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Koji Aoki
Konan University
Kobe, Japan

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Koji Aoki

Faculty of Economics
Konan University
8-9-1 Okamoto, Higashinada-Ku
Kobe 658, Japan

Abstract

This paper studies empirically the macro-economic determinants of Japan's manufacturing foreign direct investment in East Asian countries. To do so, we first extend the marginal q theory of investment to its multi-regional version, and then carry out an empirical analysis. Specifically, it is shown that (1) Japan's manufacturing foreign direct investment has responded quite straightforwardly to the changing relative wage structure across East Asian countries including Japan, and that (2) the FDI regulations imposed by host countries have significantly affected the behavior of FDI. Furthermore, we show an empirical evidence that (3) the upsurge in stock prices in the second half of the 1980s had in part helped to stimulate the FDI by allowing the firms to raise funds cheaply.

1. Introduction

The last decade has witnessed a spur in Japan's foreign direct investment towards East Asian countries amidst the relative decline of the foreign direct investment in North America and Europe which had surged in the background of the proliferation of Japan-US economic friction and the European economic integration in the second half of the 1980s. In a sense, it might be no exaggeration to say that Japan has revived the 1970s when the Japanese FDI concentrated on Asia.

Of course, the current domestic and international economic environment facing Japan is quite different from that in the 1970s: First of all, the main host countries have switched from the NIEs to the ASEAN countries such as Thailand and Malaysia, and recently to China according to at least the official statistics. Note, however, that we cannot definitely say that Japan's FDI towards NIEs has literally declined when including the reinvestment of profits in the local affiliates, because the Japanese FDI statistics have several serious drawbacks as explored later. Moreover, its industrial composition has dramatically shifted from the textile and resource-based industries in the 1970s to the now dominant electrical and electronic good industry and quite recently to the auto parts industry, reflecting the change in the Japanese industrial and trade structure. Needless to say, these Japanese FDI together with NIEs' FDI which now far exceeds Japan's one at least in flow values have contributed to generate a driving force for the structural change that has occurred in East Asia since the second half of 1980s, and even outward FDI from ASEAN and China are now markedly enlarging. In other words, the cross-hauling of FDI that characterizes the FDI among Western countries becomes increasingly a key feature of the intra-regional FDI in East Asia.

Apart from vast descriptive, yet insightful, analyses, however, few empirical studies on Japan's FDI in East Asia based on a rigorous theory have so far been done, [see for a few exception Fukao, Izawa, Kuninori and Nakakita (1994a,b) among others,] reflecting the fact that we lack the theoretical underpinning to bridge the micro-economic essential of FDI,, i.e., the internal managerial resource transfer, over the macro-economic dynamics as well as an insurmountable obstacle of the data availability. The purpose of the paper, while it does not aim to completely answer the analytical subjects of FDI, to empirically study the macro-economic determinants of Japan's manufacturing FDI towards East Asian countries. To do so, we extend the marginal q theory of investment to its multi-regional version, and then carry out an empirical study using this theoretical framework. Specifically, it is shown that Japan's FDI in East Asia has responded quite straightforwardly to the changing relative wage structure among the East Asian countries including Japan, and that a hump of Japan's FDI observed in the second half of 1980s is likely due to the upsurge in share prices leading to a huge amount of equity financing largely made by the large manufacturing firms. Furthermore, we will show an empirical evidence that suggests the importance of the FDI regulations imposed by host countries.

The organization of the paper is as follows. In the next section, we explain the theoretical model with an introduction of intuitive exposition of the logic underlying the model. In section 3, we give some preliminary description of the data and several caveats, and then report the estimation results. The final section 4 concludes with a few remarks.

2. The Model

A. An Intuitive Exposition

It may be useful at the outset to explain intuitively the basic logic underlying the model used for the following estimation since the model is too complicate to allow our straightforward understanding. For this purpose, imagine a representative multinational firm who engages in production activities in home country, Japan, where the parent company is located, and foreign country or region, Asia, where the local subsidiary operates, and assume that the firm as a whole faces the demand constraint which will prove to be crucial for our analysis later. We also assume that the production function is homogeneous of degree one.

In Figure 1, the amount of capital (K) is measured in the vertical axis and the amount of labor (L) in the horizontal axis, respectively, and the locus F_0F_0 represents the initial isoquant of each plant, where for the expositional convenience we assume that each production unit operates in the same production level. Let the wage relative to capital cost be given by the slope of the line PP for Japan, and that of the line P*P* for Asia, respectively, so the optimum is attained at the point Q^{JP}_0 for Japan, and the point Q^{AS}_0 for Asia. Note that rigorously speaking, these point are not ultimate optimum, but we ignore this in order to facilitate an intuitive understanding.

Starting with those setup, suppose that the relative wage in Japan rises due to, say, the Japanese yen appreciation against the foreign currency, so that the iso-cost line facing the parent company shifts to the line P'P'. As a result, the optimal point for the Japanese parent company will move to the point Q^{JP}_1. That is to say, it is rational for the firm to invest in parent company's plant in order to save the higher labor cost by substituting capital for labor, which closely corresponds to the Japanese situation in the second half of the 1980s then described as "squeezing further a dried duster." In what follows, we call this sort of investment the "investment for rationalization".

It is obvious, however, that the firm's optimal response to the rising wage cost in Japan is not necessarily confined to this rationalization investment, for there is an option available for the firm to simply relocate the production from Japan to the Asian subsidiary. For example, suppose that the firm further reduces the production in Japan to the level corresponding to the point Q^{JP}_2 and in turn expands the production in Asia to the level corresponding to the point Q^{AS}_1. Note that the points Q^{JP}_1 and Q^{JP}_2, and the points Q^{AS}_0 and Q^{AS}_1 are, respectively, on the same rays from the origin, and that the points Q^{JP}_1 and Q^{AS}_1, and the points Q^{JP}_2 and Q^{AS}_0 are, respectively, on the same iso-cost lines. In other words, the contracted production in Japan's parent company is just offset by the enlarged production in Asian subsidiary, so that the assumed demand constraint continues to hold. But the cost saving attained in the parent outweighs the cost increase observed in the Asian subsidiary by the amount indicated as "net cost saving" in the figure, and therefore the firm will invest in Asian plant to expand the local production. In what follows, we think of this investment as the FDI made by the Japanese firm and may alternatively refer to it as "investment for production relocation". Note in passing that the ultimate effect of the rising wage cost in Japan on the parent company's domestic investment is ambiguous since the investment for production relocation may be countervailed by the investment for rationalization.

B. The Formal Model

Bearing in mind those intuitive exposition, we shall next set out the formal model and subsequently derive the reduced form equation used for the estimation.

Imagine that the Asian region including Japan can be divided into three sub-regions which are identified by the index k=0,1,2, where the index number 0,1,2 can be thought of as indicating Japan in which the parent company is located, NIEs, and ASEAN/China, respectively. Note that we now enlarge the number of sub-regions to *three* instead of two in the last sub-section. This reflects the fact that the Japanese multinational firms usually view East Asian countries as alternative or competitive candidates for location in contemplating overseas production. The firm treats Asia including Japan as if a coherent region controlled by a single headquarter and decides his optimal investment, production, employment schedule collectively. [Urata(1996) gives an interesting discussion that the Japanese consumer electrical good companies tend to segment their world production network into three sub-blocks, North-America, Europe, and Asia, and manage respective regional territories independently.]

Define the firm's total net cash flow in period t by

$$\pi_t = \sum_{k=0}^{2} \{F^k(K_t^k, L_t^k) - w_t^k L_t^k - p_{K,t}^k C(I_t^k)\}$$

where F^k is the production function in sub-region k, K^k and L^k are the capital stock at the beginning of period t and the labor employment in period t in sub-region k, w^k and $p^k{}_K$ are the wage and capital good price in terms of the final goods in sub-region k, I^k is the gross real investment in sub-region k, and $C(I)$ is the adjustment cost function of investment with the usual properties. It is assumed that the production function is homogeneous of degree one, and that all the prices are measured in a common currency, say, the US dollar, so as to be commensurable. We also have the capital accumulation equation in each subregion:

$$(1)\quad K_{t+1}^{k}=I_{t}^{k}+(1-\delta)K_{t}^{k}$$

where for simplicity the depreciation rate δ is assumed to be common.

Here we impose a crucial assumption that the firm as a whole faces the demand constraint:

$$(2)\quad Q_t=\sum_{k=0}^{2}F^k(K_t^k,L_t^k)$$

where Q_t is the exogenous total demand facing the firm. This constraint is not only intuitively plausible but also necessary to incorporate the substitution effect in investment explored in the last sub-section. In fact, it is quite difficult to elucidate the fundamental macro-economic determinant of Japan's FDI in East Asia, i.e., the relative wage structure among sub-regions, without this constraint. It in turn amounts to say that the production decision is separable, at least as a first approximation, from the demand side concerns. Of course it might be desirable to simultaneously take account of the demand side factors such as the respective market size, the impact of regulations against domestic sales, the role of international trade and so on, and one could do so at least in theory. However, data limitation which researcher in this field are necessarily confronted with prevents us from estimating such a possibly extended version, so we are forced to abandon this.

