Reported Increases in Labor Productivity in Communist China

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It should be mentioned at the outset that no attempt will be made in this paper to present a complete examination of changes in productivity in Communist China in recent years. Neither the space nor the present status of research on this subject would warrant such a definitive report. Instead we shall attempt to get a glimpse of some of the changes in productivity in several sectors of the economy with a view to identifying the principal factors responsible for the reported changes in productivity in order better to understand the nature of these changes.

The term "productivity" refers to the quantitative relationship between certain inputs and the output or outputs for which they are responsible. In the case of a given production process, it may therefore refer to the quantitative relationship between the output and all the inputs used in its production. Understood in this sense, the measurement of productivity changes from one point of time to another cannot be clearly differentiated from the concept of variations in the rate of return over cost. Where several different commodities and services are included in the output and/or input, the need for aggregation occurs and the index number problem arises. There is the further question as to whether, in the absence of free markets for price formation, it is at all meaningful to measure productivity in value terms. On the other hand, productivity is frequently expressed in terms of the relationship between the output and a single input, and it is information of this type that is generally reported in Communist Chinese statistics. Where informa-

tion is of this nature, it is interesting to try to ascertain the extent
to which any change in this partial productivity is due to an increase
in the amount of other cooperative inputs as against changes in
productivity that should be ascribed to shifts of the production
function.[1] In the case of Chinese statistics, reports of changes in
partial productivity are usually with reference to labor in industrial
production, and to land in agriculture.

SOME GENERAL FIGURES

It may be well to note at this point a few figures on the increase
in labor productivity in general terms that have been reported by
Communist Chinese sources, even though our discussion will con-
centrate on developments in several specific economic sectors. We
shall be well advised not to use any 1958 figures because of the un-
settled state of statistics of that year. Thus the annual increase in
labor productivity in the industrial sector was, in comparison with
that of the preceding year, 10% in 1955 and 18% in 1956. For the
entire first five-year plan period the increase in labor productivity
in industry was estimated at 55% by the end of 1957 as compared
with the corresponding level in 1952, the last pre-plan year.[2] How-
ever, in addition to the problems confronting aggregate indices men-
tioned earlier, the meaning of these all-industry figures is obscured
by the fact that there was a major change in industrial prices in
1956. The relative rates of expansion of the individual industries
were quite uneven, and many new products were also introduced
during this period. The uncritical use of these over-all productivity
figures can therefore be quite misleading.

STATISTICAL VERSUS REAL INCREASES
IN PRODUCTIVITY

The theory that changes in labor productivity constitute a use-
ful index of economic development is of course based in the notion
that if the same amount of input can produce a larger output, an
increase in labor productivity would bring about a larger total
output even if the amount of total input were to remain constant.
But an important point to bear in mind is that not all reported
increases in productivity in Communist China are real increases,
because from time to time some of the Communist functionaries
have paid more attention to the variation of the index than to the

real significance of potential production increase that the index is supposed to measure.

An analogy may bring this point out more clearly. For instance, it is known that if the room temperature is kept at a certain level, it is then most conducive to physical comfort. But if undue attention is given to the maintenance of the temperature indicated by the thermometer at a certain level, one may find that attempts may be made artificially to maintain the temperature at a given level as indicated by the thermometer, regardless of the actual temperature in the room. Thus one may pack ice around the thermometer on a sweltering day and keep the temperature indicated by the thermometer at 70° and then maintain that it is not really hot.

The annual increase in labor productivity in the Chinese construction industry has been reported at 17% in 1955 and 6% in 1956 on a link index basis. The formula used by the Chinese bureau of statistics to measure labor productivity in the construction industry is the ratio between the completed volume of construction in value (gross) terms and the average number of workers engaged in the installation of new construction. The significance of the reported increase as measured in terms of this index may be seen from the following excerpt from a Chinese statistical publication in 1957.

