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Effectiveness of the Flowchart Approach to Industrial Cluster Policy in Asia

by
Akifumi Kuchiki

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KUCHIKI Akifumi[*]

Abstract

Our static model concludes that a multinational in industry of diminishing returns to scale will increase production of a region in a developing country if its exchange rate to the developing country is appreciated. Our dynamic model also shows that the longer its investment period becomes the more the currency exchange rate of a multinational's country should be appreciated to invest in the developing country. The dynamic model concludes that the longer the investment period becomes the less the country risk of the developing country should be. However, we show that its high country risk can be compensated by lowering the corporate tax rate of the developing country. A more realistic model of countries in East Asia in the 1980s can confirm this conclusion. That is, the preferential treatment of tax reductions or exemptions by the developing countries was effective in inviting foreign direct investment. Our above models imply that roles of central governments are crucial to inviting foreign direct investment to form industrial clusters by building capacity of infrastructure and institutions.

Key words: flowchart approach, industrial cluster policy, capacity building, institutions, exchange rate, country risk, corporate tax rate

JEL Classification Code: O41, O18, L52, L53, L62

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[*]Executive Vice President, Institute of Developing Economies - Japan External Trade Organization; Visiting Research Fellow (From April 2004 to March 2005), Economic Research Center, Graduate School of Economics, Nagoya University.
E-mail: akifumi_kuchik@ide.go.jp

Effectiveness of the Flowchart Approach to Industrial Cluster Policy in Asia

Akifumi Kuchiki

1. Introduction

Central governments in Asian countries such as Japan and Thailand are implementing industrial cluster policies. Industrial cluster is a geographic concentration of manufacturing companies, suppliers, service providers and related institutions in a particular field of industry. In most of the cases, the industrial cluster policies are implemented by the local governments. On the other hand, industrial policies, which are different from industrial cluster policies, are policies implemented by the central government to foster domestic industries through the reallocation of its resources. Industrial policy is a selective-intervention policy by central governments. Scholars to advocate industrial polices have decreased in number after the Asian currency crisis in 1997 (see Stiglitz and Yusuf (2001)). Neverthless, we would like to analyze the following question: What are the roles of central governments to implement industrial cluster policies to activate local regions?

Many industrial clusters in industrial zones and export processing zones have been formed in Asia. An export processing zone in Kaohsiung in Taiwan in 1965 was the original model for this in Asia. Industrial clusters in East Asia in the first half of the 1980s followed those of special economic zones in Shenzhen in China and free trade zones in Penang and Johor in Malaysia. The issue for central governments and local governments is to judge whether their policies are effective on forming industrial clusters.

The industrialization of East Asia in the latter half of the 1980s was a game involving recipient countries such as Malaysia and Thailand on the one hand, and the multinational companies of South Korea, Taiwan and Japan on the other. The policies of these countries were centered on deregulation to attract foreign investment, permitting 100% ownership of capital by foreign investors, not only in a few specific sectors but over a wide range of export-oriented industries. Moreover, the governments of these countries implemented preferential treatment for foreign capital, primarily involving tax incentives such as low corporate tax rates and tax holidays (exemption) for a certain period, and provided industrial parks with an infrastructure to entice foreign investment.

Incentives for multinational companies to establish their subsidiaries in other countries are to transfer management resources (Penrose, 1956) and to reduce transaction costs (Hymer, 1960). In the case of East Asia in the 1980s, however, cost reduction was the primary objective. As is proved in this paper, cost was the primary motivation behind the increasing number of South Korean, Taiwanese and Japanese companies that expanded overseas production during the latter half of the 1980s. As domestic costs rose, due to the increase in wage rates and the appreciation of the domestic currency rates, the Asian companies reduced costs by expanding overseas production. As is shown in Figure 1, Kuchiki (2005) proposed the flowchart approach and theoretically proved that industrial cluster policy is effective in forming industrial clusters by establishing export processing zones, building capacity, and inviting anchor firms. The capacity means infrastructure, institutions, human resources, and living conditions. The flowchart approach emphasizes the importance of ordering and timing

of policy measures. Kuchiki (2003) and Kuchiki (2004) illustrated its successful cases of Canon's effect in Hanoi, Vietnam and Toyota's effect in Tianjin, China. Canon and Toyota are both Japanese companies and function as the anchor companies at the flowchart approach. But we have not shown whether policies of inviting foreign direct investment to export processing zones by central governments are effective in forming industrial clusters.

The purpose of this paper is to examine whether governmental exchange rate policies, preferential tax policies, and country risk management policies are effective in inviting foreign investors to the industrial clusters. We will build both static and dynamic models to analyze the effectiveness of each of the policies.

Our static model concludes that a multinational in industry of diminishing returns to scale will increase production in a developing country if its exchange rates to the developing country is appreciated. Our dynamic model also shows that the longer its investment period becomes the more the currency exchange rate of a country of multinational companies should be appreciated to invest in the developing country. The dynamic model concludes that the longer the investment period becomes the less the country risk of the developing country should be. However, we show that its high country risk can be compensated by lowering the corporate tax rate of the developing country. A more realistic model of countries in East Asia in the 1980s can confirm this conclusiton. That is, the preferential treatment of tax reductions or exemptions by the developing countries was effective in inviting foreign direct investment. Our above models imply that roles of central governments are crucial to inviting foreign direct investment to form industrial clusters by building capacity of infrastructure and

institutions. It is noted that this paper focuses specifically on institutions of capacity building as Table 1 shows.

The paper is organized as follows. Section 2 demonstrates how deregulation and preferential tax treatment, which were selected to encourage foreign investment, played major roles in enhancing the economic growth of Kaohsiung in Taiwan, the Chinese province of Guandong, Malaysia, and Thailand. Section 3 presents a decision-making model for multinational companies which intend to invest overseas. This model indicates that multinational companies will not become interested in foreign direct investment unless the overseas costs decrease to a certain threshold, which depends on tax rates of a recipient country. Preferential tax treatment is thus a crucial factor for multinational companies to make decisions on their investment in other countries. Section 4 draws the conclusion of this paper.

2. Export Processing Zones

Export processing zones represent one of the mechanisms for rapid economic growth in East Asia. The prototype version for Kaohsiung in Taiwan was modeled on those in Malaysia and Guangdong province in China, and applied to Thailand and other Asian countries.