Subject to the constraints given by (1) and (2), the firm decides the optimal plan so as to maximize the present value of the net cash flows,

$$V_t = E_t\{\sum_{j=0}^{\infty}[\prod_{i=0}^{j}(1+R_{t+i})^{-1}]\pi_{t+j}\}$$

where $E_t\{\ \}$ stands for the expectations operator conditionally upon currently available information, and R_t means the real interest rate defined over period t to period t+1. Note that we implicitly assume that the firm is risk neutral.

Now, let $\tilde{q}^k_{t+j}[\prod_{i=0}^{j}(1+R_{t+i})^{-1}]$ and $\lambda_{t+j}[\prod_{i=0}^{j}(1+R_{t+i})^{-1}]$ be, respectively, the Lagrange multipliers associated with the constraint (1) and (2), and define the variables as

$$q^k_t = \frac{\tilde{q}^k_t}{p^k_{K,t}}$$

$$\beta^k_t = \frac{1-\delta}{1+R_t}\frac{p^k_{K,t}}{p^k_{K,t-1}}$$

$$M^k_t = \frac{1}{1-\delta}\frac{w^k_t}{p^k_{K,t}}\frac{\partial F^k / \partial K^k_t}{\partial F^k / \partial L^k_t}$$

where q_t indicates the marginal q of investment, β the discount factor including the expected capital gain in the capital good price, M_t the marginal cost reduction due to the substitution of capital for labor. It can then be easily verified that the firm's optimal conditions are given by the following three sets of equations:

(3) $1-\lambda_t = \dfrac{w^k_t}{\partial F / \partial L^k_t}$

(4) $C'(I^k_t) = q^k_t$ $\qquad\qquad$ (k=0, 1, 2)

(5) $q^k_t = E_t\{\beta^k_{t+1}[M^k_{t+1} + q^k_{t+1}]\}$

The first set of equation (3) means the usual marginal condition that the marginal cost of labor must be equal in all sub-regions, and the second set of equation (4) implies that the marginal adjustment cost of investment must be equal to the marginal q of investment, and the last set of equation (5) is the usual law of motion to generate the marginal q of investment. As equation (5) implies, the marginal q of investment is the capitalized value of the labor cost reduction expected from an additional investment. Thus the optimal investment plans are determined simultaneously within those equations system.

C. The Linearization

We may have three alternative estimation strategies: The first and most popular approach is to directly calculate the marginal q of investment under some plausible assumptions, and then estimate equation (4), while the second one is to estimate the Euler equation (5) together with a specific adjustment cost function of investment by applying, say, the GMM. However, severe data limitation does not allow us to adopt those approaches, so we choose the third one, that is to say, the reduced form equation approach. To do so, we linearize the set of equations around the stationary state. Note that the linearized system is proven to be a good approximation at least for the empirical purpose. [see Abel and Blanchard(1986).]

Let the bar ($\overline{}$) over the variable indicate the stationary state value associated with that variable, and the hat (^) over the variable the deviation of the variable from its stationary state value, respectively. We further write the deviation rate from the stationary state value as *dln*. For example, $\hat{x} = x - \bar{x}, d\ln x = (x - \bar{x}) / \bar{x}$. We can first linearize the equation (5) as

$$\text{(5')} \qquad \hat{q}_t^k = E_t\{[\overline{M}^k + \bar{q}^k]\hat{\beta}_{t+1}^k + \bar{\beta}^k[\hat{M}_{t+1}^k + \hat{q}_{t+1}^k]\}$$

where $1 > \bar{\beta}^k > 0$ is the stationary state value of the discount factor.

Next we assume the Cobb-Douglas production function and let α be the capital distributive share. It can then be shown that the optimal condition for labor allocation among sub-regions (3) together with the demand constraint (2) leads to a representation for the marginal rate of substitution between factors in sub-region k,

$$d\ln(\frac{F_K^k}{F_L^k})_{t+1} = -\frac{1}{\alpha}d\ln(\frac{w^k}{w^0})_{t+1} + \frac{1}{\alpha}\sum_{i=1}^{2}\theta_i d\ln(\frac{w^i}{w^0})_{t+1} + \frac{1}{1-\alpha}d\ln Q_{t+1}$$
$$-\frac{1}{1-\alpha}\sum_{i=0}^{2}\theta_i d\ln K_{t+1}^k$$

where $\theta_i = \overline{Q}^i / \overline{Q} > 0(\sum_{i=0}^{2}\theta_i = 1)$ is the production share of sub-region i, and F_xs are the partial derivatives of production function with respect to the variable x. Letting $1/a^k=C''(I^k)>0$, equation (4) combined with equation (1) gives rise to

$$d\ln K_{t+1}^k = (\overline{K}^k)^{-1}[a^k\hat{q}_t^k + (1-\delta)\hat{K}_t^k]$$

and therefore the labor cost reduction expected from an additional investment can be expressed as

$$\hat{M}_{t+1}^k = \overline{M}^k d\ln(\frac{w^k}{p_K^k})_{t+1} - \frac{\overline{M}^k}{\alpha}d\ln(\frac{w^k}{w^0})_{t+1} + \frac{\overline{M}^k}{\alpha}\sum_{i=1}^{2}\theta_i d\ln(\frac{w^i}{w^0})$$
$$+\frac{\overline{M}^k}{1-\alpha}d\ln Q_{t+1} - \frac{\overline{M}^k}{1-\alpha}\sum_{i=0}^{2}\theta_i(\overline{K}^i)^{-1}[a^i\hat{q}_t^i + (1-\delta)\hat{K}_t^i]$$

To save the notation, we define the variable which means the linear combination of fundamentals by

$$(6)\qquad z_t^k = \alpha^k(\frac{\hat{w}_t^k}{p_{K,t}^k}) - \gamma_1^k(\frac{\hat{w}_t^k}{w_t^0}) + \gamma_2^k\theta_1(\frac{\hat{w}_t^1}{w_t^0}) + \gamma_2^k(\frac{\hat{w}_t^2}{w_t^0}) + \sigma^k\hat{Q}_t + \tau^k\hat{\beta}_t^k$$

where α, γ, σ s are all positive parameters. We also define the variable by

$$\eta_i^k = \frac{\overline{M}^k}{1-\alpha}\theta_i(\overline{K}^i)^{-1} > 0$$

and denote $E_t[x_{t+1}]={}_tx_{t+1}$ for abbreviation. Consequently equation (5') can be rearranged into

$$(7)\quad {}_t\hat{q}_{t+1}^k = \frac{1}{\overline{\beta}^k}\hat{q}_t^k + \sum_{i=0}^{2}\eta_i^k[a^i\hat{q}_t^i + (1-\delta)\hat{K}_t^i] - {}_tz_{t+1}^k \qquad (k=0,1,2)$$

and we have another equation to give the law of motion for the state variables,

$$(8)\quad \hat{K}_{t+1}^k = a^k\hat{q}_t^k + (1-\delta)\hat{K}_t^k \qquad (k=0,1,2)$$

Thus the dynamics of the linearized system can be described by those two sets of equations (7) and (8).

D. The Reduced Form Equations

The next step is to express the marginal q of investment as a function of the state and exogenous variables. However, it is intractable to solve the sets of equations (7) and (8) directly since the system involves 6 equations . Rather we proceed by assuming that all the parameters identified by the sub-region index k are common.

Now define the aggregate variables over the sub-regions by

$$q_t = \sum_{k=0}^{2}q_t^k, K_t = \sum_{k=0}^{2}K_t^k, z_t = \sum_{k=0}^{2}z_t^k$$

The system can then be rearranged into

$$(9)\qquad {}_t\hat{q}_{t+1} = [\bar{\beta}^{-1} + 3\eta a]\hat{q}_t + 3\eta(1-\delta)\hat{K}_t - {}_t z_{t+1}$$

$$(10)\qquad \hat{K}_{t+1} = a\hat{q}_t + (1-\delta)\hat{K}_t$$

$$(11)\qquad {}_t\hat{q}^k_{t+1} = (\bar{\beta})^{-1}\hat{q}^k_t + \eta a\hat{q}_t + \eta(1-\delta)\hat{K}_t - {}_t z^k_{t+1} \qquad (k=0,\ 1,\ 2)$$

It turns out that the model has the recursive structure in that the regional-wide marginal q of investment and the regional-wide capital stock are determined by equations (9) and (10) independently, and then the respective marginal qs are determined by equation (11). In other words, the firm first designs the optimal plans from the regional-wide point of view and subsequently constructs the respective sub-regional plans in a way to be consistent with the regional-wide optimum.