Because only a part of the construction workers is included in the denominator of this formula, the result computed thereby is unable to reflect the actual conditions of the entire enterprise concerned. At the same time, since elements unrelated to production are included in the numerator and since this is the only method of computing labor productivity in the construction industry in the present system, some enterprises have been led to take a disproportionate interest in work that requires little labor but has a high value upon completion. For example, the First Construction Company of the Northwest worked on some thirty construction projects in Work Area No. 2 from the beginning of November, 1955, to the end of November, 1956. However, only some ten projects were completed at the end of the period. The others could not be transferred to the users because, in all cases, the final finishing work had not been completed. (In general, finishing work in the last period is of low value and consumes a great deal of labor.) This is a general phenomenon. Certain construction companies in Peking have

indulged in the practice of installing central heating fixtures before completing work on the floors and walls, only to dismantle the fixtures in the following months. Some construction enterprises also sub-contract to outside agencies a substantial amount of labor-consuming earth work and undertake within their own units work of a higher value. . . . Even more curious is the practice of individual enterprises that would hire pedicabs to transport bricks for the simple reason that pedicab drivers are not considered construction workers in the computation of the index.[3]

There is no evidence on the basis of which a valid generalized statement can be made regarding the extent of such manipulators of the labor productivity index. It would seem, however, that we must definitely take the reported increases in labor productivity with a grain of salt and bear in mind that some of the increases may be more apparent than real.

CHANGES IN LABOR PRODUCTIVITY IN THE MACHINERY, IRON AND STEEL, AND ELECTRIC-POWER INDUSTRIES

According to a study of the Chinese Bureau of Statistics,[4] the increment in the gross value of production of the metal-processing sector of the machinery industry in 1956 as compared with 1952 was 227.9%. During the same period the amount of fixed assets and the number of workers within the sector increased by 122.9% and 58.1% respectively. The result was an increase in the amount of fixed assets per worker and an increase in production at a rate exceeding that of the increase in employment. One might reason that since there was a 58.1% increase in the number of workers, the value of production should rise in the same proportion on the basis of linear homogeneous assumptions. However, since output actually increased by 227.9%, there must have been an increase in labor productivity per man by about 107%. Thus one might say that the 107% increase in productivity per man was due to a 41% increase in the amount of fixed investment per worker.[5]

Such a facile conclusion is rather dangerous, however. It should be noted that in Communist Chinese practice the term "labor productivity" is frequently employed in the sense of output per man instead of output per man-hour. This means of course that it is

possible to increase labor productivity by increasing the number of man-hours performed per worker within a given period of time without actually increasing the volume of output per man-hour. But while an increase in productivity per man-hour may not by itself raise the total labor cost, an increase in the number of man-hours would normally increase the total labor cost. It is well, therefore, to distinguish an increase in labor productivity that is due to a lengthening of the hours of work from an increase that is the result of higher productivity per man-hour. The information available on the machinery industry does not provide this distinction.

In the iron and steel industry, taking 1952 as 100, the output of pig iron reached 200.8 in 1955. During the same period there was an increase in the utilization rate of iron smelting equipment from 84.4% of capacity to 95.4%. The increase in the utilization rate of the existing equipment implies an increase in the number of machine-hours and consequently in all probability an increase in the number of man-hours spent in the iron smelting process without necessarily increasing the number of workers. Thus out of the increment of 100.8% in production, some 13% may be ascribed to the better utilization rate. During the same period there was also a 30% increase in the number of workers, together with an increase of 43.7% in the amount of fixed assets per worker within the iron and steel industry. The increase in capital investment per worker and in the number of workers then accounts for the remaining 87.8% in the production of pig iron between 1952 and 1955. It may be no more than a coincidence, but if we compute the increase in productivity per man-hour on the basis of the 30% increase in the number of workers and 87.8% in production, the increase in labor productivity would come to 40%, which happens to be very close to the percentage increase in fixed assets per worker noted earlier. Since it may be assumed that the new equipment installed was utilized at least to the same degree as the previously existing equipment, this computed increase in productivity may be regarded as largely, if not entirely, due to an increase in productivity per man-hour. Without going into details, it may be stated that the same is generally true in the production of steel. As reported by the Communist Bureau of Statistics, 45.9% of the increase in steel output between 1952 and 1955 was accounted for by newly built equipment,

while 54.1% was the result of the fuller utilization of existing equipment.

