RIETI Discussion Paper Series 07-E-006

The Effects of Multinational Production on Domestic Performance: Evidence from Japanese Firms

Alexander HIJZEN
OECD and GEP, University of Nottingham

INUI Tomohiko
Nihon University

TODO Yasuyuki
Aoyama Gakuin University

RIETI
Research Institute of Economy, Trade & Industry, IAA
The Research Institute of Economy, Trade and Industry
http://www.rieti.go.jp/en/

RIETI Discussion Paper Series 07-E-006

The Effects of Multinational Production on Domestic Performance: Evidence from Japanese Firms

Alexander Hijzen†, Tomohiko Inui‡ and Yasuyuki Todo§

Abstract

In the present paper we investigate the causal effect of becoming a multinational on home performance for a large panel of Japanese firms for the period 1995-2002. We adopt matching techniques in combination with a difference-in-difference estimator to evaluate the causal effect of establishing a foreign affiliate on productivity, output and employment. We find that Japanese outward FDI tends to strengthen the economic activities of Japanese firms in Japan in terms of both output and employment. This finding is in line with the stylized fact in the literature that FDI and exports are complements. However, we do not find a significant positive effect on productivity.

Keywords: FDI, multinationals, propensity score matching

JEL Code: F14, F21, F23

This research was conducted as part of a project on industry-and firm-level productivity in Japan undertaken at the Research Institute of Economy, Trade and Industry (RIETI).

The authors would like to thank RIETI for providing us the opportunity of conducting this research and the Ministry of Economy, Trade and Industry for providing us valuable datasets. The authors are also grateful to Kyoji Fukao, Tsutomu Miyagawa, Jungsoo Park, Eiichi Tomiura, Masaru Yoshitomi, and seminar participants at the RIETI-21st Century COE Hi-Stat Program Workshop for helpful comments and suggestions and Young Gak Kim, Hyeog Ug Kwon, and Toshiyuki Matsuura for their help in constructing the dataset. In particular, the authors also would like to thank Akie Takeuchi for her comments that substantially improved the quality of this paper. Inui thanks the Japan Society for the Promotion of Science (Grant-in Aid for Scientific Research). Alexander Hijzen gratefully acknowledges financial support from the Leverhulme Trust (Grant No.F114/BF). The opinions expressed and arguments employed in this paper are the sole responsibility of the authors and do not necessarily reflect those of RIETI or any institutions the authors belong to.

†OECD.

‡Corresponding author. College of Economics, Nihon University. E-mail: inui@eco.nihon-u.ac.jp

§School of International Politics, Economics and Business, Aoyama Gakuin University.

1. Introduction

During the late 1980s and 1990s Japanese firms' have increased their production activities abroad through the expansion of outward FDI. According to the "Survey on Overseas Business Activities" Japanese firms expanded their overseas production ratio (on the basis of all domestic companies) from 3.1% in 1986 to 15.6% in 2003. The overseas production ratio is particularly high in the transportation machinery industry and electric machinery industry amounting to 32.6% and 23.7% in 2003 respectively. From the same statistics, we can observe that the majority of the recently established overseas affiliates are located in East Asia, and especially in China (see Figure 1).

Japanese policymakers have expressed concerns over the so-called "Hollowing-Out Effect" that these developments may have on the manufacturing base. The fear is that outward FDI reflects the relocation of domestic production activities abroad and hence is likely to result in job losses in Japan. It has further been suggested that productivity may also be negatively affected when the contraction of home activities following relocation may reduce efficiency through a decreasing plant-level scale effect (Barba Navaretti and Venables, 2004).

In order to analyse the effects of outward FDI one needs to compare the firm outcomes in the presence of multinational production with the outcomes that would have prevailed in the absence of multinational production. Unfortunately, we cannot observe what would have happened to firms that did engage in multinational production yet had they not done so. We therefore propose to use propensity score matching techniques to construct a valid control group of domestic firms that did not engage in multinational production but are similar in their observable characteristics to firms that did. We further combine the matching method with difference-in-differences techniques to control for unobserved fixed effects that both affect the decision to engage in multinational production and firm outcomes.

