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Cross-Border Acquisitions and Target Firms' Performance
Evidence from Japanese Firm-Level Data

Kyoji Fukao, Keiko Ito, Hyeog Ug Kwon, and Miho Takizawa

11.1 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 percent in 2004) is only about one seventh of the corresponding value of the United States (14.1 percent in 2003), employment in foreign affiliates as a share of total employment is 2.75 percent, which is equivalent to about half of the corresponding value, 5.61 percent for the United States (table 11.1).

FDI is a form of international capital flows that are accompanied by intangible assets, such as technology, management skills, and marketing know-how. Because of such intangible assets, foreign-owned firms will have higher productivity and higher profit rates. International economics theory suggests that the inflow of such intangible assets should benefit Japan. Being aware of this benefit, the Japanese government set the goal to double the inward FDI stock relative to GDP, first in 2003 and again in 2006, as part of its policies to restructure the Japanese economy and boost economic growth. To promote inward FDI, the Japanese government in May 2007

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Table 11.1 **Employment in foreign affiliates as a share of total employment (in %)**

Industry	JAFF (33.4%) 1996	JAFF (33.4%) 2001	JAFF (20%, single owner) 2001	USAFF (10%, single owner) 1997
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
Manufacturing total	**1.36**	**1.94**	**5.91**	**10.78**
Construction & civil engineering	0.05	0.05	0.03	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 services	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.
Services total	**0.65**	**0.97**	**2.04**	**4.31**
Total: all sectors	**n.a.**	**1.15**	**2.75**	**5.61**

Source: Paprzycki and Fukao (2005). Original data is compiled from the microdata of the Ministry of Internal Affairs and Communications' *Establishment and Enterprise Census for 1996 and 2001* and the 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.

Notes: JAFF (33.4%): Japanese Affiliates of Foreign Firms (33.4% or more foreign-owned by 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).

lifted the ban on triangular mergers involving foreign firms. In addition, the Japan External Trade Organization (JETRO), a government-related institution, provides a one-stop window and other services to facilitate foreign investment.

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 Shimbun* 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 Japanese firms that were acquired by foreign firms receive new technologies and management skills from their foreign owners, or 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 a previous study (Fukao, Ito and Kwon 2005), we conducted two empirical tests using firm-level data for Japan's manufacturing industry in order to determine which one of the two effects is responsible for the positive correlation between foreign ownership and productivity. 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 investments.[1] Estimating a Probit model, we found that foreign firms who 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

1. Although the majority of FDI in developed economies has taken the form of cross-border acquisitions, studies on cross-border M&As are rather scarce. 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 firms' productivity before and after acquisition, they showed that firms that were acquired by foreign firms exhibited an increase in labor productivity of 13%. Arnold and Javorcik (2005) and Bertrand and Zitouna (2005) found that foreign acquisitions improved the productivity of target firms in Indonesia and France. On the other hand, Gugler et al. (2003) did not find any significant differences in the effect on profits of cross-border and domestic M&As.

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 chapter seeks to overcome. First, although our study found that in-in M&As had the characteristics of rescue missions, this result 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 chapter, 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 nonmanufacturing sectors, such as the finance and 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 chapter, 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 foreign investors somehow acquire more promising Japanese firms than Japanese investors do. Then the ex post facto 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 while comparing treated (out-in M&A targets) and 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 chapter is organized as follows: In section 11.2, we provide an overview of out-in M&As in Japan. Section 11.3 then pre-

sents an outline of our data and reports our empirical results. Section 11.4 summarizes our results.

11.2 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, we provide an overview of M&A activity in Japan using these data. Figure 11.1 shows the number of out-in and in-in M&A cases in Japan by year. Both M&A cases have dramatically increased since the end of the 1990s.

Several factors seem to have contributed to the increase in M&A cases during this period. First, 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. Second, advances in information and communication technology, as well as deregulation during the 1990s, mean the optimal size and optimal scope of firms in many sectors, such as electronics, pharmaceuticals, telecommunications, finance, insurance, and commerce may have changed. Third, deregulation in Japan has removed barriers to inward FDI in some industries, such as broadcasting, telecommunications, finance, and insurance. Fourth, there was a worldwide 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. Fifth, as a result of the prolonged

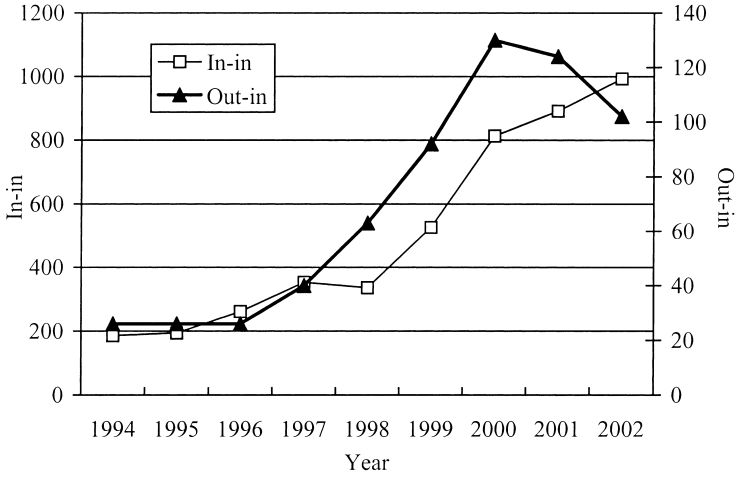

Fig. 11.1 Number of in-in and out-in M&A transactions in Japan by year: 1994–2002

Source: RECOF (2003).

Note: M&A transactions include mergers, purchases of substantial minority interests, and purchases of additional shares and acquisitions.

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 for in-in M&As (figure 11.1). Figure 11.2 shows the number of out-in M&A cases by source region and by year. United States 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 ninety-seven out-in M&As involving firms from Asia in the period between 1994–2002, thirty-six involved firms from China, twenty-four from Korea, nineteen from Taiwan, and eight from Singapore.

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 11.2 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.

