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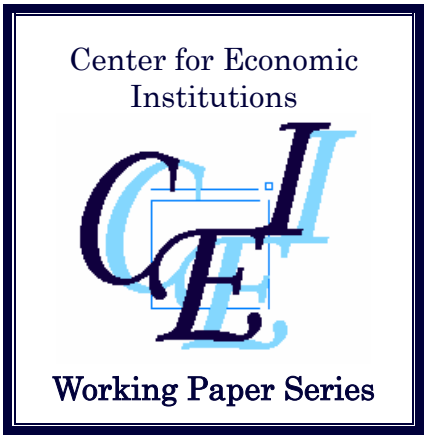

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Cross-Border Acquisitions and Target Firms' Performance: Evidence from Japanese Firm-Level Data[*]

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ABSTRACT

Using Japanese firm-level data for the period from 1994-2002, this paper examines whether a firm is chosen as an acquisition target based on its productivity level, profitability and other characteristics and whether the performance of Japanese firms that were acquired by foreign firms improves after the acquisition. In our previous study for the Japanese manufacturing sector, we found that M&As by foreigners brought a larger and quicker improvement in total factor productivity (TFP) and profit rates than M&As by domestic firms. However, it may argued that firms acquired by foreign firms showed better performance simply because foreign investors acquired more promising Japanese firms than Japanese investors did. In order to address this potential problem of selection bias problem, in this study we combine a difference-in-differences approach with propensity score matching. The basic idea of matching is that we look for firms that were not acquired by foreign firms but had similar characteristics to firms that were acquired by foreigners. Using these firms as control subjects and comparing the acquired firms and the control subjects, we examine whether firms acquired by foreigners show a greater improvement in performance than firms not acquired by foreigners. Both results from unmatched samples and matched samples show that foreign acquisitions improved target firms' productivity and profitability significantly more and quicker than acquisitions by domestic firms.

Moreover, we find that there is no positive impact on target firms' profitability in the case of both within-group in-in acquisitions and in-in acquisitions by domestic outsiders. In fact, in the manufacturing sector, the return on assets even deteriorated one year and two years after within-group in-in acquisition, while the TFP growth rate was higher after within-group in-in acquisitions than after in-in acquisitions by outsiders. Our results imply that in the case of within-group in-in acquisitions, parent firms may be trying to quickly restructure acquired firms even at the cost of deteriorating profitability.

JEL classification: C14, D24, F21, F23

Keywords: FDI, TFP, Acquisition, Selection bias, Propensity score matching, Average treatment effect

1. Introduction

The flow of inward foreign direct investments (FDI) to Japan has increased dramatically since the latter half of the 1990s. According to Japan's international-investment-position statistics, the stock of inward FDI in Japan rose 3.4-fold to 10.1 trillion yen during the six years from 1998 to 2004. Although Japan's inward FDI stock/GDP ratio (2.0% in 2004) is only about one seventh of the corresponding value of the U.S. (14.1% in 2003), employment in foreign affiliates as a share of total employment is 2.75%, which is equivalent to about half of the corresponding value, 5.61%, for the U.S. (Table 1.1).

Insert Table 1.1

Despite the importance of the subject, there are few meaningful empirical studies on the implications of the increase in inward FDI for the Japanese economy. In fact, some observers have argued that Japan does not need more FDI. Like FDI in other developed economies, the largest part of recent inflows to Japan took the form of mergers and acquisitions (M&As). The critics fear that inward M&As are dominated by "vulture" funds seeking to reap quick profits by taking advantage of troubled firms (*Nihon Keizai Shinbun* 2003). Another argument is that some inward M&As are in fact aimed at acquiring advanced technologies (Werner 2003) rather than at transferring and employing intangible assets in Japan.

According to quantitative studies on corporate performance in Japan, such as Kimura and Kiyota (2004) and Fukao and Murakami (2005), foreign-owned firms tend to show higher productivity than domestically-owned firms. However, the positive correlation between foreign ownership and productivity does not necessarily mean that Japanese firms that were acquired by foreign firms receive new technologies and management skills from their foreign owners and that

this transfer of intangible assets is responsible for their higher TFP (the technology-transfer effect). There is another possible theoretical explanation for the positive correlation: Foreign-owned firms enjoy greater productivity because foreign firms choose firms with higher TFP as their M&A targets (the selection effect).

In order to determine which one of the two effects is responsible for the positive correlation between foreign ownership and productivity, in a previous study (Fukao, Ito and Kwon, 2005), we conducted two empirical tests using firm-level data for Japan's manufacturing industry. In that study, we first estimated a Probit model explaining whether a firm is chosen as an M&A target based on its TFP level and other characteristics. Second, we tested whether the TFP of Japanese firms that were acquired by foreign firms improved after the investment.[1] Estimating a Probit model, we found that foreign firms acquired Japanese firms enjoyed higher TFP levels and higher profit rates. In contrast, in-in M&As seemed to have the characteristics of rescue missions as they tended to target small firms with a higher total liability/total asset ratio. Estimating the dynamic effects of M&As on target firms, we found that out-in M&As improved target firms' TFP level and current profit/sales ratio. Compared with in-in M&As, out-in M&As brought a larger and quicker improvement in TFP and profit rates but no increase in target firms' employment two years after the acquisition. Based on these results, we concluded that both the selection effect and the technology-transfer effect play a role in explaining the positive correlation between foreign ownership and productivity.

Our previous study has several limitations, which this paper seeks to overcome. First, although our study found that in-in M&As had the characteristics of rescue missions, this result

[1] Although the majority of FDI in developed economies has taken the form of cross-border acquisitions, to our knowledge, there are only two empirical studies on this issue, Conyon et al. (2002) and Fukao, Ito and Kwon (2005). Conyon et al. (2002) conducted an empirical analysis on the impact of foreign ownership on productivity in the United Kingdom for the period 1989-1994. By observing productivity before and after the event of acquisition, they showed that firms that were acquired by foreign firms exhibited an increase in labor productivity of 13%.

may have been influenced by the fact that some in-in M&As are conducted within groups of related firms. In the case of M&As within firm groups, acquisitions are conducted as part of a restructuring of the firm group and will indeed have the characteristics of rescue missions. On the other hand, in-in M&As involving outsiders of firm groups may have similar effects as out-in M&As. In this paper, using data on Japanese firm groups compiled by Toyo Keizai Shinposha, we distinguish in-in M&As within firm groups and in-in M&As involving outsiders.

Second, although 72 percent of FDI during the 1997-2002 period went into non-manufacturing sectors, such as the finance & insurance, telecommunications, service, and retail/wholesale sectors, which experienced deregulation, Fukao, Ito and Kwon (2005) only examined M&As in Japan's manufacturing industry. In this paper, we look at M&As not only in the manufacturing sector but also in the wholesale and retail industry.

Third, estimation results on the dynamic effects of M&As on target firms may suffer from a selection bias problem. Suppose that foreign investors somehow acquire more promising Japanese firms than Japanese investors do. Then the ex-post improvement of out-in M&A target firms' performance should not be regarded as evidence of technology-transfer from foreign investors to acquired firms. In order to solve this selection bias problem, following Arnold and Javorcik (2005), we combine a difference-in-differences approach with propensity score matching. We employ the propensity score matching technique proposed by Rosenbaum and Rubin (1983). The basic idea is that we first look for firms that were not acquired by foreign firms but had similar characteristics to firms that were acquired by foreigners. Using these firms as control subjects and comparing the treated (out-in M&A targets) and the control subjects, we examine whether firms acquired by foreigners show a greater improvement in performance than firms not acquired by foreigners.

Fourth, using data for the period from 1994 to 2001, Fukao, Ito and Kwon (2005)

investigated the performance of target firms for only two years after each M&A. By adding data of one more year, 2002, we now study dynamic effects of M&A with a longer time span.

The remainder of this paper is organized as follows: In Section 2, we provide an overview of out-in M&As in Japan. Section 3 then presents an outline of our data and reports our empirical results. Section 4 summarizes our results.

2. An Overview of M&As in Japan

Probably the most comprehensive data on M&As in Japan are published by the private information service company RECOF. In this section, using these data, we provide an overview of M&A activity in Japan. Figure 2.1 shows the number of out-in and in-in M&A cases in Japan by year. Both out-in and in-in M&A cases have dramatically increased since the end of the 1990s.

Insert Figure 2.1

Several factors seem to have contributed to the increase in M&A cases during this period. Firstly, in order to speed up the restructuring of Japanese firms, Japan's corporate law was amended at the end of the 1990s to facilitate M&As. Secondly, advances in information and communication technology as well as deregulation during the 1990s mean that the optimal size and optimal scope of firms in many sectors, such as electronics, pharmaceuticals, telecommunication, finance, insurance, and commerce may have changed. Thirdly, deregulation in Japan has removed barriers to inward FDI in some industries, such as broadcasting, telecommunication, finance, and insurance. Fourthly, there was a world-wide boom in M&As during this period and foreign investors, including private equity funds, and foreign agents of

M&A, including investment banks, brought their M&A techniques and the M&A boom to Japan. Fifthly, as a result of the prolonged recession and the financial crisis in 1998, Japanese stock prices plunged and financially distressed firms and banks were forced to unwind their cross-shareholdings, creating a “fire sale” situation that allowed foreign firms to acquire Japanese companies.

Probably as a result of the last three of these factors, the rapid increase in out-in M&As preceded the boom in in-in M&As (Figure 2.1). Figure 2.2 shows the number of out-in M&A cases by source region and by year. U.S. and European firms were the major investors. One interesting new trend is that since 2000, investments from Asian countries have also been increasing. Among the total of 97 out-in M&As involving firms from Asia in 1994-2002, 36 involved firms from China, 24 from Korea, 19 from Taiwan, and 8 from Singapore.

Insert Figure 2.2

An interesting question is whether there are any differences in the industry distribution of target firms between M&A investments from Western countries and from Asia. Table 2.1 shows the industry distribution of out-in M&A target firms by source region. Compared with investments from Western countries, M&A investments from Asia tend to be concentrated in electrical machinery, communication and broadcasting, and software. One possible explanation regarding these differences is that Asian firms conduct M&A investments in Japan in order to gain access to the technology of Japanese high-tech firms.

Insert Table 2.1

Another issue concerns the extent to which the out-in M&A boom in Japan was dominated by private equity funds ("vulture funds"). Table 2.1, which shows the number of out-in acquisitions by purchasers' industry and by target firms' industry, provides a clue. The table shows that out-in M&As in the same industry are much more common than cross-industry out-in M&As. There were only seven acquisitions of Japanese manufacturing firms by foreign investors from the financial sector, which includes M&As by private equity funds. It is also interesting to note that in the case of out-in M&As in the commerce sector, the majority of purchasers were manufacturing firms. This is probably because manufacturers of differentiated products, such as automobiles and electronic machinery, usually try to integrate the overseas sales of their products in order to control and promote their exports.

