

# Firm and Labor Adjustment to FDI Liberalization

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## Abstract

This paper studies how allowing domestic firms to invest overseas affects both their investment activities across space and their domestic employees' labor market outcomes. Most related empirical research faces identification challenges due to the endogeneity of investment decisions. Focusing on a policy change from the Taiwanese government in 2001 that permits production in China for 122 consumer electronic products, we estimate its causal effect on Taiwanese electronic manufacturers and their native workers. We found that the targeted manufacturers are on average 15% more likely to invest in China relative to the non-targeted ones. Correspondingly, the domestic workers initially employed by the targeted manufacturers are on average more likely to lose their jobs, stay fewer years employed, and have lower cumulative wages in subsequent years relative to those initially employed by the non-targeted manufacturers. The worker-level effects exhibit substantial heterogeneity across the initial wage distribution, with the top-decile workers winning and the rest losing.

**Keywords:** Production, Employment, International Investment

**JEL Codes:** E23, E24, F21

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# 1 Introduction

This paper studies how liberalizing outward foreign direct investments (FDI) affects the investment decisions of manufacturers and the labor market outcomes of their domestic employees. Stylized models in international trade and multinational firms predict that when firms are allowed to invest abroad, it is the most productive ones who will exploit the opportunity and go first (Antràs and Yeaple, 2014). This creates an advantage for the productive firms over the others as they now can access cheaper labor sources and the foreign markets more easily. If we also take into account the possibility of using foreign countries as export platforms to ship products to the world market (Tintelnot, 2017), the advantage becomes even greater. As a result, firms who are targeted by a FDI liberalization policy should perform better and enjoy higher profits afterward. However, the prediction regarding outcomes of the domestic workers employed by those FDI firms is unclear. On the one hand, the domestic workers could benefit and have higher wages due to higher profits of their employers; on the other hand, they could suffer and lose their jobs due to production process shifting abroad. This motivates our empirical investigation to understand and quantify the effect of such a FDI liberalization episode on domestic firms and their workers.

To study the effect of outward FDI on the labor market outcomes in the home country, we need a dataset that tracks production activities for both the parent firms in the home country and their affiliates in the host country. The convention in the offshoring literature (Hummels et al., 2014, 2018) is to use intermediate imports as a standard measure of firm reliance on foreign inputs; however, this approach misses a large chunk of outward FDI activities by foreign affiliates that either serve the foreign market in the host country (horizontal FDI) or the world market (platform FDI, as in Tintelnot, 2017). These activities cannot be captured by import data but can still have an impact on workers in the home country.

We utilize novel data sources to study a liberalization policy that changes the incentive for a subset of domestic firms to conduct outward FDI. Our context is Taiwan from the late 1990s to early 2000s, where outward FDI gradually increase over this period, with a major proportion targeting China. We successfully assemble a matched firm-level dataset over

1998-2007 that covers all Taiwanese listed firms in the electronic manufacturing industry by matching Taiwanese firms from the Taiwan Economic Journal (TEJ) and the Chinese Annual Survey of Industrial Firms (ASIM). The resulting dataset contains balanced-sheet information for both the Taiwanese parent firms and their Chinese affiliates, allowing us to examine the extent of outward FDI activities in the electronic manufacturing sector, a major component of Taiwanese FDI in China. Furthermore, we bring in administrative matched employer-employee data from the Taiwan Fiscal Information Agency (FIA) to identify the domestic workers that are hired by the parent firms in our firm-level data over the sample period. With these data sources, we have a complete picture of the multinational production activities and associated labor market outcomes for the electronic manufacturing sector in Taiwan.

The liberalization policy of focus is a policy change from the Taiwanese government in 2001 that permitted 122 electronic products to be produced in China. We argue that the timing and content of this policy are exogenous from the perspective of Taiwanese firms, and it increases the incentives for the electronic manufacturers to conduct FDI in China. Specifically, we employ a matched difference-in-differences strategy: we first define the “treatment firms” as the electronic manufacturers who have produced products related to the 122 products over 1998-2000, then match these firms one-to-one with the other electronic manufacturers who have never produced related products before 2001 but nonetheless exhibit similar characteristics in 1998 (the “control firms”), and compare their outcomes before and after the policy change. The underlying assumption of this strategy is that the treatment firms would follow the same investment trend as the control firms in the absence of the policy change. We find that the treatment firms are more likely to increase their investments in China at both the extensive and intensive margins after the policy change relative to the control firms.

With the firm-level results, we then move on to the individual analysis and study how home country workers initially hired by the treatment and control firms differ by their labor market outcomes in subsequent years. The average effect on wages for the “treated” workers (those who worked for the treatment firms in 2001) is large and negative in magnitude

but not statistically significant. Nonetheless, there is supporting evidence that this negative wage effect is inflicted on the “treated” workers around the median of the initial wage distribution (25th-75th percentiles in 2001). These treated workers also experience less years employed and higher job transition rates from 2001 onward. Overall, the individual-level results indicate an imprecise negative wage effect of the liberalization policy on average, but the distribution implication is clear: the effect of FDI liberalization on labor market outcomes is positive mainly for the workers in the top decile of initial wages who plausibly have higher education and skilled levels but is negative for the other workers.

It is now well-recognized that trade liberalization can have sizable and persistent effects on labor markets. Consistent results across developing and developed countries have shown that regions (Topalova, 2010; Autor et al., 2013; Kovak, 2013; Dix-Carneiro and Kovak, 2017) and individuals (Autor et al., 2014; Dix-Carneiro, 2014; Dix-Carneiro and Kovak, 2019) that are initially more exposed to trade liberalization episodes experience relative declining employment and lower wages in subsequent years. Most of these liberalization episodes are either due to productivity growth from foreign exporters, as the so-called “China shock” in the context of the United States, or policies that reduce import tariffs across sectors, as in the context of India and Brazil. Despite these extensive studies, another common episode of trade liberalization - the liberalization of outward FDI - is less covered in the literature. Given the major role of multinational firms in international trade,<sup>1</sup> trade policies that remove outward investment barriers can affect multinational firms’ investment responses and have a crucial impact on the local labor market in the home country. This paper fills this gap by studying one such FDI liberalization policy and estimating its causal effect on targeted firms’ investment and production activities at home and abroad as well as the effect on labor market outcomes of the affiliated workers in the home country.

The rest of the paper is organized as follows. Section 2 introduces the background of Taiwanese outward FDI since the 1990s as well as our firm- and worker-level datasets. Then we talk about our empirical strategy in Section 3 and present the empirical results for the

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<sup>1</sup>For example, trade statistics from the US Census Bureau reveal that about 90% of US export and import activities are through multinational firms (Bernard et al., 2005; Antràs and Yeaple, 2014; Antras, 2015).

firms and workers in Section 4 and Section 5 respectively. Lastly, we conclude in Section 6.

## 2 Background and Data

### 2.1 Background of FDI Liberalization in Taiwan

In this section, we discuss the factors behind the pivotal change in official guidelines on Taiwanese firms investing in China. We present the background of the 2001 liberalization policy that marked the end of Taiwanese government’s restrictive attitude toward FDI in China. Finally, we provide two reasons to support the exogeneity of our policy of interest.

Due to political tensions and national security concerns, the Taiwanese government was initially skeptical about investment opportunities following the Chinese economic reform in the 1980s. Under strict regulations, it was not until the 1990s that Taiwanese FDI in China really took off. In 1996, Taiwanese President Lee Teng-Hui announced a series of regulations termed ”no haste, be patient”, which prohibited a total of 316 products from investing in China, imposed an investment cap of \$50 million USD for any single investment project in China, and required the total investment amount per firm to be lower than 40 percent of its net worth.

In 2000, Chen Shui-Bian, the leader of the long-time opposition Democratic Progressive Party (DPP), won the presidential election by a small margin. The DPP had been known for its tougher stance toward China. Under the worldwide economic downturn and intensified cross-strait tensions, the new president was faced with an urgent need to calm skeptics from the business and political groups. Lacking a clear mandate and confronted by an opposition-controlled legislature, Chen Shui-Bian greatly moderated DPP’s stance on Taiwan independence and took economic liberalization as a friendly gesture to Beijing. Also, Taiwan and China were both about to join the WTO at that time. Under the trend of trade liberalization, critics doubt the competitiveness of Taiwanese firms against other foreign companies that took advantage of global supply chain management. If Taiwanese firms were

prohibited from offshoring to China, the heavy labor cost will harm the competitiveness of Taiwanese firms.

On account of those concerns, Chen adopted a series of trade policies termed “active opening, effective management”. Particularly, the 50 million USD investment cap was alleviated, and a list of 122 high-tech products, including laptops, mobile phones, digital optical drives, computer hardware and software, communication products, and consumer electronics, were allowed to be produced in China starting from 2001<sup>2</sup> In Figure 1, we can see that the outward FDI amount into China substantially increased after 2001, with a major proportion from the electronic manufacturing industry.

FDI Liberalization in Taiwan was driven by a series of political shocks. In particular, this paper focuses on the 2001 policy change for two reasons. First, it only allowed a fraction of high-tech products to be produced in China, granting us a natural control group. Second, it was adopted soon after the DPP’s (who is more skeptical toward China) unexpected win in the presidential election. Based on these two reasons, we believe that the policy is plausibly exogenous from the view of the electronic manufacturers in Taiwan.

## 2.2 Firm-level Dataset

To investigate the effect of the 2001 liberalization policy on firm investment decisions across Taiwan and China, we need a firm-level dataset that collects the production activities of Taiwanese manufacturers in those two places over this period. Focusing on Taiwanese electronic manufacturers, we record their production activities over 1998-2007 utilizing two main sources. On the one hand, their production activities in Taiwan are obtained from the Taiwan Economic Journal (TEJ) dataset, which contains detailed firm information for all publicly listed companies in Taiwan; on the other hand, their production activities in China are provided by the Chinese Annual Survey of Industrial Manufacturers (ASIM), which surveys state and non-state firms above 5 million RMB in annual sales (Brandt et al., 2014).

The summary of the full firm sample before the policy change in 2001 is provided in

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<sup>2</sup>The complete list of products is provided in Appendix A.

column 2 of Table 1. Overall, we have 533 Taiwanese electronic manufacturers in total. On average, each firm has 1.25 affiliates in China, hires 473 workers in Taiwan and 851 workers in China, pays annually 5.2K USD per worker in Taiwan and 1.4K USD per worker in China, and records annual sales of 54K USD in Taiwan and 49K USD in China.<sup>3</sup>

## 2.3 Worker-level Dataset

The Fiscal Information Agency (FIA) under the Ministry of Finance in Taiwan provides yearly assembled taxation data starting from 2001. Our main data source for the worker-level analysis is the FIA data for Individual Income Tax filing (equivalent to the IRS data in the US). We track the source of all taxable income of individuals in Taiwan and construct a matched employer-employee dataset. With the unique firm identifier, information from the firm-level dataset can be combined with the employer-employee dataset. Since income types are provided by the matched employer-employee dataset, we can restrict our focus on wage incomes and will not mistake employees for shareholders. We also drop self-employed observations. We focus on native workers since foreign workers are subjected to different labor market regulations in Taiwan.

