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Foundations of Industrial Upgrading in ASEAN Economies: Policy Effort and Status Quo

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I. East Asian Miracle Revisited

Over the period 1965–1990, the East Asian region registered a fast rate of economic growth of more than 5 percent per annum (World Bank, 1993). The source of this rapid growth in East Asian economies has been a matter of some contention: while the World Bank (1993) has emphasized the role of "productivity-based" industrial upgrading and resultant export competitiveness as the source of Asia's growth, its contribution was estimated to be roughly one-third of the observed output growth, with the remaining two-thirds coming from the factor input increase. Economists such as Krugman (1994) and Young (1995) have advanced a pertinent argument, stressing that East Asia's growth during the said period was, after properly taking into account all the factor inputs including labor force participation (instead of aggregated total population), little more than a consequence of mere input growth rather than technological growth.

Whether or not the real source of Asia's growth in the above period was input-driven or productivity-driven, East Asia's further economic development indeed hinges on the region's potential for technical progress, or industrial upgrading, and in this regard the ASEAN region is no exception. In the efforts that the ASEAN countries are making toward forming a comprehensive economic partnership agreement with Japan and other developed economies, industrial upgrading of the ASEAN economies is a necessary "springboard". This paper attempts to investigate the capacity of future industrial upgrading in East Asian economies, with particular emphasis on the ASEAN economies. The structure of the paper is as follows. Section II offers a conceptualization of industrial upgrading

with a view to clarifying what is meant by this oft-cited yet somewhat unclear term. A theoretical argument as to the effects of policy efforts on industrial upgrading is also advanced. Then, drawing on the definition of, and theoretical implication for industrial upgrading, Section III discusses appropriate policy efforts to be pursued by developing economies in general. Section IV compares the current status of industrial upgrading and policy efforts in the ASEAN and other East Asian economies. Section V provides a conclusion in which the main points of the paper are summarized.

II. Conceptualization of Industrial Upgrading

A. Brief Definition of Industrial Upgrading

The issue of industrialization came to the fore of contemporary policy debates in the early post-war period (see, e.g., Prebisch, 1950 and Singer, 1950). In this sense, industrialization is a familiar issue which is not confined to a particular regional or historical perspective. What exactly is meant by industrial upgrading in conceptual terms? In the standard Cobb-Douglas specification, industrial upgrading refers to the *increase in marginal products of capital (MPK) and/or labor (MPL).*[1] Although economic growth can be attained through "quantity increase" (increased amount of capital K and/or labor L), it takes more factor inputs. Krugman (1994) and Young (1995) both point out that East Asia's rapid economic growth was driven mainly by extraordinary growth in inputs of labor and capital rather than through gains in efficiency as a result of industrial upgrading. With an ever-tightening resource constraint on both K and L in East Asia including the ASEAN economies and Japan, increases in MPK and MPL are essential for the further economic development of the region. In the case of industrial upgrading as "qualitative improvement" or increase in the knowledge level of the economy, acquired knowledge can avoid this sort of resource constraint and can be "recycled" over and over again, thus exhibiting a "public good" property.[2]

How then is the enhancement of MPK and/or MPL brought about for fixed amounts of K and L? As is clear from the above expressions for MPK and MPL, the increased levels of capital productivity (hereafter H_K) and labor productivity (hereafter H_L) cause the rise of MPK and MPL respectively. Thus, industrial upgrading in the present chapter can also be defined as the increase in H_K and/or H_L.

B. Production before Trade, and Human Skill before Production

Since the above formalization is generic in nature with no mention of the role of government interventions, a specification has been made by Grossman and Helpman (1991) to investigate the linkage between industrial upgrading and policy effort through the use of a comparative-static, general equilibrium framework.[3]

Grossman and Helpman derive the following three propositions concerning industrial upgrading. (1) An R&D subsidy raises the rate of innovation in the country, but lowers the number of high-technology goods produced in the country; (2) A production subsidy for high-technology goods increases the number of high-technology goods manufactured in the country, but *reduces* the rate of innovation in the country; (3) A small tariff on imports of high-technology goods coupled with a small subsidy to exports of these goods at equal *ad valorem* rate expands the number of high-technology goods manufactured and exported by the country. However, the rate of technological progress falls in the country.

A key feature of the above framework is the significance it ascribes to a resource constraint. That is, factor supply for R&D and production activities are in a trade-off situation with each other. In this connection, Grossman (1990) underscores Japan's "strategy" (albeit one not taken intentionally) to specialize in production *per se* rather than in R&D. And the R&D projects undertaken by major Japanese manufacturing firms were, if at all, heavily oriented toward practical applications (Grossman, 1990). A fall in the number of current high-tech products means that in the long-run the country subsidizing R&D will enjoy comparative advantage but only in a smaller range of high-technology products than before. On balance, country A loses products in this process. This can be understood as follows: Country A uses more of its skilled labor in the research laboratory when R&D is highly subsidized, and therefore less skilled labor is available for the production of high-technology goods per se.

R&D subsidies and production subsidies exert mirror impacts on the rate of innovation and the number of high-tech products. A crucial difference, however, is that in the case of R&D, the resulting benefits come only in a stochastic, haphazard manner. After all, there is no guarantee that quality enhancement or cost reduction factor will be small enough to more than offset the cost of R&D. In this light, engaging in something less uncertain, i.e., production operation with incremental improvement, could be a suitable option. To reinforce this point, the government should provide subsidies for production-related industrial upgrading instead of subsidies

for R&D in the laboratory.

This finding is again relevant to Japan's experience over the past three decades: the Japanese government financed a much smaller fraction of private R&D projects than is typical for the advanced industrial economies, thus contributing to an expansion in the size of the Japanese high-technology sector. What can ASEAN learn from Japan's experience? Current ASEAN economies serve as net exporters of industrial products. This, however, might imply multinational firms' significant presence or even dominance in the region. Put differently, manufacturing firms located in ASEAN merely import "high-tech" parts from their home economies and assemble them with not too sophisticated "screwdrivers".

The results of the modeling analysis are somewhat extreme and of course are heavily dependent on the particular setting of the model employed here. Yet resource constraint is ubiquitous in any actual policy formulation. The possibility of a counterproductive role of R&D and/or production subsidy should always be taken into account in formulating industrial upgrading policies. In the case of "policy mix" where both R&D and production subsidies are provided by the government, the overall effect of these subsidies could have a positive impact in a certain circumstances.

An important point to be borne in mind here is that the amount of subsidies constitute a cost to the country. In this light, the cost of R&D and production subsidies should exceed the over-time (or "dynamic") benefit in the actual implementation of industrial upgrading policy. Again, these results are dependent on the specification of the model. Yet the actual presence of resource constraints (both in human and physical resources), particularly in the face of uncertainty as to the dynamics of economic variables (including factor prices), seems to suggest that policy mix of a moderate kind should be an appropriate option for inducing industrial upgrading. While not captured in the model, workers' production skills *per se* should also be subsidized.

Thus, the main feature of the model specification is the trade-off nature of the two subsidies, and the symmetric roles of R&D subsidy and production subsidy. It would be appropriate for the governments of ASEAN economies lacking in knowledge capital to grant policy incentives to indigenous firms in a manner which allows those firms to specialize in a narrow range of industrial operations. Again, the trade-off nature should be taken into account in the formulation of industrial upgrading policy.

In contrast with the trade-off property that government direct subsidies possess, the increase of skilled workers serves as the prime-mover of a

country's industrial upgrading and hence seems to be the best policy target. The government can best stimulate this increase in human skills through direct and/or indirect subsidy for workers' skill-development.

III. Effective Policy Efforts: Direct Subsidy versus Indirect Subsidy

Industrial upgrading can be effected through a combination of government policy interventions, as shown in Figure 10.1. The domestic sector can be divided into three spheres: factor endowments, firms, and the government. The government has the discretion to influence these spheres. Inasmuch as the economic behavior of the external sectors has a direct relevance to the domestic economy in the form of foreign direct investment, the government is deemed to be justified in intervening in the flow of FDI, as shown in Figure 10.1.

