labour are expressed in value units

Finally, a second step for value expression is when we also express the labour factor in monetary units: salaries paid to the employees. In this case, if compared with the previous version, we add the price of the labour factor, namely the paid wages (w). For the needs of our paper, we'll call the productivity calculated with such value data as "full value productivity" or "complete" (total value expression). In this, only values (in monetary units) are used: beside the price of the production, we also include the salary, as market price.

We underline here an essential difference, regarding prices, according to the market realities:

- *Case (p)*. On the products market, due to globalization, we witness a tendency of homogenization. This is true, even if there are of course certain differences. For example, in the case of Romania, at least, it is known that certain retail multinational companies sell certain products at higher prices, due to the privileged place such products have in the day-by-day consumption of Romanians (Romanians having structures of consumption specific for average revenues that are smaller than in other countries). Other products can have, on the other hand, smaller prices. In the present paper we take into account the tendency of *homogenization* of prices due to globalization.

- *Case (w)*. In the case of salaries (the price of the *labour* factor), we notice *differences* from one country to another, which constitutes (as shown) the main reason for direct foreign investments.

Therefore, in this case, the (additional) calculus becomes:

$W_{L_0}^R = Q_0^R \cdot p / L_0^R \cdot w^R = 4.000 \cdot 10 / 100 \cdot 1.000 = 0.400$ monetary units of production per monetary unit of revenue generated by the labour of workers (of consumption of labour factor, of cost for the company)

$W_{L_1}^R = Q_1^R \cdot p / L_1^R \cdot w^R = 10.000 \cdot 10 / 150 \cdot 1.000 = 0.667$ monetary units got as average per one monetary unit of salary paid (of consumption of labour factor for the production).

$W_{L_{1mgn}}^R = \Delta Q^R \cdot p / \Delta L^R \cdot w^R = (Q_1^R - Q_0^R) \cdot p_1^R / (L_1^R - L_0^R) \cdot w^R = (1,000,000 - 400,000) \cdot 10 / (150 - 100) \cdot 1,000 = 1,200$ m.u. of production increase per unit of cost of the labour factor.

We notice the increase of the average productivity for the Romanian enterprise of the chosen example; the full value marginal productivity is of 1.2 monetary units of production increase for each monetary unit of cost with the salaries.

$W_{L_1}^A = W_{L_0}^A = Q_0^A \cdot p / L_0^A \cdot w^A = 1,000,000 \cdot 10 / 1,500 \cdot 10,000 = 1,000,000 / 1,500 = 0.667$ m.u. of production per m.u. of consumed factor.

For computing the marginal productivity for the company that invests in other countries (symbolised with "A"), we should consider – as a difference if compared to the Romanian firm – to decide the size of the salaries according to where the production units are: in the country of origin of the company, the market price of labour is, as shown, of 10,000 m.u., and in the poor country of 1,000 m.u.

So, the marginal productivity for the big company is going to be:

$$W_{L_2^A} = Q_2^A \cdot p / L_2^A \cdot w^A = (Q_1^A + Q_1^R) \cdot p / (L_1^A \cdot w^A + L_1^R \cdot w^R) = (1,000,000 + 100,000) \cdot 10 / (1,500 \cdot 10,000 + 150 \cdot 1,000) = 1,100,000 \cdot 10 / 15,000,000 + 150,000 = 11,000,000 / 15,150,000 = 0.726 \text{ m.u. per m.u. of the factor.}$$

It is known that, in order to attract the best labour force from the labour market, international companies offer usually the best salaries in the country where they externalise their branches or production capacities. In our example, we'll consider that in comparison with the 1,000 m.u. average salary that was offered by "R" company from the poorer country, company "A" shall offer to its employees, from the unit it bought in Romania, an average salary of 3,000 m.u.

$$W_{L_2^A} = Q_2^A \cdot p / L_2^A \cdot w^A = (Q_1^A + Q_1^R) \cdot p / (L_1^A \cdot w^A + L_1^R \cdot w^R) = (1,000,000 + 100,000) \cdot 10 / (1,500 \cdot 10,000 + 150 \cdot 3,000) = 1,100,000 \cdot 10 / (15,000,000 + 450,000) = 11,000,000 / 15,450,000 = 0.712 \text{ m.u. per m.u. of factor.}$$

Such salaries increases offered by companies of type "A", do not represent a significant financial effort for them and do not generate an important decrease in their productivity (but only from 0.726, to 0.712 m.u. per m.u. of factor); in exchange, besides the subjective aspects of image, this gives them the chance of recruiting the best human elements of the local labour market. And this advantage is obtained with much smaller salary costs than the company would have in its origin country. Even if the hypothetic international company increases the salaries paid to the employees of the small unit it bought in Romania, we can notice an increased average productivity of the American company as result of such investment in a foreign country (the difference between 0.726 m.u. per m.u. of factor and 0.712 m.u. per m.u. of factor – when it decides to take such measures in order to attract labour force of the best quality from the market that it just entered – is very small for the company in our example).