The causal effect of multinational production abroad in the home country has received ample attention in the literature on exporting, but so far has received limited attention in the context of multinationals.[1] Egger and Pfaffermayr (2003) use several different endogenous treatment approaches to analyse the impact of investing abroad on the domestic investment behaviour of Austrian manufacturing firms. Barba Navaretti and Castellani (2004) use propensity score matching to estimate the causal effect of investing abroad on the performance of Italian firms. In the present paper we propose to apply the framework put forward in Barba Navaretti and Castellani (2004) to evaluate the causal effect of switching from domestic production to multinational production on a number of domestic outcomes of policy interest using micro data for Japan.[2]

A recent study that that has addressed a similar issue in the context of Japan is Kimura and Kiyota (2006). Using the same firm-level data set as in the present paper they analyze the effects of outward FDI on TFP growth. They find that firms that engage in FDI exhibit on average 1.8% higher productivity growth than those that do not. However, since their analysis is based on a fixed-effects model, they do not fully

[1] The main concern is to evaluate whether exporters are more important because of self-selection into export market or whereas this reflects learning-by-exporting (see amongst others Clerides *et al*, 1998; Girma *et al*., 2004)

[2] Barba Navaretti *et al.* (2006), Hijzen, Jean and Mayer (2006) and Debeare *et al.* (2006) also analyse the causal effects of becoming a multinational, but distinguish between high and low income investment locations.

account for the endogeneity bias that arises when firms self-select into multinationals. In the present paper we address this problem by explicitly defining the counterfactual using score matching techniques.[3]

2. Data Description and Summary Statistics

The data employed in this paper are drawn from the Basic Survey of Business Structure and Activities, conducted by Ministry of Economy, Trade and Industry. This survey is compulsory, and the data set comprises all firms with more than 50 employees and 30 million yen of assets in manufacturing, mining and commerce. The survey was first conducted in 1991, and then annually from 1994 onward and covers mining, manufacturing and wholesale/retail trade firms. We restrict our focus to firms in the manufacturing sector and removed any observations from our sample that are associated with non-positive values of sales, employment, tangible assets, wages and intermediate inputs. We impose the condition that the panel should be balanced.

We classify firms into three categories: multinational firms, switching firms and domestic firms. We define each type as follows. Multinational firms are firms which i) have at least one foreign subsidiary, ii) are owned for 50% or more by a foreign company, and iii) have positive values of outward loans and investments. Switching firms are non-multinational firms which set up their first overseas subsidiaries in the period between 1995 and 2000 (and had no prior outward loans and investment). Domestic firms are firms which have no overseas subsidiaries at any point during the sample period. After cleaning we have 1060 multinational firms, 350 switching firms

[3] See Kiyota (2006) for an overview of recent empirical studies on firm productivity in Japan.

and 4579 domestic firms in our sample.

Table 1 provides the summary statistics on the average TFP levels, TFP growth rates[4], the growth rate of real sales and number of employees in each category during the period 1994/5-2002. Multinational firms have both higher TFP levels and TFP growth rates compared to either switching or domestic firms. Domestic firms show negative growth in both real sales and the number of employees. Switching firms exhibit the highest growth rates in real sales and small negative growth in the number of employees.

3. Methodology

The need to evaluate the impact of particular policies has given rise to a vast literature on evaluation methods. This literature is primarily concerned with identifying the causal effect of a treatment on a certain outcome of interest relative to an unobserved counterfactual for the population of interest. The crucial problem in the evaluation literature is the missing data problem, i.e. the fact that the outcome of individual *i* that was treated yet had it not been treated, is unobserved and vice versa. The main challenge therefore is to construct an appropriate counterfactual that can be used to solve the missing data problem.

In the present paper we adopt matching techniques in combination with a difference-in-difference (DID) estimator to evaluate the causal effect of establishing a foreign affiliate ('the treatment') on a range of outcomes relative to that of firms that continue to produce exclusively in Japan ('the control').

[4] See the appendix for details on the measurement of TFP.

Matching involves re-constructing the missing data for the treated outcomes had they not been treated by 'matching' treated firms with firms from the group of untreated firms that are very similar in their pre-treatment observable characteristics. The causal effect of the treatment can than be estimated by comparing the mean difference in outcomes between the treated and the untreated. More precisely, we will focus on the average effect of the treatment on the treated (ATT):

$$\hat{\alpha}_{ATT} = E(y^1 | D=1) - E(y^0 | D=1), \tag{1}$$

where y^1 and y^0 are the treated and non-treated outcomes, respectively and D is a dummy variable, which equals 1 when a firms is treated and 0 otherwise.

