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How Does Overseas Activity Affect Parent Firm Employment in Newly Advanced Economies? Evidence from Taiwan

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This study explores the effects of overseas activity on parent firm employment in Taiwan's listed firms during 2000–2005. Propensity score matching estimates of discrete effects suggest that employment growth did not differ significantly between new parent firms and firms with no overseas operations. Generalized method of moments' estimates of marginal effects for all firms indicate that a statistically significant and positive correlation exists between the size of overseas investment and parent employment after considering factors potentially influencing firm employment. However, this employment effect is negative for non-electronics parents with investment in China.

Keywords: foreign direct investment, employment, propensity score matching
JEL classification: F21, F23, J21

1 Introduction

Over the last two decades, foreign direct investment (FDI) by multinational enterprises (MNEs) from recently developed economies, such as Taiwan, Korea, and Singapore, has considerably increased. Many, if not most, of the major corporations in these economies operate overseas, some extremely extensively. The advent and expansion of large-scale overseas operations has raised old concerns that MNE parent firms may export jobs overseas when

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they shut down production lines in their home countries. Reactions are often strongest among labor unions and related activists, who purport to fight for the rights of workers and often view MNEs as their nemesis.

However, the reality is more complex, even within the parent company. Expansion of overseas activities often decreases parent employment in relatively inefficient production and increases parent employment in more efficient production. The net effect of these changes is not clear a priori and has been investigated by several studies on MNE parent companies in the United States, Europe, and Japan. The study of Korean parent firms by Debaere, Lee, and Lee (2010) is the only known study of parent firms from newly developed economies, and Chen and Ku (2005) provided related industry-level estimates for Taiwan.[1] The first contribution of this paper is that it reports how overseas activity affected parent employment in a large sample of Taiwan's listed firms during a key period, 2000–2005, when Taiwan's outward FDI was booming and concentrated in China because of the deregulation of FDI toward China in 2001.

The effect of foreign production on domestic employment in Taiwan has increasingly attracted attention since the mid-1990s and is related to several major macroeconomic trends. First, after remaining at 2.0% or lower in 1987–1995, the unemployment rate increased to 2.6%–3.0% in 1996–2000 and to 4.1%–5.1% in 2001–2005 (Directorate-General of Budget, Accounting and Statistics DGBAS (2010)). Second, the share of manufacturing in total employment fell from a peak of 34%–35% in 1983–1989 to 27%–28% in 1993–2006. Third, the accumulated value of the actual outward FDI from 1981 onward (as recorded in the balance of payments) increased from US$17 billion at the end of 1990 to US$54 billion in 2000 and US$83 billion in 2005. In particular, approvals of outward FDI have been increasingly concentrated in China, and most of these investments being in manufacturing.[2]

[1]Chen and Ku (2005) investigated the effect of outward FDI on Taiwan's manufacturing employment and suggested that the net effect of FDI on domestic employment was positive in most scenarios. Technical workers experienced the highest job gains from FDI in China and/or other regions, followed by managerial workers and finally by blue-collar workers, who were expected to lose jobs because of FDI outside China.

[2]For example, China's share of cumulative, approved, outward FDI from 1981 onward rose from 0% in 1990 to 26% in 1995, 31% in 2000, and 45% in 2005. However, data on FDI approvals must be used with extreme caution because numerous actual FDIs were never approved (e.g., the ratio of cumulative approved-to-actual outward FDI was only 17%

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Because Taiwan's relationship with China is politically sensitive and economically crucial, FDI in China is closely scrutinized by Taiwan. Before Taiwan joined the World Trade Organization (WTO) in 2001, Taiwanese authorities severely restricted FDI in China, particularly in electronics-related industries, which are large and considered strategic. Although restrictions were substantially relaxed to comply with WTO rules, and FDI in many electronics firms was reclassified accordingly, FDI in China, particularly in electronics, remains controversial. In 2001, regulators of outward FDI in Taiwan adopted a new principle of active openness and effective management. Thereafter, only outward FDI using technologies classified as state secrets was forbidden. Other FDI, including substantial FDI in electronics and in China was reclassified and permitted (Yang, Wu, and Lin, 2010), leading to a sharp increase in FDI in China, as mentioned previously. Thus, 2000–2005 is a key period for investigating the relationship between FDI and domestic employment in Taiwan. In addition, distinguishing FDI in China, and particularly in electronics, is of potential economic interest because related MNE affiliates are often considered to be involved in vertical production chains. Conversely, MNE operations elsewhere, particularly in such developed economies as Europe, Japan, and the United States, and in other industries are usually considered to be more frequently involved in horizontal production networks that replicate similar activities in multiple locations. Although classifying actual foreign operations into these theoretically distinct (i.e., vertical and horizontal) categories is difficult (Lipsey, 2004), whether FDI in China and elsewhere and in electronics and other manufacturing industries affect employment in Taiwanese parent firms differently is worth investigating. This is the second major contribution of this study.

This paper briefly reviews the related literature (Section 2) before describing the two employed analytical methodologies and data (Section 3). It then analyzes results of propensity score matching (PSM) estimates of the effects of FDI on parent employment and compares it with similar nonparent employment and generalized method of moments (GMM) estimates of

in 1990, 47% in 1995, 72% in 2000, and 97% in 2005 (DGBAS (2010); Investment Commisson (2010))). According to a 2005 survey of outward investors (Ministry of Economic Affairs, 2007), manufacturing parent firms in Taiwan employed 626,792 production workers domestically (50% in electronics) and parent firms with FDI in China employed 519,684 production workers (52% in electronics).

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the marginal effects of FDI on parent employment (Section 4), and finally summarizes the major findings (Section 5).

2 Related Literature

Does a positive or negative association exist between outward FDI and domestic employment? Theoretically, outward FDI can destroy or create jobs through several mechanisms. MNEs shut down production lines in the home countries and transfer them overseas in many scenarios. The transfer of labor-intensive activities from high-wage home countries to low-wage hosts is often conspicuous. Moreover, if the parent firm chooses to eliminate employees after transferring activities, it would have fewer employees after undertaking or expanding FDI. These are perhaps the simplest scenarios in which overseas production substitutes for parent firm exports (Kokko, 2006), which are often attacked by labor unions and others opposing overseas expansion by MNEs.

Conversely, efficiency-seeking outward FDI allows the investing firms to expand their domestic output through enhanced competitiveness, because FDI allows parent firms to reallocate their resources, including workers, to activities that are more cost effective in the home economy. For example, FDI may allow a parent firm to expand activities such as supply of capital or intermediate goods used by the transferred production line and/or related research and development (R&D) and marketing. In addition, FDI may facilitate the initiation of new production lines and related activities in the parent firm. Thus, the net effect of FDI on parent exports is ambiguous a priori. The net effect of overseas expansion on parent employment usually depends on whether the employment losses caused by transferring some activities overseas are higher or lower than the employment gains by other parent firm activities that are facilitated by reorganization of activities in the parent firm and related affiliates.

