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Labour Productivity in Planning

by

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C o n t e n t s

Labour Productivity in Planning

The increase of labour productivity is the sine qua non of economic development and progress. It is essential , therefore, that planners understand very well its importance. They have to develop methods which provide a full command and control of the trends in productivity throughout the economy.

1. The general concept of productivity of labour.

In a sense, labour productivity is the general indicator of economic efficiency. It gives the final result that comes from absolutely all measures and steps in planning. Efficiency, however, must be clearly defined in terms of time. This so, because finally economy and its planning are a matter of time. A society or country which needs less time for producing all necessary goods than before or than any other economy will be the more advanced and economically more powerful one. The less time we have to use for producing all the necessary goods the more time will be available both for additional production and human activities in other fields (science, arts, health etc.).

Thus, we can define labour productivity as follows:

Volume of output per worker in one unit of time,

or the inverse of this definition:

Time needed by one worker for producing one unit of output.

The time needed for one unit of production (or the number of units produced in one unit of time) are determined by four main factors:

(i) Average skills and experiences of the worker and his attitude to work as well;
(ii) quality and quantity of means of production which the worker is operating;
(iii) level and degree of technological applicability of science;
(iv) organization of production at all levels of the economy.

The main factor , apparently, is the worker. He represents the ultimate productive force we have. It is essential, therefore, that all social political, educational, technological etc. conditions be created for giving full scope to his activity. There can be no doubt that already the establishment of a public sector may give the worker a feeling that he is not working anymore for the mere benefit of the former private owner of the factory. This fact will give an impetus to work more, which is a direct factor of productivity.

Nowadays, productivity cannot be separated from the utilization of modern equipment. If, therefore, developing countries wish to have a remarkable increase in productivity they should think and act in terms of capital intensive industries and techniques.[1]).

Science seems to be widely acknowledged as a direct factor of economic development. Hence the remarkable efforts especially of the socialist countries for promotion of science. However, it is not merely science as such which greatly helps ahead the national economy . It is rather its degree of technological applicability which makes it function as a productive force. Any work in the field of science, therefore, should be geared to the main lines and targets of economic development. Yet, what and how much should be done in science (and when) must be directly planned. Research is no longer an activity of individuals with no strict link to the

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1) cf. Memo. No. 262 "Technological analysis of industry and Memo. No. 384 "the role of industry in development".

social and economic targets of the plan. Countries which do have all the necessary conditions for planning in its proper sense face the problem of planning the ever growing share of scientific labour in total productive labour. This is the way to fully utilize this extremely important factor of labour productivity. This factor, however, has to be made operational on many lines; new technologies, modernization of equipment and last not least, better technological training of all manpower.[1)]

Finally, the mode of organization of production directly reduces the time required for a given volume of production. It is well-known that generally specialized productive units are superior to universal ones. Since the advanced capitalist economies have developed, in many cases, a fairly good system of intra-factory organization of production, all developing countries with a large public sector have the chance to set up, in addition, a highly productive national organization of production on a functional basis. This chance stems from the, though partial, elemination of private capitalist influence on the national economy which, by its nature, gives preference to the factory's interest. The General Public Organizations in the UAR - industry are a promising beginning in this field. They can be substantially 'productivity creating' if they manage to model a national organization of economic activities at the level, at least, of that industry for which they are responsible.

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1) cf. "Science as a direct productive force" by A.A. Zvorykin in "Impact of Science on Society".
(Vol. XIII, 1963; No. 1) UNESCO, P. 49.

2. Calculation of labour productivity

2.1. " The time-summing method"

Although there exist several ways to calculate productivity according to the specific aims the planner has in mind, all of them have to be related, primarily, to the result of productive labour (= production) and the time required for achieving this result. The following brief discussion deals with the so-called 'time-summing-method' which is being applied since 1963 in the industry of the German Democratic Republic. This method is a compulsory one in the German industrial planning system, and its basic idea is to calculate exactly the time needed for doing every partial operation in producing one product and the total time used for the product itself, and, finally, the time that had been (or has to be) spent for total production of a factory.

This approach necessitates a technical plan (cf. I.N.P. Memo. NO. 262 'Technological Analysis of Industry') which covers all measures in the field of technical and technological improvement and their impacts on the time consumption for producing the planned assortment of output. In other words: labour productivity (both in absolute terms and given as a growth rate) describes the final efficiency of technical and hence economic progress or, the other way round, the technical plan is the prerequisite of planning of productivity.

The mentioned time-summing-method as such is based on two simple formulas:

$$(1)\quad \frac{\sum q_1 \cdot t_0}{\sum q_1 \cdot t_1} \qquad (2)\quad \frac{\sum q_0 \cdot t_0}{\sum q_0 \cdot t_1}$$

where q_o stands for the quantity of production in the base (or previous) year;

q_1 for the quantity of production in the plan year;

t_o for the time actually needed for producing q_o

t_1 for the time planned for producing in the plan year.

Formula (1) tells us how much time we would need for the planned production (q_1) if the work standards (norms) were taken from the preceding year (t_o) as against the time we plan for the new year (t_1). The result is the rate of growth in productivity.

In practical planning, however, we face repeated changes of the structure of production which remarkably affect the average productivity indicator. These shifts have to be eliminated. This is why we need formula (2). Here the calculation is related only to the output of the base year (q_o) whilst a comparison is made between the definitely used time (t_o) and the planned time (t_1).