Define the new variables by

$$s = 1/\bar{\beta} + 3\eta a + 1 - \delta - \lambda, \qquad \Omega_t = \sum_{j=1}^{\infty}(\frac{1}{\lambda})^j\,{}_t z_{t+j}$$

where $\lambda>1$ is the larger Eugen value associated with the difference equation system (9) and (10). We note also that $1-\delta>s>0$. With some tedious computations and rearrangement, it can be verified that the marginal q of investment in sub-region k is expressed as

$$(12)\qquad \hat{q}^k_t = \sum_{j=1}^{\infty}(\bar{\beta})^j\,{}_t z^k_{t+j} - \eta a\bar{\beta}\{s\sum_{j=1}^{\infty}\bar{\beta}^j[\sum_{i=0}^{j+i-1}s^i\,{}_t\Omega_{t+i}] + \sum_{j=0}^{\infty}\bar{\beta}^j\,{}_t\Omega_{t+j}\}$$

$$- \eta\frac{s\bar{\beta}}{1-s\bar{\beta}}\hat{K}_t \qquad (k=0,\ 1,\ 2)$$

At a glance, equation (12) appears too complicated to allow us to readily understand the economic implications, but the basic insights are simple: The first term on the right hand side captures the idiosyncratic shocks that might affect the marginal q in sub-region k individually, and the second parenthesized term implies the aggregate shocks common to all sub-regions, and the last term represents the stock adjustment effect that the accumulation of the capital stock itself exerts the negative impact on the marginal q. Therefore, with these marginal q, the investment in sub-region k is determined by

$$(13) \quad \hat{I}_t^k = a\hat{q}_t^k \qquad (k=0,1,2)$$

E. The Macro-Economic Determinants of FDI

In order to proceed further, we assume that any stochastic variable can be decomposed into the transitory and permanent components. More concretely, letting X_t be a stochastic variable, it is expressed as

$$X_t = X_{P,t} + C_t$$

where the permanent component $X_{P,t}$ follows a random walk process

$$X_{P,t} = X_{P,t-1} + u_t \quad \textit{where } u_t \textit{ is a white noise,}$$

and the transitory component C_t is a white noise. Noting that only the permanent component is relevant to the firm's decision making, with some manipulation, we can obtain from equation (12) and (13) the following expression;

$$(14) \quad \hat{I}_t^k = a\frac{\overline{\beta}}{1-\overline{\beta}}\{z_{p,t}^k - \chi\sum_{i=0}^{2} z_{p,t}^i\} - \eta a \frac{s\overline{\beta}}{1-s\overline{\beta}}\hat{K}_t \qquad (k=0,\ 1,\ 2)$$

where the subscript ($_p$) indicates the permanent component associated with the variable, and

$$\chi = \frac{\eta a}{(1-s\overline{\beta})(\lambda-1)} > 0$$

Note that the parameter χ can be interpreted as indicating the degree to which the present investment will exert an influence on the future marginal rate of substitution between factors via the increase in capital stock, and may be referred to as the parameter indicating the "indirect" effect.

The remaining problem is to obtain an explicit representation of the individual determinants of FDI. For this purpose, it is sufficient to consider only a representative sub-region, say, NIEs identified by the index k=1 since investments in other sub-regions are in principle parallel. To save the notation without loss of generality, assume that the parameters pertaining to individual sub-region are common across region except for the production share θ. Then equation (14) together with equation (6) leads to

$$
\begin{aligned}
(15)\ \hat{I}_t^1 = {} & \alpha \frac{a\overline{\beta}}{1-\overline{\beta}} \{ (\frac{\hat{w}^1}{p_K^1})_{p,t} - \chi \sum_{i=0}^{2} (\frac{\hat{w}^i}{p_K^i})_{p,t} \} - \gamma \frac{a\overline{\beta}}{1-\overline{\beta}} [1-\theta_1 + \chi(3\theta_1 - 1)] (\frac{\hat{w}^1}{w^0})_{p,t} \\
& + \gamma \frac{a\overline{\beta}}{1-\overline{\beta}} [\theta_2 - \chi(3\theta_2 - 1)] (\frac{\hat{w}^2}{w^0})_{p,t} + \sigma \frac{a\overline{\beta}}{1-\overline{\beta}} (1-3\chi) \hat{Q}_{p,t} \\
& + \tau \frac{a\overline{\beta}}{1-\overline{\beta}} \{ \hat{\beta}_{p,t}^1 - \chi \sum_{i=0}^{2} \hat{\beta}_{p,t}^i \} - \eta a \frac{s\overline{\beta}}{1-\overline{\beta}} \hat{K}_t
\end{aligned}
$$

While equation (15) appears rather complicated, it may be interpreted as follows: The first term on the right hand side captures the impact of the real wages in terms of the capital good prices on the investment carried out in the subsidiary in NIEs and corresponds to the rationalization investment effect explored in the preceding sub-section. For example, suppose that the real wage in terms of the capital goods in NIEs increases persistently. Facing the increase in wage cost, the firm will substitute capital for labor in the NIEs' plant and therefore increase the FDI towards NIEs. On the contrary, this investment will decrease the future marginal rate of substitution between factors and thus entails the countervailing forces. Therefore, while the total effect is ambiguous, we can think of the final effect as positive insofar as the latter indirect effect via the expectations is negligibly small, that is to say, χ

is small enough.

The second and third terms on the right hand side represent the production relocation effect of the relative wages in terms of the Japanese wage. For example, assume that the wage in NIEs compared with that in Japan increases just like the situation in the period after 1987. Then the firm will decrease the FDI towards NIEs simply because of the hike in wage costs and relocate the production from NIEs to the other regions, say, ASEAN/China to the extent that the indirect effect through the expectations can be thought of as negligibly small. Analogously, the increase in the relative wage in ASEAN/China compared with Japan will induce the firm to relocate the production from ASEAN/China to NIEs and Japan. Therefore these terms may capture the competitive effect of FDI among sub-regions.

The fourth term on the right hand side represents the effect of the regional market size on the FDI in NIEs and can be naturally thought of as positive. That is to say, facing the enlarging regional markets, the firm will invest to expand the production capacity. The fifth term on the right hand side is the effect of the discount factor on the FDI and may be thought of as positive since the decline in real interest rate in general causes the investment to increase. The last term on the right hand side captures the stock adjustment effect and implies that the investment opportunities will vanish with the capital accumulation.

3. The Estimation

A. Specification, The Data Description and Some Qualifications

Having established the theoretical benchmark, we can now carry out the estimation. To do so, we first transform the reduced form equation (15) into its log-linear counterpart by noting that $\hat{x} \equiv \bar{x}(\ln x - \ln\bar{x})$,

$$(16)\qquad \ln I_t = a_0 + a_1 \ln(\frac{w}{p_K})_{p,t} - a_2 \ln(\frac{w}{w^{JPN}})_{p,t} + a_3 \ln(\frac{w^{ROW}}{w^{JPN}})_{p,t} + a_4 \ln Q_{p,t} + a_5 \ln \beta_{p,t} - a_6 \ln K_t + u_t$$

where w and p_K are the wage and capital good price in the concerned country, w^{JPN} and w^{ROW} are the wages pertaining to Japan and the other regions or countries, respectively, u_t is the disturbance term, and the expected signs of as are all positive assuming that the indirect effects are small enough.

At this point, several remarks may be in order. First, while the concept of FDI in this paper corresponds to the fixed capital investment made by Japan's foreign affiliates, we necessarily face a serious obstacle of the limited data availability and therefore must make some compromises. In fact, the survey data for the fixed investment compiled by the Ministry of International Trade and Industry which are annually published as *Wagakuni Kigyono Kaigai Jigyo Katsudo* [The Foreign Business Activities of the Japanese Firms] are unreliable because of the low and unstable rate of response and the lack of the succession of respondent, while the Balance of Payments data compiled by the Bank of Japan are not suitable for our purpose since the compilation of the country data that we need started only from 1995. Therefore we are forced to use the approved and notified FDI data annually publicized by the Ministry of Finance. Note that this data has a merit that it has been compiled as a panel data with the industry and country entries since 1978.

More concretely, we focus on Japan's manufacturing FDI in NIEs [Korea, Taiwan, Hong Kong, and Singapore], ASEAN [Thailand, Malaysia, Indonesia, and The Philippines], and China for the period from 1978 fiscal year [1980 for China] when the compilation of panel data started through 1994 fiscal year which is the latest year that all the relevant data are available. Note that our exclusive focus on FDI in manufacturing industries might be justifiable if one remind the fact that Japan's FDI in Asian countries have been overwhelmed by those in 9 countries [more than 90% of the total value] and the latter has been dominated by the FDI in manufacturing sector except for Hong Kong and Singapore. On the other hand, while the FDI in Vietnam has recently been highlighted, we are forced to exclude it from our analysis simply because the actual observations are restricted to a few years in the 1990s.

We next converted those into the real value by deflating them with the deflators for the fixed investment in respective countries, where in what follows all the real variables are evaluated in the 1990 year prices unless otherwise stated. Figure 2 depicts these real value of Japan's manufacturing FDI in NIEs, ASEAN, and China. As clearly seen, while slightly plunged in the early 1990s, Japan's manufacturing FDI towards those 9 countries have dramatically surged since the mid of the 1980s, and at the same time the main host countries or regions turn out to have changed from NIEs to ASEAN and then to China.

However, these approved and notified data contain several well known drawbacks: First, these data do not exclude the possibility of the delayed disbursement and the cessation of the planed FDI after approval or notification, and therefore may overstate the actual FDI. Secondly, these do not include the reinvestment of profits accruing to the parent companies, which is the same in situation as BOP data for the period before 1995 when the Japanese BOP statistics were significantly changed. Thirdly, a problem associated with the classification of industry is involved. That is to say, as pointed out by some researcher, [see Fukao and Nakakita(1996)] it may be the case that part of the FDI towards commerce have been classified in the manufacturing FDI. Fourthly, these do not deal with the withdrawal that are recently increasing, nor the indirect FDI through the Japanese foreign affiliates. [For the indirect FDI via the foreign subsidiaries in Hong Kong and Singapore, see Low, Ramstetter and Yeung(1996).] At any rate, as the Japanese FDI data have several drawbacks as explored above, we should read the results with caution.

