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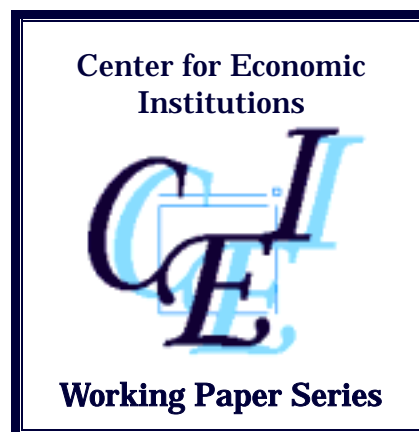# Working Paper Series

"The Performance of Foreign Firms and the Macroeconomic Impact of FDI"

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The Performance of Foreign Firms and the Macroeconomic Impact of FDI

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Abstract

In this paper, I examine the macroeconomic impact of inward FDI in Japan. From a general equilibrium point of view of the macroeconomy, probably the most important host country benefit of inward FDI is improvements in productivity caused by the inflow of managerial resources. In the first part of this paper, which is largely based on the results of Fukao, Ito and Kwon (2005), I review the evidence suggesting that inward FDI raises the average total factor productivity of firms in Japan. In the second part, using a general equilibrium model of an open macroeconomy, I simulate the macroeconomic impact of an increase in the inward FDI stock. The results suggest that if Prime Minister Abe's goal on inward FDI, which is to increase the inward FDI stock to 5 percent of GDP by the end of 2010 is achieved, this will help to raise Japan's GDP by 0.226 percent and real wage rates by 0.156 percent. Dividend payments abroad by foreign-owned firms and the fall in Japan's foreign investment income caused by the inflow of capital (or the decline in capital outflows), will make the increase in Japan's GNP (which includes net foreign investment income) smaller than the increase in GDP. The increase in GNP will be 0.125 percent of GDP.

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1. Introduction

According to economic theory, foreign direct investment (FDI) is a form of long-term international capital movement which is accompanied by investors' intangible assets, such as the accumulated technological knowledge through R&D, management skills, or marketing know-how based on past advertising activity. Because of these intangible assets, affiliates owned by foreign firms are expected to enjoy higher total factor productivity (TFP)[1] and profit rates than the average domestic firm. Such inflows of intangible assets will benefit the Japanese economy. In this paper, I quantitatively evaluate how much the Japanese economy will benefit from increases in inward FDI.

In the first half of this paper, I review some econometric evidence from Fukao, Ito and Kwon (2005) which suggests that foreign firms display higher productivity than domestic firms. The method of investigation in that study is based on the following reasoning: if foreign firms in Japan possess technologies that are superior to those of their domestically-owned counterparts, then this should manifest itself in higher total factor productivity (TFP). In this case, Japan benefits from inward FDI. Like FDI in other developed economies, the largest part of recent inflows to Japan took the form of mergers and acquisitions (M&As). There is, of course, the possibility that foreign firms may enjoy greater productivity because they pick firms with higher TFP as M&A targets. In order to take account of this possibility, the study also tests whether foreigners have tended to acquire firms that already enjoy higher TFP, or whether the acquired firms' productivity improved after the take-over.

The second part of this paper then uses the results of Fukao, Ito and Kown (2005) on the effects of FDI on firm-level productivity to estimate the impact of inward foreign investment on Japan's macroeconomy. Since such investments represent international capital flows accompanied by intangible assets, it is possible to use standard economic theory on the international movement of production factors for the macroeconomic analysis. In the case of FDI, the home country will benefit from the earnings of their affiliates abroad, while in the host country, the higher productivity of foreign firms will increase real wage rates and benefit workers. Foreign firms will have a higher rate of return to capital because of their higher productivity, and this higher rate of return to capital will induce capital deepening through capital imports. This capital deepening will further raise real wage rates and benefit workers in the host country. Using this reasoning and a simple standard macro model, the effects of inward FDI on Japan's macroeconomy and the balance of payments structure will be calculated.

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[1] Several recent studies conducting macroeconomic growth accounting exercises have tried to isolate intangible assets from TFP growth and treat them as a factor input (see, e.g., Corrado et al. 2005, 2006). Since it is very difficult to measure the accumulation of some types of intangible assets at the firm level, in this paper, I take the more traditional approach of treating intangible assets not as factor inputs, so that TFP growth includes the contribution of intangible asset accumulation.

The analysis in this paper focuses on the direct benefits of the higher productivity of foreign firms, which is relatively easy to measure. However, in addition, FDI may also improve Japan's social welfare through a variety other channels. When foreign firms introduce new goods and services, consumers in the host country benefit from these innovations In the case of services, many of which are non-tradable, customers would not be able to enjoy the new services offered by foreign firms if these do not set up a supply-base in the country. Inward FDI may also enhance competition in the host country market and improve market performance. Finally, Japanese firms may also benefit from technological spillovers from advanced foreign firms. These are all pertinent issues with regard to inward FDI and I hope to address these difficult-to-measure benefits in the future.

2. Does Inward FDI Increase Japan's TFP?

Concerning the potential benefits of inward foreign direct investment for the host economy, it has been frequently claimed that such investment, and especially greenfield investment, generates new employment. It has also been argued that export-oriented foreign firms help to improve the host country's current account balance. However, it is important to note that these arguments are based on a partial equilibrium approach and do not take account of second-order effects throughout the economy. For example, the increased competition from foreign firms may also lead to a reduction of employment at domestically-owned firms. Moreover, exports by foreign firms may lead to an appreciation of the host country's currency and therefore potentially do not help to improve its current account balance. In the end, standard macroeconomic theory suggests, the current account balance of an economy with free international capital flows is determined by the saving-investment balance.

From such a general equilibrium point of view, probably the most important host country benefit from inward FDI is the improvement in productivity brought about by the inflow of managerial resources. In this subsection, relying on the results of Fukao, Ito and Kwon (2005; hereafter referred to as Fukao et al.), I review the evidence that foreign firms indeed show a better performance than the average domestic firm.[2]

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[2] Quite a number of studies, on various countries, have dealt with this topic. These typically show that labor tends to be more productive in foreign-affiliated companies than in domestic companies. See, for example, Blomström and Sjöholm (1998) on Indonesia and Griffith and Simpson (2001) on Britain. Doms and Jensen (1998) in their study on the US found that US multinational plants had the highest labor productivity, followed by foreign-owned establishments, while US-owned non-multinational plants had the lowest labor productivity. However, this is generally due to a greater concentration of capital investment; total factor productivity (TFP) analyses indicate that foreign firms' productivity is not necessarily higher if differences in capital intensity are taken into account. Studies coming to this conclusion include Ito (2004b) on Indonesia, Ramstetter (2001, 2002) and Ito (2002, 2004a) on Thailand, and Globerman, Ries, and Vertinsky (1994) on Canada.

Fukao et al. used the firm-level panel data underlying the *Basic Survey of Japanese Business Structure and Activities* conducted annually by the Ministry of Economy, Trade and Industry (METI). The survey covers all firms with at least 50 employees and ¥30 million of paid-in capital in the Japanese manufacturing and mining sectors and several service industries. Fukao et al. used the data for manufacturing firms. Their data cover the period 1994–2000 (1994–2001 in the case of the analysis on M&A). After some screening of the data their panel data consists of 93,880 observations. [3]

In the survey, firms were asked what percentage of their paid-in capital was owned by foreigners and whether they had a foreign parent owning more than fifty percent of the firm. Based on this information, Fukao et al. determined whether a firm is foreign-owned. They used the following two definitions of foreign-owned firms: a broad definition, where one or several foreigners own 33.4 percent or more of the firm's paid-in capital in total, and a narrow definition, where foreign-owned firms are those majority-owned by a single foreign firm. It should be noted, though, that there are several Japanese firms where more than one third of issued stocks are owned by foreign institutional investors as portfolio investment and there is therefore a risk that the broad definition includes such firms. In this paper, I mainly refer to the results for the narrow definition.