We can apply this model to East Asian countries wishing to invite foreign investment that had established conditions of political and macroeconomic stability and public security. The main features of the policies implemented to encourage foreign investment were as follows: first the quasi-public sector provided production sites, that

is, industrial parks with well developed “infrastructure” which was a common way to encourage foreign investment; sequentially, the government selected leading industries to give preferential treatment for foreign capital, usually involving “tax incentives” such as low tax rates and tax holidays (exemption) for several years after the first profit has been generated; at the same time, the government deregulated to allow up to 100% ownership by foreign investors. The permission reduces the investors’ risk since they need not find their partners. It is noted that a high export ratio was the only required condition for incentives such as 100% ownership of capital and preferential tax rates.

The export processing zones with these features, however, was not enough to attract foreign direct investment. The mechanism will have no effect until companies (usually multinational companies) become interested in increasing overseas production; to achieve this, foreign companies must have incentives to invest outside their own countries. The most important incentive is to reduce cost, which is determined mainly by three factors: wages, exchange rates and taxes. Smaller costs had a decisive impact on the decision for overseas investment by Taiwanese, South Korean and Japanese companies in common from 1985 to 1990. We can recognize this fact by the results of regression analyses presented in the Appendix 1.

3. Theoretical Analyses on Multinational Companies

This section theoretically proves that governments’ policy of the recipient countries is effective in inviting multinational companies under certain conditions. We will focus on three policies: (i) currency devaluations, (ii) permission of multinational

companies with totally foreign owned capital, and (iii) preferential tax treatment by governments. By focusing on these three policies, we get the following three conclusions. First, proposition 1 insists that it becomes easier that multinational companies decide to invest in a country if its government hold a devaluation policy. Second, Propositions 2, 3, and 4 make clear that it will contribute to inviting multinational companies if governments of recipient countries reduce country risk by permitting multinational companies with totally foreign capital. Third, Proposition 5 shows that preferential tax treatment by recipient countries will reduce its country risk for multinational companies.

The three policies mentioned above were taken in the ASEAN countries from 1981 to 1994 and contributed to their high economic growth during the period.

(1) Necessary conditions for overseas investment

The variable θ denotes country risk, the level of political and macroeconomic stability in the recipient country. The variable θ affects the level of production in the recipient country $F(k,\ell)$, where k is capital and ℓ labor. t represents the corporate tax rate and e the exchange rate of the investing country with respect to the recipient country (per unit of recipient country's currency). P represents the price of product in investors' currency, r the interest rate, and w wage levels evaluated in the currency of the recipient country. The level of profit from overseas production π_f can be expressed as follows:

$$\pi_f = \max_{k',l'} (1-t)\{P\,\theta\,F(k',l')-rk'-ewl'\}$$

= (1-t)){P θ F(k,l)-rk-ewl},

where k'=k, l'=l.

Let us now contrast this with domestic production, using exactly the same production function. The new variables in an investors' country are θ_d (country risk), t_d (corporate tax rates) and w_d (wage levels). Without loss of generocity we can assume that the country risk of the investers' country is assumed to be 1. the profit π_d obtained from domestic production is then

π_d = max (1-t_d){P θ F(k'$_d$,l'$_d$)-rk_d'-ewl_d'}

k'$_d$,l$_d$'

= (1-t_d){P θ F(k_d,l_d)-rk_d-w$_d$$l_d$},

where k'$_d$=k_d, l'$_d$=l_d. Here the interest rate r is the same as that in overseas production π_f.

Assume here that the Cobb-Douglas production function for profit from overseas π_f is

F(k, l) = $k^a l^b$ (We can assume, without loss of generality, constant=1)

Fluctuations in the exchange rate e then affect k and l as expressed in the following formulae :

$$\partial \ell / \partial e = -(\ell / e) \cdot (1-a)/(1-a-b) < 0$$

$$\partial k / \partial e = -(k / e) \cdot b/(1-a-b) < 0$$

where diminishing returns to scale in the form a + b < 1 prevail, representing the increase in overseas labor input and capital input as the currency of the investors country appreciates. The reverse could apply for increasing returns to scale.

Contrasting profits earned at home π_d with profits earned overseas π_f, we have

$$\pi_d / \pi_f = \{ (1-t_d)/(1-t)\}[(1/\theta)(ew/w_d)^b]^{1/(1-a-b)}$$

A multinational company invests overseas if $\pi_d/\pi_f < 1$, i.e. $\pi_d < \pi_f$

Relative profit π_d / π_f with respect to the location of production is governed by the following factors:

Country risk, corporate tax rates, overseas wage levels, and exchange rate

$= (\theta, t, w, e)$.

It should be remembered that these four factors act as a group in determining the final outcome. The level of wages in the recipient w is multiplied by the exchange rate e to obtain the level of wages paid out by the investing company. Since the following exchange rate analysis is equally valid for all wage levels w, relatively low wage levels do not constitute the only factor influencing relative profit.

Country risk θ and corporate tax rates (t) will be explained briefly.

Country risk θ is governed by:

(1) Political stability;

(2) Macroeconomic stability.

The concept of political stability requires no explanation. Macroeconomic stability refers to consumer prices and the international balance of payments. Both forms of stability are considered pre-conditions for rapid economic growth.

With respect to corporate tax (t), preferential tax treatment via incentives such as tax holidays (zero taxation for a period of several years, i.e., $t = 0$) provide a major incentive for overseas production. That is, the relative profit π_d / π_f is less than 1 if

$(1/\theta)\,(ew / w_d)^b \leq 0.$

The introduction of preferential tax treatment by one East Asian country immediately puts the others at a disadvantage. Later developers in Southeast Asia -- including Indonesia, the Philippines and Vietnam -- have thus been obliged to follow suit.

(2) Dynamic analysis

This section presents a dynamic analysis, which can be more realistic and show the importance of the role of the government. The model examines a multinational company operating over two periods. In each period, π_f represents the level of potential profit from the overseas operation when the company does not set up overseas facilities. This is dependent on the exchange rate e which is stochastic, has distributions G, and is identical and independent each other.

A company searches for countries and regions suitable for expansion. The potential profit earned from overseas operations is given by

$$\pi_f = (1-t)\,(P\theta F - rk - ew\ell),$$

where country risk θ and exchange rate e are considered random variables.