On the other hand, we constructed the series of the real capital stock by using as a benchmark the cumulative FDI at the end of 1977 deflated with the fixed investment deflator and applying the perpetual inventory method. For this purpose, we need an information of the depreciation rates, but the data availability prevents us from doing this. With this limitation, we proceeded by referring to the Japanese domestic depreciation rate and applying the common value of 0.04

We next explain the wage data briefly in which we face another serious obstacle of the data availability. More concretely, apart from NIEs and China, the availability of the wage data for ASEAN countries is severely limited regarding the long-run continuity and the reliability of the data for work time. Alternatively, we used the per capita consumption as a proxy for the wage rates of these countries with the presumption that the per capita consumption is closely correlated to the wage rate. Moreover, while we need the wage data which correspond to the concept of the wage per hour, the data availability prevents us from making this adjustment for China and partly Hong Kong as well as the ASEAN countries. Recognizing those problems seriously, Figure 3 shows the movement of the wage rates of respective countries and regions relative to the US manufacturing wage rate by choosing 1980 as a benchmark year. Note that the wage series pertaining to NIEs and ASEAN were compiled by geometrically averaging respective country's data with the weight of the share in Japan's FDI. Note also that the wage series of China before 1978 when the reforms and open door policy was initiated is not depicted since this seems to be economically insignificant. While, at first sight, we may be impressed with the dramatic upsurge of the Japanese relative wage against the US especially since the second half of the 1980s, it is more important to note that the relative wage of NIEs has also shown a similar tendency since 1987 which was the memorial first year of the democratization in Korea and Taiwan, and that there has bee no symptom for the trend of the rising relative wage in NIEs to stop. Secondly, the observation of the relative wage in ASEAN against the US tells us that it has declined up until the mid of the 1980s, reflecting the significant drop of the primary commodity prices such as the oil price. That is to say, the countries such as Thailand, Malaysia, and Indonesia suffered from a huge drop in primary commodity prices started from 1982, resulting in a struggle against the reverse Dutch decease. However, this tendency has been reversed since around 1988 when a big wave of the FDI fell on these countries, which is roughly consistent with the casual observation of rising wage in these regions, especially in the 1990s. Thirdly, the Chinese relative wage against the US has incessantly declined throughout the period since the first devaluation in 1981, reflecting China's recurrent depreciation policy pursued to realize the market equilibrium RMB/Dollar exchange rate and partly to accommodate the real appreciation of the RMB due to the domestic higher inflation. In short, a wave of the rising relative wages in the East Asia including Japan has surged first from Japan to NIEs, and then to ASEAN as if a lot of ninepins.

Thirdly, we should refer to several technical problems associated with the estimation: The same variable, wage rate, simultaneously appears in the second and third terms on the right hand side of equation (16), where the second and third terms in theory capture the rationalization and production relocation effects, respectively. For this respect, one may be confronted with a cumbersome problem, i.e., the multi-colinearity. In fact, a preliminary estimation revealed that the sign condition associated with the second term was not satisfied in many cases and that the statistical significance of the third term extremely fell. To alleviate the problem, we decided to proceed by making an assumption. That is to say, the capital equipment used in the Japanese foreign subsidiaries are usually imported from Japan and therefore the prices in the local capital goods should strongly reflect the Japanese export prices. Given this fact, we assume that the capital goods produced in Japan is produced with only labor and that the export price of capital goods from Japan is proportionate to their wage costs. With this additional assumption, the relative wage in terms of the local capital good price may be proportionate to the relative wage in terms of Japan's wage, so that we can reduce these second and third terms into one factor. In this case, we interpret the term as lumping together those two opposing effects.

Another source of the multi-colinearily is that we have two explanatory variables in the equation, the capital stock K and the expected demand Q, both of which have obviously a strong time trend. In fact, a preliminary experiment revealed the instability of the estimated parameters associated with these terms. To deal with this problem, we adopted a pooling method using a panel data: As previously mentioned, the approved and notified FDI data are compiled in a panel data with the country and industry entries. We then estimated the parameter associated with the expected demand term separately by using this panel data together with the sales value data of Japan's affiliates in Asia compiled by the Ministry of International Trade and Industry and publicized in *Wagakuni Kigyono Kaigaijigyou Katsudo.* Note that since the data for the local sales have several shortfalls we made many cumbersome adjustments before estimation, although the details are suppressed.

Fourthly, all the explanatory variables except for the capital stock are defined as the expected permanent component associated with them. Although it is quite difficult to capture the expectations empirically, we adopted for this purpose the decomposition proposed by Beverage and Nelson(1981), which may briefly be outlined as follows: Assume that for a non-stationary stochastic variable z_t, its first difference $w_t=z_t-z_{t-1}$ is stationary. Letting μ be the drift associated with z_t, the Wold's decomposition theorem leads to a moving average representation,

$$w_t = \mu + \sum_{j=0}^{\infty} \lambda_j \varepsilon_{t-j}$$

where ε s are white noises and λ s are constants with $\lambda_0 = 1$. Beverage and Nelson(1981) then proposed that the original stochastic variable z_t may be decomposed into the permanent component $z_{p,t}$ and the transitory component C_t, where $z_t=z_{p,t}+C_t$, and

$$z_{p,t} = z_t + (\sum_{j=1}^{\infty} \lambda_j)\varepsilon_t + (\sum_{j=2}^{\infty} \lambda_j)\varepsilon_{t-1} + \cdots\cdots = z_{p,t-1} + \mu + (\sum_{j=1}^{\infty} \lambda_j)\varepsilon_t$$

With this idea, we can construct the permanent component associated with the explanatory variable by estimating relevant time series model and then applying an appropriate transformation. For this purpose, we used the data over the period of 1973 when Japan moved to the flexible exchange rate system, through 1994.

Fifthly, it may be useful to refer to the discount factor appeared on the right hand side of equation (16). For, while there are some studies that point to the insignificance of the financial factor in explaining the Japanese domestic investment, [see for example Kiyotaki and West(1996)] a special attention may deserve regarding the Japanese foreign direct investment for the period from the mid of the 1980s to the early 1990s. In fact, an observation of Japan's FDI data would reveal that a big hump was formed in the second half of the 1980s just like those in the domestic production, employment and investment. In other words, a large swing in the stock and land prices observed in the period of the 1980s to the 1990s as well as the exchange rate seem to have had significant impacts on Japan's FDI. [For the similar point, see for example Ito(1996) and Kinoshita(1995).]

For the relationship between the FDI and asset prices, Froot and Stein(1991) and Klein and Rosengren(1994) provided an interesting argument: Within the circumstance characterized by an informational asymmetry, borrower must incur the agency costs and the magnitude of those costs crucially depends on the net wealth held by the borrower. In this context, the rise in asset prices as well as the currency value of the concerned country would increase the net worth of investors, thereby stimulating the FDI via the lower agency costs. [For the related argument, see the financial accelerator theory pioneered by Bernanke and Gertler(1989). Also see Ogawa, Kitasaka, Yamaoka and Iwata(1996) for the empirical study on the Japanese domestic investment which is in line with the agency cost approach.] However, apart from the FDI in the form of M&A and in real estate, it is tenuous if we can apply this argument to understanding of Japan's manufacturing FDI in East Asia. In fact, Japan's manufacturing FDI has been made chiefly by large firms [accounting for 70 to 80% of the total value in the 1990s] who do not seem to significantly have anything to do with incomplete information setting. In addition, the 22th *Wagakuni Kigyono Kaigai Jigyo Katsudo* reports that the FDI made by the small and medium sized firms had reached a peak in the 1988 fiscal year when the Japanese yen appreciation stopped for the time being whereas the asset prices still continued to rise, which seems to point to the irrelevance of the agency cost approach that might assert that the hike in asset prices induces the small and medium sized firms who may be most significantly influenced by an incomplete information to enlarge the FDI through improving their financial position. Rather the key factor that should not be ignored to understand the hump observed in Japan's FDI may be the equity financing carried out largely by the large manufacturing firms.

That is to say, the large manufacturing firms in Japan who could easily pass the then eligibility standards for bond issuance had issued a huge amount of domestic convertible bond and euro-dollar warrant bond in the second half of the 1980s within the favorite background of the hike in sock prices and the then ongoing financial deregulation, and they had utilized the funds raised through the capital market for establishing new domestic and foreign affiliates as well as for investment in financial assets such as *Tokutei Kinsen Sintaku*, *Fandotorasuto* [both are Trust Funds with special booking treatment and tax benefits,] and time deposit with large minimum deposit requirement.

