NATIONAL PRODUCTIVITY OF THE SOUTHEAST ASIAN COUNTRIES

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Abstract

Since the financial crisis of 1997, Southeast Asia's fast recovery and continued development has surprised the world. This paper investigates national productivity of the ten Southeast Asian countries. The high national productivity explains why the economy of this region developed steadily after the financial crisis. From the viewpoint of labor productivity and capital productivity, the ten countries are classified as high-productivity, low-productivity, labor-intensive, and capital-intensive countries. Together with another indicator used by many economists to represent living standards, GDP per capita, the Southeast Asian countries are categorized into four types: fast growing-moderate living standards, fast growing-low living standards, stable growing-high living standards, and slow growing-low living standards. Categorization into corresponding groups facilitates subsequent inference regarding their characteristics and stage of economic development. More importantly, weak areas are identified for future improvement.

Keywords: Productivity, competitiveness, Southeast Asia

Introduction:

Southeast Asia is a region with abundant natural resources. Its half billion people provide a sufficient labor force for economic activities. Each year, a collective gross domestic product (GDP) of nearly one trillion US dollars is generated. The ten countries of the Association of Southeast Asian Nations (ASEAN), Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam, have close political, economic, and cultural relationships. Following the lead of Japan and the four tigers of Asia-Hong Kong, Korea, Singapore, and Taiwan, the flying-geese model (Cutler et al. 2003, Dowling and Cheang 2000, Ozawa 2003) properly explains how this region has experienced impressive economic development in the 1980s and 1990s.

Despite the Asian financial crisis of 1997, the region recovered in a very short period of time to attain a high growth rate. This high growth rate has continued, even through the worldwide economic slowdown in 2000-2002. The ratio of exports and imports to GDP in the region is over 20%, which is higher than the world average (World Bank web). As the ASEAN Free Trade Area (AFTA) becomes a reality, trade in this region is expected to be more vigorous than before, which will undoubtedly trigger the growth of world trade and GDP. It is thus worthwhile to investigate the performance of this region in economic development.

There are a lot of indicators for measuring the performance of a unit, of which productivity is probably the most widely used. Generally speaking, productivity measures the efficiency of converting a set of inputs to a set of outputs. Lower productivity implies that larger amount of inputs must be consumed to produce a fixed amount of outputs. Thus, at the firm level, a decline in productivity means an increase in production costs and therefore a deterioration of the competitiveness of the firm. In a similar vein, at the country level, a decline in productivity can lead to slow economic growth and therefore a deterioration of the

competitiveness of the country. Higher productivity can lead to higher living standards, for it is only by producing more efficiently that we create the possibilities of a larger total of goods and services in which we can all share. There are many articles (Dewan and Kraemer 2000, Gomory 1995) that address the topics related to national productivity. However, due to difficulty in data collection, a complete discussion of national productivity of the Southeast Asian countries from the economic point of view is still lacking. This paper tries to measure the national productivity of the ten Southeast Asian countries.

In the sections that follow, firstly, we discuss the methods for measuring national productivity. Next, we describe how the data was collected to measure the national productivity of the ten Southeast Asian countries in the period of 1999-2001. In addition to investigating the national productivity of the Southeast Asian countries, how they compare to each other is also discussed. Finally, some conclusions are drawn from the discussion.

Productivity Measurement:

Productivity is generally defined as the ratio between input and output in a specified period of time for measuring the transformation efficiency. The contents and dimensions of the inputs and outputs specify different kinds of productivity (Kurosawa 1991). From the viewpoint of dimensions, there are physical and value productivity, where the outputs are measured in units and monetary terms, respectively. Regarding contents, there are single factor productivity and total factor productivity (TFP), where the former is related to each of the factors of production while the latter is concerned with the total of the factors of production. Since the production factors are generally categorized as labor and capital, the most popular kinds of single factor productivity are labor productivity (LP) and capital productivity (CP) (Craig and Harris 1973, Sumanth 1984).