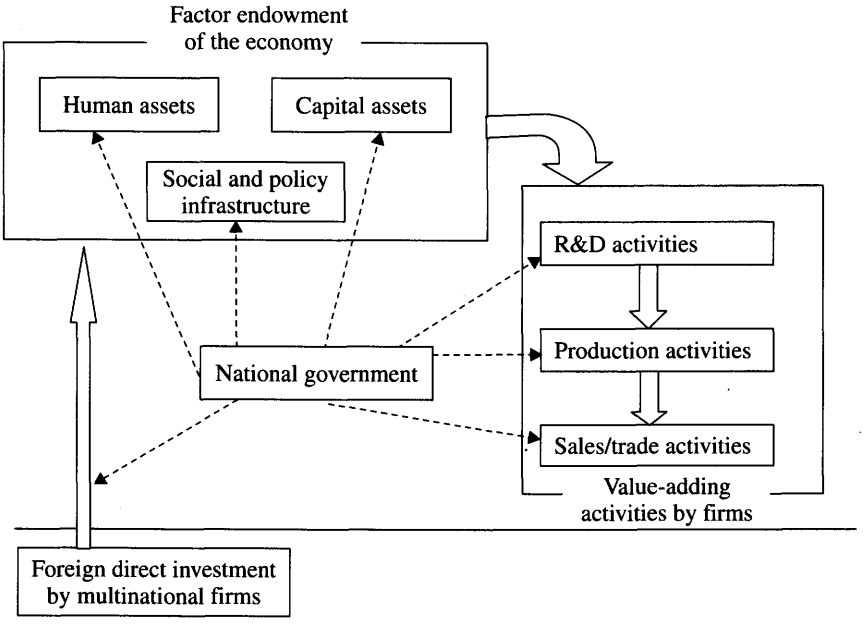
For the purpose of promoting H_K (capital productivity) and H_L (labor productivity) governments choose to intervene in the private sector's production activities. How should government policymakers behave in achieving industrial upgrading? Wherever the market is well-functioning, de-intervention or deregulatory measures should be taken. Trade liberalization and trade facilitation are salient examples. Wherever the market functions imperfectly, policy intervention can be justified. In the context of industrial upgrading, information provision is a case in point.

Up to now, Japan, with its scarcity of natural resources, has had to resort to industrial upgrading, or the accumulation of knowledge capital for efficient productive activities. Knowledge capital here includes both human- and physical infrastructure- assets utilized for industrial production activities. An important point is that in Japan, process innovation has been more important than product innovation: incremental and idiosyncratic cost cutting measures[4] have been the focal point of industrial production upgrading.

It is worthwhile pointing out here that although the role of the government in inducing industrial upgrading is significant, it is inevitably partial, since in the absence of underlying national circumstances that support industrial upgrading over time in any industry, policy interventions would not be successful. The primary role of government policy therefore is to marshal the economy's scarce resources (labor and capital) in a manner conducive to raising levels of productivity, so that manufacturing firms can create competitive fields of operation over a spectrum of

Figure 10.1

Forms of Government Intervention for Industrial Upgrading



Source: Author.

Note: Broken arrows denote government interventions. Block lines denote the flow of economic resources.

industries and associated production stages.

More practically, government policies toward industrial upgrading can be loosely divided into two types: (1) direct subsidies to private investment, e.g., R&D subsidies, production subsidies, and (2) indirect "subsidies" to information provision and skill-oriented education. An increase in HK (capital productivity) is brought about mainly by the first of these types of government policy (1). An increase in HL (labor productivity) can be achieved by government policy of the second type (2).

As regards (1), investment plays an essential role side by side with overall macroeconomic stability of the economy. Empirical evidence reveals a stronger correlation between investment and economic development if the concept of investment is widened to include investment in human and technological capital (UNIDO, 1995, 1997). Promoting

investment through policy incentives therefore constitutes a significant part of industrial upgrading policy. How then can investment be induced? Both direct and indirect subsidies can be used for stimulating investment for production. For the sake of analytical convenience, a classification has been made of government incentives mainly for physical investment, and is set out in Tables 10.1 to 10.3.[5]

As indicated in the title of each table, government incentives for inducing domestic production and foreign investment can be loosely

Table 10.1

Classification of Fiscal Incentives for Industrial Upgrading

Profit-based	Reduction of the standard corporate income-tax rate; tax holidays; allowing losses incurred during the holiday period to be written off against profits earned later (or earlier).
Capital investment based	Accelerated depreciation; investment and reinvestment allowance.
Labour-based	Reductions in social security contributions; deductions from taxable earnings based on the number of employees or on other labour-related expenditure.
Sales-based	Corporate income-tax reductions based on total sales.
Value-added-based	Corporate income-tax reductions or credits based on the net local content of outputs;[a] granting income-tax credits based on net value earned.[b]
Based on other particular expenses	Corporate income-tax deductions based on, e.g., expenditures relating to marketing and promotional activities.
Import-based	Exemption from import duties on capital goods, equipment or raw materials, parts and inputs related to the production process.
Export-based	a) Output-related, e.g., exemptions from export duties; preferential tax treatment of income from exports; income-tax reduction for special foreign-exchange-earning activities or for manufactured exports; tax credits on domestic sales in return for export performance. b) Input-related, e.g., duty drawbacks, tax credits for duties paid on imported materials or supplies; income-tax credits on net local content of exports; deduction of overseas expenditures and capital allowance for export industries.

Source: UNCTAD (1996).

Notes: [a] "Net local content" is the value of sales less depreciation of capital equipment and the value of imported raw materials and supplies.

[b] "The net value earned" is the value of sales less the cost of raw materials and components, supplies and utilities, and depreciation of capital equipment.

Table 10.2

Classification of Financial Incentives for Industrial Upgrading

Government grants	A variety of measures (also loosely referred to as "direct subsidies") to cover (part of) capital, production, or marketing costs in relation to an investment project.
Government credit at subsidized rates	Subsidized loans; loan guarantees; guaranteed export credits.
Government equity participation	Publicly funded venture capital participating in investments involving high commercial risks.
Government insurance at preferential rates	Usually available to cover certain types of risks such as exchange-rate volatility, currency devaluation, or non-commercial risks such as expropriation and political turmoil (this type of insurance is often provided through an international agency).

Source: UNCTAD (1996).

Table 10.3

Classification of Other Incentives for Industrial Upgrading

Subsidized dedicated infrastructure	Include provision, at less-than-commercial prices, of land, buildings, industrial plants, or specific infrastructure such as telecommunications, transportation, electricity and water supply.
Subsidized services	Services offered may include assistance in identifying finance; implementing and managing projects; carrying out pre-investment studies; information on markets, availability of raw materials and supply of infrastructure; advice on production processes and marketing techniques; assistance with training and retraining; technical facilities for developing know–how of improving quality control.
Market preferences	Preferential government contracts; closing the market for further entry; protection from import competition; granting of monopoly rights.
Preferential treatment on foreign exchange	Special exchange rates; special foreign debt-to-equity conversion rates; elimination of exchange risks on foreign loans; concessions of foreign exchange credits for export earnings; special concessions on the repatriation of earnings and capital.

Source: UNCTAD (1996).

classified into three categories, namely, fiscal incentives, financial incentives, and other incentives. Although these listings are not

exhaustive, for the sake of convenience policy incentives can be located under their respective properties. The overall objective of fiscal incentives is to reduce the tax incurred by MNFs. Fiscal incentives can be classified according to the tax base (Table 10.1). Financial incentives denote the provision of funds directly to MNFs to finance new FDI projects, and there are several types of financial incentives, as shown in Table 10.2. Other types of incentives are presented in Table 10.3. Incentives under this type are designed to grant total or partial relief from the payment of income tax. Actual policy incentives are sometimes a mixture or combination of these three basic types. R&D subsidies and production subsidies introduced in the previous modeling analysis can take the form of any one of these three types of incentives.

In empirical terms, strands of industrial policies have been provided by ASEAN and other East Asian economies, and due to the idiosyncratic nature of individual industrial policies, a cross-country comparison would seriously suffer partiality or one-sidedness. Table 10.4 gives the investment-related policy incentives in ASEAN and other East Asian economies. As shown, each economy is unique in its way of providing policy incentives for investors. An important point to be noted here is that there is no a priori criterion on the basis of which the efficacy of these industrial policy frameworks can be measured.

Put differently, the empirical performance of these economies in terms of industrial upgrading alone reveals the efficacy of these policy measures. Of course, a dynamic interpretation would suggest that the current performance of these policy options does not reveal over-time, future facilitation of industrial upgrading through current policy circumstances, something that would not be feasible. In this sense, indirect comparison of these industrial policy frameworks are not pursued here.

Table 10.5 compares various tax rates in ASEAN and selected East Asian economies. The same consideration holds here: while lower tax rates could be viewed as desirable (at least in the short run) for potential business investors both domestic and foreign, this table indicates the idiosyncratic nature of these tax rates. For example, a low income tax rate would be desirable for investors, yet that could mean, from a long-run perspective, that future public investments in infrastructure could be restrained by a weaker tax base. This could discourage potential domestic and foreign investment in the economy. Hence, the degree of concession inherent in each economy's policy incentives cannot be measured in an objective way.[6]

Apart from the categorization used in the tabulation, various policy

Table 10.4

Comparison of Investment-Related Policy Incentives in Selected Asian Economies (November 2001)

