Appendix I

Comparison of economic forecasts of Asian Development Bank (ADB) and those of Institute of Developing Economies (IDE)

Asian Development Bank (ADB) published its economic forecasts for developing economies including East Asia in ADB (1997).[20] The forecast figures are neither GDP nor its growth rate. ADB predicted an average annual growth rate of per capita GDP of each economy over 30 year period from 1996 to 2025. Since a stage of economic development of a country can be measured by per capita GDP, a growth rate of per capita GDP is called an "economic development rate" in the following.

Before predictions, a single equation of an average annual economic development rate was estimated based on the pooling data of 78 countries and regions for the 1965-1995 period. This method assumes the same development path for either developed or developing economies.

In the ADB equation, an average annual economic development rate of an economy in the 30 year period was explained by an initial condition and exogenous variables. Hence, this approach can be said to be a reduced-form model of economic development. Per capita GDP of an economy relative to that of the United States in the initial year of 1965 is the initial condition. Exogenous variables which explain an average annual economic development rate of an economy include average annual increasing rates of population and labor, natural resource abundance, and policy stance such as openness to the global economy (see ADB (1997), Box A-1, p.328.)

The estimated equation is explained in Table A-2 in ADB (1997). By utilizing this equation, ADB forecast average annual economic development rates of developing economies, including East Asia, over the 30 year from 1996 to 2025. (The forecast figures are shown in ADB, op. cit., Table 2.11, p.122.)

The 10 year forecasts for East Asian economies from 1996 to 2005 by Institute of Developing Economies (IDE) include GDP and its growth rates of the economies but not economic development rates. Hence, Forecasts of average annual economic development rates of the East Asian economies in the next 10 years are calculated here by utilizing predicted population growth rates for the economies by the United Nations (1995) so that the IDE forecasts can be compared to those of ADB.[21] The comparison of the two forecasts is shown in Table 11.

The following three points should be taken into consideration when the IDE forecasts are compared to those of ADB in Table 11.

a. In converting nominal GDP in a local currency into real GDP in the U.S. dollar, ADB adopts 1985 as the base year and applies a purchasing power parity method. IDE picks up 1996 as the base year and uses the exchange rate of a local currency for the U.S. dollar in 1996.
b. The initial condition in the ADB forecast is a relative economic development rate of an economy to that of the United States in 1995. This implies that the United States is a reference country of economic development.
c. While ADB assumes the same pattern of economic development for all the economies, IDE recognizes different economic structures and therefore different economic development patterns for East Asian economies.

With the above mentioned points in mind, average annual economic development rates of East Asian economies forecast by IDE are compared to those by ADB in the followings.

(1) The forecast figures for NIEs, ASEAN4 and China by ADB are lower than those by IDE by about 2 points each. The main reason for this lies in different length of forecast periods: the ADB's forecast period is 30 years while that of IDE is 10 years.
Table 11 shows average annual economic development rates over the specified periods. Here, we notice that positive economic development

is predicted for the East Asian economies both by ADB and IDE. As Japan experienced from the 1960s through the 1980s, the higher is a stage of economic development of an economy, the lower is a rate of economic development of that economy. In other words, it is natural that as long as economic development continues, the longer is the forecast period, the lower is the average annual economic development rate.

(2) The average annual economic development rate for NIEs over the next 10 years is predicted to be a 4.8 percent by IDE while the corresponding average rate over the next 30 years is forecast to a 2.8 percent by ADB. The largest difference between forecasts by the two institutions is found for Singapore. The reason for this disparity, in addition to the aforementioned forecast-period differential is one of the characteristics of the ADB forecasting equation, which is described in the following (3).