Table 1, which is based on the METI data, shows how the presence of foreign-owned firms in Japan's manufacturing sector increased in 1994–2000. The number of foreign-owned firms grew from 195 in 1994 to 236 in 2000. During the same period, the sales of foreign-owned firms nearly doubled from ¥12.2 trillion to ¥23.7 trillion. 62 foreign-owned firms exited and 73 foreign-owned firms newly entered in this period. 61 domestically-owned firms in 1994 had become foreign-owned by 2000. I regard these firms as having been acquired by foreign firms.

INSERT Table 1

The increase in foreign-owned firms' market share was mainly caused by these 61 M&As. The total sales of these 61 firms amounted to ¥14.1 trillion in 2000, which is greater than the total increase in

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[3] Kimura and Kiyota (2007), who used the same data source, examined the relationship between ownership and firms' performance indicators (such as the capital-labor ratio, real value-added and TFP). Covering the period 1994–1998 (fiscal years), their study shows that foreign-ownership has a positive impact on the growth rate of real value-added, the rate of return to capital, and TFP. Compared with Kimura and Kiyota's analysis, the Fukao et al. study is more sharply focused on the TFP level as a measure of performance and the effect of out-in and in-in M&As.

foreign-owned firms' sales of ¥11.5 trillion in the 1994–2000 period.

Fukao et al. measure each firm's TFP level using the method developed by Good, Nadiri, and Sickles (1997). Figure 1 compares the histograms of foreign-owned and domestically-owned firms' TFP. The figure shows that foreign-owned firms tend to have substantially higher TFP levels than domestically-owned firms. The distributions are based on pooled data and determinants of the TFP level other than foreign ownership are not taken into account. Therefore, the derived interpretation carries the risk of being biased. For example, suppose that the average TFP level grows over time and the market presence of foreign-owned firms is also on the rise. In that case, since observations for foreign firms are concentrated in the latter part of the observation period when the average TFP level is higher, in pooled data for the entire period, foreign firms will display higher average TFP than domestic firms even when there is no gap in TFP in any particular year. In order to avoid this kind of bias, Fukao et al. conducted a regression analysis.

INSERT Figure 1

Firms' performance is regressed on the foreign-ownership dummy and firms' other characteristics. As a first step, only the industry and year dummies are used. The main results (using the narrow definition of foreign-owned firms) are as follows (Table 2):

1） Foreign-owned firms' TFP is about 8 percent higher and their current profit-to-sales ratio 1.5 percentage points higher.

2） Foreign-owned firms enjoy slightly higher TFP growth.

3） Foreign-owned firms spend proportionately more on R&D per worker. They also have a significantly higher capital-labor ratio. Probably because of this, the labor productivity of foreign-owned firms is higher than that of domestically-owned firms.

4） There is no significant difference between domestically-owned and foreign-owned firms in the growth rates of real sales and employment. But foreign-owned firms show a significantly lower growth rate of tangible assets.

5） Average wages at foreign firms are ¥1.28 million higher per year.

INSERT Table 2

As we have seen, foreign-owned firms tend to conduct more R&D and pay higher wage rates. Although their TFP level is significantly higher than that of Japanese firms, this difference might be

caused not by the transfer of managerial resources, knowledge, etc., from their parent firms but by their own R&D activities or the (potentially) higher quality of their labor. In order to test which of the above two hypotheses is correct, Fukao et al. empirically examine the determinants of each firm's TFP level and TFP growth rate. Descriptive statistics of the main variables used in the regression are presented in Table 3, while the results of this regression are reported in Table 4. The regression is conducted using OLS and pooled data for 1994–2000.

INSERT Tables 3 and 4

Again, foreign-owned firms display a TFP level about 5 percent higher than that of Japanese firms even after controlling for other factors such as R&D intensity, the percentage of non-production workers, the number of years since the firm was established, and firm size (sales) in addition to industry differences (industry dummies) and the observation year (Table 4.a). However, when Fukao at al. add firm dummies to the regression model, the gap between the TFP level of foreign-owned firms and Japanese firms becomes insignificant. This result suggests that the strong correlation between foreign ownership and the TFP level is at least partly the result of the initially higher TFP level of the firms later acquired by foreign firms. I will discuss this issue in more detail later.

Table 4.b shows that foreign-owned firms have a 1.4–1.8 percentage-point higher (annual) TFP growth rate than Japanese firms even after controlling for other factors. Yet, this positive correlation between foreign ownership and the TFP growth rate again becomes insignificant in the fixed effect models.

Overall, the comparison between foreign-owned and domestically-owned firms shows that foreign-owned companies had a 5 percent higher TFP level as well as higher returns on capital. Moreover, they displayed a higher capital-labor ratio and R&D investment per worker. They also enjoyed a higher TFP growth rate. Probably reflecting the higher levels of capital intensity and technology, foreign-owned companies showed higher labor productivity and wage rates as well. But in the fixed effect models, Fukao et al. could not find a significant positive correlation between foreign ownership and the TFP level or growth rate.

Are Good Firms Chosen as M&A Targets?

As pointed out above, there are two possible theoretical explanations for the positive correlation between foreign ownership and productivity. One potential explanation is that foreign-owned firms enjoy greater productivity because they choose domestic firms with higher TFP as M&A targets. I

call this mechanism the selection effect. The alternative explanation is that Japanese firms that were acquired by foreign firms receive new technologies and management skills from their foreign owners and this transfer of intangible assets boosts their TFP. For short, I call this mechanism the technology-transfer effect. In order to determine which one of the two effects is responsible for the positive correlation between foreign ownership and productivity, Fukao et al. conduct two empirical tests. First, they estimate a Probit model explaining whether a firm is chosen as an M&A target based on its TFP level and other characteristics. Second, they test whether the TFP of Japanese firms that were acquired by foreign firms improves after the investment.

Following the narrow definition of foreign ownership above, Fukao et al. define out-in M&As as cases where a firm that did not have a foreign parent firm with majority ownership at time $t–1$ comes to have a foreign parent firm with majority ownership at time t. In order to compare out-in M&As with in-in M&As (M&As involving only domestic firms), they define in-in M&As as cases where a firm that did not have a parent firm with majority ownership at time $t–1$ comes to have a domestic parent firm with majority ownership at time t. Table 5 shows the number of out-in and in-in M&A cases in Fukao et al.'s dataset. It includes 67 cases of narrowly defined out-in M&As and 1,362 cases of in-in M&As.

INSERT Table 5

Using the panel data of manufacturing firms for 1994–2001, Fukao et al. estimated a Probit model explaining whether a firm is chosen as an M&A target based on its TFP level and other characteristics. The dependent variables are the out-in M&A dummy and the in-in M&A dummy. Each M&A dummy variable takes value one when this type of M&A occurs. As explanatory variables, Fukao et al. use the logarithm of the TPF level, the growth rate of TFP, firm size (the number of workers), the current profit/sales ratio, the total liabilities/total assets ratio, year dummies, and industry dummies. All the explanatory variables are values at the period (time $t–1$) preceding the M&A transaction (time t).

Table 6 shows the estimation results. The determinants of M&As are surprisingly different for out-in and in-in M&As. In the case of out-in M&As, firms with higher TFP, a higher profit rate, and of a larger size are chosen as targets. In the case of in-in M&As, firms with a lower profit rate, larger liabilities, and of a smaller size are chosen as targets. In both cases, the growth rate of firms' TFP (from t-2 to t-1) does not have any significant effect on the selection.

INSERT Table 6

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These results imply that foreign firms acquire Japanese firms that already at the time of acquisition show a better performance. It thus seems that at least part of the higher TFP of foreign-owned firms is the result of the selection effect. In contrast, in-in M&As tend to display characteristics of rescue missions. One possible explanation is that in-in M&As in Japan are mainly conducted within vertical and horizontal keiretsu networks and financially distressed small firms are salvaged by other member firms through M&As.

Do M&As Improve the Performance of Target Firms?