The advantage of the FIA data is that we can combine datasets for different tax categories and demographic data from other administrative databases in Taiwan with the de-identified individual ID number. By accessing the household registration database, basic demographic information of workers is also available, e.g. age, gender, residence (county level), and marriage status of each worker.

The limitation of our data source is that it does not record information unrelated to tax collection. For example, there is no data for the total working years and education level of workers. In addition, for each individual, we have no information about the working status prior to 2001. We also acknowledge the fact that we cannot accurately determine the skill level of workers. We group the workers with the initial wage rank in 2001 instead.

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<sup>3</sup>If a firm has more than one Chinese affiliate, we sum up their statistics to the firm level.

### 3 Empirical Strategy

As introduced in Section 2, the policy in 2001 opened up the possibility for Taiwanese electronic manufacturers to conduct FDI in China. Our goal is to exploit this liberalization policy that is exogenous from the firms’ perspective and study its effect on the firms and their domestic workers. To achieve this goal, we employ a matched difference-in-differences approach for the firm-level analysis and a cross-section regression approach for the worker-level analysis. In the rest of the section, we explain the empirical approach in details and then present the summary statistics of the firm and worker samples respectively.

#### 3.1 Research Design for the Firm-level Analysis

For the firm-level analysis, the main outcomes of interests include measures of outward FDI activities at both the extensive and intensive margins. The extensive margin outcomes include indicators of exiting the market, investing in China, and investing in the same three-digit industry in China. Making a distinction between the last two investment outcomes is to specify whether the outward FDI into China are directly related to the Taiwanese electronic manufacturers’ core production activities and not for other purposes, e.g. marketing. The intensive margin outcomes include variables that cover the extent of production activities for the parent firms in Taiwan and the affiliate firms in China, including number of workers, wage bills per worker, total sales, and export sales for both the parents and affiliates respectively.

To study the causal effect of the liberalization policy in 2001, we employ a difference-in-differences design. In particular, we define the Taiwanese electronic manufacturers who had been producing products related to the 122 permitted product categories before the policy change to be the “treatment firms” and the other electronic manufacturers who had never done so to be the “control firms”. The identification assumption is the standard parallel trend assumption, i.e. the treatment firms would follow the same time trend as the control firms in the absence of the policy. We later conduct a sensitivity analysis relaxing this assumption and allowing for linear and non-linear time trend ([Rambachan and Roth, 2022](#)).



The classification procedure for the electronic manufacturers are conducted by utilizing the product-level sales in the TEJ dataset and manually checking whether each firm had produced any product that has the same keywords as the 122 electronic products in Appendix A. We end up obtaining 190 treatment firms and 343 control firms, with main outcomes over year 1998-2000 summarized in Table 1. Treatment firms are significantly more engaged in FDI activities in China and have higher total and export sales than the control firms before the policy change. The ex-ante difference in firm characteristics poses a threat to the control firms as a proper control group and hence motivates our matching approach to obtain a sample that is balanced in observables across the treatment and control firms. In addition to the binary treatment measure, we also define a continuous treatment measure as the share of related-product sales for each firm.

## 3.2 Matching Procedure and Summary of the Firm Sample

To ensure that the control firms serve as a suitable counterfactual group for the treatment firms in the absence of the policy, we conduct a one-to-one matching procedure that provides balance along observable characteristics. Specifically, we match on parent firm characteristics over year 1998-2000, including number of workers, average wage bills, total sales, and export sales. We avoid matching on investment outcomes in China intentionally as they are the main outcomes of interests. The propensity scores, i.e. predicted probabilities of being in the treatment group, are illustrated in Figure 2, where all control firms are on the common support.

The resulting sample statistics over year 1998-2000 are provided in Table 2, where the one-to-one matched sample consists of 174 treatment and control firms each, and the outcomes are now balanced across two groups. The share of treatment and control firms doing outward FDI into China is plotted in Figure 3 and Figure 4. A common rising trend of outward FDI into China is featured for both groups, but it is particularly higher for the treatment firms to conduct FDI in the same 3-digit industry in China after the policy change in 2001. Our matching procedure seems to achieve a well-balanced sample and therefore ensure that the

parallel trend assumption is plausible under this setup. As a robustness check, we also conduct a sensitivity analysis in the later section allowing for linear and non-linear time trend using the HonestDID package developed by [Rambachan and Roth \(2022\)](#).

### 3.3 Research Design for the Worker-level Analysis

For the worker-level analysis, our outcomes of interests are individual outcomes that evaluate their job security and earnings in the labor market, including whether a worker is employed, whether a worker switches their job, and their wage normalized by a base year.

To understand how the FDI liberalization policy affects the local workers in Taiwan, an intuitive approach is to follow the same strategy as the firm-level analysis and conduct difference-in-differences for the worker sample. Unfortunately, the FIA matched employer-employee dataset only starts from 2001 (i.e. the year when the policy change happened), so it is not feasible to do so. Instead, we follow a similar approach to [Autor et al. \(2014\)](#) by studying workers' cumulative outcomes by their treatment status from 2001 onward. Specifically, the Taiwanese workers employed by the treatment firms in 2001 are defined as the “treated workers”, and the others employed by the control firms in 2001 are defined as the “untreated workers”. We then compare the cumulative labor market outcomes over 2001-2007 between the two groups conditioning on individual demographic variables. The identification assumption requires that conditional on these individual characteristics, working for a treatment or control firm at the start of the policy is “as if” random. Given this assumption, the difference between their subsequent labor market outcomes will be a plausible estimate of the treatment effect of the policy. To investigate the heterogeneous treatment effect by initial wage levels, six wage groups are defined based on wage percentiles of the workers in 2001 and summarized in Table 3.

### 3.4 Summary of the Worker Sample

The main variables of the worker sample are summarized in Table 4. Out of the 348 electronic manufacturers in the one-to-one matched firm sample, we are able to identify 344 of them in the FIA dataset (175 treatment firms and 169 control firms) and collect 180,132 workers who worked in those firms in 2001 and were within age range 22-65 over 2001-2007. The number of total employers hiring those workers in 2007 becomes a staggering 18,886 in total, indicating a large transition out of the original firms in subsequent years. In fact, 60% of the workers left their original firms by 2007, and the numbers for the treated and untreated workers are 70% and 50% respectively. The mean yearly wage of the treated workers is similar to that of the untreated workers at around 20K USD in 2001, but then it becomes significantly lower by 1,560 USD in 2007.

## 4 Firm-level Response to the Liberalization Policy

With the firm sample obtained via the matching procedure outlined in Section 3.2, we first study how Taiwanese electronic manufacturers respond to the liberalization policy in 2001. In the following, we first lay out the empirical specifications, then present results for extensive and intensive outcomes.

### 4.1 Empirical Specification

To estimate the effect of the liberalization policy on firm investment behavior, we compare firms who had produced related products before the policy change (i.e. the “treatment firms”) versus those who had not (i.e. the “control firms”). This motivates the difference-

in-differences specifications for the firm sample as follows:

$$Y_{jkt} = \alpha_0 + \alpha_1 Post_t \times Treatment_j + Year_t + Firm_j + \epsilon_{jkt} \quad (1)$$

$$Y_{jkt} = \alpha_0 + \sum_{t'=1998}^{2007} \alpha_{t'} Year_{t'} \times Treatment_j + Year_t + Firm_j + \epsilon_{jkt} \quad (2)$$

where the outcome variable is indexed by firm  $j$ , industry  $k$ , and time  $t$ . *Post* is an indicator of the years after 2001 (including 2001). *Treatment* equals one for the treatment firms and zero for the control firms. *Year* and *Firm* are the year and firm fixed effects. Error terms  $\epsilon$  are clustered at the three-digit industry level of the parent firms.

## 4.2 Extensive Margin Outcomes

We first look at the extensive margin outcomes, including whether firms exiting the market, conducting FDI in China, and conducting FDI in the same 3-digit industry in China. The corresponding DID estimates for Eq (1) are presented in Table 5. The treatment firms do not seem to be different in terms of the exit margin relative to the control firms. However, we do see that the treatment firms are on average 7.8% more likely to invest in China. In particular, the treatment firms are on average 15.2% more likely to invest in the *same* three-digit industry; this magnitude is more than six times as big as the mean for the control firms before 2001. This result is consistent with the argument that the liberalization policy allows the firms who had produced related products to start investing in China and producing those related products after the policy change. The event study graphs following Eq (2) in Figure 5 also convey a similar message, where higher propensities to invest in China and particularly in the same industry after 2001 are observed for the treatment firms.

We also run the same specifications using a continuous treatment measure (defined as the share of sales that is related to the 122 products before 2001) and present the DID estimates in column (2), (4), and (6) of Table 5. Again the estimate for the exit margin is not statistically different from zero, but the two investment outcomes are significant: on average, raising the share of policy-related sales before the policy change by one standard

deviation (0.373) would lead to an increase of investing into China by 4.5% and investing in the same three-digit industry by 7.2%. The estimates using the continuous measure are consistent with the previous estimates using the discrete treatment measure.

### 4.3 Intensive Margin Outcomes

To understand how firms respond to the policy at the intensive margin, we restrict our sample to the firms that have investments in China over the whole sample period (1998-2007) and study their outcomes including number of workers, wage bills per worker, total sales, and export sales for both the parent firms in Taiwan and the affiliate firms in China. The DID estimates for all outcomes in log terms are presented in Table 6. With the binary treatment measure, the DID estimates for the parent firms are not statistically significant, but they suggest that the treatment firms in Taiwan decrease their hiring and wage bills per worker by 8% and 22% relative to the control firms; on the contrary, the affiliates of the treatment firms in China hire 31% more workers (statistically significant at 90% level) and also raise the wage bills by 6% (statistically insignificant) relative to the control firms. For the production outcomes, the treatment firms seem to have a positive increase in sales for both the parent and affiliate branches; in particular, export sales of the affiliates increase by 56% (statistically significant at 99% level), echoing the export-oriented feature of the new outward FDI induced by the policy.

We also use the share of related product sales over 1998-2000 as a continuous treatment measure and report their DID estimates in Table 6. The standard deviation of the continuous treatment is about 0.4, so the DID estimates for the parent outcomes indicate that a standard deviation increase in the share of related product sales for the electronic manufacturers would result in a 20% decrease in their number of workers hired in Taiwan and a 23% decrease in their wage bills paid per worker (statistically significant at 99% level). On the other hand, the estimates for the affiliate outcomes suggest that a standard deviation increase in the share of related product sales would lead to increases in number of workers hired and total sales in China both by around 22%. Overall, the results are consistent with the binary

treatment measure and indicate a strong resource reallocation effect of the FDI liberalization policy. Lastly, the event study results are also consistent with the DID estimates, as shown in Figure 6 and Figure 7.

