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COMPUTING LABOR PRODUCTIVITY IN THE USSR

/Numbers in parentheses refer to appended sources./

Concept of Labor Productivity in Soviet Union

Labor productivity in the Soviet Union is expressed in terms of quantity of output during a unit of time spent in production or in terms of time spent in producing a unit of production.(1) Generally, it is defined as "output per worker per unit of time."(2, 3) The labor productivity index is the ratio of the volume of output and the working time spent in producing it. If P equals labor productivity, V the volume of output, and T the working time spent in production, $P = \frac{V}{T}$. Thus, true to Marxian concept, labor productivity can be increased either by increasing the volume of output or by shortening the time spent in production.(3)

/In publishing statistics on labor productivity increases, the Soviets do not generally distinguish between increases in labor productivity which were caused by changes in the ratio of capital equipment to labor and those which were caused by an increase in the efficiency of labor with a fixed ratio of capital equipment to labor./

Measuring Labor Productivity

The basic method of measuring labor productivity in the Soviet Union is by dividing gross production (measured in unchangeable 1926 - 1927 prices) by the average number of workers available during the year. For example, if production of an enterprise for a given month amounts to 1.5 million rubles, while the average number of workers was 300, the index of labor productivity is $\frac{1,500,000}{300} = 5,000$ rubles per worker.

For measuring labor productivity in the production of a single type of product, the index of labor productivity is expressed as the ratio of the quantity of production for a given period in physical units (pieces, tons, meters, etc.)

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and the average number of workers. For example, if production in an iron foundry for a given period amounts to 150 tons of cast iron and the average number of workers in 75, the labor productivity index is $\frac{150}{75} = 2$ tons per worker.

A third type of index for measuring labor productivity is expressed in units of working time as the ratio between the time spent in production (man-days) and the average number of workers.(4) When production output is compared with a planned figure or with production for a previous (base) period, it is expressed in "norm-time" units. In such a calculation, it is advisable to use the norms used in drawing up the plan, as shown in the following table:

Type of Goods	Quantity of Goods Produced for t ie Qu			Norm Time in Man-Days	Norm-Days Spent in Production			Av No of workers		
	Base Period	Plan	Given Period		Base Period	Plan	Given Period	Base Period	Plan	Given Period
No 1	2,500	3,000	3,000	3.0	7,500	9,000	9,000	--	--	--
No 2	500	500	600	0.5	250	250	300	--	--	--
No 3	3,500	4,000	4,500	1.2	4,200	4,800	5,400	--	--	--
	--	--	--	--	11,950	14,050	14,700	150	165	165

According to the table, the labor-productivity indices are:

a. For the base period, $\frac{11,950}{150} = 79.6$ man-days

b. For the plan, $\frac{14,050}{165} = 84.1$ man-days

c. For the given period, $\frac{14,700}{165} = 89.2$ man-days

The labor productivity of the given period compares with that of the base period, as follows: $\frac{89.2 - 79.6}{79.6} . 100 = 12.1\%$

It compares with the planned figure as follows: $\frac{89.2 - 84.1}{84.1} . 100 = 6.1\%$(5)

According to a publication of the Academy of Sciences USSR, the first, or the gross production, method is considered fundamental and compulsory for planning and calculating labor productivity for an enterprise as a whole, for a branch of industry, or the whole economy.(5) /However, even the Soviets recognize the faultiness of calculating labor productivity by the gross production method./ One author suggests adjustments in the following cases where labor productivity for an enterprise is measured by this method:

a. A shift in the assortment of goods produced.

b. A change in the relative emphasis on the production of certain shops in the total volume of the enterprise's output.

c. Adjusting the quantity of unfinished goods. (4)

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In addition to the erroneous assumption that the price structure prevailing in 1926 - 1927 holds true for the present, the gross production method also results in a downward bias of output per worker in branches of industry which produce raw materials as compared with branches which process raw materials ans semifinished goods.(6) Defects of the gross production method are reflected in sharp changes in the relative emphasis on the production of certain branches, or by significant changes in assortment within a branch. In such cases, the dynamics of output, expressed in prices, differs from the dynamics of labor productivity, which is expressed in terms of expenditure of labor. In the case of rapidly increasing production of a branch of industry (or a commodity within a branch) for which prices are high, calculation by the gross-production method shows exaggerated productivity. The broader the basis for calculating average output (e.g., the average for an industry, kray, or oblast), the less will it reflect changes in assortment and volume of production of more or less costly products, and the more accurate will be the average and its dynamics. However, in a calculation of average productivity in terms of 1926 - 1927 prices for a single enterprise or a small group of products, the dynamics of the average output may not be significant.

Suppose an enterprise produces two kinds of shoes, leather and canvas. The same length of time, 4 hours, is required for each, but a pair of leather shoes is priced at 40 rubles, canvas at 25. Suppose that during a given period, 100 workers produce 400 pairs of leather shoes at 40 rubles a pair, totaling 16,000 rubles, and 400 pairs of canvas shoes at 25 rubles a pair, totaling 10,000 rubles. Altogether, 100 workers produced 26,000 rubles' worth, and output per worker amounted to 2,600 rubles.

