

PRODUCTIVITY, GROWTH, AND PUBLIC POLICY

Charles Wolf, Jr.

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The Rand Corporation, Santa Monica, California

I.

In discussions of productivity and how to increase it, three different productivity concepts should be distinguished. All are important, and the three are often confused. The first is labor productivity, output per man, or output per man-hour. The second is capital productivity, defined as output per unit of capital. (I will ignore such complexities as those relating to the definition of capital, how depreciation is treated, and whether one should be concerned with capital services rather than its stock.) The third concept is that of total factor productivity, output per unit of combined factor inputs; under certain assumptions, the weights attached to the inputs are the income shares received by owners of labor and capital.

If one is concerned with economic growth and how to accelerate it, we need to investigate changes in these different productivity measures. All three are of interest and importance in the growth process.

Increases in labor productivity are valuable as an indicator of increases in standard of living. However, from the standpoint of national economic welfare, the limitation of this indicator derives from the fact that it applies only to that part of the labor force that is employed. Given market imperfections, or certain other

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circumstances, average output per employed worker might be rising, notwithstanding a high, or even increasing, rate of unemployment.

Increases in capital productivity are also important as an indicator of efficient use of an input that is especially scarce in developing countries. But exclusive concern with increasing capital productivity may be subject to another limitation: it may distort the distribution of benefits from growth in favor of owners of capital.

In many respects the third measure of productivity increase, total factor productivity, is the most comprehensive and useful of the three. In a sense, it is also the purest measure of increased efficiency. Increases in labor productivity may, for example, simply be due to increased capital intensity, while increased capital productivity may simply be due to increased labor intensity. On the other hand, for total factor productivity to rise, there must be an increase in output per unit of combined inputs, hence an increase in efficiency. Increased efficiency in turn implies innovation in methods and products, as well as improvements in the quality of inputs -- in other words, improvements in precisely those attributes which are the principal concerns and raison d'être of the Asian Productivity Organization.

II.

I think it is fair to say that most development economists used to think that the quickest way to raise living standards and labor productivity in the developing countries was to increase inputs of capital; and thereby to raise capital-labor ratios. There is no doubt that this is important. When one looks around the world at the relatively small number of countries in which dramatically rapid development has taken place, say, more than 8 or 9 percent growth in real terms per annum, capital inputs have increased considerably. Nevertheless, there are still powerful reasons for stressing increased efficiency and the total-factor-productivity concept as well. One reason is that increased capital inputs seem as likely to result from

accelerated growth, as accelerated growth is to result from increased capital inputs. (It is worth noting that recent empirical work, by Leibenstein, suggests that capital-output ratios seem to vary inversely with growth rates, a finding which is as compatible with the notion that causation runs from growth toward capital as that it runs the other way.) Another reason for stressing efficiency is the acute scarcity of capital, both from internal and external sources, facing the developing countries. And an additional reason lies in the weight that is, and should be, attached to the goal of expanding employment in the developing countries, which militates against the achievement of higher capital-labor ratios.

Moreover, it seems to be the case that those countries that grow rapidly, or grow moderately but over a long period, achieve increases in efficiency or total-factor-productivity that are relatively large.

So, for all these reasons, it seems quite relevant to ask how can such increases in total-factor-productivity be realized? What are the policy variables, or actions, to which such increases are likely to be responsive? And what costs and effectiveness are likely to be associated with these alternative actions?

We don't know the answers to these questions with much confidence. Empirical work suggests that increases in total factor productivity seem to be closely associated with rapid growth; while, conversely, in slowly growing economies, the growth that occurs seems to be almost entirely accounted for by increases in inputs, rather than by increased efficiency. Nevertheless, we don't really know whether this increase in efficiency operates as cause or effect in the growth process; nor, to the extent that it is a cause, do we know the underlying explanations.

