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Restructuring Regional Distribution of FDI: Convergence between Japanese and US Manufacturing FDIs

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Abstract. There have been numerous changes in the international economic environment for foreign direct investment (FDI) over the past decades. More than ever, the trend towards globalization has stimulated both firms and countries to establish closer cross-border economic linkages and interdependence throughout the world. This study finds evidence that there has been a convergence in the regional distribution pattern between Japanese and US manufacturing FDIs among six host regions in the period of 1976-1996. We also present evidence that this convergence can be accounted for by the converging responses to competitive advantages of the investing and host country firms, and to comparative advantages of the resource endowments of investing and recipient nations.

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Keywords: Foreign Direct Investment (FDI), Globalization, Japan, the United States, Eclectic Paradigm, Convergence, Time Trend

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I. Introduction

There have been numerous changes in the international economic environment for foreign direct investment (FDI) over the past decades. More than ever, the trend towards globalization, particularly since the early 1980s, has stimulated both firms and countries to establish closer cross-border economic linkages and interdependence throughout the world. This, in turn, has fostered a reconfiguration of both geographical and industrial compositions of multinational enterprises' (henceforth, MNEs) activities. This globalization process, coupled with technological advances, has led to an increasing convergence of economic structures among developed countries over time. It has also contributed to generating new markets between developed and developing countries, and functions as a stimulus to the promotion of competitiveness-enhancing policies by the governments engaged in FDI. In addition, the elimination or reduction of trade barriers has put more pressure on MNEs to sustain and/or augment their global competitive advantages by securing created assets and inputs from the cheapest and most reliable sources, and by exploiting both vertical and horizontal economies of scale and the benefits of geographical clustering (Dunning, 1995).

Based on these observations, this study attempts to investigate the following two issues with focus: (i) how the regional distribution of FDI by MNEs has been restructured from the 1970s to the 1990s; and, more specifically, (ii) how Japanese MNEs' FDI compares and contrasts with US MNEs' in terms of regional distribution. This study finds evidence that there has been a converging pattern in the regional distributions of Japanese and US manufacturing FDIs among six host regions in the period of 1976-1996. We also present evidence that this convergence can be accounted for by the changing competitive advantages of the investing and host country firms, and of the resource endowments of investing and recipient nations.

Technically, in showing evidence of convergence between Japanese and US FDIs over the sample years 1976-1996, we first present the time trend of estimated correlation coefficients between the two countries' FDIs and test whether a converging time trend is true by regressing the estimated correlation coefficients on time; second, we adopt the "differences-in-differences" approach to identify what the determinants of the convergence in time trend are if the convergence has really happened; and third, a seemingly unrelated regression model is also utilized to deal with possible contemporaneous correlations between the two countries' FDIs.

The remainder of the paper is as follows. Section II describes notable trends of FDI for the two countries using basic descriptive statistics. Section III offers some theoretical explanations for these trends based on the related literature. We conduct empirical analyses of Japanese and US FDI data, and then perform various tests of the hypotheses formulated in Section III. Beginning with documenting the time trend of estimated correlation coefficients of Japanese and US regional FDIs over the sample period of 1976-1996, we present more thorough empirical results using the specifications based on the eclectic paradigm of international production (Dunning, 2000). Summary and conclusions are given in Section V.

II. Changes in the Regional distributions of Japanese and US FDIs

In the 1970s, the Japanese FDI focused predominantly on adjacent countries within its economic sphere of influence. Such FDI was mainly of a "natural resource seeking" and "vertically-oriented efficiency seeking"[1] kind. By contrast, most of the US FDI was concentrated in Canada and Europe, which can be characterized as "market seeking" or "horizontally-oriented efficiency seeking." These differences can be accounted for by the comparative economic advantages and market opportunities of both investing and host countries, not to mention psychic distance. However, over the last twenty years, the Japanese MNE activity has changed its industrial and geographical profiles to place more emphasis on the European and North American markets as destinations for FDIs in the context of "market" and "horizontal efficiency." By contrast, the US FDI has placed more emphasis on Asian markets as a "vertical efficiency" seeking. As a result, the regional distribution of both countries' FDI flows has been reversed in recent decades.

We now provide basic descriptive statistics on the regional distributions of Japanese and US FDIs between developed and developing countries; and between six major regions of the world. Table 1 presents data on the total amount of Japanese and US FDI stocks and flows, and Table 2 presents data on the distributions of Japanese and US manufacturing FDI stocks across six regions between 1975 and 1996 which are broken down by three periods.

1. FDI Distribution between Developed and Developing Countries

Table 1 shows that the regional distribution pattern of the US-outbound FDI over time has not changed as much, or as drastically, as those of Japanese outbound FDI, while a moderate

[1] The literature makes distinction between vertical efficiency seeking FDI, designed to exploit the benefits of Hechscher-Ohlin type specialization while horizontal efficiency seeking FDI which is designed to capture the advantages of scale and scope economies.

increase in the US FDI in developing countries can be noticed. The average flow of the US FDI into developing countries between 1977 and 1979 was about 24 percent, while developed countries attracted 76 percent of US FDI stocks in 1979. These statistics clearly show a historical concentration of the US FDI in developed countries. This propensity to heavily favor developed countries by US MNEs has changed only slightly since the 1980s. While the share of US FDI flows going to developing countries has increased, the strong preference for developed countries -- particularly European countries -- is still clearly evident in 1996.

By contrast, the distribution of Japanese FDI between developed and developing countries has been remarkably restructured since the 1980s. The share of Japanese FDI stocks directed to developing countries decreased from 55 percent in 1979 to 34 percent in 1989 and to 31 percent in 1996. Correspondingly, the share directed to developed countries increased throughout the 1980s and the 1990s, from 45 percent in 1979 to 69 percent in 1996.

2. Manufacturing FDI Distribution among Six Regions

The changing patterns of the regional distributions of Japanese and US manufacturing FDIs (henceforth, MFDI) across six regions are presented in Table 2.[2] It can be seen that, throughout the 1980s and 1990s, the Europe has been the most attractive and dominant location for US MFDI. Africa, Latin American, and Middle East markets have maintained similar shares in US MFDI. However, the shares of US MFDI in Canadian[3] and Asian markets have changed

[2] Data on the distribution of Japanese manufacturing FDI at the country level are available only after 1989, so we rather perform a region-level analysis.
[3] In the US data, the region of North America includes only Canada. Mexico is classified as Latin America. Since Mexico became a member of NAFTA in 1994, this may cause some sort of a group-classification error. However, this potential problem does not seem serious because (i) the year 1994 is almost the last part of our sample period 1976-1996 and (ii) changes in Japanese and US FDI flows into Mexico from 1993 to 1996 were in fact not apparent: even though Mexico's share of the Japanese FDI flow rose from 0.1 percent in 1993 to 1.5 percent in 1994, the share went down to 0.4 percent in 1995 and 0.2 percent in 1996.

substantially. While Canada has gradually lost its attractiveness for US MFDI from 24.7 percent in the 1970s to 17.4 percent in the 1990s, Asia has become more attractive as US MFDI recipient countries from 9.9 percent in the 1970s to 16.9 percent in the 1990s.

In the case of Japan, the changing patterns of Japanese MFDI among the six regions since 1975 could be described as complete geographical restructuring. Not only the Asian region, which was the most favorable location for Japanese MFDI in the 1970s, but also much of Africa, Latin America, and Middle East countries have lost considerably their attractiveness to draw Japanese MFDI in the 1980s and the 1990s. By contrast, North American and European countries became the first and third most important destinations of receiving Japanese MFDI in the 1990s. With these changes in the FDI pattern described, we will review possible theoretical explanations for the changes, which helps us construct the framework of our empirical analysis.

III. Possible Explanations and Testable Hypotheses

1. Dunning's explanation

According to Dunning (1993, 1997), the different geographic distribution pattern of FDI between the 1970s and the 1990s can be explained by reconfigurations of the competitive advantages of firms, the location advantages of countries, and the ways in which firms organize their cross-border value-added activities in accordance with the previous two sets of advantages. In light of Dunning, we discuss the changes of FDI below. First, in the 1970s, the core competencies and ownership advantages of Japanese and US MNEs were largely derived from the resource endowments and capabilities of their home countries, and by Japanese MNEs' privileged possession of or access to specific intangible assets. However, in the late 1980s and the early 1990s, such competencies were increasingly related to the ability of MNEs to govern and coordinate their own specific assets across national boundaries and to use these in conjunction with new competitive advantages obtained from the host countries or regions where MNEs engaged in value-added activities.