Table 11. Comparison of IDE's Long-Run Forecast[1] and ADB's Super Long-Run Forecast[2] for Annual Growth Rates of Per Capita GDP of East Asian Economies

(%)

	Actual		Forecast	
	IDE	ADB	IDE	ADB
Period	1985-1995[3]	1965-1995	1995-2005[3]	1995-2025
Years	10	30	10	30
South Korea	7.8	7.2	4.8	3.5
Taiwan	6.9	6.2	5.0	3.1
Hong Kong	5.3	5.6	3.5	2.1
Singapore	6.5	7.2	5.4	2.5
NIEs	7.0	6.6	4.8	2.8
Malaysia	5.1	4.8	5.0	3.9 (4.1)[5]
Thailand	7.8	4.8	5.9	3.8 (4.0)
Indonesia	5.9	4.7	7.2	5.0 (5.6)
Philippines	1.2	1.2	5.1	5.3 (6.5)
ASEAN4	5.5	3.9	6.2	4.5 (5.1)
China	8.5	5.6	8.0	6.0 (6.6)
East Asia[4]	7.0	5.4[6]	6.2	4.2 (4.6)[7]

Notes: (1) Calculated from Table 9.
(2) Asian Development Bank (1997), Table 2. 11, p.122.
(3) The "1985-1995" period in this table follows ADB's definition of a period, showing from the initial year ("t" = 0) of 1985, and corresponds to the "1986-1995" period in the main text. Similarly, the "1995-2005" period in this table corresponds to the "1996-2005" period in the main text.
(4) In ADB (1997), "East Asia" includes only NIEs. Here and in the main text, "East Asia" consists of NIEs, ASEAN4 and China.
(5) Figures in parentheses are estimated annual growth rates of per capita GDP of ASEAN4 and China, if these economies adopt the same policy as the NIEs in the past.
(6) Estimated by the author, using 1985 GDP of East Asian economies as weights of average.
(7) Estimated by the author, using 1995 GDP of East Asian economies as weights of average.

(3) In the ADB forecasting equation, the initial condition is a relative level of economic development (per capita GDP) of an economy to that of the United States in the initial year of 1995. Since Singapore is a city-state economy, as with any city in an advanced country, its per capita income (GDP) is high. Actually, per capita GDP of Singapore exceeded that of the United States in 1995 and it became 1.14 times the figure for the United States in 1996. Hence, in Singapore's case, applying the level of economic development of the United States as the reference level results in a downward bias in forecast of an economic development rate over long term.

(4) For the average annual economic development rate of the ASEAN4, IDE forecasts a 6.2 percent while ADB, in its base-case forecast, predicts a 4.5 percent. Moreover, if the ASEAN4 adopts the same policy stances as the NIEs , the rate rises to 5.1 percent (parenthesized figures in Table 11) according to the ADB predictions.

(5) In the IDE forecast for ASEAN4 it was assumed that inflow of FDI and trade liberalization would both increase, as in the ADB's "NIEs-like" case. Considering this, it is natural that , in the ADB forecast, the value for the "NIEs-like" case for ASEAN4 should approach to that of IDE.
In the forecast figures of average annual economic development rates for the East Asian economies, the only case in which ADB's forecast values exceed those of IDE is the Philippines. Whether viewed over the past 10 or the past 30 years in Table 11, the average annual economic development rate of the Philippines was a low 1.2 percent. After suffering from a long-run stagnation, the Philippine economy started to grow helped by vigorous inflow of FDI and exports in the middle of 1990s. Hence, the economy is likely to enter an expansion period in the next decade, and thereafter a period of accelerated growth. Based on this view, it is quite reasonable that the average annual economic development rate of the Philippines over the next 30 years forecast by ADB is a 5.3 percent, exceeding the corresponding rate of 5.1 over the next 10 years estimated by IDE by 0.2 points.

(6) For China as with the ASEAN4, the ADB's base-case forecast is 6.0 percent, 2 points lower than IDE's 8.0 percent. If China adopts "NIEs-like" policy stances, the ADB prediction will rise to 6.6 percent.

(7) For East Asia as a whole, the ADB's forecast figure in the base-case prediction is 4.2 percent, 2 points lower than IDE's 6.2 percent.