Insert Table 2.2

3. Research Approach, Empirical Model and Results

Attempts to provide a theoretical explanation for changes in ownership and the causes and consequences of acquisitions have produced two different hypotheses: the synergy hypothesis and the managerial-discipline hypothesis.[2] The synergy hypothesis claims that acquisitions take place when the value of the combined new hierarchical firm group to be created by the acquisition is expected to be greater than the sum of the values of the independent firms. As Nguyen and Ollinger (2002) have pointed out, if an acquisition is motivated by this synergy effect, acquiring firms tend to target only productive and efficient firms. After a merger,

[2] Lichtenberg and Siegel (1987) and McGuckin and Nguyen (1995) tested these hypotheses using U.S. plant level data. Lichtenberg and Siegel (1987) found that firms with low productivity were chosen and productivity increased after the acquisition. McGuckin and Nguyen (1995) found a positive relationship between changes in ownership and both initial productivity and productivity growth after the acquisition.

synergies between the firms are expected to improve the performance of the acquired firm. In contrast, the managerial-discipline hypothesis claims that acquisitions are driven by the intention to strengthen managerial control over entrenched managers, who try to maximize their own benefits rather than owners' wealth. Therefore, takeover targets are likely to be inefficient firms and their performance, especially the rate of return on capital, is expected to improve after the acquisition (Jensen, 1988).

In our previous study, Fukao, Ito, and Kwon (2005), we examined the characteristics of firms acquired by in-in and out-in M&As by estimating Probit models and also estimated the dynamic effects of M&As on target firms by regressing changes in performance on a set of control variables and dummy variables which represent firms acquired by in-in or out-in M&As. Through these estimations, we found that foreign firms acquired better performing Japanese firms with higher TFP levels and higher profit rates. Moreover, out-in M&As improved target firms' TFP level and current profit-sales ratio, and compared with in-in M&As, out-in M&As brought a larger and quicker improvement in the performance of acquired firms. Therefore, we concluded that the motivation for out-in M&As tended to be to achieve synergy effects while the motivation for in-in M&As tended to be to improve managerial efficiency. The analysis in Fukao, Ito, and Kwon (2005) was based on the firm-level data for the period from 1994 to 2001 underlying the *Basic Survey of Japanese Business Structure and Activities* and the analysis focused on the manufacturing sector. In this paper, we extend the sample period until 2002 and include the data on non-manufacturing industries. The survey covers many non-manufacturing industries: wholesale and retail trade, electricity and gas, information and communication services, credit and finance business, restaurants, private education services, and other services such as amusement and recreation, business services, and personal services. In the 2003 survey, 27,545 firms answered the survey. Of these, 12,946 firms are classified in the manufacturing

sector (47 percent of the total number of responding firms). In this paper, using the new dataset, we analyze the effect of out-in M&As on target firms' performance for both the manufacturing sector and the non-manufacturing sector following the methodology employed by Fukao, Ito, and Kwon (2005). We examine whether the effects of M&As are temporary or long-lasting by analyzing the dynamic effects using a longer time span. Moreover, we investigate whether there are any differences between the effects of in-in M&As within a corporate group and those of in-in M&As by outsiders.

However, one possible concern is that firms acquired by foreign firms show better performance simply because foreign firms acquired better performing firms or firms that would potentially perform well even under local ownership.[3] As Arnold and Javorcik (2005: 6) point out, "plants acquired by foreign investors are unlikely to be a random sample from the populations. To the extent that the acquisition targets differ systematically from other plants, a problem of simultaneity between ownership status and other performance-relevant variables will arise and bias the estimate of the productivity advantage." In order to control for this selection bias, we apply a matching technique in this paper. Using this technique, we identify for each firm acquired by a foreign firm a suitable firm under continued domestic ownership for comparison.[4] In other words, we find firms that were not acquired by foreign firms but had similar characteristics as firms that were acquired by foreigners. Comparing the treated group (out-in M&A targets) and the control group, we examine whether firms acquired by foreigners show a

[3] Many FDI-related studies show that compared with domestically-owned firms, foreign-owned firms tend to be larger in size, more capital- and skill-intensive, and show better business performance in terms of, for instance, productivity and profitability. See, for example, Doms and Jensen (1998) for the United States, Griffith and Simpson (2001) for the United Kingdom, Ramstetter (1999), Takii (2004), and Ito (2004) for Asian countries. Fukao, Ito, and Kwon (2005) also compared differences in performance and other characteristics of local and foreign-owned firms in Japanese manufacturing and found that foreign-owned firms showed a better performance.

[4] Arnold and Javorcik (2005), using plant-level data on the Indonesian manufacturing sector, apply the matching technique and compare TFP levels and other performance measures of domestic plants and plants acquired by foreign firms.

greater or faster improvement in performance than firms not acquired by foreigners.

In order to examine this issue, we compare the growth rates of performance measures of acquired firms with those of firms remaining under domestic ownership using a difference-in-differences (DID) technique. The difference-in-differences technique compares the difference in average outcome before and after the treatment for the treated group with the difference in average outcome during the same period for the comparison group.[5] However, before applying the difference-in-differences technique, we need to overcome or at least reduce the problem of sample selection bias. Following Arnold and Javorcik (2005), we combine the difference-in-differences approach with propensity score matching.[6] We employ the propensity score matching technique proposed by Rosenbaum and Rubin (1983). In studies evaluating the effects of economic policy interventions, etc., data often come from (non-randomized) observational studies and the estimation of the effect of treatment may be biased by the existence of confounding factors. The propensity score matching method provides a way to reduce the bias of the estimation of treatment effects controlling for the existence of the confounding effect by comparing treated and control subjects that are as similar as possible. Since matching subjects on an *n*-dimensional vector of characteristics is typically unfeasible for large *n*, the propensity score matching method summarizes the pre-treatment characteristics of each subject into a single-index variable (i.e., the propensity score) which makes the matching feasible.[7]

3.1 The Propensity Score Matching and the Difference-in-Differences Estimator

[5] The DID estimator assumes that unobserved macro-economic shocks affect the treatment and the control group in the same way ("common trends assumption").

[6] This type of strategy is often employed in studies in the field of labor economics such as Heckman, Ichimura, and Todd (1997) and Heckman, Ichimura, Smith, and Todd (1998). Moreover, the matching estimator has become increasingly popular in international economics and other areas of economics. See, for example, Girma, Greenaway, and Kneller (2004), Barba Navaretti, Castellani, and Disdier (2006) and Hijzen, Jean, and Mayer (2006).

[7] For details on the method and an explanation of the Stata program for the method, see Becker and Ichino (2002).

The propensity score is defined by Rosenbaum and Rubin (1983) as the conditional probability of assignment to a particular treatment given the pre-treatment characteristics:

$$p(x) \equiv \Pr\{z = 1 \mid x\} = E\{z \mid x\} \tag{1}$$

where $z = \{0, 1\}$ is the indicator of receiving the treatment and x is a vector of observed pretreatment characteristics. Rosenbaum and Rubin (1983) show that if the recipient of the treatment is randomly chosen within cells defined by x, it is also random within cells defined by the values of the single-index variable $p(x)$. Therefore, for each treatment case i, if the propensity score $p(x_i)$ is known, the Average effect of Treatment on the Treated (ATT) can be estimated as follows:

$$\begin{aligned} \hat{\alpha}_{ATT} &= E\{y_{1i} - y_{0i} \mid z_i = 1\} \\ &= E\{E\{y_{1i} - y_{0i} \mid z_i = 1, p(x_i)\}\} \\ &= E\{E\{y_{1i} \mid z_i = 1, p(x_i)\} - E\{y_{0i} \mid z_i = 0, p(x_i)\} \mid z_i = 1\} \end{aligned} \tag{2}$$

where y_1 and y_0 denote the potential outcomes in the two counterfactual situations of treatment and no treatment, respectively. Therefore, according to the last line of equation (2), the ATT can be estimated as the average difference between the outcome of recipients and non-recipients of the treatment whose propensity scores $p(x_i)$ are identical.

In the case of this study, we focus on the difference in *ex post* performance between acquired firms and non-acquired firms. Therefore, in our case, z denotes whether a firm is acquired or not, x is a vector of various characteristics of a firm such as firm size, length of business experience, *ex ante* performance, etc. At the first stage, by estimating a probit model, we investigate important determinants of acquisitions and compute the propensity score (i.e., the probability of a firm being acquired by another firm) for each firm. Making use of this result, we conduct propensity score matching and compare the performance of firms within the pairs of observations matched on the propensity score. In our matching process, firms are matched

separately for each year and industry using one-to-one nearest matching with replacement.[8]

In the second stage, we estimate a difference-in-differences (DID) estimator to evaluate the causal effect of acquisition on a set of performance variables of interest. Once matched, the only difference between acquired and non-acquired firms is their acquisition status. Therefore, we focus on the Average effect of Treatment on the Treated (ATT). The ATT can be estimated as equation (2) above, which, in the case of this study, is equivalent to the following equation:

$$\hat{\alpha}_{ATT} = \frac{1}{n}\sum\nolimits_{1}^{n}\left(y^{treated}_{acqusition\ year+s} - y^{control}_{acquisition\ year+s}\right) - \frac{1}{n}\sum\nolimits_{1}^{n}\left(y^{treated}_{pre-acquisition\ year} - y^{control}_{pre-acquisition\ year}\right)$$

$$s = \{0, 1, 2, 3, 4\} \qquad (3)$$

where *n* denotes the number of observations and *y* denotes outcome variables

In the following subsections, we (1) provide details on our dataset (Section 3.2); (2) show the result of the probit estimation on the determinants of acquisition (Section 3.3); (3) examine, by OLS regression analysis, whether the acquired firms saw an improvement in performance after the acquisition using unmatched samples (Section 3.4); and finally (4) examine the *ex post* performance differences between acquired and non-acquired firms using matched samples (Section 3.5).

3.2 Data Source

Our analysis on the effects of acquisitions is based on the firm-level data of the *Kigyo Katsudo Kihon Chosa* (*Basic Survey of Japanese Business Structure and Activities*) compiled by the Ministry of Economy, Trade, and Industry (METI).[9] Our data cover the period from 1994 to

[8] Our matching procedure is implemented in Stata 9 using a modified version of the procedure provided by Leuven and Sianesi (2001). As we match firms separately for each year and industry (13 manufacturing industries and 9 non-manufacturing industries), we had to modify the program.

[9] The survey covers all firms with at least 50 employees or 30 million yen of paid-in capital in the Japanese manufacturing, mining, commerce, and several other service sectors.

2002.[10] We define out-in M&As as cases where a firm that did not have a parent firm abroad with majority ownership at time t–1 comes to have a foreign parent firm with majority ownership at time t. Similarly, we 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. Therefore, if a firm is sold from a domestic parent firm to another domestic parent firm, such cases are not counted as in-in M&As in our above definition.

Tables 3.1 and 3.2 show the number of out-in and in-in M&A cases in our dataset. We have 156 cases of out-in M&As and 3,132 cases of in-in M&As for the period from 1994 to 2002. As shown in Table 3.2, our unbalanced panel consists of 186,080 observations, out of which 53 percent fall into the manufacturing sector. More than 80 percent of the non-manufacturing observations fall into the wholesale and retail trade sector. Table 3.2 also shows that out-in M&As are heavily concentrated in a relatively small number of industries, which include chemicals, machinery, and wholesale and retail trade.[11] Although in-in M&As also tend to be concentrated in these industries, they are more widely dispersed, covering all industries except agriculture, forestry and fishing.

