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Productivity Growth in Thailand*

Pranee Tinakorn and **Chalongphob Sussangkarn** examine the sources and determinants of productivity growth in one of Asia's most rapidly industrializing countries

Thailand's Seventh National Economic and Social Development Plan (1992-1996) addresses the importance of productivity in sustaining the country's economic growth and maintaining international competitiveness. Productivity growth is becoming particularly important considering that Thailand's economic advantages, through abundant supplies of such production factors as land and labor, are diminishing.

Previous empirical studies of productivity in Thailand relied on some specific notions of production function; and production function estimates were used to derive measurement of the total factor productivity index. An alternative approach is to explain the growth of output without any assumed form of production function. This approach is known as the growth-accounting analysis.

The analysis starts with a general form of production function from which the growth rate of output is expressed as a configuration of the rate of inputs weighted by their respective output elasticities, plus a shift factor referred to as the total factor productivity, or TFP. Under the assumption of profit maximization and producer's equilibrium, the output elasticity with respect to each input, which is unobservable and must be estimated from an assumed form of production function, is replaced by the share of factor income, which is observable. This makes it possible to measure TFP as the difference between the growth of output and the growth of each input weighted by its income share. This TFP measure is also commonly called the rate of technical change. Although this approach is quite appealing and has been used in many studies for other countries, the analysis has never been used in Thailand.

This paper provides an estimate of the sources of growth in Thailand, using the growth-accounting approach. The paper, which is a summary of a report, is organized in five sections: the first is an introductory section. The second section discusses data problems and measurement; the third and fourth sections deal with the empirical results of the estimated sources of growth both in the aggregate economy and by economic sector; the last section discusses the determinants of productivity.

DATA MEASUREMENT

Though it appears that TFP can be easily measured by the growth-accounting approach, researchers who have taken this route have often run into data measurement and data availability problems. In the case of Thailand, we used the following data and estimates:

- Output is measured by the real value of gross domestic product at 1972 and 1988 prices;
- Land used in production is measured by the total cultivated area of rice and other cash crops;
- Capital stock is measured by the real value of both net and gross capital stock, as recently estimated by the NESDB at 1988 prices; and
- Labor is measured by both employment and working hours during the rainy season, as surveyed by the National Statistical Office (NSO).

The above three inputs are the main inputs receiving income in the national income accounts. Apart from measuring the quantity of input, we also considered changes in their quality. While it was not possible to measure the quality change in capital, the quality change in land is inclusive in our measure, since it

includes the second cropping area, which is a proxy for "effective irrigation." Labor is the only input which provides many dimensions of quality change. The details of the qualitative measurement are not discussed here, but can be found in the full research report. Suffice it to say that between 1977 and 1990, the quantity of labor input increased at the rate of 3.5 percent per year, while its quality—as measured from the change in the composition of age, sex, and education—improved at the rate of 2.6 percent per year.

Other required information is the proportion of income going to each input factor which, in principle, should be available from the national income account (NIA). It was found, however, that the compensation of employees and the return to capital, as reported in NIA, are both under-estimated, because these two items are mixed in the income from unincorporated enterprises. The authors therefore resorted to the data available in the social accounting matrix of 1987 (SAM 1987) to make estimates of the factor income shares. As an example, in the year 1989, the compensation of employees as reported in NIA was about 34.8 percent of the national income, but our estimate based on SAM 1987 was about 48.4 percent. Details about estimates on factor income shares based on SAM 1987 can be found in the full research report.

ESTIMATED SOURCES OF GROWTH

Table 1 provides estimates of the sources of growth for Thailand during the period 1978 to 1990. It was found that the average growth rate of the whole economy was about 7.6 percent per year and this growth could be accounted for by the following factors: (1) about 26 percent from the change in labor employment; (2) about 20 percent from the improved quality of labor; (3) about 37 percent from capital; and (4) about 1.2 percent from land use. All these changes in both the quantity and quality of factor inputs accounted for about 84.2 percent of the economic growth. The remaining 15.8 percent was the contribution of the total factor productivity. The average rate of TFP between 1978 and 1990 was about 1.2 percent per year, and it was found to be quite sensitive to business cycles.