The crucial assumption of the matching methodology is that of conditional independence, which requires that conditional on observables the non-treated outcomes are independent of treatment status. The violation of this assumption leads to selection bias, i.e. the bias one attempts to address by using matching rather than standard OLS.[5]

In order to implement matching one has to overcome the curse of dimensionality which complicates finding an appropriate counterfactual when firms differ along several dimensions. Rosenbaum and Rubin (1983) propose to match on the *propensity score* which can be obtained in our case by specifying the propensity to establish an affiliate abroad as a function of observable characteristics.

---

[5] Matching also requires that all treated firms have a counterpart in the untreated population and all firms have a positive probability of investing abroad ('the common support assumption'). However, this can be easily imposed on the matching methodology.

$$E(D|y,X) = P(D=1|X) \quad (2)$$

The propensity score thus defines the neighbourhood for each treated observation. We will be using nearest neighbour (one-to-one) matching to match our treated observations to their controls.[6]

In order to improve the performance of propensity score matching we combine it with the difference-in-differences estimator following Heckman *et al.* (1997) and Blundell *et al.* (2004). The conditional independence assumption (CIA) is a strong assumption once it is realised that firms base their investment decisions on future expected profits, which are unobserved by the econometrician. The DID-estimator allows one to control to some extent for selection on unobservable characteristics by transforming the evaluation problem to that of the difference in the trend before and after treatment instead of that of the difference in levels.

$$\hat{\alpha}_{DID} = (y_{t+1}{}^{1} - y_{t-1}{}^{1}) - (y_{t+1}{}^{0} - y_{t-1}{}^{0}) \quad (3)$$

The CIA now requires that conditional on observables treatment status is independent of unobserved temporary individual-specific effects.

4. Constructing the Counterfactual

In order to retrieve the propensity of switching from exclusive domestic production to

[6] Nearest neighbour matching attributes unity weights to the nearest neighbour and zero to any others.

multinational production we estimate the following probit model of the probability to switch for each year for the period 1996-2000.

$$\mathrm{P}\left(FDI_{i,t}=1\right)=F\left(TFP_{i,t-1}, size_{i,t-1}, R\&D_{i,t-1}, Export_{i,t-1}, K/L_{i,t-1}, age_{i,t-1}, profit_{i,t-1}\right) \quad (4)$$

The explanatory variables included in the right hand side of equation above are common determinants of FDI as can be found in for example Kimura and Kiyota (2006) or Blonigen (2005). We include TFP, employment (as a proxy for firm size), the R&D intensity (the ratio between R&D expenditure and sales), the export intensity (the ratio between the amount of export and sales), the capital-labor ratio, firm age and the profit ratio (the ratio between operating profit and sales). All variables are lagged by one year. We further include a subsidiary dummy[7], a full set of industry and year dummies. All coefficients of the explanatory variables have the expected signs and the coefficients of TFP, size, R&D intensity and export intensity are statistically significant. The capital-labor ratio, firm age and profits ratio do not appear to exert a significant effect on the propensity to become a multinational.

Using the estimation results, the probability of switching (propensity score) for each firm is obtained. The propensity scores are used to match switching firms with domestic firms that did not invest abroad but are very similar in terms of their observable characteristics using the nearest neighbour method.

Propensity score matching provides an adequate method to evaluate the causal effect of becoming a multinational when conditional on the propensity score the pre-treatment

[7] The firm where more than 50 per cent of their share is hold by a domestic parent company is treated as a subsidiary firm.

characteristics of the untreated are independent of treatment status. In order to verify whether matching on the propensity score effectively balances the matched sample across individual observable characteristics we perform standard t-tests for equality of means in the treated and non-treated for each variable in the propensity score before and after matching.

Table 3 reports the means of a range of covariates in the unmatched and the matched sample. As one would expect, the means of the treated and the control observations in the unmatched sample are typically statistically different. After matching, the t-tests for the equality of the means indicate that the balancing condition is satisfied in our matched sample.

5. Results

Using the matched sample, we use difference-in-differences in order to evaluate the causal impact of switching toward multinational production overseas on home performance. We measure performance in terms of productivity (TFP), real sales and employment.