Insert Tables 3.1 and 3.2

Data on sales, purchases, total assets, profits, total liabilities, firm age, the number of employees, the number of non-production workers, exports, R&D expenditure, and advertising expenditure are taken from the *Basic Survey of Japanese Business Structure and Activities.* We mainly use newly constructed industry-level deflators which were taken from the JIP (Japan

[10] The compilation of the micro data of the METI survey was conducted as part of the project "Study Group on the Internationalization of Japanese Business" at the Research Institute of Economy, Trade and Industry (RIETI).

[11] These industries have a higher share of foreign-owned firms than other industries. For detailed statistics on foreign-owned firms in Japan, see Fukao, Ito, and Kwon (2005) and Ito and Fukao (2005).

Industry Productivity) Database 2006.[12] We use the industry-level output and input deflators to deflate firms' sales and intermediate inputs, respectively. Exports and R&D expenditure are deflated by the export price index compiled by Bank of Japan and the R&D price index compiled by the Science and Technology Agency and reported in *Kagaku Gijutsu Yoran 2003,* respectively. Advertising expenditure is deflated by the corporate services price index provided by the Bank of Japan. ROA is defined as the ratio of after-tax profits inclusive of interest payments to total assets. Table 3.3 provides a description of the variables used in our econometric analysis. The summary statistics for the variables are shown in Appendix Table 1 and a detailed description of our TFP measure is provided in the Appendix.

Insert Table 3.3

3.3 Are Acquisition Targets Better Than the Rest? A Probit Estimation

Using our panel data for 1994-2002, we estimate probit models designed to test whether a firm is chosen as an M&A target based on its productivity or profitability level or whether other characteristics are more important.

The dependent variables are the out-in M&A dummy (*Out-in*) and the in-in M&A dummy (*In-in*).[13] Each dummy variable takes value one when an acquisition occurs. As explanatory

[12] The JIP Database 2006 was compiled as part of the RIETI (Research Institute of Economy, Trade and Industry) research project "Development of a RIETI Manufacturing Database and Study of Productivity by Industry" for fiscal 2004-05. The JIP 2006 contains sector-level information on 108 sectors from 1970 to 2002 that can be used for total factor productivity analyses. These sectors cover the whole Japanese economy. A preliminary version of the JIP database is available from the RIETI website <http://www.rieti.go.jp/jp/database/d04.html>.

[13] We were also interested in the difference between determinants of out-in M&As by Asian firms and by Western firms and the difference between the outcomes for these two types of out-in M&As. However, the number of observations for M&A cases by Asian firms is very small and almost no observations were left after we screened the data. Therefore, we gave up investigating the characteristics or outcomes of out-in M&As by Asian firms in this study. Nonetheless, as mentioned in Section 2, the number of out-in M&A cases by Asian firms has been increasing in recent years and M&As by Asian firms are an issue that deserves further investigation in future studies.

variables, we use the logarithm of TFP, ROA (return on assets), the logarithm of employment to represent firm size, firm age, the share of the number of non-production workers in the total number of workers as an indicator of human capital, R&D intensity, advertising intensity, export intensity, and the debt-asset ratio.[14] All the explanatory variables are values in year *t*-1, i.e., the year preceding the year of acquisition, *t*. The model also includes a full set of industry and year dummies.

The results from the probit estimation are presented in Table 3.4. The determinants of acquisition are quite different for out-in acquisitions and in-in acquisitions. In the case of out-in acquisitions, consistent with the preceding results of Fukao, Ito and Kwon (2005) and Conyon et al. (2002), we find that firms with higher TFP, a higher profit rate, a higher share of non-production workers, a higher export intensity, and of larger size are chosen as targets in the manufacturing sector (equation (1) of Table 3.4). As for the non-manufacturing sector, firms with a higher profit rate and higher advertising and export intensities tend to be chosen as out-in M&A targets (equation (2) of Table 3.4). This result implies that foreign firms acquire well-performing Japanese firms. In contrast, in the case of in-in acquisitions, many of these performance measures are not significant determinants of acquisitions, although we can see that in the manufacturing sector, firms with higher TFP are more likely to be acquired (equation (3) of Table 3.4). Moreover in the case of in-in acquisitions in the non-manufacturing sector, firms with a higher profit rate and export intensity are less likely to be acquired, which is conspicuously different

[14] In the case of the non-manufacturing sector, the share of the number of non-production workers in the total number of workers, R&D intensity, and export intensity are excluded from the explanatory variables. We define "production workers" as the workers who are working in manufacturing plants and consequently, our definition of the share of non-production is not appropriate as a proxy for human capital or skilled labor in the case of the non-manufacturing sector. The data on R&D expenditure are not very reliable for many firms in the non-manufacturing sector in our dataset. As for exports, most of exporting firms are trading companies and there are very few firms who export their products or services in other non-manufacturing industries. Therefore, we think these variables are not appropriate explanatory variables in the case of non-manufacturing sector.

from the case of out-in acquisitions (equation (4) of Table 3.4). Another important difference between out-in and in-in acquisitions is that firms with a higher debt-asset ratio are chosen as targets in the case of in-in acquisitions while firms with a lower debt-asset ratio are chosen as targets in the case of out-in acquisitions. This result implies that in-in acquisitions may have the characteristics of rescue missions. As discussed in Fukao, Ito, and Kwon (2005), in-in acquisitions in Japan may be mainly conducted within vertical and horizontal *keiretsu* networks or within a corporate group, and financially distressed firms are salvaged by other member firms or parent firms through M&As. We will return to this issue in the next subsection.

Insert Table 3.4

The results from the probit estimation generally indicate that foreign firms tend to target firms that are more productive and have a higher ROA while Japanese firms target firms with low profitability. There are two potential explanations for these revealed preferences of foreign firms. One is the synergy hypothesis. Foreign firms seek synergy effects when they purchase Japanese firms. In order to make sure they reap synergy effects, foreign firms prefer excellent Japanese firms. The other explanation, which is not necessarily inconsistent with the first, is an asymmetric information problem. Foreign firms are disadvantaged in gathering information on small Japanese firms. It is a very difficult task for foreign firms to correctly evaluate whether they can restructure a small Japanese firm teetering on the brink of bankruptcy and negotiate from their home country debt rescheduling with the Japanese main bank of such a firm. Because of this problem, foreign firms might prefer better Japanese firms as their target.

In the case of cross-border portfolio investment, it is well known that investors tend to prefer stocks of excellent and large manufacturing firms with high export intensity. Probably in the case of out-in M&As, the problem of asymmetric information causes a similar phenomenon.

After establishing a beachhead by purchasing an excellent Japanese firm, foreign firms probably can gather more information on smaller and inferior Japanese firms and then start purchasing such firms. But if this new purchase is conducted by the beachhead Japanese affiliate, our data on out-in M&As do not cover such cases.

In the case of in-in M&As, we found that Japanese firms tend to target inefficient firms with low profits or with a high debt-asset ratio. This finding is consistent with the managerial-discipline hypothesis.

3.4 Do Acquisitions Improve the Performance of Target Firms? – An Analysis of the Dynamic Effects Based on the Unmatched Sample

In this subsection, we examine how the performance of targeted firms changes after the acquisition. First, following Fukao, Ito, and Kwon (2005), we estimate the following model of the dynamic effects of an acquisition in order to see whether the improvement in performance is significantly faster for acquired firms than for non-acquired firms:

$$y_{f,t+s} - y_{f,t-1} = \alpha + \beta_1 Outin_{f,t} + \beta_2 Inin_{f,t} + x_{f,t-1}\phi + \sum_{\tau} \lambda_{\tau} YearDummy(t,\tau) + \sum_{j} \delta_j IndustryDummy(i,j) + \varepsilon_{f,t} \quad (4)$$

$s = \{1, 2, 3, 4\}$

where $y_{f,t}$ denotes the performance of firm *f* in year *t* and $x_{f,t-1}$ is a vector of various firm characteristics which are expected to affect the performance of firm *f* in year *t-1*. As variables to measure targeted firms' performance we use the logarithm of TFP and the return on assets (ROA) ratio. It likely takes several years for the performance improving effects of an acquisition to materialize. In order to take this time lag into account, we examine whether the performance of acquired firms has improved *s* (=1, 2, 3, 4) years after the acquisition compared with the

performance in the year prior to the acquisition. As explanatory variables, we use out-in and in-in acquisition dummies (*Out-in* and *In-in*) which take 1 for an acquired firm in year *t* when the acquisition occurs, the lagged values of the two performance variables (the *TFP* level and the *ROA*), the lagged logarithm of the number of employees in year *t-1*, and several additional firm characteristics, such as the length of business experience (*Age*), the ratio of the number of non-production workers to the number of total workers, R&D intensity, advertising intensity, export intensity, and the debt-asset ratio.[15] A full set of industry and year dummies is also included. λ_τ and δ_j denote the coefficients of the year and industry dummies, respectively. By looking at the coefficients on the *Out-in* and *In-in* dummy variables, β_1 and β_2, we will evaluate whether the performance of acquired firms improved faster than that of non-acquired firms once other characteristics are controlled for.

Insert Tables 3.5 and 3.6

The estimation results for the manufacturing sector on the effects of the acquisition are reported in Tables 3.5 and 3.6. Table 3.5 presents the effect of the acquisition on the TFP growth rate, while Table 3.6 shows the effect of the acquisition on the ROA ratio. The results in Table 3.5 suggest that compared with non-acquired firms, both firms acquired by foreigners and firms acquired by another domestic firm show a significantly higher TFP growth rate during the four-year-period from the year prior to the acquisition to three years after the acquisition. The coefficient on the out-in dummy variable is much larger than that on the in-in dummy in the cases of the 3-year window (equation (2) of Table 3.5) and the 4-year window (equation (3) of

[15] In the case of the non-manufacturing sector, we exclude the share of non-production workers, R&D intensity, and export intensity for the same reasons as in the probit estimation in the previous subsection.

Table 3.5), which implies that out-in acquisitions may have a larger positive effect on TFP growth. In the case of the 5-year window (equation (4) of Table 3.5), however, the coefficient on the out-in dummy becomes insignificant while the coefficient on the in-in dummy remains positive and significant. Therefore, regarding the effects of acquisitions on the TFP growth rate, the results in Table 3.5 suggest that out-in acquisitions tend to bring a larger productivity improvement than in-in acquisitions three years after the acquisition, but the productivity improvements from out-in acquisitions do not last long.

On the other hand, the results in Table 3.6 indicate that out-in acquisitions lead to a significant improvement in target firms' profitability (measured as ROA) three and four years after the acquisition. Although no immediate improvement in profitability can be observed after out-in acquisitions, the results clearly indicate that out-in acquisitions contribute to higher profitability while in-in acquisitions do not have any impact on target firms' profitability.

In the case of the non-manufacturing sector, the impact of out-in acquisitions on target firms' performance differs more sharply from that of in-in acquisitions (Tables 3.7 and 3.8). Out-in acquisitions result in higher TFP growth for target firms three years after the acquisition, while the TFP improvement effect of in-in acquisitions is very small or even negative and not statistically significant (Table 3.7). As for ROA, out-in acquisitions have a significant positive effect beginning immediately after the acquisition, while the effects of in-in acquisitions are negative but insignificant in all equations except one in Table 3.8.