Over the past decade, several studies have examined this debatable topic by investigating MNEs from developed countries and have reported ambiguous results. Initially, cross-sectional evidence from the United States in 1982 (Kravis and Lipsey, 1993) and 1989 (Lipsey, 1995) suggests a negative correlation between affiliate net sales and parent employment for these years. In other words, a higher overseas activity appears to have resulted in some substitution for U.S. parent employment. In addition, Kravis and Lipsey (1993) observed that U.S. parent firms tend to pay slightly higher

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average wages and salaries and interpreted these findings as indications that the larger a firm's overseas production, the stronger is its ability to allocate the more labor-intensive and less skill-intensive portions of its activity to locations outside the United States.[3]

Blomström, Fors, and Lipsey (1997) and Lipsey (2002) further analyzed data from 1989 to determine whether the effect of affiliate activities on parent firm employment is dependent on FDI location or industry. Both studies reported that negative correlations were related to affiliate activity in developing economies but in developed economies. When Lipsey stratified the data in six industry groups, differences among FDI locations were only significant in the food industry, with FDI in developed economies and inward-oriented developing economies negatively correlated to parent employment, and FDI in outward-looking developed economies positively correlated to parent employment. The net effect was significantly positive in nonelectric, electric, and electronic machinery, significantly negative in transportation equipment, and nonsignificant in food, chemical, and metal industries.

Studies on European countries, such as those by Blomström and Ari (1995), Blomström, Fors, and Lipsey (1997), and Blomstrom and Ari (2000),[4] have concentrated on Swedish MNEs. They observed that employment in Swedish parent firms was usually positively correlated to the extent of overseas activities, which contradicted the U.S. experience. Positive employment effects were stronger for blue-collar workers than for white-collar workers. The effects were stronger for both types of labor when related to overseas activities in developing economies than in developed economies. Blomström, Fors, and Lipsey (1997) argued that this finding possibly indicated that Swedish MNEs were inclined to upgrade their overseas workforce but to maintain and expand unskilled-intensive activities at home.

Japan's experience is similar to that of Sweden. Analyses of Japanese parent firms in 1986, 1989, and 1992 by Lipsey, Ramstetter, and Blomström (2000) revealed that the results varied among these years and the 12 industry groups for which equations were estimated. Most correlations (85 of 136) between parent employment and overseas activity were nonsignificant; how-

[3]A substantial amount of literature focuses on how overseas activities affect the composition of parent firms' workforce and wages, but this literature is not directly relevant to the present study and hence was omitted from the review.

[4]In addition, Blomström, Fors, and Lipsey (1997) and Blomstrom and Ari (2000) examined the effects of FDI on employment in U.S. MNEs.

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ever, significantly positive correlations outnumbered significantly negative correlations (39 to 12), and the number of significantly negative correlations dwindled from six in 1986 to two in 1992. Correlations to overseas activities in developed regions were more frequently significant than correlations to activities in developing regions. Yamashita and Fukao (2010) used a similar approach to examine the effect of overseas operations on parent employment, but controlled for several additional firm and industry characteristics; on the basis of a large sample of firms in 1992–2001 and using four alternative panel estimation techniques, they concluded that expanded overseas operations by MNEs positively influence employment in home MNEs by generating higher demand for more technological- and skill-intensive activities. Moreover, their results indicated that FDI in different regions had different effects on parent employment and that the size and significance levels.[5]

Recently, several studies have used a PSM estimator to revisit this issue by focusing on the comparison of employment levels in new parent and nonparent firms with similar characteristics in a home economy. This methodology corrects the sample-selection bias that might result from focusing exclusively on the employment effects of overseas operations in existing MNEs. Moreover, it helps answer two related yet distinct questions: (a) how does expanding affiliate activity affect employment in parent firms and (b) how does employment growth compare in parent firms after undertaking FDI and similar non-MNEs during the same period?

Most existing studies using this methodology focus on European firms. Barba Navaretti and Castellani (2004) and Castellani, Mariotti, and Piscitello (2008) analyzed samples of Italian firms in 1993–1998 and 1998–2001, respectively. The first study observed that overseas investments improved total factor productivity (TFP) and output but had no significant effects on employment. Similarly, Castellani, Mariotti, and Piscitello (2008) observed that investments in neither developed nor developing countries reduce do-

[5]A review by Lipsey (2004) of related empirical literature suggests that net export substitution has been rare in U.S., European, and Japanese MNE parent firms and industries, whereas export complementarity and/or neutral (statistically nonsignificant) net export effects have been more common. Moreover, several other studies (e.g., Brainard and Riker (1997) for the United States and Cuyvers et al. (2005) and Konings and Murphy (2006) for the European Union) have estimated the elasticities of parent firm labor demand with respect to labor prices in alternative affiliate locations in the MNE.

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mestic employment. Barba Navaretti, Castellani, and Disdier (2010) compared the effects of FDI in developed and developing economies on the employment of both French and Italian parent firms in 1993–2000 and reported that the employment effects of initiating FDI in both developed and developing economies were positive. Similarly, Hijzen, Jean, and Mayer (2011) suggested a positive employment effect on French manufacturing parent firms that made market-seeking investments in 1987–1999. Parent firms that made factor-seeking investments showed weak (nonsignificant) indications of an initial drop in employment at the time of investment, followed by a stronger positive effect after two years.

Hijzen, Inui, and Todo (2007) studied a large sample of Japanese firms in 1995–2002; their results suggested that outward FDI led to increased output and employment in parent firms; however, it generally nonsignificantly affected productivity. Hayakawa et al. (2013) in their study of Japanese manufacturing firms divided outward FDI into horizontal FDI (HFDI) and vertical FDI (VFDI). Through PSM, they observed that HFDI increases demand for nonproduction workers whereas VFDI increases demand for skilled production workers. Debaere, Lee, and Lee (2010) examined the employment effect of FDI from Korea, a then newly developed Asian economy, during 1981–1995. Similarly, they distinguished investments in more- and less-developed countries and observed a negative employment effect on investments in less-developed countries, particularly in the short run, whereas no significant effect was observed on investments in more-developed countries.

Empirical studies have adopted various methodologies and MNE data of various countries to examine this long-standing question; however, no definitive answers were obtained, implying the need for more such studies.

3 Empirical Methodologies and Data

This section describes the two methodologies used to examine the effects of initial FDI and the marginal effects of expanding overseas operations on parent employment. It concludes by describing the data used to facilitate these analyses.

3.1 Estimating Discrete Employment Effects

As discussed in Section 2, recent literature predominantly focuses on how

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the discrete decision to undertake FDI affects parent employment. Some of these studies have suggested that estimates of marginal employment effects in existing parent firms are subject to sample-selection bias because they ignore that new investors are not selected randomly from a population of firms but are self-selected so that firm characteristics can predict which firms engage in FDI and which remain domestic. As explained before, we believe that emphasis on sample-selection bias may be exaggerated because the marginal effects of overseas activity on employment in existing parent firms are of economic interest. Nonetheless, simply comparing averages for MNEs initiating FDI (the treated group) and non-MNEs (the control group) in year t yields biased estimates of the differences between the two groups (the treatment effect).