Economy	Policy Incentives for Investment
Indonesia	(1) Preferential measures for export-oriented companies (VAT exemption or reduction, import tax exemption or reduction); (2) simplified export procedures (passage through customs possible in about four hours), and easier immigration procedures (work visa acquisition); (3) easier bringing in and taking out of foreign capital; (4) 100% foreign capital possible (It is obligatory to transfer shares to Indonesian individuals or companies 15 years after the founding of a company, but the ratio is not stipulated.)
Malaysia	As regards manufacturing industry, 100% foreign capital is possible whatever the export ratio (excluding 8 areas in 7 industries; until the end of 2003). Exemption of corporate tax for 10 years and 100% investment tax deduction are applicable for companies that have acquired Multimedia Supercorridor (MSC) status.
Philippines	Investment promotion organizations in the Philippines include the Board of Investment, the Philippine Economic Development Zone Agency (PEZA), the Subic Urban Development Agency (SBMA), and the Clark Development Corporation. Under the BOI, corporate income tax is exempted or reduced for a maximum of eight years. Under the PEZA, SBMA, and CDC, in addition to the exemption or reduction of corporate income tax as with the BOI, the exemption or reduction of tariffs on imported capital goods and imported raw materials and other handling fees is permitted.
Singapore	(1) preferential tax system for pioneer companies (exemption or reduction of corporate tax for 5–10 years; also targeted at service industries); (2) preferential tax system for development and expanded investment (reduction of corporate tax for 5–10 years; preferential tax rate of 13%); (3) deduction from taxable income of the equivalent of a maximum of 50% new plant and equipment investment amount; (4) dual income deduction system for R&D investment (double inclusion in expenses); (5) preferential tax system for regional head company (preferential corporate tax rate of 10%)
Thailand	Corporate tax exemption or reduction and machinery import tariff exemption or reduction for a maximum of eight years for each zone. (However, the amount of corporate tax exemption or reduction is up to the investment amount excluding land costs and operating funds.) There are 1,126 incentive businesses. Furthermore, maximum privileges are granted to 51 specially important industries in 5 fields. Businesses of over 10 million baht are obliged to acquire international certification, such as ISO, within two years of operation. Under certain conditions, corporate income tax is reduced to 10% for regional head companies of foreign enterprises.

Table 10.4 (Continued)

Economy	Policy Incentives for Investment
Vietnam	Corporate income tax for manufacturing companies in industrial zones is (1) 15% and exempted for two years after declaration of profit if export ratio is less than 50%; (2) 15%, exempted for two years after declaration of profit, and reduced by 50% for two years after that if export ratio is over 50% but under 80%; and (3) 10%, exempted for two years after declaration of profit, and reduced by 50% for two years after that if export ratio is over 80%. Corporate income tax for manufacturing companies in export processing zones is 10%, exempted for four years after declaration of profit, and reduced by 50% for four years after that.
Myanmar	(1) Corporate income tax exemption or reduction for 3 years after start of commercial production; (2) exemption or reduction of tariffs and domestic taxes on machinery, machinery parts, etc. relating to plant construction; (3) exemption or reduction of tariffs and domestic taxes on imported raw materials for 3 years after start of commercial production; (4) exemption or reduction of income tax on a maximum of 50% of profits gained from the export of products; (5) accelerated depreciation of fixed assets; etc.
China	The corporate income tax rate is a uniform 33% nationwide (30% national tax, 3% local tax). However, if they meet the following conditions, foreign companies can receive tax rate preferential treatment. (1) Production companies in economic special zones, economic and technological development zones, hi-tech zones, and bonded zones: 15%. (2) Production companies in urban areas of cities with coastal economic free zones, economic special zones, and economic and technological development zones: 24%. (3) Production companies operating for more than 10 years: tax exemption for two years after declaration of profit and tax reduction to 15% for three years after that. (4) Companies that export more than 70% of annual production value: tax rate of 15% applicable even after application of two-year exemption and three-year reduction. (5) Hi-tech companies: tax rate of 15% applicable for three years after application of two-year exemption and three-year reduction. (6) Companies that reinvest profit and operating for more than five years: 40% refund of already paid corporate income tax. In addition to the above, on December 1, 2001, the Beijing Economic Development Area ceased collecting administrative and management expenses for 98 items, including "temporary land and temporary construction" and "real estate trade procedure expenses," from companies located in the area.
Hong Kong, China	There is no legislation on preferential measures or regulations for foreign capital, and under the legal system there is no discrimination between domestic and foreign capital. Tariffs, added-value tax, and interest tax are basically not levied, and the corporate tax is a uniform 15% or 16% for all industries, not only manufacturing. There are no restrictions under the law on capital ratio, domestic ratio, fund procurement, remittance, or reinvestment. Regarding the installation of machinery related to manufacturing and computers and software possessed by end users, 100% initial allowance for depreciation is recognized.

Table 10.4 (Continued)

Economy	Policy Incentives for Investment
Taiwan	There is a five-year corporate tax exemption measure for newly developing and strategically important industries, aimed at promoting the hi-tech side of industry.
Korea	(1) Taxation: There is a system of exemption or reduction of corporate tax (initially 100% a year, reduced by 50% for three years after that), real estate acquisition tax, registration tax, general land tax, etc. for foreign investment businesses in a total of 533 industries (436 industries in the high-level technology accompaniment project and 97 industries in the industrial support service project), foreign companies located in foreign investment zones and foreign company special industrial estates, and foreign companies located in free trade zones and tariff free zones. (2) Public owned land rental: There are preferential measures for providing cheap rents or 50-year free rental (renewable), depending on scale and other factors, to foreign companies in the above-mentioned 533 industries, foreign companies located in foreign investment zones and foreign company special industrial estates, etc. (3) Tariffs: Tariffs, the special consumption tax, value–added tax, etc. are exempted or reduced for capital goods that foreign companies introduce for the purpose of investment.
India	Corporate tax on export income is exempted or reduced. However, this measure is scheduled to be abolished from 2010. Capital gains scheme to promote exports: A lighter tax rate of 5% is applied to imported capital goods on condition that exports reach five times the cost, insurance, and freight price of imported capital goods or five times on a new foreign currency acquisition base within eight years.

Source: File at Japan External Trade Organization (JETRO).

options would of course be conceivable, e.g., those for increasing competitiveness and export orientation, mobilizing and securing new investment (especially FDI), ensuring the inflow, absorption and adaptation of new technologies, achieving appropriate levels of privatization, and accelerating human resource development and training (UNIDO, 1996). Under whichever labeling, though, policy incentives *without* an increase in human skill would simply distort the current resource allocation for better or for worse depending on other economic fundamentals.

In the light of market imperfection or market failure, which pervade developing economies including those of ASEAN, industrial policy constitutes an appropriate tool. In East Asia, government policies have played a major role in the process of capital accumulation by pushing firms' profits beyond those that could have been attained under purely free market conditions (UNIDO, 1997).

Table 10.5

Comparison of Tax Rates in Asian Economies (as of November 2001)

(%)

Economy	Corporate income tax rate	Highest tax rate on interest remitted to Japan	Highest tax rate on dividends remitted to Japan	Highest tax rate on royalties remitted to Japan
Indonesia	10.0–30.0	10	10[g]	10
Malaysia	28.0	15	28	10
Philippines	32.0	10	10	10
Singapore	24.5	15	0	15
Thailand	30.0	15	10	15
Vietnam	10.0–20.0[c]	10	3, 5 or 7[h]	10
Myanmar	35.0–40.0	0	0	0
China	33.0	10	0	10
Taiwan	25.0[b]	20	20	20
Hong Kong	16.0	0	0	16
Japan	30.0	—	—	—
South Korea	28.0[a]	10	10[f]	10
Pakistan	43.0[d]	5–10[i]	15	15
Sri Lanka	35.0	10	10	10
Bangladesh	35.0[e]	n.a.	n.a.	n.a.
India	35.7	10	15	20

Source: Japan External Trade Organization, *JETRO Sensor,* April 2002, pp.42–54.
Notes:

[a] for corporate profits (gross) over 100 million won (16.0 percent otherwise).
[b] for corporate profits (gross) over 100 thousand yuan (15.0 percent otherwise).
[c] for manufacturing (25.0 percent otherwise).
[d] for private firms (33 percent for state-owned firms).
[e] for firms registered at the stock market (40.0 percent otherwise).
[f] for corporate shareholders of over 25 percent (otherwise 15 percent).
[g] if objective is business participation (otherwise 15 percent).
[h] differs according to investment amount and investment business incentive system.
i differs by industry.

Given the possibility of unfavorable market distortion of item (1) above (direct subsidy to investment), a "fresh approach to industrial policy" (UNIDO, 1996) should be focused on item (2), namely, indirect subsidy to "investment" in a broader sense. Formulation of industrial policy must be made in the direction of conformity with market mechanisms, but the existence of market failures justifies the positive role of governments not

in changing but in facilitating efficient resource allocation. Policymakers can aptly adjust to changing economic circumstances by shifting industrial policy away from interventions designed to protect and promote a specific industry or sector, towards more general interventions aimed at boosting economy-wide competitiveness indirectly. Examples include increased investment in skill-oriented education for workers and information provision.

In sum, industrial policy providing direct subsidies to either R&D or production activities, as an economy's "downstream" production process, can lead to the situation in which such subsidies distort the country's resource allocation in a counterproductive way. In contrast, as underscored also in the modeling analysis of the previous section, a rise in the effective amount of skilled labor enhances both innovation and production activities. Hence, subsidizing the "upstream", human resource enhancement can be viewed as a suitable policy tool for industrial upgrading. The next section touches on this issue by presenting relevant empirical data for East Asian economies.