## 5 Worker-level Response to the Liberalization Policy

### 5.1 Empirical Specification

After examining the firm-level response in Section 4, we now move on to the worker sample to study the implication for the workers who originally worked for the electronic manufacturers. As discussed in Section 3, our worker sample only starts from year 2001, so the empirical strategy is to compare the cumulative outcomes over 2001-2007 for the treated and untreated workers conditional on their demographic characteristics. This implies the following regression specifications:

$$Y_{ijk} = \alpha Treated_{ij} + Industry_k + X_{ijk} + \zeta_{ijk} \quad (3)$$

$$Y_{ijk} = \alpha Treated_j + \beta Treated_j \times G_{i2001} + \gamma G_{i2001} + Industry_k + X_{ijk} + \zeta_{ijk} \quad (4)$$

where  $Y$  are the cumulative outcomes over 2001-2007 for worker  $i$  who originally worked in firm  $j$  of industry  $k$  in 2001,  $Treated$  indicates whether a worker worked in a treatment firm in 2001,  $Industry$  is the four-digit industry fixed effect, and  $X$  is a set of individual demographic characteristics, including their age, age-squared, gender, and marriage status in 2001. To investigate the heterogeneous treatment effects by initial wage levels, we also run a specification in Equation 4 that interacts  $Treated$  with the wage group indicator  $G_{i2001}$  based on worker  $i$ 's wage percentile in 2001.<sup>4</sup>

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<sup>4</sup>We define six wage groups (below 10th, 10th-25th, 25th-50th, 50th-75th, 75th-90th, over 90th) and use the top-decile group as the reference group in the regressions.

## 5.2 Worker Cumulative Outcomes

The regression estimates of the policy effect on the worker cumulative outcomes are presented in Table 11. The cumulative outcomes we are considering include number of job transitions, total years employed, and cumulative wages (normalized by workers' own wages in 2001), over 2001-2007.

The estimated effect on cumulative wages is negative but not statistically significant; however, the magnitude suggests that the treated workers on average accumulate less wages over 2001-2007 relative to the untreated workers. The estimate on years of employment is small and insignificant, but it is large and significant for the number of job transitions over 2001-2007. Specifically, the treated workers experience 16.8% more job transitions relative to the untreated workers conditional on their industries and individual characteristics.

When decomposing the treatment effect by wage groups, we see that the negative wage effect is concentrated among workers in the 25th-75th percentiles; on the contrary, the treated workers initially ranked in the top decile actually experience a positive wage increase relative to the untreated workers. This substantial heterogeneity across wage groups is also observed for the other two outcomes: the treated workers in the 25th-75th percentiles have less years being employed and experience more job transitions relative to the untreated workers, while those in the top decile stay employed for more years and face less job transitions.

Overall, our results are consistent with the story that FDI liberalization would trigger manufacturing firms to move their production to low-cost countries and reduce their employment in the home country, in particular lower-skilled and less-educated workers. Our firm-level analysis also indicates that the liberalization of FDI in China resulted in substantial downsizing for the parent firms. The workers in the top wage decile who are mostly in charge of management and R&D activities would benefit, because their employers now enjoy higher profits from cost reductions and increasing sales and have larger demand for headquarter services in the home country.

## 6 Conclusion

FDI liberalization is a common episode of trade liberalization yet much less studied comparing to other episodes such as import competitions. The theoretical prediction for the causal effect of such liberalization policies on worker outcomes is unclear due to competing forces of firm growth and worker replacement. Taking advantage of novel data sources that cover Taiwanese electronic manufacturers and their affiliates in China as well as their workers in Taiwan, we study a policy change in 2001 that provides a subset of Taiwanese electronic manufacturers extra incentives to conduct FDI in China.

The DID estimates at the firm level confirm a large treatment effect for the treatment firms which reallocate their production resources to China both at the extensive and intensive margins. Furthermore, the worker-level analysis indicates an income redistribution effect, where the workers originally in the top wage decile of the treatment firms benefit and the other workers lose out from the liberalization policy. Our results echo the predictions from classic trade models that trade liberalization creates winners and losers, and a large-scale FDI liberalization episode can substantially affect the overall income distribution and inequality of the home country.



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# Tables

**Table 1:** Summary statistics of the full firm samples over 1998-2000

|                              | All    | Treatment firm | Control firm | Difference |
|------------------------------|--------|----------------|--------------|------------|
| CN FDI                       | 0.33   | 0.39           | 0.29         | -0.10**    |
| CN FDI SIC3                  | 0.06   | 0.09           | 0.04         | -0.06***   |
| # affiliates                 | 1.25   | 1.28           | 1.23         | -0.05      |
| Parent # workers             | 472.64 | 474.15         | 471.78       | -2.37      |
| Parent average wage bills    | 5.22   | 5.61           | 5.01         | -0.59      |
| Parent total sales           | 53.67  | 71.89          | 43.30        | -28.58*    |
| Parent export sales          | 39.47  | 58.44          | 28.68        | -29.76*    |
| Affiliate # workers          | 851.17 | 866.23         | 837.98       | -28.25     |
| Affiliate average wage bills | 1.43   | 1.53           | 1.35         | -0.17      |
| Affiliate total sales        | 49.29  | 67.94          | 32.97        | -34.97     |
| Affiliate export sales       | 34.41  | 43.65          | 26.32        | -17.33     |
| Observations                 | 533    | 190            | 343          | 533        |

NOTE: “CN FDI” is an indicator of whether a Taiwanese electronic manufacturer conducts FDI in China, and “CN FDI SIC3” is an indicator of whether a Taiwanese electronic manufacturer conducts FDI in China in the same 3-digit industry. “Parent” indicates the parent branch in Taiwan, and “Affiliate” indicates the affiliate branch in China. The unit of sales and wages is 1,000 USD.

**Table 2:** Summary statistics of the matched firm samples over 1998-2000

|                              | All    | Treatment firm | Control firm | Difference |
|------------------------------|--------|----------------|--------------|------------|
| CN FDI                       | 0.33   | 0.35           | 0.31         | -0.04      |
| CN FDI SIC3                  | 0.03   | 0.04           | 0.02         | -0.02      |
| # affiliates                 | 1.22   | 1.28           | 1.14         | -0.14      |
| Parent # workers             | 394.73 | 440.70         | 348.76       | -91.94     |
| Parent average wage bills    | 4.68   | 5.19           | 4.17         | -1.02      |
| Parent total sales           | 51.82  | 64.14          | 39.49        | -24.65     |
| Parent export sales          | 39.96  | 51.51          | 28.41        | -23.10     |
| Affiliate # workers          | 770.16 | 764.50         | 779.16       | 14.66      |
| Affiliate average wage bills | 1.36   | 1.35           | 1.38         | 0.03       |
| Affiliate total sales        | 51.99  | 53.08          | 50.25        | -2.83      |
| Affiliate export sales       | 32.61  | 28.94          | 38.44        | 9.50       |
| Observations                 | 348    | 174            | 174          | 348        |

NOTE: “CN FDI” is an indicator of whether a Taiwanese electronic manufacturer conducts FDI in China, and “CN FDI SIC3” is an indicator of whether a Taiwanese electronic manufacturer conducts FDI in China in the same 3-digit industry. “Parent” indicates the parent branch in Taiwan, and “Affiliate” indicates the affiliate branch in China. The unit of sales and wages is 1,000 USD.

**Table 3:** Summary statistics of mean wages by worker group

| Group | Wage percentile in 2001 | Number of workers | Wage mean in 2001 | Wage mean in 2007 |
|-------|-------------------------|-------------------|-------------------|-------------------|
| 1     | < 25th                  | 45,032            | 8.157             | 15.452            |
| 2     | 25th-50th               | 45,035            | 12.919            | 17.705            |
| 3     | 50th-75th               | 45,032            | 17.884            | 24.891            |
| 4     | 75th-90th               | 27,020            | 27.101            | 38.205            |
| 5     | > 90th                  | 18,013            | 62.599            | 73.959            |

The unit of wages is 1000 USD.

**Table 4:** Summary statistics of the worker sample

|                               | All     | Treated worker | Untreated worker | Difference |
|-------------------------------|---------|----------------|------------------|------------|
| Number of employers in 2001   | 344     | 175            | 169              |            |
| Number of employers in 2007   | 18,886  | 11,565         | 11,109           |            |
| Leaving original firm in 2007 | 0.600   | 0.711          | 0.515            | -0.196***  |
| Wage in 2001                  | 20.065  | 19.965         | 20.142           | 0.177      |
| Wage in 2007                  | 28.648  | 27.748         | 29.308           | -1.56***   |
| Male                          | 0.508   | 0.527          | 0.493            | -0.034***  |
| Age in 2001                   | 32.01   | 32.76          | 31.42            | -1.34***   |
| Number of workers             | 180,132 | 78,406         | 101,726          |            |

The unit of wages is 1000 USD.

**Table 5:** DID estimates of the policy effect on firm extensive margin outcomes

|                         | (1)<br>Exit      | (2)<br>Exit      | (3)<br>CN FDI     | (4)<br>CN FDI      | (5)<br>CN FDI<br>SIC3 | (6)<br>CN FDI<br>SIC3 |
|-------------------------|------------------|------------------|-------------------|--------------------|-----------------------|-----------------------|
| Disc. treatment*Post    | 0.009<br>(0.016) |                  | 0.078*<br>(0.044) |                    | 0.152*<br>(0.078)     |                       |
| Cont. treatment*Post    |                  | 0.027<br>(0.046) |                   | 0.121**<br>(0.055) |                       | 0.192*<br>(0.106)     |
| Year FE                 | Yes              | Yes              | Yes               | Yes                | Yes                   | Yes                   |
| Firm FE                 | Yes              | Yes              | Yes               | Yes                | Yes                   | Yes                   |
| Pre-policy control mean | 0                | 0                | 0.308             | 0.308              | 0.023                 | 0.023                 |
| Observations            | 3480             | 3480             | 3480              | 3480               | 3480                  | 3480                  |
| Adjusted $R^2$          | 0.341            | 0.342            | 0.651             | 0.651              | 0.610                 | 0.609                 |

Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 6:** DID estimates of the policy effect on firm intensive margin outcomes**(a)** Parent firms in Taiwan

|                 | (1)       | (2)       | (3)                   | (4)       | (5)         | (6)     | (7)          | (8)     |
|-----------------|-----------|-----------|-----------------------|-----------|-------------|---------|--------------|---------|
| Parent firms    | # workers |           | Wage bills per worker |           | Total sales |         | Export sales |         |
| Disc. treatment | -0.340*   |           | -0.240                |           | 0.317       |         | -0.274       |         |
| *Post           | (0.185)   |           | (0.164)               |           | (0.207)     |         | (0.546)      |         |
| Cont. treatment |           | -0.846*** |                       | -0.688*** |             | 0.189   |              | -0.352  |
| *Post           |           | (0.214)   |                       | (0.203)   |             | (0.262) |              | (0.629) |
| Year FE         | Yes       | Yes       | Yes                   | Yes       | Yes         | Yes     | Yes          | Yes     |
| Firm FE         | Yes       | Yes       | Yes                   | Yes       | Yes         | Yes     | Yes          | Yes     |
| Observations    | 300       | 300       | 250                   | 250       | 150         | 150     | 150          | 150     |
| Adjusted $R^2$  | 0.871     | 0.883     | 0.905                 | 0.914     | 0.952       | 0.949   | 0.824        | 0.824   |