Second, factor endowment and accessibility to local markets, which were the critical location determinants of MNE activities in the 1970s, have been replaced by the quality and availability of created assets and access to regional markets in the 1990s. Aligned to this, the location-specific advantages of countries in the 1970s were primarily those of a Hechscher-Ohlin (H-O) kind, noticeably their possession of natural resources, cheap labor, the size of local markets, and final products. However, since the 1980s, other reasons have become more influential: accessibility to created assets and supportive physical and organizational infrastructure can provide more opportunities for firms to exploit economies of scale and scope and to integrate value-added activities at the regional or global level. Third, because of the changed nature and characteristics of the competitive advantages of firms, and their increasing needs to engage in asset-creating activities outside their national boundaries, inter-firm collaborative arrangements, mergers and acquisitions (M&A),[4] have become a major modality of FDI for firms from both developed and developing countries.

With these two points combined, we can say that the major determinants of the geographic pattern of outbound FDI in the 1990s have changed substantially compared to those

[4] The value of all M&As (domestic and cross-border) has grown at an average annual rate of 42 percent during the past two decades (1980-1999). Based on a simplistic assumption that all cross-border M&As are financed by FDI, the ratio of world cross-border M&As to world FDI flows has increased from 52 percent in 1987 to 83 percent in 1999. While the ratio for developed countries has risen from 45 percent in 1999 to 63 percent, that for developed countries does from 62 percent in 1987 to more than a hundred percent in 1999. Although these statistics do not take into account the fact that not all cross-border M&As are financed by FDI, they lend support to the increased importance of M&As in FDI flows (UNCTAD, 2000).

in the 1970s. Although the H-O characteristics of home countries still explain the geographic distribution pattern of some kinds of FDI in the 1990s, particularly in the North-South context, MNEs have placed an increasing emphasis on establishing globally integrated production systems, and on promoting their global or regional product, processing and marketing strategies (Dunning, 1997). These, in turn, have been made possible by advances in technology and liberalization of cross-border markets. This also suggests that, as MNEs locate an increasing proportion of their value-added activities outside their home countries, the location-specific characteristics of home countries diminishes in importance as an element influencing their competitive advantages (Gray, 1995).

2. Behavioral Changes of Japanese and US MNEs

Concerning the Japanese MNEs, the most significant change has been a reorientation of its FDI from developing to developed countries. There are many factors underlying these changes. First, we could observe the growing competitiveness of Japanese firms in sectors such as automobiles and consumer electronics previously dominated by US and European producers. Second, Japanese government's deregulation of foreign exchange controls in December 1980, combined with the development of the Euromarkets (e.g., Euro-currency and Euro-bond markets) and other financial deregulations in developed countries, gave considerable impetus to the integration of global financial markets and to the increase in Japanese FDI outflows. Third, the Japanese current account surplus, and the appreciation of yen after 1983 were due, in part, to a decrease in portfolio capital exports. At the same time, the excess of domestic savings over investment, resulting from the declining Japanese economic growth, helped to promote large FDI outflows. Fourth, trade barriers such as voluntary export restraints (VER), and orderly marketing arrangements (OMA) by the United States and European countries encouraged Japanese firms to switch from exports to FDI as a modality of serving these markets. Fifth, there was an additional large-scale appreciation of the Japanese yen after the G-5 meeting in 1985.[5] Sixth, the favored locations for Japanese FDI in the 1970s have no longer become attractive. In the first half of the 1980s, most Asian and other developing countries suffered from accumulated debts, wars, political instability, and unfavorable economic conditions arising from global stagnation (Komiya, 1990; Davis & Cull, 1994).

Meanwhile, from the perspective of US MNEs, there have not been many changes in the geographic distribution of their FDI compared to those of Japanese FDI except some increasing share in Asia and a bit decreasing share in North America, which are detailed in Tables 1 and 2. This pattern can be explained by the following factors. First, the increased global competition provided incentives for US MNEs not only to develop new products and technologies, but also to improve the efficiency of their production technologies. *Inter alia*, this stimulated more "vertical efficiency seeking" FDI in Asia. Second, the increased income levels in Asian countries, especially in newly industrialized countries (NICs), created new demands for US FDI. Third, the increased value added activities by US MNEs in the NICs also increased the demand for intermediate inputs, which were frequently produced in adjacent ASEAN countries. Fourth, Asian countries provided more incentives to attract new US FDI (Ramstetter, 1991). Fifth, the emergence of NAFTA caused some switch of US MNEs activities from Canada to Mexico.

3. Testable hypotheses

Based on the previous discussions on the changing regional distributions of Japanese and US FDIs from the 1970s to the 1990s combined with possible explanations, we may derive some

[5] The Japanese Yen appreciated from 164.75 yen per US dollar in 1985 to 99.90 yen in 1987 (IMF, 1997).

specific testable hypotheses. In this paper, we will examine the following two. First, we will investigate whether or not there exists an overall converging time trend in the regional distributions of Japanese and US FDIs from the 1970s to the 1990s. If there is a converging time trend, then our next question is which elements have been the major determinants that led to an overall convergence in Japanese and US FDIs during the past two decades.[6]

Our empirical analysis will focus on whether empirical results are consistent with the following summary of changes shown above: the regional distribution of Japanese FDI was mostly determined by that of H-O resource endowments in the 1970s, and in the 1990s by technology-related variables and/or the desire to augment their strategic assets; by contrast, the regional profile of US FDI in the 1970s was largely determined by the geographical distribution of natural and created assets, by oligopolistic market behavior, and by the desire of US MNEs to exploit specially-related economies of scale and scope; whereas in the 1990s it was also promoted by the desire to better exploit the economies of vertical integration, and/or the need to augment their existing ownership specific advantages.

[6] There are two major streams to explain FDI patterns in international economics/management literatures. First, according to the dynamic comparative-advantage theory of Kojima (1990), the patterns and determinants of Japanese FDI are different from those of US FDI because Japanese and US FDIs are characterized as "trade oriented" and "anti-trade oriented" respectively, and because the major goals of Japanese and US MNEs are "efficiency increasing" and "profit maximizing" respectively. Second, according to the eclectic paradigm of Dunning (1993), the patterns and determinants of FDI are determined by the interaction of the tripod factors: ownership specific advantages (O), location specific advantages (L), and internalization advantages (I). If there is a converging time trend in the distributions and determinants between Japanese and US FDI, it could indicate that the eclectic paradigm of Dunning might be a more relevant theory to explain Japanese and US MNEs' foreign production activities during the past two decades.

IV. Econometric Approach and Empirical Results

We begin with our approaches to showing evidence of convergence between Japanese and US MFDIs over the sample years 1976-1996. For the sake of exposition, we will examine the existence of a converging time trend first, and then what the determinants of the convergence are if the convergence really has happened.

1. Converging Trend of the Regional distributions of Japanese and US MFDIs

Our approach: time trend of correlation coefficients between two countries' MFDIs

To examine whether the Japanese and US FDI distribution patterns have converged over the sample period, we perform the estimation of correlation coefficients between the shares of Japanese and US manufacturing FDIs (in stock) directed to each of the six host regions (i=1,2, .., 6) from 1976 to 1996 (t=1976, 1977, …, 1996).

$$\rho\left(jpfdi_{it}, usfdi_{it}\right) = \frac{COV\left(jpfdi_{it}, usfdi_{it}\right)}{\sqrt{VAR\left(jpfdi_{it}\right)VAR\left(usfdi_{it}\right)}}, \qquad (1)$$

where $jpfdi_{it} = JPFDI_{it} / \sum_{i=1}^{6} JPFDI_{it}$

= share of the Japanese MFDI in region i in year t to its total MFDIs in year t;

$usfdi_{it} = USFDI_{it} / \sum_{i=1}^{6} USFDI_{it}$

= share of the US MFDI in region i in year t to its total MFDIs in year t;

$JFDI_{it}$ = level of the Japanese FDI in region i in year t;

$USFDI_{it}$ = level of the US FDI in region i in year t.