The calculation of the sources of growth and TFP, based on 1988 prices, is also presented in Table 1. In general, the results are similar to those based on 1972 prices of the same period.

Although this framework has been used to analyze the sources of growth in many other countries, the authors did not feel comfortable to compare their calculated figures with those of all other countries, due to the different levels of economic development and different time frames. Kim and Park's study of Korea (1963 to 1982), however, was chosen for comparison purposes, since Korea's economy from 1972 to 1982 was found to be similar to Thailand's from 1978 to 1990 in many respects.

The comparison between Korea (1972-1982) and Thailand (1978-1990) as provided in Table 2 shows that the main sources of growth of these two countries are from input factors. The average rate of TFP growth in Korea (1.47), however, was a little higher than that of Thailand (1.2). Labor and its improved quality, though important in both countries, accounted for as much as 50 percent of output growth in Korea.

SOURCES OF GROWTH BY ECONOMIC SECTOR

The same framework and method of factor income share estimation were applied to the data in the three major economic sectors: agriculture, industry (including mining and quarrying, manufacturing, construction and public utilities), and services (including transportation and communications, retail and wholesale trade, banking insurance and real estate, dwellings, public administration and defense, and other services).

Table 3 presents the estimated sources of growth by sector for the period 1978 to 1990. It was found that the TFP rates in the non-agricultural sectors were negative, but the sizes of TFP were small. This was because the rates of growth of factor inputs and their qualities, weighted by their income shares in these sectors, could account for more than the total growth of output. This rendered negative TFP rates. In agriculture, all factor inputs and their qualities could account for about 68 percent of the growth rate of output; the remaining 32 percent was accounted for by the TFP.

If we consider the figures for the period 1981 to 1990 in Table 4, however, the average TFP rates for the

non-agricultural sector were positive, but the sizes of TFP were again small. This emphasizes the role of factor inputs as the main agent of growth. Capital appeared to make the most important contribution to growth, especially in industry. During the period under study, it was found that the rate of capital accumulation in the non-agricultural sectors was quite high.

The implication of such findings is that Thailand's rapid growth in the past decade or so has been achieved by adding more labor, capital and land to production. Some productivity improvements have been achieved, but these may have been through importing more efficient and modern machinery and through the employment of better or more productive workers.

The results of the sectoral TFP calculation are rather unexpected, as the agricultural sector appears to have been more successful in using new technology to increase output, particularly when pushing the land frontier to increase production has become more and more limited. The contribution of technology to the growth of output in agriculture between 1981 and 1990 averaged about one quarter compared to the average figures of less than one-tenth in the non-agricultural sectors. A possible explanation for this phenomenon is that the high growth rate in the non-agricultural sector in the past has been sustained through imported technology, i.e., new machinery and equipment. This situation is unlike those of other newly industrialized countries where some local industries have attained independence from imported technology through indigenous research and development, something which appears to have attracted little attention in Thailand.

DETERMINANTS OF PRODUCTIVITY

The final part of the research project investigated possible determinants of productivity growth by using econometric techniques. It was found that the pace of capital accumulation has the greatest influence on TFP. Another important determinant is the increase in foreign exposure, which has an effect on the market size and can improve productivity through foreign competition. A third variable is the effect of resource allocation which, in our study, is measured by the shift of labor from the low marginal product sector (agriculture) to the higher one (non-agriculture).

The role of capital stock on productivity is sometimes split by researchers into that of the private and public sectors. Lynde and Richmond (1993), for example, examined the impact of the stock of public capital on output levels and productivity growth rates in the United States. They found that much of the recent decline in productivity can be explained by a fall in public capital-labor ratio. In the case of Thailand, however, we did not find a significant influence of public capital on TFP, while either growth rate of the private capital or the growth of total capital was statistically significant.

There must be other important determinants of TFP, such as research and innovations, especially at the plant level, but we are not able to quantify and use them in the estimated equation. Other important determinants of TFP that we cannot measure include the expertise of workers acquired through the process of learning by doing, managerial improvement, business reorganization, and government policies and/or regulatory measures. All these can affect the utilization of resources and hence productivity.

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