ARE EAST ASIAN ECONOMIES DYNAMICALLY EFFICIENT?

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This paper investigates dynamic efficiency of major East Asian economies based on the criterion of Abel, Mankiw, Summers and Zeckhauser(1989). It shows that both Korea and Taiwan are not necessarily dynamically efficient since they do not satisfy the sufficient condition of dynamic efficiency. It also shows that, contrary to the claim by Abel, Mankiw, Summers and Zeckhauser(1989), Japan also does not satisfy the sufficient condition of dynamic efficiency. Possible causes and implications of these empirical results are briefly reviewed.

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1. INTRODUCTION

As Abel, Mankiw, Summers and Zeckhauser (1989) stated, dynamic efficiency is one of the most important issues in analyses of economic growth, the effects of fiscal policies, and the pricing of capital assets. Diamond (1965) showed that a competitive economy can reach a steady state in which there is too much capital. In situations where the real economic growth rate always exceeds the real interest rate or the marginal product of capital, the economy is said to be dynamically inefficient. In the terminology of Phelps (1961), the capital stock exceeds the Golden Rule level. A Pareto improvement can be achieved in a dynamically inefficient economy by allowing the current generation to devour a portion of the capital stock and then holding constant the consumption of all future generations.

In actual economies, the Phelps' Golden Rule criterion is not empirically useful. Depending upon business conditions and various methods of calculating real interest rates, the real economic growth rate can be either greater or smaller than real interest rates. One can question whether there is any other dynamic efficiency criterion that is both theoretically sound and empirically useful.

Abel, Mankiw, Summers and Zeckhauser (1989, AMSZ, hereafter) presented such a criterion. According to the AMSZ criterion, an economy is dynamically efficient if it invests always less than or equal to the return to capital and is inefficient if it invests

always more than the return to capital. This sufficiency criterion applies to a stochastic overlapping generations model with a very general production technology. In a competitive economy, therefore, the issue of dynamic efficiency can be resolved by comparing the level of investment with the cash flows generated by production after the payment of wages. Using this criterion they found that the United States economy is dynamically efficient since investment is always (since 1919 at least) less than capital income. OECD countries such as England, Germany, France, Italy, Canada and Japan are also shown to be dynamically efficient at least during the period of 1960-1984. It is surprising that even the Japanese economy is dynamically efficient since the 1960s. Recall that Japan enjoyed an annual average growth rate of 10.7% with a low single digit real interest rate during the 1960s.

The purpose of this paper is to investigate dynamic efficiency of East Asian economies. Over the last thirty years or so, most East Asian economies showed high investment rate as well as high economic growth. East Asian economies, therefore, can be major candidates for dynamic inefficiency, if it exists. The major finding is that such East Asian countries as Korea, Taiwan, and Japan are not necessarily dynamically efficient.

The paper is organized as follows. The next section discusses the dynamic efficiency condition presented by AMSZ. Section 3 shows that the Korean economy does not satisfy the AMSZ sufficient condition of dynamic efficiency. Since the late 1980s, Korea exhibits overaccumulation of capital in the sense that gross investment exceeds gross capital income. Section 4 shows that the Taiwanese economy does not meet the AMSZ sufficient condition, although the degree of overaccumulation of capital is much less than that of Korea. Section 5 shows that, contrary to the AMSZ's finding, the Japanese economy does not satisfy the sufficient condition of dynamic efficiency. Possible causes of dynamic (in)efficiency and their implications are discussed. Concluding remarks are in Section 6.

2.   DYNAMIC EFFICIENCY CONDITION BY ABEL, MANKIW, SUMMERS AND ZECKHAUSER

Using an overlapping generations model with stochastic population growth and constant returns to scale production technology, Abel, Mankiw, Summers and Zeckhauser (1989) showed that an economy is dynamically efficient if its gross capital income is always larger than or equal to gross investment. An economy is dynamically inefficient if its gross capital income is always smaller than gross investment. Gross capital income and gross investment are defined as follows:

(1)   Gross capital income = domestic factor income + capital consumption allowances
                                  − employee compensation − proprietors' labor income.

(2)   Gross investment = gross domestic fixed capital formation
                                    + increases in inventory.

   In the national income account, proprietors' labor income is not shown. Following Christensen (1971), AMSZ imputes 67% of proprietors' income in OECD countries to labor. How large will be the labor share out of proprietors' income in East Asian countries? In the national income account, proprietors' income is usually recorded as operating surplus of private unincorporated enterprises. Private unincorporated enterprises in developing countries are, in general, less capital intensive as compared with those of developed countries. This will make the labor share of proprietors' income in developing countries larger than that in developed countries.