But the Japanese equity financing upsurged in the second half of 1980s may be thought of as a product of fallacies and illusion as pointed out by, say, Bank of Japan(1996): Namely, the Japanese firms have a tendency to emphasize on the direct fund costs appeared in the books and ignore the "capital costs" in its true sense. For example, the domestic convertible bonds were issued at the average rate of 1.56% per annual in the 1989 fiscal year which was far less than the then average discount rate in Japan, 3.78%, and moreover the issuance rate of euro-dollar warrant bonds after structuring the currency swap arrangement temporarily recorded a negative value in 1987. Facing these apparent low rates of interest, it might not be strange that the Japanese corporation rushed into issuing a huge amount of equity related bonds. However, the low issuance rates themselves reflected simply the value of sweetener attached to these bonds, i.e., the option to convert CB or warrant into new shares, and therefore taking the fact of low interest rates with the face value were equivalent to the ignorance of the dilution effect associated with the convertible and/or warrant bonds that the share holders might suffer from. Presumably it may be the case that such factors contributed to this extraordinary behavior that although not observed recently, the then capital market ridiculously had reacted to the new issuance of CB and WB with a good news, which was in stark contrast with the case of the USA, and that the then Japanese accounting system failed to incorporate the international standard of treating part of bond value corresponding to the option as a loss to be written off.

Either way, Japan's FDI seems to have significantly been influenced by the equity financing in the second half of the 1980s, and therefore it is necessary to take account of this in conducting the estimation. For this purpose, we incorporated into an explanatory variable the real stock price index deflated by the Japanese GDP deflator that had been a key factor in determining the fund costs that the corporation really thought to face. In fact, it is relatively easy to verify that the stock prices and the issuance rates of CB and WB are inversely correlated.

Finally, we shall note the role of deregulation for the FDI in East Asian countries. As well known, ASEAN countries have dismantled the FDI regulations since the mid of the 1980s within the unfavorable background of the sharp fall of the primary commodity prices. For example, Thailand who took the first initiative in a wave of deregulation amended the Investment Promotion Law in 1983 to attract the FDI through easing the equity regulation together with the tax and tariff benefits in favor for the labor intensive exports, although one might also add the partial reversal of the FDI policy in 1977. Malaysia also reversed her FDI policy aiming at the attainment of the Bumiputra policy in the aftermath of the serious economic stagnation in 1985 and enacted the Foreign Investment Promotion Law in 1986 to dramatically ease the equity regulation. Subsequently, the success of the FDI led industrialization in Thailand and Malaysia echoed Indonesia and The Philippines, although it was only in 1994 that the former had accomplished the same level of regulations as those in Thailand and Malaysia, while the latter had faced a serious debacle in combating the external debt burden and the subsequent political instability under Marcos' administration. It is also well known that China has dramatically switched its policy stance to the so-called open door policy since the end of 1978, initially setting up the 4 special economic zones and then the 14 coastal open cities in 1984 and 3 regions in 1985, and further enlarging them to the cities in the nation as a whole in 1992 to attract the FDI.

While it is difficult in general to gauge the impact of those deregulation on the FDI, a recent attempt by Fukao and Chung(1996) who applied the principal component analysis to the unpublicized survey data of the FDI regulations compiled by the Ministry of International Trade and Industry fortunately enables us to quantify the magnitude of the tightness of regulations imposed on the Japanese FDI in respective host countries. Table 1 selectively reproduces the first principal component of their analysis which can be interpreted as indicating the magnitude of the tightness of FDI regulations, where the ingredients of regulations comprise the export obligations, import restrictions, local content regulations, employment regulations in favor for the local employees, and equity regulations. As the table shows, the result seems to be consistent with our casual observation in that within the group of NIEs, Hong Kong and Singapore on one hand have been the most open to the FDI with virtually no regulation, while the Korean FDI regulations on the other hand have been the severest, Taiwan having been ranked in the middle. Table also shows that Thailand's regulations have been relatively ease within the group of ASEAN except for Singapore while those of Malaysia and Indonesia have been remarkably weakened especially since the mid of the 1980s. Furthermore, it may be impressive that the Chinese regulations have been relatively severe despite its open door policy.

In any case, since the influence of the FDI regulations cannot be disregarded, we decided to exploit this index as a proxy to gauge the tightness of FDI regulations, and incorporated it into the right hand side of the estimation equation as an additional explanatory variable signified by *FDIREG*, although somewhat ad hoc. Unfortunately, however, these are available only for 1980, 1983, 1986, 1989, 1992 fiscal years in which the comprehensive survey were made. Given this limitation, we decided to use these only for the pooling analysis, where we supplemented the missing date with the appropriate smoothing. It should be noted in passing that we could not take into account the impacts of fiscal beneficiary measure such as tax benefits and tariff concessions that almost all the countries except for Hong Kong have implemented, due to the lack of appropriate data. It was because this that we dared to assume away the impact of tax on the FDI and the use of intermediate input in production within the theoretical framework.

Given those considerations, the final estimation equation can be reduced to

$$\text{(17)} \quad \ln I_t = b_0 + b_1 \ln(\frac{w}{w^{JPN}}) + b_2 \ln(\frac{w^{ROW}}{w^{JPN}}) + b_3 \ln(\frac{TOPIX}{P^{JPN}})$$
$$+ b_4 \ln Q_{p,t} - b_5 \ln K_t - b_6 FDIREG + u_t$$

where $TOPIX$ and P^{JPN} are, respectively, the Tokyo Stock Exchange Stock Price Index and the Japanese GDP deflator, all the relative wages and the real stock price are the indices with 1990=100, and the expected signs of parameters except for b_0 and b_1 are all positive. Note that while the expected demand and capital stock data as well as the FDI data were compiled on the fiscal year basis, the relative wages were constructed on the calendar year basis. But we cannot help ignoring this inconsistency of data interval. Furthermore, taking account of the possibility of mutual correlation of the FDIs in respective countries, the estimation was carried out by SUR.

B. The Estimation Result

Table 2 shows the estimation result associated with NIEs, where the first and second columns in respective country headlines were jointly estimated with the common parameter estimate for the expected demand term obtained by the pooling method, and we exploited as the third country's wage, w^{ROW}, the geometrical average of relative wages in ASEAN and China for the countries except for Hong Kong with the weight of the FDI share in real term, and the relative wage of China for Hong Kong which has kept a close economic relationship with it, respectively. Note that the result for Hong Kong would not significantly change even when we utilized the average wage of ASEAN and China instead of just the Chinese one. We also added several dummy variables in order to accommodate the apparent outliers due to, say, the policy changes, the political instability, the significant fluctuation of the FDI value per project observed in chemical and steel/nonferrous metal industries, although the results are not reported.

The inspection of the terms of relative wage against Japan reveals that the signs of estimated parameters are all negative and statistically significant except for

Korea, indicating that the Japanese FDI towards NIEs tends to increase when the Japanese wage relative to those in NIEs goes up. Secondly, the estimates of the term associated with the third country's relative wage are all negative, again, except for Korea and statistically significant for Taiwan and Singapore. That is to say, the FDI towards NIEs tends to decrease when the wages in ASEAN and China relative to that in Japan go down. This in turn implies that Japanese firms have viewed NIEs as a competitive candidate with ASEAN and China.

Thirdly, the estimates of the parameters associated with the real stock price are all positive and statistically significant, which lends support to the hypothesis that the Japanese FDI have been in part backed by the extraordinarily favorable financial environment in the second half of the 1980s. Fourthly, contrary to our expectations, we failed to estimate the capital stock terms with a right sign except for Korea, and the statistical significance for Korea is somewhat low. Finally, while all positive as expected, the statistical significance of the estimates associated with the expected demand term is generally low, with Korea being significant only at 10% on one side tail.

To recapitulate, it is concluded that Japan's manufacturing FDI towards NIEs has been dominated by the production relocation motivation, and that the expectations for demand expansion have played a rather minor role. Within this broad environment, the FDI has partly been stimulated by a favorite wind of the soaring stock prices, especially in the second half of the 1980s.

Note that as the second columns show, the foregoing results continue to hold even when we dropped the capital stock term of which estimation was unsuccessful. Also note that the explanatory power of the model for Singapore seems to be relatively low compared with those of other countries. In fact, Japan's FDI towards Singapore has persistently increased despite the steady rise in her relative wage largely due to the appreciation of the Singapore dollar since 1988. This in turn suggests that there may be a room for improving the model: Although within the reach of guess, the FDI in Singapore may have been undertaken with a view to the strategic complementarity consideration within the intra-ASEAN production network in which Singapore plays a regional headquarter role as well as the intra-regional procurement center one. Also note that the third country's relative wage term associated with Hong Kong is estimated with the wrong sign, although statistically insignificant. As previously mentioned, it is highly probable that the FDI in commercial sector has been inadvertently classified in the manufacturing FDI, presumably because many local subsidiaries often conduct the sales activity as well as the production one. In this context, we should note that while the total cumulative value of Japan's FDI towards Hong Kong is the second largest in Asia, following Indonesia, the amount per project has been relatively small despite the large number of projects. One source of the unsuccessful estimation for Honk Kong may be that while officially classified in the manufacturing FDI, the FDI towards Hong Kong has been truly the commercial investment and/or the investment in headquarter to control the affiliates located in southern China.

Next we shall explain the estimation results associated with ASEAN and China, where we exploited as the third country's wage the average wage of NIEs with the weight of the FDI share in real term for Thailand and Malaysia, and Thailand's wage for Indonesia and The Philippines, respectively, since Thailand seems to have been a direct competitor with the latter countries for the locational candidate in contemplating the FDI in ASEAN. Note that the FDI data of China is shorter, started only from 1980, so we applied Schmidt's(1977) method to obtain the consistent estimate of the variance-covariance matrix of the residuals. Note also that we added several dummies as additional explanatory variables to absorb the apparent outliers due to, say, the policy changes and so on, although the results are suppressed. Finally, we only report the estimation results with the capital stock terms being eliminated since the estimation results with them were in general unstable, suggesting the possibility of the multi-colinearity.

