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Firm and labour adjustments to FDI liberalisation

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Abstract

This paper studies how liberalizing outward foreign direct investments (FDI) affects manufacturers' engagement in global production and their domestic workers' labor market outcomes. Focusing on a liberalization policy in 2001 by the government of Taiwan that allowed 122 electronic products to be produced in China, we estimate its effect on Taiwanese electronic manufacturers and their domestic workers. Employing a matched difference-in-differences strategy, we find that the manufacturers targeted by the policy were on average 14% more likely to invest in China relative to the non-targeted ones. Correspondingly, the domestic incumbent workers of the targeted manufacturers were on average more likely to change their jobs, stay employed for fewer years, and have lower wages in subsequent years relative to those employed by the nontargeted ones. The worker-level effects of the policy exhibited substantial heterogeneity across the initial wage distribution, with the top-decile workers benefiting and the other workers losing on average.

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Non-Technical Summary

This paper examines the effects of a government policy change that allowed Taiwanese electronic manufacturers to move their production to China. The study looks at how this policy, enacted in 2001, impacted both the Taiwanese companies themselves and their workers back in Taiwan. Understanding these effects is important because companies increasingly operate across borders, and it's crucial to know how such international activities affect the home country. While much research has explored the impact of trade liberalisation (like reducing tariffs on imports), the consequences of making it easier for companies to invest and produce abroad (outward Foreign Direct Investment, or FDI) are less understood.

The researchers focused on a specific event when the government of Taiwan unexpectedly permitted the production of 122 high-tech electronic products in China. The timing of the policy, followed by a surprising election win of the pro-independence party in year 2000, makes it a great case to study the causal effects of FDI liberalization. This policy change created a natural experiment, allowing the researchers to compare companies that produced these newly allowed products (the "treatment" group) with other electronic manufacturers that were not affected by this particular liberalisation (the "control" group).

To analyze the impact on firms, the study used detailed production data for Taiwanese electronic manufacturers in Taiwan and China from 1998 to 2007. They compared the investment activities and performance of the treatment and control firms before and after the 2001 policy change. To make sure they were comparing similar companies, they used statistical techniques to match firms based on their characteristics before the policy.

The findings show that the policy significantly increased the likelihood of Taiwanese investments in China, particularly in the same type of products the firms were already making in Taiwan. This suggests that companies were moving their core production activities to China after the liberalisation. For companies that already had investments in China, the policy led to increased employment and wage bills in their Chinese affiliates. Moreover, the evidence suggests a slight reduction in employment and wage bills per worker in the parent companies in Taiwan.

To understand the impact on workers in Taiwan, the researchers used Taiwanese administrative dataset that matched employees to their employers from 2001 to 2007. They compared the job market experiences of incumbent workers who were employed by the treatment firms with those employed by the control firms.

The study found that, on average, the FDI liberalisation policy had a negative effect on the domestic workers of the treatment firms. Specifically, workers in these firms experienced higher rates of job transitions and fewer years of employment with their initial company after the policy. They also earned less in total wages over the period of 2001-2007 compared to workers in the control group.

However, the impact was not the same for all workers. The study revealed a clear distinction based on initial wage levels. Workers from the treatment firms who were in the top 10% of the wage distribution in 2001 actually benefited from the policy, experiencing more job security and higher earnings relative to the workers from the control firms. These were likely higher-skilled workers in managerial or research positions. In contrast, workers in the middle and lower wage percentiles faced negative consequences, including more job changes, fewer years at their initial firm, and lower cumulative wages. The negative impact on employment was particularly noticeable in the number of years workers stayed with their initial employer.

The researchers also explored whether the impact differed by gender, finding that female workers, who were often overrepresented in lower wage brackets, experienced greater negative effects.

In conclusion, this study provides strong evidence that while liberalising outward FDI can lead to increased global production for firms, it can also have significant and uneven effects on domestic workers. The policy in Taiwan led to a redistribution of benefits, with higher-skilled, higher-paid workers potentially gaining from the increased profitability of their firms, while lower-skilled, lower-paid workers faced greater job insecurity and wage losses.

Firm and Labor Adjustments to FDI Liberalization*

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Abstract

This paper studies how liberalizing outward foreign direct investments (FDI) affects manufacturers' engagement in global production and their domestic workers' labor market outcomes. Focusing on a liberalization policy in 2001 by the government of Taiwan that allowed 122 electronic products to be produced in China, we estimate its effect on Taiwanese electronic manufacturers and their domestic workers. Employing a matched difference-in-differences strategy, we find that the manufacturers targeted by the policy were on average 14% more likely to invest in China relative to the non-targeted ones. Correspondingly, the domestic incumbent workers of the targeted manufacturers were on average more likely to change their jobs, stay employed for fewer years, and have lower wages in subsequent years relative to those employed by the non-targeted ones. The worker-level effects of the policy exhibited substantial heterogeneity across the initial wage distribution, with the top-decile workers benefiting and the other workers losing on average.

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1 Introduction

Foreign production activities by multinational enterprises (MNEs) play a crucial role in the global economy today. According to the OECD, the gross output of foreign affiliates increased from 7 to 20 trillion USD over 2000-2014, which accounted for 12% of global output overall (Cadestin et al., 2018). If the barrier to conducting foreign direct investments (FDI) gets lifted, how would the domestic manufacturers respond? What would happen to their workers in the home country? From a theoretical perspective, domestic manufacturers that are more productive could respond to such opportunities and set up foreign affiliates in order to utilize cheaper production factors abroad. However, the prediction regarding domestic workers is unclear: on the one hand, domestic workers could enjoy higher wages due to their employers' growth (Helpman, Itskhoki and Redding, 2010); on the other hand, they could be replaced by foreign workers if their employers shift production activities abroad. This paper examines these two questions empirically utilizing novel multinational production data and a liberalization policy in Taiwan that allows 122 electronic products to be produced in China.

To study the effect of outward FDI on firm and worker outcomes, two main challenges are present in the literature: data availability and identification. First, it is difficult to capture the extent of foreign production activities using home country data alone especially if the major purpose of the FDI is to access the host country market (i.e. horizontal FDI, as in Helpman, Melitz and Yeaple, 2004) or to export to the world market (i.e. export-platform FDI, as in Tintelnot, 2017). Even if firm production activities across locations are observed, the effect of FDI cannot be identified due to the endogenous nature of investment decisions. As theoretical papers on multinational production and FDI (Helpman, Melitz and Yeaple, 2004; Antràs and Yeaple, 2014) have already highlighted, firms self-select into FDI activities based on their unobserved productivity in the face of fixed entry costs. As a result, comparing outcomes of FDI firms versus non-FDI firms reflects not only the causal effect of conducting FDI activities that we seek to capture but also the unobserved productivity differences across firms. One ideal solution would be to randomly distribute licenses for firms to invest abroad, but it is probably not feasible in real life. A second-best solution then is to find a natural experiment that triggers some firms to conduct FDI but not others.

This paper deals with the challenge of data availability by utilizing novel data sources. At the firm level, we combine multiple data sources covering Taiwanese listed firms and their Chinese affiliates in the electronic manufacturing sector from 1998-2007. It contains balance-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, where China is the predominant destination for outward FDI. At the worker level, we draw on administrative matched employer-employee data in Taiwan to trace the domestic incumbent workers of the parent firms in our firm-level data over the sample period. These sources provide a complete picture of the multinational production activities and associated labor market outcomes for the electronic manufacturing sector in Taiwan.

Furthermore, this paper addresses the identification challenge by studying a rare policy change by the Taiwanese government in 2001 that permitted 122 electronic products to be produced in China. As we argue in detail in Section 2, this policy change is a great natural experiment, as its timing and content were exogenous from the perspective of Taiwanese electronic manufacturers at that time. In addition, during the studied period it significantly reduced the targeted firms' fixed costs to produce their products in China and thus increased their incentives to set up affiliates in China and shift their production there.

To estimate the causal effects of the policy change on firm investment behaviors, we employ a matched difference-in-differences (DID) strategy. We first define the "treatment firms" as the electronic manufacturers that produced products related to the 122 products before the policy change, then match these firms one-to-one with other electronic manufacturers that never produced these products before 2001 but nonetheless exhibited similar characteristics in 1998 (the "control firms"). Then we estimate a standard DID regression on investment outcomes in China controlling for the yearly Chinese and US import tariffs at the sector level. The key underlying assumption of this strategy is that the treatment firms would have followed the same investment trend as the control firms in the absence of the policy change.[1] We find a quantitatively sizable and statistically significant response from

[1]The parallel trends assumption is supported by our event study estimates, as no significant pre-trends are detected. We further conduct a sensitivity analysis following Rambachan and Roth (2023) as a robustness check.

the electronic manufacturers. At the extensive margin, the treatment firms were on average 14% more likely to start investing in China relative to the control firms. At the intensive margin, the treatment firms tended to hire more workers in China and fewer in Taiwan, paid higher wage bill per worker in China and lower in Taiwan, and enjoyed higher total and export sales in both locations.

Following the firm-level results, we then shift our attention to worker-level responses. In particular, we examine how home country workers employed by the treatment and control firms in 2001 (i.e. the "treated" and "untreated" workers) differed by their labor market outcomes in subsequent years after the policy change. The treated workers experienced significantly higher job transition rates after 2001 relative to the untreated workers. They also tended to stay employed for fewer years and accumulated slightly lower wages on average, but these effects were not statistically significant. Nonetheless, we find that treated workers in the top decile of the wage distribution in 2001 enjoyed significantly better outcomes, while the negative effects were mainly found in the treated workers around the median of the distribution (25th-75th percentile in 2001). Overall, the worker-level results indicate a negative effect of the liberalization policy on average with a clear distributional implication: the effect of FDI liberalization was positive for the workers in the top wage decile, who were likely more educated and on the managerial or research positions, but it was negative for the rest, who were likely to mostly be workers on the production line.

Our study contributes to two main strands of research in trade and globalization. The first one is about globalization and firm internal organizations. Many papers have found that global engagements of firms, either through imports, exports, or FDI, lead to more employment of domestic high-skilled workers and less employment of low-skilled workers (Burstein and Vogel, 2017; Hsieh and Woo, 2005; Hur, Yoon and Ahn, 2019; Bernard and Jensen, 1997; Menezes-Filho and Muendler, 2011; Tsou et al., 2013; Alviarez et al., 2022). Most of the papers do not observe the production activities abroad and could not study the intensive margin of FDI activities. In addition, most of them do not have good exogenous variations to identify the firm investment responses. Some recent exceptions include Alviarez et al. (2022), which exploits an inward FDI policy change in China that affects the set of

"encouraged" FDI industries and study its impact on structural transformation in Japan, and Branstetter et al. (2021), which focuses on the same policy in Taiwan as our paper and finds that outward FDI into China actually decreases overall innovation levels. Our paper complements their findings by utilizing an FDI liberalization episode in Taiwan that creates *within-industry* variation in FDI activities to explore firm investment responses and the labor market effect for domestic incumbent workers.

We also contribute to another strand of literature on globalization and domestic labor market outcomes. Consistent results across developing and developed countries have shown that regions (Topalova, 2010; Autor, Dorn and Hanson, 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 declining employment and lower wages in subsequent years. Most of these liberalization episodes are due to either 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 the extensive studies on trade liberalization, the liberalization of outward FDI is less covered in the literature. This paper fills in the gap by studying an FDI liberalization episode and confirms the large redistributive impact of such policy change on domestic workers.

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 data. Section 3 describes our empirical strategy and summarizes our firm and worker samples. Section 4 and Section 5 present the results of firm and worker responses to the liberalization policy respectively. Lastly, Section 6 concludes.

2 Background and Data

2.1 Background on FDI Liberalization in Taiwan

Taiwanese investments in China began under strict regulations in the 1990s. Initially, the Taiwanese government was cautious about investments in China following its economic reforms due to the cross-strait political tensions. While outsourcing to China was not actively encouraged, it was also not entirely prohibited during this period. After Taiwan abolished foreign exchange controls in 1987, manufacturers sought to capitalize on China's lower labor costs and market proximity, leading to gradual but targeted investments. Prior to 2001, Taiwanese FDI in China predominantly targeted labor-intensive and export-oriented industries such as textiles, toys, plastic and rubber products, and home electronics (Zhang, 2005). Among these, home electronics are particularly relevant to our study. Furthermore, Hsu and Liu (2004) highlighted that electronic parts and components emerged as a key focus of Taiwanese FDI in China during the 1990s.