Insert Tables 3.7 and 3.8

Overall, we find some evidence that out-in acquisitions lead to an improvement in target firms' ROA both in the manufacturing and the non-manufacturing sector. Moreover, out-in

acquisitions also lead to a TFP improvement three years after the acquisition both in the manufacturing and the non-manufacturing sector. These results regarding out-in acquisitions are consistent with the synergy hypotheses. On the other hand, in the case of in-in acquisitions, the result that there is no significant improvement in ROA does not provide much support for the managerial-discipline hypotheses.

Although our results do not seem to support the managerial-discipline hypotheses, in the case of in-in acquisitions, firms with a lower profit rate (for the non-manufacturing sector) and a higher debt-asset ratio (for both the manufacturing and the non-manufacturing sectors) are, as discussed in Section 3.3, more likely to be acquired. This result implies that in-in acquisitions may have the characteristics of rescue missions, which may be one reason why there is no conspicuous improvement in performance after an in-in acquisition. As mentioned above, many cases of in-in acquisitions in Japan are conducted within vertical and horizontal *keiretsu* networks or within a corporate group. In the case of within-group acquisitions, since workers and managers of acquired firms expect further support by group firms, it may be difficult to accomplish drastic restructuring. On the other hand, in-in acquisitions involving outsiders may have a positive effect on performance after the acquisition in a way that is similar to out-in acquisitions. In order to test this hypothesis, we examine the dynamic effects of in-in acquisitions within firm groups and of in-in acquisitions involving outsiders.

For information on firm groups, we use the *Kankei Kaisha* database (subsidiary firms database) compiled by Toyo Keizai Shinposha. We define acquisitions as conducted within a group if, prior to the acquisition, between 20 and 50 percent of the paid-in capital of the acquired firm was held by a related company. It is important to note, however, that if firm A was partly owned by related firm B, but the majority of firm A's equity is newly acquired by another firm C, which did not have a close relationship with firm A before the acquisition, such a case is

incorrectly included in our sample as a "within-group acquisitions." Using the Toyo Keizai information, we find 518 within-group in-in acquisition cases in our dataset for the period from 1994 to 2002, which is approximately one-sixth of the total of in-in acquisition cases (refer to Table 3.1). The estimation results including the within-group in-in acquisition dummy variable and the dummy for in-in acquisitions by outsiders are reported in Tables 3.9 to 3.12.

Insert Tables 3.9 and 3.10

Tables 3.9 and 3.10 show the results for the manufacturing sector. Contrary to our expectation, target firms of within-group in-in acquisitions tend to show a higher TFP growth rate than target firms of in-in acquisitions by outsiders. The TFP growth rate during the period from a year prior to the acquisition to three years after the acquisition is significantly higher for firms acquired by a group firm than for firms acquired by a domestic outsider firm. As for ROA performance, however, within-group in-in acquisitions tend to have a significant negative impact, while acquisitions by domestic outsiders did not have any significant effects. These results imply that again, the managerial-discipline hypothesis does not seem to apply in the case of in-in acquisitions in Japan. Rather, the results may be interpreted as follows: In the case of within-group in-in acquisitions, parent firms may try to quickly restructure acquired firms, which temporarily worsens their profitability. However, after the business restructuring is completed, the acquired firms may be able to enjoy higher productivity by effectively utilizing managerial and technological resources within the corporate group.

Insert Tables 3.11 and 3.12

According to the results for the non-manufacturing sector shown in Tables 3.11 and 3.12, we can see a significant positive impact of within-group in-in acquisitions on the TFP growth rate only in the case of the 5-year window (equation (4) of Table 3.11). In all the other cases, the coefficients for within-group in-in acquisitions and in-in acquisitions by outsiders are not statistically significant. Although out-in acquisitions positively affect the return on assets in the case of the non-manufacturing sector, neither type of in-in acquisitions has a positive impact on ROA. In the case of the non-manufacturing sector, our results suggest that there is no conspicuous difference between the effects of within-group in-in acquisitions and in-in acquisitions by outsiders. That is, in the non-manufacturing sector, even acquisitions by domestic outsiders do not lead to an improvement in the acquired firms' performance.

Thus, we find that there is no positive impact on target firms' ROA both in the case of within-group in-in acquisitions and in-in acquisitions by outsiders, implying that the managerial-discipline hypothesis is not supported.

3.5 Do M&As Improve the Performance of Target Firms? – Analysis Based on Difference-in-Differences Estimates from the Matched Sample

Our estimation results on the dynamic effects of out-in and in-in acquisitions in the previous subsection indicate that both in the manufacturing and the non-manufacturing sectors out-in acquisitions lead to improvements in target firms' TFP and ROA. These results are consistent with those in Fukao, Ito, and Kwon (2005), although the results of that study indicated that out-in acquisitions improve target firms' performance more quickly.[16] However, as

[16] The difference between the results of that study and the present one is probably due to the fact that (1) the data for this study cover the period 1994-2002, which is one year longer than the observation period in Fukao, Ito, and Kwon (2005); (2) this study uses newly compiled and detailed industry-level deflators taken from the JIP database 2006; and (3) the explanatory variables employed in the regression analyses are not exactly the same as those in Fukao, Ito, and Kwon (2005).

described at the beginning of Section 3, the Fukao, Ito, and Kwon (2005) study does not address the selection bias problem and therefore suffers from the problem of simultaneity between ownership status and other performance variables because out-in acquisition targets differ systematically from other firms as indicated by the results of probit analysis. The analysis in this study so far also has not addressed the simultaneity problem yet. Therefore, we now employ the propensity score matching and the difference-in-differences (DID) techniques described in Section 3.1 and examine whether we still find that out-in acquisitions lead to an improvement in acquired firms' performance even after the simultaneity problem has been overcome or at least reduced. What we are interested in is the causal effect of acquisition on target firms' performance. However, changes in performance following an acquisition are not exclusively the result of the acquisition but also depend on other factors. Applying the DID technique, the change in performance before and after the acquisition therefore is further differenced with respect to changes in performance of the control group of non-acquired firms. Therefore, the DID estimator removes the effects of common shocks and more accurately measures the causal effect of the acquisition.

Using the probit estimation results shown in Table 3.4, we first identify the probability of acquisition (or "propensity score") for all firms in our dataset.[17] Our probit estimation model in Table 3.4 assumes that the propensity of firms to be acquired by other firms is a function of the

[17] In order to verify whether the balancing condition is satisfied in our matched sample, we conduct two tests, following Hijzen, Jean, and Mayer (2006). First, we examine the standardized bias for variables included in the propensity score estimation before and after matching (see Smith and Todd, 2005). Rosenbaum and Rubin (1985) assume that a standardized bias in excess of 20 percent is large, although there is no formal criterion to assess the bias. Second, for each variable in the propensity score estimation, we perform standard t-tests for equality of means of each variable between the treated group and the non-treated group before and after matching. The results of these two tests are presented in Appendix Tables 2 and 3. The standardized bias and t-test for equality of means before and after matching indicate that the balancing property is satisfied for most of our variables. However, the debt-asset ratio in the case of manufacturing and the ROA ratio in the case of non-manufacturing are less likely to satisfy the balancing property. Further investigation and improvement in matching accuracy may be necessary.

TFP level, firm size, the number of years since establishment, the share of the number of non-production workers, R&D intensity, advertisement intensity, export intensity, and the debt-asset ratio.[18] A non-acquired firm which is "closest" in terms of its propensity score to an acquired firm is selected as a match for an actually acquired firm using the one-to-one nearest neighbor matching method. One-to-one nearest neighbor matching means that we can use data only from a subset of the sample. In the case of out-in acquisitions, our matched sample contains 132 firms not acquired by foreigners as a match for the 132 firms acquired by foreigners (60 firms in manufacturing and 72 firms in non-manufacturing). In the case of in-in acquisitions, our matched sample contains 2,820 firms not acquired by domestic firms as a match for the 2,820 firms acquired by domestic firms (1,385 firms in manufacturing and 1,435 firms in non-manufacturing).

Using the subsets of the sample, we estimate a difference-in-differences (DID) estimator, which in our case, is equivalent to calculating the Average effect of Treatment on the Treated (ATT) based on equation (3) in Section 3.1. The calculated effects of out-in and in-in acquisitions are presented in Tables 3.13 and 3.14. In the case of the manufacturing sector (Table 3.13), a foreign acquisition leads to an additional 5 percentage-point productivity growth in the firms acquired by foreigners three years after the acquisition. The result also shows that firms acquired by foreign firms enjoy an ROA advantage over the control group equivalent to 4 percentage-points at the end of the third year of foreign ownership and 2.5 percentage-points at the end of the fourth year of foreign ownership. Although we find a TFP improvement effect four years after in-in acquisitions, the results in Table 3.13 generally show that performance improvements are likely to be larger in the case of foreign acquisition. Table 3.14 shows that foreign ownership improved the TFP and ROA of acquired firms also in the non-manufacturing

[18] In the case of the non-manufacturing sector, we exclude the share of non-production workers, R&D intensity, and export intensity.

sector at the end of the third year of foreign acquisition. On the other hand, in-in acquisitions do not have any significant impact on the performance of acquired firms. Moreover, the magnitude of the ATT tends to be much larger for out-in acquisitions in the non-manufacturing sector compared with that for out-in acquisitions in the manufacturing sector, although in many cases the ATT is not statistically significant.

The results from the matched sample indicate that foreign acquisitions improve target firms' productivity and profitability while acquisitions by domestic firms hardly have any positive impact on performance. However, the significant positive effect of foreign acquisitions shows up only three years after acquisition, implying that the realization of synergy effects from acquisitions or the restructuring of acquired firms take at least three years. Moreover, according to the results, improvements experienced by firms acquired by foreigners are likely to be a temporary phenomenon. Although the matching results provide only weak evidence that acquisition by a foreign firm improves the performance of acquired firms, they do confirm that such a positive effect exists, even when the sample selection bias is removed. Furthermore, the matching result that performance improvements are likely to be realized three years after acquisition are consistent with the estimation results from the unmatched samples in the previous subsection.

Insert Tables 3.13 and 3.14

4. Conclusion

In recent years, the Japanese government has been actively promoting inward foreign direct investment with the aim of accelerating structural adjustment and achieving a full-scale economic recovery. In order to examine whether the entry of foreign firms indeed does provide a stimulus to the Japanese economy and contribute to a better performance of Japanese firms, we

investigated the effects of out-in M&As on target firms' performance in a previous study (Fukao, Ito, and Kwon, 2005). Although that study found some evidence that out-in M&As brought larger and quicker improvements in TFP and the profit-to-sales ratio than in-in M&As, the study had several limitations. This paper sought to overcome these limitations by conducting (1) a much more careful investigation of the effect of in-in acquisitions by distinguishing within-group in-in acquisitions and in-in acquisitions by outsiders; (2) an analysis on firms in the non-manufacturing sector; (3) a more rigorous analysis by employing propensity score matching and the difference-in-differences technique; and (4) an analysis using a new dataset which contains the most recent data available.

The results of this paper were generally consistent with those in Fukao, Ito, and Kwon (2005). But the present study also produced several new findings. First, we found that there was no positive impact on target firms' ROA in the case of both within-group in-in acquisitions and in-in acquisitions by domestic outsiders. In fact, in the manufacturing sector, the return on assets even deteriorated one year and two years after within-group in-in acquisitions. The results thus did not support the managerial-discipline hypothesis which suggests that acquisitions are intended to strengthen managerial control over entrenched managers who are more interested in their own benefit than the wealth of the firm's owners, and which therefore predicts that the profitability of acquired firms improves after the acquisition. Rather, our results imply that in the case of within-group in-in acquisitions, parent firms may be trying to quickly restructure acquired firms even at the cost of deteriorating profitability. Our results also showed that within-group in-in acquisitions brought a larger and quicker improvement in TFP compared with in-in acquisitions by domestic outsiders both in the manufacturing and non-manufacturing sectors.