All outcomes are in log. Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**(b)** Affiliate firms in China

|                 | (1)       | (2)     | (3)                   | (4)     | (5)         | (6)     | (7)          | (8)     |
|-----------------|-----------|---------|-----------------------|---------|-------------|---------|--------------|---------|
| Affiliate firms | # workers |         | Wage bills per worker |         | Total sales |         | Export sales |         |
| Disc. treatment | 0.403     |         | 0.574**               |         | 0.420       |         | 0.846**      |         |
| *Post           | (0.274)   |         | (0.241)               |         | (0.281)     |         | (0.331)      |         |
| Cont. treatment |           | 0.574*  |                       | 0.511*  |             | 0.155   |              | 0.661   |
| *Post           |           | (0.266) |                       | (0.263) |             | (0.488) |              | (0.481) |
| Year FE         | Yes       | Yes     | Yes                   | Yes     | Yes         | Yes     | Yes          | Yes     |
| Firm FE         | Yes       | Yes     | Yes                   | Yes     | Yes         | Yes     | Yes          | Yes     |
| Observations    | 280       | 280     | 300                   | 300     | 290         | 290     | 230          | 230     |
| Adjusted $R^2$  | 0.788     | 0.790   | 0.818                 | 0.814   | 0.817       | 0.814   | 0.838        | 0.829   |

All outcomes are in log. Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 7:** Robustness check: DID estimates of the policy effect on firm extensive margin outcomes (full sample)

|                         | (1)<br>Exit      | (2)<br>Exit      | (3)<br>CN FDI    | (4)<br>CN FDI    | (5)<br>CN FDI<br>SIC3 | (6)<br>CN FDI<br>SIC3 |
|-------------------------|------------------|------------------|------------------|------------------|-----------------------|-----------------------|
| Disc. treatment*Post    | 0.003<br>(0.016) |                  | 0.034<br>(0.032) |                  | 0.144*<br>(0.082)     |                       |
| Cont. treatment*Post    |                  | 0.018<br>(0.046) |                  | 0.070<br>(0.051) |                       | 0.188*<br>(0.108)     |
| Year FE                 | Yes              | Yes              | Yes              | Yes              | Yes                   | Yes                   |
| Firm FE                 | Yes              | Yes              | Yes              | Yes              | Yes                   | Yes                   |
| Pre-policy control mean | 0                | 0                | 0.292            | 0.292            | 0.036                 | 0.036                 |
| Observations            | 5330             | 5330             | 5330             | 5330             | 5330                  | 5330                  |
| Adjusted $R^2$          | 0.328            | 0.328            | 0.654            | 0.654            | 0.648                 | 0.647                 |

Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 8:** Robustness check: DID estimates of the policy effect on firm intensive margin outcomes (full sample)

| (a) Parent firms in Taiwan |           |           |                       |           |             |         |              |         |
|----------------------------|-----------|-----------|-----------------------|-----------|-------------|---------|--------------|---------|
|                            | (1)       | (2)       | (3)                   | (4)       | (5)         | (6)     | (7)          | (8)     |
| Parent firms               | # workers |           | Wage bills per worker |           | Total sales |         | Export sales |         |
| Disc. treatment            | -0.141    |           | -0.207                |           | 0.100       |         | -0.296       |         |
| *Post                      | (0.146)   |           | (0.144)               |           | (0.204)     |         | (0.366)      |         |
| Cont. treatment            |           | -0.524*** |                       | -0.565*** |             | -0.039  |              | -0.420  |
| *Post                      |           | (0.084)   |                       | (0.117)   |             | (0.180) |              | (0.401) |
| Year FE                    | Yes       | Yes       | Yes                   | Yes       | Yes         | Yes     | Yes          | Yes     |
| Firm FE                    | Yes       | Yes       | Yes                   | Yes       | Yes         | Yes     | Yes          | Yes     |
| Observations               | 510       | 510       | 430                   | 430       | 260         | 260     | 260          | 260     |
| Adjusted $R^2$             | 0.883     | 0.888     | 0.900                 | 0.906     | 0.948       | 0.948   | 0.869        | 0.870   |

All outcomes are in log. Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

| (b) Affiliate firms in China |           |          |                       |         |             |         |              |         |
|------------------------------|-----------|----------|-----------------------|---------|-------------|---------|--------------|---------|
|                              | (1)       | (2)      | (3)                   | (4)     | (5)         | (6)     | (7)          | (8)     |
| Affiliate firms              | # workers |          | Wage bills per worker |         | Total sales |         | Export sales |         |
| Disc. treatment              | 0.319*    |          | 0.442**               |         | 0.168       |         | 0.499**      |         |
| *Post                        | (0.145)   |          | (0.165)               |         | (0.178)     |         | (0.198)      |         |
| Cont. treatment              |           | 0.591*** |                       | 0.501** |             | 0.209   |              | 0.517   |
| *Post                        |           | (0.125)  |                       | (0.204) |             | (0.314) |              | (0.394) |
| Year FE                      | Yes       | Yes      | Yes                   | Yes     | Yes         | Yes     | Yes          | Yes     |
| Firm FE                      | Yes       | Yes      | Yes                   | Yes     | Yes         | Yes     | Yes          | Yes     |
| Observations                 | 500       | 500      | 510                   | 510     | 510         | 510     | 430          | 430     |
| Adjusted $R^2$               | 0.822     | 0.825    | 0.835                 | 0.834   | 0.831       | 0.831   | 0.838        | 0.836   |

All outcomes are in log. Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 9:** Robustness check: DID estimates of the policy effect on firm extensive margin outcomes (kernel matching sample)

|                         | (1)<br>Exit      | (2)<br>Exit      | (3)<br>CN FDI    | (4)<br>CN FDI     | (5)<br>CN FDI<br>SIC3 | (6)<br>CN FDI<br>SIC3 |
|-------------------------|------------------|------------------|------------------|-------------------|-----------------------|-----------------------|
| Disc. treatment*Post    | 0.007<br>(0.015) |                  | 0.054<br>(0.038) |                   | 0.150*<br>(0.086)     |                       |
| Cont. treatment*Post    |                  | 0.022<br>(0.043) |                  | 0.098*<br>(0.052) |                       | 0.200<br>(0.116)      |
| Year FE                 | Yes              | Yes              | Yes              | Yes               | Yes                   | Yes                   |
| Firm FE                 | Yes              | Yes              | Yes              | Yes               | Yes                   | Yes                   |
| Pre-policy control mean | 0                | 0                | 0.279            | 0.279             | 0.022                 | 0.022                 |
| Observations            | 5110             | 5110             | 5110             | 5110              | 5110                  | 5110                  |
| Adjusted $R^2$          | 0.334            | 0.334            | 0.656            | 0.656             | 0.610                 | 0.609                 |

Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



**Table 10:** Robustness check: DID estimates of the policy effect on firm intensive margin outcomes (kernel matching sample)

| (a) Parent firms in Taiwan |                   |                      |                              |                      |                    |                  |                     |                   |
|----------------------------|-------------------|----------------------|------------------------------|----------------------|--------------------|------------------|---------------------|-------------------|
| Parent firms               | (1)<br># workers  | (2)                  | (3)<br>Wage bills per worker | (4)                  | (5)<br>Total sales | (6)              | (7)<br>Export sales | (8)               |
| Disc. treatment<br>*Post   | -0.082<br>(0.183) |                      | -0.153<br>(0.176)            |                      | 0.194<br>(0.177)   |                  | -0.176<br>(0.363)   |                   |
| Cont. treatment<br>*Post   |                   | -0.557***<br>(0.093) |                              | -0.571***<br>(0.152) |                    | 0.104<br>(0.186) |                     | -0.257<br>(0.463) |
| Year FE                    | Yes               | Yes                  | Yes                          | Yes                  | Yes                | Yes              | Yes                 | Yes               |
| Firm FE                    | Yes               | Yes                  | Yes                          | Yes                  | Yes                | Yes              | Yes                 | Yes               |
| Observations               | 450               | 450                  | 370                          | 370                  | 230                | 230              | 230                 | 230               |
| Adjusted $R^2$             | 0.875             | 0.881                | 0.889                        | 0.895                | 0.921              | 0.920            | 0.795               | 0.795             |

All outcomes are in log. Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

| (b) Affiliate firms in China |                   |                     |                              |                    |                    |                  |                     |                  |
|------------------------------|-------------------|---------------------|------------------------------|--------------------|--------------------|------------------|---------------------|------------------|
| Parent firms                 | (1)<br># workers  | (2)                 | (3)<br>Wage bills per worker | (4)                | (5)<br>Total sales | (6)              | (7)<br>Export sales | (8)              |
| Disc. treatment<br>*Post     | 0.417*<br>(0.192) |                     | 0.491**<br>(0.206)           |                    | 0.199<br>(0.199)   |                  | 0.517**<br>(0.186)  |                  |
| Cont. treatment<br>*Post     |                   | 0.628***<br>(0.188) |                              | 0.531**<br>(0.175) |                    | 0.048<br>(0.431) |                     | 0.534<br>(0.386) |
| Year FE                      | Yes               | Yes                 | Yes                          | Yes                | Yes                | Yes              | Yes                 | Yes              |
| Firm FE                      | Yes               | Yes                 | Yes                          | Yes                | Yes                | Yes              | Yes                 | Yes              |
| Observations                 | 440               | 440                 | 450                          | 450                | 450                | 450              | 370                 | 370              |
| Adjusted $R^2$               | 0.774             | 0.775               | 0.807                        | 0.805              | 0.789              | 0.788            | 0.790               | 0.788            |

All outcomes are in log. Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 11:** Regression estimates of the policy effect on worker cumulative outcomes

| Cumulative outcome   | (1)<br>Job transition | (2)      | (3)<br>Years employed | (4)       | (5)<br>Normalized wage | (6)       |
|----------------------|-----------------------|----------|-----------------------|-----------|------------------------|-----------|
| Treated              | 0.168*                | 0.052    | -0.025                | 0.091     | -0.879                 | 0.823     |
|                      | (0.066)               | (0.074)  | (0.055)               | (0.070)   | (1.007)                | (0.587)   |
| Treated*<p10         |                       | 0.038    |                       | 0.038     |                        | -1.728    |
|                      |                       | (0.088)  |                       | (0.115)   |                        | (3.274)   |
| Treated*p10-p25      |                       | 0.217**  |                       | -0.163*   |                        | -1.174**  |
|                      |                       | (0.071)  |                       | (0.069)   |                        | (0.377)   |
| Treated*p25-p50      |                       | 0.254*** |                       | -0.297*** |                        | -1.380*** |
|                      |                       | (0.056)  |                       | (0.057)   |                        | (0.219)   |
| Treated*p50-p75      |                       | 0.246*** |                       | -0.347*** |                        | -1.353*** |
|                      |                       | (0.043)  |                       | (0.069)   |                        | (0.220)   |
| Treated*p75-p90      |                       | 0.049    |                       | -0.131**  |                        | -0.991*** |
|                      |                       | (0.067)  |                       | (0.045)   |                        | (0.142)   |
| Industry FE          | Yes                   | Yes      | Yes                   | Yes       | Yes                    | Yes       |
| Control mean in 2007 | 0.9297                | 0.9297   | 5.279                 | 5.279     | 7.382                  | 7.382     |
| Adjusted R-squared   | 0.069                 | 0.114    | 0.079                 | 0.141     | 0.001                  | 0.009     |
| Observations         | 180,135               | 180,135  | 180,135               | 180,135   | 180,135                | 180,135   |