There are several reasons for using the shares of FDI stocks instead of those of FDI flows. First, because FDI is characterized as a long-term investment in nature to own and manage foreign production activities, the study based on annual flow data may not fully capture the importance of accumulated overseas assets. The data used in this paper also show a useful feature that the stock of FDI is less volatile than the flows. Second, the rationale for using the *shares* of FDI rather than the levels is to focus on the changes in *relative* importance of FDI among six regions.

To display the converging pattern between the two countries' MFDI distributions, this paper takes several approaches that complement with each other. First, Model 1 estimates correlation coefficients using the data from year 1976 to the year *t* listed in the first column. For instance, the number 0.16 in the last cell of Model 1's column shows the correlation coefficient for the sample period 1976-1996. To estimate each of the correlation coefficients, we stack the MFDI shares data as in typical panel data: the MFDI data are stacked from the first region to the last one for the first sample year 1976; this is repeated until the last sample year of interest. If there really exists a convergence in time trend, then we expect that the estimated correlation coefficient rises gradually over time. In a slightly different angle, Model 2 estimates correlation coefficients using the observations only from each (single) year listed in the first column. This is to obtain the correlation coefficient for each year and see the time trend out of these annual correlation coefficient estimates. Since each year's observation is only six, possible errors in estimates ought to be taken into account. To alleviate this small sample problem while keeping the spirit of Model 2 in our analysis, Model 3 does similar tasks using the observations from the year *t* listed in the first column and one year after that year, *t*+1; Later models do the same tasks with a greater time interval of *t* to *t*+2, *t* to *t*+3, and finally *t* to *t*+4 in Models 6.

Dynamics of estimated correlation coefficients

Estimation results in Table 3 show the clear converging trend of the regional distributions of Japanese and US MFDIs from 1976 to 1996. According to the correlation coefficients of the regional distribution from Model 1 which uses data from the base year 1976 to a specific year of interest, a negative correlation gets smaller until 1985, and then the correlation becomes a greater positive number of 0.16 in 1996, the last sample year. In a slightly different context, we reestimate the correlation coefficients using different models, Models 2, 3, 4, 5, and 6 which use data from a specific year to some years after that year. These models help us look at correlations that are specific to a particular time interval over time. Model 2 shows each individual year-specific correlation coefficient estimate for all sample years. The results show a remarkably rapid increase in correlation coefficient (since early years' observations are not contributed to the estimation of ρ this time), suggesting strong evidence of convergence over time in FDI patterns between the two countries from -0.08 to 0.30. Then we add observations from one year later (t+1) to the previous model in Model 3. The estimation results become smoother since more observations are used in estimation. To avoid repetition, we summarize our results using Model 6, which is based on the observations from t to t+5. Estimated correlation coefficients become higher as time goes through the 1970s, 80s, and 90s. Correlation coefficients are -0.09 in 1976-80, 0.20 in 1985-89 and 0.33 in 1992-96.

A test of time trend

We also run the regression of these estimated correlation coefficients from each model on the time variable (year t = 76, 77,…, 96). In all regressions, the Wald test results reject the null hypothesis that there is no time trend with a p-value far less than 0.01. Finally, all the results are recapitulated by Figure 1 showing a steady pattern of convergence, regardless of the choice of models. These results support our first hypothesis that there has been a convergence in the regional distributions of Japanese and US MFDIs from the 1970s to the 1990s with a high statistical significance.

2. Decomposition of the converging trend

Given the fairly strong evidence of convergence in two countries' FDIs over time, our next topic is what has caused such convergence. To deal with that, we will propose regression models below to examine whether the two countries' FDI behavioral equations have converged over time, and present empirical results later.[7]

Empirical specification

To investigate the determinants of the convergence over time for the regional distributions of Japanese and US MFDIs, we adopt the framework of "eclectic paradigm" as the conceptual basis of our regression analysis. The primary reason for utilizing this framework is that the paradigm is widely accepted as the most comprehensive explanation of FDI activities by MNEs (Urata, 1991). It is based on the attempts to integrate both firm- and country- specific variables affecting the geographical distribution of FDI. For this reason, this framework can be used to explain international trade and production within the same analytical framework (Ietto-Gillies, 1992; Markusen, 2001). It also means that more specific and operationally testable models of international trade and production can logically coexist within this paradigm without

[7] Since the two countries have been leading economic powers in the world during the sample period, systematic differences in explanatory variables between them are unlikely not to mention changing differences in explanatory variables. This conjecture is supported by our analysis of correlations in explanatory variables between Japanese and US MFDIs among six regions. It shows that they remain almost constant throughout the sample period. Then the remaining issue is to see whether the responses of the two countries to various competitive advantages have converged over time.

overemphasizing any particular model (Tolentino, 2001). As a result, our explanatory variables include ownership- (O), location- (L), and internalization- (I) specific advantages with the interaction between home- and host-country characteristics, and are classified into "natural resource", "market", "efficiency", and "strategic asset" seeking. Table 4 provides a summary of definition, measurement, motivation and sources of all these variables.

It is worthwhile to mention that since it is sometimes hard to distinguish between some of the OLI variables or between "efficiency" and "strategic asset" seeking FDIs, some variables represent more than one advantage or motivation. For example, tax rates may be viewed as an L or I variable. For some MNEs trying to integrate regional production by taking advantage of lower tax rates of a host country within a region, tax rates can be a "governance" type advantage. For others, however, they may be treated as an L advantage in cases where tax rates help to reduce production costs. In addition, infrastructure (GFDI) and government policy to FDI (TAX) variables could be classified into the motivation of "efficiency" or "strategic asset" seeking. This would suggest that higher levels of infrastructure and/or favorable government policies to FDI could be used by MNEs to optimize their structure of established FDI (efficiency seeking) or to promote their long-term strategic objectives (strategic asset seeking). Based on these discussions, we propose the following two specifications for estimation.

Specification 1:

$$\begin{aligned} fdi_{ijt} &= DT_t\alpha + \beta DJ_j + X_{ijt}\gamma + \left(X_{1,ijt}\cdot DT_t\right)\delta_1 + \left(X_{2,ijt}\cdot DT_t\right)\delta_2 + \ldots + \left(X_{k,ijt}\cdot DT_t\right)\delta_k \\ &\quad + \left(DJ_j\cdot X_{1,ijt}\cdot DT_t\right)\theta_1 + \left(DJ_j\cdot X_{2,ijt}\cdot DT_t\right)\theta_2 + \ldots + \left(DJ_j\cdot X_{k,ijt}\cdot DT_t\right)\theta_k + \varepsilon_{ijt} \end{aligned} \tag{2}$$

where $fdi_{ijt} = FDI_{ijt} / \sum_{i=1}^{6} FDI_{ijt}$

= share of the MFDI by country *j*'s region *i* in year *t* to the total MFDIs of *j* country in year *t*:

DT_t = a 1×4 vector of time interval dummies: DT_t=[$T1_t$ $T2_t$ $T3_t$ $T4_t$] ,[8]

where $T1_t$ = 1 if year *t* belongs to time interval 1976-1980 and zero otherwise;

$T2_t$ = 1 if year *t* belongs to time interval 1981-1985 and zero otherwise;

$T3_t$ = 1 if year *t* belongs to time interval 1986-1990 and zero otherwise;

$T4_t$ = 1 if year *t* belongs to time interval 1991-1996 and zero otherwise;

DJ_j = dummy for Japan: DJ_j =1 if country *j* is Japan and zero otherwise;

$X_{ijt} = [X_{1,ijt}\ X_{2,ijt}\ \cdot\cdot\cdot\ X_{k,ijt}]$, a 1×*k* vector of variables representing OLI advantages, where its first column element is $X_{1,ijt}$, and the last one is $X_{k,ijt}$;[9]

$X_{q,ijt} \cdot DT_t$ = a 1×4 interaction vector of DT_t and $X_{q,ijt}$ for *q*=1,2, ..,*k*;

$DJP_j \cdot X_{q,ijt} \cdot DT_t$ = a 1×4 interaction vector of DJP_j and $X_{q,ijt} \cdot DT_t$;

ε_{ijt} = error term for country *j*'s region *i* in year *t*;

$\alpha = [\alpha_{T1}, \alpha_{T2}, \alpha_{T3}, \alpha_{T4}]$, a 4×1 vector of coefficients for time dummies, where α_{Tl} is the time interval *Tl*-specific intercept (with *l*=1, 2, ., 4), β is the coefficient for the Japan dummy, γ is the vector of coefficients for *X*, $\delta_1 = [\delta_{1,T1}, \delta_{1,T2}, \delta_{1,T3}, \delta_{1,T4}]$, a 4×1 vector. For instance, the first element $\delta_{1,T1}$ is the time interval T1-specific coefficient for $X_{1,ijt} \cdot DT_t$, and $\theta_1 = [\theta_{1,T1}, \theta_{1,T2}, \theta_{1,T3}, \theta_{1,T4}]$, a 4×1 vector, where $\theta_{1,T1}$ is the time interval T1-specific coefficient

[8] Clearly, it is the best to allow a year *t*-specific dummy variable for each year from 1976 to 1996 (21 year dummies in total). Doing so, however, limits degrees of freedom too much, and we cannot obtain statistically significant results, and hence testing hypotheses are not possible. Therefore, we introduce time dummies for the time intervals, 1976-1980, 1981-1985, 1986-1990, and 1991-1996.