There are two approaches for measuring TFP. One is the econometric approach, where the output (or value-added) is expressed as a function of the inputs multiplied by an efficiency parameter. The other is an index number approach which defines TFP as the ratio of the aggregated output to the aggregated input (Bitran and Chang 1984). The inputs are separated into labor inputs and capital inputs so that LP and CP can be calculated (Kendrick and Creamer 1965):

$$\text{TFP}=\frac{\text{Value-added}}{\text{Labor inputs}+\text{Capital inputs}}, \tag{1a}$$

$$\text{LP}=\frac{\text{Value-added}}{\text{Labor inputs}}, \tag{1b}$$

$$\text{CP}=\frac{\text{Value-added}}{\text{Capital inputs}}. \tag{1c}$$

The study of Kao et al. (1995) is of this approach. In Equation (1), usually the three components, viz., value-added, labor inputs, and capital inputs, are represented in monetary terms, so they have a common base for comparison and combination. The ratio represents the value of outputs generated from each dollar value of inputs. The econometric approach, on the other hand, when being applied, does not require all three components to have the same units. The interpretation is usually economical, for example, the elasticity of the output with respect to each input factor. Since the purpose of this paper is to investigate the amount of value-added that can be generated from each dollar value of inputs, the second approach is used.

For a business unit, value-added is the net contribution of its input factors through a production process during a specific period. Labor inputs are the expenses related to employees and capital inputs include fixed capital inputs and working capital inputs. At the country level, value-added can be considered as the net contribution generated by the country's economic activities. In this sense, GDP, which is the value of final goods produced within the country, is a suitable measure. Regarding labor inputs, the total remuneration of all

employees (TR) in the country can be used for representation. Due to the availability of data, TR is calculated as the product of the average remuneration per employee (AR) and the number of employees (NE). Finally, capital inputs are composed of foreign direct investment (FDI) and domestic direct investment (DDI). The sum of these two is called gross capital formation (GCF) and is used as the capital inputs of the country. To summarize, the national productivity (NP), labor productivity at the country level (LP), and capital productivity at the country level (CP) are calculated as:

$$NP= \frac{GDP}{TR+GCF}, \quad (2a)$$

$$LP= \frac{GDP}{TR}, \quad (2b)$$

$$CP= \frac{GDP}{GCF}. \quad (2c)$$

When expressed in monetary terms, national productivity shows how much value of GDP is generated from each dollar of inputs (a combination of labor and capital). Similarly, labor productivity and capital productivity show how much value of GDP is generated from each dollar input of labor and capital, respectively. If labor (or capital) productivity is high, then this country is labor (or capital) efficient. However, one must bear in mind that the single factor productivity can give misleading indications. The level of labor (or capital) productivity could be improved by raising the amount of capital (or labor) inputs; in other words, at the expense of capital (or labor) productivity. Therefore, the interpretation of specific single factor productivity must be accompanied with others at the same time.

A simple mathematical manipulation shows that national productivity is one-half of the harmonic average of labor productivity and capital productivity:

$$NP= \frac{1}{\frac{1}{LP}+\frac{1}{CP}} = 0.5\frac{2}{\frac{1}{LP}+\frac{1}{CP}}. \quad (3)$$

Increasing both LP and CP by the same proportion *k*, NP will be increased by proportion *k* as well.

Data Collection:

From August 2001 to July 2004, a three-year project regarding the investment environment of the Southeast Asian countries was conducted by a research team at National Cheng Kung University with the financial support of the National Science Council of the Republic of China. One objective of that project was to calculate the national productivity of the ten Southeast Asian countries. With the help of scholars from the universities of those countries, the University of Brunei, Royal University of Phnom Penh, University of Indonesia, National University of Laos, University of Malaya, University of Yangon, University of the Philippines, Nanyang Technological University, Chulalongkorn University, and University of Economics- HCMC, the data required for calculating national productivity were collected from publications of world organizations and government reports. Most of the data are available on public websites. The period covered is 1999, 2000, and 2001. To grasp a general idea of the national productivity of those countries and to avoid unstable results caused by data fluctuation in individual years, three-year averages were used to calculate one single productivity measure for the three-year period instead of three productivity measures for three individual years. Table 1 shows the data for GDP, AR, TR, and GCF of the ten countries. The units are in US dollars.