As Taiwan's economic structure evolved alongside the growth of the global electronics industry, production shifted from low-value-added activities, such as radio and television assembly, to higher-value products like laptops, communication devices, and basic integrated circuits (ICs). However, this transformation raised concerns about Taiwan's increasing reliance on China, particularly in outsourcing high-tech manufacturing. In 1996, Taiwanese President Lee Teng-Hui announced a series of regulations termed "no haste, be patient" aimed at mitigating economic risks associated with cross-strait tensions. The policy implemented stringent regulations to protect industries critical to high technology and basic infrastructure. Key measures included prohibiting the production of 314 products in China, capping single investment projects at 50 million USD, and limiting total firm-level investment in China to no more than 40% of a company's net worth. These restrictions curbed Taiwanese FDI in China's electronics manufacturing sector throughout the late 1990s.

However, the landscape began to shift in the early 2000s. Trade liberalization surged following the establishment of the World Trade Organization (WTO) in 1995, and offshoring

accelerated, with low-cost destinations like China, India, and Southeast Asia emerging as critical players in global supply chains. Taiwanese businesses faced mounting pressure to adapt, as competitors from other countries capitalized on China's low labor costs and its expanding role in global trade. In this context, Taiwan's restrictive FDI policies risked undermining the competitiveness of its export-oriented industries, particularly in electronics.

The conflict between Taiwan's economic interests and its political concerns over dependency on China set the stage for the policy of interest, making it inevitable for the Taiwanese administration to strike a balance between these competing priorities. However, as this was the government's first step toward trade liberalization, the selection of products to be liberalized was plausibly exogenous to firms, especially given that the political party responsible for ending the prohibition came to power unexpectedly.

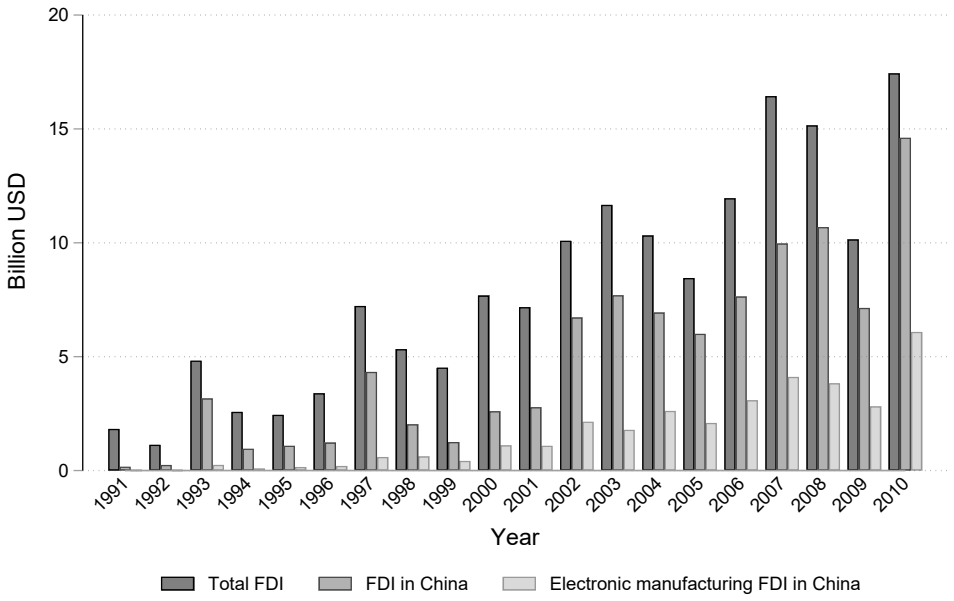
In 2000, Chen Shui-Bian, the leader of the long-time opposition of the Democratic Progressive Party (DPP), narrowly won the Taiwanese presidential election, marking a significant political transition. His victory ended more than half a century of Kuomintang (KMT) rule on the island. Historically known for its cautious stance toward China, the DPP faced the challenge of balancing its political ideology with mounting business interests and legislative pressures. To address these concerns, the new administration introduced the policy framework "active opening, effective management," signaling a moderated approach to cross-strait economic relations. Under this policy, 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.[2] In Figure 1, we can see that the outward FDI amount into China substantially increased after 2001, with a major proportion coming from the electronic manufacturing industry.

This 2001 policy change provides an excellent natural experiment for studying the impact of FDI liberalization. First, by allowing only a subset of high-tech products to be produced in China, the policy created a clear treatment group (newly approved products) and control group, facilitating robust comparative analysis. Second, the policy was implemented follow-

[2]The complete list of products is provided in Appendix A.

ing the DPP's unexpected presidential victory, a political transition that was expected to be associated with a cautious stance toward China. This context suggests that the policy was unlikely to be a strategic response to specific firm-level lobbying. For these reasons, the policy change can be considered plausibly exogenous from the perspective of Taiwanese electronic manufacturers. However, some contemporaneous events could potentially confound the effects of the policy. These confounding factors are addressed in the following section.

Figure 1: Taiwanese yearly outward FDI (Billion USD)



NOTE: This figure illustrates Taiwanese outward FDI over 1991-2010, which further breaks down into total investment activities in China and electronic manufacturing activities in China. The statistics are downloaded from the Department of Investment Review, Ministry of Economic Affairs (MOEA) in Taiwan.

2.2 Contemporaneous Events

Around year 2000, three additional major events could affect the incentive for Taiwanese firms to invest in China: (i) Taiwan and China officially joined the WTO, (ii) the United States granted Permanent Normal Trade Relations (PNTR) status to China in October 2000, and (iii) China revised its Catalogue for the Guidance of Foreign Investment Industries in

2002. We briefly provide the background of these three events, and explain why they should not influence the Taiwanese electronic manufacturers differently.

First, although Taiwan and China officially joined the WTO around 2001, the accession process began much earlier and was broadly anticipated. For China, WTO accession marked a key milestone in its "Reform and Opening Up" strategy, and the commitments made during the 15-year negotiation were well-publicized (Branstetter and Lardy, 2008). For Taiwan, joining the WTO was seen as a diplomatic success (Copper, 2019), with efforts beginning in 1992 following its application to the General Agreement on Tariffs and Trade (GATT). Between 1992 and 2001, Taiwan engaged in 11 formal meetings with member states and representatives as part of its accession process. Key milestones including Taiwan's GATT application in 1995, the conclusion of bilateral trade negotiations by 2001, and its WTO membership in January 2002 (World Trade Organization, 2002). Thus, both Taiwan's and China's WTO accessions were long expected and unlikely to affect Taiwanese electronic manufacturers in fundamentally different ways.

Second, the US granted PNTR status to China in October 2000, which came into effect at the end of 2001. This change, as noted by Pierce and Schott (2016), did not significantly alter US tariffs on Chinese goods. Instead, it mainly reduced uncertainty by eliminating the need for an annual renewal of China's "Normal Trade Relations" (NTR) status. If any resulting tariff reductions varied by firms' treatment status of Taiwan's FDI liberalization policy, they could confound the estimated treatment effects in our firm-level analysis. To address this concern, we directly control yearly Chinese import tariffs (on exports from Taiwan) and US import tariffs (on exports from China) in the empirical specifications.

Lastly, China revised its Catalogue for the Guidance of Foreign Investment Industries in 2002, classifying industries as "encouraged," "restricted," or "prohibited." Following the "Reform and Opening Up" policy, China issued the Catalogue for the Guidance of Foreign Investment Industries in 1995. In the Catalogue, industries are classified as "encouraged", "restricted", and "prohibited". Industries in the "encouraged" category were eligible for various incentive measures, including tariff and value-added tax exemptions within a quota, as well as simplified approval procedures, making them particularly attractive to foreign

investors. The electronics manufacturing sector, which is the focus of our study, was classified as "encouraged" from the initial version of the Catalogue in 1995.

As released in the State Council of the People's Republic of China Gazette, the principle of categorizing industries was to promote technological innovation and accelerate the upgrading of domestic industries in China. Clearly, there was a conflict of interest between China and Taiwan in terms of regulating investments. While the Taiwanese government aimed to retain industries with higher comparative advantage from outsourcing, the Chinese government welcomed high-tech industries such as the semiconductor industry to invest in the mainland.

We observe that the electronic manufacturing sector as a whole falls into the "encouraged" category in the initial version of the Catalogue in 1995. During our sample period (1998-2007), the direction of revisions has been towards further opening up, and the electronic products listed in the initial version remain encouraged. Therefore, the treatment and control firms were not impacted differently by the 2002 revision of the Catalogue.

2.3 Firm-level Dataset

Focusing on Taiwanese electronic manufacturers who were the target of the 2001 policy, we recorded their production activities from 1998-2007 utilizing two main sources. Their production activities in Taiwan were collected from the Taiwan Economic Journal (TEJ) database, which contains balanced-sheet information for all publicly listed companies in Taiwan (equivalent to the Compustat data in the US); on the other hand, their production activities in China were provided by the Chinese Annual Survey of Industrial Firms (ASIF), which surveys state and non-state firms above 5 million RMB in annual sales (Brandt, Biesebroeck and Zhang, 2014). We have 533 Taiwanese electronic manufacturers in total. Before the policy change in 2001, each firm on average had 1.25 affiliates in China, employed 473 workers in Taiwan and 851 workers in China, paid annually 5.2K USD per worker in Taiwan and 1.4K USD per worker in China, and recorded annual sales of 54K USD in Taiwan and 49K USD in China.

2.4 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 FIA dataset. For the purpose of this paper, we restrict our focus to wage incomes. All workers that receive wage incomes from a registered firm will be included in our analysis. If the workers become self-employed after leaving the initial firm, we can track their income if the newly established business is registered at the National Taxation Bureau. Otherwise, they will be considered unemployed.

Some features of the FIA data are worth noting. 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, the basic demographic information of workers is also available, e.g. age, gender, and marital status of each worker. Despite its advantages, the FIA data do 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 that we cannot accurately determine the skill level of workers.

3 Empirical Strategy

As introduced in Section 2, the policy in 2001 lowered the barrier for Taiwanese electronic manufacturers to conduct FDI in China. Our goal is to exploit this unforeseen liberalization policy 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-sectional regression approach for the worker-level analysis. In the rest of the section, we explain the empirical approach in detail and then present the summary statistics of the firm and worker samples respectively.

3.1 Conceptual Framework

Based on the 122 high-tech products permitted to be produced in China in 2001, we can categorize Taiwanese electronic manufacturers into treatment and control groups based on whether their products fall into the product list (see Appendix A for the list of permitted products). To better clarify the nature of Taiwan's FDI in China before and after the 2001 policy change, we can further categorize the control firms into three subgroups: "always allowed", "always prohibited", and semiconductor firms. This classification was based on a list of prohibited products released by the Taiwanese government in 2001, which identified 97 products that remained restricted by FDI in China (see Appendix D for the list of prohibited products). These prohibited products include specific chemical compounds, pharmaceuticals, items for military use, and most notably, products in the semiconductor sector, where Taiwan holds a significant comparative advantage.

Using the two product lists, we established the three subgroups of controlled firms as follows: (i) firms that did not produce products related to prohibited items between 1998 and 2000 (classified as "always allowed" firms), (ii) firms that produced products related to the prohibited items during the same period (classified as "always prohibited" firms), and (iii) the semiconductor manufacturers, which is a subset of the second group. Conceptually (see Table 1), the treatment firms experienced a reduction in investment costs after the 2001

policy change, while the costs remained low for the control firms in group (i) and remained high for group (ii) and group (iii).

Table 1: Conceptual framework

Investment cost in China	Treatment firm	Control firm		
		Always allowed	Always prohibited	Semiconductor
Before policy change	High	Low	High	High
After policy change	Low	Low	High	High

3.2 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. We make a distinction between the last two outcomes to specify whether the outward FDI into China is directly related to the Taiwanese electronic manufacturers' core production activities rather than other purposes, e.g. marketing or retail. 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 employment, wage bill 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, which had been producing products related to the 122 permitted product categories before the policy change as the "treatment firms" and the other electronic manufacturers, which had never done so, as the "control firms". The key identification assumption here is the parallel trends of firm outcomes, the validity of which will be examined in Section 4.