As Table 3 shows, the similar results are obtained for ASEAN and China. First, the estimates of own relative wage term are all negative with the statistical significance, and the estimates of the third country's relative wage term are all positive and almost statistically significant. Moreover, the sum of these two estimates are negative except for Malaysia and Indonesia, indicating that the rise in the Japanese wage due to, say, the yen appreciation leads to the increase of the FDI towards these regions even when taking account of its indirect effect on the third countries, i.e., NIEs. It can thus be concluded that Japan's manufacturing FDI in East Asian countries have responded straightforwardly to the changing relative wage structure in this region, which may be in line with our common sense.

Secondly, similarly to the case of NIEs, the estimates of the real stock price terms are positive for Thailand, Malaysia and China with the former two being statistically significant, while those of Indonesia and Philippine have wrong sign. One interpretation may be that the FDIs in Indonesia and The Philippines have lagged behind those in Thailand and Malaysia due to the difference in the general investment environment such as the FDI regulations, the physical infrastructure and the political stability, and therefore concentrating on the years after the stock prices crashed. A typical case is the FDI in The Philippines in which Japan's FDI had been rather stagnant until the early 1990s because of the political instability and the insufficient infrastructure, especially its low capacity of generating electric power, and it was only since 1994 that Japan's FDI in Philippine has been recovered, which now concentrates on the CALABALIZON area in Luzon island.

Finally, although the sign conditions are ensured, the estimates of the expected demand terms are not in general statistically significant. A sole exception is the estimate of China which is statistically significant at 1%, indicating the importance of the expected market expansion in this country. Either way, the production relocation motivation has predominated in the FDIs in ASEAN and China, and the market consideration seems to have played a relatively minor role except for China.

However, those results may not be instructive since the sample interval is too short, only 17 years. In order to check the robustness of the results, therefore, it may be desirable to estimate the equation with the pooled data. Table 4 shows the results, where we made the estimation for NIEs and ASEAN separately, and we also eliminated China from the data sample since China seems to be worthwhile being isolated as an independent entity. Note also that we exploited as the third country's relative wage the same variable as before, and that we inserted several dummy variables to deal with the outliers as well as the country effect. As clearly seen, the results are broadly in line with the foregoings: We obtain the positive estimates for the own relative wage term and the negative estimates of the third country's relative wage term, both of which are statistically significant at the conventional significance level. Furthermore, the real stock price terms are all positive and statistically significant at 1% level even after controlling the relative wage effects. However, the estimates of the capital stock adjustment effect again have a wrong sign, though statistically insignificant, and finally the expected demand terms are estimated positively with NIEs being statistically significant only at 10% on one side tail.

More interesting is the fact that the country dummies associated with Taiwan and Singapore are estimated positively with the statistical significance at 1%, suggesting the importance of the relatively tighter FDI regulations in Korea previously touched upon. On the other hand, while the estimates of the country dummies associated with ASEAN are not statistically different from zero except for Philippine whose investment environment had not been good due to the economic and political instability at least before the early 1990s, this does not necessarily imply that the FDI regulations have been less important for these countries since our estimation was made independently of that in NIEs.

It is therefore worthwhile carrying out the estimation by pooling the data of all the countries and adding the proxy for the tightness of the FDI regulations, *FDIREG*, to gauge the importance of the FDI regulations. The results are shown in Table 5, where the estimation was made in a similar way regarding the third country's relative wage and the dummy variables. Since the estimate of the capital stock term is not statistically significant as before, we focus only on the results without that term. Note that the estimates of the country dummies are suppressed. As table shows, the results other than that associated with the FDI regulation proxy are the same as before, and the estimate of *FDIREG* is positive and statistically significant at 1% as expected. That is to say, the surge in Japan's FDI towards East Asian countries has reflected not only the changing relative wage structure and the large swing in stock prices, but also the deregulation of the FDI that almost all the countries have attempted

4. Concluding Remarks

The paper empirically tried to elucidate the macro-economic determinants of Japan's manufacturing FDI in East Asian countries that has greatly increased since the mid of the 1980s by using a simple theoretical framework. To summarize the main results briefly, Japan's manufacturing FDI in East Asia has had an aspect characterized as the production relocation investment in our sense and has responded straightforwardly to the changing relative wage structure across those countries including Japan. It has also significantly been affected by a wave of the FDI deregulation that has been implemented in many host countries since the mid of the 1980s. In this broad environment, the soaring stock prices had helped lower the fund costs that the firms really thought to face, thereby stimulating the FDI, although temporarily in the second half of the 1980s.

As previously mentioned, however, the empirical study on the FDI necessarily confronts a serious obstacle in data availability and this paper is not an exception. Furthermore, we were not successful in estimating the stock adjustment effect and the expected market effect, whose main cause may lie in our usage of a single common variable to capture the respective effects. Meanwhile, Japan's manufacturing FDI in the 1990s seems to have shifted its importance to the investment for serving the local domestic market as typically exemplified in the auto industry, reflecting the surge in the middle class in urban area who are able to enjoy the higher purchasing power, so we need to improve the theoretical framework to accommodate this aspect. More than these, the search on the reason for the persistent rise in the relative wages in NIEs as well as Japan that has so far been a main driving force to generate the surge in the FDI in East Asia remains yet to be answered. But those subjects must be delegated to the future research.

Appendix: The Data Sources

Foreign Direct Investment (I): We used the approved and notified FDI data compiled by the Japan's Ministry of Finance and publicized in *Zaisei Kinyu Toukei Geppo* [*Ministry of Finance Statistics Monthly*].

Investment Deflator (p_K): We basically relied on the data published in the world Bank, *The World Table, 1995*, and the data for the recent several years that are not available were supplemented by the respective national account statistics.

Manufacturing Wage per Hour (w): For the NIEs' countries except for Taiwan, the data are available from ILO, *Yearbook of Labour Statistics*, various years. For Taiwan, we used the data publicized in CEPD, *Taiwan Statistical Data Book*, various years, and DGBAS, *Statistical YearBook of the Republic of China*, various years. For the ASEAN countries except for Singapore, we exploited as a proxy the per capita consumption, and calculated the latter by IMF, *International Financial Statistics*, various issues. For China, we used the data in State Statistical Bureau, *China Statistical Yearbook*, 1996. Note that the missing data for 1979, 1981 and 1982 were supplemented by regressing the manufacturing wage on the industry wage. The Japanese wage data were obtained from Toyo Keizai Shinposha, *Keizai Toukei Nenkan 1996* [*Economic Statistics Yearbook* .] We converted those wages in terms of the respective national currencies into the US dollar denominated ones by using the exchange rates published in IMF, *International Financial Statistics* and others.

Real Stock Price ($TOPIX/P^{JPN}$): We deflated the Tokyo Stock Exchange Stock Price Index of the 1st listed shares by the Japanese GDP deflator. The data were obtained from Toyo Keizai Shinposha, *Keizai Toukei Nenpo* and EPA, *Annual Report on National Accounts*.

Real Capital Stock (K): We constructed this data by using as a benchmark the cumulative FDI at the end of 1977 fiscal year and applying the perpetual inventory method with the depreciation rate of 0.04.

Real Sales Value of the Japanese Affiliates in Asia (Q): We used the data compiled by the Japan's Ministry of International Trade and Industry and publicized in

Wagakuni Kigyono KaigaiJigyo Katsudo [*The Foreign Activities of the Japanese Firms*] various years, and *KaigaiTousi Toukei Souran* [*The Comprehensive Survey on the Foreign Activities of the Japanese Firms*] for 1980, 1983, 1986, 1989, 1992 fiscal years. The daflators were constructed by using the manufacturing GDP deflators available from the World Bank, *The World Tables,* and the respective national accounts.