Second, we found that foreign acquisitions improved target firms' productivity and

profitability significantly more and quicker than acquisitions by domestic firms. We confirmed these results by employing a methodology that combines propensity score matching and difference-in-differences techniques. The methodology enabled us to ensure that the characteristics of acquired firms and non-acquired firms are as close as possible and to isolate causal effects that can be reliably attributed to acquisitions.

One potential concern is that our results from the matched sample may not be very strong and robust. A possible reason for our somewhat weak results may be the accuracy of the matching. As mentioned in Girma, Greenaway, and Kneller (2004), the importance of appropriate matching cannot be overemphasized. If acquired firms experience a surge in productivity just before the acquisition, their productivity is likely to grow more slowly in subsequent periods. In such a case, a difference-in-differences estimator based on randomly matched firms is likely to underestimate the performance impact of acquisitions. There may be room for further improvement of the matching methodology in future studies.

Another possible concern is that the reliability of the difference-in-differences methodology is dependent on the assumption that acquired and non-acquired firms are similarly affected by macroeconomic factors. However, the bias arising from this assumption is mitigated as much as possible in this study because firms are matched in the same industry and year in our matching process.

Although we found some positive effects of foreign acquisitions on target firms' performance, the magnitude of the positive effects is much smaller than that observed in Arnold and Javorcik's (2005) study for Indonesia. This is not surprising because the difference in technological and managerial capabilities between domestic and foreign firms is much larger in Indonesia than in Japan and technology transfer effects from foreign firms to domestic firms should be less relevant in Japan. However, our results in this study imply that even in Japan,

where many domestic firms are closer to the technology frontier, performance improvement effects from foreign acquisitions are present. Moreover, we find that the positive effects of foreign acquisitions tend to be much larger in the case of the non-manufacturing sector than in the case of the manufacturing sector. It is often argued anecdotally that the productivity of Japanese non-manufacturing firms is relatively low compared with firms in other developed countries. If this is true, the positive effect of foreign acquisitions in the non-manufacturing sector may have very important policy implications: Foreign acquisitions possibly contribute to a better performance of target firms in the non-manufacturing sector by transferring advanced technology or managerial know-how. However, in our dataset, most out-in acquisitions in the non-manufacturing sector occur in the wholesale and retail trade industries. The majority of out-in acquisitions in these industries consist of acquisitions by manufacturing firms, suggesting that foreign manufacturing firms often acquire Japanese wholesalers or retailers in order to obtain their own distribution channels. Although technology and managerial know-how transfer effects may not be relevant, such cases possibly contribute to the streamlining of distribution networks in the Japanese commerce sector. A more detailed investigation of technology transfer effects particularly in the non-manufacturing sector is an issue warranting of further investigation.

Appendix: Construction of the Multilateral Index

The dataset employed in this paper was obtained from *Kigyo Katsudo Kihon Chosa* (*Basic Survey of Japanese Business Structure and Activities*), which is conducted annually by the Ministry of Economy, Trade and Industry (METI).

We define the productivity level of firm *i* in year *t* in a certain industry in comparison with the productivity level of a hypothetical representative firm in base year 0 in that industry.

The TFP level is defined as follows:

$$\begin{aligned}\ln TFP_{i,t} &= (\ln Q_{i,t} - \overline{\ln Q_t}) - \sum_{f=1}^{n} \frac{1}{2}(S_{f,i,t} + \overline{S_{f,t}})(\ln X_{f,i,t} - \overline{\ln X_{f,t}}) \\ &+ \sum_{s=1}^{t} (\overline{\ln Q_s} - \overline{\ln Q_{s-1}}) - \sum_{s=1}^{t} \sum_{f=1}^{n} \frac{1}{2}(\overline{S_{f,s}} + \overline{S_{f,s-1}})(\overline{\ln X_{f,s}} - \overline{\ln X_{f,s-1}})]\end{aligned} \tag{A1}$$

where $Q_{i,t}$, $S_{f,i,t}$, and $X_{f,i,t}$ denote the output of firm *i* in year *t*, the cost share of factor *f* for firm *i* in year *t*, and firm *i*'s input of factor *f* in year *t*, respectively. Variables with an upper bar denote the industry average of that variable.

Output: Except for the commerce sector, gross output is defined as firms' total sales. For the commerce sector, gross output is measured as sales minus expenses for purchased materials. Gross output is deflated by the output deflator derived from the JIP 2006.

Intermediate inputs: For the commerce sector, intermediate inputs are calculated as (Cost of sales + Operating costs) – (Wages + Depreciation costs + Expenses for purchased materials). The intermediate inputs of other sectors are defined as (Cost of sales + Operating costs) – (Wages + Depreciation costs). Intermediate inputs are deflated by the intermediate input deflator provided in the JIP 2006.

Labor input: As labor input, we used each firm's total number of workers multiplied by the sectoral working hours from the JIP 2006.

Capital Stock: For capital stock, the only data available are the nominal book values of tangible fixed assets. Using these data, we calculated the net capital stock of firm *i* in industry *j* in constant 1995 prices as follows:

$$K_{it} = BV_{it} * (INK_{jt} / IBV_{jt})$$

where BV_{it} represents the book value of firm *i*'s tangible fixed capital in year *t*, INK_{jt} stands for

the net capital stock of industry *j* in constant 1995 prices, and IBV_{jt} denotes the book value of industry *j*'s capital. INK_{jt} was calculated as follows. First, as a benchmark, we took the data on the book value of tangible fixed assets in 1975 from the *Financial Statements Statistics of Corporations* published by MOF. We then converted the book value of year 1975 into the real value in constant 1995 prices using the investment deflator provided in the JIP 2006. Second, the net capital stock of industry *j*, INK_{jt}, for succeeding years was calculated using the perpetual inventory method. We used the investment deflator in the JIP 2006. The sectoral depreciation rate used is taken from the JIP 2006.

Cost Shares: Total cost of labor is measured as total wages. We used nominal intermediate input as the intermediate input cost. Capital cost was calculated by multiplying the real net capital stock with the user cost of capital. The latter was estimated as follows:

$$c_k = \frac{1-z}{1-u} p_k \{\lambda r + (1-u)(1-\lambda) i + \delta_i - (\frac{\dot{p}_k}{p_k})\}$$

where $p_k, i, \delta, u, \lambda$ and z are the price of investment goods, the interest rate, the depreciation rate, the corporate tax rate, the equity ratio, and the present value of depreciation deduction on a unit of nominal investment, respectively. Data on investment goods prices, interest rates, and corporate tax rates were taken from the JIP 2006, the Bank of Japan's website, and the *Ministry of Finance Statistics Monthly*, respectively. The depreciation rate for each sector was taken from the JIP 2006. We calculated the cost shares of each factor by dividing the cost of each factor by total costs, which consist of the sum of labor costs, intermediate inputs costs, and capital costs.

Insert Appendix Tables 1, 2, and 3

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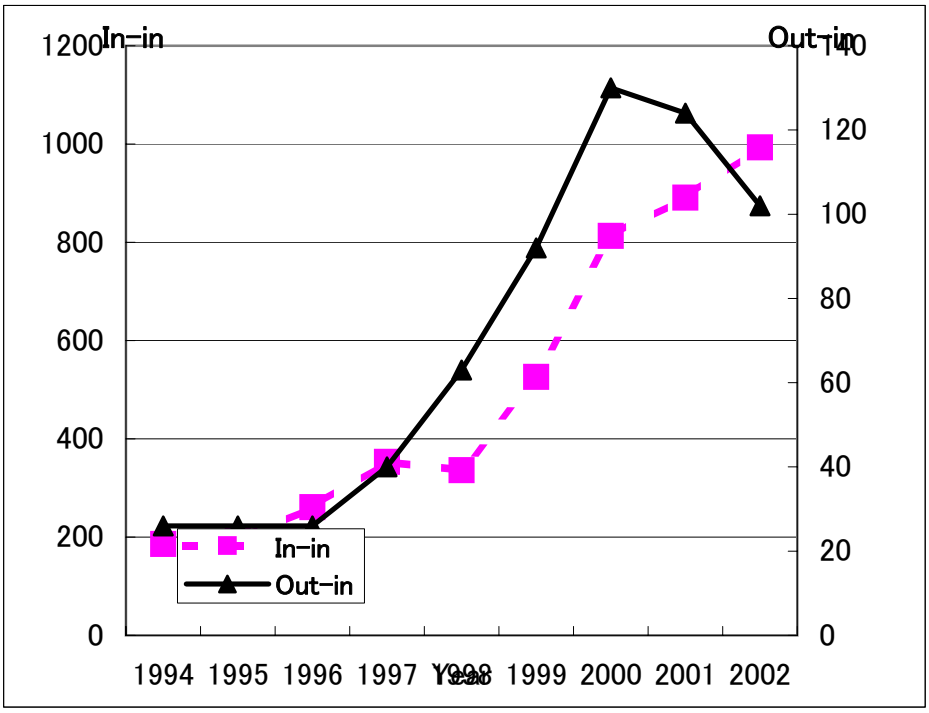
Table 1.1 Employment in Foreign Affiliates as a Share of Total Employment (in %)

Industry	JAFF (33.4%)	JAFF (33.4%)	JAFF (20%, single owner)	USAFF (10%, single owner)
	1996	2001	2001	1997
Total all sectors	**n.a.**	**1.15**	**2.75**	**5.61**
Manufacturing total	**1.36**	**1.94**	**5.91**	**10.78**
Food products	0.29	0.34	1.32	8.38
Textiles & apparel	0.15	0.17	0.93	5.83
Wood and paper products	0.06	0.16	0.83	4.95
Publishing & printing	0.13	0.22	0.38	7.83
Chemical products	3.61	3.27	13.5	21.8
Drugs & medicine	7.21	15.49	15.27	31.9
Petroleum and coal products	7.24	2.91	2.31	22.2
Plastic products	0.41	0.45	3.22	10.03
Rubber products	1.08	1.15	2.81	40.18
Ceramic, stone and clay	0.28	0.35	1.55	21.45
Iron & steel	0.01	0.13	0.27	19.35
Non-ferrous metals	1.61	0.44	7.72	15.73
Metal products	0.31	0.2	0.72	7.52
General machinery	1.68	1.78	6.82	12.75
Electrical machinery	2.46	2.48	12.51	13.78
Motor vehicles & parts	4.72	10.79	18.32	15.6
Miscellaneous transport equipment	0.7	0.62	12.71	4.23
Precision instruments	0.41	0.9	5.04	11.16
Miscellaneous manufacturing	0.47	0.72	1.71	6.62
Services total	**0.65**	**0.97**	**2.04**	**4.31**
Construction & civil engineering	0.05	0.05	0.3	1.72
Electricity, gas, steam and water supply, etc.	0	0	0.04	1.96
Wholesale trade	2.31	2.57	4.24	7.89
Retail trade	0.29	0.49	0.77	4.5
Financial intermediary services	1.47	1.75	10	6.1
Insurance	1.67	6.69	12.57	6.4
Real estate	0.02	0.08	0.28	1.64
Transportation & postal service	0.5	0.27	3.52	4.82
Telecommunications & broadcasting	0.22	2.31	6.55	7.66
Education & research institutes	0.34	0.97	1.76	6.39
Medical services, health and hygiene	0.02	0.04	0.16	1.99
Computer programming & information service	1.83	2.55	4.33	3.88
Goods & equipment rental & leasing	0.88	1.2	0.49	3.66
Other business services	0.52	1.71	2.1	4.77
Eating & drinking places	1.58	2.36	3.89	2.48
Other personal services	0.12	0.39	0.38	4.23
Other services	0.01	0	0	n.a.