The classification procedure for the electronic manufacturers is 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 with 190 treatment firms and 343 control firms, with the main outcomes over 1998-2000 summarized in Table 2. 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 observable characteristics across the treatment and control firms.

Table 2: Summary statistics of the full firm sample over 1998-2000

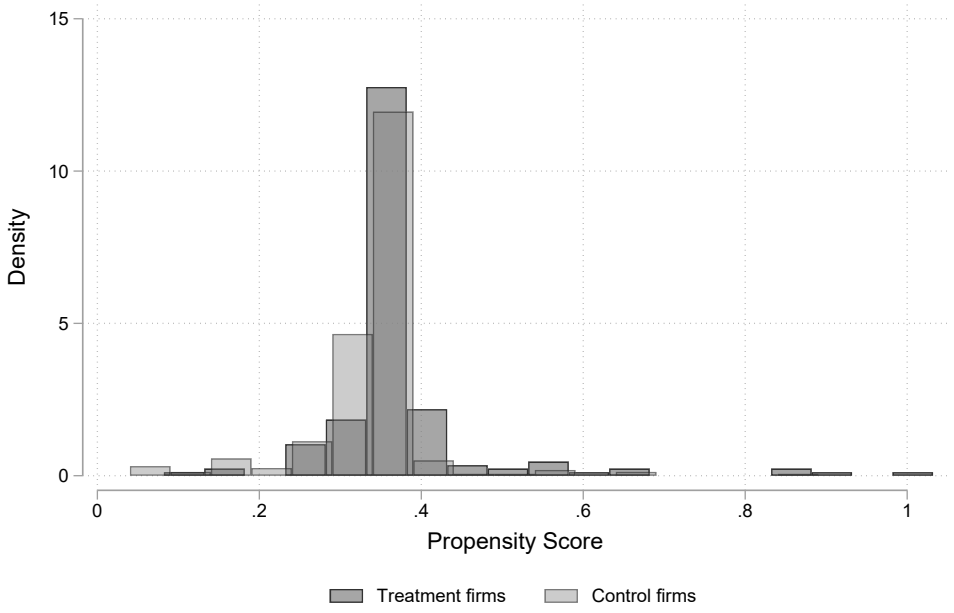
	All	Treatment firm	Control firm	T statistics
CN FDI	0.33	0.39	0.29	(2.61)**
CN FDI SIC3	0.06	0.09	0.04	(3.41)***
No. of affiliates in CN	1.25	1.28	1.23	(0.51)
Parent employment	472.64	474.15	471.78	(0.03)
Parent wage bill per worker	5.22	5.61	5.01	(0.60)
Parent total sales	53.67	71.89	43.30	(1.99)*
Parent export sales	39.47	58.44	28.68	(2.28)*
Affiliate employment	851.17	866.23	837.98	(0.09)
Affiliate wage bill per worker	1.43	1.53	1.35	(0.32)
Affiliate total sales	49.29	67.94	32.97	(1.20)
Affiliate export sales	34.41	43.65	26.32	(1.00)
Number of firms	533	190	343	

NOTE: This table shows the summary statistics of the full firm sample. "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 three-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. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.3 Matching Procedure and Summary of Matched Firm Sample

To ensure that the control firms serve as a suitable counterfactual group for the treatment firms in the absence of the liberalization policy, we conduct one-to-one propensity score matching to obtain a firm sample that is balanced along pre-policy observable characteristics. Specifically, we match on parent firm characteristics over 1998-2000, including the number of workers, wage bill per worker, total sales, and export sales. We avoid matching on investment outcomes in China intentionally, as they are the main outcomes of interest. The propensity scores, i.e. predicted probabilities of being treated, are illustrated in Figure 2. The common support assumption seems plausible, as the treatment and control firms share overlapping support and have similar distributions.

Figure 2: Propensity scores for the treatment and control firms



The resulting matched sample is summarized for the years 1998-2000 in Table 3. It consists of 174 treatment and control firms each, and the outcomes are now balanced between the two groups, unlike the full sample in Table 2. The percentages of treatment and control firms conducting outward FDI into China are plotted in Figure 3a and Figure 3b. A common

rising trend of outward FDI into China exists for both groups, but it is noticeably higher for the treatment firms that conducted FDI in the same three-digit industry in China after the policy change in 2001. Our matching procedure seems to have achieved a well-balanced sample, as is reflected in the parallel trend before 2001. To address concerns of trade liberalization episodes around this period and firm size differences between the two groups, we control for Chinese and US yearly import tariffs as well as the parent pre-2001 firm-size decile group that interacts with the post-2001 dummy in the firm-level analysis below. Furthermore, we also use the kernel matching method to construct another firm sample for robustness checks to ensure the robustness of our results to different matching methods.

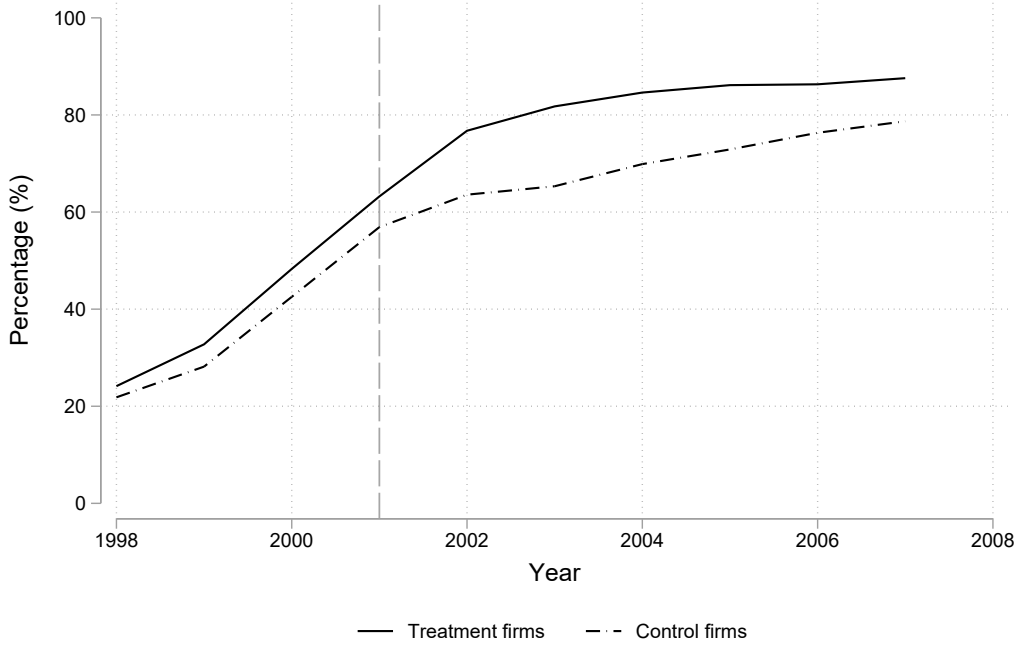
Table 3: Summary statistics of the matched firm sample over 1998-2000

	All	Treatment firm	Control firm	T statistics
CN FDI	0.33	0.35	0.31	(0.96)
CN FDI SIC3	0.03	0.04	0.02	(1.65)
No. of affiliates	1.22	1.28	1.14	(1.36)
Parent employment	394.73	440.70	348.76	(1.26)
Parent wage bill per worker	4.68	5.19	4.17	(0.95)
Parent total sales	51.82	64.14	39.49	(1.85)
Parent export sales	39.96	51.51	28.41	(1.89)
Affiliate employment	770.16	764.50	779.16	(0.05)
Affiliate wage bill per worker	1.36	1.35	1.38	(0.05)
Affiliate total sales	51.99	53.08	50.25	(0.07)
Affiliate export sales	32.61	28.94	38.44	(0.38)
Number of firms	348	174	174	

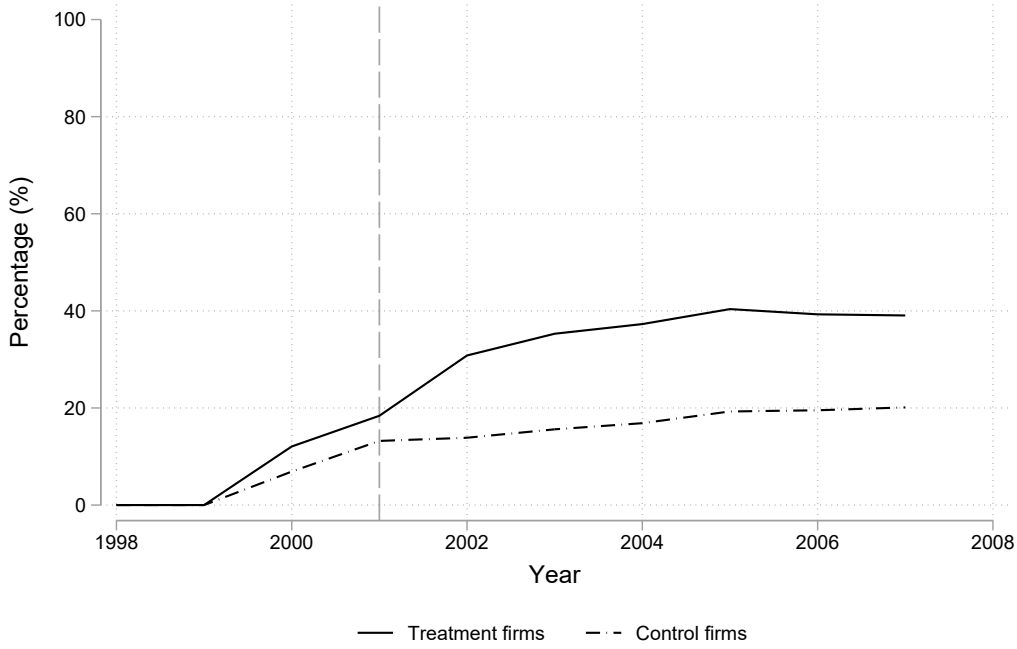
NOTE: This table shows the summary statistics for the firm sample constructed via one-to-one propensity score matching. "CN FDI" is an indicator of whether a Taiwanese electronic manufacturer conducted FDI in China during the studied period. "CN FDI SIC3" is an indicator of whether a Taiwanese electronic manufacturer conducted FDI in China in the same three-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. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 3: Percentage of FDI in China for treatment and control firms over 1998-2007

(a) Conducting FDI in China



(b) Conducting FDI in the same industry in China



NOTE: The figures show the percentages of treatment and control firms investing in China over 1998-2007. The firm sample is obtained via one-to-one propensity score matching.

3.4 Research Design for the Worker-level Analysis

To understand how the liberalization policy affected the local workers in Taiwan, a natural approach would be to follow the same strategy as the firm-level analysis and conduct a difference-in-differences analysis for the worker sample. Unfortunately, the FIA-matched employer-employee dataset only starts from 2001 (when the policy change happened), so the DID approach is not feasible. Instead, we opt for an approach similar to Autor et al. (2014) by following the incumbent workers' cumulative outcomes from 2001 onward.

The incumbent workers are assigned to treatment and control groups analogously to the firm sample. Specifically, the Taiwanese workers employed by the treatment firms in 2001 are defined as the "treated workers", and those employed by the control firms in 2001 are defined as the "untreated workers". We then compare their cumulative outcomes over 2001-2007 conditional on worker characteristics in 2001, including their age, gender, and marital status, as well as the industry fixed effect of their initial employer. The outcomes of interest are individual outcomes that evaluate their job security and earnings in the labor market, including whether a worker switches jobs, whether he or she is employed, and their wages received in a given year. The key identification assumption here is the conditional independence assumption, which is discussed in detail in Section 5.