The PSM method developed by Heckman, Ichimura, and Todd (1997) and Heckman, Ichimura, and Todd (1998) provides an appropriate approach. We set the treatment dummy variable DFDIN_{it} to 1 if an MNE engaged in a new FDI in year t (i.e., the firm's FDI stock [cumulative flows from 1998] was 0 in year $t-1$ and 1 in year t) and 0 otherwise, and DLOC_{it} to 1 for all firms without FDI in any year.[6]

We defined $G1_{it}$ as the growth rate of employment in an FDI parent firm i between year t and $t+s$ ($s = 1, 2$). Assuming the firm was not an MNE in year $t-1$ but became one thereafter, the treatment effect was observed and DFDIN_{it} equals 1. Alternatively, for purely domestic firms, which did not invest overseas between 1998 and t, DLOC_{it} is 1 and $G0_{it}$ denotes the employment growth rate. The average treatment effect is therefore

$$E\left(G1_{it} - G0_{it} | \text{DFDIN}_{it} = 1\right) = E\left(G1_{it} | \text{DFDIN}_{it} = 1\right) - E\left(G0_{it} | \text{DLOC}_{it} = 1\right). \quad (1)$$

Because $G0_{it}$ is unobservable, estimation of Equation (1) requires construction of counterfactual observations for comparison with observations of firms engaging in new FDI. This is only possible if data on both new investors and

[6]Because of data constraints, we defined DFDIN as new FDI from firms with no FDI flows from 1998 onward. This is a potentially serious shortcoming of both this and the following marginal analysis. Moreover, FDI stocks (and flows) can be used to finance investments in nonfixed assets (e.g., bank accounts, bonds, stocks, and inventory), many of which are only loosely related to employment or production. However, data constraints prevent the use of preferable measures, such as foreign affiliate employment, sales, and value added.

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non-investors in the initial period is available; then, the average employment growth rate differential between new MNEs and non-MNEs can be calculated using Equation (1).

To construct a valid control group, firm characteristics that can successfully predict whether a firm engages in new FDI or not should be identified. In addition, a group of non-FDI firms with characteristics similar to those of the new FDI firms should be identified, and these domestic firms should be compared with FDI firms. Because these groups of new FDI and domestic firms share major characteristics that determine whether a firm engages in FDI, differences between the two groups are assumed to be FDI-related.

The probability of a firm engaging in new FDI is estimated using the following regression:

$$\begin{aligned} \mathrm{DFDIN}_{it} = {} & \beta_{20} + \beta_{21} \ln \mathrm{SALE}_{it} + \beta_{22} \ln(1 + \mathrm{PATENT})_{it} \\ & + \beta_{23} \mathrm{EXPR}_{it} + \beta_{24} \ln \mathrm{TFP}_{it} + u_{it}, \end{aligned} \tag{2}$$

where SALE_{it}, PATENT_{it}, EXPR_{it}, and TFP_{it} are the firm i's sales, number of registered patents, export-sales ratio, and TFP in year t, respectively, and DFDIN_{it} is the new MNE dummy (Equation [1]). Larger, patent-intensive, and exporting firms are expected to have a relatively high probability of conducting a new overseas activity. In addition, firms with higher productivity might be expected to have a greater probability of running the risks of initially engaging in overseas activities; however, firms with lower productivity can be motivated to move low productivity activities overseas and therefore are more likely to engage in new FDI.

The most crucial part of the matching process is balancing the distribution of firm characteristics between the new FDI firms and purely domestic firms (the control group). The seven-step algorithm proposed by Becker and Ichino (2002) is widely used for this purpose and was adopted in this study. Moreover, to ensure the robustness of the results, two alternative matching criteria, nearest-neighbor and kernel matching, were compared.[7]

3.2 Marginal Employment Effects of Foreign Activity

Van Reenen (1997) proposed a labor demand function, which is the point of departure for estimating the marginal effects of overseas activity on par-

[7] In addition, a third technique, caliper matching, was used, but it did not yield meaningful (converging) results in these relatively small samples. For an extensive discussion of these matching methods, refer to Heckman, Ichimura, and Todd (1998).

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ent employment in Taiwan. He assumed constant elasticity of substitution production function and that firms minimize the costs of producing gross output. Following Greenhalgh, Longland, and Bosworth (2001), the debt–equity ratio was added as a proxy for the firm-specific cost of capital, which was not accounted for in Van Reenan's model. In other words, the core model assumes that the log of employment in firm i for year t ($\ln \mathrm{EMP}_{it}$) is a function of the logs of its annual wage payments per employee ($\ln \mathrm{WAGE}_{it}$), fixed capital stock ($\ln \mathrm{CAP}_{it}$), and debt–equity ratio (DEBTR_{it}). In the Taiwanese context, extending the model to account for four other factors likely to be correlated with firm employment is crucial. The first is the extent of innovative activity, measured as the log of the number of patent applications, because firms with more advanced technology are expected to hire more workers, ceteris paribus (Yang and Lin, 2008). The second is the firm's ability to export, measured as the export propensity EXPR_{it} (Debaere, Lee, and Lee, 2010); firms that are more successful in exporting are generally expected to have relatively large work forces. The final two variables are the size of a firm's domestic sales (measured as the log of domestic market sales, $\ln \mathrm{SALES}_{it}$) and log of the firm's TFP ($\ln \mathrm{TFP}_{it,}$), because relatively large and efficient firms are expected to hire more workers, ceteris paribus (Lipsey, 2004; Yamashita and Fukao, 2010).

The ratio of cumulative total FDI and the value of a firm's common stock (FDI_{it}) is then added to the employment equation, its coefficient reflecting the marginal effect of overseas activity on employment in Taiwan's large firms. The resulting equation is

$$\begin{aligned}\ln \mathrm{EMP}_{it} = {} & \beta_{30} + \beta_{31} \ln \mathrm{WAGE}_{it} + \beta_{32} \ln \mathrm{CAP}_{it} + \beta_{33} \mathrm{DEBTR}_{it} \\ & + \beta_{34} \mathrm{FDI}_{it} + \beta_{35} \ln(1 + \mathrm{PATENT})_{it} + \beta_{36} \mathrm{EXPR}_{it} \\ & + \beta_{37} \ln \mathrm{SALES}_{it} + \beta_{38} \ln \mathrm{TFP}_{it} + u_{it}. \end{aligned} \tag{3}$$

FDI is then disaggregated by destination to investigate the potential for FDI in China to have different effects on parent employment than does FDI in more developed economies:

$$\begin{aligned}\ln \mathrm{EMP}_{it} = {} & \beta_{40} + \beta_{41} \ln \mathrm{WAGE}_{it} + \beta_{42} \ln \mathrm{CAP}_{it} + \beta_{43} \mathrm{DEBTR}_{it} \\ & + \beta_{44} \mathrm{FDIC}_{it} + \beta_{45} \mathrm{FDIA}_{it} + \beta_{46} \ln(1 + \mathrm{PATENT})_{it} \\ & + \beta_{47} \mathrm{EXPR}_{it} + \beta_{48} \ln \mathrm{SALES}_{it} + \beta_{49} \ln \mathrm{TFP}_{it} + u_{it}, \end{aligned} \tag{4}$$

where FDIC_{it} and FDIA_{it} are the ratios of the FDI stock in China and in more developed economies, respectively, to the value of a firm's common

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stock.[8] Because only one or two cases of FDI exist in other developing countries per year, we do not examine the employment effect of FDI on these countries, because results based on rare samples are unreliable. Estimating Equations (3) and (4) thus facilitates the analysis of how the extent of overseas activity in these major, alternative locations affects employment in Taiwan's largest firms.