2.2 A simplified model of productivity

Planning of productivity requires a differentiated study of its factors. These factors can be singled out by an appropriate economic model which integrates all those magnitudes that are objectively related to productivity. Our following model will be built of two time categories, two manpower categories and two products:

actual working time (t_o and t_1)

nominal working time (t_o nom. and t_1 nom.)

workers

all employed (incl. workers).

From statistics we learn for the previous year which is the base year of our plan:

Previous Year (o)

		Workers		all employed	
	q_o	t_o	t_o nom.	t_o	t_o nom.
Product A.	3	1	1,33	1,66	2,33
Product B	7	2	3,	2,57	3,86

Having drafted the plan (production plan and technical plan) we arrive at the following figures which actually are the targets for the plan year:

Plan Year (1)

		Workers		all employed	
	q_1	t_1	$t_1$nom.	t_1	t_1 nom.
Product A	10	0,5	0,6	0,7	0,82
Product B	10	2,	2,5	2,2	2,73

The reader can easily see which improvements and changes we have provided for in our plan. Now the productivity indicators (coefficients) must be found. We do need several ones because we have assumed various time and manpower categories. It is clear that different factors of productivity cannot be expressed by one coefficient. With the help of the two mentioned formulas and the two tables (previous plan and the new one) we shall have the following productivity coefficients.[1]

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1) For implification we have dropped some coefficients.

	Workers		all employed.	
	Base Year	Plan Year	Base Year	Plan Year
Actual time	1,1	1,2	----	----
Nominal time	----	1,4	----	1,74

(The first coefficient:

$$\frac{\sum q_0 \cdot t_0}{\sum q_0 \cdot t_1} = \frac{3.1 + 7.2}{3.0,5 + 7.2} = \frac{17,}{15,5} = 1,1$$

the second one:

$$\frac{\sum q_1 \cdot t_0}{\sum q_1 \cdot t_1} = \frac{10.1 + 10.2}{10.0,5 + 10.2} = \frac{30}{25} = 1,2$$

etc.)

2.3 Factor analysis:

The subsequent analysis reveals to what extent each factor will really contribute to the increase in productivity of labour. The grand total in our model is 1,74 i.e., finally, productivity will grow by 74% during the plan period.

(i) The first coefficient of 1,1 tells about the contribution of technological improvements to the planned increase of productivity. This so, because it had been calculated on the basis of the output in the previous year (i.e. all changes of the assortment are actually eliminated) and the time needed and planned (t_0. t_1). The new element in this first calculation is the reduced time.

If we would have produced the same quantity (q_o), as against the year before, productivity of labour would have risen by 10%. This increase, which is the inverse of the reduction of the actual working time, comes from technical progress.

(ii) The second coefficient (1,2), expresses the expenditure of actual working time for the planned production (q_1). In addition to the first, it includes the new structure of output. Here we have the result of the shifts in the assortment of production. As the two tables show output of product A rose from 3 units to 10 with actual working time for each being reduced from 1 unit to 0,5. Simultaneously, there was a less significant increase in production of commodity B (from 7 to 10) with no reduction of actual working time ($t_o - t_1$) per unit.

Up till now, total increase is 20% (1,2). As technical progress accounts for 10%, structural improvement in output contributed another 10% to the growth of productivity.

(iii) So far, both calculations covered the actual working time. The latter, however, as a rule, is less than the nominal working time. To lessen the difference between both time categories means to have more actual working time available which increases production without any increase in the number of workers and the actual time required for one unit of output. Better utilization of the nominal working time diminishes the waste of time which substantially contributes to productivity. The reason for that is, usually, improvement in the organization and management of production.

Thus, the third indicator (1,4) adds 20% to the productivity already gained from technical progress and better structure of output.

(iv) Finally, we have to take into account not only the workers but all manpower of our factory. These include, in addition to the workers, the engineering, managerial (administrative) and auxiliary personnel. Apart from the engineering staff, the share of the other sub-categories of manpower should decrease to an extent which is minimal but just sufficient for running the plant efficiently. We may assume rightly, that most factories do have possibilities to reduce the number of their administrative etc. staff thus economizing their management. In our case the difference between 1,4 and 1,74 (total increase) marks the effect of improvement in the field under discussion. Actually, the efforts against bureaucracy resulted in a contribution of 34% to the overall growth of labour productivity.

Summing up we find the following impacts of the various factors on productivity:

		Share in total increase
i)	technical progress 10% (1,1)	13,5%
ii)	structural changes 10% (1,2) of output	13,5%
iii)	better utilisation 20% (1,4) of nominal working time	27 %
iv)	better management 34% (1,74) and administration	46 %
	Increase of productivity 47:	100%

The model, simplified as it is, entails two important general rules for the planner. The first is that productivity per nominal working time should always grow faster than per actual working time (this is valid for all categories of manpower).

Δ 'output per worker (1 hour nominal working time) $>$ Δ 'output per worker (1 hour actual working time)

If so, we have a smaller absolute difference between both time categories or less waste of time. And time is prodctivity.

The second rule favours a more rapid increase of productivity per employed than per worker. The difference , if shrinking, again means less waste of manpower in the field of administration and the like.

Δ 'output per employed $>$ Δ 'output per worker

Both rules seem to be very advantageous for industrial planning in developing economies. Because they provide for an increase in productivity , which is the main problem in development, without or almost without investment . Either factor is productivity - creating and simultaneously, investment-saving. However, it remains still true, that the most significant factor of productivity is technical progress which is by no means investment-saving. However, no country can afford to neglect even secondary and tertiary factors in this vital field of economic progress.