[9] See the discussions of those variables above and Table 4 also.

for $DJ_j \cdot X_{1,ijt} \cdot DT_t$; since other elements can be explained similarly, they are not discussed for brevity.

This specification utilizes some sort of "difference-in-differences" estimation technique, which is popularly utilized in quasi-experimental studies with their focus on identifying policy effects or program evaluations (Heckman et al., 1999). The interaction term $X_{q,ijt} \cdot DT_t$ captures the time trends of the impact of variables $X_{q,ijt}$. If Japanese and US FDI patterns converge over time, then the coefficient of $DJ_j \cdot X_{q,ijt} \cdot DT_t$ for q=1,2, ..,k, should converge to zero; or more realistically, it should get smaller as time goes by: $\theta_{1,T1} > \theta_{1,T2} > \theta_{1,T3} > \theta_{1,T4}$ if all the coefficients are positive, or $\theta_{1,T1} < \theta_{1,T2} < \theta_{1,T3} < \theta_{1,T4}$ if negative.

Note that specification 1 is based on the independence between the error terms for two countries. If there exists contemporaneous correlation between the errors, we need to construct the following system of equations, the so-called Seemingly Unrelated Regression (SUR), to achieve consistent estimation of the standard errors, which permits precise tests of hypotheses.[10]

Specification 2:

$$jpfdi_{it} = DT_t\alpha_{jp} + X_{it}^{jp}\gamma_{jp} + \left(X_{1,it}^{jp} \cdot DT_t\right)\delta_{1,jp} + \left(X_{2,it}^{jp} \cdot DT_t\right)\delta_{2,jp} + \ldots + \left(X_{k,it}^{jp} \cdot DT_t\right)\delta_{k,jp} + \varepsilon_{it} \quad (3)$$

$$usfdi_{it} = DT_t\alpha_{us} + X_{it}^{us}\gamma_{us} + \left(X_{1,it}^{us} \cdot DT_t\right)\delta_{1,us} + \left(X_{2,it}^{us} \cdot DT_t\right)\delta_{2,us} + \ldots + \left(X_{k,it}^{us} \cdot DT_t\right)\delta_{k,us} + \eta_{it},$$

where $jpfdi_{it}$ and $usfdi_{it}$ were defined in equation (1);

DT_t and $X_{q,it} \cdot DT_t$ are similarly defined as in equation (2);

ε_{it} = error term for Japanese MFDI in region *i* in year *t*;

η_{it} = error term for US MFDI in region *i* in year *t*,

[10] An anonymous referee made this useful point.

and $COV(\varepsilon_{it}, \eta_{it})$ may not be zero (contemporaneously correlated);

α_{jp}, γ_{jp}, δ_{jp} and θ_{jp} are the coefficients of independent variables for Japan;

α_{us}, γ_{us}, δ_{us} and θ_{us} are the coefficients of independent variables for US.

Note that since two regression equations represent Japanese and US MFDI determination models respectively, country dummy *DJ* and its interaction with other variables are thus absent in Specification 2. The time trends in the coefficients of the variables $X_{q,it} \cdot DT_t$ for the two countries should become similar over time if convergence really has happened. We will display the point estimates of $X_{q,it} \cdot DT_t$ for two countries, respectively, and then test whether two countries' trends are identical later.

Data

The data used in our study come from various sources over the sample period. First, the shares of MFDI stocks (the dependent variable) for the United States are obtained from the Survey of Current Business published by the US Department of Commerce. For Japan, those are obtained from the Financial Statistics of Japan published by the Department of Finance of Japan gives information and the EXIM Review by the Export-Import Bank of Japan. In accordance with the eclectic paradigm mentioned earlier, we use eight independent variables: indices of globalization, market size, market growth rates, labor costs, infrastructure, inflation rates, tax rates and competitive advantages. They are available from International Financial Statistics by IMF, OECD Stan Database for Industrial Analysis by OECD, and World Development Indicators by World Bank. Each variable's definition, measurement, motivation, and source are detailed in Table 4.

Estimation results

a. Results from specification 1

Table 5 presents the estimation results from specifications 1 and 2. Our econometric analysis identifies the determinants of Japanese and US MFDI using the data from six host regions in four time periods (1976-80, 1981-85, 1986-90, and 1991-96). Specification 1 (the full model) shows the "difference-in-differences" estimates of the OLI advantage variables. As mentioned earlier, the interaction term $X_{ijt} \cdot DT_t$ captures the time trends of the impact of variables *X* (henceforth, the "changing" effects of *X* over time). Our ultimate interest is on whether Japanese and US FDI patterns converge over time. This issue can be addressed by looking at whether the coefficient of $DJ_j \cdot X_{ijt} \cdot DT_t$ (henceforth, the "between-country differences" in the "changing" effects of *X* over time) should converge to zero as time passes, after controlling for (i) the country-specific effect by the dummy variable *DJP* and (ii) the common time trends by the vector of variables $X_{ijt} \cdot DT_t$.

Based on the estimated coefficients from specification 1, the between-country differences in the effects of market size (GDP), infrastructure (GFDI), and inflation rates (INF) on the regional distributions of MFDI have been reduced considerably over time and those of market growth (GGDP) have been reduced slightly. Meanwhile, we see slightly-increasing between-country differences in the effects of globalization (GLOB), labor costs (LC), tax rates (TAX), and competitive advantage (MAC). The overall convergence between the two countries' MFDI behaviors can happen, when the impacts of the determinants leading to convergence dominate, which seems quite likely when we add up all the estimated individual time trends. In fact, the previous section about correlation coefficients analysis shows that it really did happen. Looked at another way, the overall convergence shown in the previous section can be decomposed into each of the determinants of the OLI advantages in this section.

In addition, Table 6 shows test results of the null hypothesis that $\theta_{q,T1} = \theta_{q,T2} = \theta_{q,T3} = \theta_{q,T4}$ for $q = 1, 2, \ldots, k$: the between-country differences in the effects of each of the OLI variables have no time trend. The test results suggest that the null hypothesis is rejected with high statistical significance for the variables such as GLOB, GDP, GFDI and MAC, while it is not rejected for the variables such as GGDP, INF and TAX. Combining all the evidence, it seems that convergence has been driven by some variables mentioned above. All these discussions are summarized by Figure 2 displaying convergence for the OLI variables very clearly.

Another column under Specification 1 in Table 5 shows the results from the restricted model which takes out GGDP, INF, and TAX from the full model because our time trend tests suggest that these variables are not highly statistically insignificant (see the results under Specification 1 of Table 6).[11] According to the estimation results from this restricted model, all the coefficients of $DJ_j \cdot X_{ijt} \cdot DT_t$ decrease over time as expected. Again, small changes in specification do not seem to affect our earlier evidence that there has been a converging trend for the determinants of regional distributions of Japanese and US MFDIs from the 1970s to the 1990s.

b. results from specification 2

To deal with possible contemporaneous correlations between Japanese and US data, we adopt Specification 2, the Seemingly Unrelated Regression (SUR), to estimate two countries'

[11] To test whether the between-country differences in the effects of *X* goes to zero over time, we perform the F-test on the hypothesis that coefficients of $DJ_j \cdot DT_t \cdot X_{ijt}$, $\theta_{q,T1} = \theta_{q,T2} = \theta_{q,T3} = \theta_{q,T4}$.