The question here is what is the threshold exchange rate e, representing the point at which the "yes" decision to invest abroad is taken. Country risk θ likewise has a threshold value. Normally, a yes decision requires both e and θ to be over their respective threshold values; one without the other is not sufficient. This allows us to perform a two-stage analysis as follows.

First stage: Dynamic analysis of e with θ constant at $\theta = 1$. This is used to

assess the likelihood of a yes decision.

Second stage: Dynamic analysis of θ as a random variable, with given e in the event that the offer is accepted.

The basic model for the first stage is as follows. The periods are $T-1$ and T. We will consider period T first and then period $T-1$. If the value function in period T is $V_t(e)$ and the state variable is exchange rate e, then decision-making behavior can be expressed thus:

$V_T(e)$ = max { π_f, π_d }

Thus, the company invests abroad in the case of $\pi_f \geq \pi_d$, that is,

$$(1-t)\ (PF(k,\ell) - rk - ew\ell)\ \geq \pi_d .$$

Therefore, the value of exchange rate should be

$$\frac{1}{w\ell}\ (PF(k,\ell) - rk - \frac{\pi_d}{1-t})\ \geq\ e.$$

Or, $\overline{e}_T \geq$ e, where $\overline{e}_T = \frac{1}{w\ell}(PF - rk - \frac{\pi_d}{1-t})$, in order that $\pi_f \geq \pi_d$.

This is illustrated in Figure 2.

In period $T-1$, the value function is given by $V_{T-1}(e,s)$, with the state variables s indicating either D (domestic production) or S (overseas production). The Bellman formula in this case is

$$V_{T-1}(e,D) = max\{(1+\beta)\pi_t, \pi_d + \beta EV_T(e',D)\},$$

where β denotes a firm's discount factor (see Sargent(1987) for the Bellman formula).

We find the optimal solution from two possible courses of action: (i) launching overseas production during the current period (T-1) at the given exchange rate e and

increasing overseas production in the next period (T); or (ii) carrying on with domestic production during the current period (T-1), postponing the decision until the next period (T). The value function $V_{T-1}(e,D)$ in this case is

$$V_{T-1}(e,D)=\begin{cases}(1+\beta)\pi_f & e\le\overline{e}_{T-1}\\ \pi_d+\beta\ EV_T(e',D) & e\ge\overline{e}_{T-1}\end{cases}$$

where $\overline{e}_{T-1}$ represents the decision threshold at the current period T-1, satisfying the following expression:

$$(1+\beta)\pi_f = \pi_d+\beta EV_T(e',D).$$

And since

$$EV_T(e',D)=\int_0^{\overline{eo}}\pi_f\,dG(e')+\int_{\overline{eo}}^{\infty}\pi_d\,dG(e'),$$

the threshold value $\overline{e}_{T-1}$ during period $T-1$ is given by:

$$\overline{e}_{T-1}=\frac{1}{w\ell}(PF(k,\ell)-rk-\frac{\pi_d}{1-t})-\frac{\beta}{1+\beta}\int_0^{\overline{e_0}}G(e')de'.$$

Comparing the threshold $\overline{e}_T$ in period T with the threshold $\overline{e}_{T-1}$ in period $T-1$, we have:

$$\overline{e}_{T-1}-\overline{e}_T=-\frac{\beta}{1+\beta}\int_0^{\overline{e_0}}G(e')de'<0,$$

Thus

$$\overline{e}_{T-1}<\overline{e}_T.$$

The critical value of exchange rate of overseas investment in period T ($\overline{e}_T$) should be more appreciated than that of investment in period T-1 ($\overline{e}_{T-1}$). That is, the threshold

value in the current period T-1 is smaller than that in the next period T. A multinational company will invest abroad in the current period unless its currency is more appreciated than the rate in the next period when it makes decision on the investment. This means that it will decide to invest abroad for two periods T-1 and T if its currency is relatively appreciated. We can continue to iterate this process as follows.

$$\bar{e}_{T-2} < \bar{e}_{T-1}.$$

The condition of the critical values for three periods is

$$\bar{e}_{T-2} < \bar{e}_{T-1} < \bar{e}_{T}.$$

Taking Japanese investment as an example, we can use the above expression to argue the following from a dynamic point of view.

Proposition 1: The longer the investment period of a multinational company becomes, the more appreciated its currency is required to be.

In the same way, a yes decision is possible even under a relatively weak yen if the investment can be recouped in short term. This explains why relatively short-term Hong Kong investment are more likely to be directed towards China than Japanese investment.

Next we shall employ the mean-preserving spread (Sargent (1987)) to examine overseas expansion with respect to risk of exchange rate. G_1 and G_2 represent distribution functions for the exchange rate e for the periods T-1 and T, which varies within a limited range, from zero to B.

Assuming a mean-preserving spread, we can say:

$$\int_0^y G_1(e)de \leq \int_0^y G_2(e')de', \quad 0 \leq y \leq B.$$

Accordingly, with $\bar{e}^i_{T-1}$ as the threshold value corresponding to G_i

$$\bar{e}^i_{T-1} = \frac{1}{w\ell}(PF(k,\ell) - rk - \frac{\pi_d}{1-t}) - \frac{\beta}{1+\beta}\int_0^{\bar{e}_0} G_i(e')de',$$

where i is equal to 1 and 2.

Therefore,

$$\bar{e}^1_{T-1} - \bar{e}^2_{T-1} = -\frac{\beta}{w\ell(1+\beta)}(\int_0^{\bar{e}_0} G_1(e')de' - \int_0^{\bar{e}_0} G_2(e')de').$$

And so

$$\bar{e}^1_{T-1} < \bar{e}^2_{T-1}.$$

From this we derive the following:

Proposition 2: The higher the risk of exchange rate is, the stronger the currency of the investers country is required to generate a yes decision.

Now we shall consider the basic model for the second stage, looking at country risk θ with the exchange rate fixed at e=1. As before, we will use two periods, $T-1$ and T. The value function in period T is given $V_T(\theta)$

$$V_T(\theta) = max\{\pi_f, \pi_d\},$$

where θ is a state variable with a distribution function H.

When overseas production is more profitable than domestic production, $\pi_f \geq \pi_d$,

$(1-t_2)(PF\theta - rk_2 - \bar{e}w\ell_2) \geq \pi_d$.

The decision will be yes. The threshold is then given by

$\bar{\theta}_T = (1/PF)\{rk_2 + w\ell_2 + \pi_d/(1-t_2)\}$.