(8) Comparing and studying the ADB and IDE forecasts in this way, we find that they are well consistent to each other despite the considerable differences in their methods and forecast periods.

As mentioned in Chapter 1 of the main text, exchange or comparison of different views and forecasts for East Asian economies among researchers and institutions will help us to deepen our recognition of their current and future situations. It is sure that this is also applicable to progressively liberalizing South Asian countries and other developing regions.

Notes:

20. ADB (1977) terms "East Asia" what in this volume is NIEs, and calls "Southeast Asia" what this volume terms ASEAN4. In this Appendix, as in the main text, East Asia refers to nine countries and regions of NIEs, ASEAN4 and China.
21. The IDE forecast figures are estimated by the "Projections for Asian Industrializing Region" (PAIR) project team at the institute.

Appendix II

Outline of Econometric Models Used in Economic Forecast for East Asia

Long term outlook of the East Asia in this volume is derived from a macroeconometric model for each country and region constructed by this Institute's "Projections for the Asian Industrializing Region" (PAIR) project. Here we will review the essence of these models used in this forecasting.

A. Macroeconometric Models

When describing an economy from the macro point of view and how its GDP is determined, we must first recognize its economic system or model.

It is sure that supply (production) and demand (expenditures) are equal to each others export, but there are economies wherein there is a tendency toward insufficient effective demand despite sufficient production capacity. In these economies GDP is determined by the effective demand, and construction of a demand oriented model is appropriate. On the other hand, there are economies wherein supply capacity is insufficient despite a sufficiency of demand. In these cases GDP is determined by the production side, and construction of a supply oriented model is appropriate.

In the PAIR project models, a supply oriented model was constructed whereby the constraints for factors of production, namely labor and capital, can be investigated for Singapore and Malaysia, noteworthy for their overseas dependence of capital and labor. With regard to the economies of the other seven countries and regions in East Asia, exports and investment as components of aggregate demand are so important that demand oriented models were constructed.

B. Exogenous and Endogenous Variables

After determining a country's economic model, it is necessary to specify behavior of principal economic agents such as household and firms under given conditions including international economic environment, and fiscal and monetary policy. Surely behaviors of these economic agents in a macro model are interdependent. Behavior of each agent can be expressed in a mathematical equation. Based on actual values (statistical data) coefficients (structure) of independent variables are estimated.

In a demand oriented model, for example, the structure of how the household (consumers) responds to an increase in income (the propensity to consume) is represented by the estimated coefficient for the income variable, which is one of independent variables in a consumption function.

Estimating behavior (structure) of each economic agent in this way and based on given external conditions, consumption, investment, GDP, inflation rates and so on are simultaneously determined as solutions to a system of multiple behavioral equations.

In an econometric model variables that represent given external conditions are called exogenous variables, while those whose values are simultaneously determined within the model are called endogenous variables.

C. Singapore and Malaysia: Supply Oriented Models Including Inflow of Foreign Direct Investment

Since Singapore's 1965 founding as a country, foreign direct investment (FDI) has risen far above investment by local corporations, and in the 1990s has accounted for about 80 percent of the total. Going into the 1990s the labor market has also become so tight that more and more foreigners have been allowed to work in Singapore. Today, even in the manufacturing sector up to 50 percent of the employees can be foreigners, if enterprises pay levies on their foreign workers.

Also in Malaysia, from the second half of the 1980s economic development has been led by FDI. The labor market has also become tight, with foreign workers, including illegal ones, estimated at 1.2 to 2 million; of a national labor force of 8.2 million, they account for 10 to 20 percent of the Malaysian labor force.

For these two countries with high dependence on foreign capital and labor, the PAIR project has constructed supply oriented models comprising 11 equations.

The estimated coefficients (structures) of the independent variables in both Singapore and Malaysian models are satisfactory both economically and statistically. And trustworthiness of the simultaneously-determined endogenous variables such as consumption, investment and GDP is sufficiently high.[22] This can be said to the models for other seven East Asian countries and regions.

