

The Invisible Hands of Inter-industry Links

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Summary: This paper examines the issue of measuring the influence of processes, running outside a company, on its results, using the "input-output" method. For this purpose, a separation of the economic system into two subsystems without crossover was made, called "company" and "rest of economy". When the "input-output" method was not used, three "invisible" groups of influences on the company's results were identified and the way of measuring the direct and indirect effects was formulated.

In particular, the following groups of effects were identified:

- Effects in respect to inter-industry relations due to changes in the final demand for products of the "rest of the economy";
- Effects in respect to the reverse, inducted influence of the company's production program on its own results through the inter-industry relations system;
- Effects from the interdependence between the final demand for the company's products and the rest of the economy.

Conditions were specified, under which the formulation is appropriate and useful for a more in-depth analysis of the relations between the

company and the rest of the economy and which a company must observe in order to use the "input-output" method effectively.

An emphasis was placed on the unproductive and groundless overestimation of the impact of a company's marketing activity on its results. The issue about quantification of direct and indirect effects on the company of processes, running outside of it and independently from it and its management's decisions was examined and formulated precisely to protect the companies' management from a similar overestimation.

Key words: marketing, "input-output" method, direct effects, indirect effects, full cost matrix.

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In recent years, we have been witness to widespread worship of marketing's "incredible potential". The majority of managers believe that "everything is marketing", however they understand that "Marketing is everything". Marketing and its tools and methods are seen as a secret art, verging on magic and able to work miracles in situations that objectively do not presume wonderful manifestations.

In fact, even the issue of approximate measurement of the impact of the actions, collectively referred to with the name "marketing", and therefore – its effectiveness remains controversial in the

theory. The faith in marketing power has given rise to the terms “good marketing” and “bad marketing”, something like “white magic” and “black magic”, and they “explain” a company’s good and bad results, when appropriate. Indeed, for those who are not aware of the complex interactions between a company and the rest of the economy, unexpected successes (or failures) could be explained only by the impact of some supernatural powers and here mystical marketing rituals are among the first candidates. It seems as if some invisible hand rising out of nowhere takes money from or gives it to businesses.

At the same time, the only method so far that is capable of measuring the direct and indirect effects in the economy – the “input-output” method – remains ignored. In our opinion there are several reasons for that:

1. Most managers or decision makers in general have never heard about this method, for which the educational system is only partially responsible, since not all managers have had an economic education.
2. Some small part of decision makers in the economy, with an economic education, have a vague idea of the method, which has given them the opinion that this is some abstract theory related to macroeconomics and which has nothing in common with company management.
3. Another part of those with an economic education, having been frightened by the formulas expressed as a matrix, remain with the wrong impression that this is an extremely complex and difficult-to-apply method.
4. Finally, we could put down as a reason the lack of timely and appropriately processed and submitted information about the Bulgarian economy; however here, as the expression goes, the lack of demand completely explains the lack of supply.

The objectives of this paper could be graded as follows:

To give an idea of and provide measures for the “invisible” effects for a company, for effects that have nothing in common with marketing and even with decisions and actions of the company’s managers;

To distinguish the sources of those effects and to give the reader a clearer picture of the interaction between the company and the rest of the economy;

To make decision makers see that what goes on outside the company and generally “does not concern” them does in fact have significance for and a measurable influence on the company and it is imprudent to ignore such events;

To overcome the delusion that marketing is omnipotent and the blind faith that everything is achieved as a result of “good marketing”, and failures could be overcome by nominating a new marketing manager, who has proved him/herself in another company or by spending money on a new commercial.

We will present the company and its relations to the rest of the economy as a classical “input-output” system with several special features.

Taking into account the separation of the economy into two parts – “company” and “rest of economy”, the basic equation would look like this:

$$\begin{pmatrix} X_1 \\ X_2 \end{pmatrix} = \begin{pmatrix} A_1 & A_2 \\ A_3 & A_4 \end{pmatrix} \begin{pmatrix} X_1 \\ X_2 \end{pmatrix} + \begin{pmatrix} Y_1 \\ Y_2 \end{pmatrix},$$

Where:

Matrix A_1 is the company’s technical matrix describing the company’s consumption of materials to produce its products. The most

appropriate measures here are the natural ones, since there could be interim products among the company's products, which are only produced and consumed, and not sold, i.e. they do not leave the company as an individual product on its market, and therefore there are no measures of their value. Its coefficients measure how many natural units of various companies' products are consumed to produce one natural unit of a certain product. In this sense, it is actually a technological matrix, since the coefficients in it are not affected by price ratios. This matrix is square, containing the kind of detail on the products produced by the company that the company considers necessary.