Standard errors are clustered at the 3-digit industry level.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

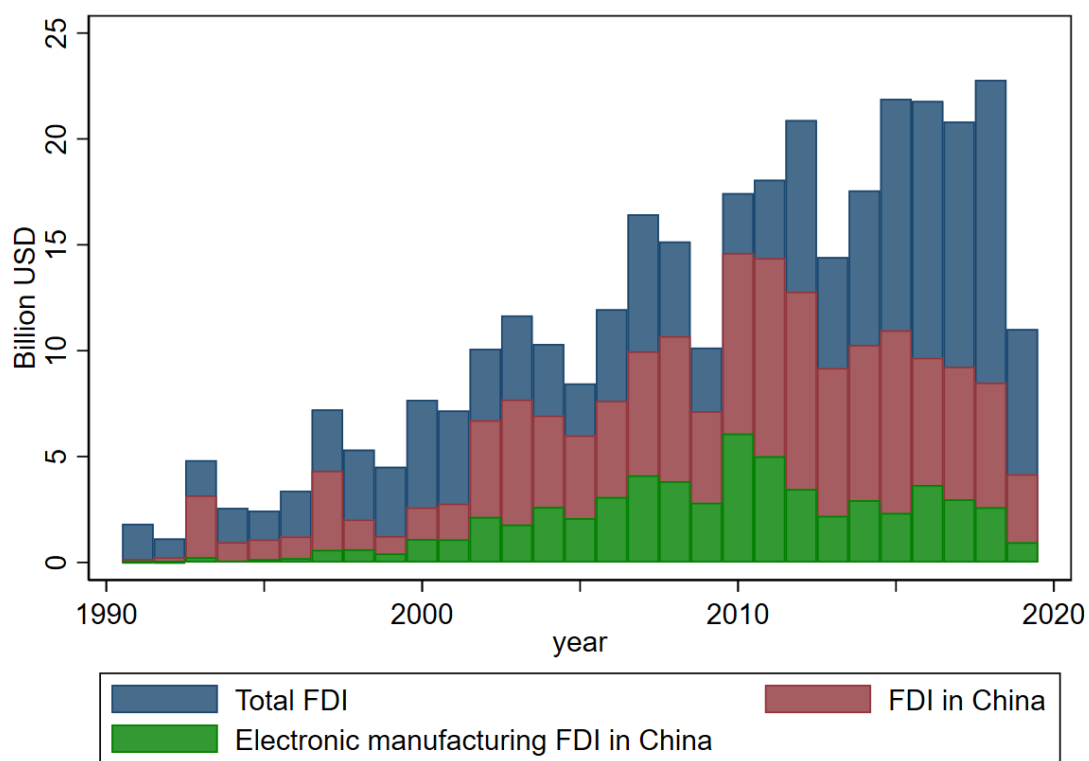
**Table 12:** Composition of workers leaving the original firm

| Wage group  | <p10          | p10-p25       | p25-p50       | p50-p75       | p75-p90       | >p90          |
|---|---------------|---------------|---------------|---------------|---------------|---------------|
| Leave labor market  |               |               |               |               |               |               |
| Treatment   | 33.09%        | 28.31%        | 23.01%        | 17.42%        | 10.58%        | 10.24%        |
| Control   | 36.66%        | 24.21%        | 16.48%        | 10.62%        | 9.12%         | 10.72%        |
| Difference  | -3.57%<br>*** | 4.10%<br>***  | 6.53%<br>***  | 6.80%<br>***  | 1.46%<br>***  | -0.48%        |
| Leave the industry but stay in the labor market             |               |               |               |               |               |               |
| Treatment   | 48.43%        | 46.23%        | 44.31%        | 41.19%        | 36.66%        | 34.93%        |
| Control   | 37.04%        | 27.43%        | 24.78%        | 19.71%        | 20.16%        | 19.00%        |
| Difference  | 11.39%<br>*** | 18.79%<br>*** | 19.53%<br>*** | 21.49%<br>*** | 16.50%<br>*** | 15.92%<br>*** |
| Leave the original firm but stay in the industry (2-digits) |               |               |               |               |               |               |
| Treatment   | 8.68%         | 7.88%         | 8.57%         | 8.58%         | 8.61%         | 8.92%         |
| Control   | 9.55%         | 8.85%         | 10.00%        | 11.78%        | 15.07%        | 14.39%        |
| Difference  | -0.87%<br>**  | -0.97%<br>*** | -1.43%<br>*** | -3.20%<br>*** | -6.46%<br>*** | -5.47%<br>*** |
| Leave the original firm (overall)                           |               |               |               |               |               |               |
| Treatment   | 90.20%        | 82.43%        | 75.89%        | 67.20%        | 55.85%        | 54.09%        |
| Control   | 83.25%        | 60.50%        | 51.26%        | 42.11%        | 44.35%        | 44.11%        |
| Difference  | 6.95%<br>***  | 21.93%<br>*** | 24.63%<br>*** | 25.09%<br>*** | 11.50%<br>*** | 9.97%<br>***  |

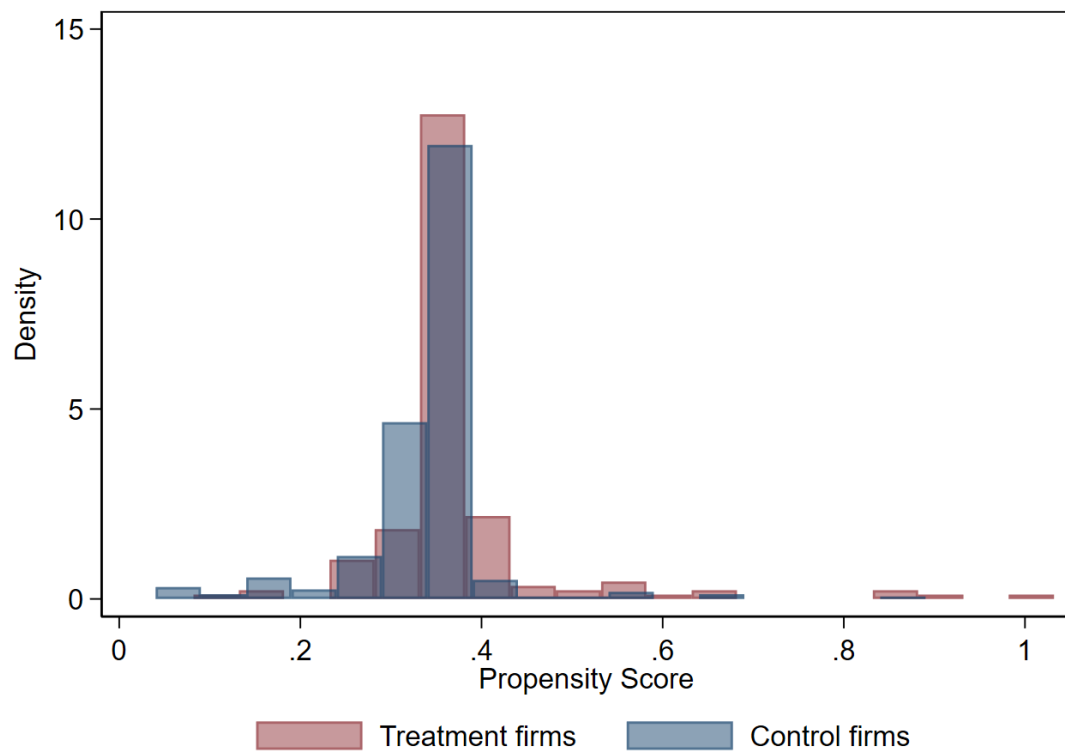
# Figures

**Figure 1:** Taiwanese yearly outward FDI (Billion USD)

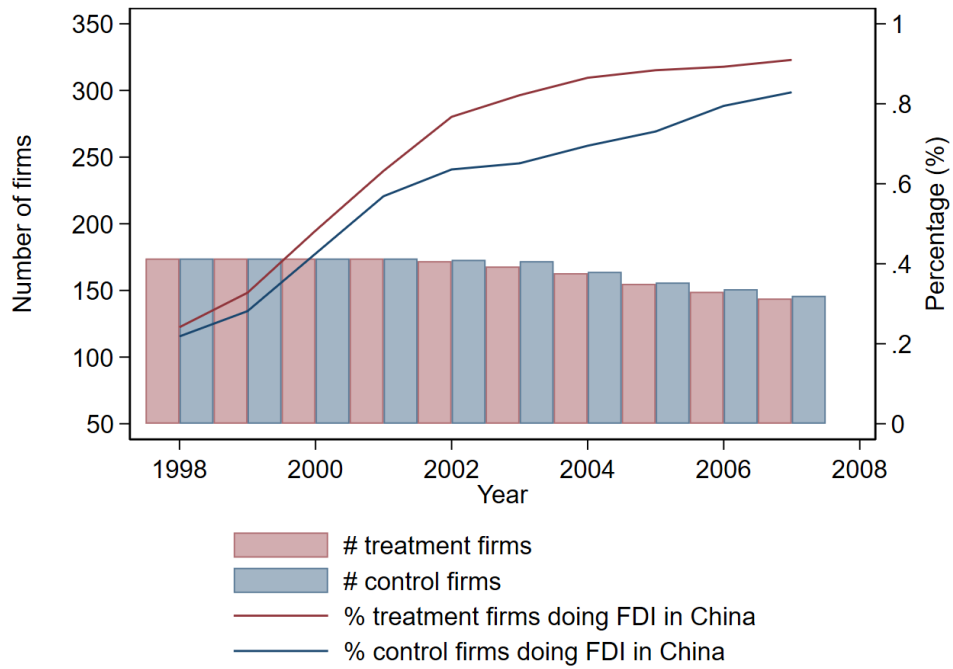
Source: The Investment Commission, Ministry of Economic Affairs, Taiwan.