Next, I will explain the technology-transfer effect. Fukao et al. examined this effect by estimating how the performance of out-in and in-in M&A target firms changes after the acquisition. The following econometric model is estimated:

$$Y_{f,t+\tau} - Y_{f,t-1} = \alpha + \beta_1 outinM\&ADummy_{f,t} + \beta_2 ininM\&ADummy_{f,t}$$
$$+ \sum_i \gamma_i X_{i,f,t-1} + \sum_j \delta_j IndustryDummy_{j,f,t} + \sum_T \theta_T YearDummy_{T,f,t} + \varepsilon_{f,t}$$

where $Y_{f,t}$ denotes the performance of firm f in year t. As $Y_{f,t}$ they used the logarithm of the TFP level, the logarithm of the number of workers, and the current profit/sales ratio. It is quite likely that it takes several years for technology-transfer effects to manifest themselves and in order to take account of this time lag, the effects two years ($\tau=1$) and three years ($\tau=2$) after the acquisition are examined. As explanatory variables, they used out-in and in-in M&A dummies in year t, the values of the three performance variables (the logarithm of the TFP level, the logarithm of the number of workers, and the current profit/sales ratio) in year t-1, the R&D/sales ratio, the total liabilities/total assets ratio, industry dummies, and year dummies. In the case of the estimation where changes in employment are the dependent variable, they used sales per worker as an additional explanatory variable in order to take account of labor hoarding.

The regression results on the effects two years ($\tau=1$) after the acquisition are reported in Table 7, while the results on the effects three years later ($\tau=2$) are reported in Table 8.

INSERT Tables 7 and 8

The results indicate that out-in M&As improve target firms' TFP level and current profit/sales ratio. Compared with out-in M&As, in-in M&As bring a smaller and slower improvement in target firms' TFP level and there is no improvement in the current profit/sales ratio. The impact of out-in M&As on target firms' employment is also sharply different from that of in-in M&As. In the case of in-in M&As, there is a significant and positive effect on employment two years after the acquisition, while in the case of out-in M&As, the effect on employment is negative but insignificant.

Overall, Fukao et al. found some evidence showing that target firms' TFP improved as a result of out-in M&As. Compared with in-in M&As, out-in M&As bring a larger and quicker improvement in TFP and the profit rate but, at least in the short-run (i.e., two years after the acquisition) do not increase employment at the target firms.

The overall comparison between foreign-owned and Japanese companies shows that foreign-owned companies enjoyed 5 percent higher TFP as well as higher earnings and returns on capital. They also displayed a higher capital-labor ratio and higher R&D intensity. Reflecting their higher TFP and labor-saving production patterns, foreign-owned companies showed higher labor productivity and wage rates as well. By estimating Probit models, it was found that foreign firms acquire Japanese firms with higher TFP levels and higher profit rates. In contrast, in-in M&As seem to have the characteristics of rescue missions. Small firms with a higher total liability/total asset ratio tend to be chosen as targets of in-in M&As. Fukao et al. also estimated the dynamic effects of M&As on target firms. The results indicate that out-in M&As improve target firms' TFP level and current profit/sales ratio. Compared with in-in M&As, out-in M&As bring a larger and quicker improvement in TFP and the profit rate but no increase in target firms' employment two years after the acquisition.

To sum up the above results, both the selection effect and the technology-transfer effect appear to play a role in explaining the positive correlation between foreign ownership and productivity. The transfer of intangible assets from foreign firms to M&A takeover targets represents one important avenue by which Japan can benefit from FDI, and the evidence presented here shows that such a technology-transfer effect is indeed operating.

3. The Macroeconomic Impact of Inward FDI

In March 2006, then-Prime Minister Junichiro Koizumi set a new goal on inward FDI.[4] The target was to achieve an increase of the inward FDI stock to 5 percent of GDP by the end of 2011. In his policy speech to the 165th session of the Diet (September 29, 2006), the new Prime Minister, Shinzo Abe, promised to aim for the early achievement of this goal by 2010. In this section, I estimate the macroeconomic impact inward FDI would have if the target was met.

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[4] The previous goal announced by Koizumi was to double the inward FDI stock from ¥6.6 trillion to ¥13.2 trillion in the five year period from the end of 2001 to the end of 2006. By the end of 2005, the inward FDI stock stood at ¥11.9 trillion, very close to the target. But because of several large retreats, the inward FDI stock had plunged to ¥10.6 trillion by the end of June 2006 (preliminary estimate by the Ministry of Finance and the Bank of Japan). General Motors reduced its stake in Suzuki by ¥0.23 trillion in March, while Vodafone sold its portable phone business to Softbank in April in a deal worth ¥1.7 trillion.

Using Japan's GDP in 2006 (¥510 trillion) and assuming a nominal GDP growth rate of 2.0 percent, the country's GDP at the end of 2010 should be around ¥552 trillion. 5 percent of this – the target for the inward FDI stock – amounts to about ¥27.6 trillion. At the end of June 2006, the inward FDI stock was ¥10.6 trillion. Therefore, I estimate the macroeconomic impact of an increase in the inward FDI stock by ¥17.0 trillion. However, rather than basing the estimation of the macroeconomic impact on the increase in the inward FDI stock, it is more appropriate to consider the increase in the presence of foreign-owned firms in the economy this translates into.

As a first step, let us estimate how much the employment and the value added of foreign firms would increase. Based on micro-data from the *Establishment and Enterprise Surveys* for 1996 and 2001, the Fukao et al. study suggests that between these two years, the number of workers employed by the Japanese affiliates of foreign firms (33.4 percent or more foreign-owned) increased by 271,000, from 485,000 to 756,000. During the same period, the inward FDI stock increased by ¥3.16 trillion, from ¥3.47 trillion to ¥6.63. This means that an increase of the inward FDI stock of ¥11.7 million was needed for each additional person employed by a foreign-owned firm in Japan. If we assume that this relationship remained unchanged from 2001 to 2006, then the number of employees at foreign-owned firms in Japan as of June of 2006 was an estimated 1,095,000 (=756,000+(10,600,000–6,630,000)/11.7). A further increase of the inward FDI stock by ¥17.0 trillion from June 2006 to 2010 thus would raise the number of employees of foreign-owned firms by an additional 1,453,000. According to this "back of the envelope" calculation, if Abe's goal is accomplished, the number of workers employed by foreign-owned firms would more than triple by 2010 compared with the number in 2001, from 756,000 to 2,548,000.

Using information on the average per-capita gross value added in each industry at the 3-digit industry level, Fukao et al. estimated that the 756,000 employees of foreign-owned firms in 2001 created gross value added of ¥8.1 trillion. That is, the average per capita gross value added of foreign-owned firms was ¥10.7 million. As labor productivity improves, per capita gross value added usually increases over time. If we assume that the average per capita nominal gross value added of foreign-owned firms increases by 2.5 percent annually from 2001 to 2010, the estimated 1,095,000 employees in 2006 created ¥13.3 trillion of gross value added, equivalent to approximately 2.6 percent of GDP.[5] And in 2010, the estimated 2,548,000 employees of foreign-owned firms would create ¥34.0 trillion of gross value added, which would be about 6.2 percent of Japan's projected GDP in that year.

As I explained above, these results do not mean that the additional FDI will raise Japan's GDP by as

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[5] The figure for Japan's GDP in 2006 is based on the second preliminary estimate published on February 15, 2007.

much as 3.6 percent. A large part of the increase in foreign-owned firms' production will be canceled out by a corresponding decline in domestic firms' production. From this general equilibrium point of view, the major benefit of the new FDI will be the improvement of Japan's total factor productivity.

The empirical results reported in the previous section suggest that foreign firms' average TFP level is 8 percent higher than that of domestic firms. However, it was also shown that foreign firms enjoy higher TFP levels partly because they purchase Japanese firms that already have higher productivity than the average firm.[6] But the Japanese firms newly acquired by a foreign firm also display a further 2.2-percent increase of their TFP level in comparison with other domestic firms two years after the acquisition (see the coefficient on the out-in M&A dummy in the first estimation in Table 7). Because large-scale FDI and out-in M&As are such a recent phenomenon in Japan, and the data used in the empirical investigation reported above only go up to 2001, the time span covered is relatively short. It is therefore difficult at this stage to assess the long-term effects of acquisitions by foreign firms on the TFP level of acquired Japanese firms.