Table 1. GDP, average remuneration (AR), total remuneration (TR), and gross capital formation (GCF) of the ten Southeast Asian countries in US dollars.

Country	GDP (10^6)	AR	TR (10^6)	GCF (10^6)
Malaysia (My)	85746	4534*	41857	11314
Indonesia (I)	145844	825	74279	21336
Philippines (P)	74095	1260*	35955	13396
Singapore (S)	89172	20742	41732	26619
Brunei (B)	4982	16994*	2437	1500*
Myanmar (Mm)	6420	246*	4858	752
Cambodia (C)	3348	469*	2531	512
Thailand (T)	120033	2652	82980	26410
Laos (L)	1637	-	1235*	363
Vietnam (V)	30942	691	25463	8677

** Data are unavailable and are estimated from other sources.*

Most of the data were collected from publications or websites such as the Asian Development Bank, ASEAN, EIU, World Bank, and World Development Indicators Database. Data for Vietnam for all three items, viz., GDP, TR, and GCF, were collected by scholars at University of Economics-HCMC from General Statistics Office (GSO), Vietnam. Some data were not available and had to be estimated by professors in local universities.

Productivity Analysis:

By applying the data contained in Table 1 to Equation (3), the labor productivity, capital productivity, and national productivity of the ten Southeast Asian countries are calculated as shown in the last three columns of Table 2. The average LP of the ten countries is 1.6885 and the average CP is 5.4315. Figure 1 is a scatter diagram of the ten countries where the horizontal axis is labor productivity and vertical axis is capital productivity. This figure clearly shows that the ten countries are separated into two groups, one with high LP and the other with low LP. Singapore, the Philippines, Malaysia, Brunei, and Indonesia belong to the first group. They have an LP measure greater than 1.95 and are considered as labor efficient. The other five countries, Thailand, Laos, Cambodia, Myanmar, and Vietnam, belong to the second group. Their LP measures are smaller than 1.45 and are labor inefficient as compared to the first group.

It is also interesting to note that the five labor efficient countries have the highest AR (referring to Table 1). Since the GDP of these countries generated are high enough to compensate the high remuneration rate, their LP measures are still high. Thailand is an exception in this, although it has the fourth highest AR, it is a low-LP country.

Table 2. GDP per capita, national income (NI) per capita, and productivity measures of the ten Southeast Asian countries.

Country	GDP p.c.	NI p.c.	Labor P.	Capital P.	National P.
Malaysia (My)	3715	3390	2.0485	7.5788	1.6126
Indonesia (I)	701	613	1.9635	6.8356	1.5253
Philippines (P)	971	1033	2.0608	5.5311	1.5014
Singapore (S)	22530	22180	2.1368	3.3499	1.3046
Brunei (B)	12555	14094	2.0443	3.3213	1.2654
Myanmar (Mm)	279	300	1.3215	8.5372	1.1444
Cambodia (C)	261	293	1.3228	6.5391	1.1002
Thailand (T)	1985	1997	1.4465	4.5450	1.0973
Laos (L)	312	258	1.3255	4.5096	1.0244
Vietnam (V)	401	383	1.2152	3.5660	0.9063
Average			1.6885	5.4315	1.2482

Suppose we denote the coordinates of the average LP and average CP as the origin. Then the LP-CP plane can be divided into four quadrants and the ten countries are categorized into four clusters according to the quadrant they are located in. The first quadrant has three countries: Malaysia, Indonesia, and the Philippines. Since the countries in this quadrant have both high LP and high CP, their NP are of the highest among the ten countries. This cluster is considered as the high-productivity cluster. The second quadrant is the region of low LP and high CP. There are two countries in this quadrant, Myanmar and Cambodia. The high CP measure indicates that they are capital efficient, but they are using relatively larger amounts of labor to generate GDP, as is evident from their low LP measures. Therefore, they are labor-intensive countries and this cluster can be called the labor-intensive cluster.