If country risk exceeds this value the decision will be yes; otherwise the company will choose to remain at home. This is illustrated in Figure 3.

The value function for period $T-1$ is $V_{T-1}(\theta, s)$, where $s = D$ (domestic production) or S (overseas production). The Bellman formula in this case is

$$V_{T-1}(\theta, D) = max\left\{(1+\beta)\pi_f, \pi_d + \beta EV_T(\theta', D)\right\}.$$

The value function in this case is

$$V_{T-1}(\theta, D) = \begin{cases} (1+\beta)\pi_f, & \theta \geq \bar{\theta}_{T-1} \\ \pi_d + \beta EV_T(\theta', D), & \theta \leq \bar{\theta}_{T-1} \end{cases},$$

where $\bar{\theta}_{T-1}$ represents the decision threshold, satisfying the following expression:

$(1+\beta)\pi_f = \pi_d + \beta V_T(\theta', D)$.

Country risk θ is greater than $\bar{\theta}_{T-1}$. Thus, if country risk is higher than that of domestic production, the decision will be yes. If lower, the company will choose to stay at home, postponing the decision until period T.

Comparing threshold $\bar{\theta}_T$ in period T with threshold $\bar{\theta}_{T-1}$ in period $T-1$, we find:

$$\bar{\theta}_{T-1} - \bar{\theta}_T = \frac{\beta}{1+\beta}\int_{\theta}^{\infty}(\theta' - \bar{\theta})\, dH \geq 0,$$

where H is a distribution function for θ'.

Thus

$$\bar{\theta}_{T-1} > \bar{\theta}_T .$$

We can therefore argue as follows:

$$---> \bar{\theta}_{T-3} > \bar{\theta}_{T-2} > \bar{\theta}_{T-1} > \bar{\theta}_T .$$

Proposition 3: The longer the investment period, the higher the country risk level required to generate a yes decision.

We shall now examine the issue of preferential tax treatment.

Proposition 4: Preferential tax treatment (i.e., lower rates of corporate tax t_2) generates a yes decision in the face of high country risk $\bar{\theta}_{T-1}$ at period T-1.

This can be demonstrated quite readily as shown below.

$$\bar{\theta}_{T-1} = \frac{1}{PF}(rk_2 + w\ell_2 + \frac{\pi_d}{1-t_2}) + \{\beta/(1+\beta)\}\int_{\theta}^{\infty}(\theta' - \bar{\theta})\, dH(\theta) .$$

And so

$$\frac{\partial \bar{\theta}_{T-1}}{\partial t_2} = \frac{\pi_d}{PF(1-t_2)^2} > 0 .$$

That is, a company faces two thresholds in the decision to expand overseas, both of which must be satisfied to generate a yes decision. One is the cost threshold,

appreciated exchange rate and increased wage level of the investing countries. The other is country risk, determined by political stability, public security and macroeconomic stability. In addition, preferential tax treatment provided by developing countries makes a critical contribution towards passing the two thresholds.

(3) East Asian Model

Let us now develop a general model with respect to three considerations.

The first is preliminary survey costs associated with overseas investment, denoted as C. The costs are burdened by profits in the domestic or overseas production. Information has to be obtained from abroad and investing firms use to dispatch study missions abroad. These costs are very high as for Japanese companies, which tend to take longer time to decide overseas production.

Next is the possibility that changes in the candidate country render the planned expansion unfeasible in the event that overseas production has been postponed until the following period. One example of this is the bottleneck caused by rapid economic growth in Thailand and Malaysia in the late 1980s and early 1990s. As infrastructure inadequacies in Thailand and labor shortages in Malaysia became evident, companies were forced to abandon earlier plans for expansion. The probability of such circumstances arising is denoted as x. Here we can assume that the probability (x) to abandon a plan for overseas production becomes lower as we increase survey costs (C). That is, $\partial x / \partial C < 0$.

Lastly, we have the possibility that a company with overseas operations is forced to revert to domestic production (or move to a different country) when operations

become untenable. This was witnessed in Singapore, Taiwan, South Korea and other Asian NIEs. For instance, a number of foreign companies attracted to the Julon Industrial Park in Singapore in the late 1970s were subsequently obliged to pull out of labor-intensive industries, unable to maintain production under the three-year wage doubling policy brought in during the early 1980s. The probability of such an outcome is denoted as δ .

The three variables in the model are thus: preliminary survey costs C; the probability x of overseas production being rendered unfeasible sometime between the current period and the next; and the probability δ of overseas operations established during the current period becoming untenable in the next.

The value function for period T is

$V_T(\theta, \theta^c, C, s)$,

where θ represents country risk in the country under consideration (the reciprocal of country risk); θ^C, country risk in a second candidate country; C, preliminary survey costs; and s, either domestic production D or overseas production S.

The Bellman equation in this case is:

$V_T(\theta^c, \theta, C, D) = \max\{\pi_f - C, \ \pi_d - C\}$.

As before

$$\overline{\theta}_T = \frac{1}{PF}\left(\frac{\pi_d}{1-t} + w\ell + rk\right).$$

Note that profits from production in the second candidate country at productivity θ^c are assumed to be below profits π_f from the primary country under consideration.

In period $T-1$:

$V_{T-1}(\theta^{c}, \theta, C, D) = \max\{A, B\}$.

Here,

$$A = \pi_f - C + \beta\ [\delta EV_T(\theta', \theta^{c'}, C, D) + (1-\delta)EV_T(\theta', \theta^{c'}, C, F)],$$

$$B = \pi_d - C + \beta[x(c)EV_T(\theta, \theta^{c'}, C, D) + (1-x(c))EV_T(\theta', \theta^{c'}, C, D)],$$

$\partial x/\partial C<0$.

Where B is calculated as follows. During period $T-1$, production is carried out at home and prior survey costs C are incurred, so $B = \pi_d - C$. With x as the probability that overseas production in period T becomes underside, the total expected value B for period T is obtained by summing expected values $xEV_T(\theta, \theta^{c'}, C, D)$ and $(1-x)EV_T(\theta', \theta^{c'}, C, D)$ and discounting the total at a factor of β.