Source: Paprzycki and Fukao (2005). Original data is compiled from the micro-data of the Ministry of Internal Affairs and Communications' *Establishment and Enterprise Census for 1996 and 2001* and Bureau of Economic Analysis, *Foreign Direct Investment in the United States: Establishment Data for 1997* , online: <http://www.bea.gov/bea/ai/iidguide.htm#FDIUS> (accessed 18 Feb. 2005).

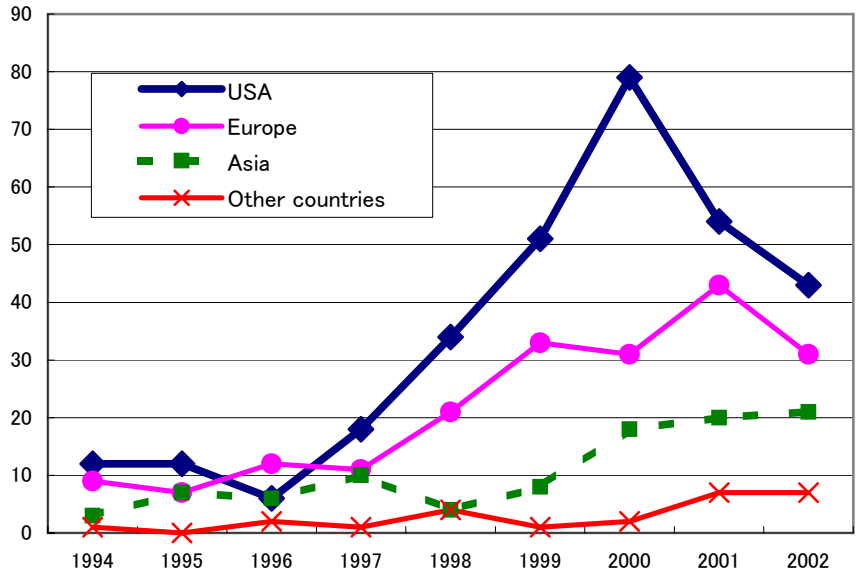
Notes: JAFF (33.4%): Japanese Affiliates of Foreign Firms (33.4% or more foreign-owned, one or more foreign companies); JAFF (20%): Japanese Affiliates of Foreign Firms (20% or more foreign-owned by a single foreign company); USAFF: U.S. Affiliates of Foreign Firms (10% or more foreign-owned by a single foreign company).

Figure 2.1 Number of In-In and Out-In M&A Transactions in Japan by Year: 1994-2002



Source: RECOF (2003).
Note: M&A transactions include mergers, purchases of substantial minority interests, and purchases of additional shares and acquisitions.

Figure 2.2 Number of Out-In M&A Transactions in Japan by Year and by Source Regions



Source: RECOF (2003).
Note: M&A transactions include mergers, purchases of substantial minority interests, and purchases of additional shares and acquisitions.

Table 2.1 Industry Distribution of Target Firms in Out-In M&A Transactions: By Source Region, 1994-2002

Target firms' industry	Source region			
	USA	Europe	Asia	Other countries
Mining	0.0%	0.0%	0.0%	4.0%
Construction	1.6%	1.0%	0.0%	8.0%
Food	1.9%	1.0%	2.1%	0.0%
Textiles	0.0%	0.5%	2.1%	0.0%
Paper and pulp	0.3%	0.0%	1.0%	0.0%
Chemicals	2.6%	13.6%	3.1%	0.0%
Medical supplies	2.3%	7.1%	1.0%	0.0%
Petroleum and coal	1.0%	0.5%	0.0%	0.0%
Rubber	0.6%	0.0%	1.0%	0.0%
Publishing and printing	1.0%	1.0%	0.0%	4.0%
Stone, Clay and Glass	0.3%	2.0%	1.0%	0.0%
Steel	1.0%	0.0%	2.1%	0.0%
Non-Ferrous Metals	1.3%	2.0%	3.1%	4.0%
General Machinery	4.5%	5.1%	3.1%	4.0%
Electrical Machinery	9.4%	8.6%	21.6%	12.0%
Transportation	5.5%	10.1%	3.1%	0.0%
Precision Machinery	1.0%	1.0%	2.1%	4.0%
Other Manufacturing	0.6%	0.0%	0.0%	4.0%
General trading company	0.6%	1.0%	1.0%	0.0%
Food wholesale	0.6%	2.0%	0.0%	4.0%
Medical-supplies wholesale	0.0%	0.5%	0.0%	4.0%
Other wholesale	9.1%	8.1%	8.2%	12.0%
Department stores	0.3%	0.0%	0.0%	0.0%
Supermarkets, Convenience Store	1.0%	0.0%	0.0%	0.0%
Other retail	0.6%	2.5%	0.0%	0.0%
Food Services	0.0%	0.5%	0.0%	0.0%
Banks	1.3%	1.5%	0.0%	0.0%
Life insurance, Damage insurance	1.6%	3.0%	0.0%	0.0%
Security	2.9%	1.0%	8.2%	0.0%
Other finance	7.1%	5.6%	0.0%	4.0%
Transportation, Warehouses	1.0%	1.0%	1.0%	4.0%
Communication, Broadcasting	7.8%	5.1%	12.4%	8.0%
Real Estate, Hotels	1.3%	1.5%	2.1%	0.0%
Amusement	1.6%	1.5%	2.1%	0.0%
Software	16.8%	6.1%	12.4%	12.0%
Services	11.3%	5.6%	6.2%	8.0%
Total no. of Out-in M&As	309	198	97	25

Source: RECOF (2003).
Note: M&A transactions include mergers, purchases of substantial minority interests, and purchases of additional shares and acquisitions.

Table 2.2 Number of Out-In Acquisition Cases by Purchasers' Industry and by Target Firms' Industry: 1994-2002

		Target firms' industry					
		Manufacturing	Commerce	Finance	Other services	Primary industry and construction	Total
Purchasers' industry	Manufacturing	118(98)	31	0	13	0	162
	Commerce	2	8(7)	0	1	0	11
	Finance	7	4	32(23)	16	0	59
	Other services	8	4	5	54(47)	2	73
	Primary industry and construction	2	0	0	0	4(4)	6
	Total	137	47	37	84	6	311

Source: RECOF (2003).

Notes: Figures in parentheses denote the number of acquisition cases between the same industries at a 2-digit industry classification. (See Table 2.1 for the 2-digit industry

Table 3.1 Number of Out-in and In-in Acquisitions, by Year

Year	Out-in	In-in
1994-1995	20	410
1995-1996	17	417
1996-1997	32	516
1997-1998	16	352
1998-1999	14	406
1999-2000	20	314
2000-2001	26	473
2001-2002	11	244
Total	156	3,132

Source: Authors' calculation.

Table 3.2 Number of Out-in and In-in Acquisitions, by Industry (1995-2002)

Industry	Out-in	In-in	Number of observations
Agriculture, forestry and fishing	0	0	80
Mining	0	5	395
Food products and beverages	2	203	11,799
Textiles	1	44	2,733
Pulp, paper and paper products	2	65	3,264
Chemicals	20	105	7,010
Petroleum and coal products	2	7	430
Non-metallic mineral products	1	64	4,271
Basic metals	1	88	5,451
Fabricated metal products	0	102	7,144
General machinery	10	147	11,349
Electrical machinery, equipment and supplies	15	234	14,919
Transport equipment	7	166	8,616
Precision instruments	5	35	2,624
Manufacturing not elsewhere classified	9	262	19,812
Construction	0	42	3,206
Electricity, gas and water supply	0	3	392
Wholesale and retail trade	77	1,351	71,175
Finance and insurance	0	8	297
Real estate	0	3	230
Transport and communications	0	13	678
Service activities	4	185	10,205
Total	156	3,132	186,080

Source: Authors' calculation.

Table 3.3 Definition of Variables

Variable name	Definition
TFP	Multilateral TFP index (see Appendix)
ROA	Return on assets measured as: (after-tax profits ＋interest payments)/total assets
log(size)	Firm size measured as the log of the number of workers
Age	Number of years since the foundation of the firm
Number of non-production workers/number of workers	Quality of firms' human capital measured as the share of non-production workers
R&D intensity	R&D expenditure divided by total sales
Advertising intensity	Advertising expenditure divided by total sales
Export intensity	Export ratio measured as exports divided by total sales
Debt/total assets	Debt-asset ratio measured as total liabilities divided by total assets

Table 3.4 What Firms are Chosen as Acquisition Targets? Probit Analysis

Dependent variable	Out-in Acquisitions				In-in Acquisitions			
	(1)		(2)		(3)		(4)	
	Manufacturing		Non-Manufacturing		Manufacturing		Non-Manufacturing	
	Coef.	z-value	Coef.	z-value	Coef.	z-value	Coef.	z-value
TFP(t-1)	0.898	2.69 ***	-0.071	-0.48	0.218	2.10 **	-0.007	-0.15
ROA(t-1)	0.184	2.97 ***	0.837	4.24 ***	-0.011	-0.09	-0.283	-1.95 *
log(size)(t-1)	0.095	3.06 ***	0.064	1.28	-0.020	-1.50	0.003	0.21
Age(t-1)	-0.017	-5.75 ***	-0.021	-6.47 ***	-0.006	-7.31 ***	-0.007	-8.47 ***
(Number of non-production workers/number of workers)(t-1)	0.516	3.44 ***			-0.024	-0.46		
R&D intensity(t-1)	1.386	1.25			-0.828	-1.20		
Advertising intensity(t-1)	-1.443	-0.59	3.833	4.55 ***	-1.594	-1.23	-0.468	-0.63
Export intensity(t-1)	1.009	5.18 ***			-0.157	-1.18		
(Debt/total assets)(t-1)	-0.022	-0.12	-0.387	-2.15 **	0.246	7.72 ***	0.226	6.83 ***
Constant	-6.769	-15.86 ***	-0.632	0.00 ***	-6.055	-6.84 ***	-6.238	-9.60 ***
Obs.	52611		37369		88060		72033	
Pseudo R2	0.1421		0.1630		0.0314		0.0396	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
Z-values are White-corrected for heteroskedasticity.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.5 Dynamic Effects of Acquisition on TFP Growth: Manufacturing Sector