Another issue concerns the extent to which the out-in M&A boom in Japan was dominated by private equity funds (vulture funds). Table 11.3,

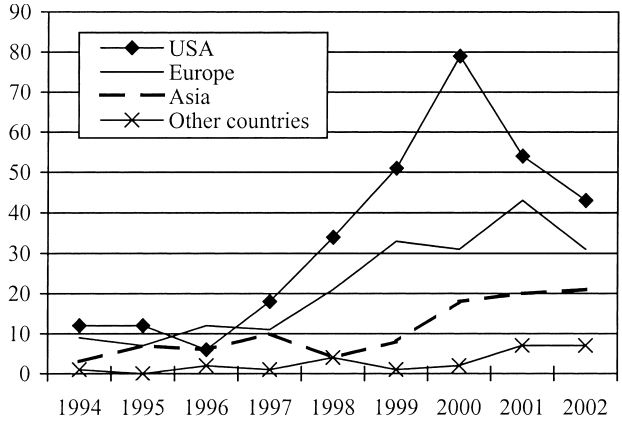

Fig. 11.2 Number of out-in M&A transactions in Japan by year and by regions
Source: RECOF (2003).
Note: M&A transactions include mergers, purchases of substantial minority interests, and purchases of additional shares and acquisitions.

Table 11.2 **Industry distribution of target firms in out-in M&A transactions: By source region, 1994–2002**

	Source region			
Target firms' industry	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
Nonferrous metals	1.3	2.0	3.1	4.0
General machinery	4.5	5.1	3.1	4.0
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 stores	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 # of out-in M&As	309	198	97	25

Source: RECOF (2003).

Notes: All figures are in %. M&A transactions include mergers, purchases of substantial minority interests, and purchases of additional shares and acquisitions.

Table 11.3 **Number of out-in acquisition cases by purchasers' industry and by target firms' industry: 1994–2002**

Purchasers' industry	Target firms' industry					
	Manufacturing	Commerce	Finance	Other services	Primary industry and construction	Total
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 11.2 for the 2-digit industry classification.)

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 (see table 11.3). 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.

11.3 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 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 inde-

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.

pendent 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, synergies between the firms are expected to improve the performance of the acquired firm. In contrast, the managerial-discipline hypothesis claims 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. We 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 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 chapter, we extend the sample period until 2002 and include the data on nonmanufacturing industries. The survey covers many nonmanufacturing 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 chapter, using a new dataset, we analyze the effect of out-in M&As on target firms' performance for both the manufacturing sector and the nonmanufacturing 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 over a longer time span. Moreover, we investigate whether there are 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 firms acquired by foreign firms show better performance simply because foreign firms acquired better perform-

ing firms or firms that would potentially perform well, even under local ownership.[3] As Arnold and Javorcik (2005, p. 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 chapter. Using this technique, we identify for each foreign-acquired firm a suitable domestically-owned firm 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 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 control 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, and so on, data often come from (nonrandomized) 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

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.

5. The DID estimator assumes that unobserved macroeconomic 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).

way to reduce the bias of the estimation of treatment effects and control 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 pretreatment characteristics of each subject into a single-index variable (i.e., the propensity score) which makes the matching feasible.[7]

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

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

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

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:

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

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 nonrecipients of the treatment whose propensity scores $p(x_i)$ are identical.

In the case of this study, we consider two types of treatment: acquisition by foreign investors and acquisition by domestic investors. Therefore, we focus on the difference in ex post facto performance between firms acquired by foreigners and firms that remain independent (nonacquired firms), as well as between firms acquired by domestic investors and independent firms (acquired by neither foreigners nor domestic investors). Therefore, in our case, z denotes one of three possible outcomes: remaining independent (nonacquired), acquired by foreigners, or acquired by do-

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

mestic investors. Variable x is a vector of various characteristics of a firm such as firm size, length of business experience, ex ante performance, and so on. Therefore, by estimating a multinomial logit model at the first stage, we investigate important determinants of acquisition by foreigners and by domestic firms and compute the two propensity scores (i.e., the probabilities of a firm being acquired by a foreign firm or by a domestic 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 nonacquired firms is their acquisition status. Therefore, we focus on the ATT. The ATT can be estimated as equation (2) above, which in the case of this study is equivalent to the following equation:

$$\hat{\alpha}_{ATT} = \frac{1}{n}\sum_{1}^{n}\left(y^{treated}_{acquisition\ year+s} - y^{control}_{acquisition\ year+s}\right) - \frac{1}{n}\sum_{1}^{n}\left(y^{treated}_{pre-acquisition\ year} - y^{control}_{pre-acquisition\ year}\right) \quad (3)$$

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

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

In the following subsections, we (a) provide details on our dataset (section 11.3.2); (b) show the result of the multinomial logit estimation on the determinants of acquisition (section 11.3.3); (c) examine, by OLS regression analysis, whether the acquired firms saw an improvement in performance after the acquisition using unmatched samples (section 11.3.4); and finally (d) examine the ex post facto performance differences between firms acquired by foreigners and nonacquired firms, as well as between firms acquired by domestic investors and nonacquired firms, using matched samples (section 11.3.5).

11.3.2 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*

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 (thirteen manufacturing industries and nine nonmanufacturing industries), we had to modify the program.

Structure and Activities) compiled by the Ministry of Economy, Trade, and Industry (METI).[9] Our data cover the period from 1994 to 2002.[10] We define out-in M&As as cases where a firm 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. Similarly, we define in-in M&As as cases where a firm 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 11.4 and 11.5 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 11.5, our unbalanced panel consists of 186,080 observations, of which 53 percent fall into the manufacturing sector. More than 80 percent of the nonmanufacturing observations fall into the wholesale and retail trade sector. Table 11.5 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.

Data on sales, purchases, total assets, profits, total liabilities, firm age, the number of employees, the number of nonproduction 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 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

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

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).

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.

Table 11.4 **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 11.5 **Number of out-in and in-in acquisitions, by industry: 1994–2002**

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 11.6 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 nonproduction workers/number of workers	Quality of firms' human capital measured as the share of nonproduction 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

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 11.6 provides a description of the variables used in our econometric analysis. The summary statistics for the variables are shown in Appendix table 11A.1, and a detailed description of our TFP measure is provided in the Appendix.

11.3.3 Are Acquisition Targets Better Than the Rest? A Multinomial Logit Estimation

Using our panel data for the period 1994–2002, we estimate multinomial logit 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 multinomial logit estimation allows us to compute the probability of remaining independent and the probability of being acquired by foreign investors or domestic investors.