Equations (3) and (4) are estimated using panel techniques to account for unobservable firm heterogeneity; however, such estimates cannot account for potential endogeneity involving FDI and employment variables. Results of Wu–Hausman tests for endogeneity between large-firm employment and the three FDI variables in Equations (3) and (4) indicated endogenous causality between cumulative FDI in China and large-firm employment, but no endogeneity involving cumulative FDI in developed countries.[9] Because these results suggest potential endogeneity, the GMM estimator is combined with instrumental variables to account for this problem. In addition, this approach has the advantage of robustness in the presence of heteroscedasticity across firms, another potentially major problem in this context.

The choice of instrumental variables is critical and can influence results; independent variables other than FDI are obvious choices. Another essential instrument in this case is the dummy variable $TT1_{it}$, which equals 1 for firms potentially affected by the liberalization of policies toward FDI in China after November 2001.[10] As explained in Section 1 and detailed by Yang, Wu, and Lin (2010), this change to active openness and effective

[8]The more advanced economies are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

[9]Results of endogenous tests between FDI in China and developed countries and employment are presented in the appendix table.

[10]TT1 = Time × Treat1. Time is a dummy variable denoting firms that invested in China after November 2001. Treat1 is a policy dummy identifying firms likely to be affected by this policy change, mainly in the electronics industry. Thus, most firms affected by this policy change ($TT1_{it} = 1$) were electronics firms. The policy change in 2001 was effective only for electronics firms belonging to the treatment group, whereas other firms not influenced by the policy were classified into the control group. Because this policy change affected FDI behavior rather than other firm conducts, revealing it as an appropriate IV for investment in China.

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management greatly reduced Taiwanese restriction on FDI in China, particularly in electronics. Because its primary effects were realized during the period under study, it is a particularly appropriate instrumental variable in this context.

3.3 Data

This study analyzed employment decisions in a sample of large firms listed on the Taiwan Stock Exchange (TSE) from 2000–2005.[11] This sample is not comprehensive and excludes small and medium enterprises, some of which have overseas activities. However, it includes most of Taiwan's outward investors and covers an average of 51.16% of the Taiwan manufacturing sector's FDI overseas during 2000–2005. After eliminating a few firms with missing observations, the data set was an unbalanced panel of 621 firms with 3,628 observations (597–608 firms per year).

Most firm characteristics were obtained from annual financial statements of these firms, which are compiled by the Taiwan Economic Journal Company. Data on FDI in China and other countries were obtained from firm-level records of actual FDI provided by the Ministry of Economic Affairs' Investment Commission.[12] The number of patent applications is collected from Taiwan Intellectual Property Office's database. TFP levels were calculated using the semiparametric approach proposed by Levinsohn and Petrin (2003).

Sample firm employment grew slowly during the recession year of 2001 (0.1%), moderately in 2003–2004 (2.9%–3.0%), and rapidly in 2002 and 2005 (6.4% and 8.3%, respectively; Table 1). In all years except 2005, sample firm employment grew faster than average for Taiwan's manufacturing firms, and MNE parent employment grew more rapidly than the sample average.[13] Correspondingly, MNE shares of sample firm employment in-

[11]According to the official definitions of the Small and Medium Enterprise Administration of the Ministry of Economic Affairs, in 2005, a firm with 200 or fewer employees and capital less than NT$80 million was classified as a small and medium enterprise. However, the capital requirement for an initial public offering on the TSE is NT$600 million.

[12]These data differ from published figures on approved investment (Investment Commission, various years).

[13]Ratios of employment in sample firms and that in total manufacturing employment as estimated in Taiwan's labor force surveys increased from 20% in 2000 to 24% in 2005 (Table 1; DGBAS, 2011). A discrepancy exists between firm-level data and individual-level labor

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Table 1: Number of Employees and Ratios (in percent) of Cumulative FDI to Common Stock in Sample Firms

Variable, sample	2000	2001	2002	2003	2004	2005
Employees, all firms (EMP_{it})	536,563	537,247	571,546	588,806	605,853	655,875
MNE parents ($FDI_{it} > 0$)	337,800	404,797	457,464	481,118	533,769	559,387
Electronics (MNEs only)	182,605	204,116	243,385	256,404	299,169	321,005
New MNEs ($DFDIN_{it} = 1$)	81,269	109,536	141,474	161,132	197,660	216,161
Other manufacturers (MNEs only)	155,195	200,681	214,079	224,714	234,600	238,382
New MNEs ($DFDIN_{it} = 1$)	57,110	124,249	144,725	157,717	167,861	172,034
Non-MNEs ($FDI_{it} = 0$ [$FDIC_{it} = FDIA_{it} = 0$])	198,763	132,450	114,082	107,688	72,084	96,488
FDI/Common Stock, all firms ($FDI_{it} > 0$)	16.51	21.75	26.04	28.12	28.89	28.33
MNE parents ($FDI_{it} > 0$)	31.69	34.97	37.66	37.90	37.65	36.11
Electronics (MNEs only)	39.38	44.27	47.67	46.95	45.62	41.57
New MNEs ($DFDIN_{it} = 1$)	47.78	49.03	48.53	46.49	45.11	40.40
Other manufacturers (MNEs only)	23.10	24.68	26.91	28.57	29.58	30.44
New MNEs ($DFDIN_{it} = 1$)	20.62	20.44	24.34	25.55	27.52	27.83
FDI in China/Common Stock, all firms ($FDIC_{it} > 0$)	12.59	17.41	21.46	23.07	23.51	22.70
MNE parents ($FDI_{it} > 0$)	24.16	27.99	31.03	31.10	30.63	28.93
Electronics (MNEs only)	32.82	37.95	40.92	40.00	38.14	33.93
New MNEs ($DFDIN_{it} = 1$)	38.58	42.06	41.41	39.31	37.03	32.36
Other manufacturers (MNEs only)	14.50	16.97	20.40	21.92	23.04	23.75
New MNEs ($DFDIN_{it} = 1$)	16.83	16.81	19.95	21.42	22.95	23.34

Sources: See details in Section 3.

creased rather steadily from 63% in 2000 to 85%–88% in 2004–2005. In other words, simple comparisons suggest that these large firms, particularly the large MNEs in the sample, usually created more new employment op-

force data, but it is unlikely to be large (e.g., most employees reporting that they were in manufacturing were probably classified under manufacturing firms).