Table 4 and Table 5 report the average differences in TFP, real sales and employment between the switching firms and the matched domestic firms in the year during which firms may switch, and one, two and three years following the establishment of the affiliate abroad.[8] Table 4 reports the estimation results of equation (3), which include

[8] Since our data period is limited to the year 2002 and we define the switching firm that established their first overseas establishments in the period between 1996 and 2000, the number of cases available for the estimation for the third year case is smaller than those in the first and the second year cases.

year dummies as a control variable. In order to investigate the robustness of our estimation results, the estimations in Table 5 include two other control variables (export ratio and capital labor ratio) in addition to the year dummies.

The results from our empirical analysis suggest that becoming multinational has a positive effect on domestic output and employment, particularly three years after becoming a multinational. More precisely, we find that engaging in multinational production on average raises domestic sales by 3 to 6 % relative to the unobserved counterfactual in the switch and the following years. We further find that switching increases firm-level employment in Japan relative to the unobserved counterfactual. Moreover, the positive boost in employment due to switching grows over time from 2.9% one year after switching, 4.2% after two years, and 6.9% after three. We do not observe strong positive effects in productivity relative to our counterfactual.

These findings are broadly in line with findings by Barba Navaretti and Castellani (2004) for Italy who find that if anything multinational production increases both domestic employment and domestic productivity. This finding is also in line with the stylized fact in the literature that FDI and exports are complements. For example, Head and Ries (2001), who use Japanese firm-level data for a 25 year period, find that foreign production complements exports. Finally, in contrast to previous work for Japan on the FDI and productivity, including that by Kimura and Kiyota (2006), the results in this paper explicitly control for the endogeneity bias that arises when domestic firms self-select into multinationals by explicitly defining the appropriate counterfactual. After doing so we not find that FDI enhances (or worsens) productivity at home.

5. Conclusion

Japanese outward foreign direct investment (FDI) soared in the latter half of the 1980s as the yen rapidly appreciated after the Plaza Accord. There was much discussion of the so-called “hollowing out” effect, with many fear might be associated with the surge in outward FDI. There is also concern for the negative effect on the productivity, because the foreign expansion of the firms’ activity may reduce the efficiency through decreasing the plant level scale.

In the present paper we apply a novel methodology to investigate the causal effect of becoming a multinational on home performance for a large panel of Japanese firms. More precisely, we adopt matching techniques in combination with a difference-in-difference estimator to evaluate the causal effect of establishing a foreign affiliate on productivity, output and employment. In order to overcome the problem of self-selection the matching method only compares firms that are very similar in terms of their observable characteristics. The difference in outcomes for otherwise identical firms is then interpreted as the causal effect that derives from establishing an affiliate abroad.

We find that Japanese outward FDI tends to strengthen the economic activities of Japanese firms in Japan in terms of both output and employment. This finding is in line with the stylized fact in the literature that FDI and exports are complements. Although we do not find a significant positive effect on productivity, we neither observe any negative effect as some observers feared. Hence we can conclude that there is no direct negative effect on the firm’s productivity.

However, here we only examine the effect of the firm's foreign production on its own domestic activity. In order to examine the effect of outward FDI on the total economy, we should also investigate the indirect effects of the firm's relocation of the production from domestic to abroad. On the one hand, the relocation of productivities may reduce the importance of business to business linkages in the domestic economy, while on the other, the establishment of international production networks may facilitate international technology transfers.

Appendix: Construction of variables

This appendix provides supplementary information on the construction of our dataset. To construct the real value of output, intermediate inputs, capital stocks and labor inputs of firms in Japan, we use firm-level data from the Basic Survey of Business Structure and Activities and industry-level data from the Japan Industry Productivity (JIP) Database 2006. The JIP Database 2006 is constructed by the Firm- and Industry-Level Productivity Research Group organized in the Research Institute of Economy, Trade and Industry (RIETI) of Japan and headed by Kyoji Fukao and Tsutomu Miyagawa. The JIP Database 2006 includes various data during the period 1970-2002 at the 3-digit industry level, including price deflators of output, intermediate inputs, and capital goods and input-output matrices. The complete database is available at the web site of RIETI (http://www.rieti.go.jp).

Real output is defined as nominal total sales reported in the survey deflated by output deflator at the 3-digit level taken from the JIP Database. The nominal value of intermediate inputs is defined as the sum of costs of goods sold and selling and general and administrative expense minus labor costs and the value of depreciation. The nominal value of intermediate inputs is deflated by the intermediate-goods deflator also taken from the JIP Database.