MFDI equations jointly (see Table 5). And then we perform the time trend test for each regressor to see whether there exists any time-varying effect of each regressor. If so, then we will visually examine whether there are converging patterns between the two countries' time-varying coefficients for each of the OLI variables, despite possible sampling errors arising from our small sample.

Concerning Japanese MFDI, the estimated coefficients for GLOB and MAC interacted with the time dummy vector (henceforth, a variable name represents the variable interacted with the time dummy vector) -- ownership (O) specific advantages -- turn from being positive in 1970s to being negative in the 1990s. With the coefficient estimates taken at their face values, this change in sign suggests that an increasing share of Japanese MFDI has been redirected to more globalized and competitively advantaged locations over the sample period. Also, the estimated coefficients for GDP -- representing location- (L) and/or internalization- (I) specific advantages -- have been changed from being positive to negative, and the coefficients for GFDI and INF have been changed from being negative to positive during the same periods. These results indicate that favorable locations for Japanese MFDI have been changed from developing countries to developed countries since the 1970s.

Because LC is measured by the ratio of the home country's average wage to the host country counterpart, this variable can be viewed as a proxy for productivity. Thus, the increasing negative coefficients for LC interacted with time dummies suggest that a higher proportion of Japanese MFDI has been directed to the locations exhibiting higher productivities and more pronounced competitive advantages. It is also worthwhile to mention our test results that except for INF, the effects of all the variables on MFDI have changed over time, which is supported at conventional levels of statistical significance (see the column for Japan in Table 6).

Meanwhile, concerning US MFDI, the coefficients for GLOB and MAC -- ownership (O) specific advantages -- have been more negative and positive, respectively. It indicates that since the 1970s, relatively less competitive regions compared with the United States have received more US MFDIs while more pronounced levels of globalization of host regions compared with that of the United States have attracted more US MFDIs. The coefficients for GDP and LC -- location- (L) and/or internalization- (I) specific advantages -- have been changed from being negative to positive. The coefficients for GGDP have been changed from being positive to negative, and the coefficients for GFDI and INF have been decreased during the same periods. This suggests that a higher share of US MFDI have been redirected to countries where L- and I-bound competitive advantages were inferior to those of the United States. In contrast to the Japanese case, our test results show that the effects of all the variables on US FDI have changed over time except for GLOB and GGDP (see the last column of Table 6).

Figures 3 to 10 display the time-varying effects of key variables from the 1970s to the 1990s for the two countries at the same time. The effect of GDP becomes almost identical at the end of the sample period, and the effects of GLOB, GDP, GFDI, and INF on the distributions of Japanese and US MFDI have been significantly similar after the beginning or middle of the 1980s. However, we do not see convergence for all variables: there are some sort of diverging effects of LC and MAC on the distributions of Japanese and US MFDIs, and it seems that favorable locations for Japanese and US MFDIs have been changed to somewhat opposite directions.

V. Summary and Conclusions

This paper has presented evidence that there has been a converging pattern of the regional distributions of Japanese and US manufacturing FDIs among six regions from the 1970s to the 1990s. We have also shown that this convergence can be accounted for by the changing competitive advantages of investing- and host-country firms, and of the resource endowments of investing and recipient nations in the 1990s.

In summary, the changing Japanese MFDI distribution among six major regions reveals that the rationale behind Japanese MFDI has shifted from an H-O resource seeking nature in the 1970s, mainly directed to developing countries, to a "strategic asset" and "horizontal market" seeking nature in the 1990s, directed to developed countries. In contrast, the changing US MFDI distribution suggests that the major motivation of US MFDI among six regions has been changed from being "market seeking" and/or "horizontally oriented efficiency" seeking in the 1970s to "vertically oriented efficiency" seeking in the 1990s.

Our research also provides some implications for the FDI theory. First, it highlights the dynamics of FDI and it is quite possible to evaluate the evolving characteristics of the OLI components within the eclectic paradigm. Second, because of the increasing interdependence in the economic activities of both firms and countries, each of the components of the paradigm needs to be considered holistically, rather than separately, as an individual component closely interacts with the other.

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Table 1. FDI Distributions between Developed and Developing Countries, 1977 - 1996

Unit: US$ millions

		1977-1979		1979		1980-1989		1989		1990-1996		1996	
		Flow*	%	Stock	%	Flow	%	Stock	%	Flow	%	Stock	%
Japanese	Developed Countries	1854	45	14173	45	15373	69	167899	66	31387	70	387608	69
FDI	Developing Countries	2280	55	17631	55	6837	31	85997	34	13195	30	176320	31
USA	Developed Countries	12506	76	138668	76	13590	74	274564	75	41710	68	566537	72
FDI	Developing Countries	3999	24	48092	24	4744	26	95527	25	19204	32	229957	28

Note: *: Flow is measured as the sample average during the sample period. Sources: Financial Statistics of Japan published by the Department of Finance of Japan, the EXIM Review by the Export-Import Bank of Japan and Survey of Current Business published by the US Department of Commerce.

Table 2. Manufacturing FDI Distributions across Regions, 1975 – 1996

Unit: percents

Home Country	Year	North America	Asia	Africa	Europe	Latin America*	Middle East
	1975-79	17.9	41.8	0.9	5.5	26.4	7.5
Japan	1980-89	33.0	35.5	0.8	8.4	17.1	5.2
	1990-96	47.2	28.4	0.2	16.1	6.6	1.4
	1975-79	24.7	9.9	1.5	48.1	15.3	0.3
USA	1980-89	22.1	12.2	1.2	48.5	15.6	0.4
	1990-96	17.4	16.9	0.5	49.6	14.3	0.8

Sources: See the note in Table 1.

Table 3. Estimated Correlation Coefficients between the distributions of Japanese and US Manufacturing FDIs (in stock) across Six Host Regions, 1976-1996

Year	Model 1[1]	Model 2[2]	Model 3[3]	Model 4[4]	Model 5[5]	Model 6[6]
1976	-0.08	-0.08	-0.09	-0.10	-0.10	-0.09
1977	-0.09	-0.10	-0.11	-0.10	-0.10	-0.08
1978	-0.10	-0.13	-0.10	-0.10	-0.08	-0.06
1979	-0.10	-0.08	-0.08	-0.07	-0.04	-0.02
1980	-0.09	-0.08	-0.06	-0.03	0.00	0.03
1981	-0.08	-0.04	0.00	0.03	0.06	0.08
1982	-0.07	0.04	0.06	0.10	0.11	0.12
1983	-0.05	0.08	0.13	0.14	0.14	0.15
1984	-0.03	0.18	0.16	0.16	0.16	0.17
1985	-0.01	0.15	0.16	0.16	0.17	0.20
1986	0.00	0.16	0.16	0.18	0.21	0.24
1987	0.02	0.15	0.19	0.23	0.25	0.27
1988	0.04	0.22	0.26	0.29	0.29	0.30
1989	0.06	0.30	0.32	0.32	0.32	0.32
1990	0.08	0.34	0.33	0.33	0.33	0.33
1991	0.10	0.32	0.33	0.33	0.33	0.33
1992	0.12	0.34	0.33	0.33	0.33	0.33
1993	0.13	0.32	0.33	0.33	0.32	
1994	0.14	0.34	0.33	0.32		
1995	0.15	0.32	0.31			
1996	0.16	0.30				
Test of Time trend	Yes [7] P-value < 0.00	Yes P-value < 0.00	Yes P-value < 0.00	Yes P-value < 0.00	Yes P-value < 0.00	Yes P-value < 0.00

Note. 1-6: Model 1 estimates correlation coefficients using the Japanese and US regional manufacturing foreign direct investment (MFDI) distribution data from 1976 to the year listed in the first column. For instance, the number 0.16 in the last cell of the Model 1 column shows the correlation coefficient for the sample period 1976-1996; Model 2 calculates correlation coefficients using the observations only from each individual year listed in the first column; Model 3 calculates correlation coefficients using the observations from the year listed in the first column and one year after; Model 4 calculates correlation coefficients using the observations from the year listed in the first column and the following two years; the later columns similarly estimate correlation coefficients using more years included. 7: "Yes" means that there exists the convergence between the USA and Japanese regional FDI distribution patterns over time.