Matrix A_2 is a matrix of the sales of the company's products in branches of the "rest of the economy" and it is expressed in terms of type of nature/value. This matrix describes the branches that buy the company's product. Its coefficients measure how many natural units of the company's products are purchased and consumed to be used in the production of a unit in the relevant branches. The dimensions of this matrix are determined by the number of products, with which the company wants to describe itself (number of lines) and by the number of branches describing the national economy (number of columns).

Matrix A_3 is a matrix of the company's purchases of products and services from the branches of the "rest of the economy" and the logical measure here is the value/nature type. Its coefficients measure how many value units of the production of individual branches of the "rest of the economy" are purchased and consumed to produce one natural unit of the relevant company's products. The dimensions of this matrix are determined by the number of branches describing the national economy (number of lines), and by the number of products, with which the company wants to describe itself (number of columns).

Matrix A_4 is a traditional matrix of direct cost coefficients, describing the relations between branches from the "rest of the economy". Its coefficients are expressed as value/value. This matrix is also square, with dimensions adopted by the NSI (National Statistical Institute) and EUROSTAT.

Vector X_1 describes the production of the company's products in kind and with dimensions selected by it.

Vector X_2 describes the production of branches of the "rest of economy" in terms of value, with dimensions adopted by NSI.

Vector Y_1 describes the sales of the company's products in kind to end consumers under the model of inter-industry relations, including for export.

Vector Y_2 describes the sales of products of branches from the "rest of economy" in terms of cost to end consumers under the model of inter-industry relations, including for export.

We could say that the four submatrixes A form a common matrix describing the non-uniform entity "company – rest of economy", where measurement units are incomparable in individual submatrixes.

By multiplying the common matrix block-by-block, two balance equations are derived, respectively for the company and for the rest of economy:

$$\begin{aligned} X_1 &= A_1 X_1 + A_2 X_2 + Y_1 \\ X_2 &= A_3 X_1 + A_4 X_2 + Y_2 \end{aligned}$$

By transforming the second equation describing the rest of economy, we derive a version of the famous equation of the inter-industry relations model:

$$(I - A_4)X_2 = A_3 X_1 + Y_2$$

As you can see, the difference in the classical equation is the presence of another element of "end consumption", namely the products from the branches of the rest of economy consumed by the company during manufacture. For the rest of the economy, from which the company was extracted, this in fact appears as end consumption. We are focusing on this equation, because it is exactly the A_4 matrix that has the properties required to make $I - A_4$ non-special, i.e. for its inverse matrix to exist. The existence of an inverse matrix (also known as full cost matrix) enables us to write an expression for X_2 .

$$X_2 = (I - A_4)^{-1}(A_3X_1 + Y_2)$$

We substitute the resulting expression for X_2 in the balance equation of the company and derive an expression for its production:

$$X_1 = A_1X_1 + A_2(I - A_4)^{-1}(A_3X_1 + Y_2) + Y_1$$

What new elements are present in this equation in addition to the ones known from the classical "input-output" model? An expression comprehensive by content, on which we would like to focus the reader's attention, because the type and meaning of the other elements are known.

The expression $A_2(I - A_4)^{-1}$ should be familiar to those familiar with the inter-industry relations model: thereby are calculated any full costs for resources, appearing as "external" to the economic system (e.g. total labor intensity, capital intensity, import intensity, etc. are calculated in this way). In this case, the focus is on the full costs of the company's products that the rest of economy incurs to produce one (value) unit of end product. The understanding of this expression and its interpretation precisely as full costs of the system will help to understand the remaining part of the equation and where the "invisible hands" are coming from.

The first "invisible" hand" is the expression $A_2(I - A_4)^{-1}Y_2$, which will present the sales of the company's products, directly and indirectly consumed for the production of the end production of the rest of the economy. As it can be seen, in addition to the direct costs for the company's products in the branches of the rest of the economy (Matrix A_2), the matrix of full costs of the rest of the economy and the vector of the end production of the rest of the economy are also crucial in the expression. If the values in matrix A_2 are due to the technical requirements of the rest of the economy and the efforts for positioning of the company as a supplier for the branches (own - "marketing" efforts, but not only), the other elements in the expression are not dependent on the company at all!