Conceptually, the liberalization policy could have first- and second-order effects on the incumbent workers. First of all, the policy lowers the treatment firms' cost of investing in China and shifting their production activities. It would then affect the treated workers directly through higher job losses or lower wages due to decreasing labor demand in Taiwan, leading to fewer years employed and fewer wages accumulated in the initial firm. On the other hand, the policy may also have a second-order effect on workers separated from their initial employers, as being laid off could have adverse effects on re-employment probabilities in the future.

To distinguish the first-order effect from the second-order effect, we further decompose the employment status into four mutually exclusive outcomes: employment years in the initial firm, years outside the initial firm and same industry, years outside the initial firm

and different industries, and years unemployed. Similarly, cumulative wages are decomposed into wages earned in the initial firm, wages earned in the initial industry, and wages earned in different industries. Since the first-order effect is expected to be larger, the negative effect of the policy should be more salient, both on workers' employment years and their wages earned from the initial firm.

3.5 Summary of the Worker Sample

The average characteristics of the worker sample are presented in Table 4. Out of the 348 electronic manufacturers in the one-to-one matched firm sample, we are able to identify 304 of them in the FIA dataset (148 treatment firms and 156 control firms) and collect data for 111,426 workers who worked full time in those firms in 2001 and were within the age range of 22-65 over 2001-2007. The summary statistics indicate a large transition out of the original firms in subsequent years. 61% of the workers left their original firms by 2007, and the numbers for the treated and untreated workers are 68% and 54% respectively. The mean yearly wages of the treated workers were similar to that of the untreated workers at around 18K USD in 2001, but then it became significantly lower by 1.4K USD in 2007. The high separating rate and negative wage effect observed in the summary statistics are consistent with our empirical results in Section 5.

To investigate the heterogeneous treatment effect by initial wage levels, five wage groups are defined based on wage percentiles of the workers in 2001 and summarized in Table 5. In 2001, the average annual wages were 51K USD for workers in the top decile and 8K USD for workers in the bottom quartile. In 2007, the average yearly wages were 56K USD for workers in the top decile and 10K USD for workers in the bottom quartile.

Table 4: Summary statistics of the worker samples

	All	Treated worker	Untreated worker	T statistics
Male (%)	53.5	54.2	52.7	(4.75)***
Age in 2001	32.4	32.7	32.0	(17.30)***
Wage in 2001	17.6	17.7	17.6	(0.97)
Wage in 2007	19.5	18.9	20.3	(8.74)***
Left initial firm by 2007 (%)	61.4	67.7	53.7	(48.11)***
Number of workers	111,426	61,468	49,958	

NOTE: The treated workers are workers employed by the treatment firms in 2001. The untreated workers are workers employed by the control firms in 2001. The unit of wages is 1,000 USD. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Summary statistics of mean wages by worker group

Group	Percentile in 2001	No. of workers	Wage in 2001	Wage in 2007
1	<p25	27,857	7.8	10.0
2	p25-p50	27,856	11.1	12.4
3	p50-p75	27,857	15.1	18.7
4	p75-p90	16,714	22.6	29.6
5	>p90	11,142	51.4	56.1

NOTE: The unit of wages is 1,000 USD.

4 Firm-level Responses to the Liberalization Policy

With the firm sample obtained via the matching procedure outlined in Section 3.3, we now present how Taiwanese electronic manufacturers responded to the liberalization policy in 2001. In the following, we first lay out the empirical specifications and identification assumption, then present the empirical results for extensive and intensive outcomes.

4.1 Empirical Specification

To estimate the effect of the liberalization policy on firm investment behavior, we compare Taiwanese electronic manufacturers 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 following difference-in-differences (DID) and event-study specifications:

$$Y_{jkt} = \alpha_0 + \alpha_1 Post_t \times Treatment_j + \tau_{kt}^{CN} + \tau_{kt}^{US} + X_{jkt} + \epsilon_{jkt} \tag{1}$$

$$Y_{jkt} = \alpha_0 + \sum_{t'=1998}^{2007} \alpha_{t'} \, Year_{t'} \times Treatment_j + \tau_{kt}^{CN} + \tau_{kt}^{US} + X_{jkt} + \epsilon_{jkt} \tag{2}$$

where j indexes firm, k indexes industry, and t indexes year ($t \in [1998, 2007]$). Y_{jkt} indicates the yearly firm outcome, $Post_t$ is an indicator of year t after 2001. $Treatment_j$ equals one for the treatment firms and zero for the control firms. τ_{kt}^{CN} and τ_{kt}^{US} are average Chinese and US import tariffs at the sector-year level from the World Integrated Trade Solution (WITS). X_{jkt} includes firm, year, and firm-size-decile-post fixed effects. Error terms ϵ_{jkt} are clustered at the three-digit industry level of the parent firms. The parameters of interest are α_1 in Equation (1) and $\{\alpha_{t'}\}$ in Equation (2).

4.2 Identification Assumption

For the parameters of interest to have a causal interpretation, the parallel trends assumption needs to hold; in other words, the treatment firms should follow the same time trend as the

control firms in the absence of the policy conditional on yearly tariff levels and pre-policy firm sizes. Under this assumption, α_1 and $\{\alpha_{t'}\}$ can be interpreted as the overall and period-specific average treatment effects on the treated (ATT) for the liberalization policy.[3]

We assert that the parallel trends assumption is valid for the following reasons. First, the matching procedure outlined in Section 3 ensures similarity across observable characteristics between the treatment and control firms before the policy change. As the firms are similar ex-ante, it is plausible that the treatment firms would have exhibited the same time trend as the control firms if the policy change had not happened. As shown later in Figure 4, no pre-trend is spotted in the event study graphs. Second, our focus on the electronic manufacturers and the sole distinction by their products produced warrant that other major events during this time (e.g. Taiwan's accession to the WTO in 2001) would not affect the treatment and control firms differently.

With a recent method developed by Rambachan and Roth (2023), we can also allow for linear and non-linear time trends and examine to what extent our results would be affected. This sensitivity analysis is conducted in Section 4.5.2 following the firm-level results.

4.3 Extensive Margin Outcomes

We first look at the extensive margin outcomes, including whether firms exit the market, conduct FDI in China, and conduct FDI in the same or different three-digit industry in China. The corresponding DID estimates for Equation (1) are presented in Table 6. In column (1), 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 were on average 9% more likely to invest in China in column (2). In particular, the treatment firms were on average 14% more likely to invest in the *same* three-digit industry in column (3); this magnitude is six times bigger than the mean of the control firms before 2001. This result is consistent with the argument that the liberalization policy drove the firms that had produced related products to start investing in China and producing those related products after the

[3]In the event-study graphs below, $\{\alpha_{t'}\}$ are adjusted with respect to the one before the policy, i.e. α_{2000}.

policy change. Lastly, column (4) shows that the treatment firms did not invest more in other three-digit sectors than the control firms. The event study graphs following Equation (2) in Figure 4 convey a similar message, where higher propensities to invest in China, particularly in the same industry after 2001, are observed for the treatment firms.

Table 6: Effect of the liberalization policy on firm extensive margin outcomes

	(1) Exit	(2) CN FDI	(3) CN FDI SIC3	(4) CN FDI NOT SIC3
Treatment*Post	0.002	0.094**	0.141**	-0.047
	(0.005)	(0.033)	(0.061)	(0.064)
CN Import Tariffs	-0.001	-0.010	-0.021***	0.011**
	(0.001)	(0.008)	(0.006)	(0.005)
US Import Tariffs	-0.001	-0.011	-0.070	0.059
	(0.025)	(0.057)	(0.062)	(0.102)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Size*Post FE	Yes	Yes	Yes	Yes
Pre-policy control mean	0.000	0.308	0.023	0.285
Observations	3480	3480	3480	3480

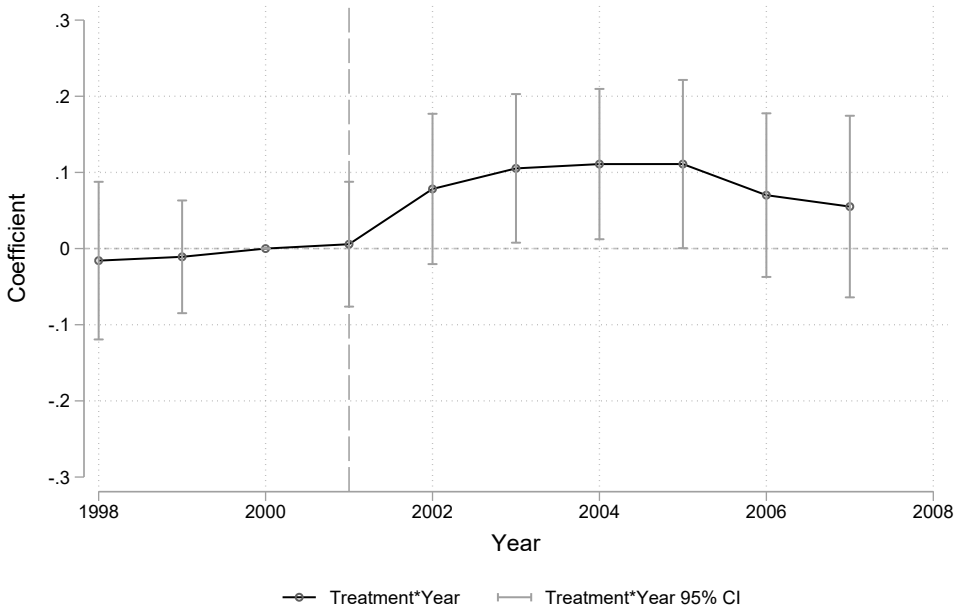
NOTE: This table shows the DID estimates α_1 in Equation (1) for firm extensive margin outcomes. Exit is an indicator of a firm that exists in the data in the previous year but disappears in the current year. CN FDI indicates a firm investing in China in a given year. CNFDI (NOT) SIC3 indicates a firm investing in China in the same (different) three-digit industry as the parent firm in a given year. Pre-policy control mean is the mean outcome for the control firms over 1998-2000. Standard errors are clustered at the three-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.4 Intensive Margin Outcomes

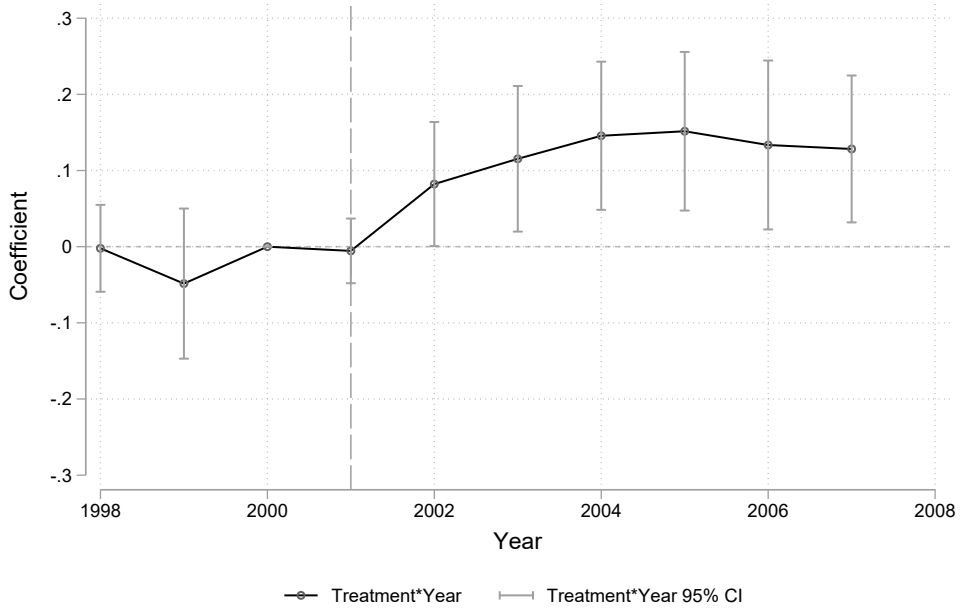
To understand how firms responded to the policy at the intensive margin, we restrict our sample to the firms with positive investments in China throughout the sample period (1998-2007) and study their outcomes including employment, wage bill per worker, total sales, and export sales for both the parent firms in Taiwan and their affiliates in China. The DID

Figure 4: Event study graph for firm extensive margin outcomes

(a) Conducting FDI in China



(b) Conducting FDI in the same industry in China



NOTE: The figures illustrate the event-study estimates $\{\alpha_{t'}\}$ in Equation (2). The point estimates are adjusted with respect to one year before the policy change, such that α_{2000} equals zero.

estimates for all outcomes in level with the pre-policy mean for the control firms are presented in Table 7. Despite lower statistical power due to fewer observations, the DID estimates for the parent firms show that on average, the treatment firms in Taiwan decreased their hiring and wage bill per worker by 65% and 57% relative to the control firms, while their affiliates in China nearly doubled their hiring and also raised the wage bill (although this did not reach statistical significance) relative to the counterparts. For the production outcomes, the treatment firms enjoyed a sizable increase in sales for both the parent and affiliate branches; in particular, export sales of the affiliates increased nearly nine-fold relative to the control mean, echoing the export-oriented feature of the new outward FDI induced by the policy.