There are various theories concerning these explanations: movement of capital and labor from lower to higher productivity uses (for instance, migration from rural agriculture to urban industrial employment); improvement in the skill and quality of inputs, particularly human inputs, through education and training; realization of increased

returns from larger-scale operations; development of new methods, products and industries; and improvements in management practices. All of these explanations certainly play an important part, and often they seem to reinforce one another. However, since each of the explanations leads to somewhat different policy implications (for example, with respect to the degree of emphasis placed on education and training, or on improvement in management practices, or on incentives to stimulate licensing and patent agreements), it would be valuable to know the relative importance of the various explanations.

III.

At the present time there is an active controversy underway on this matter among economists and others concerned with understanding and analyzing economic growth. The controversy concerns the extent to which increases in total factor productivity are due to improvements in the quality of inputs, which are embodied in capital and labor, but are not fully reflected in the units that we use to measure these inputs; and to what extent the increases in total factor productivity are due to new ideas, knowledge and technology that are not embodied in factor inputs. The first explanation, the so-called "embodiment" hypothesis, argues that if full allowance for improvements in input quality were made (for example, by expressing these inputs in terms of "efficiency units" that would be comparable over time, rather than man-hours in the case of labor inputs, or yen or dollars in the case of capital inputs), most of the increase in total factor productivity would be fully explained. Indeed, some empirical work (by Jorgensen and Griliches) has successfully demonstrated this point with data on the United States.

However, the counter to this view is that, if such an adjustment is made, thereby increasing the efficiency-equivalent of the later inputs, then a compensating adjustment must be made on the output side, in order to take account of the fact that units of output have also increased in "efficiency" terms. This latter view,

the "disembodiment" hypothesis, has also been applied in recent econometric work, with the result that the importance of new ideas, new technology, new management practices, and other measures that are not fully embodied in capital and labor inputs, has been reemphasized.

Proceeding from strong assumptions about the "disembodiment" hypothesis, one economist (Professor Fellner) has done some interesting recent work with U.S. data. Fellner attributes productivity increases to what he calls "progress generating" expenditures, consisting principally of research and development in the private sector, with varying assumptions as to the additional amounts of government R&D that are also assumed to contribute to increases in knowledge and improvements in technology. Depending on which assumptions are used with respect to the inclusion of government R&D, Fellner has found that over the period from 1953 to 1966 the yield in terms of productivity increases to such knowledge-and-idea-generating expenditures has been between 13 and 60 percent per annum!

Without going into more detail on this matter, which would take more time than is available, my own feeling is that Fellner's results are quite interesting and certainly may be of considerable relevance to Japan's future growth. At the same time, I suspect they are much less relevant to the growth problems of the less developed countries (LDCs). The LDCs should certainly expect to spend considerably less on research and development as a proportion of GNP, simply because of the off-the-shelf possibilities for new methods and products that they can draw on. However, we often exaggerate the value of unadapted technology in the LDCs. Indeed, these new possibilities may have much lower, and even negative, payoffs in LDCs unless appropriate adaptations are made in them. So some R&D efforts -- for market research, simplified specifications, improved quality control, and simplified maintenance practices -- may be highly important.

In conclusion, I think there are some important lessons, from this controversy about productivity, that are worth emphasizing from the standpoint of the LDCs:

(1) improvements in efficiency, as well as increased inputs of capital and labor, are of great importance for rapid growth;

(2) such improvements require a fairly extensive and continuous process of innovation in production methods, products, organizations and management practices;

(3) this stream of innovation requires improved access to information (on technology, products, markets, performance), as well as powerful market and other incentives that recognize and reward those who contribute to efficiency, innovation, and higher productivity.

And

(4) such innovation requires adaptation, rather than simply transfer, of know-how from the more-developed countries.

These are the tasks that the Asian Productivity Organization is, I believe, dedicated to. These are the tasks that the Asian Productivity Year 1970, as well as the decade ahead, should be especially focussed on in the developing countries. These are the directions in which the motto of this Congress, "Prosperity Through Productivity," is urging us to move.