Based on the considerations above, the simulation of the macroeconomic impact of inward FDI considers different scenarios for the increase in foreign firms' gross value added share in the Japanese economy and the effect of out-in acquisitions on TFP. For the standard scenario, let us assume that the increase in the share of the gross value added by foreign firms in Japan's total GDP by as much as 3.6 percentage points is the result of out-in acquisitions. Moreover, let us also assume that out-in acquisitions increase the TFP level of purchased Japanese firms by 5 percent in the long run. A 5-percent increase in the TFP level means that Japanese firms purchased by foreign firms can produce 5 percent more output from the same amount of input. This change in itself will increase Japan's GDP. But from a general equilibrium point of view, many other additional changes in the Japanese economy are expected. First, the improvement in TFP raises the demand for labor and increases the real wage rate. Second, the improvement in TFP raises rate of return to capital and will induce new capital accumulation. This capital accumulation will further increase Japan's GDP. Third, the increase in investment will reduce Japan's saving-investment balance, the current account surplus and capital outflows. Fourth, dividend payments abroad by foreign-owned firms and the fall in Japan's foreign investment income, caused by the decline in capital outflows, mean that the increase in Japan's GNP, which includes net foreign investment income, will be smaller than the increase in Japan's GDP.

Taking these additional changes into account, I evaluate the overall effects of inward FDI on Japan's GDP and GNP by constructing a general equilibrium model of the economy. We should note that the

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[6] Because the majority of inward direct investments in developed economies such as Japan are conducted as M&As and not as greenfield investments, it is appropriate to concentrate on the TFP level of acquired domestic firms here.

assumptions here, a 5 percent increase in the TFP level and a 3.6 percentage point increase of foreign-owned firms' production share in GDP from 2006 to 2010, are relatively conservative. Firstly, inward FDI might bring larger TFP improvements. The comparison of the TFP levels of Japanese and foreign-owned firms in Section 2 is based on data for the manufacturing sector. But according to several preceding studies (Baily and Solow 2001; Fukao and Miyagawa 2007), Japan's labor productivity level is on par with the US and major European economies in the case of manufacturing industries. On the other hand, Japan's labor productivity level in many non-manufacturing sectors, such as retail and construction, is only about two-thirds or less of labor productivity levels in the US and major European economies. Therefore, FDI from developed economies in Japan's non-manufacturing sectors would probably bring much larger TFP gains than suggested by the estimates above for the manufacturing sector. Secondly, there is considerable scope for the share of foreign owned firms' production to increase by much more than the 3.6 percentage points, if Japan were to abolish obstacles to inward FDI and the presence of foreign-owned firms increased to levels similar to those in other developed economies. In 2002, foreign-owned firms' share in manufacturing turnover was only 2.6 percent in Japan, but 20.3 percent in the US, 24.4 percent in Germany, 35.9 percent in France, and 36.1 percent in the UK. In services, foreign owned firms' share in turnover in Japan was 0.9 percent compared with 7.8 percent in the US, 8.7 percent in Germany, 9.5 percent in France, and 16.8 percent in the UK (OECD 2005). Thus, even if foreign-owned firms' share in turnover in Japan were to triple or quadruple, it would still only be half or less of that in other major economies.

Based on these considerations, four scenarios are considered. The standard scenario shows the potential macroeconomic impact based on the assumption that the TFP improvement and the increase in the presence of foreign-owned firms is relatively moderate in line with the estimation results for TFP and the government target. In addition, however, alternative scenarios are also considered. The first alternative scenario assumes that the TFP improvement effect in the service sector, and hence overall, is probably much greater than in the manufacturing sector. The second alternative assumes a much larger in increase in the presence of foreign firms to illustrate the impact that FDI could have even at levels that would still lag considerably behind those of other advanced economies. The last scenario, finally, combines the assumptions of a larger TFP improvement and a larger increase in FDI. Thus, the following four cases are examined:

Case I (standard scenario): a 5 percent improvement of the TFP level and a 3.6 percentage-point increase in foreign-owned firms' share in production.

Case II: a 15 percent improvement of the TFP level and a 3.6 percentage-point increase in foreign-owned firms' share in production (i.e., it is assumed that the improvement of the TFP level is three times as great as in the standard scenario).

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Case III: a 5 percent improvement of the TFP level and a 10.8 percentage-point increase in foreign-owned firms' share in production (i.e., it is assumed that the increase in foreign firms' presence is three times as great as in the standard scenario).

Case IV: a 15 percent improvement of the TFP level and a 10.8 percentage-point increase in foreign-owned firms' share in production.

The details of the analysis are reported in Appendix A. The main assumptions on which the macroeconomic model is based can be summarized as follows:

(1)   In order to explain the coexistence of productive and unproductive firms, it is necessary to assume that firms produce differentiated products. It is also assumed that firms operate under monopolistic competition. In such an economy, out-in acquisitions may bring two types of innovation. Using foreign parent firms' technology, domestic firms may improve their production process (process innovation). Alternatively, they may increase the variety of their products (product innovation). In order to simplify the analysis, I assume that only process innovations will occur.

(2)   The analysis is static, this is, it only examines the long-run effect of a one-time acquisition of domestic firms by foreign firms. In order to simplify the analysis, the employment and production share of foreign-owned firms in the Japanese economy are assumed to increase from zero to 3.6 percent or 10.8 percent.

(3)   All products are internationally traded without trade costs. Very smooth international indirect capital flows ensure that Japan's real interest rate is equal to the world real interest rate.

(4)   The world equilibrium interest rate and the world price level will not be affected by the increase in Japan's inward FDI.

The results of the simulation analysis are shown in Table 9. The second column of the table shows the results for Case I: a 5 percent improvement of the TFP level and a 3.6 percentage point increase in foreign-owned firms' share. The second row of the table shows that in Case I, the increase in inward FDI will raise Japan's real wage rate by 0.17 percent. As I explained in Section 1, FDI consists of international capital flows accompanied by the transfer of intangible assets. According to standard economic theory on the international movement of production factors, in the FDI host country, the higher productivity of foreign firms will increase real wage rates and benefit workers. The higher rate of return to capital will induce capital deepening through capital imports, and this capital deepening will also raise real wage rates and benefit workers in the host country. The 0.17 percent increase of the real wage rate shown in Table 9 is the result of all these effects combined. In our macro-model, the ratio of the increase in the capital stock to the initial capital stock is also 0.17

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percent. The increase of the average level of firms' productivity and the capital deepening induced by the higher rate of return to capital together raise Japan's GDP by 0.24 percent in Case I. This is a permanent increase, i.e., wages and GDP will be higher by this amount in every year.

When we assume that inward FDI raises the TFP level three times as much (Case II) or the increase in foreign-owned firms' share is three times as great (Case III), the impact in terms of the increase in the wage rate, induced capital deepening, and the increase in GDP almost triples in comparison with Case I. That is, the size of the macroeconomic impact is almost proportionate to the magnitude of either the TFP improvement or the increase in inward FDI. In the case of the most optimistic scenario, Case IV, we can expect large increase in real wages and GDP.

INSERT Table 9

Dividend payments abroad by foreign-owned firms and the fall in Japan's foreign investment income caused by the inflow of capital (or the decline in capital outflows) mean that the increase in Japan's GNP (which includes net foreign investment income) will be smaller than the increase in GDP. How the increase in GNP will differ from the increase in GDP is also shown in Table 9. Inward FDI will change Japan's international asset-liability position in three respects: first, foreign investment increases Japan's international liabilities and overseas investors will receive the profits earned by foreign-owned firms in Japan. Under our assumptions, which are explained in Appendix A, dividend payments from foreign-owned firms in Japan to foreign investors will be 0.36 percent of total GDP in Case I. Second, in compensation for the sale of Japanese firms, Japanese residents will receive foreign assets. It is assumed that Japanese residents use this money as portfolio investment abroad. Investment income from Japan's assets abroad received in compensation for the sale of Japanese firms will be 0.30 percent of total GDP. Third, the capital accumulation induced by inward FDI will cause capital inflows and increase Japan's liabilities to non-residents. Interest payments abroad for Japan's liabilities resulting from the capital deepening induced by inward FDI will be 0.05 percent of total GDP. These three changes in Japan's international asset-liability position will permanently change Japan's balance of payments. Taken together, these effects will reduce Japan's income account surplus by 0.11 percent of Japan's GDP in Case I. Thus, subtracting this income account effect from the increase in GDP through inward FDI, the increase in GNP will be 0.24–0.11=0.13 percent of GDP.