IV. The Foundations of Industrial Upgrading

A. Statistics Pertaining To Industrial Upgrading

In what follows, the perspective inherent in Figure 10.1 is applied to make an empirical comparison of the current status of industrial upgrading in selected ASEAN economies. As shown in Figure 10.1, an economy's value-adding activities can be divided into a spectrum of sub-divisions, loosely labeled as (in the order from "downstream" to "upstream"): sales/trade activities, production activities, R&D activities, on the basis of the economy's capital and human assets. Accordingly, government authority has the discretion to intervene in any one these sub-divisions. The previous sections have emphasized that direct subsidy to "downstream" components (R&D and production) leads to counterproductive distortion in the allocation of skilled labor as a scarce resource. In this light, "indirect subsidy" to these segments, or direct subsidy to "upstream" part of the economic process could be arguably justified. Put differently, workers' skill development could be viewed as the government's main task.

Economies can never be operated in isolation from external sectors. In this sense, attention should also be paid to the role of FDI in Figure 10.1. The role of FDI is especially high in the ASEAN economies.

Moreover, related to, yet distinct from artificially created policy incentives, the host economies of FDI possess their own locational advantages. As discussed in the previous sections, the extent of industrial upgrading can be expressed in theory as the levels of H_K (capital productivity) and H_L (labor productivity). The levels of H_K and H_L are determined both as a consequence of policy intervention and as an outcome of the economy's natural factor endowments. Almost by definition, fixed capital formation through domestic capital investment and/or FDI is conducive to a rise in H_K. In developing economies, FDI also enhances H_L, since FDI is not merely an inflow of monetary assets but also an inflow of managerial assets which the investing foreign firms possess as their firm-specific assets. Educational achievements and workers' training opportunities, as a consequence of government policy effort would result directly in an enhanced level of H_L. Importantly, the enhanced levels of both H_K and H_L are conducive to a higher level of FDI. Thus, the increased level of investment and economy-wide productivities have a bi-directional and self-reinforcing causality.

ASEAN economies have been upgrading their domestic industry on the basis of various kinds of economic infrastructure or "fundamentals". There are many strands of factors by which the government can bring about industrial upgrading, and important among them is consideration as to the flow of the economic process depicted in Figure 3.1. The following sub-sections address the current status and potential of selected Asian economies' industrial upgrading in turn, from the direction of "downstream" to "upstream" of value-adding processes.

The performance of sales and/or trade activities can be measured by trade statistics. More specifically, the competitiveness index[7] and/or revealed comparative advantage index[8], together with the ratio of export to consumption, reveal an economy's comparative advantage in the production of those goods concerned. Although, and importantly, production activities are logically needed *before* exporting those products, the performance of sales and international trade (or export more specifically) reveals the acquired (or dynamic) comparative advantage of those products as a *consequence* of industrial upgrading. Likewise, GDP is viewed as a consequence of total industrial upgrading (See Table 10.6 for GDP and trade performance of selected Asian economies).

Production activities, which are notionally placed just one stage upstream of sales and/or trade activities, have ranked high on industrial policy agendas. First of all, capital formation at either macro- or micro-economic level translates into the foundation of the economy's industrial

Table 10.6

Basic Indicators of Selected East Asian Economies and the U.S.

Economy	Population 2001	GDP, 2001 (US$ million)	Exports, 2001 (fob, US$ million)	Imports, 2001 (cif, US$ million)
Indonesia	213.54	143,363	58,893	46,702
Malaysia	23.80	88,050	102,436	86,254
Philippines	80.10	70,812	34,326	33,309
Singapore	4.13	82,904	117,790	112,206
Thailand	62.91	115,343	76,423	69,438
Vietnam	78.92	32,120	17,427	18,472
China	1,271.90	1,191,499	266,098	243,553
Korea	47.34	419,915	177,394	167,828
Japan	127.34	3,818,695	398,839	374,757
United States	284.80	10,082,200	1,034,100	1,383,000

Source: Calculated from IMF, *International Financial Statistics,* May 2003.

Table 10.7

Per Capita Fixed Capital Formation in Selected East Asian Economies and the U.S. (5-year average)

(US$ thousand)

Economy	1986–1990 average	1991–1995 average	1996–2000 average
Indonesia	171	261	210
Malaysia	541	1,266	1,270
Philippines	116	183	214
Singapore	2,787	5,921	7,875
Thailand	371	879	667
Vietnam	17	42	91
China	93	153	254
Korea	1,348	2,932	2,966
Japan	6,360	9,990	9,488
United States	3,042	3,373	5,189

Source: Calculated from World Bank (2002).

upgrading (Yoshikawa, 2000). Table 10.7 shows per capita fixed capital formation in selected East Asian economies. As can be seen, overall, the listed ASEAN economies have been accumulating capital essential for industrial upgrading.

Table 10.8

FDI Inflow (5–year average)

(US$ million)

Economy	1986–1990 average	1991–1995 average	1996–2000 average
Indonesia	573	2,344	644
Malaysia	1,240	4,532	4,803
Philippines	492	1,015	1,268
Singapore	3,443	4834	8,591
Thailand	1,175	1,837	3,483
Vietnam	6	776	1,773
China	2,853	22,535	41,852
Korea	676	1,016	5,839
Japan	316	1,125	3,342
United States	51,878	39,194	189,315

Source: Calculated from UNCTAD, *World Investment Report,* various years.

Table 10.9

Per Capita FDI Inflow (5-year average)

(US$)

Economy	1996–2000 average
Indonesia	3.1
Malaysia	208.8
Philippines	16.7
Singapore	2147.7
Thailand	57.1
Vietnam	22.4
China	33.2
Korea	124.2
Japan	26.3
United States	672.7

Source: Calculated from UNCTAD, *World Investment Report,* various years.

FDI serves as a carrier not only of monetary value but also of production technologies. Growth in FDI is among the most distinctive features of globalization and reflects the increasing its importance of international value-adding activities by multinational firms. The ASEAN economies have been attracting an increasing amount of FDI (Table 10.8), and the relative size of FDI in this region is high (Table 10.9).

In line with this trend, a growing number of developing economies

Table 10.10

Labor Cost Per Worker in Manufacturing in Selected East Asian Economies and the U.S.

(US$ per year)

Economy	1980–84 average	1995–99 average
Indonesia	898	3,054
Malaysia	2,519	3,429
Philippines	1,240	2,450
Singapore	5,576	21,317
Thailand	2,305	3,868
Vietnam	n.a.	711
China	472	729
Korea	3,153	10,743
Japan	12,306	31,687
United States	19,103	28,907

Source: World Bank (2003).

including the ASEAN economies have benefited from their cheap factor costs and have also liberalized their trade and investment regimes, reducing barriers to FDI. In the ASEAN region, cheap factor costs have been the main attractor of FDI. Table 10.10 shows labor costs in selected East Asian economies. As can be seen, labor costs in most ASEAN economies are lower than NIEs, Japan and the United States, but are higher than in China. In relative terms, while each East Asian economy has been experiencing a rise in labor cost, the extent is larger for ASEAN economies than in China. Hence, ASEAN economies' comparative locational advantage for attracting investment in the form of "cheap labor" has been gradually lost.

Table 10.11 shows value added per worker in manufacturing. The larger this measurement is, the more productive the workers are. As shown, Japan, the United States, Singapore and Korea exhibit large value-added per worker. This, however, does not directly translate into the economy's locational advantage, since the cost of employing a labor force is not taken into account in this measurement. Put differently, low wages are not enough to attract FDI (Kumar, 2002). Manufacturing value-added per capita divided by wage would reflect "effective" quality of labor. With this point in mind, wage-adjusted value added per worker in manufacturing is presented in Table 10.12. This Table shows that wage-discounted productivity is larger in some ASEAN economies than in the above-

Table 10.11

Value Added Per Worker in Manufacturing in Selected East Asian Economies and the U.S.

(US$ per year)

Economy	1980–84 average	1995–99 average
Indonesia	3,807	5,139
Malaysia	8,454	12,661
Philippines	5,266	10,781
Singapore	16,442	40,674
Thailand	11,072	19,946
China	3,061	2,885
Korea	11,617	40,916
Japan	34,456	92,582
United States	47,276	81,353

Source: World Bank (2003).

Table 10.12

Wage-Adjusted Value Added Per Worker in Manufacturing[a] in Selected East Asian Economies and the U.S.

Economy	1980–84 average	1995–99 average
Indonesia	4.2	1.7
Malaysia	3.4	3.7
Philippines	4.2	4.4
Singapore	2.9	1.9
Thailand	4.8	5.2
China	6.5	4.0
Korea	3.7	3.8
Japan	2.8	2.9
United States	2.5	2.8

Source: Calculated from World Bank (2003).

Notes: [a] Calculated as the average manufacturing value added per capita provided in Table 10.11 divided by wage rate provided in Table 10.10.

mentioned economies with high per capita manufacturing value-added. In other words, ASEAN economies have a potential for further attracting both domestic capital investment and FDI, despite China's abundance of cheap labor.