Important for the new economic entity (extended at international level) is that the registered productivity is superior to the previous productivity of the American entity, as well as from the productivity registered by the "R" company, before being bought by foreign capital.

We find this as being an advantage, from the point of view of productivity, *at global level*.

When computing the marginal productivity (with the increased salary for the employees in Romania) we obtain:

$$W_{L_2^{\text{(increased)2mgn}}^A} = \Delta Q^A \cdot p / \Delta L^A \cdot w^A_{\text{increased}} = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A_{\text{increased}} = (1,100,000 - 100,000) \cdot 10 / (1,500 \cdot 10,000 + 150 \cdot 3,000 - 1,500 \cdot 10,000) = 10,000,000 / 450,000 = 22.222 \text{ m.u. production increase on m.u. of increase of the expenses with labour.}$$

The full value marginal productivity shows an increase of production of 22.222 m.u. at each m.u. of increase in the salary expenses.

But if the company externalises all of its productive capacities – in countries with cheap labour force, using the economic advantage of savings concerning the labour costs –, then the paid salaries will all be of, let's say, 3,000 m.u. per person, generating a marginal productivity that is considerably bigger, when the evolution with the expenses with the labour factor are strongly decreasing:

$$W_{L_2^{\text{(uniform)2mgn}}^A} = \Delta Q^A \cdot p / \Delta L^A \cdot w^A_{\text{uniform}} = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (1,100,000 - 1,000,000) \cdot 10 / (1,500 \cdot 3,000 + 150 \cdot 3,000 - 1,500 \cdot 10,000) \cdot 3,000 = 100,000 \cdot 10 / (4,500,000 + 450,000 - 15,000,000) = 1,000,000 / -10,050,000 = -0.0995024 \text{ m.u. production increase per m.u. of increase of the factor.}$$

The 1,000,000 m.u. plus of production is in this case, obtained by the company, with salaries expenses with 10,050,000 m.u. smaller.

We observe that extending the capital from the countries having strong economies, in less developed countries, has important advantages for those companies and for their origin countries, the impact being regarded as the different influences that they can use. Also, this expansion has

advantages for the less developed country, for example through the development of business techniques and technology.

We should also say that if the company would have kept the uniform salaries for *all* employees (including the workers in the capacities bought abroad), the new acquisition wouldn't have been profitable, as the surplus of production generated by the new workers wouldn't have been much bigger than the increases of expenses with the salaries.

$$W_{L(\text{uniform})2\text{mgn}}^A = \Delta Q^A \cdot p / \Delta L^A \cdot w^A_{\text{uniform}} = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (1,100,000 - 100,000) \cdot 10 / (1,500 \cdot 10,000 + 150 \cdot 10,000 - 1,500 \cdot 10,000) = 10,000,000 / 1,500,000 = 6.667 \text{ m.u. of production increase per m.u. of increased expenses with the labour factor.}$$

In this case, buying production units abroad wouldn't be justified.

For the sake of comparisons, we can take also the hypothetic case when the company A would continue to pay its employees in Romania salaries at the smaller level (unmodified) of the average salary of the local economy where the investment was made (such an approach would have been the most beneficial for the company in respect to the increase of production brought by each additional unit of supplementary salary expense); but, such a case has just a theoretical character for, despite the fact that international companies try to have the biggest benefits, they often use human resources policies that conserve their image of best paying companies on the labour market. The companies that pay salaries which are higher than the average of the economy afford to use lots of selections and checks in recruiting new employees, which allows them to employ the best labour force from the relatively poor countries in which they decide to produce:

$$W_{L(\text{unmodified})2\text{mgn}}^A = \Delta Q^A \cdot p / \Delta L^A \cdot w^A_{\text{unmodified}} = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (Q_2^A - Q_1^A) \cdot p / (L_2^A - L_1^A) \cdot w^A = (1,100,000 - 100,000) \cdot 10 / (1,500 \cdot 10,000 + 150 \cdot 1,000 - 1,500 \cdot 10,000) = 10,000,000 / 150,000 = 66.667 \text{ m.u. production increase per m.u. increase of the expenses with the labour factor.}$$

3. Interpretation. Conclusions and comments

In the present analysis, we considered a hypothetic case, comparing the possible evolutions of two very different economic entities: a relatively small Romanian company and a big American company. We didn't take into account the field of activity, but we had a general, theoretic approach (with no other specificities, besides the economic market force given by the size of the considered entities and the differences generated by the national economy in which these entities act). Therefore, we underline that the results of these formulas (of the average physical productivity), computed for random data, are valid in the hypothetic senses that we've assumed from the very beginning.