D. Core Equations in a Supply Oriented Model

Among the 11 equations that comprise the models for Singapore and Malaysia, 4 constitute the model's core: those for production (GDP), investment, capital stock and labor demand.

In the production function (equation (1)), GDP is basically determined by capital and labor, but exports and FDI are introduced as a parameter that raises production efficiency. The sign above each independent variable is a theoretically expected one.

(+) (+) (+) (+)
(1) GDP = f (labor, capital; exports, FDI)

Investment is the sum of FDI and local investment, namely investment = local investment + FDI. In equation (2), this investment is explained by future revenues (GDP being used as a proxy variable) and the availability of investment funds (or the interest rates as the cost of funds).

(+) (+) (−)
(2) Investment = f (GDP, availability of funds (or the interest rate))

Capital stock is obtained by adding investment (local and FDI) to the previous period's capital, and subtracting depreciation. If we elucidate the increase in production capacity by inflow of FDI, capital is defined by the following equation.

(3) Capital = previous period's capital + (local investment + FDI) − depreciation

Labor demand responds positively to output (GDP), negatively, to capital, due to substitutability of labor and capital, and also negatively to the wage rate.

(+) (−) (−)
(4) Labor demand = f (GDP, capital, wage rate)

E. Role of Exports and FDI in Supply Oriented Models

In the group of equations at the core of a supply oriented model, let us look at the chain of reasoning whereby exports and FDI exert influence on economic growth. Increases in exports raise production efficiency (or operating rates) and boost GDP, as equation (1) indicates.

Increases in FDI operate to increase such intangible assets as the management know-how, access to overseas markets, etc., that foreign capital brings with it, and as shown in equation (1) improves production efficiency and boosts GDP in the same way as exports. In the case of FDI increases, moreover, the capital stock increases as in equation (2), and this capital increase subsequently raises production through the operation of equation (1).

F. A Reply To Krugman's Limit to Growth

Krugman (1994) maintains that East Asia's high growth in recent years was owed simply to increases in labor and capital. If Singapore in particular, with its limits on domestic labor and capital, did not improve the quality of its labor to the point where every citizen had a doctorate (and this was impossible), could not expect high growth in future.

Considering Krugman's points in PAIR's Singapore and Malaysia models, in employment there are no restrictions coming from domestic supply (population increases, etc.), and labor demand (equation (4)) is determined by production (GDP) side.

As noted in the main text, PAIR model's forecasted values for the economic growth rates over the next decade (1996 - 2005) are for annual rates of 7.3 percent for Singapore and 7.6 percent for Malaysia. The simultaneously determined annual rates of increase in labor (employment) demand are 3.2 percent and 3.4 percent, respectively for Singapore

and Malaysia. These labor demand growth rates are within the bounds of annual employment increases in both countries over the past 10 years. If both countries adopt at least the same policy stances toward their labor markets as they have over that period, PAIR models' forecasted values suggest that Krugman is wrong, and that over the next decade they could achieve annual growth in the 7 percent range.[23)]

G. Demand Oriented Models for the Other Seven East Asian Economies

With regard to the economies of the other seven East Asian countries and regions than Singapore and Malaysia, we have constructed demand oriented models that determine GDP as the sum of demand components.

The equations at the core of a demand oriented models describe behavior of economic agents in respect of the demand (expenditures) aspect. Private consumption is determined by income (GDP) and the amount of financial assets held.

(5) Private sector consumption = f (GDP, financial assets) (+) (+)

The investment behavior of enterprises is, as in the supply oriented model, explained by the proxy variable for future revenues (GDP) and the availability of funds (or the interest rate as the cost of funds).

(6) Investment = f (GDP, availability of funds (or the interest rate) (+) (+) (–)

Whether we can divide government spending into government investment and consumption depends on each country's statistical situation. In any case, for the private-sector economy government spending is basically one of given conditions and within the model is treated as an exogenous variable.