Table 4. Measurements and Sources of Independent Variables

Variable	Measurement	OLI Specific Advantage	Motivation	Source
Globalization (GLOB)	The ratio of FDI in stock to GDP of the home country divided by the host region counterpart	Ownership Specific Advantage	Efficiency Seeking	UNCTAD Handbook of Statistics, UNCTAD International Financial Statistics, IMF
Market size (GDP)	The ratio of per capita gross national production of the home country to the host region counterpart	Location Specific Advantage	Market Seeking	International Financial Statistics, IMF
Market Growth (GGDP)	The ratio of annual growth of per capita gross national production of the home country to the host region counterpart	Location Specific Advantage	Market Seeking	International Financial Statistics, IMF
Labor costs (LC)	The ratio of average wages and salaries of the home country to the host region counterpart	Location or internalization Specific Advantage	Resource or Efficiency Seeking	OECD Stan Database for Industrial Analysis, OECD
Infrastructure (GFDI)	The ratio of gross fixed domestic investment to GDP of the home country divided by the host region counterpart	Location or internalization Specific Advantage	Efficiency or Strategic Asset Seeking	OECD Stan Database for Industrial Analysis, OECD
Inflation Rates (INF)	The ratio of the home country's inflation rate to the host region counterpart	Location or internalization Specific Advantage	Efficiency or Strategic Asset Seeking	International Financial Statistics, IMF
Tax Rate (TAX)	The ratio of total tax revenue to GDP of the home country divided by the host region counterpart	Location or internalization Specific Advantage	Efficiency or Strategic Asset Seeking	International Financial Statistics, IMF
Competitive Advantage in Manufacturing (MAC)	The ratio of machinery and transport equipment to the total value added from manufacturing divided by the host region counterpart	Ownership Specific Advantage	Efficiency or Strategic Asset Seeking	World Development Indicators, World Bank

Table 5. Estimation Results by Specification

variable	Specification 1		Specification 2 (SUR)[2]	
	Full model	Restricted model[1]	Japan	USA
DJ *T1*GLOB	2.85 (1.07)	1.60 (1.72)	---	---
DJ *T2* GLOB	-1.31 (0.68)	-2.02 (1.10)	---	---
DJ *T3*GLOB	-6.55 (1.59)	-4.55 (2.41)	---	---
DJ *T4*GLOB	-4.01 (1.54)	1.21 (2.32)	---	---
DJ *T1*GDP	25.39 (4.87)	29.35 (7.71)	---	---
DJ *T2*GDP	8.78 (4.98)	14.56 (7.21)	---	---
DJ *T3*GDP	0.00 (0.00)	0.00 (0.00)	---	---
DJ *T4*GDP	0.00 (0.00)	0.00 (0.00)	---	---
DJ *T1*GGDP	-0.27 (0.45)	---	---	---
DJ *T2*GGDP	0.08 (0.06)	---	---	---
DJ *T3*GGDP	-0.41 (0.31)	---	---	---
DJ *T4*GGDP	0.19 (0.60)	---	---	---
DJ *T1*LC	-0.14 (0.02)	-0.15 (0.03)	---	---
DJ *T2*LC	-0.14 (0.03)	-0.13 (0.05)	---	---
DJ *T3*LC	-0.15 (0.03)	-0.08 (0.05)	---	---
DJ *T4*LC	-0.30 (0.06)	0.00 (0.08)	---	---
DJ *T1*GFDI	-44.16 (11.14)	-54.24 (12.09)	---	---
DJ *T2*GFDI	-24.53 (10.59)	-29.50 (13.88)	---	---
DJ *T3*GFDI	-4.63 (8.44)	-2.36 (12.05)	---	---
DJ *T4*GFDI	-11.56 (6.85)	-9.40 (10.42)	---	---
DJ *T1*INF	8.52 (7.43)	---	---	---
DJ *T2*INF	-4.76 (8.06)	---	---	---
DJ *T3*INF	4.74 (8.06)	---	---	---
DJ *T4*INF	1.74 (5.87)	---	---	---
DJ *T1*TAX	92.07 (13.95)	---	---	---
DJ *T2*TAX	128.12 (13.58)	---	---	---

DJ *T3*TAX	102.47	---	---	---
	(9.58)			
DJ *T4*TAX	109.07	---	---	---
	(8.46)			
DJ *T1*MAC	-15.42	-13.80	---	---
	(4.92)	(7.67)		
DJ *T2*MAC	-9.75	-4.83	---	---
	(3.57)	(5.68)		
DJ *T3*MAC	-8.91	-1.67	---	---
	(1.89)	(2.68)		
DJ *T4*MAC	-19.77	-6.19	---	---
	(2.49)	(3.62)		
T1*GLOB	-1.81	-1.57	0.93	-1.76
	(0.23)	(0.38)	(1.05)	(0.16)
T2*GLOB	-1.77	-1.64	-3.19	-1.75
	(0.25)	(0.43)	(0.64)	(0.17)
T3*GLOB	-2.34	-2.44	-8.86	-2.24
	(0.79)	(1.13)	(1.37)	(055)
T4*GLOB	-2.14	-3.50	-6.06	-2.42
	(0.74)	(1.24)	(1.34)	(0.49)
T1*GDP	-2.10	-2.56	22.49	-1.82
	(3.66)	(6.04)	(3.32)	(2.47)
T2*GDP	-7.70	-5.07	2.65	-8.34
	(3.49)	(5.75)	(4.50)	(2.42)
T3*GDP	0.00	0.00	-0.00	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)
T4*GDP	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
T1*GGDP	0.09	0.12	-0.00	0.09
	(0.19)	(0.29)	(0.42)	(0.13)
T2*GGDP	-0.01	0.03	0.08	-0.02
	(0.04)	(0.05)	(0.04)	(0.03)
T3*GGDP	0.10	-0.08	-0.29	0.16
	(0.29)	(0.17)	(0.10)	(0.20)
T4*GGDP	0.01	0.08	0.22	-0.01
	(0.40)	(0.50)	(0.44)	(0.27)
T1*LC	-0.03	-0.02	-0.17	-0.03
	(0.01)	(0.02)	(0.02)	(0.01)
T2*LC	0.00	-0.02	-0.15	0.00
	(0.02)	(0.03)	(0.03)	(0.01)
T3*LC	-0.05	-0.06	-0.19	-0.05
	(0.02)	(0.04)	(0.02)	(0.02)
T4*LC	-0.08	-0.23	-0.38	0.07
	(0.04)	(0.07)	(0.05)	(029)
T1*GFDI	37.14	51.52	-14.31	42.11
	(11.12)	(16.49)	(9.74)	(8.16)
T2*GFDI	-5.04	18.54	-25.60	-7.30
	(11.30)	(18.49)	(9.74)	(9.01)
T3*GFDI	3.42	10.13	-1.32	1.63
	(7.96)	(12.81)	(4.41)	(6.38)
T4*GFDI	16.72	19.56	5.45	14.70
	(6.23)	(10.25)	(4.25)	(4.46)
T1*INF	-0.95	1.13	7.50	-0.40
	(5.62)	(6.19)	(4.81)	(3.79)
T2*INF	3.35	2.54	-1.40	3.32
	(2.79)	(4.41)	(7.54)	(1.89)