In Case III, which assumes that the increase in foreign-owned firms' share is three times as large as in the standard scenario (Case I), the change in the balance of payments and in GNP are also about three times as large. On the other hand, in Case II, which assumes an improvement of TFP through inward FDI three times as great as in the standard scenario, the effect on the balance of payments is

slightly less than three times as large and the increase in GNP therefore slightly more than three times as large..

4. Conclusions

In this paper, I examined the macroeconomic impact of inward FDI in Japan. From a general equilibrium point of view, probably the most important host country benefit of inward FDI is the improvement in productivity caused by the inflow of managerial resources. In the first part of the paper, mainly referring to the results of Fukao, Ito and Kwon (2005), I reviewed the evidence suggesting that inward FDI will raise the average TFP level of firms in Japan. In the second part of the paper, using a general equilibrium model of an open macroeconomy, I simulated the macroeconomic impact of an increase in the inward FDI stock. I found that if Prime Minister Abe's goal on inward FDI, which is to increase the inward FDI stock to 5 percent of GDP by the end of 2010, is attained, Japan's GDP will increase by 0.24 percent and Japan's real wage rate will rise by 0.17 percent. Dividend payments abroad by foreign-owned firms and the fall in Japan's foreign investment income caused by the inflow of capital (or the decline in capital outflows), will make the increase in Japan's GNP (which includes net foreign investment income) smaller than the increase in Japan's GDP. The increase in GNP will be 0.13 percent of GDP.

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Appendix A. Macroeconomic Simulation Analysis of the Impact of Inward FDI in Japan

This appendix provides the details of the macroeconomic simulation of the impact of inward FDI based on a model of the Japanese economy with microeconomic foundations.

Basic assumptions on market and technology

The simulation is based on a model with monopolistic competition. It is assumed that in Japan, n commodities are produced by n firms and each commodity is produced by one firm. There are $n\theta_F$ foreign firms and $n(1-\theta_F)$ domestic firms. All products are final goods and internationally traded and there are no trade costs. All consumers, domestic and foreign, have identical homothetic preferences with regard to these goods. Each firm faces the following demand function:

$$X_i = \left(\frac{p_i}{p*}\right)^{-\frac{1}{1-\sigma}} E \tag{1}$$

where X_i denotes the demand for firm i's product, p_i, is the price of firm i's product, and $p*$ stands for the world price level. $1/(1-\sigma)$ is the price demand elasticity. It is assumed that $1/(1-\sigma)$ is greater than one. The parameter E denotes the size of world wide demand. It is also assumed that Japan is not a large country and $p*$ and E can be treated as constant over time.

A Cobb-Douglas constant return production function is assumed:

$$X_i = a_i L_i^{\beta} K_i^{1-\beta} \tag{2}$$

where L_i and K_i denote firm i's labor and capital input and a_i denotes the TFP level of firm i. Labor and capital markets are competitive so that the cost share of labor is equal to the constant parameter β.

The introduction of managerial resources through out-in acquisitions can be expressed in the model in at least two ways. First, foreign firms can produce with a higher TFP level, a_i (process innovation). Second, foreign firms can produce new goods, so that the number of commodities produced in Japan, n, increases (product innovation). For simplicity, the analysis here focuses on the first type of innovation as a result of managerial resource transfers. In the baseline scenario, it is assumed that foreign firms' TFP level, a_F, is 5 percent higher than domestic firms' TFP level, a_J.

Let r denote the constant world equilibrium real interest rate. Further assumptions are that domestic net saving is zero under r and that there is no capital depreciation.

The profit maximization behavior of firms

In production function (2), marginal cost does not depend on the production level and can be expressed by

$$\frac{wL_i + rK_i}{X_i} = \frac{B}{a_i} w^{\beta} r^{1-\beta} \tag{3}$$

where w denotes the domestic real wage rate and B stands for $(\beta/(1-\beta))^{1-\beta} + ((1-\beta)/\beta)^{\beta}$. When firms operate under monopolistic competition and the price demand elasticity is $1/(1-\sigma)$, profit maximizing firms set the price level equal to marginal costs times $1/\sigma$. These conditions yield the following optimal output and factor input levels:

$$X_i = \left(\frac{B}{a_i \sigma \ p*} w^{\beta} r^{1-\beta} \right)^{-\frac{1}{1-\sigma}} E \tag{4}$$

$$L_i = \frac{1}{a_i} \left(\frac{r}{w} \right)^{1-\beta} \left(\frac{\beta}{1-\beta} \right)^{1-\beta} X_i \tag{5}$$

$$K_i = \frac{1}{a_i} \left(\frac{w}{r} \right)^{\beta} \left(\frac{1-\beta}{\beta} \right)^{\beta} X_i \tag{6}$$

Foreign firms, which have a higher TFP level, a_F, and can produce output at lower marginal cost, set lower sales prices and produce more output than domestic firms (equation (4)). The total sales of foreign firms are $(a_F/a_J)^{\sigma(1-\sigma)}$ times greater than the total sales of domestic firms. And both foreign firms' share in total sales and their share in labor input in the Japanese economy overall are equal to $\theta_F(a_F/a_J)^{\sigma(1-\sigma)}/(1-\theta_F+\theta_F(a_F/a_J)^{\sigma(1-\sigma)})$.

The labor market equilibrium condition

The equilibrium condition for the labor market can be expressed by

$$(1 - \theta_F)nL_J + \theta_F nL_F = L .$$

Using equations (4), (5), and the above equation yields

$$(1-\theta_F)n\frac{1}{a_J}\left(\frac{r}{w}\right)^{1-\beta}\left(\frac{\beta}{1-\beta}\right)^{1-\beta}\left(\frac{B}{a_J\sigma\ p*}w^{\beta}r^{1-\beta}\right)^{-\frac{1}{1-\sigma}}$$

$$+\theta_F n\frac{1}{a_F}\left(\frac{r}{w}\right)^{1-\beta}\left(\frac{\beta}{1-\beta}\right)^{1-\beta}\left(\frac{B}{a_F\sigma\ p*}w^{\beta}r^{1-\beta}\right)^{-\frac{1}{1-\sigma}}=L \tag{7}$$

where L denotes Japan's total labor endowment, which is assumed to be constant. The domestic real wage rate is determined by the above equation. Equation (7) shows that inward FDI (an increase in θ_F) will increase the demand for labor and raise the equilibrium real wage rate. Since the price level $p*$ remains unchanged, the level of workers' welfare will be improved by inward FDI.

Capital accumulation induced by FDI

Productive foreign firms enjoy higher returns to capital and this fact will induce capital accumulation. Under production function (2), the following equation holds:

$$\frac{wL}{rK}=\frac{\beta}{1-\beta} \tag{8}$$

where L and K denote Japan's total endowment of labor and total input of capital. Under the assumption of perfect international capital mobility, the capital input level, K, is endogenously determined by the above equation. Therefore, the increase in capital input is proportional to the increase in the real wage rate.

Japan's GDP before and after inward FDI

Using the model just developed it is possible to determine how inward FDI changes Japan's GDP. To simplify the analysis, an equilibrium without inward FDI ($\theta_F=0$) and another equilibrium with inward FDI ($\theta_F>0$) are compared.