Firms' real net capital stock represents the real value of the stock of tangible fixed assets excluding land, since the book value of land may not reflect the true value of the land, in particular if the land was purchased long time ago. However, the value of land owned by each firm is available only in the survey data for 1995 and 1996, although information on the total value of tangible fixed assets including land is available for all years. Therefore, we estimate the nominal value of tangible fixed assets excluding land of firm i in industry j in year t, NomKijt, by multiplying the firm's total tangible assets including land by one minus industry j's average share of the land value in the total tangible fixed assets in 1995 and 1996. Then, we derive the real net capital stock of firm i in industry j in year t, K_{ijt}, from $NomK_{ijt}$, using the industry total of nominal tangible fixed assets excluding land, $NomK_{jt} = \sum_{i \in j} NomK_{ijt}$, and the estimated real value of the corresponding variable, K_{jt}, and they are estimated by using the "Financial Statement Statistics of Corporations by Industry" (Ministry of Finance, Research Institute): $K_{ijt} = NomK_{ijt} \times \frac{K_{jt}}{NomK_{jt}}$. More specifically, K_{jt}, is obtained by the perpetual inventory method, using industry-level data on fixed capital formation during the period 1975-2000 and industry-level data on fixed assets in 1975. Labor inputs are measured in the man-hour base. Since information on working hours for each firm is not available in the survey, we use the industry average of working hours taken from the JIP Database.

We calculate the each firm's TFP growth rate following the method of Good, Nadiri and Sickles (1997), taking the year 1994 as the base time period. For this calculation, we use our estimated real output and real inputs explained in the above. In addition we need the cost share of each input for this calculation. We use the labor cost and nominal value of intermediate input from the survey and the capital cost is estimated as follows. The capital cost was calculated by multiplying the real net capital stock with the user cost. The user cost (C_k) was estimated by the following equation.

$$c_k(t) = \frac{1-z(t)}{1-u(t)} p_{kj}(t)\{\lambda(t)r(t) + (1-u(t))(1-\lambda(t))i(t) + \delta_j - (\frac{\dot{p}_{kj}(t)}{p_{kj}(t)})\}$$

where z(t) is the expected present value of tax saving due to depreciation allowances on unit value of investment in capital good, u(t) is effective corporate tax rate, taken from "Results of the Corporation Sample Survey (National Tax Agency, Japan)", λ(t) is own-capital ratio(=1-debt/total asset). r(t) is yield of 10 years government bond and i(t) is prime lending rate (long term loans), taken from the "Financial and Economic Statistics Monthly (Bank of Japan)". δ_j is depreciation rate in the industry j, and p_{kj} (t) is the investment price index in the industry j, taken from JIP database. The value of z(t) is calculated using the following equation.

$$z(t) = (u(t) \cdot \delta_j) / [\{\lambda(t) r(t) + (1 - u(t))(1 - \lambda(t) i(t)\} + \delta_j]$$

References

Andrew B. Bernard, A.B. and J.B. Jensen (1999), "Exceptional Exporter Performance: Cause, Effect, or Both?" *Journal of International Economics*, Vol. 47, No. 1, pp. 1-25.

Barba Navaretti, G. and Castellani, D. (2004), "Investments Abroad and Performance at Home: Evidence from Italian Multinationals," *CEPR Discussion Paper*, No. 4284.

Barba Navaretti, G. and Venables, A. (2004), *Multinational Firms in the World Economy,* Princeton, Princeton University Press.

Barba Navaretti, G. D. Castellani and A. Disdier (2006), "How Does Investing in Cheap Labour Countries Affect Performance at Home?", mimeo.

Blonigen, B. (2005), "A Review of the Empirical Literature of FDI Determinants," NBER Working Paper 11299

Blundell, R. and M. Costa Dias (2002), "Alternative Approaches to Evaluation in Empirical Microeconomics," *IFS CEMMAP Working Papers*, CWP10/02.

Blundell, R., M. Costa Dias, C. Meghir and J. Van Reenen (2004), "Evaluating the Employment Impact of a Mandatory Job Search Program," *Journal of the European Economic Association*, Vol. 2, No. 4, June 2004, pp. 569-606.

Clerides, S.K., Lach, S. and J.R. Tybout (1998), "Is Learning by Exporting Important? Micro-Dynamic Evidence from Columbia, Mexico, and Morocco," *Quarterly Journal of Economics*, Vol. 113, No.3, pp. 903-948.