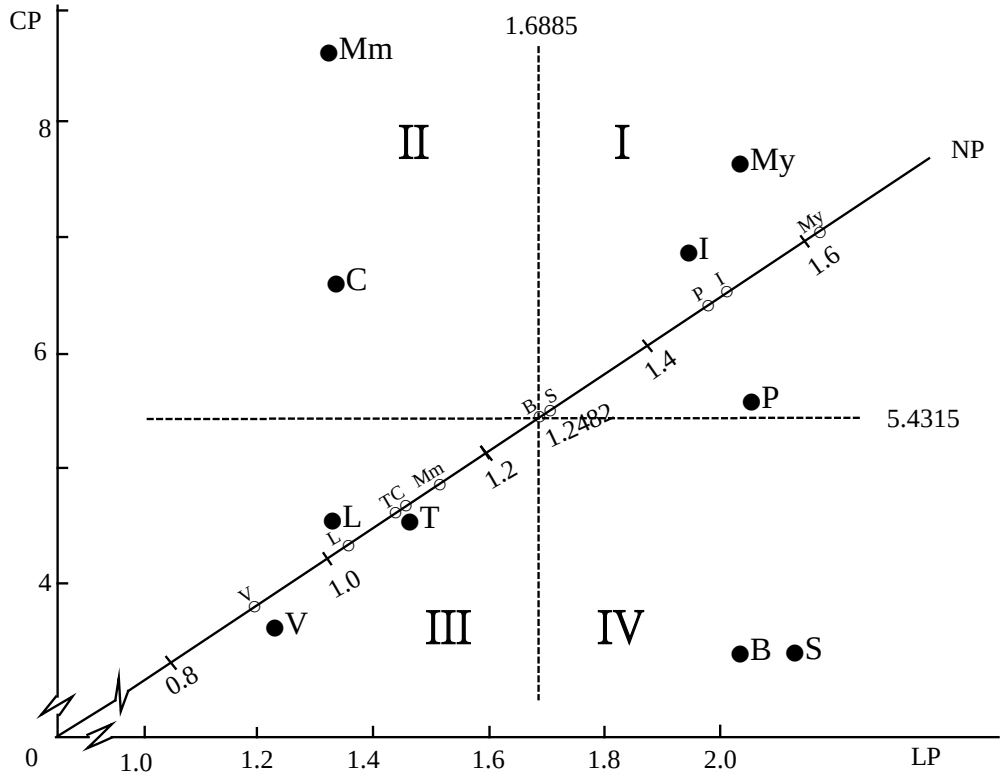

Figure 1. Scatter diagram of the productivities of the ten Southeast Asian countries.

The third quadrant is the region of both low LP and low CP. There are three countries in this quadrant, Thailand, Laos, and Vietnam. Since both the LP and CP are low, the NP measures of these three countries are the lowest among the ten countries, and this cluster is considered as the low-productivity cluster. The fourth quadrant has high LP and low CP.

There are two countries in this quadrant, including Singapore and Brunei. As opposed to the second quadrant, countries in this quadrant are capital intensive because they use relatively high amounts of capital compared to labor in transforming inputs into GDP. This cluster can thus be called the capital-intensive cluster. Note that in this example, the capital-intensive countries have higher national productivity than the labor-intensive countries, indicating that capital is more effective than labor in generating GDP.