Important, from the methodological point of view, is that the results are not influenced by any subjective desire: we didn't want to pre-establish some results that are more "convenient" to a certain conception. In the example we considered, the starting average productivity (at the moment t_0) was the same for both entities (40 pieces per worker); and in the following period, the productivity of 66,67 pieces per worker, was also the same.

From our calculus, a relative disadvantage of the American company resulted in comparison with the smaller (Romanian) enterprise, in terms of the marginal productivity in physical units. The initial apparent contradiction with the usual perception upon the economic realities is cleared once we pass to calculating productivity in the most common way: in value units. We've introduced in our analysis, step by step, firstly the price of the sold production, then the price at which the labour force is bought (the salaries). These elements of calculus are no longer connected to the productive quality (of creating value) but to the market negotiations, done in a certain conjuncture.

The productivity computed this way (considering both value elements – prices), which we named full value productivity, showed increases, for the chosen examples, in the case of the Romanian enterprise, both of the average productivity and the marginal one (we established an increase of 1,2 m.u. of production value at each unit of value of the labour factor).

The big difference, when we look at the events in their evolution, is that company "A", which externalizes part of its capital to foreign countries, shall exploit that capital by working in those

countries with a cheaper labour force than in its own country of origin. This aspect is important from the point of view of the *reasons* of externalising the capital factor.

By analysing what happens with the indicators, we notice that, even if the marginal productivity of the company stays the same, the paid salaries will be smaller: the investor takes into account the prices on the local labour market. In their decisions, companies do not follow a marginal calculus that describes some sort of rule in establishing the salaries to be paid: the only law is the market itself, where the company "A" negotiates the prices according to its own interests, not according to marginal mathematic calculi (according to Jivan, 2014).

Therefore, the international company, without doing any special financial effort, and maintaining an important increase of marginal productivity (0,712 m.u. of production per m.u. of wages), manages to have a good image and to obtain the highest quality labour force of the local market, by paying higher salaries, even if those higher salaries (often much bigger than the relatively smaller salaries of the local workers) represent smaller costs for the company, than those it would have paid in the origin country for the same labour services.

The big company's productivity after the acquisition of the Romanian production unit is bigger than the calculated productivity of the Romanian production unit when it had local capital, but, as previously shown through calculus, it is bigger than the productivity of the American company before this investment also. By paying salaries that are 10,050,000 m.u. smaller than those it would have paid in its own country, the company in our hypothetic example obtained an extra production of 1,000,000 m.u. We've also noticed a significant increase in the marginal productivity calculated with both mentioned price elements (prices of the sold production and of the purchased labour force) of 22.222 (compared with the 1.2 increase computed for the "R" company).

In the paper, we have also highlighted the advantages seen from the point of view of the productivity, at the level of the world economy as a whole.

In conclusion, compared with the initial productivities taken as identical (in physic units), the differences appear when we consider the market policies evolutions, the confrontations of forces that we find even in the negotiated prices; from this point forward, things change, leading to the known image where the strong entities from strong countries will register better productivities than others, not obligatory because their capacity of creating production per physic unity of labour is bigger, but because they have a bigger force to negotiate better prices for themselves (in value expression). And more favourable prices for an "A" entity means higher prices for what that entity sells and smaller prices for what it buys (for example, labour).

The hypothetic example can for sure be considered to be a particular one. Nevertheless, the validity of the ideas is general: namely, the theoretic analysis is done on the basis of practice, of the real economy. And this, the economic life, works according to the laws of market confrontation between diverse economic entities that come with specific arguments, negotiate from diverse positions, in real given conditions, without any theoretic or mathematic predetermination.

The lesson that can be learned from this analysis, by looking at the two categories of economic entities taken as example, with market policies that are more or less expansive (according to certain very different conditions of economic force and available capital) is that the effects over their productivities are different when these productivities are computed in value expression, in a dynamic approach of these indicators. This can be useful as a frame for the perception over the productivity that offers suggestions not only for more complicated and detailed simulations of this research subject, but also for new analysis and developments, including some with real date, for management decisions and market policies.

4. References

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