Any increase in productivity per man-hour following an increase in investment per worker is of course the result both of an increase in the capital-labor ratio and of a possible shift of the production function. While it is impossible to segregate these two effects on the basis of available information, it is well to note that the Chinese Communists themselves have attributed the rise of productivity to a considerable extent to labor emulation spearheaded by the dissemination of Soviet techniques, including the widespread adoption of the use of hard alloy drill bits in extracting iron, the introduction of furnace top regulators in the blast furnaces, and the addition of steam blast in iron smelting, and so forth. It would seem that instances of increasing labor productivity as a result of certain new techniques acquired without any appreciable new investment on the part of the enterprises themselves represent a shift of the production function. On the other hand, one should realize that the higher utilization rate of existing equipment is often associated with changes in labor organization and in technical operations. For instance, the degree of utilization of blast furnaces is increased by reducing the time needed for furnace repairs, which is partly the result of new techniques and partly a consequence of improved scheduling. To this extent, therefore, one might maintain that a simultaneous shift of the production function has also occurred. A theoretical issue, then, is what constitutes a complete description of the production process, i.e., whether indirect labor such as labor for repair work should be regarded as a part of the inputs of the production process.

A further example of changes in industrial productivity may be found in the electric-power industry. Between 1952 and 1956, there was an increase of 25.3% in the degree of utilization of existing capacity as well as a 67.6% increase in new generating capacity. The total increase in capacity at the rate of utilization obtained in 1952 thus amounted to 109.9%, which corresponds to the 109.9% increase in the volume of electricity generated in Mainland China during the same period. In addition it may be observed that the increase in new capacity, together with the greater demand for direct labor to operate this new capacity, presumably at the higher rate of utilization, comes to 84.5% in terms of the effective capacity of 1952. This

is only slightly higher than the 73.7% increase in the number of workers employed officially reported by Communist China. Thus one may conclude that in this case there was very little increase in investment per man and in labor productivity per man-hour, although the increase in productivity per man has been reported at 17.9%.

While it is not possible at this point to make any generalized statement on the precise extent to which individual factors have been responsible for the reported increases in labor productivity, some tentative statements may nevertheless be made. Their validity, if one were to hazard a guess, may yet be borne out by more detailed studies: First, the reported increase in productivity per man within the industrial sector is to a considerable extent a reflection of an increase in the utilization of existing capacity, which has led to a simultaneous increase both in the number of machine-hours available and in that of man-hours of direct labor. This was true especially during the period of recovery between 1949 and 1952. This emphasis stands in direct contrast to the resistance to effort to "make do" with existing facilities in some of the non-Communist under-developed countries. The latter attitude may very well be encouraged by the belief that foreign capital is available. The greater degree of utilization has, however, been made possible partly through changes in labor organization and partly through the employment of new techniques. The latter has frequently involved a speeding up of operations of the Stakhanovist type made popular by an uninterrupted series of emulation campaigns. In this sense, therefore, a shift of the production function may be said to have also occurred. Secondly, to a lesser extent, the increase in productivity per man is the result of an increase in productivity per man-hour. This is probably more true today than it was before 1952. The increase in productivity per man-hour is in turn the result both of an increase in the capital-labor ratio and of a shift of the production function. The latter may again be attributed to the adaptation of new techniques, a great many of which have been imported from the Soviet Union. One index of the technological improvement may be found in a 250% increase in the number of technicians and engineers during the first five-year plan, the combined result of in-training and of the expansion of technical schools.
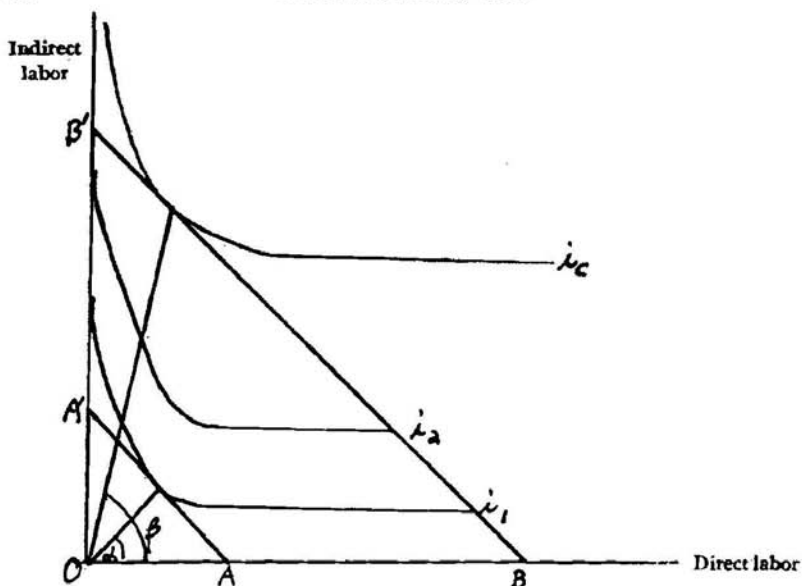
FIGURE 1