   Kim and Hong (1997) estimates that farmers' capital income is less than 15% of the farmers' operating surplus and labor income of private non-farmer unincorporated enterprises is between 41-81% of their operating surplus during the period of 1965-1995 in Korea. The labor share, in particular, of private non-farmer unincorporated enterprises exceeds 50% in the late 1980s and 60% in the 1990s.[1] Hence, it is reasonable to assume that proprietors' labor income in Korea is 67% of the total proprietors' income as in developed countries. In this paper I will assume that proprietors' labor income share in East Asian countries is 67% as in the Western developed countries.

   The AMSZ model is being built on the maintained assumption of perfect competition and constant returns to scale. Gross capital income as defined in Equation (1) is the summation of rent, interest income and profit. These raise the possibility of overestimating gross capital income in two ways.

   Firstly, gross capital income as defined in (1) may include monopoly profits. If imperfect competition gives rise to chronic excess capacity, gross capital income measured in Equation (1) may overstate the marginal returns to investment. Secondly, and more importantly, it includes land rent. According to Rhee (1988), in the US, the share of land rents in total income is about 5% over the period of 1900-1987. Hence, in order for the US economy to be dynamically efficient, gross capital income as defined in (1) should be larger than gross domestic investment by at least 5% of GNP. In their Table 1, AMSZ reports that this is the case for the US economy by showing that the difference between gross capital income and gross investment exceeds 8% of GNP every year during the period of 1929-1985. AMSZ states that "In 1985, the ratio of land value to annual GNP was about 2/3. Even if the ratio of land rents to land values is 10%, the correction for land would be insufficient to overturn our conclusion that the US economy is dynamically efficient"(p. 9). In East Asian economies, the ratio of rents to land values appears to be very low as compared with Western industrial economies. Let's assume that the ratio of rents to land values in East Asian economies is just 1%.

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[1] There will also be labor income in the operating surplus of corporate and quasi-corporate enterprises.

The ratio of land value to GDP is around 2 in recent years. Then the ratio of land rent to GDP in East Asian countries is about 2%.

$$\frac{land\ rent}{GDP} = \frac{land\ rent}{land\ value} \times \frac{land\ value}{GDP} = 1\% \times 2 = 2\%.$$

This means that as percentage of GDP gross capital income always should be larger than gross investment by about 2% points in order for the East Asian economies to be dynamically efficient. It turns out that this is not the case in three East Asian countries.

3. DYNAMIC EFFICIENCY OF THE KOREAN ECONOMY

Table 1 shows gross capital income, gross investment and the difference between the two (dubbed as "net cash flow") as percentage of GDP in Korea.

The table shows that, unlike the developed countries, the Korean economy does not satisfy the sufficient condition of dynamic efficiency. The net cash flow is negative during the second oil crisis period. It is also negative during the period of 1988-1997. During the latter period Korea invested 35.9% of GDP and had gross capital income of mere 28.7% of GDP on an annual average basis.

If we take into account the land rent factor subtracting 2% points from the net cash flow, the net cash flow becomes negative almost all years since 1978 until 1997. The full-fledged heavy and chemical industry drive was launched by the Korean government from the mid-1970s. Since that time the net cash flow is persistently negative. It was not until the 1997 economic crisis occurred that the net cash flow became positive.

4. DYNAMIC EFFICIENCY OF THE TAIWANESE ECONOMY

The Taiwanese economy is similar to the Korean economy in that it shows high saving, high investment and high economic growth. It differs from the Korean economy in that it enjoys persistent current account surplus and more stable price. Accordingly, we are not sure in advance whether the Taiwanese economy is dynamically efficient.

Using the same method as in the previous section, I calculated the net cash flows in Taiwan. Time series data of proprietors' income available for several years show that average share of proprietors' income out of the total operating surplus is around 40%. Hence, I assume that the share of proprietors' income out of the total operating surplus in Taiwan is 40% each year.

Table 1. Gross Capital Income and Gross Investment in Korea

(as % of GDP)