In the external sector of a model, there are, to begin with, exports considered as overseas demand for country's products and services. Next, there is import demand for country's goods and services produced overseas. Exports are basically handled as an exogenous variable as part of the given external environment. As in equation (7), imports change in response to country's domestic (both households and firms) economic activities (GDP) and react to foreign and domestic price differentials.

(7) Import = f (GDP, import prices/domestic prices) (+) (–)

Aggregating these, GDP is determined by the sum of the demand components in equation (8).

(8) GDP = private consumption + (private) investment + government spending + exports – imports.

H. South Korea and Taiwan: Advanced-Country Type Demand Oriented Models

The South Korea and Taiwan models in the PAIR project have as their cores equations (5) - (8) and are similar to a demand oriented for an ordinary advanced country. The former's comprises 18 equations, and the latter's 8.

In South Korea's model the private consumption function adopts GDP minus government income (mainly tax receipts) as a substitute variable for disposable income. It is possible to divide investment data by objective such as equipments and construction but private and government investments are not distinguished. Regarding the equipment investment function, in addition to GDP, availability of funds is used as an independent variable. Construction investment is explained by GDP and the cost of funds (the real interest rate).

It is possible to break down the Taiwan investment statistics into these by private sector, public corporations, and government. PAIR project's Taiwan model makes the first of these an endogenous variable. In order to grasp an investment cycle private investment is explained by GDP in the previous period and two periods ago, and by the one year lagged private investment. This specification of private investment follows one of ordinary types adopted for an advanced country. As partly described above, for South Korea and Taiwan advanced-country demand oriented models are constructed in the PAIR project.

I. Hong Kong Model: Effects of Entrepot Trade

PAIR project's Hong Kong model comprises 16 equations. What must be given particular attention

in respect of Hong Kong economy's demand aspect is how to handle entrepot trade. Hong Kong's definition of this differs from that of the United Nations. In latter's method , within a country value is added to imports and if these are then exported they are treated as that country's exports. But in Hong Kong's statistics, if the value added to imports is within 25 percent of the import value they are not recorded as the region's own exports but as re-exports (entrepot trade). Actually, in the first half of the 1990s a high 17 percent has been estimated as the average share of re-exports accounted for by locally-added value. Hong Kong's re-exports, moreover, have climbed sharply since China opened its doors 1978, and in 1996 were 4 times the region's own exports. The locally-added value share of re-exports of course contributes to Hong Kong's GDP, and cannot be overlooked in construction a demand oriented model for the region.

In PAIR project's Hong Kong model the share of locally-added value in re-exports is theoretically calculated and its contribution to GDP taken in.

J. Thailand, Indonesia, Philippines, China: Introducing FDI Into Demand Oriented Models

Looking at the domestic situations of these four countries, we see that capital is insufficient but not labor over the next decade. Each country will aggressively introduce foreign capital over that period.[24)]

As was noteworthy for Thailand and China, these four countries saw high growth over the past 10 years on favorable investment and export cycles.

Viewed in this light, the GDPs of these four countries are greatly influenced by investment and exports as demand components. For this reason the PAIR project constructed demand oriented models that explicitly introduce FDI. The numbers of equations are 21 for Thailand, 17 for Indonesia, 24 for the Philippines, and 13 for China.

Let us look now at the China model introducing FDI. Local investment is specified in equation (6) above, and total investment is defined as the sum of local investment and FDI, as in the following equation.

(9) Investment = local investment + FDI

Defining investment in this way, the contribution to GDP of FDI increases is equivalent to investment and/or export increases in the ordinary oriented model. For China, FDI's indirect effect on GDP[25)] via exports is incorporated in addition to the direct effect on GDP mentioned above. In the China model, based on the recognition that FDI is highly exports oriented, if the FDI/GDP ratio is high[26)] one period ago, exports increase and GDP is boosted. Of course in the Chinese model FDI increases also cause increases in imports of capital goods and intermediary goods, and these FDI derived imports are incorporated in the model. In the resulting estimates, however, the export growth derived from FDI exceeds the resulting growth in imports.