Table 10.13

Comparison of FDI-related Costs in Selected Cities and Regions in Selected Asian Economies (November 2002)

(US$)

City (Economy)	Industrial estate purchase rate (per square meter)	Industrial estate rental price (per square meter per month)	Transportation cost (40-foot container transport by ship) to Yokohama port, Japan
Jakarta (Indonesia)	45–60	3.80–4.10	820
Kuala Lumpur (Malaysia)	49–99	—	884
Manila (Philippines)	65.54	4.50–5.00	700
Singapore (Singapore)	119–569	0.66–2.75	550
Bangkok (Thailand)	51.78	4.60	1,304
Hanoi (Vietnam)	—	0.21–0.22	1,470
Yangong (Myanmar)	—	3.00/year[a]	1,150–1,600
New Delhi (India)	12	—	2,214
Beijing (China)	72.49	3.62–7.25	734
Hong Kong (China)	243.53	—	850
Taipei (Taiwan)	1,180	4.26	619
Seoul (Korea)	—	0.02	600
Yokohama (Japan)	1,409–1,492	—	—

Source: JETRO (2003).

Notes: - not applicable. n.a. not available.

Exchange rates applied are as follows. US$1 = 1,207.50 Korean won; US$1 = 8,2772 Chinese yuan; US$1 = 7.78019 Hong Kong dollars; US$1 = 34.71 Taiwanese yuan; US$1 = 1.763 Singaporean dollars; US$1 = 43.45 Thai baht; US$1 = 3.8 Malaysian ringgit; US$1 = 9,010 Indonesian rupiah; US$1 = 53.40 Philippine pesos; US$1 = 15,340 Vietnamese dong; US$1 = 1,100 Myanmarese kyat; US$1 = 48.25 Indian rupee.

[a] Hlaing Thayar Industrial Park

Apart from cheap factor costs, various other factors relate to a country's performance in attracting FDI, which themselves promote the economy's industrial upgrading. Table 10.13 compares FDI-related costs other than wage rates in selected cities and regions in Asia. Figures related to tax policies are provided in Table 10.14. As the Tables show, the economic foundations of ASEAN economies differ greatly across the components under consideration, hence easy generalization is not possible. For manufacturing firms in general, some degree of social infrastructure is required for stable production operations. The degree of

Table 10.14

Figures related to Tax Policies in Selected Asian Economies and the U.S.

(%)

Economy	Tax revenue as a percentage of GDP, 2001	Highest marginal corporate tax rate, 2002
Indonesia	13.2	30
Malaysia	n.a.	28
Philippines	13.4	32
Singapore	15.3	25
Thailand	14.5	30
Vietnam	16.8	32
China	6.8	30
Korea	n.a.	27
Japan	n.a.	30
United States	19.4	35

Source: World Bank (2003).

Table 10.15

Average Import Tariff Rates in Selected Asian Economies and the U.S.

(%)

Economy	Year	Simple mean tariff (all products)	Weighted mean tariff (all products)
Indonesia	1989	22.0	13.2
	2000	8.4	5.4
Malaysia	1988	17.0	9.9
	1997	9.2	5.8
Philippines	1989	28.0	22.4
	2001	7.0	4.0
Thailand	1989	38.5	33.0
	2000	17.0	9.7
China	1992	41.2	32.5
	2001	15.3	14.3
Vietnam	1994	12.7	18.4
	2001	15.0	15.1
Korea	1989	18.8	13.8
	1999	8.7	6.0
Singapore	1989	0.5	0.5
	2001	0.0	0.0
Japan	1989	6.0	3.6
	2001	5.1	2.1
United States	1989	5.6	3.8
	2001	4.0	1.8

Source: World Bank (2002, 2003).

Table 10.16

Taxes on International Trade as Percentage of Government Revenue

(%)

Economy	1990	2000
Indonesia	6	3
Malaysia	18	13[a]
Philippines	25	19
Singapore	2	1
Thailand	22	11
Vietnam	n.a.	15
China	14	10
Korea	12	6[a]
Japan	1	n.a.
United States	2	1

Source: World Bank (2002, 2003).
Note: [a] 1999 figure.

stability of course depends on each industrial sector. It is worth mentioning, however, that lower costs are desirable for equal quality of services provided, and in this light, efforts are needed either to enhance the quality or to reduce the costs of utilizing social infrastructure in the ASEAN economies.

Table 10.15 presents average import tariff rates in selected economies. In line with multilateral trade negotiations through the World Trade Organization (WTO) and the Asia Pacific Economic Cooperation (APEC), each economy is required to reduce tariffs within a particular time frame. The purpose of levying import tariffs is twofold: (1) to protect domestic industry from competition with otherwise cheaper foreign products; and (2) to generate government revenue. As seen in the table, import tariff rates have been on a decreasing trend, and the tariff rates of ASEAN economies are comparable to those of the other economies. The second purpose, namely, the use of tariffs as a source of government revenue, has also been discouraged through the trade liberalization process (Table 10.16).

As regards R&D activities, upstream of the production stage, MITI (1993) and Mikami (1998) stress the role of industrial knowledge in the economic growth of the ASEAN economies. Tables 10.17 and 10.18 provide statistics relevant to R&D activities. These tables show that, with the exception of Singapore in its number of scientists and engineers for

Table 10.17

Statistics on R&D in Selected East Asian Economies and the U.S.

Economy	Scientists and engineers in R&D (per million people) 1990–2000 average	Technicians in R&D (per million people) 1990–2001	Science and engineering students (percent of total tertiary level students) 1987–1997 average	Expenditures for R&D (percent of GNI) 1989–2000 average
Indonesia	n.a.	n.a.	39	0.07
Malaysia	160	45	27	0.42
Philippines	156	22	14	0.21
Singapore	4,140	335	n.a.	1.13
Thailand	74	74	18	0.10
Vietnam	274	n.a.	n.a.	n.a.
China	545	187	43	0.06
Korea	2,319	564	32	2.70
Japan	5,095	667	21	2.80
United States	4,099	n.a.	19	2.55

Source: World Bank (2002, 2003).

Table 10.18

Statistics on Science and Technology in Selected East Asian Economies and the U.S.

Economy	Receipts of royalty and license fees, 2001 (US$ million)	Payments of royalty and license fees, 2001 (US$ million)	Patent applications filed by residents, 2000	Patent applications filed by non-residents, 2000
Indonesia	n.a.	n.a	0	60,363
Malaysia	21	751	179[a]	6,272[a]
Philippines	1	158	154	3,482
Singapore	n.a.	n.a.	0	62,471
Thailand	9	823	1,117	4,548
Vietnam	n.a.	n.a.	35	59,741
China	110	1,938	25,592	96,714
Korea	688	3,221	73,378	98,806
Japan	10,462	11,099	388,879	97,325
United States	38,660	16,360	175,582	156,191

Source: World Bank (2002, 2003).
Note: [a] 1999 figure.

Table 10.19

Evaluation of Indigenous Firms' Capability by Japanese Manufacturing Subsidiaries, 2001

Economy	Local sourcing[1], 2001	Cost of procurement from indigenous firms[2], 2001	Indigenous firms' technological level[3], 2000	Indigenous firms' level of quality management[4], 2000
Indonesia	37.7	89.1	6.5	4.3
Malaysia	41.2	86.8	18.5	16.3
Philippines	21.0	96.5	17.2	20.7
Singapore	36.8	81.1	35.1	45.9
Thailand	51.2	83.0	17.0	17.0
Vietnam	17.1	79.4	5.8	5.8
China	49.7	88.8	11.5	12.7
Korea	54.8	94.4	21.1	21.1

Source: JETRO (2002a).

Notes:

[1] Percentage of the respondent Japanese firms with over 51 percent local sourcing rate.

[2] Percentage of the respondent Japanese firms with the perception of local cost of procurement being "slightly lower", "lower" and "much lower" than that in Japan.

[3] Percentage of the respondent Japanese firms with the perception of indigenous firms' technological level being "higher than" or "as high as" that of firms in Japan.

[4] Percentage of the respondent Japanese firms with the perception of indigenous firms' level of quality management being "higher than" or "as high as" that of firms in Japan.

R&D activities, the ASEAN economies are behind the other East Asian economies.

Capital and human assets, lying further upstream of an economy's value-adding process, can be viewed as closer to the "true" source of industrial upgrading.[9] Tables 10.19 and 10.20 give the evaluation results of indigenous firms' industrial capability by Japanese manufacturing subsidiaries. The measurements in both of these tables are expected to capture the level of industrial upgrading in terms of the economies' capital assets. As can be seen, a large variation exists across individual ASEAN economies. Biased as they are, these measurements reveal the still embryonic nature of ASEAN economies' capital assets development.

Tables 10.21 and 10.20 show the selected economies' level of human

Table 10.20

Evaluation (Average Score) of Indigenous Firms' Capability by Japanese Manufacturing Subsidiaries, 2001

Economy of location	Quality maintenance	Compliance with delivery date	Technological level
Total	2.76	3.04	2.74
ASEAN	2.77	2.96	2.76
Indonesia	2.59	2.83	2.65
Malaysia	2.74	3.03	2.75
Philippines	2.72	2.66	2.72
Singapore	3.41	3.78	3.24
Thailand	2.82	2.90	2.76
Vietnam	2.29	2.47	2.41
China[1]	2.72	3.10	2.68
Korea	3.05	3.79	2.95
Taiwan	2.87	3.25	3.02
India	2.60	2.65	2.50

Source: JETRO (2002b).