CROP PRODUCTION ON A GIVEN PIECE OF LAND

$OA = OA'$, Total labor force available before communization.
$OB = OB'$, Total labor force available after communization.
$\tan \alpha$, ratio of indirect to direct labor before communization.
$\tan \beta$, ratio of indirect to direct labor after communization.
$i_1, i_2, \ldots i_c$ are isoquants of crop production, $i_1 < i_2 \ldots < i_c$.

AGRICULTURAL YIELD AND THE RATIO OF DIRECT TO INDIRECT LABOR

Turning to the agricultural sector, we may note in the first place that Communist China's efforts have been devoted to increasing the productivity of land as an input. Following the establishment of the communes, an extremely large increase in labor input has been reported per hectare of crop land. As an example, the number of man-days per hectare increased from 225 in 1957 to 275 in 1958 for cotton; from 225 to 323 for potatoes; and from 210 to 263 for corn.[6] Virtually all the increase is accounted for by the expenditure of additional labor on irrigation, deep-plowing, and the collection and application of natural fertilizers. With the exception of certain experimental farms where close planting is practiced, the increase in direct labor has not been large. If we regard labor input for irrigation, deep-plowing, etc., as indirect labor and labor spent in planting and harvesting as direct labor, what has occurred in Com-

munist China since the summer of 1958 is a large increase in the ratio of indirect to direct labor following an increase in the amount of aggregate labor made available by communization. This is probably a result of the particular shape of the isoquants as shown in Figure 1.

However, one should note that this shift in the ratio between direct and indirect labor might not have been profitable from the point of view of the planner if the wage rate had not been depressed. Since under the commune system payment to labor is basically limited to the level of subsistence in the form of food and other rations, the extraction of more man-hours from a given labor force within a certain length of time without altering appreciably the total payment to labor means, of course, a decrease in the wage rate in terms of man-hours. This is probably the factor that has made possible the application of indirect labor in larger doses. In other words, the increasing disutility of work consequent upon the greater exertions of the peasant has not been included as a part of the marginal cost to the planner. Hence, the increase in partial productivity as represented by the greater crop yield of farm land is not a complete reflection of the change in the total input-output ratio in agricultural production. This is perhaps one of the best illustrations of a planner who is intent on increasing total gross output irrespective of the cost which, in this case, has entailed a thorough reorganization of the social structure.

NOTES

1. See the interesting discussion in Robert M. Solow, "Technical Change and the Aggregate Production Function," *The Review of Economics and Statistics*, August, 1957.
2. *Jen-min shou-ts'e (People's Handbook)*, Peking, 1958, pp. 22, 424, 459.
3. *T'ung-chi kung-tso (Statistical Work)*, No. 12, Peking, 1957, pp. 14-17.
4. The data relating to the industries discussed in this section are taken primarily from *Woo-kuo kang-t'ieh, tien-li, mei-t'an, chi-hsieh, fang-chih, tsao-chih kung-yeh ti chin-hsi (Past and Present of China's Iron and Steel, Electric Power, Coal, Machine Building, Textile and Paper Industries)*, compiled by the Industrial Statistical Department of the State Bureau of Statistics, Peking, 1958.
5. The increase in labor productivity between 1952 and 1956 in the state and joint state-private sectors of the machinery industry in yuan per man is reported to be 85.7% only. *Ibid.*, p. 203.
6. For a more detailed discussion, see the author's paper on "Economic Effects of Land 'Reform,' Agricultural Collectivization and the Commune System in Communist China: A Preliminary Study," presented at the Marquette Conference on Land Tenure, October, 1959.