Table 7: Effect of the liberalization policy on firm intensive margin outcomes

(a) Parent firms in Taiwan

	(1) Employment	(2) Wage bill per worker	(3) Total sales	(4) Export sales
Treatment*Post	-767.4	-8.8	659.3*	716.2**
	(544.7)	(7.8)	(302.7)	(283.2)
CN Import Tariffs	-7.5	0.0	-14.3	-10.7
	(23.3)	(0.2)	(14.8)	(12.7)
US Import Tariffs	1.1	0.8	-155.0	-148.7
	(246.1)	(3.2)	(138.2)	(127.9)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Size*Post FE	Yes	Yes	Yes	Yes
Pre-policy control mean	934.8	12.4	87.9	70.9
Observations	298	298	298	298

(b) Affiliate firms in China

	(1) Employment	(2) Wage bill per worker	(3) Total sales	(4) Export sales
Treatment*Post	1587.0*	3.0	609.1*	574.4*
	(823.3)	(3.6)	(284.6)	(298.3)
CN Import Tariffs	64.4	0.6	17.0**	13.8*
	(123.8)	(0.6)	(6.9)	(6.8)
US Import Tariffs	1627.4	12.6	25.2	17.7
	(1030.4)	(9.0)	(104.8)	(96.6)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Size*Post FE	Yes	Yes	Yes	Yes
Pre-policy control mean	988.7	1.5	52.7	42.3
Observations	298	298	298	298

NOTE: This table shows the DID estimates α_1 in Equation (1) for firm intensive margin outcomes. The sample is restricted to firms which have investments in China throughout the sample period (1998-2007). Firms that report missing values on the outcomes of interest are also excluded. Standard errors are clustered at the three-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.5 Robustness of Firm-level Responses

4.5.1 Robustness to Alternative Matching Method

To test the robustness of our estimates of the firm-level response to the liberalization policy, we first conduct the same analysis on an alternative firm sample obtained via the kernel matching method. The summary of the kernel matching sample is in Table 18 of Appendix C. The results analogous to Tables 6 and 7 using the kernel matching sample are provided in Tables 8 and 9. The estimates for the extensive margin outcomes align reasonably well; in particular, the DID estimate for investing in the same three-digit industry in China is also close to 14%. For the intensive margin outcomes, the estimates from the kernel matching sample reflect a consistent story: the treatment firms tend to reduce their employment and pay a smaller wage bill in Taiwan while raising their hiring and wage bill in China.

Table 8: Robustness check: Firm extensive margin outcomes (kernel-matching sample)

	(1) Exit	(2) CNFDI	(3) CNFDI SIC3	(4) CNFDI NOT SIC3
Treatment*Post	0.001	0.040	0.146**	-0.106
	(0.004)	(0.028)	(0.064)	(0.065)
CN Import Tariffs	-0.001**	-0.005	-0.018***	0.013***
	(0.001)	(0.007)	(0.005)	(0.004)
US Import Tariffs	0.005	-0.016	-0.069	0.053
	(0.022)	(0.057)	(0.059)	(0.098)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Size*Post FE	Yes	Yes	Yes	Yes
Pre-policy control mean	0.000	0.279	0.022	0.257
Observations	4960	4960	4960	4960

NOTE: This table shows the DID estimates α_1 in Equation (1) for firm extensive margin outcomes. Exit is an indicator of a firm that exists in the data in the previous year but disappears in the current year. CN FDI indicates a firm investing in China in a given year. CNFDI (NOT) SIC3 indicates a firm investing in China in the same (different) three-digit industry as the parent firm in a given year. Pre-policy control mean is the mean outcome for the control firms over 1998-2000. Standard errors are clustered at the three-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Robustness check: Firm intensive margin outcomes (kernel-matching sample)

(a) Parent firms in Taiwan

	(1) Employment	(2) Wage bill per worker	(3) Total sales	(4) Export sales
Treatment*Post	-497.0	-5.5	519.3*	555.9**
	(346.8)	(4.3)	(248.6)	(236.0)
CN Import Tariffs	7.4	0.2	-17.1	-15.2
	(12.1)	(0.1)	(17.4)	(16.3)
US Import Tariffs	-59.9	-0.3	-55.8	-46.8
	(146.3)	(1.9)	(89.9)	(82.5)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Size*Post FE	Yes	Yes	Yes	Yes
Pre-policy control mean	696.7	8.6	55.0	40.2
Observations	456	456	456	456

(b) Affiliate firms in China

	(1) Employment	(2) Wage bill per worker	(3) Total sales	(4) Export sales
Treatment*Post	2162.6**	5.0*	533.8*	511.5*
	(682.7)	(2.4)	(248.7)	(257.5)
CN Import Tariffs	50.8	0.5	5.4	3.5
	(101.9)	(0.4)	(8.8)	(7.7)
US Import Tariffs	1401.8	11.2	61.9	56.5
	(1034.9)	(9.1)	(63.8)	(51.6)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Size*Post FE	Yes	Yes	Yes	Yes
Pre-policy control mean	780.6	1.3	32.3	26.1
Observations	456	456	456	456

NOTE: This table shows the DID estimates α_1 in Equation (1) for firm intensive margin outcomes. The sample is restricted to firms that have investments in China throughout the sample period (1998-2007). Firms that report missing values in the outcome of interest are also excluded. Standard errors are clustered at the three-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.5.2 Robustness to Relaxing Parallel Trends Assumption

The key identifying assumption of the DID and event-study estimates is the parallel trends assumption, i.e. the treatment firms would have followed the same time trend as the control firms if the policy change in 2001 had not happened. Although we could never directly test this assumption, it is not likely to hold if there is a significant pre-trend before the policy change takes place. For example, if we saw that the treatment firms already have a higher tendency to invest in China relative to the control firms before 2001, then it is hardly believable that the two groups would behave the same in the absence of the policy. As shown in Figure 4, there are no significant pre-trends associated with the two investment outcomes.

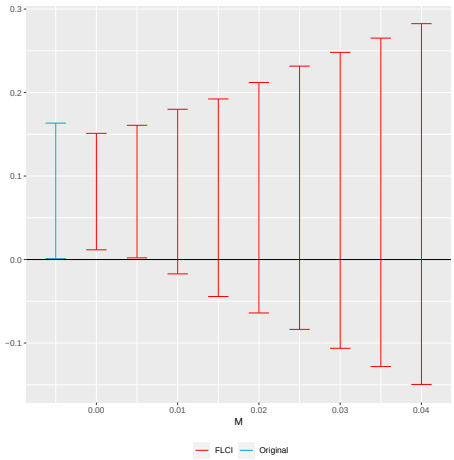
To provide a stricter examination, we conduct a sensitivity analysis using the *HonestDiD* package developed by Rambachan and Roth (2023). The main idea of this method is to relax the parallel trends assumption and allow for post-treatment differences in trends that are "close" to the estimated pre-trend, in linear or non-linear fashions. We apply the method to examine each event-study estimate after 2001 in Equation (2), i.e. $\{\alpha_t\}$. The results are shown in Figure 5. The coefficients in blue are the original estimates, and those in red are the estimated confidence sets allowing for trends, with M indicating the degree of non-linearity of the trends. It can be seen that all event-study estimates are robust to allowing for linear trends (i.e. the confidence sets when $M = 0$) but become less so as the trends get more and more non-linear. Nonetheless, most of the non-linear confidence sets cover our original estimates and thus are consistent with our main results. Overall, we are confident in concluding that our firm-level results are robust.

4.5.3 Additional Robustness Checks

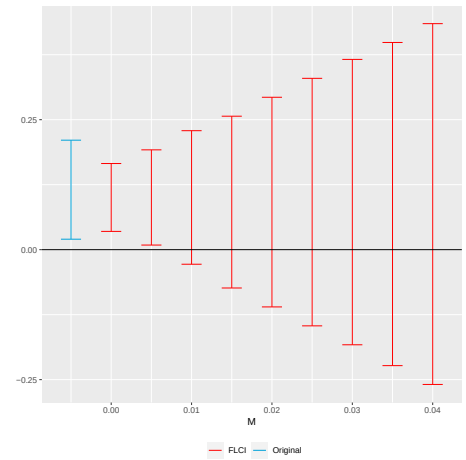
In Appendix C.1, we utilize a FDI destination list from the Ministry of Economic Affairs (MOEA) to conduct a placebo test of Taiwanese investments into countries other than China. The results indicate that there was no impact on investments into other countries, confirming that the FDI liberalization policy mainly reduced the investment barriers into China and not elsewhere.

Figure 5: Sensitivity analysis: Relaxing parallel trends assumption

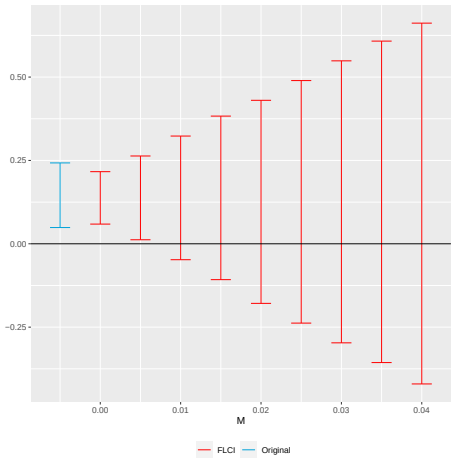
(a) Year 2002



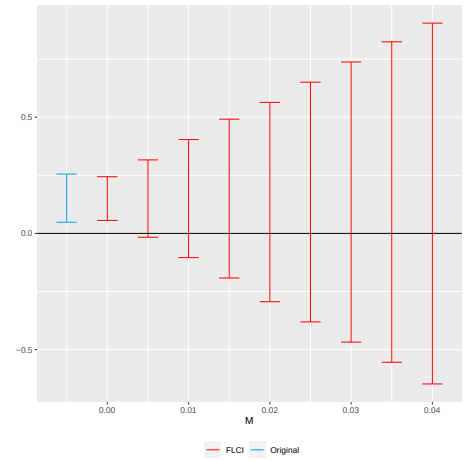
(b) Year 2003



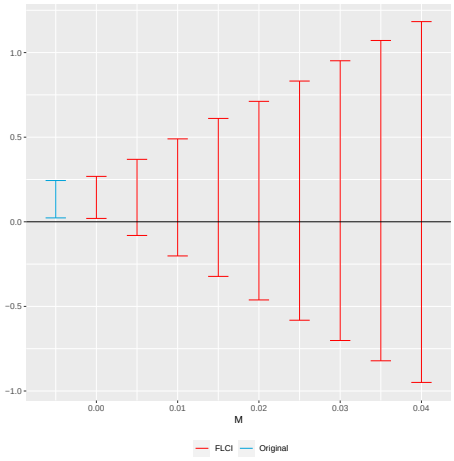
(c) Year 2004



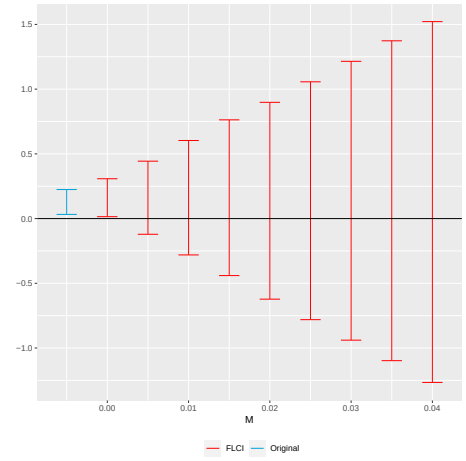
(d) Year 2005



(e) Year 2006



(f) Year 2007



NOTE: The above figures show the sensitivity analysis following the method by Rambachan and Roth (2023) for each of the yearly estimates $\{\alpha_{t'}\}_{2002}^{2007}$ in Figure 4b. The intervals in blue are the confidence intervals of the original estimates, and the intervals in red are the confidence sets allowing for linear and non-linear time trends. When $M = 0$, the interval corresponds to the confidence set with a linear time trend. The time trend becomes more non-linear as M gets larger.