When there is no inward FDI, all firms have the same productivity level and produce the same amount. Therefore, the real GDP level can be expressed by

$$\sum_{i=1}^{n} X_i = n a_J \left(\frac{L}{n}\right)^{\beta} \left(\frac{K_0}{n}\right)^{1-\beta} = a_J L^{\beta} K_0^{1-\beta} \tag{9}$$

where K_0 denotes the total input of capital stock in Japan. When FDI occurs and $\theta_F n$ firms are purchased by foreign firms, the real GDP level can be expressed by

$$\sum_{i=1}^{n} X_i = \theta_F n a_F (L_F)^{\beta} (K_F)^{1-\beta} + (1-\theta_F) n a_J (L_J)^{\beta} (K_J)^{1-\beta} \tag{10}$$

where foreign and domestic firms' factor inputs can be expressed by

$$L_i = \frac{\left(\dfrac{a_F}{a_J}\right)^{\frac{\sigma}{1-\sigma}}}{1 - \theta_F + \theta_F \left(\dfrac{a_F}{a_J}\right)^{\frac{\sigma}{1-\sigma}}} \frac{L}{n} \quad for \ i \in \mathbf{F} \tag{11}$$

$$L_i = \frac{1}{1 - \theta_F + \theta_F \left(\dfrac{a_F}{a_J}\right)^{\frac{\sigma}{1-\sigma}}} \frac{L}{n} \quad for \ i \in \mathbf{D} \tag{12}$$

$$K_i = \frac{\left(\dfrac{a_F}{a_J}\right)^{\frac{\sigma}{1-\sigma}}}{1 - \theta_F + \theta_F \left(\dfrac{a_F}{a_J}\right)^{\frac{\sigma}{1-\sigma}}} \frac{w_1}{w_0} \frac{K_0}{n} \quad for \ i \in \mathbf{F} \tag{13}$$

$$K_i = \frac{1}{1 - \theta_F + \theta_F \left(\dfrac{a_F}{a_J}\right)^{\frac{\sigma}{1-\sigma}}} \frac{w_1}{w_0} \frac{K_0}{n} \quad for \ i \in \mathbf{D} \tag{14}$$

where $\mathbf{F}$ and $\mathbf{D}$ stand for the set of foreign firms and the set of domestic firms. w_0 and w_1 denote the wage rate before and after the inward FDI, which can be calculated using Equation (7).

Assumptions on parameter values

By setting the parameter values, it is possible to simulate the macroeconomic impact of inward FDI.

The cost share of labor, β, is assumed to be equal to 2/3 and the price demand elasticity, $1/(1-\sigma)$, to be equal to 5 (this means that the mark-up rate will be $(1/\sigma-1)*100=25$ percent). As explained in Section 4, four cases are examined. Here, the calibration for Case I is explained in detail. In Case I, it is assumed that foreign firms' TFP is 5 percent higher than domestic firms' TFP, i.e., $a_F/a_J=1.05$. The ratio of foreign firms to total firms after the inward FDI, θ_F, is set at a level which satisfies the following condition:

$$\theta_F(a_F/a_J)^{\sigma/(1-\sigma)}/(1-\theta_F+\theta_F(a_F/a_J)^{\sigma/(1-\sigma)})=0.36$$

The above equation means that after the inward FDI took place, foreign firms' share of total sales and of labor input in the Japanese economy overall will be equal to 3.6 percent. The solution of the above equation is $\theta_F=0.0298$.

Simulation results

The results of the simulation analysis are shown in Table 9. They show that the increase in inward FDI assumed in Case I will raise the real wage rate and total capital input by 0.17 percent and lift GDP by 0.24 percent. Wages and GDP will be permanently higher by this amount.

The effects on Japan's balance of payments

Dividend payments abroad by domestic firms and the fall in Japan's foreign investment income caused by the inflow of capital (or the decline in capital outflows) mean that the increase in Japan's GNP (which includes net foreign investment income) will be smaller than the increase in Japan's GDP. Table 9 shows how the increase in GNP will differ from the increase in GDP. Inward FDI will change Japan's international asset-liability position in three respects. First, inward foreign investment will increase Japan's international liabilities, since foreign investors will receive part of the profits earned by foreign owned firms in Japan. Typically, foreign investors receive only part of the profits because when the foreign capital participation rate in a particular firm is less than one, then domestic investors will also receive their share. In addition, the Japanese government will receive corporate income taxes from firms in Japan. Second, in compensation for the sale of Japanese firms, Japanese residents will receive foreign assets. It is assumed that Japanese residents use these funds for portfolio investment abroad. Third, capital accumulation induced by inward FDI will cause capital inflows and increase Japan's liabilities to non-residents. These changes in Japan's international asset-liability position will permanently change Japan's balance of payments. In the simulation, the effects of these changes are calculated as follows:

(1) Dividend payments to foreign owners

In the model, 20 percent of GDP is monopolistic rent. To simplifying the analysis, it is assumed that firms pay the entire rent to their stockholders as dividends and all the real capital accumulation is financed through indirect financing. If the conditions for the Modigliani-Miller theorem hold, then firms' financial structure will not change the results. It is assumed that the average capital participation rate of foreign parent firms' in their Japanese affiliates is 50 percent. It is also assumed that there is not corporate income tax. In Case I, after the FDI, foreign firms' market share is 3.6 percent. Therefore, foreign parent firms receive $0.5 \times 0.2 \times 0.036 \times GDP_1$ in annual dividends, where GDP_1 denotes Japan's GDP after the inward FDI. Therefore, given the simulated increase in GDP as a result of inward FDI by 0.24 percent and using the relationship $GDP_1/GDP_0 = 1.0024$, dividend payments to foreign owners in terms of GDP_0 are $0.5 \times 0.2 \times 0.036 \times GDP_1 = 0.0036 \times GDP_0$.

(2) Foreign income from Japan's portfolio assets abroad received in compensation for the sale of Japanese firms

Before the inward FDI, the total value of Japanese firms' stocks is $0.2 \times GDP_0/r$, where r denotes the world equilibrium interest rate. 50 percent ownership of θ_F percent of Japanese firms is sold to foreign firms. In exchange, Japanese residents receive $0.5 \times \theta_F \times 0.2 \times GDP_0/r$ in foreign assets. The annual investment income from these assets will be $0.5 \times \theta_F \times 0.2 \times GDP_0 = 0.003 \times GDP_0$.

(3) Interest payment abroad for Japan's liabilities created by the capital accumulation induced by inward FDI

Adding the simulated increase in Japan's capital stock through FDI of 0.17 percent to the existing capital stock $(1+0.0017)$, the share of the foreign capital stock as a result of this FDI is 0.17 percent (i.e., $0.0017/(1+0.0017) = 0.17$ percent). Interest payments abroad for these liabilities on Japan's part are $0.0017 \times r \times K_1$. Since the cost share of capital is 0.3333 and the mark-up rate is 25 percent, the interest payments are equal to $0.0017 \times 0.3333 \times 0.8 \times GDP_1 = 0.0005 \times GDP_0$.