A is calculated as follows. Due to overseas production and prior survey costs C during period $T-1$, the value is $\pi_f - C$. With δ as the probability that overall operations become untenable during period T, at the point when overseas expansion is considered for the second time, the expected value is

$\delta EV_T(\theta', \theta^{c'}, C, D)$.

The expected value when overseas production continues and expansion into a second country is also being considered is given by

$(1-\delta)\ EV_T(\theta, \theta^{c'}, C, F)$,

where A is the total sum of the above three expressions. Thus:

$$V_{T-1}(\theta, \theta^{c'}, C, D) = \begin{cases} A, \theta \geq \bar{\theta}_{T-1} \\ B, \theta \leq \bar{\theta}_{T-1} \end{cases}.$$

The threshold value at this time is

$$\bar{\theta}_{T-1} = \frac{1}{PF}\left(\frac{\pi_d}{1-t} + w\ell + rk\right) + \frac{\beta(1-x-\delta)}{PF(1-t)}(Z - Z^c),$$

where

$$Z = (1-t)PF(k,\ell)\int_{\bar{\theta}_0}^{\infty}(\theta' - \bar{\theta}_T)dH(\theta'),$$

$$Z^c = (1-t_2)PF(k_2,\ell_2)\int_{\bar{\theta}_0^C}^{\infty}(\theta' - \bar{\theta}_T^c)dH^c(\theta').$$

Since $Z^c \geq 0$ and $Z \geq 0$ at all times, the above may be rewritten as follows:

$$\frac{\partial(\bar{\theta}_{T-1} - \bar{\theta}_T)}{\partial t} = \frac{\beta(1-x(C)-\delta)Z^c}{PF(k,\ell)} \geq 0.$$

Reduced corporate tax rates therefore provide incentive for multinational companies to set up overseas operations, and preferential treatment is also effective if the following condition holds. That is,

$1 - x(C) - \delta > 0$.

We showed that the smaller x(C) is, the more the chance to satisfy necessary conditions. This is the case where overseas expansion is being investigated during the current period with a view to implementation in the next period under the same set of conditions. At the same time, efforts must be made to boost survey costs (C) to reduce x(C). We can conclude that whether preferential tax treatment is effective in inviting foreign direct investment depends on value x (C). Preferential tax treatment is effective under a condition of smaller values of x (C).

Let us now consider the case where a second candidate country introduces

preferential tax treatment in competition with the first. This was witnessed in East Asia during the 1990s, as countries such as Indonesia and the Philippines deregulated in competition with one another. In this case

$$\frac{\partial \bar{\theta}_{T-1}}{\partial t_2} = \frac{\beta(1-x-\delta)Z}{1-t}.$$

Thus, the introduction of preferential treatment by a second country facilitates overseas expansion. For instance, a multinational company considering setting up operations in Vietnam benefits when Indonesia and the Philippines introduce preferential tax measures. Insufficient infrastructure and laws (θ) in Vietnam would still not render expansion unviable. In this way, foreign capital is dispersed evenly throughout East Asia. Deregulation and preferential treatment in other regions (namely Southeast Asia) therefore serve to facilitate the inflow of foreign capital, which leads to the following:

Proposition 5: Whether foreign direct investment by a multinational company in a candidate country will be more unlikely depends on value x (C) when preferential tax treatment is introduced in other countries. The more unlikely a multinational company invests in the country the higher the probability of overseas production being rendered unfeasible sometime between the current period and the next period becomes.

This paper focused especially on capacity building with respect to the flowchart approach to industrial cluster policy. Among several factors of capacity building, the paper examined the effectiveness of policies on institutions such as tax incentives in

forming an industrial cluster.

Kuchiki and Tsuji (2005) proves that the implementation of governmental policies has positive effect on inviting foreign capital and forming the industrial cluster in Hanoi, Vietnam and Guadalajara, Mexico, as Table 2 shows. Similarly, “tax incentives for investment” has a positive effect in China and Vietnam, where 17.4% and 14.1% of the interviewed companies, respectively, has picked it up as one of the reasons to invest, as Table 3 shows. In Vietnam, 20.0% of the interviewed companies had admitted “stable political and social conditions” as one of the reasons to invest in that country. The paper examined theoretically these facts.

5. Conclusions

On one side, developing countries in East Asia in the latter half of the 1980s established export processing zones with sufficient infrastructure to attract multinational companies to invest by carrying out deregulation geared towards foreign investment, authorizing export-oriented sectors as picking winners, and granting preferential tax treatment. On the other hand, multinational companies especially of South Korea, Japan, and Taiwan, where domestic wages were rising due to their tight labor markets, were forced to invest in other countries to reduce their costs. Their investment was further increased by the appreciated exchange rates, which made the domestic wages higher in dollar terms. So that EPZs in developing countries in East Asia were effective in inviting the multinational companies.

This paper theoretically proved that policies of both devaluations of currency exchange rate and preferential tax treatment were effective in inviting foreign direct

investment to countries in East Asia in the 1980s. Our static model showed that a multinational company in industry of diminishing returns to scale would increase production in a developing country if its exchange rates to the developing country is appreciated. Our dynamic model also showed that the longer its investment period becomes the more the exchange rate had to be appreciated for the multinational company to invest in the developing country. The dynamic model made clear that the longer the investment period became the less the country risk of the developing country had to be. However, we showed that its high country risk in the developing country could be compensated by reducing the corporate tax rate of the developing country. A more realistic model of countries in the East Asia in the latter half of the 1980s confirmed this conclusion. That is, preferential treatment of tax reductions or exemptions by the developing countries was effective in inviting foreign direct investment. Our above models implies that roles of central governments are crucial for inviting foreign direct investment to form industrial clusters by building capacity. That is, roles of central governments in developing countries or receipient countries to support the industrial cluster policy are to depreciate the exchange rates, to lower the corporate tax rates, and to stabilize the macroeconomic condition.

Appendix 1.

This Appendix discusses the underlying motivation for direct investment, as revealed in questionnaire surveys on direct foreign investment by Japanese companies. When wages in receipent countries were low, the major incentive for multinational companies was a cheap labor: over 70% of companies investing in Thailand (1985) and China (1990) named low wages as the reason for investment. At the same time, the growth in domestic markets in Asian NIEs and ASEAN countries prompted more companies (over 70% in 1993) to set up overseas operations in anticipation of rising demand levels in those countries.