Notes: Criteria for the scores (1–5) are as follows: 5 (higher than that of firms in Japan), 4 (same as that of firms in Japan), 3 (slightly lower than that of firms in Japan), 2 (lower than that of firms in Japan), 1 (much lower than that of firms in Japan).

[1] Beijing

resource development, in terms of the self-evaluation of Japanese manufacturing subsidiaries' skills, and the evaluation of indigenous workers employed by Japanese manufacturing subsidiaries, respectively. Table 10.23 presents the results of international vocational training competition for manufacturing-related skills. Table 10.24 gives other human-related indices. As revealed in these tables, ASEAN economies still lag behind in their accumulation of human assets.

Table 10.25 shows the ranking of selected competitive criteria for four ASEAN countries and China. Empirically, both H_K and H_L are multi-faceted, hence the need for observing various statistical figures pertinent to industrial upgrading. Based on the results of the modeling analysis in the previous section, this section makes an empirical observation of ASEAN economies' current level of industrial upgrading and/or conditions for future industrial upgrading. Several measures have been selectively compared with other East Asian economies, under the headings

Table 10.21

Self-Evaluation (Average Score) of Japanese Manufacturing Subsidiaries' Skills, 2001

Economy of location	Production technology	Operation technology	Maintenance technology	Process management	Quality management	Inventory management
Total	3.04	3.28	2.93	3.06	3.18	3.10
ASEAN	3.00	3.23	2.91	3.05	3.19	3.11
Indonesia	2.99	3.17	2.82	3.01	3.16	3.02
Malaysia	2.84	2.99	2.79	2.98	3.01	3.12
Philippines	2.99	3.36	2.99	3.09	3.26	3.13
Singapore	3.42	3.57	3.33	3.46	3.52	3.55
Thailand	3.02	3.27	2.91	3.04	3.23	3.02
Vietnam	2.85	3.25	2.74	2.81	3.06	2.92
China[1]	3.10	3.31	2.90	3.06	3.20	3.07
Korea	3.35	3.45	3.39	3.30	3.31	3.45
Taiwan	3.18	3.58	3.19	3.17	3.20	3.23
India	2.92	3.01	2.78	2.89	2.91	2.72

Source: JETRO (2002b).

Notes: Criteria for the scores (1–5) are as follows: 5 (higher than that of firms in Japan), 4 (same as that of firms in Japan), 3 (slightly lower than that of firms in Japan), 2 (lower than that of firms in Japan), 1 (much lower than that of firms in Japan).

[1] Beijing

Table 10.22

Evaluation (Average Score) of Indigenous Workers Employed by Japanese Manufacturing Subsidiaries

Economy of location	Manager	Engineer	Foreman	General worker
Total	2.30	2.30	2.34	2.50
ASEAN	2.28	2.26	2.25	2.39
Indonesia	2.13	2.19	2.13	2.25
Malaysia	2.36	2.23	2.11	2.00
Philippines	2.27	2.30	2.23	2.55
Singapore	2.75	2.53	2.67	2.60
Thailand	2.14	2.17	2.27	2.52
Vietnam	2.13	2.31	2.24	2.63
China[1]	2.02	2.13	2.26	2.45
Korea	2.71	2.65	2.75	2.78
Taiwan	2.45	2.42	2.57	2.73
India	2.70	2.73	2.68	2.76

Source: JETRO (2002b).

Notes: Criteria for the scores (1–4) are as follows: 4 (satisfactory), 3 (almost satisfactory), 2 (slightly unsatisfactory), 1 (unsatisfactory).

[1] Beijing

Table 10.23

Results of International Vocational Training Competition (for Manufacturing-related Skills), 1993–2001

Economy		1993	1995	1997	1999	2001
	Number of participating economies	25	28	30	33	35
Korea	Gold/Silver/Bronze	10/2/4	6/4/2	9/1/2	7/3/1	13/3/5
	Total no. of medals	16	12	12	11	18
	Ranking	2	2	1	1	1
Taiwan	Gold/Silver/Bronze	12/6/2	3/5/5	5/6/1	4/4/3	1/3/8
	Total no. of medals	20	13	12	11	12
	Ranking	1	1	1	1	2
Japan	Gold/Silver/Bronze	2/6/4	4/3/0	2/0/4	4/2/2	4/2/3
	Total no. of medals	21	7	6	8	9
	Ranking	3	3	5	3	3
Singapore	Gold/Silver/Bronze		1/0/1	1/1/0	2/0/0	2/2/1
	Total no. of medals	–	2	2	2	5
	Ranking		9	9	10	4
Thailand	Gold/Silver/Bronze	0/0/0	0/0/0	0/0/0	0/0/1	1/0/0
	Total no. of medals	0	0	0	1	1
	Ranking	16	18	18	14	11
Hong Kong	Gold/Silver/Bronze			0/0/1	1/0/0	0/0/0
	Total no. of medals	–	–	1	1	0
	Ranking			14	14	15
Malaysia	Gold/Silver/Bronze	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0
	Total no. of medals	0	0	0	0	0
	Ranking	16	18	18	20	15

Source: METI (2002).

Notes: - No participation.

Ranking is made according to the total number of medals.

"aggregate-level infrastructure" and "firm-level infrastructure".

The ability to acquire and diffuse technologies effectively directly translates into an economy's industrial upgrading and hence its export competitiveness. Without accumulation of skilled labor, new as well as existing technologies can neither be devised nor effectively diffused. Indeed, human resource development has been a crucial precondition for the industrial upgrading in NIEs economies and Japan.

Table 10.24

Indices Related to Human Assets

Economy	Combined primary, secondary and tertiary gross enrolment ratio, 1999 (%)	Human Development Index, 2000
Indonesia	65	0.684
Malaysia	66	0.782
Philippines	82	0.754
Singapore	75	0.885
Thailand	60	0.762
Vietnam	67	0.688
China	73	0.726
Korea	90	0.882
Japan	82	0.933
United States	95	0.939

Source: UNDP (2002).

Table 10.25

Ranking of Selected Competitive Criteria for Four ASEAN Countries[1] and China, 2000

Legal framework	Transparency	Political stability	Infrastructure	Skilled labour	Engineer	IT technician
Singapore (1)	Singapore (1)	Singapore (5)	Singapore (1)	Philippines (5)	Singapore (9)	Singapore (6)
Malaysia (20)	Malaysia (11)	Malaysia (21)	Malaysia (15)	Singapore (8)	Philippines (10)	Philippines (9)
China (22)	China (12)	China (32)	China (25)	Malaysia (33)	Malaysia (30)	Malaysia (37)
Thailand (31)	Thailand (34)	Thailand (37)	Thailand (26)	Thailand (38)	Thailand (37)	Thailand (44)
Philippines (37)	Indonesia (37)	Philippines (39)	Indonesia (39)	China (44)	Indonesia (44)	Indonesia (41)
Indonesia (46)	Philippines (44)	Indonesia (46)	Philippines (43)	Indonesia (45)	China (47)	China (46)

Source: The International Institution for Management Development (IMD), *The World Competitiveness Yearbook 2000.*

Notes: Figures in parentheses denote rank in total. In the competitiveness survey, questionnaires are sent out each year to company executives in the world's selected countries (including Asian countries) in order to quantify issues related to competitiveness or which there are no statistics. The respondents make quantitative evaluation of the country where they operate according to criteria (including those listed in the table). The rankings are calculated using standard deviation scales.

[1] Indonesia, Malaysia, Philippines, Singapore and Thailand.

B. "Industrial Upgrading Chart"

Although the foundations of future industrial upgrading can only be measured by admittedly one-sided indicators, it is still crucially important to be aware of the status quo and potentiality of each East Asian economy's industrial upgrading. In line with Figure 10.1, a country's factor endowments can be loosely categorized into three, i.e., (1) economic indicators, (2) capital (firm-level) assets indicators, and (3) human assets indicators.[10] Economies under consideration are as follows: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, China and Korea. Five components have been adopted for each of the above three categories, as follows:

(1) Economic indicators

1–1. Per capita GDP, 2001 (calculated from Table 10.6)
1–2. Per capita fixed capital formation (1996–2000 average) (in Table 10.7)
1–3. Per capita FDI inflow (1996–2000 average) (calculated from Tables 10.6 and 10.8)
1–4. Patent applications filed by both residents and non-residents per million people, 2000 (calculated from Tables 10.6 and 10.18)