We consider three outcomes: outcome 1 (not-acquired), outcome 2 (acquired by foreigners, *Out-in*), and outcome 3 (acquired by domestic investors, *In-in*).[13] As explanatory 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, ad-

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 11.2, 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.

vertising intensity, export intensity, and the debt-asset ratio.[14] All the explanatory variables are values in year $t-1$, for example, the year preceding the year of acquisition, t. The model also includes a full set of industry and year dummies.

The results from the multinomial logit estimation are presented in table 11.7. 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 nonproduction workers, a higher export intensity, and of larger size are chosen as targets in the manufacturing sector (equation (1) of table 11.7). As for the nonmanufacturing sector, firms with a higher profit rate and higher advertising tend to be chosen as out-in M&A targets (equation (3) of table 11.7). 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 (equation (2) of table 11.7). Moreover, in the case of in-in acquisitions in the nonmanufacturing sector, firms with a higher profit rate are less likely to be acquired, which is conspicuously different from the case of out-in acquisitions (equation (4) of table 11.7). 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.[15] 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.

14. In the case of the nonmanufacturing sector, the share of the number of nonproduction 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 nonproduction is not appropriate as a proxy for human capital or skilled labor in the case of the nonmanufacturing sector. The data on R&D expenditure are not very reliable for many firms in the nonmanufacturing 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 nonmanufacturing industries. Therefore, we think these variables are not appropriate explanatory variables in the case of the nonmanufacturing sector.

15. In the latter half of the 1990s, it was argued that Japanese banks were reluctant to advance loans because of the severe nonperforming loan problem. In order to check whether foreign capital helped to remove credit constraints, we included the short-term debt to assets ratio instead of the total debt to assets ratio as an explanatory variable. Short-term debt was defined as total debt minus fixed debt. The estimated coefficient on the short-term debt-asset ratio was not statistically significant in the case of out-in acquisitions, while it was positive and significant in the case of in-in acquisitions. Therefore, at least based on our dataset, we cannot conclude that foreign capital rescued Japanese firms suffering from credit constraints.

Table 11.7 **What firms are chosen as acquisition targets? Multinomial logit analysis**

	Manufacturing				Nonmanufacturing			
	(1) Out-in Acquisitions		(2) In-in Acquisitions		(3) Out-in Acquisitions		(4) In-in Acquisitions	
Dependent variable	Coefficient.	*z*-value	Coefficient	*z*-value	Coefficient	*z*-value	Coefficient	*z*-value
TFP($t-1$)	1.213	2.55**	0.236	1.14	–0.179	–0.43	–0.038	–0.34
ROA($t-1$)	0.417	3.40***	–0.018	–0.07	2.541	4.74***	–0.522	–1.73*
log(size) ($t-1$)	0.376	4.30***	–0.065	–1.93*	0.181	1.10	0.023	0.78
Age($t-1$)	–0.053	–5.84***	–0.015	–7.27***	–0.060	–5.79***	–0.017	–8.74***
(Number of non-production workers/ number of workers) ($t-1$)	2.011	4.42***	–0.121	–0.92				
R&D intensity($t-1$)	3.091	1.02	–2.036	–1.16				
Advertising intensity($t-1$)	–8.441	–0.79	–9.284	–1.91*	9.308	4.49***	–0.180	–0.10
Export intensity($t-1$)	2.785	4.65***	–0.429	–1.18				
(Debt/total assets) ($t-1$)	–0.286	–0.45	0.487	7.44***	–1.152	–2.05**	0.386	6.05***
Constant	–33.582	–24.01***	–3.686	–13.93***	–27.668	–23.80***	–26.425	–25.50***
Observations		89,168				74,644		
Pseudo R^2		0.0402				0.046		

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).

**Significant at the 5% level.

***Significant at the 1% level.

The results from the multinomial logit estimation generally indicate 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 may 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.

11.3.4 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 nonacquired firms:

$$(4) \qquad y_{f,t+s} - y_{f,t-1} = \alpha + \beta_1 \mathit{Out\text{-}in}_{f,t} + \beta_2 \mathit{In\text{-}in}_{f,t} + x_{f,t-1}\phi + \sum_{t} \lambda_\tau \mathit{YearDummy}(t,\tau) + \sum_{i} \delta_j \mathit{IndustryDummy}(i,j) + \varepsilon_{f,t}$$

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

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 that 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, the return on assets (ROA) ratio, the logarithm of sales, and the logarithm of employment. 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*) that 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 nonproduction workers to the number of total workers, R&D intensity, advertising intensity, export intensity, and the debt-asset ratio.[16] 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 nonacquired firms once other characteristics are controlled for.

The estimation results for the manufacturing sector on the effects of the acquisition are reported in tables 11.8 and 11.9. Table 11.8 presents the effect of the acquisition on the TFP growth rate. Panels (a), (b), and (c) of table 11.9 show the effect of the acquisition on the ROA ratio, sales growth, and employment growth, respectively. Although the explanatory variables in all the equations are exactly same as those in the TFP growth equations, the estimated coefficients of the variables representing all other firm characteristics except out-in and in-in dummy variables are not reported in table 11.9. The results in table 11.8 suggest that compared to nonacquired 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 three-year window (equation [2] of table 11.8) and the 4-year window (equation [3] of table 11.8), which implies that out-in acquisitions may have a larger positive effect on TFP growth. In the case of the five-year window (equation [4] of table 11.8), 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 11.8 suggest out-in acquisitions tend to bring a larger productivity

16. In the case of the nonmanufacturing sector, we exclude the share of nonproduction workers, R&D intensity, and export intensity for the same reasons as in the multinomial logit estimation in the previous subsection.

Table 11.8 **Dynamic effects of acquisition on TFP growth: Manufacturing sector**

	Manufacturing Sector Dependent variable: Growth rate of total factor productivity							
	(1) 2 windows ([t + 1] – [t – 1])		(2) 3 windows ([t + 2] – [t – 1])		(3) 4 windows ([t + 3] – [t – 1])		(4) 5 windows ([t + 4] – [t – 1])	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	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***
Observations	72,585		59,306		47,467		36,390	
R^2	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).