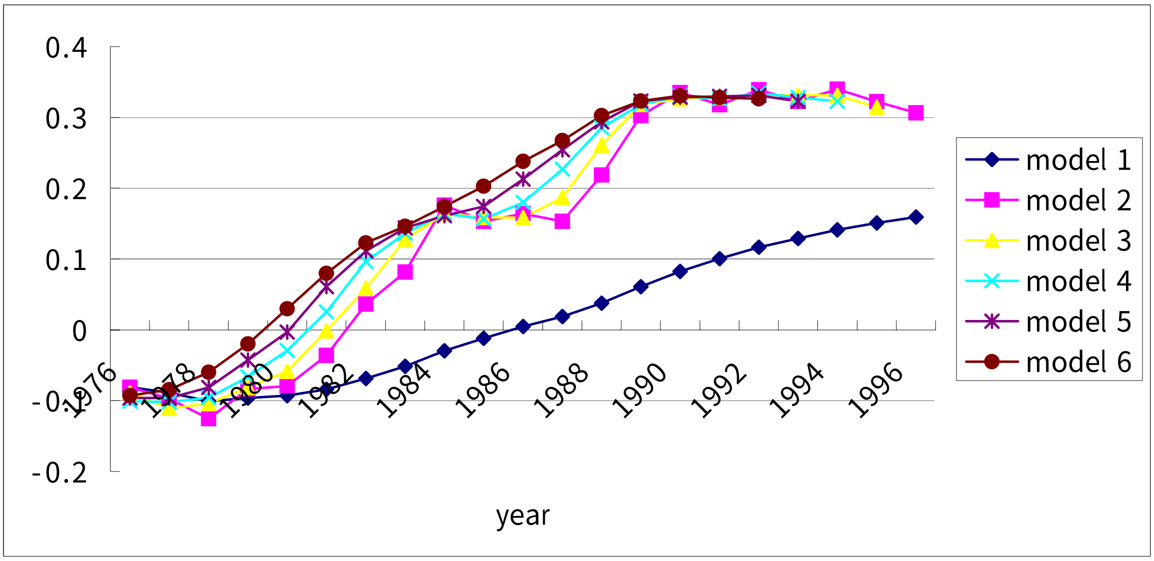
T3*INF	5.57	15.38	10.08	5.38
	(4.42)	(6.64)	(7.26)	(4.04)
T4*INF	-0.16	-0.81	1.24	-0.12
	(0.45)	(0.75)	(5.77)	(0.30)
T1*TAX	-40.61	-19.69	51.62	-38.35
	(6.05)	(9.05)	(12.50)	(4.30)
T2*TAX	-44.36	-12.94	80.77	-44.64
	(6.10)	(9.20)	(12.04)	(4.42)
T3*TAX	-49.97	-11.82	52.50	-50.60
	(5.87)	(8.65)	(8.60)	(5.27)
T4*TAX	-64.31	-15.30	44.78	-64.96
	(5.8)	(7.56)	(6.68)	(4.08)
T1*MAC	1.31	0.52	14.70	1.22
	(4.09)	(6.37)	(2.74)	(2.76)
T2*MAC	6.90	1.31	-3.66	4.49
	(3.12)	(5.15)	(2.70)	(2.24)
T3*MAC	4.86	2.69	-3.97	4.89
	(1.41)	(2.26)	(1.26)	(0.98)
T4*MAC	7.96	0.51	-11.88	8.47
	(1.94)	(3.10)	(1.57)	(1.31)
T1	41.85	10.16	1.94	34.54
	(9.68)	(15.62)	(14.72)	(7.97)
T2	73.18	30.79	16.62	75.40
	(9.74)	(15.76)	(13.29)	(8.39)
T3	59.56	15.31	7.32	61.44
	(9.11)	(14.42)	(7.47)	(10.77)
T4	60.79	29.03	7.99	64.69
	(5.98)	(9.43)	(7.67)	(4.53)
DJ	-52.28	7.88	---	---
	(7.37)	(10.20)		
# OBS	252	252	252	

Note: T1= time dummy for 1976-1980 (T1=1 for1976-1980) ; T2=1 for 1981-1985; T3=1 for 1986-1990; T4=1 for 1991-1996; DJ=dummy variable for Japan (DJ=1 for Japan; 0 for USA). Other variables are interaction terms. The numbers in parenthesis are standard errors. [1]: Specification 2 imposes the restriction that there is no time trend based on the test results (see Table 6 for the test results). [2]: Specification 2 is based on the SUR (seemingly unrelated regression) model, which estimates two different sets of coefficients of the equations for Japan and USA, so some interaction terms (i.e., the triple interaction terms) are not defined by definition.

Table 6. Tests of Convergence by Specification

variable	Specification 1 *F*-statistic	Specification 2, χ^2-statistic	
		Japan	USA
GLOB	9.70	36.71	2.34
(p-value)	(0.00)	(0.00)	(0.51)
GDP	11.89	48.71	20.62
(p-value)	(0.00)	(0.00)	(0.00)
GGDP	1.03	10.22	1.39
(p-value)	(0.38)	(0.02)	(0.71)
LC	2.39	18.28	10.67
(p-value)	(0.07)	(0.00)	(0.01)
GFDI	3.66	10.52	21.12
(p-value)	(0.01)	(0.01)	(0.00)
INF	0.52	1.90	5.05
(p-value)	(0.67)	(0.59)	(0.00)
TAX	1.30	6.81	22.25
(p-value)	(0.28)	(0.08)	(0.00)
MAC	4.42	24.65	8.30
(p-value)	(0.00)	(0.00)	(0.04)

Figure 1. Time Trends of Estimated Correlation Coefficients: the Regional distributions of Japanese and US Manufacturing FDIs (in Stock), 1976-1996



Note: Models 1-6 correspond to those in Table 3.

Figure 2. Estimated Time Trends by Variable under Specification 1

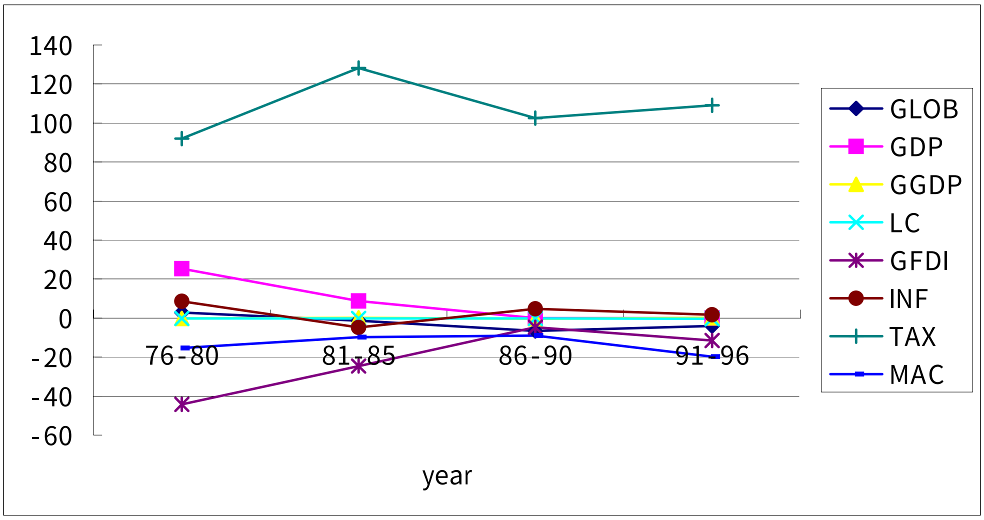


Figure 3. Estimated Time Trend: GLOB in Specification 2 (SUR)

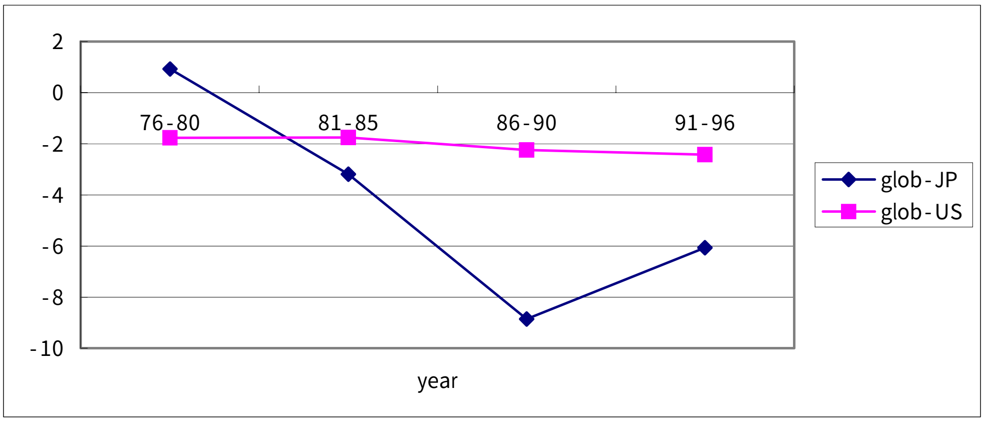


Figure 4. Estimated Time Trend: GDP in Specification 2 (SUR)