(2) Capital (firm-level) assets indicators

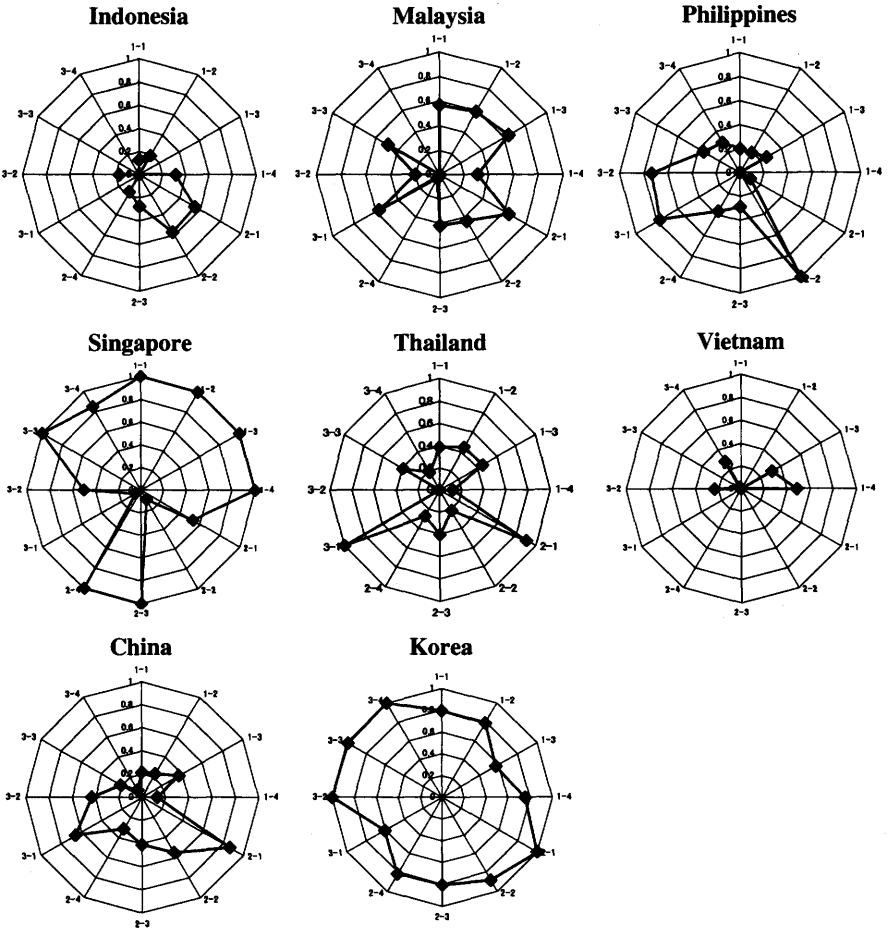
2–1. Local sourcing, 2001 (in Table 10.19)
2–2. Cost of procurement from indigenous firms, 2001 (in Table 10.19)
2–3. Skill index of indigenous firms, 2001 (calculated as the simple arithmetic mean of the three scores in Table 10.20)
2–4. Skill index of local Japanese manufacturing subsidiaries, 2001 (calculated as the simple arithmetic mean of the six scores in Table 10.21)

(3) Human assets indicators

3–1. Wage-adjusted value added per worker in manufacturing, 1995–1999 average (in Table 10.12)
3–2. Combined primary, secondary and tertiary gross school enrolment, 1999 (in Table 10.24)
3–3. Human Development Index, 2000 (in Table 10.24)
3–4. Skill index of indigenous workers employed by Japanese manufacturing subsidiaries (arithmetic mean of the scores in Table 10.22)

Figure 10.2

"Industrial Upgrading Charts" of the Selected Asian Economies



Source: Author.

Note: Standardization of measurements (to range between 0 and 1) have been made as follows. For 1–1 to 1–4, the formula of (actual value—minimum value)/(maximum value—minimum value) has been applied for the log of the value in each category. For 2–1 to 3–4, the non-log values have been used.

The results are shown in Figure 10.2. In brief, the "Industrial Upgrading Charts" of the selected Southeast and East Asian economies suggest that in comparison with the "successful" and hence "benchmark" experience of Korea which records a fairly round-shaped chart, the performance of the

listed ASEAN economies has, overall, not been well-balanced. Relative as they are, these measurements point to the need for further policy efforts toward industrial upgrading by these ASEAN economies.

V. The Possibility of Differentiated "Techno-preneurship"

The present paper has stressed the sequential nature, from "upstream" (the endowment of human and capital assets) to "downstream" (first R&D, then production and export/sales), of an economy's value-adding process. The theoretical argument has emphasized the role of human and capital assets as well-balanced contributors to the economy's "downstream" part of the value-adding process. Put differently, too much government intervention in a specific industrial sector and/or sub-process can be counter-productive. A derived policy implication would be to focus more on the "upstream" part, i.e., the enhancement of human (labor) and capital assets in terms of their productivity. Indeed, this focus seems appropriate, given the constrained status of the *amount* of these assets in the ASEAN economies especially after the financial crisis of 1997.

No one component can be seen as a single solution in isolation from the other measures that target industrial upgrading. For instance, Malaysia's high utilization of FDI, Singapore's "techno-preneurship" enhancement policy, and Thailand's development of the automotive supporting industry (Inoue, 2003) are all important undertakings. Since there is no single East Asian model to be emulated and no consensus on precisely which form of policy intervention optimizes industrial and economic growth, the industrial policy experiences of, say, Japan and Korea, remain mere anecdotes. ASEAN economies should have their own industrial upgrading strategy.

What could then be a scenario? Rapid changes in industrial production in response to equally rapid changes in industrial technology call for new approaches to industrial upgrading. The industrial structures of ASEAN economies are being increasingly diversified, and are hence becoming more productivity-intensive. Against the background of this highly differentiated industrial field of operation, there is infinite scope for industrial upgrading. The "only one", rather than "number one" industrial operation can be best pursued with a view to reaping industrial complementariness within a potential Japan-ASEAN comprehensive economic partnership agreement. Each participating economy would therefore find it rational to develop a self-generating critical mass of human and capital assets for industrial upgrading.

Appendix
A Benchmark Model by Grossman and Helpman

Major assumptions of the model by Grossman and Helpman (1991) include the following. (a) two sectors, one comprising "high-technology" goods (denoted below as X) and one producing labor-intensive "homogeneous" goods (denoted as Y); (b) two factors, knowledge capital and non-tradable resource (e.g., land); (c) perfect competition; (d) entry-free, industrial upgrading efforts aimed at raising product quality. Under these settings, the following major assumptions are made in the model specification: (1) The "high-technology" sector comprises a continuum of industries; (2) quality improvements of products through industrial upgrading activities occur stochastically (subject to Poisson distribution, as in Aghion and Howitt, 1990, and Yoshikawa, 2000), with each improvement reducing the quality-adjusted cost of the state-of-the-art product by a fixed percentage[11]; and (3) all high-technology goods are manufactured according to a common constant-returns-to-scale production function.[12]

In essence, the long-run steady state conditions in their model specification are as follows.

$$p^Y = c^Y(w^i, z^i),\ i = A, B \tag{A.1}$$

$$c^X(w^i, z^i) = (1+\beta)c^X(w^j, z^j),\ \text{for } i = A, B;\ j = B, A \tag{A.2}$$

$$\frac{(1+\beta)(1-\delta)s_x}{(1-\sigma)\alpha w^i} = \rho + \iota^i,\ \text{for } i = A, B \tag{A.3}$$

$$1 - s_x = p^Y(Y^A + Y^B) \tag{A.4}$$

$$\iota^i n^i \alpha + \frac{n_w^i \delta s_x a_{HX}}{c^X(w^i, z^i)} + Y^i a_{HY} = H^i,\ i = A, B \tag{A.5}$$

$$\frac{n_w^i \delta s_x a_{HX}}{c^X(w^i, z^i)} + Y^i a_{RY} = R^i,\ i = A, B \tag{A.6}$$

where

p^Y: price of homogeneous goods;

$c^Y(w^i, z^i)$: cost of producing a unit of homogeneous goods in country i (i = A, B);

$c^X(w^i, z^i) \equiv w^i a_{HX} + z^i a_{RX}$: cost of producing a unit of high technology goods in country i (i = A, B), with a_{HX} and a_{RX} being constant input coefficients;

$c^Y(w^i, z^i) \equiv w^i a_{HY} + z^i a_{RY}$ (i = A, B), with a_{HX} and a_{RX} being constant input coefficients;
ι^i: intensity of research (i.e., the total cost of research in country i (i = A, B) for industrial upgrading is calculated as $c^\iota(w^i, z^i)$ times ι);
w^i: wage of skilled labor in country i (i = A, B);
z^i: local factor payment to a non-tradable resource;
β: *ad valorem* rate of production subsidy to manufacturers of high-technology products (financed by lump-sum taxation);
δ: cost reduction factor (due to industrial upgrading);
σ: share of R&D costs that the government finances through lump-sum taxation;
α: unit input coefficient of skilled labor for R&D;
ρ: subjective discount rate;
s_X: share of expenditure to high-technology goods;
Y^i: output (in unit quantity) of homogeneous goods in country i (i = A, B);
n^i: number of high-technology goods in country i (i = A, B);
H^i: amount of skilled labor in country i (i = A, B);
R^i: amount of non-tradable resources in country i (i = A, B).