**Significant at the 5% level.

***Significant at the 1% level.

Table 11.9 Dynamic effects of acquisition: Manufacturing sector

	Manufacturing Sector							
	(1) 2 windows ([$t+1$] – [$t-1$])		(2) 3 windows ([$t+2$] – [$t-1$])		(3) 4 windows ([$t+3$] – [$t-1$])		(4) 5 windows ([$t+4$] – [$t-1$])	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
(a) Dependent variable: Difference in ROA								
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
(b) Dependent variable: Growth rate of sales								
Out-in	–0.038	–0.76	0.044	0.43	0.041	0.48	0.073	0.77
In-in	0.001	0.15	0.012	1.03	0.024	1.84*	0.043	2.87***
(c) Dependent variable: Growth rate of employment								
Out-in	0.025	0.69	–0.044	–0.92	–0.044	–0.77	0.017	0.22
In-in	–0.006	–0.92	0.005	0.61	0.003	0.29	0.007	0.56
(d) Dependent variable: Growth rate of TFP								
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**
(e) Dependent variable: Difference in ROA								
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
(f) Dependent variable: Growth rate of sales								
In-in (within group)	–0.011	–0.61	–0.012	–0.46	0.018	0.68	0.014	0.45
In-in (by outsider)	0.005	0.52	0.020	1.56	0.027	1.79*	0.052	3.06***
(g) Dependent variable: Growth rate of employment								
In-in (within group)	–0.001	–0.09	0.015	0.88	0.009	0.51	0.003	0.15
In-in (by outsider)	–0.007	–0.99	0.002	0.22	0.001	0.10	0.007	0.55
Observations	72,585		59,306		47,467		36,390	

Notes: Estimated coefficients of variables representing other firm characteristics, 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).

**Significant at the 5% level.

***Significant at the 1% level.

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 panel (a) of table 11.9 indicate 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 out-in acquisitions contribute to higher profitability while in-in acquisitions do not have any impact on target firms' profitability. In contrast, in-in acquisitions contribute to significantly higher sales growth three and four years after the acquisition as shown in panel (b) of table 11.9. Both out-in and in-in acquisitions do not have any significant impact on target firms' employment growth (panel [c] of table 11.9).

In the case of the nonmanufacturing sector, the impact of out-in acquisitions on target firms' performance differs more sharply from that of in-in acquisitions (tables 11.10 and 11.11).[17] 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 11.10). 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 panel (a) of table 11.11. As for sales growth and employment growth, both out-in and in-in acquisitions do not have any significant impact on target firms (panels [b] and [c] of table 11.11).

Overall, we find some evidence that out-in acquisitions lead to an improvement in target firms' ROA both in the manufacturing and the nonmanufacturing 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. However, we find some positive impact of in-in acquisitions on target firms' sales growth in the case of the manufacturing sector.[18]

17. As in table 11.9, the estimated coefficients of variables representing all other firm characteristics except out-in and in-in dummy variables are not reported in table 11.11.

18. As argued by Froot and Stein (1991) and others, a depreciation of the domestic currency can lead to foreign acquisitions of certain domestic assets. Given the important role played by the exchange rate in cross-border M&A decisions, we tried to test whether the outcome of M&As differs during periods of strong yen and a weak yen. We defined as strong yen periods years in which the average rate for the U.S. dollar was less than 115 yen and identified 1994, 1995, 1996, 1999 and 2000 as periods of a strong yen. All other years were defined as weak yen periods. We divided our data sample into the two periods and the results were mostly consistent with those in tables 11.8 to 11.11. However, out-in acquisitions in strong yen periods tended to lead to significantly higher TFP growth in the manufacturing sector and significantly higher sales growth in the nonmanufacturing sector. These findings suggest that the

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 nonmanufacturing sector) and a higher debt-asset ratio (for both the manufacturing and the nonmanufacturing sectors) are, as discussed in section 11.3.3, 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 profitability but some improvement in sales 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 11.4). The estimation results, including the within-group in-in acquisition dummy variable and the dummy for in-in acquisitions by outsiders, are reported in panels (d)–(g) in tables 11.9 and 11.11. The explanatory variables are the out-in acquisition dummy, the within-group in-in acquisition dummy, the dummy for in-in acquisitions, and the same other firm characteristics as in tables 11.8 and 11.10. In panels (d)–(g) in tables 11.9 and 11.11, the estimated coefficients on the within-group in-in acquisition dummy and the dummy for in-in acquisitions by outsiders are reported.

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role of the exchange rate in the outcome of cross-border M&As deserves more detailed investigation in the future. Calculated TFP levels tend to be affected by demand shocks. We adjusted capital utilization and hours worked by using the industry-level capital utilization ratio provided by the Ministry of Economy, Trade and Industry, and the sectoral working hours taken from the JIP database 2006. Moreover, we control for economy-wide demand shocks by including year dummies. We tried to eliminate the influence of demand fluctuation as much as possible in the calculation of our TFP measure.

Table 11.10 **Dynamic effects of acquisition on TFP growth: Nonmanufacturing sector**

	Nonmanufacturing Sector Dependent variable: Growth rate of total factor productivity							
	(1) 2 windows ([t + 1] – [t – 1])		(2) 3 windows ([t + 2] – [t – 1])		(3) 4 windows ([t + 3] – [t – 1])		(4) 5 windows ([t + 4] – [t – 1])	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	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	–65.67***	–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***	–0.07	–4.33***
Constant	0.169	6.82***	0.138	4.43***	0.140	3.94***	0.188	11.44***
Observations	55,425		43,155		33,991		25,650	
R^2	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).
**Significant at the 5% level.
***Significant at the 1% level.