It is clear, then, that direct investment by Japan was motivated by the cost factor in the 1980s. Let us now examine the correlation between the Japanese direct investment and the wages. Wage levels and exchange rates are the major considerations when comparing costs in terms of labor wages. Fluctuations in the exchange rate played a particularly important role in direct investment of South Korea, Taiwan and Japan into other Asian countries during the latter half of the 1980s.

We regressed the correlation between wage level indices for South Korea, Taiwan and Japan (converted into dollars) and the approved value of foreign direct investment by each country over the period 1981-1991. The findings are shown below.

Direct investment by South Korea = -5.56 + 3.61 (South Korean wages)

(-2.78) (9.11)

Adjusted $R^2 = 0.89$, $D-W = 1.87$

Direct investment by Taiwan = -21.8 + 6.59 (Taiwan wages)

(-4.41) (6.74)

Adjusted $R^2 = 0.82$, $D-W = 1.05$

Direct investment by Japan = -5.09 + 2.98 (Japanese wages)

(-3.00) (8.87)

Adjusted $R^2 = 0.89$, $D-W = 1.30$

Variables have been converted into logarithmic form; manufacturing wages in each country are given in dollar terms with the 1980 level equal to 100.

A high correlation was achieved in all three cases and the coefficients were significant with respect to t value. Of particular interest is the similarity between wage elasticity in South Korea (3.61) and Japan (2.98). Taiwan is close to double the figure, indicating that reaction to cost is twice as great as in Japan and South Korea.

The value of the South Korean, Taiwanese and Japanese currencies all rose against the dollar following the Plaza Accord in 1986, and wage levels rose likewise. This led to the threshold mentioned in section 3 and a sharp increase in the level of foreign direct investment from 1987 onwards.

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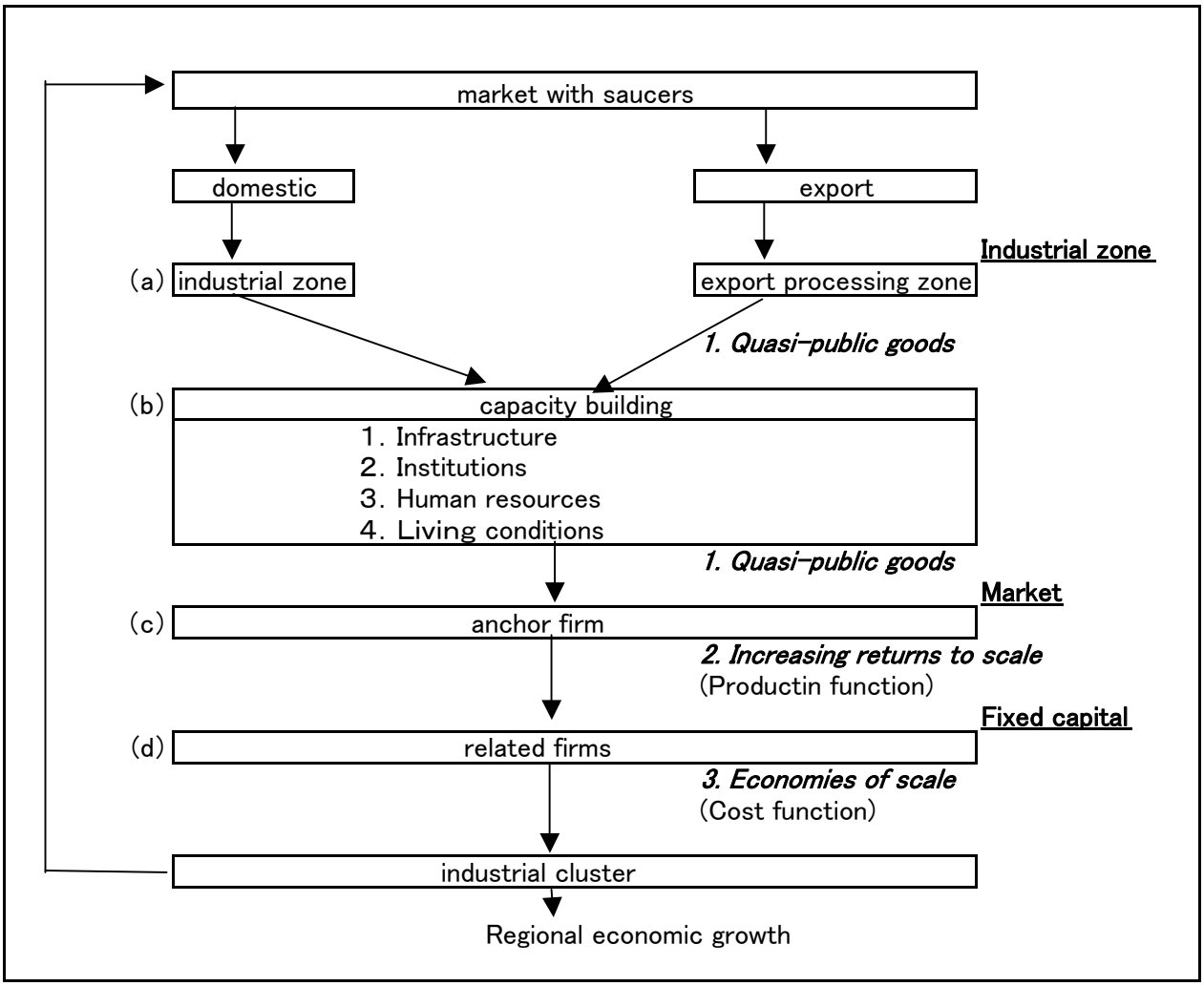
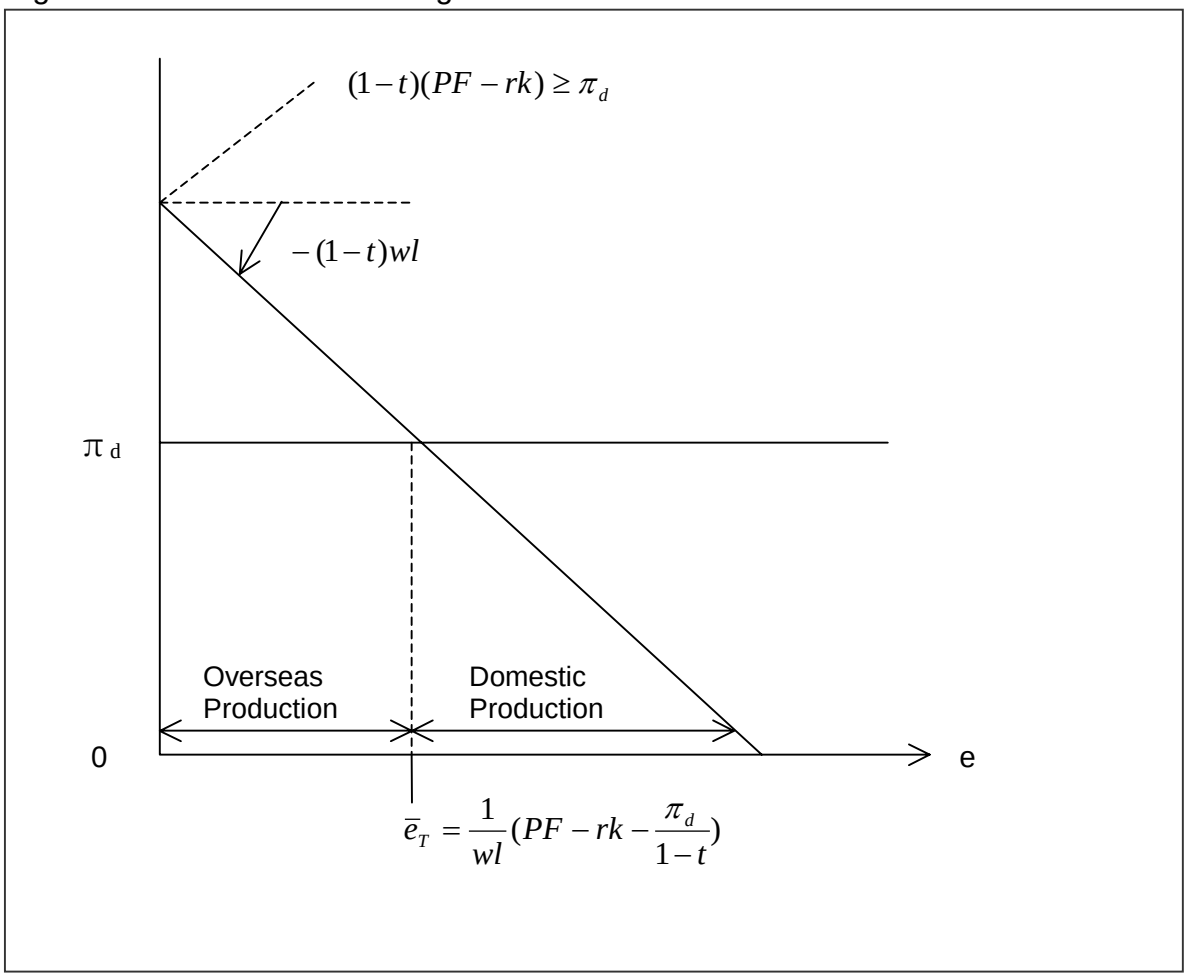
Figure 1. An Industrial Cluster Formed by an Anchor Firm