As shown in Equation (3), national productivity is one-half of the harmonic average of labor productivity and capital productivity. It is very difficult to express this relation in the LP-CP plane of Figure 1. To simplify the expression, we use a straight line passing through the origin (0, 0) and the point (1.6885, 5.4315), which is the intersection of average LP and average CP, to represent the axis of NP. The order and relative scale of the NP measures of the ten countries are shown on the NP-axis. This axis functions like a regression line. Each

country is projected onto this line according to the NP measure. The average NP of the ten countries is 1.2482. Figure 1 shows that the countries in the high-productivity cluster are located in the leading position of the NP-axis. Countries in the capital-intensive cluster have NP measures which are a little higher than the average while countries in the labor-intensive cluster have NP measures which are lower than the average. Finally, countries in the low-productivity cluster are located in the trailing position of the NP-axis.

As described in the preceding section, productivity is the value of GDP generated from each dollar of inputs. The higher this value is, the more efficient is the transformation of labor and capital into GDP. In this sense, a country of high NP is more competitive than a country of low NP. From the position of the ten countries on the NP-axis shown in Figure 1, a visual inspection categorizes them into six groups. Malaysia, as the only country in the first group, has the highest NP, followed by the second group of Indonesia and the Philippines. Countries in these two groups are developing at a relatively fast pace. Then there is the third group of Singapore and Brunei. Their NP measures indicate that their economic development have reached a stable status, they are growing steadily. The fourth group is composed of Myanmar, Cambodia, and Thailand. Finally, there is the fifth group of Laos and the sixth group of Vietnam. Countries in the last three groups are growing at a relatively slower pace. The NP measures more or less indicate the competitiveness of the ten countries.

GDP is the value of final goods produced within a country. When it is divided by the population to yield GDP per capita, it can be used for comparing living standards across periods of time or among different countries. The second column of Table 2 shows GDP per capita of the ten countries. For Malaysia, although it is the most competitive country (as indicated by its highest NP measure), its living standards are in third place (as indicated by its third highest GDP per capita). Indonesia and the Philippines have the second highest NP measures, yet their living standards are in fifth and sixth place. Singapore and Brunei are in the third group of NP measures; however, their living standards are the best and are much better than the other countries, with Singapore considered a developed country. Except for Thailand, the remaining five countries all have small NP measures and low GDP per capita. The small NP measure of Thailand is a warning to this country. Its position of being ranked fourth in living standards (as indicated by its fourth largest amount of GDP per capita) will be under threat if its NP is not improved in the future.

Conclusion:

The economic development of Southeast Asia has been and continues to be very fast. On the one hand, this fast development triggers the economic development of some countries; on the other hand, it weakens the relative competitiveness of other countries. Since high national productivity implies faster economic growth and consequently stronger competitiveness, this paper proposes a method for calculating national productivity to measure the performance of economic development. NPs of the ten Southeast Asian countries are also calculated.

From the measures of labor productivity and capital productivity, the Southeast Asian countries are classified as high-productivity, labor-intensive, capital-intensive, and low-productivity. Of the ten countries, Malaysia, Indonesia, and the Philippines are high-productivity; Myanmar and Cambodia are labor-intensive; Singapore and Brunei are capital-intensive; and Thailand, Laos, and Vietnam are low-productivity.

Based on NP measures and GDP per capita, which is a yardstick of living standards, the ten Southeast Asian countries can be categorized into four groups. The first is fast growing-moderate living standards group, and. Malaysia is the only country in this group. The second is fast growing-low living standards group. There are two countries in this group, viz., Indonesia and the Philippines. The third is stable growing-high living standards group. This group is typified by Singapore and Brunei. The remaining five countries, Myanmar,

Cambodia, Thailand, Laos, and Vietnam, belong to the fourth group of slow growing-low living standards group.

The discussion of this paper is focused on the calculation of productivity. A subsequent and more important issue is how to improve it so that continuous economic growth can be assured. Many studies address this issue from the viewpoint of research and development (Morant 1983, Verspagen 1995). This deserves further exploration.

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