Table 11.11 Dynamic effects of acquisition: Nonmanufacturing sector

	(1) 2 windows ([$t+1$] – [$t-1$])		(2) 3 windows ([$t+2$] – [$t-1$])		(3) 4 windows ([$t+3$] – [$t-1$])		(4) 5 windows ([$t+4$] – [$t-1$])	
Variable	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
(a) Dependent variable: Difference in ROA								
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
(b) Dependent variable: Growth rate of sales								
Out-in	0.033	0.59	0.098	1.61	0.114	1.33	0.090	0.77
In-in	0.009	1.12	0.002	0.19	–0.001	–0.04	–0.012	–0.64
(c) Dependent variable: Growth rate of employment								
Out-in	0.020	0.51	–0.026	–0.64	–0.020	–0.31	–0.076	–0.9
In-in	0.015	1.79*	0.006	0.6	0.013	0.96	–0.002	–0.12
(d) Dependent variable: Growth rate of TFP								
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
(e) Dependent variable: Difference in ROA								
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
(f) Dependent variable: Growth rate of sales								
In-in (within group)	–0.022	–0.85	–0.056	–1.33	–0.033	–0.87	–0.038	–0.77
In-in (by outsider)	0.013	1.54	0.010	0.87	0.004	0.27	–0.009	–0.45
(g) Dependent variable: Growth rate of employment								
In-in (within group)	–0.009	–0.37	–0.041	–1.08	–0.004	–0.10	–0.070	–1.47
In-in (by outsider)	0.017	1.99**	0.012	1.07	0.014	1.03	0.005	0.26
Observations	55,425		43,155		33,991		25,640	

Notes: Estimated coefficients of variables representing other firm characteristics, 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).

**Significant at the 5% level.

***Significant at the 1% level.

Panels (d)–(g) in table 11.9 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. Although acquisitions by domestic outsiders lead to higher sales growth, both within-group in-in acquisitions and acquisitions by domestic outsiders do not have any significant impact on target firms' employment growth.

According to the results for the nonmanufacturing sector shown in panels (d)–(g) in table 11.11, there is a significant positive impact of within-group in-in acquisitions on the TFP growth rate only in the case of the five-year window (equation [4] of panel [d] in table 11.11). There is also a significant positive impact of acquisitions by domestic outsiders on employment growth only in the case of the two-year window (equation [1] of panel [g] in table 11.11). 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 nonmanufacturing sector, neither type of in-in acquisitions has a positive impact on ROA. In the case of the nonmanufacturing 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 nonmanufacturing sector, even acquisitions by domestic outsiders do not lead to an improvement in the acquired firms' performance.

11.3.5 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 nonmanufacturing 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 out-in acquisitions improve target firms' performance more quickly.[19] However, as described at the beginning of section 11.3, 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 the multinomial logit analysis.

Also, the analysis in this study so far has not addressed the simultaneity problem. Therefore, we now employ the propensity score matching and the difference-in-differences (DID) techniques described in section 11.3.1 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 multinomial logit estimation results shown in table 11.7, we first identify the probability of acquisition (or "propensity score") for all firms in our dataset.[20] Our multinomial logit estimation model in table 11.7 assumes that the propensity of firms to be acquired by other firms is a function of the TFP level, firm size, the number of years since establishment, the share of the number of nonproduction workers, R&D intensity, advertisement intensity, export intensity, and the debt-asset ratio.[21] A nonacquired firm which is closest in terms of its propensity score to an acquired firm is

19. The difference between the results of that study and the present one is probably due to the fact that (a) 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); (b) this study uses newly compiled and detailed industry-level deflators taken from the JIP database 2006; and (c) the explanatory variables employed in the regression analyses are not exactly the same as those in Fukao, Ito, and Kwon (2005).

20. 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 (1983) 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 control group before and after matching. The results of these two tests are presented in appendix tables 11A.2 and 11A.3. The standardized bias and *t*-test for equality of means before and after matching indicate that the balancing property is satisfied for all of our variables except one (advertising intensity in the case of non-manufacturing).

21. In the case of the non-manufacturing sector, we exclude the share of nonproduction workers, R&D intensity, and export intensity.

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. Using nonacquired firms as the control group, we conduct one-to-one nearest neighbor matching on firms acquired by foreigners and then match firms acquired by domestic investors using, again, the sample of nonacquired firms as the control group. 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 (sixty-four firms in manufacturing and sixty-eight firms in nonmanufacturing). In the case of in-in acquisitions, our matched sample contains 2,827 firms not acquired by domestic firms as a match for the 2,827 firms acquired by domestic firms (1,369 firms in manufacturing and 1,458 firms in nonmanufacturing).

Using the subsets of the sample, we estimate a difference-in-differences (DID) estimator, which in our case is equivalent to calculating the ATT based on equation (3) in section 11.3.1. The calculated effects of out-in and in-in acquisitions are presented in table 11.12. In the case of the manufacturing sector (upper panel), a foreign acquisition leads to an additional 4 percentage point TFP growth in the firms acquired by foreigners two years after the acquisition. The result also shows that firms acquired by foreign firms enjoy higher TFP growth than the control group equivalent to 2.4 percentage-points at the end of the third year of foreign ownership, although the difference is not statistically significant (probably partly due to the small sample size). The lower panel of table 11.12 shows that foreign ownership improved the ROA of acquired firms in the nonmanufacturing sector at the end of the third year of foreign acquisition. On the other hand, in-in acquisitions had a significant negative impact on the TFP and ROA growth of acquired firms. Moreover, as for TFP and ROA, the sign of the DID tends to be positive for out-in acquisitions in both the manufacturing and the nonmanufacturing sector, while for in-in acquisitions it tends to be negative (although in many cases the DID is not statistically significant).

However, out-in acquisitions tend to have a negative impact on employment, while in-in acquisitions lead to an additional 4–6 percentage-point increase in the sales growth rate for the acquired firm three or four years after the acquisition, in the case of the manufacturing sector. Although many of the DID estimators are not statistically significant, foreign acquisitions tend to be associated with cost cutting and profit or productivity improvements, while domestic acquisitions tend to be associated with increases in output.