Debaere, P., H. Lee and J. Lee (2006), "Does Where you Go Matter? The Impact of Outward Foreign Direct Investment on Multinationals' Employment at Home", mimeo.

Egger, P. and M. Pfaffermayr (2003), "The Counterfactual to Investing Abroad: An Endogenous Treatment Approach of Foreign Affiliate Activity," University of Innsbruck, Working Paper, 2003/02.

Girma, S., D. Greenaway and R. Kneller (2004), "Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms," *Review of International Economics*, 12(5), pp. 855-866.

Girma, S. and G. Holger (2004), "Outsourcing, Foreign Ownership, and Productivity: Evidence from UK Establishment Level Data," *Review of International Economics*, 12(5), pp. 817-832.

Good, D., M. Nadiri, and R. Sickles (1999), "Index Number and Factor Demand Approaches to the Estimation of Productivity," in M.H. Pesaran and P. Schmidt eds., *Handbook of Applied Econometrics Volume Ⅱ: Microeconomics*, pp.14-80.

Head, K., and J. Ries (2001), "Overseas Investment and Firm Exports," *Review of International Economics,* 9(1), pp. 108-122

Heckman, J., H. Ichimura and P. Todd (1997), "Matching as an Econometric Estimator: Evidence from Evaluating a Job Training Programme", *Review of Economic Studies,* Vol. 64, Issue 221, pp. 605-654.

Helpman, E., M. Melitz and S. Yeaple (2004), "Exports vs. FDI with Heterogeneous Firms," *American Economic Review*, Vol. 94, pp. 300-316.

Hijzen, A., S. Jean and T. Mayer (2006), "The Effects at Home of Initiating Production Abroad: Evidence from Matched French Firms", CEPII, mimeo.

Kimura, F. and Kiyota, K., (2006), "Exports, FDI, and Productivity: Dynamic Evidence from Japanese Firms," *Review of World Economics*, No. 127(4), pp.695-719

Kiyota, K., (2006), "Japanese Firms Productivity in the 1990s: the Facts Found by the Recent Empirical Analysis from Japanese Firm Level Data (Japanese)," *Mitagakkai-zasshi*, forthcoming

Rosenbaum, P. and D. Rubin (1983), "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika*, Vol. 70, pp. 41-55.

Table 1: Summary Statistics

		Multilateral TFP (1994-2002)	TFP Growth Rate (1995-2002)	Growth Rate of real sales (1995-2002)	Growth Rate of number of employees (1995-2002)	N.Observations
Domestic firms	Mean (Std. Dev.)	-0.011 (0.123)	0.005 (0.087)	-0.004 (0.182)	-0.016 (0.117)	4579
Switching firms	Mean (Std. Dev.)	0.023 (0.122)	0.007 (0.091)	0.010 (0.190)	-0.009 (0.125)	350
Multinational firm	Mean (Std. Dev.)	0.039 (0.135)	0.009 (0.088)	0.003 (0.173)	-0.026 (0.127)	1060
Total	Mean (Std. Dev.)	-0.0001 (0.127)	0.006 (0.088)	-0.002 (0.181)	-0.017 (0.119)	5989

Table 2: Probit Estimations

Variable	①	②	③	④
	Coef. (Std. Err)			
Multilateral $TFP_{i,t-1}$	1.106**	1.145**	1.144**	1.146**
	(0.348)	(0.335)	(0.335)	(0.335)
Log N. $employees_{i,t-1}$	0.251**	0.250**	0.253**	0.255**
	(0.040)	(0.040)	(0.379)	(0.037)
Log(R&D $Expenditure/Sales)_{i,t-1}$	4.003**	4.109**	4.101**	4.089**
	(1.102)	(1.065)	(1.064)	(1.063)
$Log(Export/Sales)_{i,t-1}$	0.969**	0.965**	0.965**	0.972**
	(0.234)	(0.234)	(0.234)	(0.233)
Capital Labor $Ratio_{i,t-1}$	0.001	0.001	0.001	
	(0.002)	(0.003)	(0.003)	
Firms $age_{i,t-1}$	0.001	0.000		
	(0.003)	(0.003)		
$Log(Profit/Sales)_{i,t-1}$	0.128			
	(0.310)			
Constant	-3.72	-3.698	-3.375	-3.604
	(0.537)	(0.534)	(0.466)	(0.482)
Subsidely dummy	Yes	Yes	Yes	Yes
Industrial dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
N. observations	16077	16077	16077	16077
Pseudo R-squared	0.123	0.123	0.123	0.123