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portunities than non-MNEs in the sample and the generally smaller firms excluded from the sample. Conversely, the large firms in these samples accounted for relatively small proportions of total manufacturing employment, because excluded, small-, and medium-sized firms accounted for most (> three-fourths) of the employment in Taiwan's manufacturing industry.

The mean ratio of cumulative total FDI to common stock increased markedly from 17% to 26% in 2000–2002, but remained at 28%–29% in 2003–2005 (Table 1). Similarly, the mean ratio of FDI in China to common stock grew from 13% to 21% in 2000–2002 but stagnated at 23%–24% thereafter. In other words, investment in China accounted for most of the FDI by sample firms and rapid growth (relative to the value of common stock) in the early part of the sample as well as for the relative stagnation of FDI growth in the latter period. Table 1 illustrates that electronics parent firms, particularly those investing in China, had larger FDI relative to total common stock than non-electronics firms and that they generated most of the employment among the sample firms. Variable definitions and basic statistics are summarized in Table 2.

4 Empirical Results

This section analyzes the discrete effects of new FDI on parent employment in subsequent years and marginal effects of the scope of overseas operations on parent employment.

4.1 Discrete Effects of FDI on Subsequent Employment Growth

As explained in Section 3.1, estimating the determinants of whether a firm chooses to engage in initial FDI in a year [Equation (1)] is the first step in evaluating the discrete employment effects of FDI because the decision to undertake initial FDI is theoretically the most crucial trait that distinguishes MNEs from non-MNEs. Table 3 presents the results obtained from logit regressions of this equation for all manufacturing, electronics, and non-electronics firms. Combined estimates for all firms indicate that the probability of engaging in overseas activities is positively associated with sales (size), patent applications (technology intensity), and export propensities, but negatively associated with TFP. The results are generally consistent with those of previous studies, such as Chen and Yang (1999). However, the effects of patent applications and TFP are nonsignificant for electronics firms,

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Table 2: Variable Definition and Basic Statistics

	Definition	All firms	Electronics firms	Non-electronics firms
EMP_{it}	The number of employees in firm i for year t.	963.586 (1,930.369)	1,136.987 (2,390.483)	820.698 (1,430.006)
$WAGE_{it}$	Yearly wage per employee (NT$ thousand) in firm i for year t.	287.188 (267.045)	249.572 (222.893)	318.184 (295.033)
CAP_{it}	The physical capital stock in firm i for year t. (NT$ million) (fixed assets)	5,293.054 (10,593.39)	2,712.934 (4,689.947)	7,419.155 (13,289.29)
$DEBTR_{it}$	The debt to equity ratio (%) in firm i for year t	53.93869 (152.522)	34.910 (68.837)	69.619 (194.918)
FDI_{it}	The ratio of accumulated outward FDI to capital stock (%)	32.136 (49.145)	39.522 (53.770)	23.789 (41.807)
$FDIC_{it}$	The ratio of cumulative FDI in China investment to the common stock issued by firm i in year t (%)	25.780 (41.270)	33.308 (50.250)	17.273 (25.280)
$FDIA_{it}$	The ratio of cumulative FDI in advanced countries to the common stock issued by firm i in year t (%)	6.356 (25.667)	6.215 (15.977)	6.515 (33.397)
$PATENT_{it}$	The number of patent applications by firm i in year t	10.937 (57.821)	19.031 (77.810)	1.497 (4.148)
$EXPR_{it}$	The ratio of exports to sales in firm i for year t (%)	44.381 (36.313)	63.986 (30.852)	28.287 (32.335)
$SALES_{it}$	Domestic sales of firm i for year t (NT$ million)	10,159.28 (28,034.88)	13,196.17 (35,049.13)	7,656.783 (20,196.43)
$TT1_{it}$	A dummy variable equal to 1 for firms affected by the liberalization ofpolicy toward FDI in China from November 2001.	0.458 (0.498)	0.547 (0.497)	0.357 (0.479)
TFP_{it}	Levinsohn and Petrin (2003) measure of total factor productivity in firm i for year t (NT$ million)	40.516 (71.406)	42.137 (92.785)	39.317 (46.611)

and the effects of exporting are nonsignificant for non-electronics firms. In other words, non-electronics firms with relatively high sales and high tech-

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Table 3: Determinants of Whether a Firm Has New FDI (Equation (3), 2000–2005), dependent variable = $DFDIN_{it}$, pooled, cross section, logit estimates)

Independent variable	All firms	Electronics Firms	Other manufacturers
$\ln SALE_{it}$	0.427***	0.295***	0.585***
	(0.055)	(0.073)	(0.085)
$\ln(1 + PATENT)_{it}$	0.068*	0.012	0.225***
	(0.037)	(0.045)	(0.082)
$EXPR_{it}$	0.534***	0.563***	0.033
	(0.127)	(0.186)	(0.205)
$\ln TFP_{it}$	−0.173**	0.035	−0.365***
	(0.079)	(0.101)	(0.135)
Constant	−5.739***	−5.672***	−6.201***
	(0.567)	(0.726)	(0.958)
Firms	453	242	211
Observations	2,684	1,424	1,260

Note: (1) Figures in the parentheses are standard errors obtained by 100 times bootstrap; (2) *** and * denote coefficients are significant at 1% and 10% statistical levels, respectively.

nology intensity and electronics firms with relatively high sales and high export propensities are more likely to engage in new FDI than the others.

Probability ratios were retrieved from the logit model for firms engaging in new FDI and purely domestic firms. New FDI firms and purely domestic firms with similar sales levels, patent applications, export–sales ratios, and TFP levels were identified using nearest-neighbor matching and kernel matching; however, caliper matching did not yield meaningful (converging) results. Differences in employment growth rates between matched pairs, or average treatment effects, were then calculated and reported for two periods between the year of FDI and two subsequent years, as shown in Table 4.