Taken together, these effects will reduce Japan's income account surplus by 0.36–0.30+0.05=0.11 percent of Japan's GDP. Therefore the increase in GNP will be 0.24–0.11=0.13 percent of GDP.
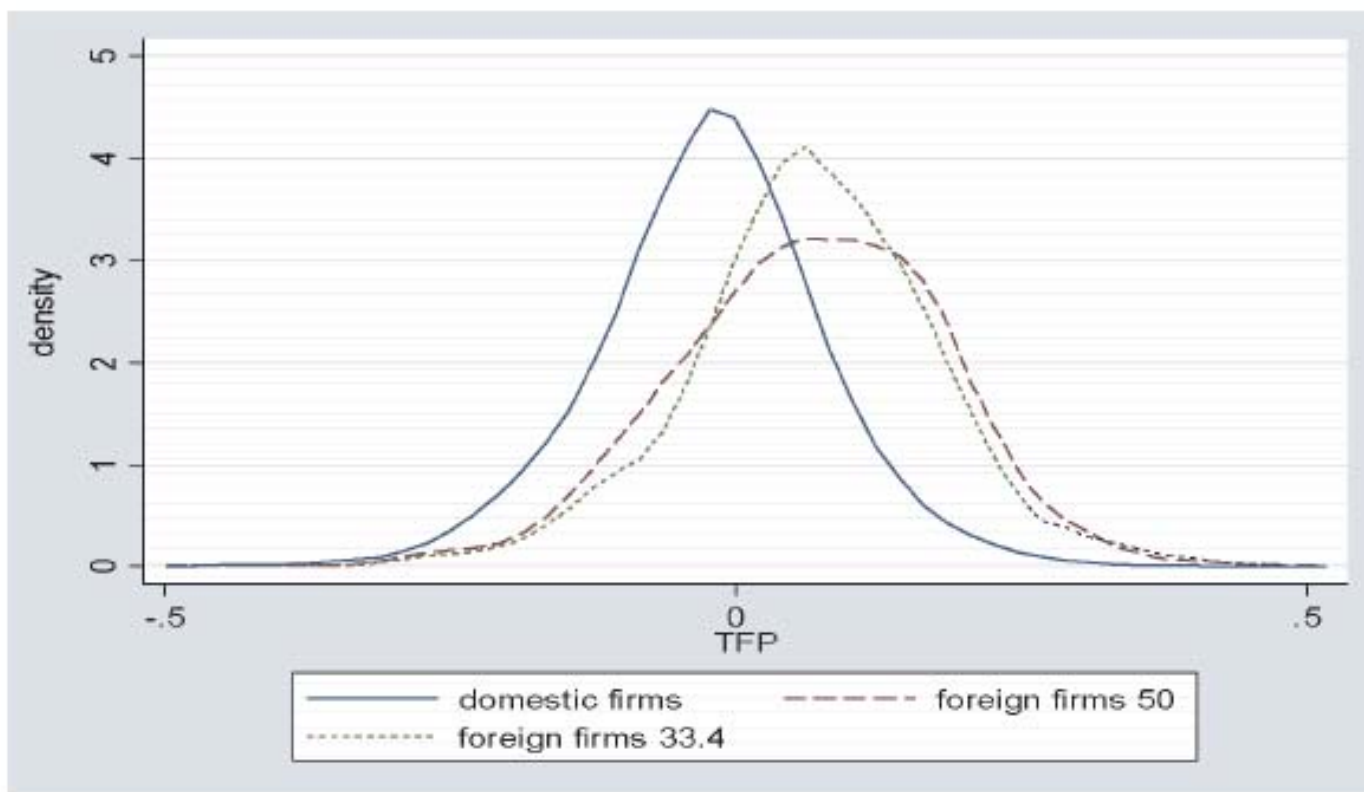
Fig. 1. Kernel density estimates for TFP level: Comparison between foreign-owned and domestically-owned firms. The number of pooled observations is 93,880. The horizontal axis denotes the log value of firms' TFP level. *Notes*: "Foreign firms 33.4" refers to firms with 33.4% or more foreign owership. "Foreign firms 50" refers

Source: Fukao, Ito and Kwon (2005).

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Table 2. a OLS estimation results: Comparison between foreign-owned (majority-owned by one foreign firm) and domestically-owned firms

	TFP level	Growth rate of TFP	Capital-labor ratio	R&D-sales ratio (%)	Current profit per worker (million yen per worker)	
Foreign-ownership dummy (majority-owned by one foreign firm)	0.0773 ***	0.0037	2.7577 ***	0.0065 ***	1.4956 ***	
	(18.35)	(1.09)	(4.00)	(5.80)	(9.79)	
_cons	-0.0524 ***	0.0025 ***	8.5831 ***	0.0038 ***	0.6475 ***	
	(-21.29)	(3.03)	(51.93)	(20.53)	(18.76)	
Industry dummy	yes	yes	yes	yes	yes	
Year dummy	yes	yes	yes	yes	yes	
Industry dummy*Year dummy	yes	no	no	no	no	
No. of observations	93880	70332	93880	93880	93880	
	Current profit-sales ratio (%)	Growth rate of real assets	Wage level (million yen per worker)	Growth rate of workers	Labor productivity (million yen per worker)	Growth rate of real sales
Foreign-ownership dummy (majority-owned by one foreign firm)	0.0192 ***	-0.0230 **	1.2754 ***	0.0003	16.2696 ***	0.0121
	(6.36)	(-2.00)	(18.52)	(0.03)	(7.91)	(1.17)
_cons	0.0169 ***	0.0477511 ***	3.4736 ***	-0.0042 **	31.9526 ***	0.0379 ***
	(20.13)	(12.79)	(178.78)	(-2.13)	(73.06)	(17.51)
Industry dummy	yes	yes	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes	yes	yes
No. of observations	93880	70332	93880	70332	93880	70332

Notes) 1.Pooled data for 1994-2000 are used.
    2. The values in parentheses are t-statistics.
    3.*P=.10, **P=.05, ***P=0.1 (two-tailed test).
Source: Fukao, Ito and Kwon (2005)

Table 3. Descriptive statistics of the main variables used in the regression analysis

Variable	Number of observations	Average	Standard deviation	Minimum value	Maximum value
TFP level	93880	-0.0216	0.1022	-0.4905	0.5076
Growth rate of TFP	70332	0.0058	0.0634	-0.5430	0.6132
R&D investment-sales ratio	93880	0.0086	0.0202	0.0000	1.6391
No. of years passed since established	93880	36.6372	15.0046	0.0000	110.0000
(No. of years passed since established)^2	93880	1567.42	1159.86	0.0000	12100.00
Outsourcing ratio	93880	0.1071	0.1496	0.0000	9.8890
ln(Sales)	93880	8.4190	1.2958	4.8255	16.0220
(ln(Sales))^2	93880	72.5595	23.7767	23.2855	256.7040
Share of non-production workers in total workers	93880	0.3315	0.2492	0.0000	1.0000

Source: Fukao, Ito and Kwon (2005).

Table 4. Estimation results: determinants of TFP level and TFP growth rate

Table 4.a Dependent variable: TFP level

Foreign-ownership dummy (majority-owned by one foreign	0.0521 ***	0.0488 ***	0.0031	0.0031
	(18.43)	(17.26)	(0.96)	(0.96)
Foreign-ownership dummy (33.4% or more is owned by				
Ratio of non-production workers		0.0377 ***		0.0003
		(29.79)		(0.24)
R&D investment-sales ratio	0.2067 ***	0.1518 ***	-0.1208 ***	-0.1208 ***
	(7.02)	(5.96)	(-7.69)	(-7.70)
No. of years passed since established	-0.0007 ***	-0.0008 ***	0.0004 ***	0.0004 ***
	(-9.43)	(-10.45)	(3.44)	(3.44)
(No. of years passed since established)^2	0.0000 ***	0.0000 ***	0.0000 **	0.0000 **
	(5.82)	(6.37)	(-2.11)	(-2.11)
Outsourcing ratio	0.0087 ***	0.0064 ***	-0.0030	-0.0030
	(4.14)	(3.14)	(-1.58)	(1.58)
ln(Sales)	0.1339 ***	0.1282 ***	0.2418 ***	0.2418 ***
	(66.71)	(63.96)	(35.21)	(35.20)
(ln(Sales))^2	-0.0056 ***	-0.0053 ***	-0.0073 ***	-0.0073 ***
	(-51.26)	(-49.00)	(-18.20)	(-18.20)
Constant	-0.7592 ***	-0.7419 ***	-1.5198 ***	-1.5199 ***
	(-80.81)	(-79.25)	(-50.53)	(-50.53)
Industry dummy	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes
Industry dummy*Year dummy	yes	yes	yes	yes
Firm dummy	no	no	yes	yes
Number of observations	93880	93880	93880	93880
Number of groups	-	-	19652	19652

Notes) 1.The values in parentheses are t-statistics.

2.*P=.10, **P=.05, ***P=0.1 (two-tailed test).