In the China model FDI anu local investment are independent of each other. But even if we assume that there is a relationship, it could be either positive or negative. (Refer to Toida (1995) on this point) If FDI substitutes for local investment its increase will cause local investment to contract. If the relationship is complementary, FDI growth will give rise to investment by related local enterprises.

Thailand is the country whose model was built on the assumption that FDI and local investment substitute for each other. Incoming FDI crowds out local enterprise investment from the financial markets. But if funds flow in from overseas in response to FDI, it is assumed that both FDI and local investment increase.

In the Indonesia model the total investment function (private + public sectors) includes FDI as an independent variable, in addition to GDP and the availability of funds. In this function the estimated FDI coefficient is 2.2, so that in Indonesia the flow of FDI is estimated to induce local investment that exceeds it in value.

With regard to the Philippines, during the period of observation the contribution of FDI to economic growth was seen only in the first half of the 1990s. But over the next decade we can expect FDI to lead the growth rate higher. In the PAIR project Philippine model we are careful about the treatment of FDI. First, private investment, including both local investment and FDI (grouped into equipment, construction, and other categories), is basically explained by the variables in equation (6). Further the model assumes that incoming FDI would cause capital investment to increase because it prevents the outflow of capital from the country.

This appendix has presented the essence of the PAIR project's model for each country and region used for the East Asian economic outlook in the main text. As noted there, degrees of development differ widely among the East Asian economies. In addition to these differences in developmental stages, this appendix explains the essence of the PAIR project's models which incorporate each economy's problems and special characteristics.

Notes:

22. There are many specific terms used in econometrics. The "statistical satisfaction" in an equation is statistical significance (t value) of the estimated coefficients, and the statistical significance of all the coefficients in the equation is the F value. The precision of endogenous variables in the simultaneous equation model is estimated by dynamic simulation of the model (final test) within the observation period. The differences (errors) between estimated and actual values are used to measure the precision of the endogenous variables. As for this statistical quantity, there are the average absolute errors and root mean precent squared errors.
23. As against Krugman, et al., who doubt that simple increases in the factors of production (labor and capital) conduce to continuous East Asian growth, there are various opposing theories besides this one. Firstly, the IMF (1997) argument on "Total Factor Productivity" (TFP) presents doubts about measurement of the contribution of technological progress to growth. Secondly, in the East Asian capital accumulated in the past, the degree of capital intensity (the ratio of capital to labor) even in the NIEs (the fastest-developing segment of East Asia) did not match that of the advanced countries in the 1960s, so henceforward capital increases in the region will lead to continuous growth. (IMF (1997), pp. 197-200)
    For the ADB, if firstly the most recent (1970-1992) period is used to measure, the East Asian TFP is the world's highest (in the empirical results used by Krugman (1994), the East Asia TFP was zero or negative). Secondly, unlike the former USSR and Eastern Europe in the 1970s, in the East Asia production-factor markets both capital and labor are active, and the rate of return on capital is high. For this reason, future increases in factors of production, (especially capital) will make for continuous growth. (Asian Development Bank (1997), pp. 119-120) Our conclusions about Singapore and Malaysia coordinate with IMF (1997) and ADB (1997).
24. With deregulation of FDI, these countries achieved high growth in the first half of the 1990s. But in 1996 there was a tendency in China to reduce the favorable treatment of FDI, while Indonesia began moves in the direction of domestic production of automobiles. Still, whether within or outside East Asia, over the next decade developing-country competition for FDI introduction will be vigorous.
25. The influence of FDI on commodity prices is taken into consideration in the Thailand model. In other words, FDI increases have the effect of boosting the capital stock and raising potential supply, reducing the demand gap and bringing down commodity prices.
26. Use of the FDI/GDP ratio for one period ago is undertaken in consideration of the fact that there is a certain period of time between investment and the commencement of production.