Panel A of Table 4 lists the employment growth rate differentials between new FDI firms in all regions in China and in developed economies and similar domestic firms. Panel B shows similar differentials for electronics and non-electronics firms in all regions. A small sample size prevents meaningful disaggregation by both investment region and industry. Table 4 combines

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Table 4: Treatment Effects Comparing Employment Growth in Parents with New Outward FDI and Similar Firms with No FDI (Derived from Equations (3) and (4), PSM Estimation) 2000–2005

Panel A

	All new FDI firms		New FDI in China		New FDI in advanced economies	
Matching technique	Growth t to $t+1$	Growth t to $t+2$	Growth t to $t+1$	Growth t to $t+2$	Growth t to $t+1$	Growth t to $t+2$
Nearest Neighbor	−0.020 (−1.046)	−0.016 (−0.651)	−0.031 (−1.281)	−0.003 (−0.112)	0.008 (0.271)	0.017 (0.468)
Kernel	0.001 (0.069)	0.001 (0.064)	0.007 (0.498)	0.007 (0.449)	0.006 (0.311)	0.006 (0.270)
No. $\text{DFDIN}_{it}=1$	1,130	1,130	812	812	478	478
No. $\text{DLOC}_{it}=1$	1,554	1,554	1,872	1,872	2,206	2,206

Panel B

	Electronics firms		Other manufacturers	
Matching technique	Growth t to $t+1$	Growth t to $t+2$	Growth t to $t+1$	Growth t to $t+2$
Nearest Neighbor	−0.017 (−0.567)	−0.052 (−1.454)	−0.016 (−0.812)	0.002 (0.073)
Kernel	−0.003 (−0.135)	−0.003 (−0.135)	−0.008 (−0.652)	−0.008 (−0.708)
No. $\text{DFDIN}_{it}=1$	635	635	495	495
No. $\text{DLOC}_{it}=1$	789	789	765	765

Note: (1) Figures in the parentheses are t value. (2) The propensity score function includes $\ln \text{SALE}_{it}$, $\ln(1+\text{PATENT})_{it}$, EXPR_{it}, and $\ln \text{TFP}_{it}$.

the analysis of subsequent growth rate differentials over the entire period (2000–2005). For all industries combined both in China and elsewhere, the kernel estimates generally suggest that growth rate differentials were relatively high, but the opposite is true when electronics and non-electronics firms are disaggregated. However, both matching techniques suggest that employment growth rate differentials were statistically nonsignificant in all samples. Because the effects of the 2001 policy change may have been greater in 2002–2003 than in other years, calculations similar to those in Panel A were made for three two-year periods: 2000–2001, 2002–2003, and 2004–

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2005; however, all growth rate differentials were statistically nonsignificant in these periods as well.[14]

In short, PSM analyses provide no evidence that new FDI led to significant differences in net employment growth between new MNE parent firms and similar non-MNEs. This result contrasts starkly with public perceptions that outward FDI, and particularly outward FDI in China, is a major cause of job losses in Taiwan. The results are consistent with previous findings for Italy (Mariotti, Mutinelli, and Piscitello, 2003), France (Hijzen, Inui, and Todo, 2007), and Korea (Debaere, Lee, and Lee, 2010), all of which suggested that new FDI in a developing economy (e.g., China) did not result in different employment effects compared with FDI in developed economies. However, for most instances, as shown in Table 4, new FDI firms have lower home-employment growth rate than non-FDI firms except for FDI in developed countries. Although the results are statistically nonsignificant, this result appears consistent with common perceptions. Heckman and Navarro-Lozano (2004) emphasized that PSM estimates can be unreliable in small samples, and the presence of relatively few non-MNEs in our sample may be a reason for the lack of statistically significant results. For a more comprehensive understanding, comparing these results with estimates of marginal employment effects is crucial.

4.2 Estimating the Marginal Effects of FDI on Large-Firm Employment

To compare with studies of MNEs of Japan, Sweden, and the United States (Blomström, Fors, and Lipsey, 1997; Lipsey, 2002; Lipsey, Ramstetter, and Blomström, 2000; Yamashita and Fukao, 2010), Equations (3) and (4) were estimated in samples of MNE parent firms alone.[15] Table 4 presents an alternative set of estimates for all MNEs using both (a) a fixed effects GMM estimator to correct endogeneity bias and (b) a simple panel fixed effects estimator with lagged FDI variables for comparison. Table 5 presents only the GMM results for MNE parent firms in electronics and other manufactur-

[14]Results of these calculations are omitted for brevity but are available from the authors.

[15]In addition, the main results (coefficients on FDI variables) are identical or qualitatively consistent (similar coefficient signs, size, and significance levels) if estimated in samples of all firms, including non-MNEs (data available from the authors).

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Table 5: The Employment Effects of FDI in All MNEs
(dependent variable = $\ln \mathrm{EMP}_{it}$)

	Panel, Fixed Effects, GMM		Panel, Fixed Effects	
	Equation (4)	Equation (5)	Equation (4)	Equation (5)
$\ln \mathrm{WAGE}_{it}$	−0.595***	−0.591***	−0.606***	−0.606***
	(0.019)	(0.019)	(0.019)	(0.019)
$\ln \mathrm{CAP}_{it}$	−0.155***	−0.172***	−0.191***	−0.193***
	(0.036)	(0.035)	(0.033)	(0.033)
DEBTR_{it}	0.026***	0.024***	0.029***	0.028***
	(0.006)	(0.006)	(0.006)	(0.006)
FDI_{it}	0.004***			
	(0.001)			
FDIC_{it}		0.005***		
		(0.001)		
FDIA_{it}		−0.002**		
		(0.001)		
FDI_{it-1}			0.684E-03***	
			(0.168E-03)	
FDIC_{it-1}				0.82E-03***
				(0.17E-03)
FDIA_{it-1}				−0.55E-03
				(0.594E-03)
$\ln(1 + \mathrm{PATENT}_{it})$	0.060***	0.060***	0.063***	0.063***
	(0.007)	(0.007)	(0.007)	(0.007)
EXPR_{it}	0.004***	0.004***	0.005***	0.005***
	(0.001)	(0.001)	(0.491E-03)	(0.491E-03)
SALES_{it}	0.087***	0.085***	0.093***	0.093***
	(0.007)	(0.007)	(0.008)	(0.008)
$\ln \mathrm{TFP}_{it}$	0.092***	0.095***	0.121***	0.121***
	(0.019)	(0.019)	(0.018)	(0.018)
Constant	7.226***	7.281***	7.087***	7.087***
	(0.218)	(0.219)	(0.220)	(0.220)
F (first stage)	73.75***	62.34***		
Hausman test	263.7***	260.5***	297.6***	271.6***
R^2	0.488	0.489	0.489	0.490
Firms	453	453	453	453
Observations	2,684	2,684	2,684	2,684

Note: Notes: (1) Figures in the parentheses are standard errors. *** and ** denote coefficients that are significant at 1% and 5% statistical levels, respectively. (2) We instrument for FDI with $\ln \mathrm{WAGE}_{it}$, $\ln \mathrm{CAP}_{it}$, DEBTR_{it}, $\ln(1 + \mathrm{PATENT}_{it})$, EXPR_{it}, SALES_{it}, $\ln \mathrm{TFP}_{it}$, and $\mathrm{TT1}_{it}$. (3) F (first stage) is the weak instrument F-test. The null hypothesis of weak instruments is rejected when the F value is larger than 10, indicating that the instruments are effective.

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ing separately.[16] For the panel fixed effects GMM estimator, results of an F test developed by Staiger and Stock (1997) indicate a rejection of the null hypothesis of weak instruments and suggest that the instrumental variables used in these estimates are effective.