**, and *: significant at 5% and 10% levels, respectively.

Table 3: Balancing Tests

	Unmatched Sample			
	Switching	Control	Percent Bias	Test for the Equality of Means (t-test)
	means			
Multilateral $TFP_{i,t-1}$	0.032	-0.016	41.8	4.91
Log N. $employees_{i,t-1}$	5.860	5.197	72.0	10.74
Log(R&D Expenditure/Sales)$_{i,t-1}$	0.024	0.010	48.9	8.26
Capital Labor $Ratio_{i,t-1}$	14.585	10.796	26.6	3.49
Firms $age_{i,t-1}$	43.583	40.425	20.3	2.77
Log(Profit/Sales)$_{i,t-1}$	0.233	0.199	18.9	1.94
Log(Export/Sales)$_{i,t-1}$	0.097	0.027	51.6	9.44

	Matched Sample			
	Switching	Control	Percent Bias	Test for the Equality of Means (t-test)
	means			
Multilateral $TFP_{i,t-1}$	0.32	0.045	-11.1	-0.93
Log N. $employees_{i,t-1}$	5.822	5.87	-5.2	-0.44
Log(R&D Expenditure/Sales)$_{i,t-1}$	0.022	0.024	-7.4	-0.41
Capital Labor $Ratio_{i,t-1}$	14.632	12.931	11.9	1.06
Firms $age_{i,t-1}$	43.431	41.925	9.7	0.82
Log(Profit/Sales)$_{i,t-1}$	0.232	0.259	-14.9	-1.55
Log(Export/Sales)$_{i,t-1}$	0.093	0.093	0.2	0.01

Table 4: Difference in Differences Results

Dep. Variable		TFP			
		Initial Year	First Year	Second Year	Third Year
Effect of investing(α)	Coef. (Std.Err.)	0.020* (0.012)	0.013 (0.012)	0.008 (0.014)	0.002 (0.014)
Constant	Coef. (Std.Err.)	0.077 (0.033)	0.050** (0.014)	0.045** (0.022)	0.007 (0.017)
Year Dummy		Yes	Yes	Yes	Yes
N. Observations		318	318	318	244
R. Squared		0.103	0.092	0.048	0.027

Dep. Variable		Output			
		Initial Year	First Year	Second Year	Third Year
Effect of investing(α)	Coef. (Std.Err.)	0.033* (0.017)	0.047** (0.023)	0.048** (0.027)	0.063** (0.031)
Constant	Coef. (Std.Err.)	0.048 (0.031)	0.089** (0.040)	0.116** (0.049)	0.045 (0.055)
Year Dummies		Yes	Yes	Yes	Yes
N. Observations		318	318	318	244
R. Squared		0.127	0.0160	0.101	0.06

Dep. Variable		Employment			
		Initial Year	First Year	Second Year	Third Year
Effect of investing(α)	Coef. (Std.Err.)	0.014 (0.012)	0.029* (0.017)	0.042* (0.023)	0.069** (0.029)
Constant	Coef. (Std.Err.)	0.011 (0.029)	0.023* (0.036)	0.093** (0.046)	0.050 (0.055)
Year Dummies		Yes	Yes	Yes	Yes
N. Observations		318	318	318	244
R. Squared		0.021	0.026	0.077	0.081

Notes:numbers in parentheses are standard error., and*:significant at 5% and 10% levels, respectively.**

Table 5: Difference in Differences Results with other control variables

Dep. Variable		TFP			
		Initial Year	First Year	Second Year	Third Year
Effect of investing(α)	Coef. (Std.Err.)	0.018 (0.011)	0.011 (0.011)	0.005 (0.013)	0.002 (0.014)
export ratio	Coef. (Std.Err.)	0.079* (0.038)	0.004* (0.047)	0.045 (0.055)	-0.009 (0.048)
capital-labor ratio	Coef. (Std.Err.)	-0.000* (0.000)	0.001* (0.000)	0.001** (0.000)	0.001* (0.000)
Constant	Coef. (Std.Err.)	0.070** (0.033)	0.034** (0.016)	0.028 (0.023)	-0.004 (0.018)
Year Dummies		Yes	Yes	Yes	Yes
N. Observations		318	318	318	244
R. Squared		0.116	0.113	0.061	0.040