The results from the matched sample indicate foreign acquisitions improve target firms' productivity and profitability, while acquisitions by domestic firms hardly have any positive impact on productivity and profitability. The significant positive effect of foreign acquisitions shows up only two years after acquisition, implying that the realization of synergy

Table 11.12 **The effect of acquisition: Matching results**

	Effect of foreign acquisition					Effect of domestic acquisition				
	TFP	ROA	Emp	Sales	Obs.	TFP	ROA	Emp	Sales	Obs.
				(a) Manufacturing sector						
Acquisition year	0.022	0.000	–0.020	–0.052	64	0.001	–0.004	–0.013**	–0.012	1,369
	(0.02)	(0.01)	(0.05)	(0.04)		(0.00)	(0.00)	(0.01)	(0.01)	
One year later	–0.008	0.000	0.022	–0.058	47	–0.004	–0.004	–0.005	–0.002	1,003
	(0.03)	(0.01)	(0.08)	(0.06)		(0.00)	(0.00)	(0.01)	(0.01)	
Two years later	0.039*	0.001	–0.067	0.022	31	0.004	–0.001	0.007	0.022	717
	(0.02)	(0.01)	(0.08)	(0.08)		(0.01)	(0.00)	(0.01)	(0.02)	
Three years later	0.024	–0.011	–0.152**	–0.055	26	0.011	–0.002	0.014	0.042*	550
	(0.04)	(0.02)	(0.06)	(0.12)		(0.01)	(0.00)	(0.02)	(0.02)	
Four years later	–0.010	–0.016	–0.015	–0.018	23	–0.003	–0.007	0.025	0.058*	387
	(0.05)	(0.02)	(0.12)	(0.013)		(0.01)	(0.01)	(0.02)	(0.03)	
				(b) Nonmanufacturing sector						
Acquisition year	0.004	–0.001	0.036	0.061	68	–0.008	–0.003	0.008	–0.006	1,458
	(0.04)	(0.01)	(0.03)	(0.04)		(0.01)	(0.00)	(0.01)	(0.01)	
One year later	0.036	–0.009	0.061	0.025	44	–0.012	–0.005	0.020*	0.013	975
	(0.07)	(0.02)	(0.05)	(0.07)		(0.01)	(0.00)	(0.01)	(0.01)	
Two years later	0.052	0.025	–0.015	0.013	33	–0.025*	–0.005	0.002	–0.015	633
	(0.08)	(0.03)	(0.07)	(0.14)		(0.01)	(0.00)	(0.02)	(0.02)	
Three years later	0.058	0.075*	–0.056	0.124	23	–0.026	–0.004	0.011	–0.034	468
	(0.07)	(0.04)	(0.10)	(0.16)		(0.02)	(0.00)	(0.02)	(0.02)	
Four years later	0.026	0.071	–0.188**	0.014	15	–0.026	–0.007*	–0.036	–0.036	299
	(0.09)	(0.06)	(0.09)	(0.23)		(0.02)	(0.00)	(0.03)	(0.03)	

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

effects from acquisitions or the restructuring of acquired firms take at least two 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.[22]

11.4 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 does indeed 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 the 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 chapter sought to overcome these limitations by conducting (a) 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; (b) an analysis of firms in the nonmanufacturing sector; (c) a more rigorous analysis by employing propensity score matching and the difference-in-differences technique; and (d) an analysis using a new dataset that contains the most recent data available.

The results of this chapter were generally consistent with those in Fukao, Ito, and Kwon (2005). However, 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

22. Instead of calculating propensity scores using multinomial logit estimation, we also tried to calculate propensity scores using probit estimation. In the latter case, we estimated the probability of being acquired by a foreign firm and the probability of being acquired by a domestic firm separately. Next we estimated the probit model, and then compared the difference in performance with the matched sample. We found both TFP growth and ROA improvement to be significantly higher three years after the acquisition in firms acquired by foreigners both in the manufacturing and the nonmanufacturing sector. In the case of in-in acquisitions, the DID was not statistically significant in all cases except one.

which therefore predicts 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 nonmanufacturing 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 nonaquired firms are as close as possible and to isolate causal effects that can be reliably attributed to acquisitions. However, we also found that foreign acquisitions lead to a lower employment growth rate in acquired firms while domestic acquisitions in the manufacturing sector lead to a higher sales growth rate in acquired firms. According to these results, it seems the outcome of M&As is quite different between foreign acquisitions and domestic acquisitions: the former is productivity- and profitability-improving but employment-reducing, while the latter is not. Although domestic acquisitions improve sales growth, this positive effect can be seen only in the manufacturing sector. One potential concern is that our results from the matched sample may not be very strong. 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 nonacquired 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.

Our major finding that acquisitions by foreign firms have a positive effect on target firms' productivity are in line with several preceding studies on this issue in other countries, including Conyon et al. (2002), Arnold and Javorcik (2005), and Bertrand and Zitouna (2005). Comparing our results with those of Arnold and Javorcik's (2005) study on Indonesia, how-

ever, the magnitude of the positive effect is much smaller in our study than in theirs.[23] 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, taking into account that inward FDI tends to generate productivity spillovers, as suggested by Blomström and Kokko (1998) and Blomström, Kokko, and Globerman (2001), our results support the idea that promoting inward FDI and facilitating cross-border M&As could help to improve productivity in Japan.[24] Since the inward FDI penetration in Japan remains low (Ito and Fukao 2005), there appears to be ample room for improvements in productivity through inward FDI.

In addition, we find that the positive effects of foreign acquisitions tend to be much larger in the case of the nonmanufacturing sector than in the case of the manufacturing sector. It is often argued anecdotally that the productivity of Japanese nonmanufacturing firms is relatively low compared with firms in other developed countries. If this is true, the positive effect of foreign acquisitions in the nonmanufacturing sector may have very important policy implications: foreign acquisitions possibly contribute to a better performance of target firms in the nonmanufacturing sector by transferring advanced technology or managerial know-how. However, in our dataset most out-in acquisitions in the nonmanufacturing 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 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 dis-

23. Our results cannot be directly compared with those obtained by Conyon et al. (2002) for the United Kingdom who used labor productivity as their measure of productivity. Bertrand and Zitouna's (2005) study on France, although employing a slightly different analytical model than the one used by Arnold and Javorcik (2005) and in our study, shows that firms acquired by foreigners have nearly 40 percent higher TFP than nonacquired firms. Why the impact of cross-border M&As on TFP is so much greater in France than in Japan certainly is an issue that it would be worth investigating. Moreover, Bertrand and Zitouna (2005) suggest that non-European M&As are more efficiency-improving than domestic or intra-EU M&As. This result highlights the fact that the country origin of the buyer firm matters, providing a further interesting line for enquiry for future studies.