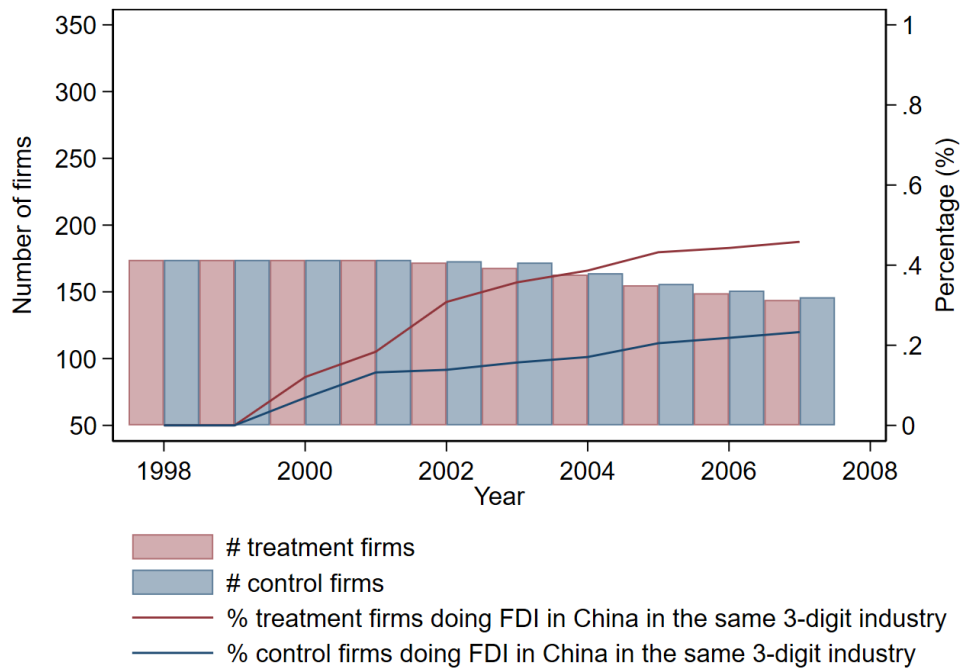
**Figure 2:** Propensity scores for the treatment and control firms



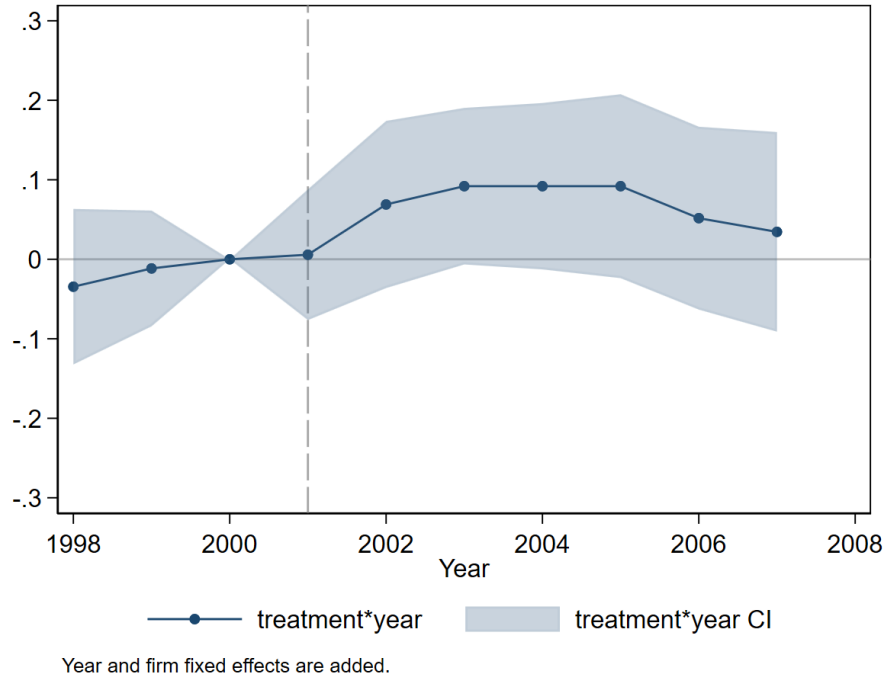
**Figure 3:** Share of treatment and control firms doing FDI in China



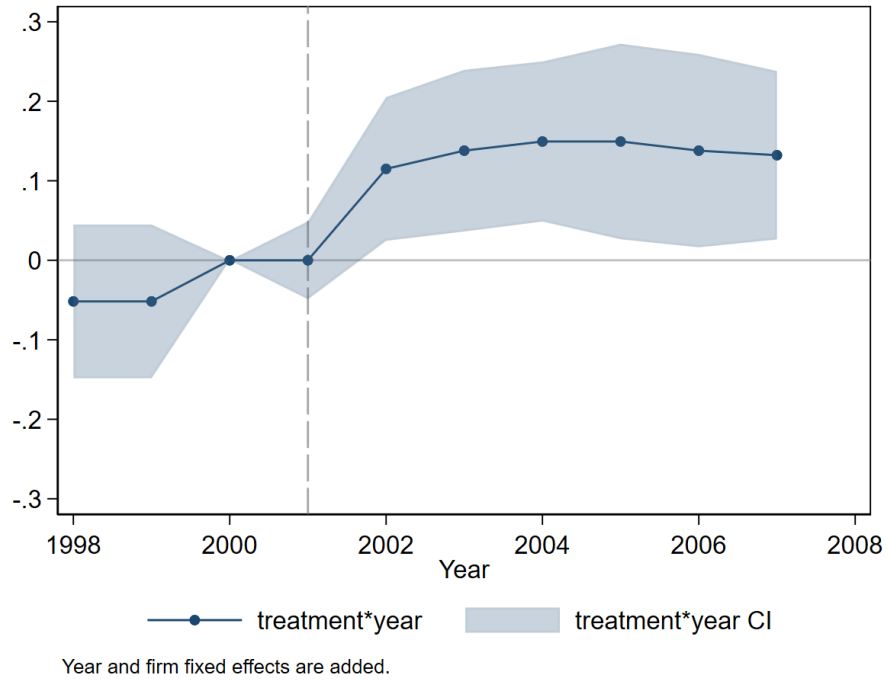
**Figure 4:** Share of treatment and control firms doing FDI in the same industry in China



**Figure 5:** Event study graph for firm extensive margin outcomes

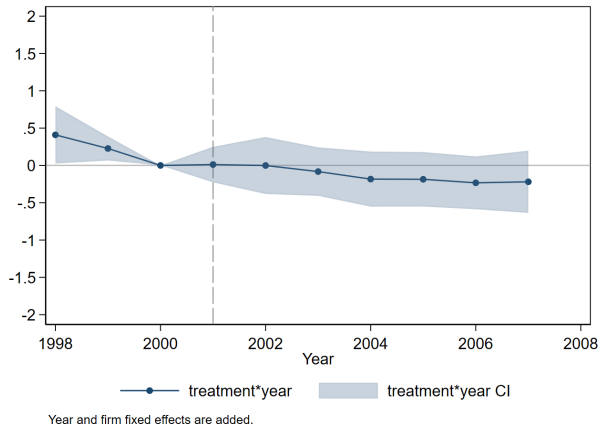


(a) Conduct FDI in China

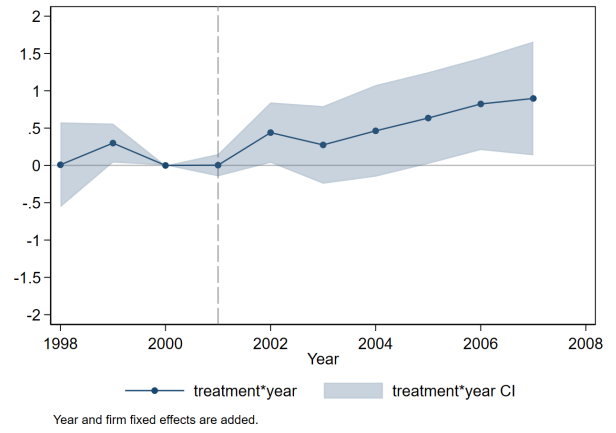


(b) Conduct FDI in the same industry in China

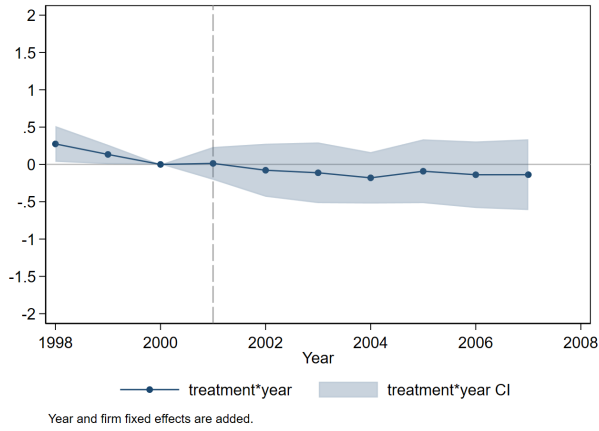
**Figure 6:** Event study graph for number of workers and wage bills per worker



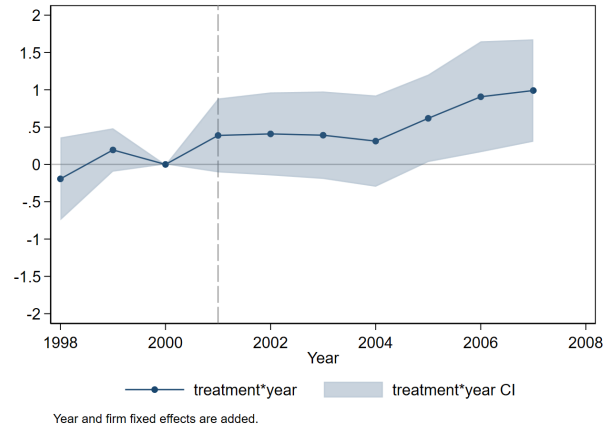
(a) Parent # workers



(b) Affiliate # workers



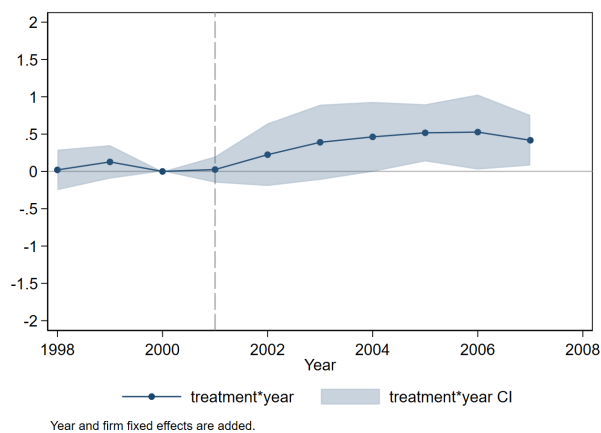
(c) Parent wage bills per worker



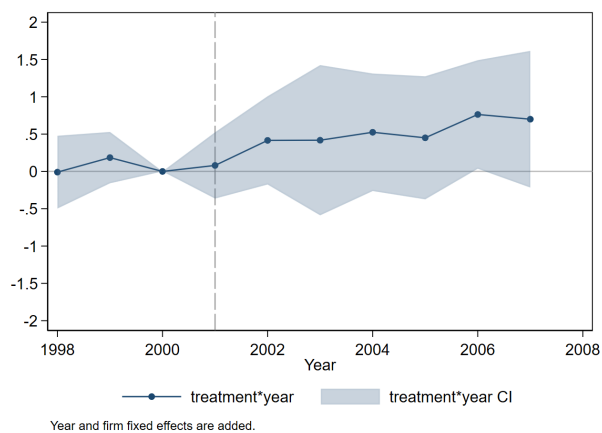
(d) Affiliate wage bills per worker



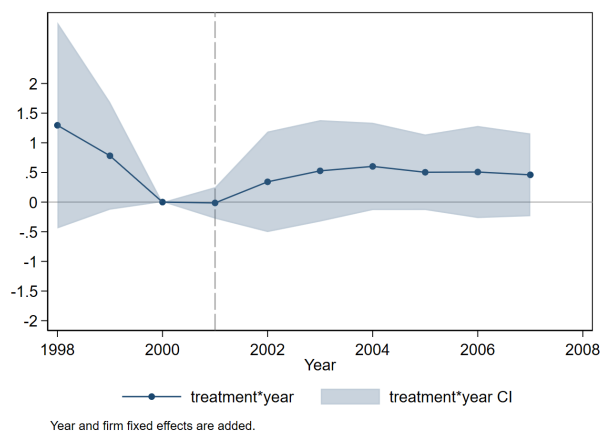
**Figure 7:** Event study graph for total sales and export sales