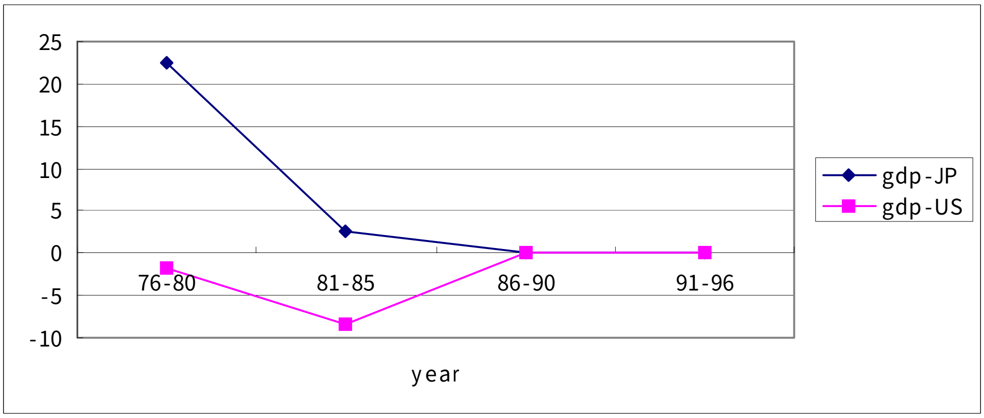


Figure 5. Estimated Time Trend: GGDP in Specification 2 (SUR)

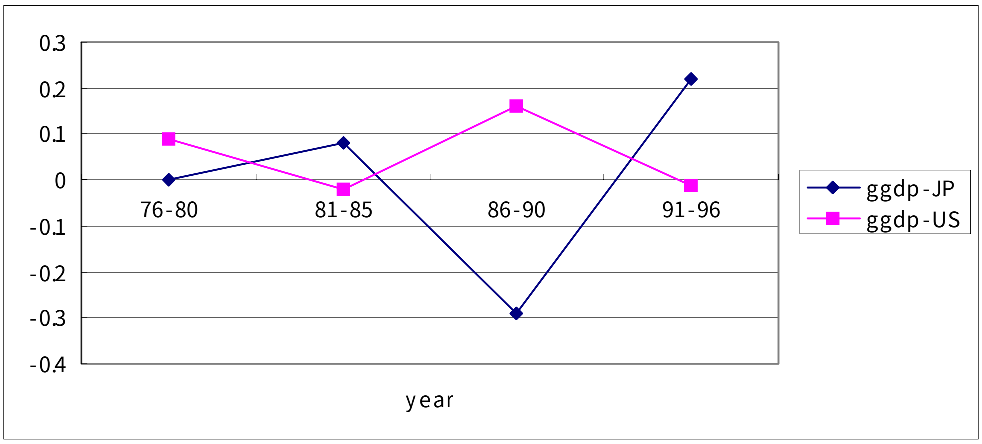


Figure 6. Estimated Time Trend: LC in Specification 2 (SUR)

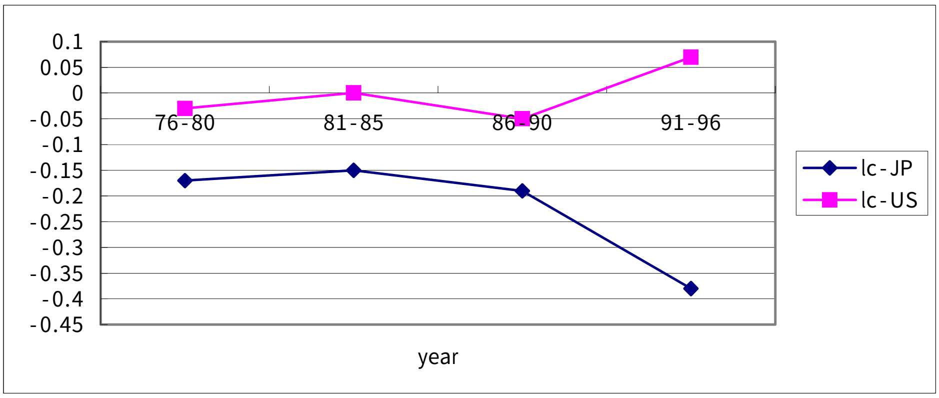


Figure 7. Estimated Time Trend: GFDI in Specification 2 (SUR)

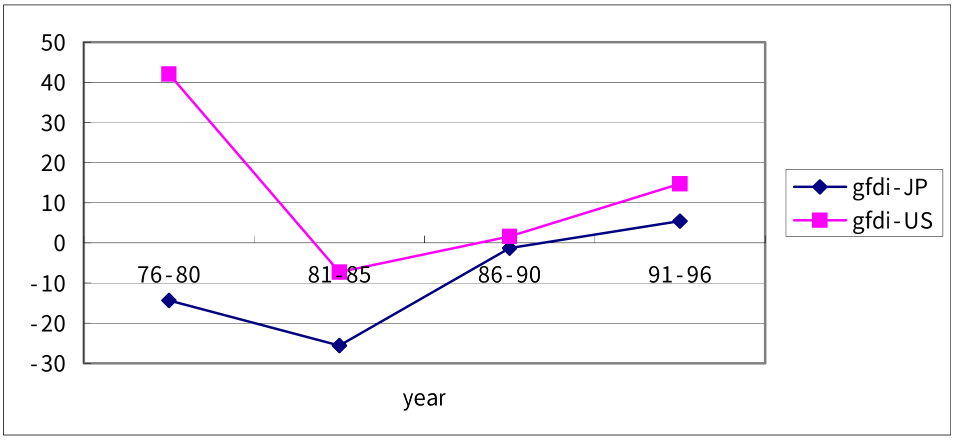


Figure 8. Estimated Time Trend: INF in Specification 2 (SUR)

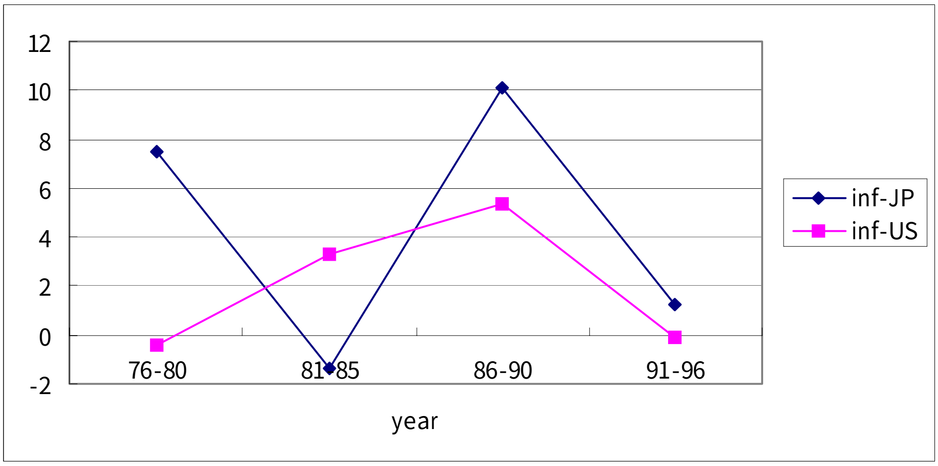


Figure 9. Estimated Time Trend: TAX in Specification 2 (SUR)

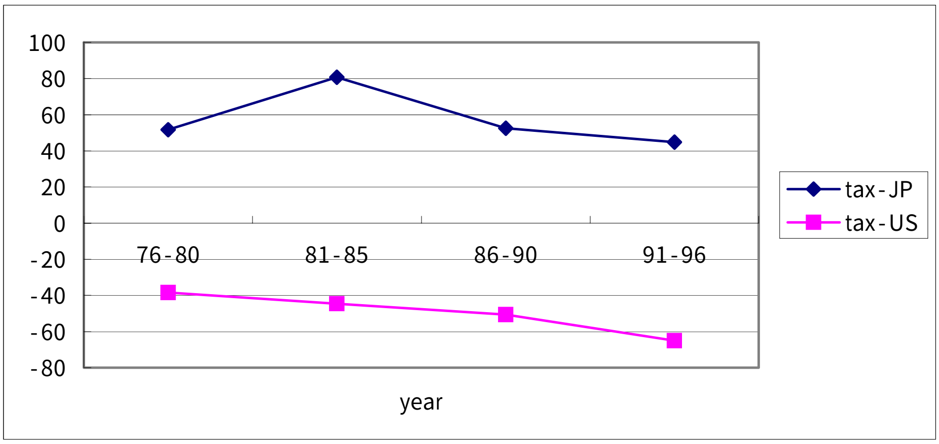


Figure 10. Estimated Time Trend: MAC in Specification 2 (SUR)