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Figure 1 Rationalization vs. Production Relocation

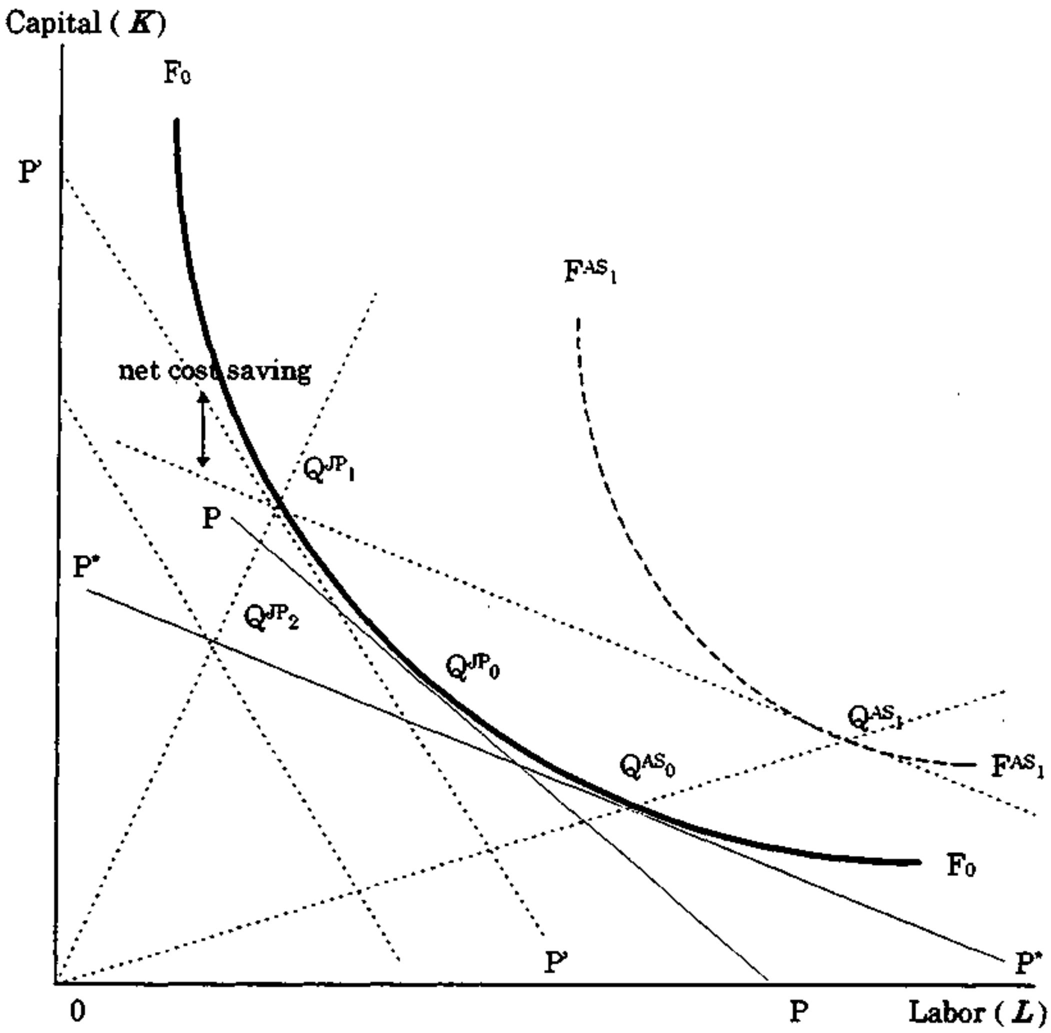
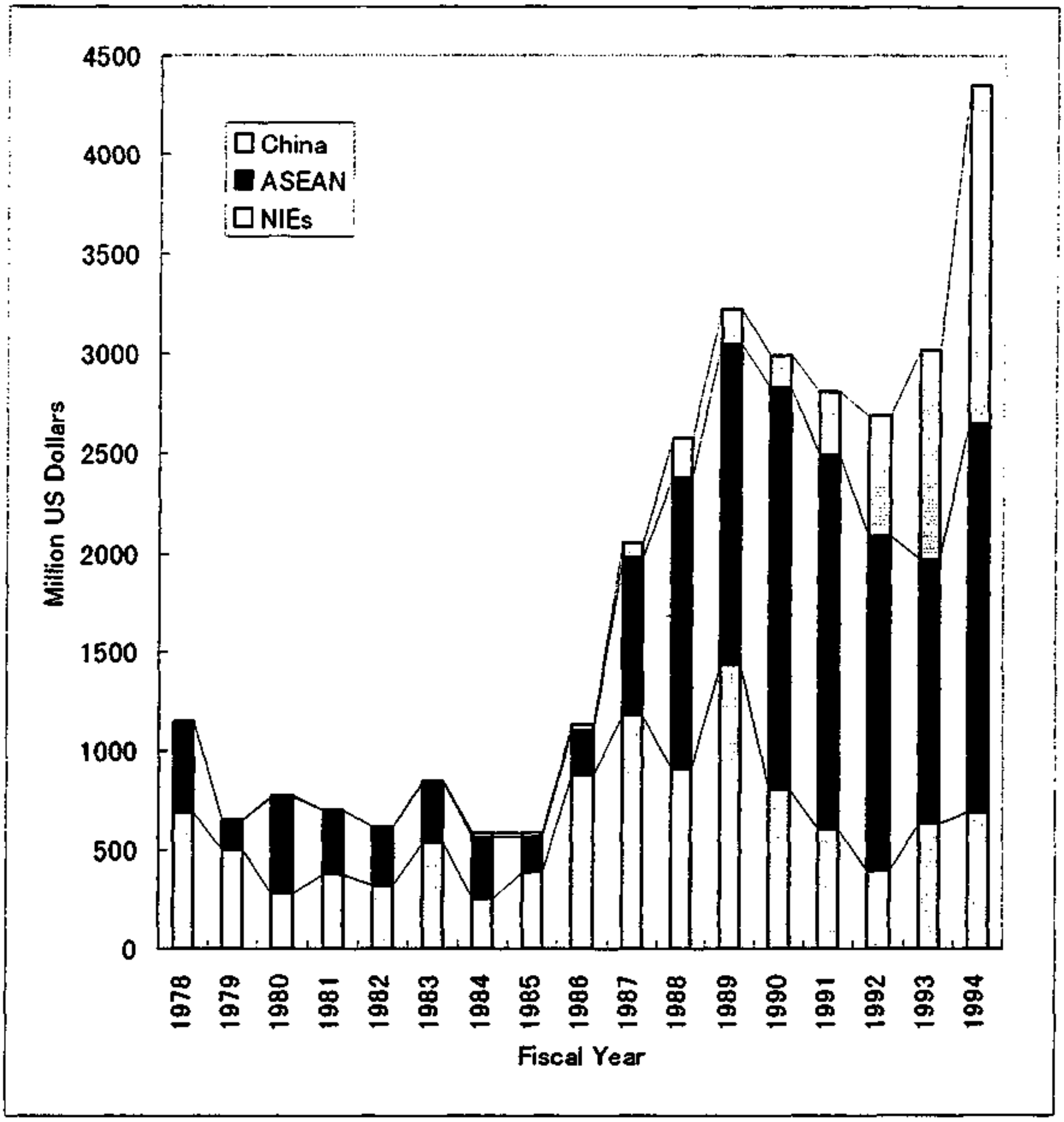
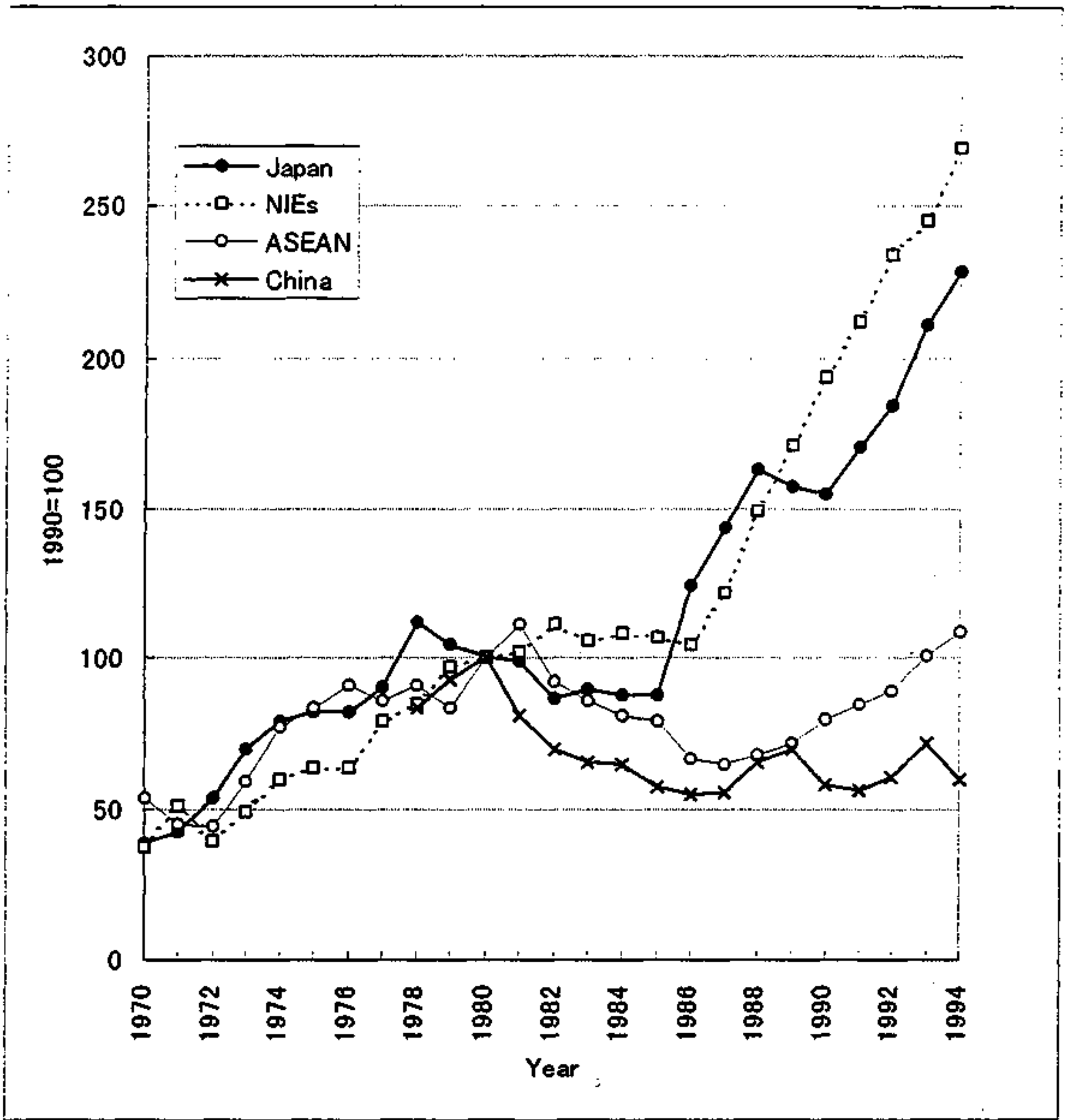


Figure 2 Japan's Manufacturing FDI in East Asia (1990 year prices)



Note: NIEs includes Korea, Taiwan, Hong Kong and Singapore. ASEAN includes Thailand, Malaysia, Indonesia and Philippine. The Japanese fiscal year starts from April.