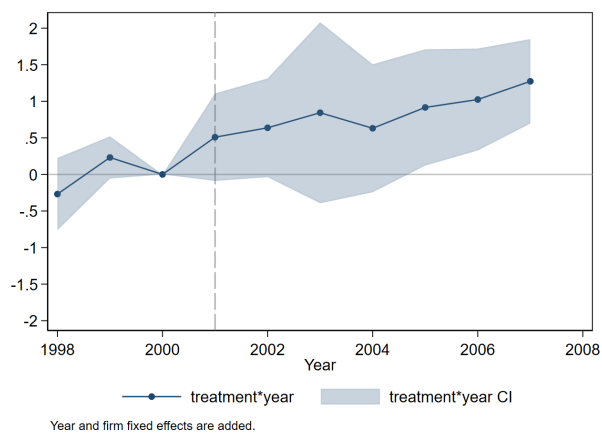
(a) Parent total sales



(b) Affiliate total sales



(c) Parent export sales



(d) Affiliate export sales

# Appendices

## A Original List of the 122 products

| C.C.C.Code  | Category in English   | Category in Chinese   |
|-------------|---|---|
| 95421090    | Fiber distributed data interface (FDDI), Synchronous Optical Networking (SONET), ISDN equipment and IC related products                               | 光纖分散數據介面、同步光纖網路系統、整體服務數位網路設備及其相關 IC   |
| 85179092108 | Thermal printhead (printer component)   | 熱感應印字頭  |
| 85252010102 | All types of mobile phones, wireless communication system, digital wireless switches, satellite communications systems                                | 行動電話、數位行動電話、GSM 行動電話機、泛歐無線電話 (DECT)、展頻數位無線電話、第二代數位無線 CT2 基台及手機、無線通信系統、數位式無線交換機與電話機、網際網路電腦通訊器及國際海事衛星通信 M/B 型移動系統 |
| 84213910    | Filtering or purifying machinery for gase   | 電動空氣過濾器及電動空氣清潔器   |
| 84219910    | Cartridges for filter/purifying machines  | 過濾芯子（供立即使用者）  |
| 84709010    | Postage machine   | 郵資機   |
| 84709090    | Other 8470 machines   | 其他第 8470 節所屬之機器   |
| 84710000    | Advanced CAD/CAM system   | 高級 CAD/CAM 系統   |
| 84711000    | Analog or hybrid automatic data processing machine  | 類比或混合自動資料處理機  |
| 84713000    | Portable automatic data-processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display | 攜帶式數位自動資料處理機，其重量不超過 10 公斤並至少包含有一中央處理單元，一鍵盤及一顯示器者  |

| C.C.C.Code | Category in English   | Category in Chinese  |
|------------|---|--|
| 84713000EX | Portable automatic data-processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display (for work processing stations and related to: RISC CHIPS, multiprocessor systems, medical optical cards, interface card, medical records system, multimedia systems - hardware, software and applications, back servers, high-performance networks and controllers)                       | 攜帶式數位自動資料處理機，其重量不超過 10 公斤並至少包含有一中央處理單元，一鍵盤及一顯示器者（高級工作站及相關 RICS CHIPS、多處理機系統、醫療光卡、光卡閱讀機個人電腦介面卡及光卡醫療記錄寫作系統、多媒體電腦系統－硬體、軟體及應用系統、後置服務器、高性能跨越網路之控制器） |
| 84714100   | Other digital automatic data processing machines comprising at least a central processing unit and an input and output unit   | 其他數位式自動資料處理機同一機殼內至少包含有一中央處理單元及一輸入、輸出單元，不論是否組合者   |
| 84714100EX | Other digital automatic data processing machines :- Comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined (for work processing stations and related to: RISC CHIPS, multiprocessor systems, medical optical cards, interface card, medical records system, multimedia systems - hardware, software and applications, back servers, high-performance networks and controllers) | 其他數位式自動資料處理機同一機殼內至少包含有一中央處理單元及一輸入、輸出單元，不論是否組合者（高級工作站及相關 RICS CHIPS、多處理機系統、醫療光卡、光卡閱讀機個人電腦介面卡及光卡醫療記錄寫作系統、多媒體電腦系統－硬體、軟體及應用系統、後置服務器、高性能跨越網路之控制器）   |
| 84714900   | Other digital automatic data processing machines :- Other, presented in the form of systems   | 其他數位式自動資料處理機，具系統形式者  |

| C.C.C.Code | Category in English   | Category in Chinese   |
|------------|---|---|
| 84714900EX | Other digital automatic data processing machines :- Other, presented in the form of systems   | 其他數位式自動資料處理機，具系統形式者（高級工作站及相關 RICS CHIPS、多處理機系統、醫療光卡、光卡閱讀機個人電腦介面卡及光卡醫療記錄寫作系統、多媒體電腦系統－硬體、軟體及應用系統、後置服務器、高性能跨越網路之控制器） |
| 84715000EX | Digital processing units other than those of sub-headings 8471.41 and 8471.49, whether or not containing in the same housing one or two of the following types of unit : storage units, input units, output units | 第 8471.41 及 8471.49 等目除外之數位式處理單元，在同一機殼內不論其是否含有一個或兩個下列形式之單元：儲存單元、輸入單元、輸出單元（電子音樂合成系統）                               |
| 84716020   | Printers  | 列表機   |
| 84716020EX | Laser printers, optical printers, high resolution printers  | 雷射印表機、光電成像印表機、高解析度頁印機   |
| 84716090   | Input or output units, whether or not containing storage units in the same housing  | 其他輸入或輸出單元，在同一機殼內不論其是否含有儲存單元者  |
| 84716090EX | High performance scanner  | 高性能文件掃描器  |
| 84717010EX | Hard disk drives, micro hard drives, micro drives   | 硬式磁碟機、微小型硬式磁碟機、微小型磁碟機   |
| 84717090   | Other storage units   | 其他儲存單元  |
| 84717090EX | Solid-state storage, medical optical cards, PC-linked smart card readers, IC cards  | 固態記憶系統、醫療光卡、光卡閱讀機個人電腦介面卡及光卡醫療記錄寫作系統、IC 記憶卡  |
| 84718000   | Other automatic data processors - magnetic or optical readers   | 其他自動資料處理機單元   |
| 84719030   | Magnetic or optical readers   | 磁性或光學閱讀機  |
| 84719030EX | Barcode readers, catalytic converters, medical optical cards, optical card reader PC interface card and the optical card medical record writing system  | 條碼閱讀機、觸媒轉化器、醫療光卡、光卡閱讀機個人電腦介面卡及光卡醫療記錄寫作系統  |

| C.C.C.Code | Category in English   | Category in Chinese   |
|------------|---|---|
| 84719090   | Other automatic data processing machines under the heading 8471   | 其他第 8471 節所屬之自動資料處理機（其中電子音樂合成系統及固態記憶系統為禁止類）                               |
| 84719090EX | Electronic music synthesis system and a solid-state memory system   | 電子音樂合成系統及固態記憶系統   |
| 84731000   | Parts and accessories of the machines of heading 84.69  | 第 8469 節機器之零件及附件  |
| 84732900   | Other parts and accessories of the machines of heading 84.70  | 其他第 8470 節所屬機器之零件及附件  |
| 84733010   | Other parts and accessories of the machines of subheading 8471.10, 8471.30, 8471.41, 8471.49, 8471.50, 8471.60 and 8471.70  | 第 8471.10、8471.30、8471.41、8471.49、8471.50、8471.60、8471.70 目下機械之零件及附件      |
| 84733010EX | Photocopying machine toners, heat sensitive printing head servo writer, fiber-optic network with a waveguide coupler, high-resolution laser printer engine, drives head | 影印機用墨粉、熱感應印字頭伺服寫入器、光纖網路用波導藕合器、高解析度雷射印表引擎、磁碟機讀寫頭                           |
| 84733021   | Parts and accessories of the machines of division 8471.90.10  | 第 847190.10 款下機械之零件及附件  |
| 84733029   | Parts and accessories of the machines of subheading 8471.80 and 8471.90   | 第 8471.80、第 8471.90 目下機械之零件及附件  |
| 84734010   | Parts and accessories of perforating (punching), stapling, and pencil-sharpening machines   | 打孔機、裝訂機及削鉛筆機之零件及附件  |
| 84735010   | Parts and accessories equally suitable for use with machines of subheading 8471.80 and 8471.90  | 同時適用於第 8471.80、8471.90 目下機械之零件及附件   |
| 84735020   | Parts and accessories equally suitable for use with machines of subheading 8471.10, 8471.30, 8471.41, 8471.49, 8471.50, 8471.60 and 8471.70                             | 同時適用於第 8471.10、8471.30、8471.41、8471.49、8471.50、8471.60、8471.70 目下機械之零件及附件 |