Thus, endogenous variables, n^A (with $n^B \equiv 1 - n^A$), p^Y, and ι^i, w^i, z^i, Y^i (for i = A, B) are determined by the above set of ten equations.[13]

A manipulation of the above equations yields "HH curve", "YY curve", "AA curve" and "BB curve":

HH curve: $$\alpha g + \frac{n^A s_X D}{p^X a_{RY}} = H^A + H^B - \frac{a_{HY}}{a_{RY}}(R^A + R^B);$$

YY curve:

$$\left(R^A + R^B - \frac{s_X a_{RX}}{p^X}\right)\left(a_{RY}\delta p^X - \frac{D(1-\delta)s_X}{\alpha(\rho+g)}\left(1 + \frac{\sigma}{1-\sigma}n^A\right)\right)\left(1 + \frac{1-\gamma}{\gamma}n^A\right) = a_{RY}a_{RY}(a - s_X);$$

AA curve: $$\alpha \iota^A n^A + \frac{n^A s_X D}{p^X a_{RY}} = H^A - \frac{a_{HY}}{a_{RY}}R^A;$$ and

BB curve: $$\alpha(1-n^A)((1-\sigma)\gamma(\rho+\iota^A) - \rho) + \frac{(1-n^A)s_X D}{p^X a_{RY}} = H^B - \frac{a_{HY}}{a_{RY}}R^B,$$

where $g \equiv \iota^A n^A + \iota^B(1-n^A)$, $D \equiv a_{HX}a_{RY} - a_{RX}a_{HY} > 0$ and

$$\gamma = \left(1 + \beta - \frac{\beta\alpha a_{RY}\delta p^X(\rho+\iota^A)}{D(1-\delta)s_X}\right)^{-1}.$$

These four curves are shown in Figures A.10.1 and A.10.2. In brief, Figure A.10.1 shows that the increase in H^A (skilled labor) has a positive impact on both ι^A and n^A (shift from E_1 to E_2 and F_1 to F_2 in the Figure). Accumulation of human skill is thus seen to constitute an

Figure A.10.1

Impact of the Increase in Skilled Labor (H^A)

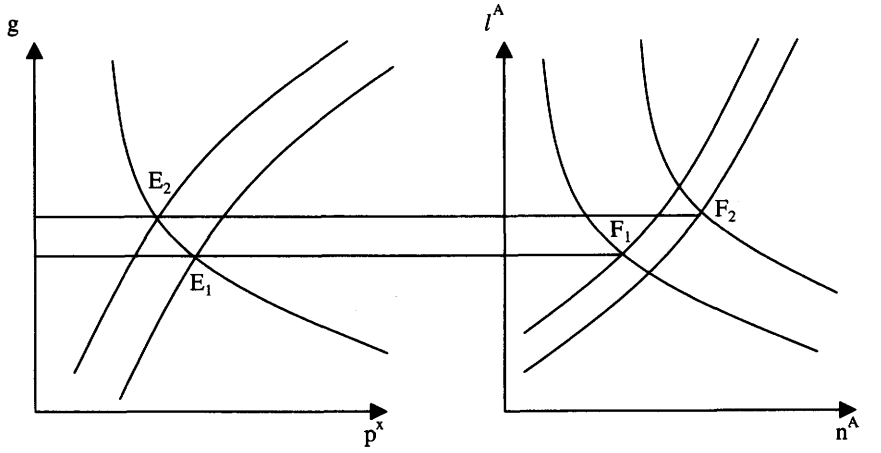
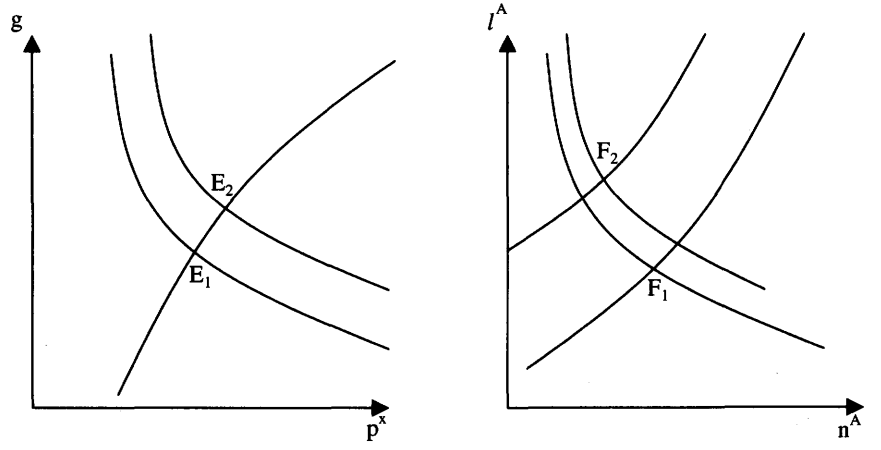


Figure A.10.2

Impact of R&D Subsidy (σ) and Production Subsidy (β)



important role for the industrial upgrading of Country A. Figure A.10.2 depicts the impact of either R&D subsidy or production subsidy on both ι^A and n^A. As shown in the Figure, the R&D subsidy can have a positive impact on the rate of innovation (captured by increasing ι^A as the equilibrium shifts from E_1 to E_2 and from F_1 to F_2). In other words, if $i^A > i^B$, then in long-run equilibrium (steady state), researchers target high-technology goods manufactured in country A for improvement to a relatively greater extent than in country B. An important point to consider, however, is that the provision of R&D subsidy to business firms can have a negative impact on the production of high-tech products (as captured by decreasing n^A).

In the case of endogenous factor prices (w^i and/or z^i), the very conduct of R&D subsidy could raise workers' wage rate, and thus *decrease* the amount of factor input, thereby reducing the number of innovation. In this process, Country B benefits, since lower level of employment encourages workers world wide to shift their inputs in the corresponding industry in Country B. This counter-intuitive result applies also to the case of production subsidy. That is, given the mirror role of production subsidy in the model, the provision of production subsidy has a positive impact on the production of high-tech products (captured by increasing n^A) yet it could have a negative impact on the rate of innovation (decreasing ι^A as the equilibrium shifts from E_2 to E_1 and from F_2 to F_1).

Notes

* The author wishes to acknowledge valuable comments and suggestions on earlier versions of this paper from my colleagues at JETRO, Ippei Yamazawa, Toshiaki Hayashi, Koichi Ishikawa, Daisuke Hiratsuka and Tomoko Kubota.

1 In the standard Cobb-Douglas specification of production function $Y = (H_K K)^a (H_L L)^b$, where Y; output; K: capital; L: labor; H_K: capital productivity; H_L: labor productivity; a, b: positive constants, marginal product of capital, *MPK* can be derived as $MPK = \frac{\partial Y}{\partial K} = {}_aH_K{}^aK^{a-1}(H_L L)^b$ and marginal product of labor, *MPL*, as $MPL = \frac{\partial Y}{\partial L} = {}_aH_L{}^bL^{b-1}(H_K K)^a$. Output growth can be expressed as:

$$\frac{\Delta Y}{Y} = \frac{MPK \bullet K}{Y}\frac{\Delta K}{K} + \frac{MPL \bullet L}{Y}\frac{\Delta L}{L}.$$

Given constant factor inputs, the increase in Y can be brought about by the increase in MPK and/or MPL. Of course there are other connotations to the term industrial upgrading, most notably the enhanced level of domestic industrial

linkage. The present paper though treat this aspect as the consequence induced from the rise in MPK and/or MPL.

2 Of course, intellectual property right protection policy would prohibit free access to the knowledge capital by any agent. At least within the agent, though, the created knowledge can be utilized with little additional cost and hence possesses the non-rivalry property of public goods. Further, since the knowledge inevitably "spills over", outside agents also benefit from the knowledge. Hence another property of public goods, "non-excludability" holds to some extent.

3 Their specification is briefly outlined in Appendix with a view to identifying policy impacts on industrial upgrading.

4 This sort of process innovation is often referred to as Kaizen (loosely translated as "improvement") in Japanese.

5 Various other classification would be conceivable. For example, policies to promote (1) the supply side of industrial upgrading, (2) the demand side of industrial upgrading, and (3) effective links between demand and supply sides (Huq and Love, 1999).

6 A subjective assessment of some of these economies are provided in the following section.

7 The export competitiveness index for an economy is defined as $\frac{X_i - M_i}{X_i + M_i}$, where X: export value of product i; M: import value of product i.

8 The revealed comparative advantage index is defined as $(X_{Ai}/X_{Wi})/(X_A/X_W)$, where X_{Ai}: economy A's export value of product i; X_{Wi}: world export value of product i; X_A: economy A's total export value; X_W: world total export value.

9 Of course, the treatment of knowledge formation, i.e., in an exogenous or endogenous manner, is a contentious issue.

10 These indicators used are not mutually exclusive.

11 A firm that has succeeded in its efforts to improve upon the state-of-the-art variety of high-technology product is assumed to produce a good that is one quality increment better (or cheaper in quality-adjusted cost terms) than the cost of production of the nearest competitor.

12 For more details, see Grossman and Helpman (1991).

13 Among these equations, (A.1) is the condition for perfect competition; (A.2) is the condition for factor price equalization; (A.5) and (A.6) are factor market clearing conditions.

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