Variable	Manufacturing Sector							
	Dependent variable: Growth Rate of Total Factor Productivity							
	(1)		(2)		(3)		(4)	
	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	-0.006	-0.33	0.011	0.68	0.042	2.25 **	0.012	0.81
In-in	0.001	0.34	0.003	0.74	0.006	1.75 *	0.012	3.18 ***
TFP	-0.391	-16.02 ***	-0.450	-17.83 ***	-0.496	-18.82 ***	-0.491	-13.90 ***
ROA	-0.046	-1.15	-0.040	-1.10	-0.009	-0.30	-0.005	-0.17
log(size)	0.011	19.13 ***	0.012	20.61 ***	0.014	21.80 ***	0.015	20.32 ***
Age	0.000	-8.93 ***	0.000	-8.93 ***	0.000	-9.88 ***	0.000	-10.74 ***
Number of non-production workers/number of workers	0.012	6.91 ***	0.017	8.52 ***	0.018	8.34 ***	0.018	6.78 ***
R&D intensity	0.318	7.74 ***	0.284	6.02 ***	0.337	6.56 ***	0.343	4.97 ***
Advertising intensity	0.094	1.46	0.101	1.44	0.089	1.22	0.113	1.27
Export intensity	0.009	1.64	0.014	2.18 **	0.014	1.94 *	0.016	2.10 **
Debt/total assets	-0.008	-2.71 ***	-0.008	-2.63 ***	-0.007	-2.17 **	-0.003	-0.64
Constant	-0.018	-0.19	0.115	10.89 ***	0.098	9.81 ***	0.042	3.51 ***
Obs.	72585		59306		47467		36390	
R-squared	0.2833		0.3170		0.3433		0.3919	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.6 Dynamic Effects of Acquisition on ROA Improvement: Manufacturing Sector

Variable	Manufacturing Sector							
	Dependent variable: Difference in ROA							
	(1)		(2)		(3)		(4)	
	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	-0.008	-0.57	0.011	1.06	0.022	1.71 *	0.021	2.18 **
In-in	-0.004	-1.28	-0.002	-0.92	-0.002	-1.03	0.001	0.29
TFP	0.075	5.20 ***	0.073	6.33 ***	0.060	4.44 ***	0.065	5.35 ***
ROA	-0.884	-16.85 ***	-0.918	-23.78 ***	-0.917	-19.79 ***	-0.941	-26.74 ***
log(size)	-0.001	-3.08 ***	-0.001	-2.54 **	0.000	-0.66	-0.001	-1.28
Age	0.000	-13.17 ***	0.000	-15.82 ***	0.000	-14.23 ***	0.000	-15.32 ***
Number of non-production workers/number of workers	0.000	0.02	0.002	1.76 *	0.004	3.45 ***	0.005	3.30 ***
R&D intensity	0.031	1.63	0.001	0.03	-0.001	-0.03	0.010	0.39
Advertising intensity	0.111	3.61 ***	0.108	3.64 ***	0.072	3.18 ***	0.105	3.53 ***
Export intensity	0.014	5.16 ***	0.016	5.15 ***	0.016	4.32 ***	0.015	3.42 ***
Debt/total assets	-0.011	-3.22 ***	-0.007	-1.94 *	-0.005	-1.17	-0.002	-0.47
Constant	0.170	9.01 ***	0.174	19.80 ***	0.177	16.36 ***	0.188	21.06 ***
Obs.	72585		59306		47467		36390	
R-squared	0.6888		0.7305		0.7088		0.7546	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.7 Dynamic Effects of Acquisition on TFP Growth: Non-Manufacturing Sector

Variable	Non-manufacturing Sector							
	Dependent variable: Growth Rate of Total Factor Productivity							
	(1)		(2)		(3)		(4)	
	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	-0.016	-0.51	0.013	0.38	0.090	2.45 **	0.053	1.02
In-in	-0.004	-0.63	-0.003	-0.43	-0.008	-1.00	0.004	0.46
TFP	-0.604	-65.57 ***	-0.647	-66.97 ***	-0.678	-66.97 ***	-0.701	-63.17 ***
ROA	-0.057	-2.42 **	-0.057	-2.68 ***	-0.053	-2.35 **	-0.051	-2.57 ***
log(size)	-0.010	-11.12 ***	-0.011	-10.34 ***	-0.010	-8.45 ***	-0.011	-8.27 ***
Age	0.000	7.53 ***	0.000	6.55 ***	0.000	4.08 **	0.000	3.44 ***
Advertising intensity	-0.669	-11.31 ***	-0.772	-13.51 ***	-0.754	-12.18 ***	-0.769	-10.58 ***
Debt/total assets	-0.035	-8.87 ***	-0.042	-9.25 ***	-0.037	-7.19 ***	-0.027	-4.33 ***
Constant	0.169	6.82 ***	0.138	4.43 ***	0.140	3.94 ***	0.188	11.44 ***
Obs.	55425		43155		33991		25640	
R-squared	0.4287		0.4395		0.4503		0.4755	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.8 Dynamic Effects of Acquisition on ROA Improvement: Non-Manufacturing Sector

Variable	Non-Manufacturing Sector							
	Dependent variable: Difference in ROA							
	(1)		(2)		(3)		(4)	
	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	0.035	2.98 ***	0.058	4.75 ***	0.093	4.21 ***	0.087	2.50 **
In-in	-0.003	-1.74 *	-0.002	-0.98	-0.001	-0.56	-0.001	-0.58
TFP	0.007	3.70 ***	0.006	3.48 ***	0.006	3.71 ***	0.005	3.89 ***
ROA	-0.861	-14.69 ***	-0.898	-18.57 ***	-0.925	-24.04 ***	-0.943	-27.67 ***
log(size)	0.001	5.49 ***	0.001	4.06 ***	0.001	3.59 ***	0.001	1.89 *
Age	0.000	-11.02 ***	0.000	-11.90 ***	0.000	-13.42 ***	0.000	-13.94 ***
Advertising intensity	0.152	4.88 ***	0.140	3.82 ***	0.155	4.28 ***	0.181	4.59 ***
Debt/total assets	-0.026	-6.24 ***	-0.029	-7.52 ***	-0.025	-6.85 ***	-0.021	-5.53 ***
Constant	0.089	8.65 ***	0.094	8.25 ***	0.093	7.23 ***	0.083	7.64 ***
Obs.	55425		43155		33991		25640	
R-squared	0.7172		0.7707		0.8074		0.8322	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.9 Dynamic Effects of Acquisition on TFP Growth:
Domestic Acquisitions (Within Group and By Outsiders) and Acquisitions by Foreigners in the Manufacturing Sector

	Manufacturing sector							
	Dependent variable: Growth Rate of Total Factor Productivity							
	(1)		(2)		(3)		(4)	
Variable	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	-0.006	-0.32	0.011	0.69	0.043	2.27 **	0.013	0.83
In-in (within group)	0.007	1.38	0.007	1.13	0.020	3.1 ***	0.021	2.85 ***
In-in (by outsider)	-0.001	-0.26	0.001	0.31	0.003	0.66	0.010	2.31 **
TFP	-0.391	-16.03 ***	-0.450	-17.83 ***	-0.496	-18.82 ***	-0.491	-13.9 ***
ROA	-0.045	-1.15	-0.040	-1.10	-0.009	-0.3	-0.005	-0.17
log(size)	0.011	19.13 ***	0.012	20.61 ***	0.014	21.8 ***	0.015	20.32 ***
Age	-0.0003	-8.94 ***	-0.0003	-8.93 ***	-0.0004	-9.89 ***	-0.0005	-10.74 ***
Number of non-production workers/number of workers	0.012	6.91 ***	0.017	8.52 ***	0.018	8.35 ***	0.018	6.79 ***
R&D intensity	0.318	7.75 ***	0.284	6.02 ***	0.337	6.57 ***	0.343	4.97 ***
Advertising intensity	0.094	1.46	0.101	1.44	0.089	1.22	0.113	1.28
Export intensity	0.009	1.64	0.014	2.18 **	0.014	1.92 *	0.016	2.09 **
Debt/total assets	-0.008	-2.71 ***	-0.008	-2.62 ***	-0.007	-2.16 **	-0.003	-0.64
Constant	-0.018	-0.19	0.115	10.89 ***	0.098	9.81 ***	0.042	3.51 ***
Obs.	72585		59306		47467		36390	
R-squared	0.2834		0.3170		0.3433		0.3919	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.10 Dynamic Effects of Acquisition on ROA Improvement:
Domestic Acquisitions (Within Group and By Outsiders) and Acquisitions by Foreigners in the Manufacturing Sector

	Manufacturing sector							
	Dependent variable: Difference in ROA							
	(1)		(2)		(3)		(4)	
Variable	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	-0.008	-0.58	0.011	1.04	0.022	1.70 *	0.021	2.14 **
In-in (within group)	-0.006	-1.83 *	-0.008	-1.91 **	-0.004	-1.04	-0.007	-1.50
In-in (by outsider)	-0.003	-0.80	0.000	-0.06	-0.002	-0.74	0.003	0.87
TFP	0.075	5.20 ***	0.073	6.33 ***	0.060	4.44 ***	0.065	5.35 ***
ROA	-0.884	-16.85 ***	-0.918	-23.79 ***	-0.917	-19.79 ***	-0.941	-26.75 ***
log(size)	-0.001	-3.08 ***	-0.001	-2.54 **	0.000	-0.65	-0.001	-1.27
Age	0.000	-13.18 ***	0.000	-15.82 ***	0.000	-14.23 ***	0.000	-15.33 ***
Number of non-production workers/number of workers	0.000	0.02	0.002	1.76 *	0.004	3.45 ***	0.005	3.29 ***
R&D intensity	0.031	1.63	0.000	0.03	-0.001	-0.04	0.010	0.39
Advertising intensity	0.111	3.61 ***	0.108	3.64 ***	0.072	3.18 ***	0.105	3.53 ***
Export intensity	0.014	5.16 ***	0.016	5.16 ***	0.016	4.32 ***	0.015	3.44 ***
Debt/total assets	-0.011	-3.22 ***	-0.007	-1.95 *	-0.005	-1.17	-0.002	-0.48
Constant	0.170	9.01 ***	0.174	19.80 ***	0.177	16.36 ***	0.188	21.07 ***
Obs.	72585		59306		47467		36390	
R-squared	0.6888		0.7305		0.7088		0.7546	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.11 Dynamic Effects of Acquisition on TFP Growth:
Domestic Acquisitions (Within Group and By Outsiders) and Acquisitions by Foreigners in the Non-Manufacturing Sector

	Non-manufacturing sector							
	Dependent variable: Growth Rate of Total Factor Productivity							
	(1)		(2)		(3)		(4)	
Variable	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	-0.016	-0.51	0.013	0.38	0.090	2.45 **	0.053	1.02
In-in (within group)	-0.006	-0.29	-0.027	-1.38	0.015	0.71	0.050	1.72 *
In-in (by outsider)	-0.003	-0.56	0.000	-0.03	-0.011	-1.29	-0.001	-0.06
TFP	-0.604	-65.57 ***	-0.647	-66.98 ***	-0.678	-66.95 ***	-0.701	-63.17 ***
ROA	-0.057	-2.42 **	-0.057	-2.69 ***	-0.053	-2.35 **	-0.051	-2.56 ***
log(size)	-0.010	-11.12 ***	-0.011	-10.34 ***	-0.010	-8.45 ***	-0.011	-8.26 ***
Age	0.000	7.53 ***	0.000	6.55 ***	0.000	4.08 ***	0.000	3.44 ***
Advertising intensity	-0.669	-11.30 ***	-0.772	-13.50 ***	-0.754	-12.17 ***	-0.768	-10.57 ***
Debt/total assets	-0.035	-8.87 ***	-0.042	-9.25 ***	-0.037	-7.19 ***	-0.027	-4.32 ***
Constant	0.169	6.82 ***	0.138	4.43 ***	0.140	3.94 ***	0.188	11.44 ***
Obs.	55425		43155		33991		25640	
R-squared	0.4287		0.4396		0.4504		0.4755	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.12 Dynamic Effects of Acquisition on ROA Improvement:
Domestic Acquisitions (Within Group and By Outsiders) and Acquisitions by Foreigners in the Non-Manufacturing Sector