Table 4. Estimation results: determinants of TFP level and TFP growth rate

Table 4.b Dependent variable: growth rate of TFP

	(1)	(2)	(3)	(4)
Lagged TFP level	-0.2817 ***	-0.2792 ***	-0.8325 ***	-0.8324 ***
	(-86.60)	(-86.52)	(-223.08)	(-222.94)
Foreign-ownership dummy	0.0145 ***	0.0155 ***	-0.0072	-0.0076
(majority-owned by one foreign	(4.56)	(4.92)	(-1.15)	(-1.21)
Foreign-ownership dummy				
(33.4% or more is owned by				
Ratio of non-production workers	0.0074 ***		0.0021	
	(7.58)		(1.36)	
R&D investment-sales ratio	0.0234 *		-0.1276 ***	
	(1.81)		(-7.37)	
No. of years passed since	-0.0004 ***	-0.0004 ***	0.0006 ***	0.0006 ***
established	(-7.24)	(-6.88)	(4.72)	(4.72)
(No. of years passed since	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***
established)^2	(4.57)	(4.37)	(-3.09)	(-3.07)
Outsourcing ratio	-0.0006	-0.0002	-0.0076 ***	-0.0079 ***
	(-0.41)	(-0.17)	(-3.36)	(-3.46)
ln(Sales)	0.0421 ***	0.0426 ***	0.2369 ***	0.2361 ***
	(27.92)	(28.34)	(29.16)	(29.06)
(ln(Sales))^2	-0.0017 ***	-0.0017 ***	-0.0063 ***	-0.0063 ***
	(-21.82)	(-22.16)	(-13.40)	(-13.26)
Constant	-0.2250 ***	-0.2263 ***	-1.5209 ***	-1.5192 ***
	(-31.16)	(-31.34)	(-42.13)	(-42.06)
Industry dummy	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes
Firm dummy	no	no	yes	yes
Number of observations	70332	70332	70332	70332
Number of groups	-	-	16471	16471

Notes) 1.The values in parentheses are t-statistics.
    2.*P=.10, **P=.05, ***P=0.1 (two-tailed test).
Source: Fukao, Ito and Kwon (2005).

Table 5. Number of out-in and in-in M&A cases

	Out-in M&A	In-in M&A
1994–1995	12	228
1995–1996	6	218
1996–1997	14	291
1997–1998	9	169
1998–1999	5	177
1999–2000	11	119
2000–2001	10	160
Total	67	1362

Source: Fukao, Ito and Kwon (2005).

Table 6. What firms are chosen as M&A targets? Probit analysis

Dependent variable	Out-in M&A (based on majority ownership by one foreign firm)			In-in M&A		
ln(TFP)t-1	1.930 (4.05) ***	1.525 (3.28) ***	1.542 (2.47) ***	-0.027 (-0.23)	0.129 (1.05)	0.195 (1.24)
TFP growth rate: ln(TFP)t-1-ln(TFP)t-2			-0.172 (-0.18)			-0.233 (-0.98)
ln(Number of workers)t-1	0.006 (0.20)	0.007 (0.23)	0.042 (1.25)	-0.064 (-5.19) ***	-0.055 (-4.42) ***	-0.047 (-3.28) ***
(Current profit/sales)t-1		1.250 (1.43)	1.836 (1.74) *		-0.065 (-1.26)	-0.058 (-1.17)
(Total liability/total asset ratio)t-1		-0.013 (-0.08)	0.005 (0.03)		0.271 (9.27) ***	0.291 (8.37) ***
Constant term	-3.298 (-12.21) ***	-3.336 (-10.33) ***	-4.201 (-9.52) ***	-1.680 (-21.82) ***	-1.929 (-23.28) ***	-2.046 (-21.22) ***
Industry dummy (30 industries)	yes	yes	yes	yes	yes	yes
Year dummy	yes	yes	yes	yes	yes	yes
Sample size	67242	67240	49204	81549	81547	62802
Log pseudo-likelihood	-485.76	-484.40	-339.65	-6834.39	-6802.75	-4905.44

1. The values in parentheses are z-statistics.
2. *P=.10, **P=.05, ***P=0.1 (two-tailed test).
Source: Fukao, Ito and Kwon (2005).

Table 7. Dynamic effects of M&A: Effects two years later

Dependent variable	TFP growth rate: ln(TFP)t+1-ln(TFP)t-1		Growth rate of number of workers: from *t* -1 to *t* +1		Change of (Current profit/Sales): from t-1 to	
Out-in M&A dummy (based on majority ownership by one foreign	0.022 (2.30)	**	-0.013 (-0.44)		0.017 (2.37)	**
In-in M&A dummy	0.004 (1.75)	*	0.004 (0.56)		0.001 (0.51)	
ln(TFP)t-1	-0.316 (-60.78)	***	0.148 (8.27)	***	0.071 (4.31)	***
ln(number of workers)t-1	0.007 (23.67)	***	-0.022 (-28.00)	***	-0.001 (-3.34)	***
(Current Profit/Sales)t-1	-0.042 (-2.30)	**	0.111 (1.54)		-0.871 (-10.67)	***
(R&D/sales)t-1	0.216 (9.67)	***	0.089 (1.99)	**	0.140 (7.92)	***
Dummy for firms which do not report R&D expenditure in t-1	-0.003 (-3.73)	***	0.004 (2.37)	**	0.000 (-0.19)	
(Total liability/total asset)t-1	-0.002 (-1.36)		-0.015 (-3.16)	***	-0.038 (-7.01)	***
(Sales/number of workers)t-1			0.000 (6.44)	***		
Constant term	-0.026 (-9.37)	***	0.127 (15.21)	***	0.061 (8.09)	***
Industry dummy (30 industries) Year dummy Sample size						

1. The values in parentheses are t-statistics based on White's method.
2. *P=.10, **P=.05, ***P=0.1 (two-tailed test).
Source: Fukao, Ito and Kwon (2005).

Table 8. Dynamic effects of M&A: Effects three years later

Dependent variable	TFP growth rate: ln(TFP)t+2-ln(TFP)t-1		Growth rate of number of workers: from *t* -1 to *t* +2		Change of (Current Profit/Sales): from t-1 to t+2	
Out-in M&A dummy (based on majority ownership by one foreign	0.018 (1.66)	*	-0.032 (-0.64)		0.016 (1.90)	*
In-in M&A dummy	0.010 (3.59)	***	0.015 (1.84)	*	0.000 (0.05)	
ln(TFP)t-1	-0.369 (-72.08)	***	0.189 (8.73)	***	0.063 (4.76)	***
ln(number of workers)t-1	0.009 (24.73)	***	-0.030 (-29.29)	***	-0.001 (-3.07)	***
(Current Profit/Sales)t-1	-0.031 (-2.64)	***	0.119 (1.41)		-0.903 (-13.64)	***
(R&D/sales)t-1	0.238 (7.81)	***	0.220 (3.33)	***	0.128 (6.29)	***
Dummy for firms which do not report R&D expenditure in t-1	-0.003 (-3.49)	***	0.009 (4.08)	***	-0.001 (-0.92)	
(Total liability/total asset)t-1	0.000 (-0.25)		-0.019 (-3.17)	***	-0.038 (-7.05)	***
(Sales/number of workers)t-1			0.000 (6.44)	***		
Constant term	-0.051 (-17.32)	***	0.178 (17.11)	***	0.060 (9.14)	***
Industry dummy (30 industries) Year dummy Sample size						

1. The values in parentheses are t-statistics based on White's method.
2. *P=.10, **P=.05, ***P=0.1 (two-tailed test).
Source: Fukao, Ito and Kwon (2005).

Table 9. Simulation results of the macroeconomic impact of inward FDI in Japan

		Case I	Case II	Case III	Case IV
sumptions; foreign-owned firms' TFP level/domestic firms' TFP level		1.05	1.15	1.05	1.15
Increase of foreign-owned firms' output share (percentage points)		3.6	3.6	10.8	10.8
Increase in wages		0.17%	0.42%	0.53%	1.30%
Increase of capital stock		0.17%	0.42%	0.53%	1.30%
Increase of real GDP	a	0.24%	0.68%	0.72%	2.06%
Dividend payment from foreign-owned firms to foreign investors/GDP	b	0.36%	0.36%	1.09%	1.10%
Investment income from Japan's assets abroad, which are received in compensation for sales of Japanese firms/GDP	c	0.30%	0.21%	0.91%	0.65%
Interest payment abroad for Japan's liability, which is created by capital accumulation induced by inward FDI/GDP	d	0.05%	0.11%	0.14%	0.35%
Net change of Japan's international investment account/GDP	e=−b+c−d	-0.11%	-0.27%	-0.32%	-0.81%
Increase of real GNP/GDP	f=a+e	0.13%	0.41%	0.39%	1.25%