24. A detailed survey of the literature on the various economic effects of FDI and a discussion of the mixed evidence on productivity and knowledge spillovers to domestic firms in previous studies is provided by Lipsey (2004). Although no universal relationships are evident, Lipsey (2004) concludes that "there is substantial evidence from several countries that inward FDI has been most beneficial to the productivity of local firms where the local firms are not extremely far behind the multinationals' affiliates (p. 365)."

tribution networks in the Japanese commerce sector. A more detailed investigation of technology transfer effects, particularly in the nonmanufacturing sector, is an issue warranting further investigation.

Appendix

Construction of the Multilateral Index

The dataset employed in this chapter 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:

$$\text{(A1)}\quad \ln TFP_{i,t} = (\ln Q_{i,t} - \overline{ln\ Q_t}) - \sum_{f=1}^{n} \frac{1}{2}(S_{f,i,t} + \overline{S_{f,t}})(\ln X_{f,i,t} - \overline{ln\ X_{f,t}}) + \sum_{s=1}^{t}(\overline{ln\ Q_s} - \overline{ln\ Q_{s-1}}) - \sum_{s=1}^{t}\sum_{f=1}^{n} \frac{1}{2}(\overline{S_{f,s}} + \overline{S_{f,s-1}})(\overline{ln\ X_{f,s}} - \overline{ln\ X_{f,s-1}})$$

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 the Ministry of Finance. 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:

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

where p_k, i, δ, u, λ, 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 web site, 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.

Table 11A.1 Summary statistics

Lagged variables	Obs	Mean	Std. Dev.	Min.	Max.
		Whole sample			
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			
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
		Nonmanufacturing sector			
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

Table 11A.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	0.058	–0.011	43.9		4.16	0.000	–0.016	–0.011	–3.9		–1.4	0.153
	Matched	0.042	0.046	–2.4	94.5	–0.13	0.896	–0.015	–0.013	–1.5	60.3	–0.4	0.670
ROA($t-1$)	Unmatched	0.088	0.049	43		3.33	0.001	0.049	0.049	0.2		0.01	0.943
	Matched	0.078	0.077	1	97.6	0.08	0.938	0.050	0.049	0.9	–318.7	0.3	0.772
log(size) ($t-1$)	Unmatched	5.741	5.256	45		4.01	0.000	5.140	5.258	–12.1		–4.3	0.000
	Matched	5.696	5.836	–13	71.2	–0.65	0.514	5.138	5.138	0.0	99.9	0.0	0.997
Age($t-1$)	Unmatched	28.449	37.493	–57.4		–4.9	0.000	32.917	37.557	–29.6		–11.2	0.000
	Matched	30.078	32.031	–12.4	78.4	–0.68	0.500	32.907	32.934	–0.2	99.4	–0.1	0.964
(Number of nonproduction workers/ number of R&D intensity($t-1$)	Unmatched	0.506	0.334	65.5		5.83	0.000	0.307	0.335	–10.9		–4.1	0.000
	Matched	0.496	0.521	–9.7	85.2	–0.53	0.599	0.308	0.305	0.8	92.4	0.2	0.825
R&D intensity($t-1$)	Unmatched	0.028	0.010	56.1		7.16	0.000	0.008	0.010	–9.8		–3.4	0.001
	Matched	0.029	0.028	3.8	93.2	0.17	0.867	0.008	0.008	–1.4	85.9	–0.4	0.693
Advertising intensity($t-1$)	Unmatched	0.007	0.005	11.5		0.92	0.356	0.003	0.005	–10.6		–3.4	0.001
	Matched	0.007	0.007	–3.6	68.9	–0.24	0.810	0.003	0.003	–0.8	92.7	–0.3	0.784
Export intensity($t-1$)	Unmatched	0.117	0.031	55.5		7.34	0.000	0.023	0.032	–8.9		–3.1	0.002
	Matched	0.093	0.106	–8.3	85.1	–0.41	0.685	0.023	0.022	1.1	87.6	0.3	0.745
(Debt/total assets) ($t-1$)	Unmatched	0.658	0.705	–16.6		–1.4	0.162	0.782	0.704	26.8		10.5	0.000
	Matched	0.666	0.681	–5.6	66.2	–0.32	0.747	0.777	0.759	6.3	76.5	1.8	0.071

Table 11.A3 Balancing tests for matching: Nonmanufacturing 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	0.017	0.003	5.4		0.44	0.659	–0.002	0.003	–1.9		–0.7	0.457
	Matched	0.017	0.029	–4.6	14.1	–0.24	0.810	–0.002	0.000	–0.6	68.6	–0.2	0.871
ROA($t-1$)	Unmatched	0.109	0.046	62.5		5.87	0.000	0.042	0.046	–5.5		–1.9	0.052
	Matched	0.109	0.087	22	64.8	1.25	0.212	0.042	0.044	–2.4	56.6	–0.8	0.445
log(size) ($t-1$)	Unmatched	5.225	5.215	0.9		0.8	0.934	5.251	5.214	3.7		1.4	0.158
	Matched	5.225	5.192	3.1	–22.79	0.18	0.856	5.250	5.200	5.0	–34.0	1.4	0.172
Age($t-1$)	Unmatched	21.382	34.459	–83.2		–6.93	0.000	29.339	34.549	–33.9		–12.7	0.000
	Matched	21.382	20.324	6.7	91.9	0.41	0.679	29.314	28.719	3.9	88.6	1.1	0.287
Advertising intensity($t-1$)	Unmatched	0.027	0.008	55.7		8.91	0.000	0.009	0.008	5.8		2.5	0.012
	Matched	0.027	0.014	38.7	30.4	2.08	0.040	0.009	0.008	3.7	35.3	1.0	0.306
(Debt/total assets) ($t-1$)	Unmatched	0.726	0.779	–19.8		–1.6	0.109	0.859	0.777	27.6		11.3	0.000
	Matched	0.726	0.708	6.7	66	0.43	0.670	0.859	0.823	12.0	56.5	3.3	0.001

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Comment M. Chatib Basri

This is a commendable chapter and a valuable reading. It addresses the issue of the relationship between merger and acquisition (M&A) and productivity and company performance. This topic is particularly valuable because, as stated by the authors, there is a growing concern today that M&A are dominated by "vulture" funds seeking to reap profits from troubled companies. As a result, understanding the relationship between M&A and productivity is particularly important.