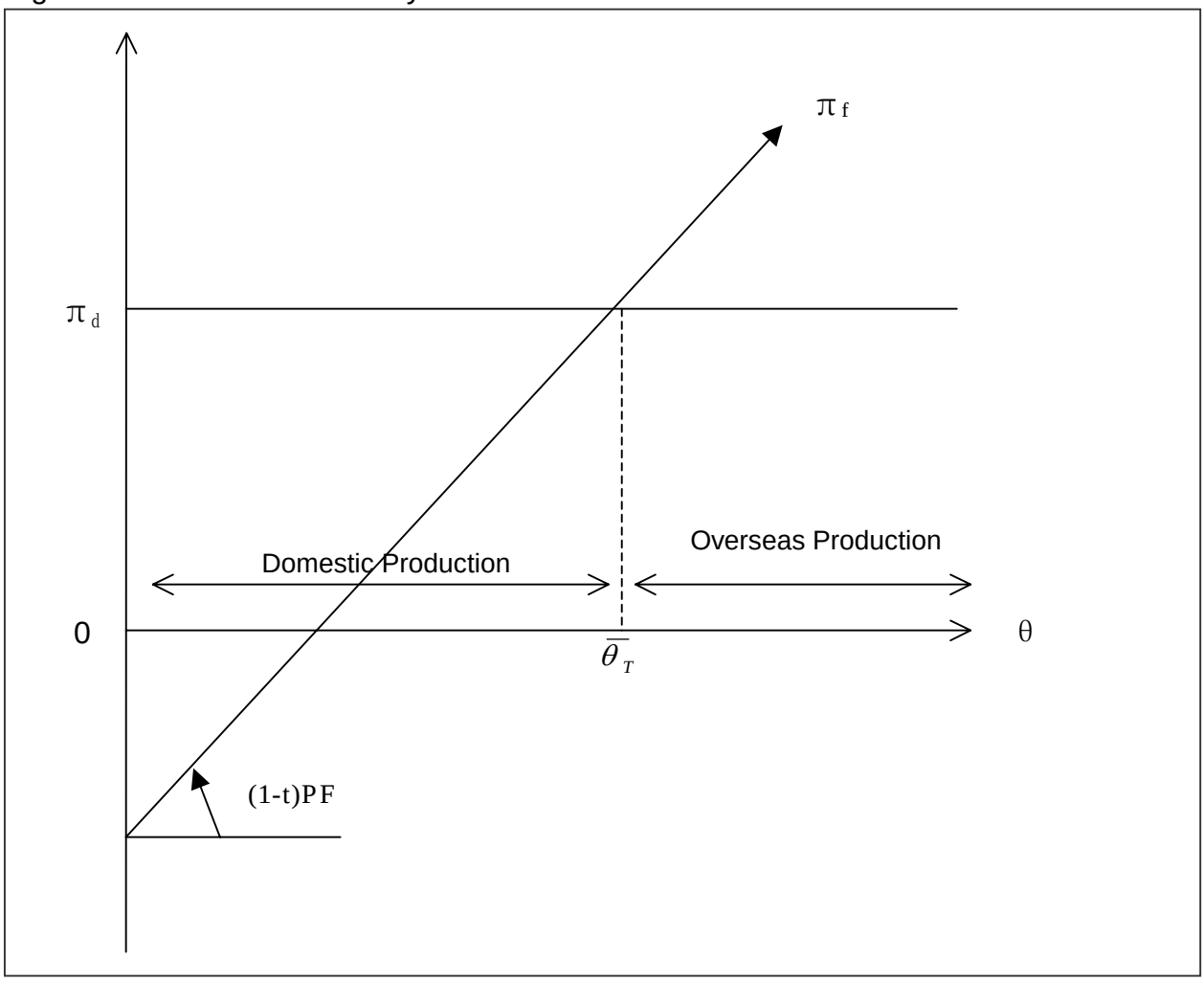
Source : Author.