Similar results were obtained for most control variables, as reported in Tables 5 and 6. Consistent with the theory, employment is negatively and strongly (significant at the 1% level) related to wage levels. Conversely, large firm employment is strongly and positively related to a firm's number of patents, export propensities, and domestic sales, as expected. For estimates of all firms (Table 5), the capital stock is negatively correlated with firm employment, whereas the debt–equity ratio is positively and strongly correlated, suggesting that capital is a substitute for labor in these firms, as theoretically expected. Moreover, similar results were obtained when estimating for other manufacturers (non-electronics firms), but the capital variables did not correlate strongly (nonsignificant) in estimates of electronics firms (Table 6).

After accounting for the effects of these control variables, do firms with relatively larger stocks of cumulative outward FDI employ more or fewer workers? Results for all firm parents (Table 5, Equation [4)] suggest that the mean, marginal effect of cumulative FDI relative to the common stock issued by a firm on parent employment is positive and highly statistically significant. The panel fixed GMM estimates of this equation indicate that a 1 pp increase in the ratio of cumulative FDI to common stock results in a 0.004% increase in parent employment. Thus, the employment-enhancing effect of outward FDI is not substantial but is clearly positive, suggesting that the positive effects of reallocating MNE resources internationally outweigh the negative effects resulting from shutting down specific production lines. This result is broadly consistent with the industry-level study of Chen and Ku (2005) and with previous studies for Sweden and Japan (Section 2).

Estimates of Equation (4) in Table 5 indicate that the positive effect on parent employment is due to the FDI in China and not in developed economies. The positive effect of FDI in China is highly statistically significant regardless of the estimation method. Conversely, the effect of FDI in developed economies is negative and significant at standard (5%) levels when the GMM estimator is used; however, it is nonsignificant when using the panel fixed effects estimator. This result suggests a pattern that contrasts

[16]Panel fixed effects estimates for MNE parents in each industry group (available with the authors) suggest that results are generally robust to estimation techniques.

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Table 6: The Employment Effects of FDI for Electronics MNEs and Other MNEs

(dependent variable = $\ln \mathrm{EMP}_{it}$, Panel, Fixed Effects, GMM Estimation)

	Electronics firms Panel, Fixed Effects, GMM		Non-electronics firms Panel, Fixed Effects, GMM	
	Equation (4)	Equation (5)	Equation (4)	Equation (5)
$\ln \mathrm{WAGE}_{it}$	−0.632***	−0.625***	−0.416***	−0.420***
	(0.027)	(0.027)	(0.024)	(0.023)
$\ln \mathrm{CAP}_{it}$	−0.034	−0.069	−0.546***	−0.537***
	(0.045)	(0.045)	(0.050)	(0.049)
DEBTR_{it}	0.021***	0.015*	0.031***	0.030***
	(0.008)	(0.008)	(0.010)	(0.010)
FDI_{it}	0.009***		−0.005***	
	(0.001)		(0.001)	
FDIC_{it}		0.010***		−0.005***
		(0.002)		(0.001)
FDIA_{it}		−0.002***		−0.002
		(0.001)		(0.001)
$\ln(1 + \mathrm{PATENT}_{it})$	0.057***	0.056***	0.036***	0.034***
	(0.009)	(0.009)	(0.011)	(0.011)
EXPR_{it}	0.003***	0.003***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
SALES_{it}	0.077***	0.072***	0.118***	0.112***
	(0.009)	(0.009)	(0.017)	(0.018)
$\ln \mathrm{TFP}_{it}$	0.118***	0.133***	0.032	0.040
	(0.029)	(0.028)	(0.025)	(0.026)
Constant	6.706***	6.750***	8.142***	8.148***
	(0.306)	(0.306)	(0.277)	(0.277)
Hausman test	114.7***	108.4***	387.4***	177.1***
R^2	0.514	0.515	0.528	0.529
F (first stage)	33.01***	28.69***	67.03***	52.55***
Firms	242	242	211	211
Observations	1,424	1,424	1,260	1,260

Note: (1) Figures in the parentheses are standard errors. *** and ** denote coefficients that are significant at 1% and 5% statistical levels, respectively. (2) We instrument for FDI with $\ln \mathrm{WAGE}_{it}$, $\ln \mathrm{CAP}_{it}$, DEBTR_{it}, $\ln(1 + \mathrm{PATENT}_{it})$, EXPR_{it}, SALES_{it}, $\ln \mathrm{TFP}_{it}$, and $\mathrm{TT1}_{it}$. (3) F (first stage) is the weak instrument F-test. The null hypothesis of weak instruments is rejected when the F value is larger than 10, indicating that the instruments are effective; (4) Panel, fixed investments with lagged FDI variables are available from the authors for comparison.

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with common perceptions and previous results for the United States, several European economies, and Korea, which suggest negative employment effects of FDI in developing economies but not in developed economies.

Previous industry-level results (Chen and Ku, 2005) suggested that the employment effects of outward FDI vary across industries. We explore this possibility for subsamples of electronics and non-electronics firms (GMM estimates only; Table 6). Results for electronics firms are similar to those for all combined firms. The employment effect of electronics FDI in all regions combined is positive, highly significant, and approximately 2.5 times that in combined samples of electronics and non-electronics firms (Table 5). Because FDI in China was distinguished from FDI in developed economies, this finding applies only to FDI in China. FDI in developed economies is negatively and significantly related to employment in electronics parent firms. By contrast, results for non-electronics firms suggest negative effects for FDI in all regions combined and for FDI in China, but nonsignificant effects for FDI in developed economies. These results thus suggest that the positive marginal effects of FDI on parent employment observed in Table 5 were concentrated in electronics firms investing in China. Conversely, for electronics firms with FDI in developed economies and non-electronics firms investing in China, FDI was negatively related to parent employment, whereas FDI was unrelated to parent employment for other manufacturers investing in developed economies.

These results again contrast with public perceptions and previous evidence, particularly in the suggestion that FDI in Chinese electronics, usually considered to involve vertically integrated production, has net positive effects on parent employment in Taiwan. As emphasized in Sections 1 and 2, the distinction between VFDI and HFDI is often statistically ambiguous; a potential explanation for these results is that a substantial portion of the electronics FDI in China was more horizontal than vertical. Many of Taiwan's major electronics producers, such as Acer, Asus, and BenQ, have developed crucial and rapidly growing final goods markets in China. In addition, China is a crucial market for intermediate goods and intangible services, such as the benefits of R&D, produced by these parent firms. Thus, even VFDI by electronics firms in China facilitates increased parent growth at home by allowing more efficient resource reallocation. Similarly, although most electronics FDI in developed economies is considered horizontal, it may actually be more vertical, serving as a means of accessing leading technologies and substitutes for domestic R&D and thus parent employment.