Neither matrix A_4 , nor vector Y_2 depends on the decisions and actions of the company's managers in any way. For this reason, they form the opinion that the events in the "rest of the economy" are not of any interest to them and that these events are in no way related to the company. And, as it can be seen, all of them influence the company's sales as a supplier for the "rest of the economy". Maybe it sounds incredible, however, indirect effects often appear even where direct are completely absent. If we want to measure individually direct and indirect effects, it is enough to calculate

$$A_2(I - A_4)^{-1}Y_2 - A_2Y_2,$$

where A_2Y_2 measures direct effects in the company's products and in branches of the "rest of the economy", i.e. the direct contribution of each branch to the company's sales, and the difference between all effects and the direct ones represents the indirect effects. It is precisely these indirect effects that are the measurable results of the influence of the "invisible hand" on the "rest of the economy". Besides making various superstitions about the omnipotence of "good marketing", the lack of measurement of these

effects also distorts the picture of the company's management of reality and, respectively, their ability to make adequate decisions.

The second "invisible hand" is manifested by the expression $A_2(I - A_4)^{-1}A_3X_1$, which measures the direct and indirect inverse influence on the company, on its own production program through the system of the "rest of the economy". Since for the "rest of the economy" its sales to the company are a kind of end production, they have a direct and indirect influence on the company's sales, like the other end production of the "rest of the economy". Again it is possible to individually assess the direct effects on the company using $A_2A_3X_1$ and indirect – using $A_2(I - A_4)^{-1}A_3X_1 - A_2A_3X_1$. Here, the "invisible hand" is even more invisible, because its influence is induced and enhanced¹ through the national economy's influence of the company on itself. Do decision makers in a certain company have any idea about how the "rest of the economy" enhances their actions? More likely is that they have not and that they attribute these multiplicative effects to "good marketing" or "bad marketing" (if they belong to the "church of believers in marketing"), or to the "good/bad situation", or as it happens most often – to their own genius and foresight. Are decisions makers willing to take into account these effects, when making decisions for the production program of the company managed by them? Again – probably not.

The third "invisible hand" is more difficult to describe as a formula, therefore we will only give a word description of it. A part of the end consumption of the company's products is determined not by the wishes and efforts of the company's managers, but by the complex relations between the company's products and branches of the "rest of the economy".

It is known that end consumers do not just use volumes of end production, but that they also have requirements for its product structure. In respect to the exchangeability and complementarity between products, some part of the end production of the company is determined by the end production of the "rest of the economy", and vice versa. It is necessary to define our hypothetical company in this field in order to determine the directions and the power of cause and effect. In one of the cases, changes in the end consumption of products of the "rest of the economy" will be an explanatory factor for changes in the sales of the company's products, which should be taken into account. In the other case, sales of the company's products will be an explanatory factor for changes in the end consumption of products of the "rest of the economy", and hence – a lever for indirect impact on that end consumption.

Once more, coming back to direct and indirect effects in respect to end consumption Y, the influence of this third "invisible hand" on the company's sale could be measured.

In conclusion

For there to be a point to use the model specified in this version, the company should meet some requirements.

First, this should be a company that is large enough within the national economy. For small companies, especially those determined by the company's influence on the national economy, direct and indirect effects will be negligibly weak. For larger companies, however, this is not the case at all; they have a significant position in the national economy.

¹ The other name of full cost coefficients is "multipliers", because they multiply the effect of the end consumption on the economy and because the method of their calculation does not differ from other multipliers in content.

Second, the company should be sufficiently integrated in the national economy, i.e. to appear as a supplier for its branches and a consumer of its products. If such integration is completely absent, which could be expressed in zero matrixes A_2 and A_3 , then both systems will function completely independently of each other and will not influence each other. The weak integration² of the company in the national economy could find expression in weak effects on it by the processes, running in the national economy. However, if the first requirement is met, it is unlikely that the second would not be met.

Third, it should be possible to easily “separate” the company’s information from the information about the national economy, as the company’s information will inevitably be present in some form or another in NSI’s data. In this case,

companies, which occupy a unique place in the economy, are in a privileged position, and according to this position they constitute a whole “industry” in and of themselves, in which case it is easy to separate data and to describe the relations. On the other hand, branches, where many small companies exist and which produce analogue products and compete with each other, provide less opportunities for reliable separation of the information at company level than that of the NSI, and here efforts will be mainly at the company’s expense.

Fourth, but not least, the company should have enough enlightened managers³, who understand the meaning of and benefits from this additional work, as well as the opportunities, which this additional information provides for making meaningful and appropriate management decisions. **EA**

² In this context, the issue of measuring the level of integration of a certain company or other structure in the national economy acquires its specificity and becomes mathematically solvable, without ignoring the technical difficulties.

³ As always “Employees are those who make decisions for everything”.