5 Worker-level Responses to the Liberalization Policy

After examining the firm-level response to the liberalization policy in Section 4, we move on to the worker sample to study the policy effect on the domestic incumbent workers, i.e. the Taiwanese workers employed by the electronic manufacturers in our firm sample at the onset of the policy in 2001. We first introduce the empirical specifications, then explain the identification assumptions needed to establish causal claims for the regression parameters, and finally present the results as well as the robustness checks.

5.1 Empirical Specification

As discussed in Section 3.4, the FIA matched employer-employee data starts from 2001 (i.e. the year when the policy change took place), so our 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 specification:

$$Y_{ijkt} = \alpha_t \, Treated_j + Industry_k + X_{ijk2001} + \zeta_{ijkt} \tag{3}$$

where i indexes incumbent workers, j indexes worker i's initial employer in 2001, k indexes worker i's initial industry in 2001, and t indexes years following the policy change ($t \in [2002-2007]$). Y_{ijkt} are the cumulative outcomes up to year t for worker i originally employed by firm j of industry k in 2001. $Treated_j$ indicates whether firm j is a treatment firm, $Industry_k$ is the four-digit industry fixed effects, and $X_{ijk2001}$ is a set of worker demographic characteristics in 2001, including their age, age squared, gender, and marital status. The statistical error ζ_{ijkt} is clustered at the level of three-digit industries. Following a similar approach by Dix-Carneiro and Kovak (2019), we estimate Equation (3) for each year t to obtain the coefficients of interests $\{\alpha_t\}$, which reveals the effect of the liberalization policy on the treated workers relative to the untreated workers up to year $t \in [2002, 2007]$.

To investigate the heterogeneous treatment effects of the policy by initial wage level and gender, we further run the following specifications:

$$Y_{ijk2007} = \alpha\, Treated_j + \sum_g \beta_g Treated_j \times WG_{ig2001} + \gamma WG_{ig2001} + Industry_k + X_{ijk2001} + \zeta_{ijk} \tag{4}$$

$$Y_{ijk2007} = \alpha\, Treated_j + \beta\, Treated_j \times Male_i + \gamma\, Male_i + Industry_k + X_{ijk2001} + \zeta_{ijk} \tag{5}$$

where $Y_{ijk2007}$ is the cumulative outcomes over 2001-2007, WG_{g2001} indicates whether worker i belongs to wage percentile group g in 2001 as defined in Table 5, and $Male_i$ is an indicator of whether worker i is male. The parameters of interest are α and $\{\beta_g\}$. The first parameter reflects the average effect of the policy for a reference group,[4] and the latter demonstrates the policy effect (for wage group g or male workers) relative to the reference group.

5.2 Identification Assumption

To identify the causal parameters $\{\alpha_t\}$ in Equation (3) as well as α and $\{\beta_g\}$ in Equations (4) and (5), the conditional independence assumption is needed. It requires that a worker's treatment status be independent of his or her potential outcomes conditional on the observable characteristics. In other words, whether a worker is employed by a treatment or control firm at the onset of the policy is "as if" random given their individual characteristics and industry fixed effects. With this assumption, $\{\alpha_t\}$ can be interpreted as the per-period average treatment effects (ATE), and $\{\beta_g\}$ indicates the conditional average treatment effects (CATE) of the liberalization policy.

We argue that the conditional independence assumption is plausible for the following reasons. First, as we explained in Section 2, the policy change can be viewed as an exogenous event from the perspective of the electronic manufacturers. With the same reasoning, the workers employed by those firms in 2001 also cannot anticipate the policy change in advance.[5]

[4] The reference group for Equation (4) is the top-decile wage group, and the reference group for Equation (5) is female workers.

[5] The policy was officially announced in November 2001.

The matching procedure further strengthens the exogeneity of the policy, as the treatment and control firms are ex-ante similar from the perspective of the workers. In addition, the control variables including the four-digit industry fixed effects, and the worker characteristics account for the potential threat of selection on observables.

Nevertheless, it is a valid concern that workers might still self-select into the treatment and control firms based on some unobserved characteristics. For example, there may be systematic differences in their education levels or family resources, which are unobserved from the matched employer-employee data but could still affect their employment decisions and future labor outcomes. We deal with this concern by conducting two robustness checks. The first check is to use a different worker sample consisting of incumbent workers of the kernel-matching firm sample ("the kernel-matching worker sample"). For the second check, we control the financial assets of workers' parents by taking advantage of the kinship information provided by the FIA. This control variable serves as a proxy of the workers' education levels and family resources; however, it would be a bad proxy for older workers whose parents had already passed away by the year 2001. Therefore, this specification is provided as a robustness check rather than the main results.

5.3 Main Outcomes

The average effect of the liberalization policy on the worker cumulative outcomes over 2001-2007 is presented in Table 10. First of all, the estimate for job transitions is large and statistically significant. Specifically, the cumulative job transition rates of the treated workers were on average 24% higher than those of the untreated workers conditional on the industry fixed effects and individual characteristics. The estimate for total years of employment is small and insignificant. However, the employment years in the initial firm were 10% lower for the treated workers, indicating that they were more likely to leave their initial employers. The estimated effect on cumulative wages was negative on average but not statistically significant; nonetheless, wages earned in the initial firm were 12% lower for the treated workers.

Following Equation (3), we run the specification for each cumulative outcome from 2001

up to year $t \in [2002, 2007]$ and record the coefficients $\{\alpha_t\}$. The results for job transitions are presented in Figure 7a. Consistent with the estimated average policy effect in Table 10, the dynamic estimates indicate that the treated workers experienced higher job transition rates. In Figure 7b and Figure 7c, we examine the employment and wage outcomes by destination. As the two figures reveal, the treated workers were more likely to leave their initial employers and accumulate fewer wages from them over time relative to the untreated workers.

Table 10: Effect of the liberalization policy on worker cumulative outcomes (2001-2007)

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated	0.225**	-0.094	-0.482*	0.254*	0.134	0.094
	(0.080)	(0.052)	(0.179)	(0.118)	(0.126)	(0.052)
Control mean in 2007	0.950	6.385	4.755	0.474	1.157	0.615
Observations	111,426	111,426	111,426	111,426	111,426	111,426

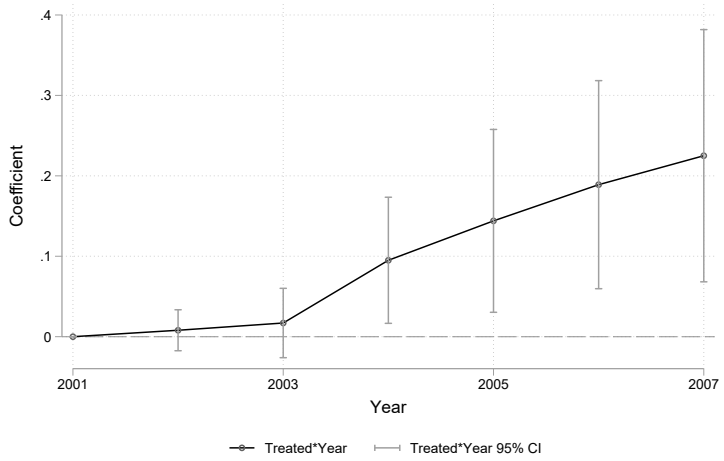
(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated	-0.161	-0.618*	0.354	0.104
	(0.223)	(0.251)	(0.200)	(0.208)
Control mean in 2007	7.136	5.304	0.583	1.249
Observations	111,426	111,426	111,426	111,426

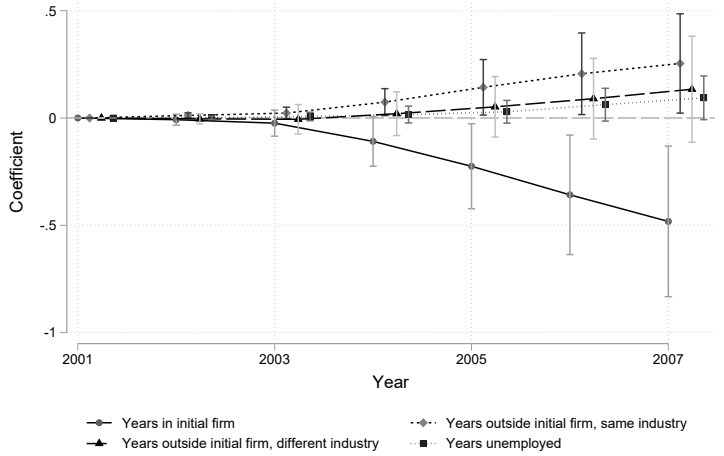
NOTE: Job transitions, years employed, years unemployed, and wages earned are cumulative outcomes from 2001 to 2007. Job transitions are the total number of job changes from 2001 to 2007. The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 6: Worker cumulative outcome by year

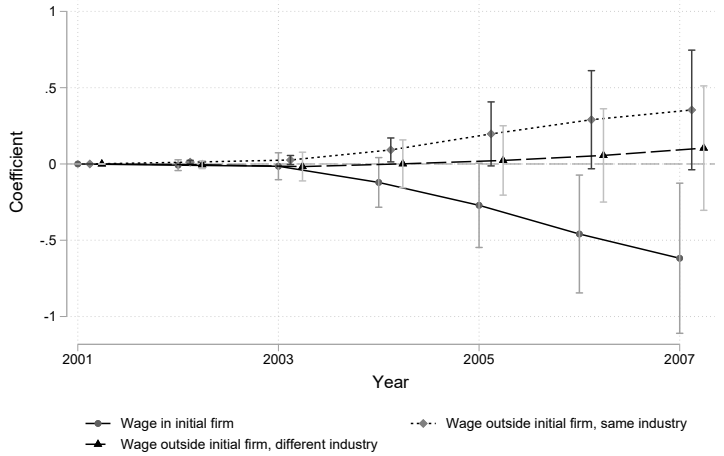
(a) Job transitions



(b) Employment years by destination



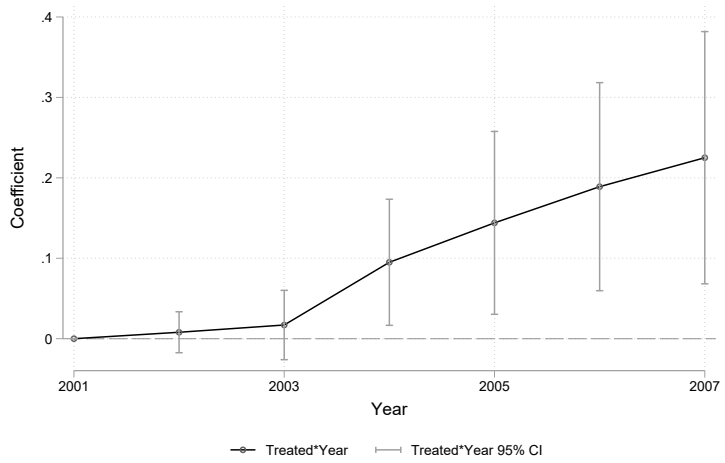
(c) Wages by destination



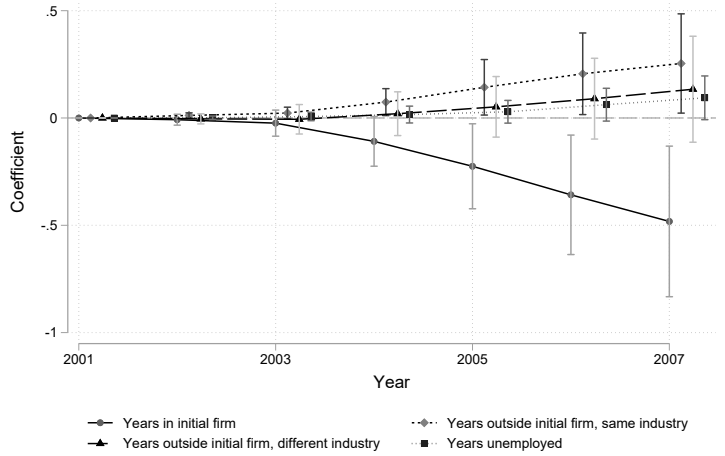
NOTE: The figures show the yearly estimates $\{\alpha_t\}_{2001}^{2007}$ in Equation (3) for worker cumulative outcomes.