Figure 2. Threshold of Exchange Rate



Source : Author.

Figure 3. Threshold of Country Risk



Source : Author.

Table 1. Roles of Actors on the Flowchart Approach

			ACTORS				
		Shortage	1	2	3	4	5
Industrial Zone							
Capacity	Infrastructure						
	Institutions						**XXX**
	Human Resources						
	Living Conditions						
Anchor company							
Related companies							

1. Private companies, 2. Multinational corporations, 3. Foreign assistance
4. Local governments, 5. Central government (The flowchart approach : ordering and timing policies.)

Source : Author.

Table 2. Capacity Building and Industrial Cluster characterized by the Anchor Firms

Country		JAPAN	INDIA	MEXICO	CHINA	CHINA	VIETNAM	Notes
City /Prefecture		Okinawa	Bangalore	Guadalajara	Shanghai	Tianjin	Hanoi	
Type of Industry		Call Center	Software	Electronic	Automobile	Automobile	Printer	
Capacity	(a) Human Resources	* Japanese speaking HR	* College and graduate Students		* Metal Industry, components	* Existence of Daihatsu		Initial condition
	(b) Infrastructure						* National roads and ports rehabilitation	Positive policy effectiveness of the central government
	(c) Institution	* Support on Communication system		* Support by the Chamber of Commerce * NAFTA	Governmental support		* One-stop service * Tax System	Positive policy effectiveness of the central government
	(d) Living condition	Good climate	Good climate					Initial condition
Anchor Firm					GM, Ford	Toyota	Canon	Automobile / Electronics

Conclusion: 1. Institutional support has a positive effect on industrial cluster formation.
2. There is no need of anchor firms for industries other than automobile, which requires a great number of components.
3. There are cases where initial condition is decisive.
There are some cases where industrial cluster policy is not effective (not always).

Source: Kuchiki, A. and M. Tsuji eds., *Comparison of Industrial Agglomerations between Asia and the Other Regions*, IDE-JETRO, 2005

Table 3. Promising Countries for Oversears Business Operations : Reasons of promising prospects for the top ten countries

		China (447companies)	Thailand (141companies)	U.S (103companies)	Vietnam (85companies)	India (69companies)
Sales	Potential for growth as a market	82.3%	51.1%	48.5%	41.2%	76.8%
	Present local market size	19.7%	17.0%	61.2%	5.9%	18.8%
	Product development tailored to the local needs	7.8%	6.4%	16.5%	1.2%	2.9%
Production	Excellent Human resources	24.2%	18.4%	24.3%	35.3%	30.4%
	Inexpensive labor force	74.9%	57.4%	1.9%	74.1%	59.4%
	Law-cost parts and raw materials	34.2%	11.3%	1.0%	12.9%	14.5%
	Supply base for final assembly manufacturers	28.6%	34.0%	26.2%	14.1%	24.6%
	Industrial concentration(concentration of sources, buyers and partners)	14.3%	21.3%	19.4%	2.4%	2.9%
	For a risk diversification	4.5%	12.8%	4.9%	31.8%	4.3%
	Base for exports to japan	22.4%	19.9%	0.0%	24.7%	10.1%
	Bases for exports to third coountries	21.9%	29.8%	3.9%	21.2%	17.4%
Infrastructure and systems	Local infrastructure (electric power, communications, transport etc) is well developed	9.4%	23.4%	35.9%	4.7%	2.9%
	Tax incentives for investment	17.4%	24.8%	2.9%	14.1%	4.3%
	Policies to attract foreign capital are stable	4.5%	14.9%	5.8%	7.1%	1.4%
	Progress towards regional integration(reduction of tariffs)	1.3%	9.2%	0.0%	2.4%	1.4%
	Stable political and social conditions	4.0%	34.0%	37.9%	20.0%	1.4%
		Indonesia (62companies)	Korea (42companies)	Taiwan (33companies)	Malaysia (30companies)	Russia (25companies)
Sales	Potential for growth as a market	56.5%	66.7%	30.3%	30.0%	92.0%
	Present local market size	17.7%	40.5%	57.6%	6.7%	16.0%
	Product development tailored to the local needs	3.2%	9.5%	6.1%	6.7%	0.0%
Production	Excellent Human resources	4.8%	21.4%	18.2%	16.7%	4.0%
	Inexpensive labor force	67.7%	7.1%	3.0%	40.0%	8.0%
	Law-cost parts and raw materials	12.9%	7.1%	6.1%	13.3%	4.0%
	Supply base for final assembly manufacturers	27.4%	4.8%	15.2%	23.3%	4.0%
	Industrial concentration(concentration of sources, buyers and partners)	11.3%	19.0%	24.2%	3.3%	4.0%
	For a risk diversification	8.1%	7.1%	6.1%	23.3%	4.0%
	Base for exports to japan	14.5%	2.4%	3.0%	23.3%	0.0%
	Bases for exports to third coountries	27.4%	9.5%	18.2%	13.3%	0.0%
Infrastructure and systems	Local infrastructure (electric power, communications, transport etc) is well developed	6.5%	35.7%	18.2%	26.7%	4.0%
	Tax incentives for investment	6.5%	4.8%	6.1%	23.3%	0.0%
	Policies to attract foreign capital are stable	3.2%	7.1%	3.0%	23.3%	0.0%
	Progress towards regional integration(reduction of tariffs)	9.7%	0.0%	0.0%	6.7%	0.0%
	Stable political and social conditions	0.0%	11.9%	18.2%	33.3%	0.0%

Notes: (1) Figures in parentheses under each country name shows the number of respondent companies.

(2) The table represents the share with respect to the total respondent companies of each country.

Source: *Survey Report on Overseas Business Operations by Japanese Manufacturing Companies* , JBIC Institute, Japan Bank for International Cooperation, 2004