| C.C.C.Code  | Category in English  | Category in Chinese                      |
|-------------|--|--|
| 84735020EX  | photocopying machine toners, heat sensitive printing head servo writer, fiber-optic network with a waveguide coupler, high-resolution laser printer engine | 影印機用墨粉、熱感應印字頭伺服寫入器、光纖網路用波導藕合器、高解析度雷射印表引擎 |
| 85011090EX  | Precision small motors   | 精密微小馬達                                   |
| 85041100    | Widescreen Desktop CRT   | 大尺寸／寬螢幕映像管 (16 : 9 CRT)                  |
| 85044011EX  | Switched mode power supplies   | 交換式電源供應器 (高功率密度、高頻電源供應器)                 |
| 85044012EX  | UPS power supplies (high power density, high-frequency power supply)   | 不斷電式電源供應器 (高功率密度、高頻電源供應器)                |
| 85044019EX  | Other power supplies (high power density, high frequency power supply)   | 其他電源供應器 (高功率密度、高頻電源供應器)                  |
| 85044090EX  | Other electrostatic converters   | 其他靜電式變流器 (微電腦控制交流感應馬達變頻器等相關變頻器)          |
| 85171 100EX | Wireless and wired phones  | 附無線手機之有線電話機 (整體服務數位網路用戶端設備)              |
| 85171910    | Video phone  | 影像電話機                                    |
| 85171990EX  | Other phones (ISDN CPE)  | 其他電話機 (整體服務數位網路用戶端設備)                    |
| 85172100EX  | fax machine, ISDN  | G4 傳真機、整體服務數位網路用戶端設備                     |
| 85173011    | Central office telephone exchange  | 局用電話交換機                                  |
| 85173011EX  | Central office telephone exchange (Integrated services digital network CPE)  | 局用電話交換機 (整體服務數網路用戶端設備)                   |
| 8517301990  | Other telephone exchange   | 其他電話交換機                                  |
| 85173019EX  | Other telephone exchange (Integrated Services Digital network CPE)   | 其他電話交換機 (整體服務數網路用戶端設備)                   |
| 85175010EX  | Modem (Integrated Services Digital network CPE)  | 數據機 (整體服務數網路用戶端設備) + E5878               |
| 85175090    | Other carrier or digital line systems with appliances  | 其他載波電流線路系統用或數位線路系統用器具                    |

| C.C.C.Code | Category in English  | Category in Chinese  |
|------------|--|--|
| 85175090EX | ADM150 synchronous optical network systems, optical digital subscriber loop carrier equipment, network take equipment, fiber distributed data interface, Integrated Services Digital network CPE, multimedia, multi-protocol network hub, Ethernet to ATM Smart Hub, High Speed digital subscriber loop equipment, ISDN router, high-speed Ethernet LAN chipset (speed of 100Mbps and above), regional control network products, high-capacity fiber-optic subscriber loop systems, digital wireless subscriber loop transmission equipment, FAST ETHERNET-speed B set line too network (speed of 100Mbps and above), the full range of network technology | 同步光纖網路 ADM150 系統、光纖迴路數位用戶載波機、網路存取設備、光纖分散式數據界面、整體服務數位網路用戶端設備、多媒體、多重協定網路中樞、Ethernet to ATM Smart Hub、高速數位用戶迴路設備、ISDN 路由器、高速乙太區域網路晶片組(速率 100Mbps 以上)、區域性控制網路系列產品、大容量光纖用戶迴路系統、數位式無線用戶迴路傳輸設備、Fast Ethernet 高速乙太網路(速率 100Mbps 及以上)、全方位網路技術之集線路 |
| 85203210   | Digital tape recorders or digital cassette tape players  | 數位錄放音帶機或數位卡帶錄放音機   |
| 85203290   | Other digital sound recording apparatus  | 其他數位錄放音器具  |
| 85209000EX | Other sound recording apparatus (digital tape players)   | 其他錄放音器具 (數位錄放音機)   |
| 85211019EX | Other tape-VCR (Digital Video Recorder)  | 其他磁帶式錄放影機 (數位錄放影機)   |
| 85219010   | Laser optical system disc video player   | 雷射光學系統碟式放影機  |
| 85219010EX | Laser video disk players   | 雷射影音碟機   |
| 85219010EX | Digital DVD player   | 數位影音光碟機  |
| 85219090   | Other VCRs   | 其他錄放影機   |
| 85219090EX | Digital VCR  | 數位錄放影機   |
| 85229020EX | Parts and accessories of tape players (digital tape players)   | 錄放音機之零件及附件 (數位錄放音機機構體)   |

| C.C.C.Code | Category in English   | Category in Chinese   |
|------------|---|---|
| 85232010   | Blank audio CDs   | 空白音碟  |
| 85232020   | Blank DVDs  | 空白影碟  |
| 85232030   | Blank disc automatic data processing systems  | 自動資料處理系統之空白磁碟   |
| 85232030EX | CD and floppy drives  | 硬碟機薄膜磁片   |
| 85232090   | Multimedia systems  | 多媒體系統   |
| 85232090   | Multimedia computer system - hardware, software, applications   | 多媒體電腦系統—硬體、軟體、及應用系統   |
| 85232090   | Multimedia computer systems and software  | 多媒體電腦系統及其軟體   |
| 85232090   | Systems and Instrumental software   | 系統及工具性軟體  |
| 85232090   | Multimedia database management system   | 多媒體資料庫管理系統  |
| 85232090   | System software   | 系統軟體  |
| 85232090   | Family information systems  | 家庭資訊系統  |
| 85232090   | High-tech application software systems  | 高科技應用軟體系統   |
| 85232090   | Electrical systems auxiliary systems engineering tools  | 電統輔助系統工程工具  |
| 85232090   | Other blank discs   | 其他空白磁碟  |
| 85232090   | Rewritable CDs/DVDs   | 可重複讀寫光碟片 (DVD-RAM, PD)  |
| 85232090EX | Floppy disks  | 磁片碟片  |
| 85233000EX | Equipped with a card magnetic strip (multimedia computer systems and software, multimedia computer systems - hardware, software and applications, systems and tools of software, multimedia systems)      | 裝有磁條之卡片 (多媒體電腦系統及其軟體、多媒體電腦系統—硬體、軟體及應用系統、系統及工具性軟體、多媒體系統)             |
| 85239090EX | Other recording media, blank or recorded (multimedia computer systems and software, multimedia computer systems - hardware, software and applications, systems and tools of software, multimedia systems) | 其他錄音或錄製其他類似現象用之空白媒體 (多媒體電腦系統及其軟體、多媒體電腦系統—硬體、軟體及應用系統、系統及工具性軟體、多媒體系統) |
| 85241010   | Language teaching records   | 語言教學唱片  |



| C.C.C.Code | Category in English   | Category in Chinese               |
|------------|---|-----------------------------------|
| 85241020   | Recorded music  | 音樂唱片                              |
| 85241090   | Other records   | 其他唱片                              |
| 85243100   | Recorded discs for reproducing phenomena other than sound or image                              | 已錄製供重放聲音或影像以外現象之碟片                |
| 85243211   | Educational, news, and audio CDs  | 教育性、新聞性音碟                         |
| 85243219   | Other recorded audio CDs  | 其他已錄製音碟                           |
| 85243910   | Educational and news DVDs   | 教育性、新聞性影碟                         |
| 85243990   | Discs for laser reading systems :– Other  | 其他已錄製供雷射閱讀系統用碟片                   |
| 85244030   | Recorded tapes for reproducing phenomena other than sound or image - of a width exceeding 6.5mm | 已錄製供重放聲音或影像以外現象之磁帶，寬度超過 6.5 毫米者   |
| 85245111   | Educational and news audio tapes, width no more than 4mm  | 教育性、新聞性錄音帶，寬度未超過 4 毫米者            |
| 85245121   | Educational and news videos, width no more than 4mm   | 教育性、新聞性錄影帶，寬度未超過 4 毫米者            |
| 85245211   | Educational and news audio tapes, width between 4 and 6.5mm                                     | 教育性、新聞性錄音帶，寬度超過 4 毫米，但未超過 6.5 毫米者 |
| 85245221   | Educational and news videos, width between 4 and 6.5mm  | 教育性、新聞性錄影帶，寬度超過 4 毫米，但未超過 6.5 毫米者 |
| 85245311   | Educational and news audio tapes, width over 6.5mm  | 教育性、新聞性錄音帶，寬度超過 6.5 毫米者           |
| 85245321   | Educational and news videos, width over 6.5mm   | 教育性、新聞性錄影帶，寬度超過 6.5 毫米者           |
| 85245329   | Other recorded videos, width over 6.5mm   | 其他已錄製錄影帶，寬度超過 6.5 毫米者             |
| 85245390   | Other recorded tapes, width over 6.5mm  | 其他已錄製磁帶，寬度超過 6.5 毫米者              |
| 85246000   | Recorded cards with a magnetic strip  | 裝有已錄製磁條之卡片                        |
| 85249100   | Recorded media for reproducing phenomena other than sound or image                              | 已錄製供重放聲音或影像以外現象之媒體                |
| 85249300   | Medical optical cards, optical card reader PC interface, and optical card medical record        | 醫療光卡、光卡閱讀機個人電腦介面及光卡醫療記錄寫作系統       |

| C.C.C.Code | Category in English  | Category in Chinese  |
|------------|--|--|
| 85249900   | Other music recordings or other similar media recordings   | 其他已錄音或已錄製其他類似現象之媒體   |
| 85251020   | Radio transmission apparatus   | 無線電廣播傳輸器具  |
| 85251030   | TV transmission apparatus  | 電視傳輸器具   |
| 85251090   | Other radio transmission machines  | 其他無線電傳輸機器  |
| 85252010   | Radio phone  | 無線電話機  |
| 85252090   | Other radio transmission receivers   | 其他具有接收器具之無線電傳輸器具   |
| 85254010   | Static camcorder   | 靜相攝影機  |
| 85254010EX | Static photography   | 電子靜相照像機  |
| 85279000EX | Other wireless telephone or wireless telegraphy receivers  | 其他無線電話或無線電報接收機（全球定位系統接收器、全球定位系統接收器及引擎、國際海事衛星通信 M/B 型移動系統及網際網路口袋型電腦通訊器） |
| 85281200EX | Color TV reception apparatus, whether or not incorporating radio broadcast receivers or sound, video recording or reproducing apparatus by TV (resolution of more than 1000) | 彩色電視接收器具，不論是否裝有無線電廣播接收機或音、影錄或放器具者 [高級數位電視機、高畫質電視機（水平解析度在 1000 條以上）]    |
| 85282110   | Color CCTV System A  | 彩色閉路電視系統   |
| 85282190EX | 17-inch or more color video monitors   | 17 吋以上彩色影像監視器  |
| 85283010   | Color projector  | 彩色影像投射機  |
| 85283010EX | Color projector (tv projector, LCD projector)  | 彩色影像投射機（投影式電視機、液晶投影電視機）  |
| 85283020EX | Black and white monochrome video projectors (digital type)   | 黑白或其他單色影像投射機（數位式）  |
| 85371010EX | Computer numerical control (CNC)   | 電腦數值控制器，PC 級電腦數值控制器  |
| 90065900EX | Static camera  | 電子靜相照像機  |
| 90079100EX | Digital camcorders   | 數位攝錄放影機  |
| 90139000   | HS Code 9013, parts and accessories  | 第 9013 節所屬物品之零件及附件   |

註：表列 122 項有條件全部開放—

「為國防用途而作特殊設計之軍用電子、通信及資訊產品設備，不得於大陸地區產製」。