Figure 7: Worker cumulative outcome by year

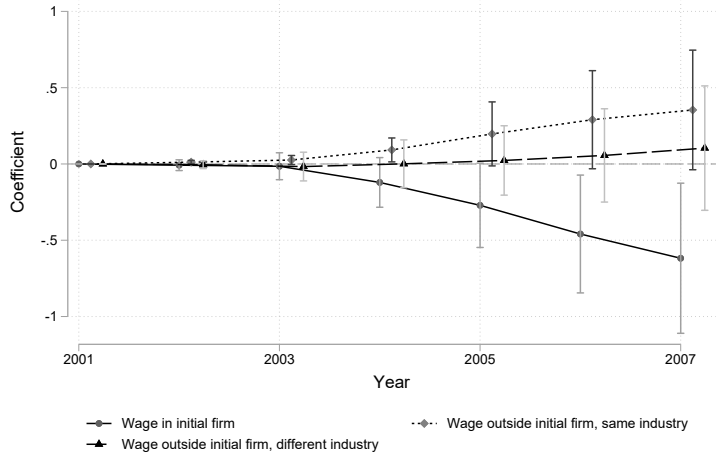
(a) Job transitions



(b) Employment years by destination



(c) Wages by destination



NOTE: The figures show the yearly estimates $\{\alpha_t\}_{2001}^{2007}$ in Equation (3) for worker cumulative outcomes.

5.4 Heterogeneity

After examining the main results, we now look into the heterogeneous treatment effects for the incumbent workers. We first investigate the heterogeneity by workers' initial wage level, separated into five wage percentile groups. Regression estimates of the treatment-wage interaction terms, based on Equation (4), are presented in Table 11, with treated workers in the top wage decile serving as the reference group.

Panel (a) of Table 11 shows that the treated workers in the 1st to 3rd wage quartiles experienced higher job transition rates and shorter employment durations relative to the untreated workers. The effects were particularly large for the treated workers in the 2nd and 3rd wage quartiles: they each experienced 37% and 29% higher job transition rates than the untreated workers[6]; furthermore, they each stayed 18% and 12% fewer years in the initial firm relative to the untreated workers. Consistent with the main results, the negative effect on employment status is most evident in years of employment at the initial firm. In contrast, the policy's effects on job transitions and years employed in the initial firm were not statistically significant for treated workers in the top wage decile.

The substantial heterogeneity across initial wage levels is also evident in cumulative wages, demonstrated in Panel (b) of Table 11. Treated workers in the 25th-50th, 50th-75th, and 75th-90th wage percentile groups earned cumulative wages from 2001 to 2007 that were 4%, 6%, and 4% lower, respectively, than those of untreated workers. Conversely, treated workers initially in the top wage decile experienced a positive cumulative wage increase of 10% compared to untreated workers. Treated workers in the 25th-50th wage percentile group experienced particularly severe outcomes, with 34% more unemployment years on average —equivalent to an additional 0.21 years. Their cumulative wages from 2001 to 2007 were 4% lower than those of untreated counterparts. In 2001, workers in this group earned an annual salary of USD 11,100 on average; hence the estimates imply a salary loss of almost USD 3,000 due to the policy.[7]

[6] The percentages are calculated as follows: $37\% = \frac{0.305+0.051}{0.950}, 29\% = \frac{0.229+0.051}{0.950}$.

[7] ΔSalary loss $= (-0.974 + 0.707) \times 11,100 = -2,964$ USD, where -0.974 and 0.707 represent the treatment effect estimates, and 7.136 is the baseline cumulative wage of untreated workers.

This welfare loss arises from two key factors: reduced cumulative wages and increased unemployment years. Similarly, workers in the wage percentile (p50–p75) experienced 6% less cumulative wages over the 2001 to 2007 period and an additional 0.23 years of unemployment. This corresponds to a welfare loss amounting to USD 6,500, reflecting the compounded negative effects of both lower wages and prolonged unemployment periods.

Apart from the initial wage level, we also explore the heterogeneity by worker gender following Equation (5). Table 12 shows that female workers in the treatment group experienced more negative effects than male workers. While the treated male workers experienced a 14% higher job transition rate, stayed 5% fewer years, and earned 7% less in the initial firm, treated female workers experienced a 34% higher job transition rate, stayed employed 14% fewer years in the initial firm, and earned 17% lower wages earned in the initial firm compared to untreated workers. This can be attributed to the well-documented observation that a larger proportion of female workers are employed in occupations with higher substitutability than male workers (Blau and Kahn, 2017), making them more vulnerable to unemployment during economic shocks. This is consistent with our findings, which reveal that lower wage percentiles, where female workers are overrepresented, experience greater adverse effects post-policy. Furthermore, existing literature indicates that during economic shocks, female workers are more likely to voluntarily leave the labor force due to factors such as family responsibilities (Adda, Dustmann and Stevens, 2017) or fertility decisions (Keller and Utar, 2022), further compounding the negative effects of the policy on this group.

Two additional approaches are adopted to address worker heterogeneity. First, we present the wage effect for workers who stayed in the initial firm throughout our sample period (i.e. the "stayers") and workers who left the initial firm (i.e. the "leavers") separately in Table 13. Among the stayers, treated workers in the 50th-90th initial wage percentiles earned less than the untreated workers. In stark contrast, treated workers in the top decile earned 10% more than the untreated workers. For the leavers, we can observe a similar negative wage effect concentrated among workers in the 50th-90th initial wage percentiles. Second, we utilize the causal forests method (Wager and Athey, 2018) to estimate the conditional average treatment effect (CATE) of the policy. Similarly, the estimates imply large heterogeneity

Table 11: Heterogeneous effect of the liberalization policy: Initial wage level

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated*<p25	0.251**	-0.098	-0.687**	0.182*	0.408*	0.098
	(0.079)	(0.059)	(0.224)	(0.072)	(0.182)	(0.059)
Treated*p25-p50	0.305***	-0.226***	-0.802***	0.198*	0.379*	0.226***
	(0.073)	(0.061)	(0.172)	(0.091)	(0.144)	(0.061)
Treated*p50-p75	0.229***	-0.250***	-0.544***	0.053	0.241**	0.250***
	(0.053)	(0.070)	(0.125)	(0.062)	(0.082)	(0.070)
Treated*p75-p90	0.000	-0.069	0.046	-0.106	-0.010	0.069
	(0.074)	(0.043)	(0.151)	(0.071)	(0.100)	(0.043)
Treated	0.051	0.019	-0.040	0.154*	-0.096	-0.019
	(0.072)	(0.046)	(0.182)	(0.062)	(0.193)	(0.046)
Control mean in 2007	0.950	6.385	4.755	0.474	1.157	0.615
Observations	111,426	111,426	111,426	111,426	111,426	111,426

(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated*<p25	-0.692*	-1.317***	0.106	0.519**
	(0.276)	(0.260)	(0.165)	(0.188)
Treated*p25-p50	-0.974***	-1.463***	0.148	0.341*
	(0.240)	(0.273)	(0.145)	(0.141)
Treated*p50-p75	-1.138***	-1.248***	-0.054	0.164
	(0.235)	(0.253)	(0.101)	(0.098)
Treated*p75-p90	-0.986***	-0.656*	-0.226	-0.104
	(0.213)	(0.255)	(0.141)	(0.108)
Treated	0.707*	0.455	0.341**	-0.089
	(0.314)	(0.250)	(0.107)	(0.280)
Control mean in 2007	7.136	5.304	0.583	1.249
Observations	111,426	111,426	111,426	111,426

NOTE: Job transitions, years employed, years unemployed, and wages earned are cumulative outcomes from 2001 to 2007. Job transitions are the total number of job changes from 2001 to 2007. Self-employed individuals are treated as unemployed. The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Heterogeneous effect of the liberalization policy: Worker gender

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated*Male	-0.186***	0.182***	0.547***	-0.190*	-0.175*	-0.182***
	(0.037)	(0.045)	(0.091)	(0.081)	(0.076)	(0.045)
Treated	0.320***	-0.187	-0.763***	0.352**	0.224*	0.187*
	(0.084)	(0.072)	(0.197)	(0.129)	(0.110)	(0.072)
Control mean in 2007	0.950	6.385	4.755	0.474	1.157	0.615
Observations	111,426	111,426	111,426	111,426	111,426	111,426

(b) Normalized wages by destination

	Wage earned			
	Overall	Initial firm	Initial industry	Other industries
Treated*Male	0.259*	0.523***	-0.205	-0.058
	(0.120)	(0.138)	(0.110)	(0.103)
Treated	-0.294	-0.887**	0.459*	0.134
	(0.247)	(0.255)	(0.210)	(0.168)
Control mean in 2007	7.136	5.304	0.583	1.249
Observations	111,426	111,426	111,426	111,426

NOTE: Job transitions, years employed, years unemployed, and wages earned are cumulative outcomes from 2001 to 2007. Job transitions are the total number of job changes from 2001 to 2007. Self-employed individuals are treated as unemployed. The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

along workers' initial wages and gender. The description of the method and related results are provided in Appendix B.

The results presented above convey stark differences in the policy effect on domestic incumbent workers. On the one hand, the treated workers from the top decile benefited from the liberalization policy in terms of job security and earnings. These workers are likely well educated, highly skilled, and in occupations that are less subject to competition from workers in the Chinese affiliates, e.g. researchers or managers. On the other hand, the liberalization policy led to higher job transitions, fewer years of employment, and lower cumulative wages for the treated workers in the medium income percentiles. The workers in the bottom wage quartile also experienced more job transitions and stayed employed for fewer years in the initial firm. However, there was no significant negative wage effect overall, possibly due to lower labor market attachment.

5.5 Robustness of Worker-level Response

5.5.1 Robustness to Alternative Worker Sample

Analogously to the firm analysis, we create another worker sample with workers employed by the firms from the kernel-matching sample for robustness checks. Their average characteristics are summarized in Table 19 of Appendix C.2. We then run the same regressions in Equation (3) and Equation (4) using this alternative sample. The results are presented in Tables 14, 20, and 21. The robustness check generates similar results. Treated workers experienced more job transitions and on average stayed employed for fewer years both overall and in the initial firm. The negative wage effects are concentrated among workers with initial wages ranked in the 25th-90th percentiles, while the treated workers from the top decile are better off.