Dep. Variable		Output			
		Initial Year	First Year	Second Year	Third Year
Effect of investing(α)	Coef. (Std.Err.)	0.029* (0.017)	0.044** (0.022)	0.042 (0.026)	0.061* (0.314)
export ratio	Coef. (Std.Err.)	0.154** (0.059)	0.116 (0.090)	0.222* (0.123)	0.050 (0.097)
capital-labor ratio	Coef. (Std.Err.)	-0.000 (0.000)	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)
Constant	Coef. (Std.Err.)	0.039 (0.031)	0.071 (0.043)	0.080 (0.053)	0.034 (0.056)
Year Dummies		Yes	Yes	Yes	Yes
N. Observations		318	318	318	244
R. Squared		0.149	0.165	0.122	0.061

Notes:numbers in parentheses are standard error., and*:significant at 5% and 10% levels, respectively.**

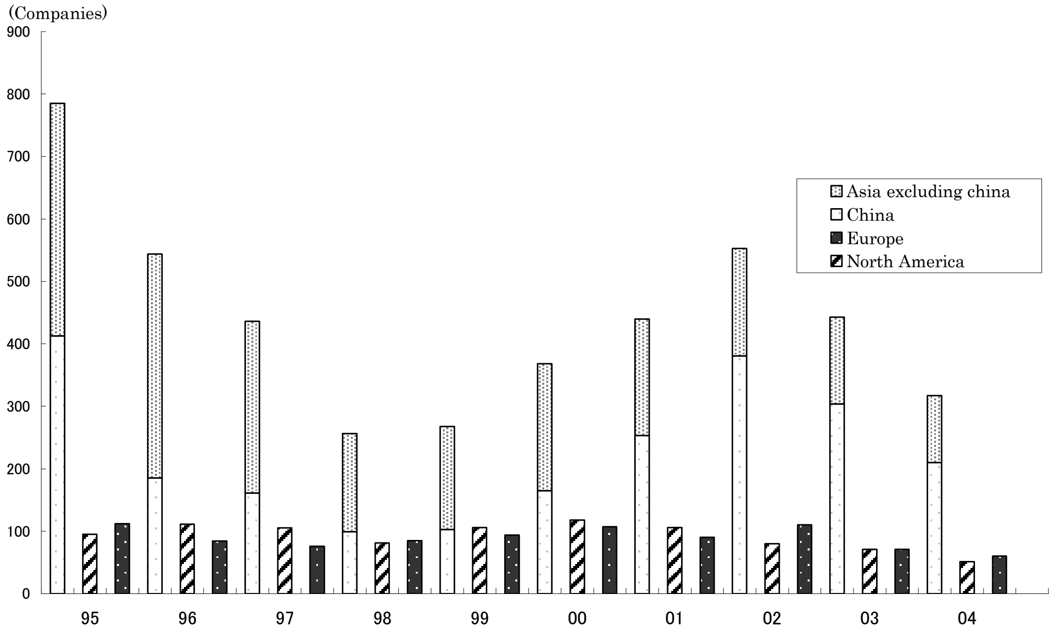
Table 5: Difference in Differences Results with other control variables

Dep. Variable		Employment			
		Initial Year	First Year	Second Year	Third Year
Effect of investing(α)	Coef.	0.011	0.026	0.040*	0.063**
	(Std.Err.)	(0.013)	(0.018)	(0.023)	(0.030)
export ratio	Coef.	0.100	0.119	0.093	0.139
	(Std.Err.)	(0.066)	(0.076)	(0.078)	(0.105)
capital-labor ratio	Coef.	0.000	0.000	0.001	0.001
	(Std.Err.)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	Coef.	-0.006	0.007	0.076**	0.023
	(Std.Err.)	(0.019)	(0.029)	(0.043)	(0.053)
Year Dummies		Yes	Yes	Yes	Yes
N. Observations		318	318	318	244
R. Squared		0.045	0.041	0.083	0.093

**, and *: significant at 5% and 10% levels, respectively.

Figure 1.

Number of overseas affiliates newly established or where capital participation implemented (by region)



Source: "Survey on overseas business activities"(Ministry of Economy, Trade and Industry)