In the next period, the same number of workers produced 600 pairs of leather shoes at 40 rubles a pair, totaling 24,000 rubles, and 200 pairs of canvas shoes at 25 rubles a pair, totaling 5,000 rubles. Thus, the same workers, working the same number of hours, produced 29,000 rubles' worth, or 2,900 rubles' worth per worker. The price /gross-production/ method shows an increase in productivity, while the number of man-hours worked per unit of output remains unchanged. This example illustrates the fallacy of calculating labor productivity by the gross-production method for a single enterprise.

These defects of the gross-production method can be corrected by use of the index method and, where possible, by the method of expressing output in terms of actual measurements or in terms of labor costs.

Calculation of productivity by the index method eliminates the effect of changes in the volume of groups of products differing in price. The average rate of increase of productivity in an enterprise, etc., will depend solely on the number of workers in each shop or enterprise and on the increase in labor productivity achieved in each group of workers. The result thus computed reflects the average difference in labor costs. The index method is of auxiliary nature, a check on the gross-production method. An example follows.

Enterprise or Branch		Report Period	Plan Period	Ratio of Plan Period to Report Period (%)
A	Gross production (rubles)	500,000	600,000	120
	Number of workers	100	110	110
	Output per worker (rubles)	5,000	5,454	109

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Enterprise or Branch		Report Period	Plan Period	Ratio of Plan Period to Report Period (%)
B	Gross production	500,000	750,000	150
	Number of workers	200	220	110
	Output per worker	2,500	3,409	136
Average by gross- production method	Gross production	1,000,000	1,350,000	135
	Number of workers	300	330	110
	Output of worker	3,333	4,090	123

According to this table, the increase of labor productivity in enterprises A and B, calculated by the price /gross-production/ method, is 23 percent.

The same calculation by the index method, using the number of workers of the plan period, shows an increase in productivity of 27 percent:

Enterprise	Workers		Labor Productivity Index		
A	110	X	109	=	11,990
B	220	X	136	=	29,920
Total	330				41,910

$\frac{41,910}{330}$ = 127 %, the labor-productivity index according to the index method.

Another advantage of the index method is that it can be used with any form for expressing production: in terms of 1926 - 1927 prices, physical units, current prices, etc. Of course, when the volume of production is given in current prices, production of both the base and the plan period must be estimated in e▪ ▪ted prices of the same year.

Planning and calculating average labor productivity in terms of physical units (man-hours or man-days per unit of production) are limited by the vast diversity of industrial production. This method is used only for enterprises and branches of industry the products of which are homogeneous and comparable. This method should be used, where possible, in connection with the gross-production (in terms of 1926 - 1927 prices) method. Calculation in terms of physical units clearly reflects actual changes in expenditure of labor per unit of production (tons of coal, petroleum, iron, thousands of bricks, etc.), and corresponds closely to the methods of factory planning. It can be used in such single-product branches of industry as the coal, petroleum, and peat industries, ferrous metallurgy, iron mining, nonferrous metallurgy, the cement and brick industry, lumbering, the plywood and veneer industry, the match and cellulose industry, various food-processing industrie3, etc.

Labor productivity may be calculated in units of working time in branches of industry where technical norms are well established and where production conditions permit an accurate computation of working time in terms of production units, to complement calculation by the gross-production method.

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The following table shows a calculation of labor productivity in units of working time.

Product	Period	Quantity	Price Each 1926 - 1927 (rubles)	Total Value (rubles)	Norm Hours Per Product	Total Hours
A	Report	1,000	5.00	5,000	0.5	500
	Plan	1,000	5.00	5,000	0.5	500
B	Report	2,000	1.50	3,000	1.0	2,000
	Plan	3,000	1.50	4,500	1.0	3,000
C	Report	3,000	3.00	9,000	1.2	3,600
	Plan	3,300	3.00	9,900	1.2	3,960
A, B, and C	Report	--	--	17,000	--	6,100
	Plan	--	--	19,400	--	7,460
	Plan ÷ report (in percent)	--	--	114.1	--	122.3

In order to meet the plan without increasing the number of workers, labor productivity must be increased not by 14.1 percent, which is the amount of increase in gross production, but by 22.3 percent, to correspond with the increase in norm time.

This method does not allow for certain important factors:

1. Norm fulfillment is not uniform in all sections and for all workers, and actual expenditure of time in production will not be the same as norm time. Even the calculation of norm fulfillment is highly inaccurate in most enterprises.

2. Such a calculation does not include the auxiliary shops and occasional workers.

3. Calculation in terms of norms is even less convincing in the cases of changes in the structure of production (new products, changes in type of production). The norms differ considerably in definition and in the degree of their fulfillment. In the absence of a practical test, the preliminary definition of norms for new or changed products is highly subjective. In the case of significant changes in production structure, calculations on the basis of norms are very inaccurate and tend to err in the direction of minimizing possible productivity.

Because of its many shortcomings, the labor-cost method should be used only for branches of industry which have a high level of labor accounting and norms, such as the machine-building industry, since this method can be used only where work and production are comparable. The basis of the calculation must be not norm time but actual time spent in producing the given product. Under such conditions, the computation of expenditure of labor in hours per unit of production can be of value in drawing up a plan for increased labor productivity.(5)

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