Consistent with the previous study, this chapter shows that M&A improved the productivity of the target firms. However, there is a question of causality direction here: whether the M&A increase the productivity of the target firms or if the high productivity of the target firms attracts some companies to pursue mergers and acquisitions. In particular this chapter tries to elucidate two questions: first, whether a firm is chosen as M&A target based on its productivity or whether it is determined by other characteristics. Second, does the M&A improve the target firms' performance.

This study pointed out that the previous study done by Fukao, Ito, and Kwon (2005) has a limitation due to the selection bias problem. This study aims to fill the gap by employing the combination of Difference-in-Difference (DID) and propensity score matching approach. I think this is a major contribution made by this chapter, which carefully takes care the issues of methodology by handling problems of selection bias. In addition, this chapter extends the coverage of the study, which is not limited to the manufacturing sector, but also includes the nonmanufacturing sector. The other contribution made by this chapter is the distinction between M&A within the group and outside the group.

The results show that in the case of out-in acquisitions, foreign firms acquire well performing Japanese firms. This was indicated by the results that the selection of the target firms was based on higher TFP, profit rate, share of nonproduction workers, export intensity, and larger size in manufacturing industries. As for nonmanufacturing industries, firm with higher advertising and low debt/sales ratio are chosen as targets. In the case of in-in acquisitions this study finds no positive impact on profit rates, in either the case of within group in-in acquisitions or in-in acquisitions by domestic outsiders. On the second question, this study also finds that foreign acquisitions improve target firms productivity and profitability, whereas domestic firms hardly have any impact on performance. The results seem compelling and supported by strong methodology. Nevertheless, to make these results more robust it is worth to address some specific issues:

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1. Is the increase of productivity merely due to acquisition by the new company or it is caused by scale effects? It is true that the matching results on TFP show a productivity increase after three years. However, the econometrics results also shows that the impacts on productivity vanish in the fourth year. Could this finding be attributed to the increase of capacity utilization or scale effect and not to the improvement of the technology that was brought by the new company? It is therefore important to check the constant return to scale assumption on this matter.[1]

2. Some studies, including Ishikawa and Tsutsui (2005) show that a credit crunch occurred in Japan during the period 1996–2001. Thus, it is important to ask whether the improvement of productivity was due to foreign acquisitions' lessening credit constraint?

3. As argued by Arnold and Javorcik (2005), improvement in productivity could also be attributed to preparation for entering the export market. Thus, it is important to investigate whether the improvement in productivity occurred due to exporter effect rather than M&A. This argument is particularly important bearing in mind that the result of this study shows that export intensity significantly determined the M&A.

4. It is particularly important to pay attention to the interpretation of the increase of TFP. It is true that TFP is proximity for productivity, but one needs to carefully interpret the change of TFP growth for the short-run, because it can also be attributed to the demand side rather than increase of productivity. This is also true for the short-run case where capital is fixed. The change of TFP growth for the short-run can be caused by rigidity rather than by productivity.

5. This chapter argues that M&A significantly increased after the Japanese government amended the corporate law on M&A, deregulated some sectors and foreign direct investment, and also because of a "fire sale" due to the economic crisis. It is also of interest to note that these patterns are similar in many countries. In addition, Hausman and Fernandes-Arias (2000) show that M&A occurs when an institution is weaker. Thus the increase of M&A could also reflect a signal of weakening institution. For these reasons it is worth it to complete some comparative studies.

6. It is useful to delve into a more disaggregated level, particularly in relation to acquisitions in some manufacturing industries, including electronics and machinery, and to look at the impact of M&A on productivity with regard to an increasing pattern of production net-work.

This chapter offers a lot of potential to draw out policy implications, including the positive effect of M&A in nonmanufacturing for production net-work. It comes to my surprise that Japan, as almost the most frontier in technology, has yet to improve its own technological productivity. It

1. For detail on this issue see Arnold and Javorcik (2005).

raises a concern that in the future Japanese companies will face strong competition pressures from their competitors.

In sum, this chapter is commendable and offers an important contribution for the study on the relationship between M&A and productivity.

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Comment Roberto S. Mariano

This chapter extends an earlier work (2005) to further examine the basis for acquisition and the impact on firms' performance when firms are acquired by foreign and domestic investors in Japan. In this chapter, the authors use Japanese firm-level data covering an extra year relative to their previous study and extend the scope to include nonmanufacturing industries.

The authors use a multinomial logit analysis (instead of their binomial probit analysis in 2005) to investigate the basis for firm acquisition as the analysis distinguishes three categories: nonacquired firms, foreign-acquired (out-in M&As), and domestic-acquired (in-in M&As). They further employ propensity score matching and difference-in-differences (DID) techniques to account for selection bias in foreign investors' choice of firms for acquisition. This is for purposes of assessing the impact of foreign versus domestic acquisition on a firm's productivity, profitability, sales, and employment growth.

The authors calculate the propensity scores through a multinomial logit model of firm acquisition—the appropriate approach since the categorical acquisition variable is trinomial. Probit estimation, as applied by the au-

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thors in their earlier study to foreign-acquired firms versus others and domestic-acquired firms versus others, may result in biased estimates of propensity scores except in special cases and, consequently, lead to mismatches in the implementation of the DID technique.

As the authors point out, the findings in the chapter are generally consistent with their earlier results. In particular, the authors find that "foreign acquisitions improved target firms' productivity and profitability significantly more and quicker than acquisitions by domestic firms."

In applying the DID, the authors keep in mind that there are three categories. They use the nonacquired firms as the control group and "conduct one-to-one nearest neighbor matching on firms acquired by foreigners and then match firms acquired by domestic investors using again the sample of nonacquired firms as the control." The differences in measured effects for foreign-acquired and for domestic-acquired firms are partly due to the fact that the matching control sets are different for the two categories. The nearest neighbor choices (from the control group) for foreign-acquired firms are based on estimated propensity scores that would be quite different from those used to get matches for domestic-acquired firms. This could account for what the authors call somewhat weak results regarding the impact of foreign acquisition relative to that of domestic acquisition.

The authors appropriately caution that matching must be done carefully when implementing the DID technique. Indeed, further research on appropriate matching methodology is needed, especially when dealing with multinomial situations.