Figure 3 The Relative Wages of East Asian Countries and Regions in Manufacturing Industries against the US (1980=100)



Note: The relative wages of NIEs and ASEAN are the geometric averages of those in respective regions with the weights of the FDI share.

Table 1 The First Principal Component of the Principal Component Analysis on the Requirements for the Local Operation imposed on the Japanese Firms

	Fiscal Year				
Country	1980	1983	1986	1989	1992
Korea	1.93	1.40	1.03	0.15	0.51
Taiwan	0.43	0.53	−0.09	−0.34	−0.44
HongKong	−2.08	−1.78	−2.00	−1.61	−1.06
Singapore	−1.59	−1.48	−1.76	−1.45	−1.32
Thailand	0.78	0.77	0.52	0.86	1.07
Malaysia	1.28	2.04	1.38	1.03	0.93
Indonesia	1.19	2.09	1.58	0.52	0.52
Philippine	1.77	2.57	2.09	1.95	1.41
China	1.61	1.61	1.61	2.14	1.46
North America	−1.45	−1.69	−1.95	−1.69	−1.60
European Union	−0.88	−1.14	−1.60	−1.29	−1.11
Oceania	−0.84	−0.34	−0.96	−1.35	−1.39
India	2.77	1.90	5.16	2.88	0.59
South America	1.96	1.57	1.67	0.60	−0.21
Avearge of 39 Countries	0.21	0.15	0.11	−0.24	−0.46

Note: The FDI regulations include the export obligations, import restrictions, local content regulations, employment regulations, equity regulations, and the restriction on remittance of dividend imposed on the Japanese FDI.

Source: Fokao and Chung(1996), p.27.

Table 2 Japan's Manufacturing FDI in NIEs

Explanatory Variables	Country							
	Korea		Taiwan		Hong Kong		Singapore	
Constant	5.0964	-3.6537	-5.0467	-1.2780	-3.5018	0.0353	-11.992	-9.8132
	(0.780)	(-1.191)	(-1.466)	(-0.840)	(-0.813)	(0.012)	(-1.954)[c]	(-2.387)[b]
$ln(w/w^{JPN})$	-1.2067	-2.1159	-1.2229	-0.6362	-2.0047	-1.5313	-2.7291	-2.2621
	(-1.791)	(-8.437)[a]	(-2.354)[b]	(-3.261)[a]	(-3.625)[a]	(-3.293)[a]	(-2.946)[b]	(-4.356)[a]
$ln(w^{ROW}/w^{JPN})$	-0.2410	0.7030	1.0449	0.5761	0.3035	-0.1236	2.7923	2.3633
	(-0.324)	(1.818)[c]	(2.364)[b]	(2.675)[b]	(0.659)	(-0.476)	(3.005)[b]	(4.136)[a]
$ln(TOPIX/P^{JPN})$	1.2927	1.5332	1.6483	1.4644	0.4999	0.5231	1.1254	1.0376
	(4.088)[a]	(5.689)	(7.479)[a]	(9.349)[a]	(2.696)[b]	(2.633)[b]	(3.057)[b]	(2.862)[b]
lnK_1	-0.7734	-	0.3595	-	0.3987	-	0.2052	-
	(-1.528)		(1.273)		(1.284)		(0.453)	
lnQ_p	0.7364		0.0374		0.9360		0.9042	
	(1.605)		(0.086)		(1.506)		(0.894)	
$adjR^2$	0.886	0.881	0.937	0.938	0.802	0.790	0.653	0.678
DW	2.087	2.033	2.470	2.435	2.540	2.377	2.366	2.292

Note: w^{ROW} is the average wage of ASEAN and China for Korea, Taiwan and Singapore, the Chinese wage for Hong Kong respectively. t values are in parentheses.

a : significant at 1%

b : significant at 5%

c : significant at 10%

Table 3 Japan's Manufacturing FDI in ASEAN and China

Explanatory Variables	Thailand	Malaysia	Country Indonesia	Philippine	China
Constant	9.6956	- 5.8262	- 1.7812	23.386	- 21.789
	(1.536)	(-2.421)[b]	(-0.254)	(3.703)[a]	(-5.126)[a]
$ln(w/w^{JPN})$	- 4.4471	- 2.2682	- 4.4390	- 2.9954	- 1.9653
	(-2.681)[b]	(-6.172)[a]	(-6.026)[a]	(-3.891)[a]	(-5.328)[a]
$ln(w^{ROW}/w^{JPN})$	2.5304	2.5005	5.7258	0.4911	0.7673
	(2.679)[b]	(8.518)[a]	(4.409)[a]	(0.417)	(1.545)
$ln(TOPIX/P^{JPN})$	0.9539	0.7881	- 0.6514	- 0.1908	0.2545
	(2.706)[c]	(4.091)[a]	(-1.060)	(-0.435)	(0.903)
lnQ_p	0.0795	0.6769	0.4598	- 0.5874	2.9101
	(0.176)	(1.044)	(1.016)	(-1.036)	(2.720)[a]
$adjR^2$	0.847	0.917	0.722	0.842	0.897
DW	1.088	1.508	2.646	1.812	1.618

Note. w^{ROW} is the average wage of NIEs for Thailand, Singapore and China, and the Thai's wage for Indonesia and Philippine. t values are in parentheses.

a : significant at 1%

b : significant at 5%

c : significant at 10%

Table 4　Japan's Manufacturing DFI : The Pooled Data

Explanatory Variables	NIEs		ASEAN	
$ln(w/w^{JPN})$	-1.2078	-1.1708	-2.8669	-2.9222
	(-3.793)[a]	(-6.917)[a]	(-5.451)[a]	(-9.334)[a]
$ln(w^{ROW}/w^{JPN})$	0.5942	0.5470	3.3999	3.5444
	(1.887)[c]	(2.845)[a]	(5.491)[a]	(10.83)[a]
$ln(TOPIX/P^{JPN})$	1.2481	1.2214	0.5066	0.5137
	(8.713)[a]	(9.496)[a]	(2.835)[a]	(2.819)[a]
lnK_1	0.0159	-	0.0697	-
	(0.089)		(0.262)	
lnQ_p	0.4395		0.1435	
	(1.612)		(0.262)	
Constant	-2.9060	-2.5851	-0.8400	-0.6086
	(-1.210)	(-1.828)[c]	(-0.282)	(-0.283)
DTW	0.4901	0.4902		
	(5.017)[a]	(5.064)[a]		
DHK	-0.1133	-0.1232		
	(-0.711)	(-0.897)		
DSP	1.0220	1.0136		
	(5.647)[a]	(6.021)[a]		
DML			0.0416	0.0536
			(0.295)	(0.433)
DIN			0.0380	0.0306
			(0.155)	(0.129)
DPH			-0.9325	-0.9520
			(-4.061)[a]	(-4.166)[a]
$adjR^2$	0.850	0.851	0.913	0.908

Note: *DTW, DHK, DSP, DML, DIN, DPH* are the dummy variables for Taiwan, Hong Kong, Singapore, Malaysia, Indonesia and Philippine, respectively. t values are in parentheses.

a : significant at 1%　b : significant at 5%　c : significant 10%

Table 5 Japan's Manufacturing FDI : The Pooled Data of 9 Countries

Explanatory Variables	(1)	(2)	(3)
Constant	- 10.164	- 9.0802	- 9.3491
	(-12.35)[a]	(-8.121)[a]	(-9.031)[a]
$ln(w/w^{JPN})$	- 0.2092	- 0.3987	- 0.2691
	(-3.880)[a]	(-3.918)[a]	(-3.066)[a]
$ln(w^{ROW}/w^{JPN})$	0.6194	1.5318	1.6105
	(4.963)[a]	(10.01)[a]	(15.67)[a]
$ln(TOPIX/P^{JPN})$	1.2712	1.6905	1.6301
	(18.81)[a]	(16.39)[a]	(15.67)[a]
lnK_1	0.6917	-	-
	(13.06)[a]		
lnQ_p		0.1136	
		(0.533)	
FDIREG	-	-	- 0.4319
			(-3.480)[a]
$adjR^2$	0.979	0.972	0.975

Note: The estimates of country dummies as well as other dummies are suppressed.

t values are in parentheses.

a : significant at 1%

b : significant at 5%

c : significant at 10%