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As displayed in the right panel of Table 6, a negative employment effect of FDI for non-electronics parent firms exists because variable FDI is associated with a significantly negative coefficient. Differentiating outward FDI in China and developed countries, the right column of Table 6 reveals that FDI in China continues to be associated with a negative employment effect, whereas the corresponding effect is nonsignificant for FDI in developed countries. The employment effect of investment in developed countries for non-electronics firms is more difficult to clarify because these firms are generally more heterogeneous. However, many firms in this group focus on acquiring advanced technologies and distribution networks in developed countries, and these activities may substitute for related parent firm activities more than usually recognized. Unfortunately, small sample sizes prevent meaningful disaggregation of this group of heterogeneous firms, which might have clarified this discussion.

The constricting employment effect of FDI for electronics and non-electronics firms can be explained in part from the aspects of rising versus declining trends. While the sample has both poor years 2000–2002 and favorable years (others) included, the 2000–2005 period was a worldwide booming period for electronic products, as revealed by the rising volume of trade in the world. Alternatively, most non-electronics firms are conventional and/or sunset industries in Taiwan.[17] The market size (ln SALE) and export ratio (EXPR) variables may have tackled part of the booming effect; the various employment effects of outward FDI across industries indicated by Chen and Ku (2005) are probably relevant to the life cycle of an industry, explaining why the electronics industry, in stark contrast with other manufacturers, is associated with a positive employment effect of FDI.

5 Conclusion

Although the effects of outward FDI on parent employment have attracted much attention in Europe, Japan, and the United States, these effects have only recently become a major concern in newly developed economies, such as Korea and Taiwan. This issue is particularly critical in Taiwan, which has witnessed concurrent increases in the unemployment rate and considerable,

[17] During the 2000–2005 period, electronics firms experienced a positive employment growth rate every year, with an average rate of 6.34%. By contrast, non-electronics firms showed a negative trend each year, with an average of −2.31%.

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politically sensitive FDI outflows to China over the past decade. Consequently, there is wide concern that these FDI outflows are a major cause of job loss in Taiwan. To evaluate these concerns, this study used data of 621 large firms listed on the TSE to explore the effects of outward FDI on parent employment during 2000–2005, by distinguishing FDI in China and developed economies as well as in electronics and other industries, and measured both the discrete effects of new FDI and marginal effects of larger overseas activity on parent employment.

To measure discrete effects of new FDI, the employment growth in similar groups of new MNEs and purely domestic firms in the years after initial FDI were compared using PSM. No statistically significant differences were observed in subsequent employment growth between the two groups of firms. Fixed effects GMM estimation suggested that the marginal effects of FDI on parent employment were positive and statistically significant but small when all destinations and industries were combined. When destinations and parent industries were distinguished, the positive effects were concentrated in electronics parent firms investing in China. Conversely, parent employment was negatively and significantly correlated with FDI by other manufacturers in China and FDI by electronics parent firms in other regions; however, no significant relationship was observed between non-electronics parent employment and FDI in other regions.

Both sets of results concurrently suggest that considerable increases in FDI during this period have not caused net reductions in aggregate parent employment. This result is crucial, partially because it contrasts the public perception that FDI has contributed to Taiwan's increased unemployment in recent years. In addition, the result that positive effects of FDI were concentrated in electronics parent firms with FDI in China is interesting. The relaxation of restrictions on FDI in China for electronics and other high-tech firms in late-2001 encouraged several electronics parent firms to move several production lines to China, which probably reduced parent employment of relatively unskilled labor with low productivity (e.g., assembly workers). However, electronics parent firms with relatively large operations in China were apparently able to increase employment in other areas, and overall parent employment was positively correlated to the extent of FDI in China. In other words, this evidence is consistent with the view that FDI contributed to an upgrading process in electronics parent firms, which probably involved increased concentration on high-tech manufacturing at home as well as the production of R&D services, capital equipment, and intermediate goods for

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affiliates in China, which focused on labor-intensive assembly.

Another possible reason explaining the concentration of positive employment effect in electronics parent firms with FDI in China is that the study period of 2000–2005 was likely to be have been a worldwide booming period for electronic products, meaning that the electronics sector is not only a rising sector in Taiwan but also globally. In this regard, we see a concordance of expansion in both FDI and parent firm employment only in the electronics sector. Therefore, this concern should be further investigated by collecting updated information regarding high-tech firms and their FDI.

Appendix: Table The Hausman Test for Investment Destination and Employment

	Equation (3)			Equation (4)		
	All MNEs	Electronics	Others	All MNEs	Electronics	Others
ln $WAGE_{it}$	−0.595***	−0.632***	−0.416***	−0.591***	−0.625***	−0.420***
	(0.019)	(0.027)	(0.024)	(0.019)	(0.027)	(0.023)
ln CAP_{it}	−0.155***	−0.034	−0.546***	−0.172***	−0.069	−0.537***
	(0.036)	(0.047)	(0.050)	(0.035)	(0.045)	(0.049)
$DEBTR_{it}$	0.026***	0.021***	0.031***	0.024***	0.015*	0.030***
	(0.006)	(0.008)	(0.010)	(0.006)	(0.008)	(0.010)
FDI_{it}	0.004***	0.009***	−0.005***			
	(0.001)	(0.001)	(0.001)			
$FDIC_{it}$				0.005***	0.010***	−0.005***
				(0.001)	(0.002)	(0.001)
$FDIA_{it}$				−0.002**	−0.002***	−0.002
				(0.001)	(0.001)	(0.001)
ln $(1 + PATENT_{it})$	0.060***	0.057***	0.036***	0.060***	0.056***	0.034***
	(0.007)	(0.009)	(0.011)	(0.007)	(0.009)	(0.011)
$EXPR_{it}$	0.004***	0.003***	0.004***	0.004***	0.003***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$SALES_{it}$	0.087***	0.077***	0.118***	0.085***	0.072***	0.112***
	(0.007)	(0.009)	(0.017)	(0.007)	(0.009)	(0.018)
ln TFP_{it}	0.092***	0.118***	0.032	0.095***	0.133***	0.040
	(0.019)	(0.029)	(0.025)	(0.019)	(0.028)	(0.026)
RES	−0.004***	−0.008***	0.005***	−0.004***	−0.009***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Constant	7.226***	6.706***	8.142***	7.281***	6.750***	8.148
	(0.218)	(0.306)	(0.277)	(0.219)	(0.306)	(0.277)

Note: (1) Figures in the parentheses are standard errors. (2) *** and ** denote coefficients that are significant at 1% and 5% statistical levels, respectively. (3) The coefficient on the residual (RES) is statistically different from zero, reject the null of exogeneity.

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海外生產活動對國內就業的影響: 台灣的實證研究

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本文探討海外直接投資對母國廠商就業的影響。利用台灣上市製造業公司2000–2005的資料, 傾向評分配對的估計結果顯示, 新進行海外投資與未進行海外投資廠商的員工數成長率並無顯著差異。以一般動差法對所有廠商進行估計則發現, 直接海外投資對就業的邊際效果爲正向顯著; 但對於非電子業廠商, 特別是投資中國的廠商, 母廠員工數受到負向顯著的影響。

關鍵詞: 對外直接投資, 就業, 傾向配對法
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