Year	Gross Capital Income	Gross Investment	Net Cash Flow
1953	41.5	14.7	26.8
1954	38.4	11.7	27.0
1955	39.2	11.7	27.5
1956	39.9	8.0	31.9
1957	38.6	14.0	24.6
1958	36.3	11.8	24.5
1959	34.0	10.4	23.6
1960	34.4	10.0	24.4
1961	36.2	12.0	24.2
1962	35.2	11.8	23.4
1963	38.1	17.0	21.1
1964	39.9	13.2	26.7
1965	38.1	14.1	24.0
1966	37.2	20.4	16.8
1967	35.6	20.9	14.7
1968	34.9	24.9	10.0
1969	34.2	27.9	6.3
1970	33.6	24.3	9.3
1971	33.8	24.8	9.0
1972	34.5	20.9	13.6
1973	34.8	25.2	9.6
1974	35.4	31.8	3.6
1975	29.5	28.6	0.9
1976	29.6	26.5	3.1
1977	30.2	28.3	1.9
1978	29.4	32.5	-3.1
1979	29.4	35.8	-6.4
1980	30.4	31.9	-1.5
1981	31.2	29.8	1.3
1982	30.6	28.9	1.7
1983	30.4	29.4	1.0
1984	31.0	30.6	0.4
1985	31.6	30.3	1.3
1986	31.7	29.2	2.5
1987	32.1	30.0	2.1
1988	31.1	31.1	-0.0
1989	29.3	33.8	-4.5
1990	28.9	37.1	-8.2
1991	28.4	39.1	-10.7
1992	28.1	36.8	-8.7
1993	29.2	35.2	-6.0
1994	28.9	36.5	-7.6
1995	28.9	37.2	-8.3
1996	26.9	37.9	-11.0
1997	27.7	34.2	-6.5
1998	29.5	21.2	8.3
1999	30.6	26.7	3.9
2000	30.7	28.2	2.5
2001	29.7	26.9	2.8

Source: Calculated from Bank of Korea (1994, 1999, 2003).

Table 2.   Gross Capital Income and Gross Investment in Taiwan

(as % of GDP)

Year	Gross Capital Income	Gross Investment	Net Cash Flow
1965	36.5	22.7	13.8
1966	35.5	21.2	14.2
1967	35.0	24.7	10.4
1968	33.8	25.2	8.7
1969	32.9	24.5	8.4
1970	33.3	25.6	7.7
1971	32.7	26.3	6.4
1972	33.3	25.6	7.6
1973	34.1	29.1	5.0
1974	32.3	39.2	−6.9
1975	30.8	30.5	0.3
1976	31.5	30.8	0.7
1977	31.4	28.3	3.1
1978	31.1	28.3	2.8
1979	30.3	32.9	−2.6
1980	30.1	33.8	−3.7
1981	29.8	30.0	−0.2
1982	29.9	25.2	4.6
1983	30.3	23.4	6.8
1984	30.3	21.9	8.3
1985	30.7	18.7	12.0
1986	32.0	17.1	14.9
1987	32.2	20.2	12.0
1988	31.2	23.1	8.1
1989	30.2	22.9	7.3
1990	29.3	22.5	6.8
1991	29.5	22.7	6.8
1992	29.2	24.4	4.8
1993	29.6	24.8	4.8
1994	29.6	25.4	4.2
1995	29.8	25.3	4.5
1996	31.2	23.2	8.0
1997	31.7	24.2	7.5
1998	32.7	24.9	7.8
1999	33.1	23.4	9.7
2000	33.1	22.9	10.2
2001	34.0	17.7	16.3

Source: Calculated from Directorate-General of Budget (1994) and www.dgbasey.gov.tw/dgbas03/bs4/ Abstract.htm.

Table 2 shows a different picture as compared with Table 1. The net cash flow in Taiwan is negative only during the first and second oil crisis periods. Even if we subtract the 2% land rents factor the net cash flow is positive during all the other times (except for the years of 1975 and 1976). If we exclude those two periods plagued by adverse supply shock, we may say the Taiwanese economy is dynamically efficient.

Taiwan's gross domestic investment rate fell under 30% since the early 1980s when its per capita GNI recorded U$ 3,000. During the 1980s Taiwan's national saving rate was 34% on average, and yet its gross domestic investment rate was only 23%. Meanwhile, Korea's gross domestic investment rate was more than 33% in the late 1980s when its per capita GNI recorded U$ 5,000, and exceeded 35% in the period of 1990-1997. Even with the 10-12% points differential of investment rates, the differential of economic growth rates between Korea and Taiwan is only 1% point since the late 1980s. This provides the background of the differences in the dynamic efficiency of the two countries.

We can think of three possible factors affecting the differences in the dynamic efficiency of the two economies.

First, big business conglomerates (*Chaebol*s) dominate the Korean economy, while medium and small sized business firms dominate the Taiwanese economy. Woo (1996) shows that capital productivity in Korea is lower among business firms belonging to *Chaebol*s. Excessive diversification and overinvestment regardless of profitability have been quite common among *Chaebol*s since the late 1980s. This is so because 'too big to fail' routine has been prevalent. Meanwhile, small and medium sized firms are dominant in the Taiwanese economy. Free entry and exit is a norm. Hence, market discipline worked much better in Taiwan than in Korea.

Second, interest rate policies adopted by both governments were different. Since the 1950s Taiwan adopted flexible high interest rate policy together with stable price. The resulting high real interest rate raised both domestic saving and investment efficiency. Korea, on the other hand, controlled bank interest rate below "market" rate despite high inflation since the 1970s. Accordingly, many investment projects which could not have been pursued under the market interest rate were executed.