	Non-manufacturing sector							
	Dependent variable: Difference in ROA							
	(1)		(2)		(3)		(4)	
Variable	2 windows((t+1)-(t-1))		3 windows((t+2)-(t-1))		4 windows((t+3)-(t-1))		5 windows((t+4)-(t-1))	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Out-in	0.035	2.98 ***	0.058	4.75 ***	0.093	4.22 ***	0.087	2.49 **
In-in (within group)	-0.004	-1.29	-0.005	-1.13	0.002	0.31	-0.003	-0.43
In-in (by outsider)	-0.002	-1.50	-0.001	-0.70	-0.001	-0.70	-0.001	-0.48
TFP	0.007	3.70 ***	0.006	3.48 ***	0.006	3.72 ***	0.005	3.89 ***
ROA	-0.861	-14.69 ***	-0.898	-18.57 ***	-0.925	-24.03 ***	-0.943	-27.67 ***
log(size)	0.001	5.49 ***	0.001	4.06 ***	0.001	3.59 ***	0.001	1.89 *
Age	0.000	-11.02 ***	0.000	-11.90 ***	0.000	-13.42 ***	0.000	-13.94 ***
Advertising intensity	0.152	4.88 ***	0.140	3.82 ***	0.155	4.29 ***	0.181	4.59 ***
Debt/total assets	-0.026	-6.24 ***	-0.029	-7.52 ***	-0.025	-6.85 ***	-0.021	-5.53 ***
Constant	0.089	8.66 ***	0.094	8.25 ***	0.093	7.23 ***	0.083	7.64 ***
Obs.	55425		43155		33991		25640	
R-squared	0.7172		0.7707		0.8074		0.8322	

Notes: Estimated coefficients of year dummies and 3-digit industry dummies are not shown in the table.
White-corrected t-values are reported in the table.
* Significant at the 10% level (two-tailed test).
**Idem., 5%.
*** Idem., 1%.

Table 3.13 The Effect of Acquisition: Matching Results for the Manufacturing Sector

	Effect of foreign acquisition			Effect of domestic acquisition		
	TFP	ROA	Obs.	TFP	ROA	Obs.
Acquisition year	0.027	0.005	60	0.001	-0.005	1385
	(0.02)	(0.01)		(0.00)	(0.00)	
One year later	-0.001	-0.007	44	0.003	-0.004	1021
	(0.02)	(0.01)		(0.00)	(0.00)	
Two years later	0.004	0.005	32	0.003	-0.003	750
	(0.03)	(0.01)		(0.01)	(0.00)	
Three years later	0.051 *	0.040 *	30	0.005	-0.004	564
	(0.03)	(0.02)		(0.01)	(0.00)	
Four years later	0.000	0.025 *	26	0.015 *	0.002	391
	(0.03)	(0.01)		(0.01)	(0.01)	

Note: Standard errors in parentheses. * statistically significant at 10%.

Table 3.14 The Effect of Acquisition: Matching Results for the Non-Manufacturing Sector

	Effect of foreign acquisition			Effect of domestic acquisition		
	TFP	ROA		TFP	ROA	
Acquisition year	0.028	-0.003	72	0.004	-0.001	1435
	(0.04)	(0.01)		(0.01)	(0.00)	
One year later	0.041	0.031	44	0.009	-0.001	933
	(0.05)	(0.02)		(0.01)	(0.00)	
Two years later	0.093	0.034	29	-0.004	-0.001	604
	(0.06)	(0.03)		(0.02)	(0.00)	
Three years later	0.201 **	0.069 *	20	0.010	-0.002	434
	(0.10)	(0.04)		(0.02)	(0.01)	
Four years later	-0.115	0.011	10	0.036	-0.005	276
	(0.10)	(0.09)		(0.02)	(0.00)	

Note: Standard errors in parentheses. *, ** statistically significant at 10% and 5%.

Appendix Table 1. Summary Statistics

Whole sample					
Lagged variables	Obs	Mean	Std. Dev.	Min.	Max.
TFP	163,812	-0.004	0.204	-5.554	4.024
ROA	163,812	0.048	0.094	-13.249	15.504
log(size)	163,812	5.237	0.998	3.912	11.563
Age	163,812	36.101	15.502	0.000	125.000
Number of non-production workers/number of workers	163,812	0.606	0.368	0.000	1.000
R&D expenditure/sales	163,812	0.006	0.030	0.000	7.339
Advertising expenditure/sales	163,812	0.006	0.019	0.000	3.009
Export/sales	163,812	0.022	0.082	0.000	1.090
Debt/total assets	163,812	0.739	0.277	0.000	12.383

Manufacturing sector					
Lagged variables	Obs	Mean	Std. Dev.	Min.	Max.
TFP	90,075	-0.010	0.127	-4.468	1.297
ROA	90,075	0.049	0.098	-13.249	15.504
log(size)	90,075	5.259	1.007	3.912	11.254
Age	90,075	37.471	15.315	0.000	111.000
Number of non-production workers/number of workers	90,075	0.339	0.250	0.000	1.000
R&D expenditure/sales	90,075	0.009	0.021	0.000	0.734
Advertising expenditure/sales	90,075	0.005	0.019	0.000	3.009
Export/sales	90,075	0.031	0.097	0.000	1.090
Debt/total assets	90,075	0.704	0.274	0.000	8.101

Non-manufacturing sector					
Lagged variables	Obs	Mean	Std. Dev.	Min.	Max.
TFP	73,737	0.002	0.270	-5.554	4.024
ROA	73,737	0.046	0.089	-3.928	12.229
log(size)	73,737	5.211	0.987	3.912	11.563
Age	73,737	34.427	15.565	0.000	125.000
Advertising expenditure/sales	73,737	0.008	0.018	0.000	0.528
Debt/total assets	73,737	0.781	0.274	0.000	12.383

Appendix Table 2. Balancing Tests for Matching: Manufacturing Sector

		Foreign acquisition						Domestic acquisition					
		Mean			% reduct	t-test		Mean			% reduct	t-test	
Variable	Sample	Treated	Control	% bias	bias	t	p>t	Treated	Control	% bias	bias	t	p>t
TFP(t-1)	Unmatched	0.062	-0.008	48.2		4.41	0.000	-0.013	-0.010	-2.3		-0.9	0.385
	Matched	0.044	0.068	-16.1	66.7	-0.87	0.386	-0.012	-0.011	-0.4	81.3	-0.1	0.907
ROA(t-1)	Unmatched	0.088	0.052	40.6		3.01	0.003	0.050	0.049	0.8		0.3	0.789
	Matched	0.079	0.095	-17.5	56.8	-0.95	0.346	0.050	0.048	2.9	-261.8	0.9	0.397
log(size)(t-1)	Unmatched	5.727	5.324	37.2		3.13	0.002	5.160	5.265	-10.8		-3.9	0.000
	Matched	5.692	5.673	1.8	95	0.09	0.928	5.152	5.136	1.7	84.2	0.5	0.626
Age(t-1)	Unmatched	29.169	36.837	-49		-4.09	0.000	32.824	37.523	-30.1		-11.4	0.000
	Matched	30.650	31.867	-7.8	84.1	-0.42	0.673	32.775	32.721	0.3	98.8	0.1	0.926
(Number of non-production workers/number of	Unmatched	0.505	0.329	66.6		5.95	0.000	0.318	0.336	-6.8		-2.6	0.009
	Matched	0.486	0.512	-9.5	85.7	-0.46	0.650	0.317	0.333	-6.3	7.5	-1.6	0.102
R&D intensity(t-1)	Unmatched	0.027	0.012	46.3		5.4	0.000	0.007	0.010	-10.2		-3.6	0.000
	Matched	0.029	0.030	-2.5	94.7	-0.1	0.920	0.007	0.008	-0.6	94.1	-0.2	0.865
Advertising intensity(t-1)	Unmatched	0.008	0.004	18.8		1.47	0.142	0.003	0.005	-7.3		-2.5	0.011
	Matched	0.008	0.012	-16.8	10.7	-1.04	0.300	0.003	0.003	0.6	91.5	0.2	0.829
Export intensity(t-1)	Unmatched	0.118	0.040	48.4		5.78	0.000	0.024	0.032	-8.4		-3.0	0.003
	Matched	0.100	0.095	2.7	94.4	0.13	0.893	0.024	0.027	-3.3	60.8	-0.9	0.381
(Debt/total assets) (t-1)	Unmatched	0.650	0.704	-19.2		-1.61	0.107	0.778	0.703	25.7		10.1	0.000
	Matched	0.650	0.558	32.7	-70.1	1.83	0.070	0.774	0.766	2.8	89.0	0.8	0.413

Appendix Table 3. Balancing Tests for Matching: Non-Manufacturing Sector

		Foreign acquisition						Domestic acquisition					
		Mean			% reduct	t-test		Mean			% reduct	t-test	
Variable	Sample	Treated	Control	% bias	bias	t	p>t	Treated	Control	% bias	bias	t	p>t
TFP(t-1)	Unmatched	0.015	0.021	-2.2		-0.18	0.856	-0.005	0.003	-2.8		-1.1	0.288
	Matched	0.015	0.035	-7.3	-233.1	-0.4	0.691	-0.005	0.013	-6.3	-126.0	-1.7	0.095
ROA(t-1)	Unmatched	0.108	0.047	65.7		7.57	0.000	0.041	0.046	-6.1		-2.1	0.035
	Matched	0.108	0.079	31	52.8	1.71	0.089	0.041	0.046	-6.6	-8.2	-1.7	0.088
log(size)(t-1)	Unmatched	5.266	5.145	11.5		1.1	0.270	5.234	5.209	2.5		0.9	0.353
	Matched	5.266	5.209	5.4	52.9	0.33	0.744	5.233	5.257	-2.4	2.1	-0.7	0.516
Age(t-1)	Unmatched	21.125	34.890	-87.5		-7.39	0.000	29.372	34.476	-33.2		-12.4	0.000
	Matched	21.125	22.792	-10.6	87.9	-0.65	0.518	29.333	28.989	2.2	93.3	0.6	0.540
Advertising intensity(t-1)	Unmatched	0.025	0.007	49.5		7.25	0.000	0.008	0.008	4.5		1.9	0.062
	Matched	0.025	0.030	-16	67.6	-0.63	0.530	0.008	0.008	0.3	94.2	0.1	0.941
(Debt/total assets) (t-1)	Unmatched	0.730	0.777	-18		-1.48	0.140	0.864	0.780	28.2		11.5	0.000
	Matched	0.730	0.731	-0.4	97.7	-0.03	0.980	0.863	0.846	5.9	79.1	1.4	0.166

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