Third, following the heavy and chemical industry drive in the 1970s Korea initiated since the late 1980s the nationwide residential construction projects whose rate of return was relatively low. Taiwan did not have those kinds of extraneous projects.

5.   DYNAMIC EFFICIENCY OF THE JAPANESE ECONOMY

AMSZ (1989) claimed that the Japanese economy is dynamically efficient during the period of 1960-1984. Here we examine whether their results still hold for the period after 1984. Table 3 shows gross capital income, gross investment and net cash flow in Japan. It shows that the net cash flow is positive after 1984, but it is not sufficiently large for several years. As discussed in Section 2, in order for any East Asian economy

to be dynamically efficient, the net cash flow as percentage of GDP should be larger than 2% if we take into account the land rent factor. Since the net cash flows for several years are less than 2% the sufficient condition of dynamic efficiency for Japan is not satisfied since 1984.

Table 3.   Gross Capital Income and Gross Investment in Japan

(as % of GDP)

Year	Gross Capital Income	Gross Investment	Net Cash Flow
1980	31.2	32.1	−0.9
1981	30.2	30.7	−0.5
1982	29.6	29.5	0.1
1983	30.2	27.9	2.3
1984	29.9	28.1	1.8
1985	30.6	28.1	2.5
1986	31.1	27.6	3.5
1987	31.2	29.2	2.0
1988	31.5	30.5	1.0
1989	31.8	31.6	0.2
1990	33.1	32.7	0.4
1991	33.2	32.4	0.8
1992	31.9	30.6	1.3
1993	31.4	29.3	2.1
1994	30.4	28.0	2.4
1995	30.2	28.1	2.1
1996	30.9	29.0	1.9
1997	30.7	28.5	2.2
1998	29.9	26.8	3.1
1999	30.1	25.9	4.2
2000	30.4	26.2	4.2
2001	29.8	25.6	4.2

Source: Calculated from Economic Planning Board, Japan (1997) and www.esri.cao.go.jp/en/h15-nenpou/index.html.

I reworked for the period of 1980-1984 and obtained the same results. Contrary to the AMSZ's results, the sufficient condition of dynamic efficiency is not satisfied. This overturn comes from the fact that AMSZ did not adjust the labor income of proprietors.[2] In the U.S. economy, proprietors' income is only about 6% of GDP. Hence, the sign of

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[2] See Table 3 in AMSZ (1989).

net cash flow is invariant regardless of whether proprietors' labor income is subtracted in calculating gross capital income. The United Kingdom, France, Germany, Italy and Canada have the same order of magnitude.

In case of Japan, however, proprietors' income comprises about 16% of GDP. The significant share can make the sign of the net cash flow vary depending upon whether proprietors' labor income is adjusted. The AMSZ's result which ignored this is erroneous.

The reason why Japan's net cash flow becomes small during some 1980s and 1990s is not clear. The possible reason may lie in changing investment pattern. After the first oil crisis, Japan maintained a high investment rate due mainly to the increase in energy-saving and environment-protecting investment. Energy-saving and environment-protecting investment may yield relatively low income flow. More satisfactory and comprehensive reasons have yet to be explored.

6.   CONCLUDING REMARKS

In Western developed countries proprietors' income comprises a small portion of GDP. Even if only 33% of all proprietors' income is imputed as capital income, gross capital income is always much larger than gross investment and the AMSZ sufficient condition of dynamic efficiency is satisfied. East Asian economies, however, are different. Proprietors' income comprises a substantial portion of GDP. When 33% of proprietors' income is imputed as capital income, gross capital income is sometimes smaller than gross investment, and the sufficient condition is not satisfied. Capital overaccumulation in the sense that investment is larger than capital income is most noticeable in Korea since the late 1980s. In Taiwan, investment is larger than capital income during the first and second oil crisis periods only.

AMSZ claimed that the Japanese economy is dynamically efficient. This paper shows that we are not sure about the dynamic efficiency of the Japanese economy. The problem is that our measured gross capital income includes land rents. Even if we exclude land rents from gross capital income, the sufficient condition of dynamic efficiency is satisfied in Western developed countries. That is not the case for Japan. If we sort out land rents from our measured gross capital income, the sufficient condition of dynamic efficiency is not satisfied in Japan.

Two questions remain. One is the composition of proprietors' income; namely, how is proprietors' income in each country decomposed into labor income, capital income, and rent? Another is the applicability of the sufficient condition of dynamic efficiency: If the AMSZ sufficient condition is not satisfied for the most East Asian economies, will there be other more practical sufficient or necessary condition of dynamic efficiency?

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