Table 13: Effect of the liberalization policy: Stayers v.s. Leavers

(a) Main results

	Wages for stayers	Wages for leavers			
	Overall	Overall	Initial firm	Initial industry	Other industries
Treated	0.022	0.169	0.026	0.260	-0.117
	(0.193)	(0.282)	(0.081)	(0.173)	(0.270)
Control mean in 2007	8.168	6.332	3.072	1.037	2.223
Observations	40,303	71,123	71,123	71,123	71,123

(b) Heterogeneity by initial wages

	Wages for stayers	Wages for leavers			
	Overall	Overall	Initial firm	Initial industry	Other industries
Treated*<p25	-0.149	-0.279	-0.471***	0.011	0.182
	(0.350)	(0.270)	(0.101)	(0.168)	(0.226)
Treated*p25-p50	-0.509	-0.557*	-0.571***	0.014	0.001
	(0.272)	(0.215)	(0.144)	(0.148)	(0.140)
Treated*p50-p75	-0.816***	-0.901**	-0.434***	-0.316*	-0.150
	(0.191)	(0.259)	(0.113)	(0.125)	(0.109)
Treated*p75-p90	-1.135***	-0.845**	-0.227**	-0.420	-0.198*
	(0.172)	(0.259)	(0.082)	(0.211)	(0.084)
Treated	0.786**	0.726	0.433**	0.376***	-0.083
	(0.289)	(0.418)	(0.137)	(0.083)	(0.371)
Control mean in 2007	8.168	6.332	3.072	1.037	2.223
Observations	40,303	71,123	71,123	71,123	71,123

NOTE: Workers that stayed working in the initial firm from 2001-2007 are defined as "stayers" and the others are defined as "leavers". Wages are cumulative outcomes from 2001 to 2007 and are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.5.2 Robustness to Additional Controls

To address unobserved worker characteristics that could affect both their employment decisions and future outcomes, we control for the total assets of workers' parents utilizing the individual wealth data from FIA. Parents' wealth can serve as a proxy for the resources of a worker's family and positively correlate with the worker's education level. We did not add this control variable to our main empirical specification, since it requires both parents to be alive in order to measure their wealth, which causes us to lose 48,457 observations. The results with parents' wealth controlled are presented in Table 15 and 22. Again, the estimates are all similar in sign and magnitude to our main results.

Overall, our results are consistent with the idea that FDI liberalization would trigger manufacturing firms to move their production to low-cost countries and reduce their employment in the home country, hurting in particular the incumbent workers with lower initial wages, who are likely low-skilled or less educated. 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; thus, they have larger demands for headquarter services in the home country.

Table 14: Robustness check: Worker average effect (kernel-matching sample)

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated	0.223***	-0.091	-0.450**	0.205*	0.154	0.091
	(0.060)	(0.052)	(0.139)	(0.089)	(0.093)	(0.052)
Control mean in 2007	0.907	6.391	4.825	0.507	1.059	0.609
Observations	195,302	195,302	195,302	195,302	195,302	195,302

(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated	-0.264	-0.579**	0.262	0.052
	(0.169)	(0.200)	(0.155)	(0.148)
Control mean in 2007	7.246	5.425	0.642	1.179
Observations	195,302	195,302	195,302	195,302

NOTE: Job transitions, years employed, years unemployed, and wages earned are cumulative outcomes from 2001 to 2007. Job transitions are the total number of job changes from 2001 to 2007. Self-employed individuals are treated as unemployed. The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: Robustness check: Worker average effect with parents' wealth controlled

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated	0.220*	-0.060	-0.461*	0.304*	0.097	0.060
	(0.091)	(0.030)	(0.203)	(0.141)	(0.127)	(0.030)
Control mean in 2007	0.950	6.488	4.716	0.548	1.224	0.512
Observations	62,969	62,969	62,969	62,969	62,969	62,969

(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated	-0.086	-0.601*	0.440	0.075
	(0.199)	(0.273)	(0.250)	(0.206)
Control mean in 2007	7.475	5.394	0.699	1.382
Observations	62,969	62,969	62,969	62,969

NOTE: The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, marital status in 2001, and parents' wealth in 2003 (which is the earliest wealth data we have access to). The sample is restricted to individuals with both parents alive in 2008, which is the earliest household registration data we have access to. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6 Conclusion

FDI activities are a crucial component of the global economy. However, episodes of FDI liberalization are much less studied than trade liberalization episodes such as import competition. 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, our paper studies a policy change in 2001 by the Taiwanese government that provides a subset of Taiwanese electronic manufacturers with extra incentives to conduct FDI in China.

The DID estimates at the firm level confirm a large treatment effect for the treatment firms, which reallocated their production resources to China both at extensive and intensive margins. Moreover, the worker-level analysis indicates substantial heterogeneous effects of the policy, where the incumbent workers in the top decile of initial wages benefited and the other workers lost out following the implementation of the policy. This result echoes the theoretical predictions from classic trade models that trade liberalization creates winners and losers. From an aggregate perspective, a large-scale FDI liberalization episode such as the one experienced in Taiwan since the 2000s could substantially affect the overall income distribution and inequality of the society as a whole.

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Appendices

A Original List of the 122 Permitted 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、高性能跨越縛路之控制器）
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、輸人單元、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	高性能文件掃瞄器
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 subheadings 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 subheadings 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 lOOEX	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 access 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 to 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、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 casette 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-style VCRs (digital video recorders)	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）
85232010	Blank audio CDs	空白音碟

C.C.C.Code	Category in English	Category in Chinese
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
85241020	Recorded music	音樂唱片

C.C.C.Code	Category in English	Category in Chinese
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、新聞胜錄影帶，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
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

C.C.C.Code	Category in English	Category in Chinese
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

B Estimate CATE Using Causal Forests

B.1 Outline of the Method

We apply the causal forests method (or generalized random forests, GRF) developed by Wager and Athey (2018); Athey, Tibshirani and Wager (2019) to our incumbent worker sample and estimate the conditional average treatment effect (CATE) of the 2001 liberalization policy.[8] The method utilizes the algorithm of random forests to estimate the CATE. Similar to random forests, subsamples are randomly drawn from the main sample to train decision trees. However, rather than splitting the tree to minimize the sum of squared residuals in the outcome within each node, the splits are chosen so as to maximize the differences of treatment effects between nodes. Once the training is done, the prediction of CATE for a test example can be made by "pushing down" the test example from top to bottom for each tree and calculating the weighted treatment effects with weights given by the share of times that the test example falls into the same leaf as the training samples.

B.2 Results

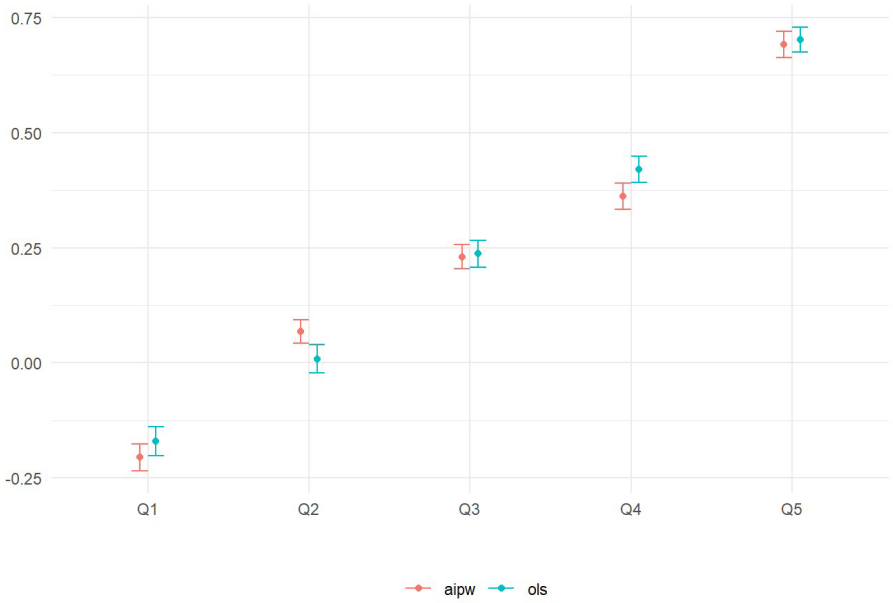
We implement the GRF package in R using our incumbent worker sample. Three cumulative outcomes over 2001-2007 are our focus: job transitions, employment years, and normalized wages. Worker characteristics of interest include their initial wages in 2001, gender, marital status, and age. Four-digit industry dummies (for their initial employers in 2001) are also added into the model to control for industry fixed effects.

The individual CATE estimates for each outcome are predicted and summarized in quintiles from the smallest to the largest in Figures 8, 9, and 10. Large heterogeneity is spotted in panel A for all three outcomes, as the estimates go from significantly negative to significantly positive. The average worker characteristics for each CATE quintile are presented in panel B. Echoing our regression-based heterogeneity analysis in Section 5, male workers and workers with higher initial wages tended to have fewer job transitions, more employment years, and higher cumulative wages.

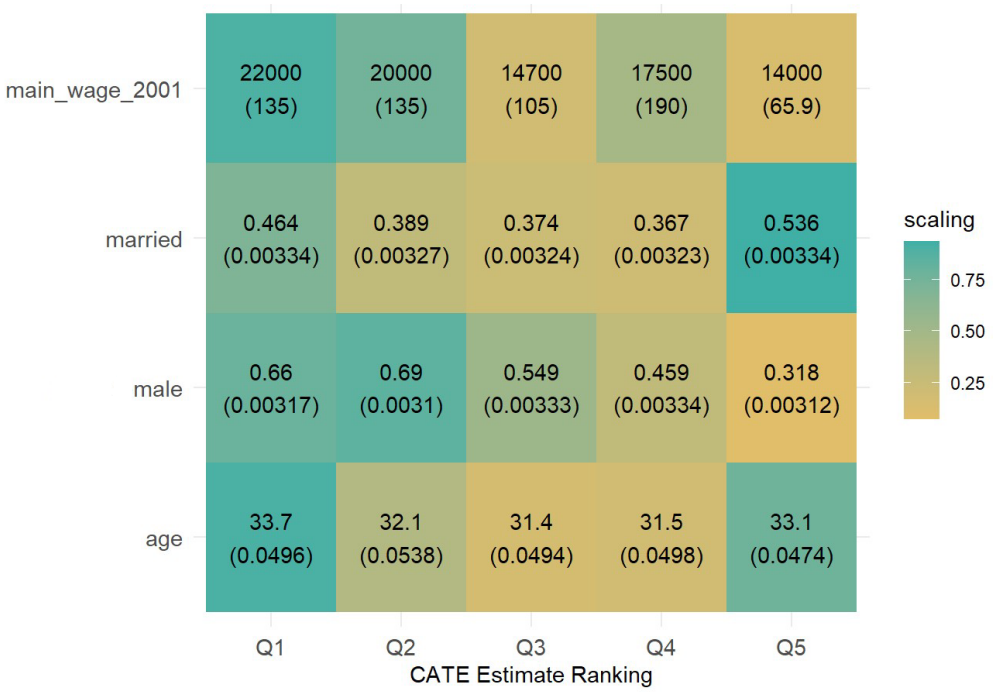
[8] Readers who are interested in the details of the method can read the original papers and refer to the package codebook online: https://grf-labs.github.io/grf/REFERENCE.html#general-algorithm.

Figure 8: CATE estimates using causal forests: Cumulative job transitions

(a) Average CATE quintiles by ranking



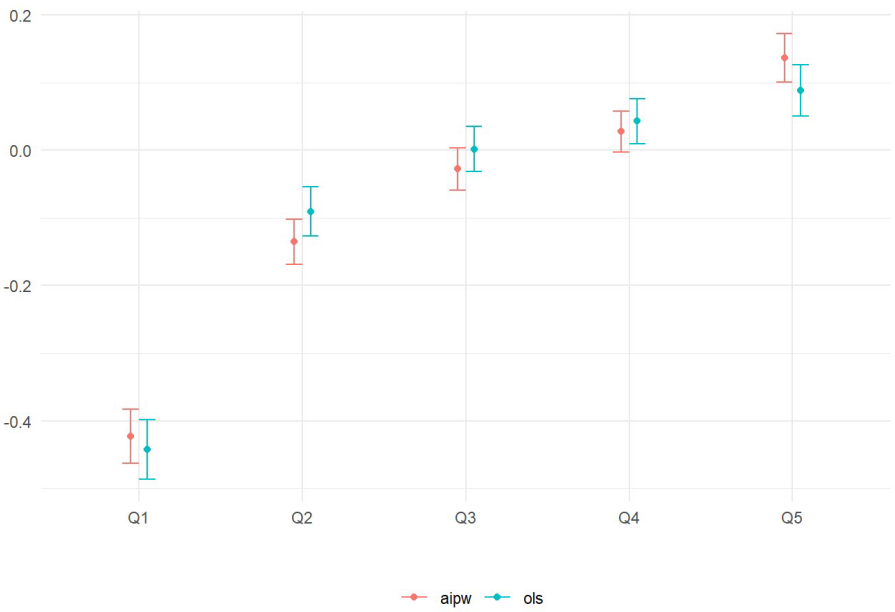
(b) Average covariate values by CATE quintile



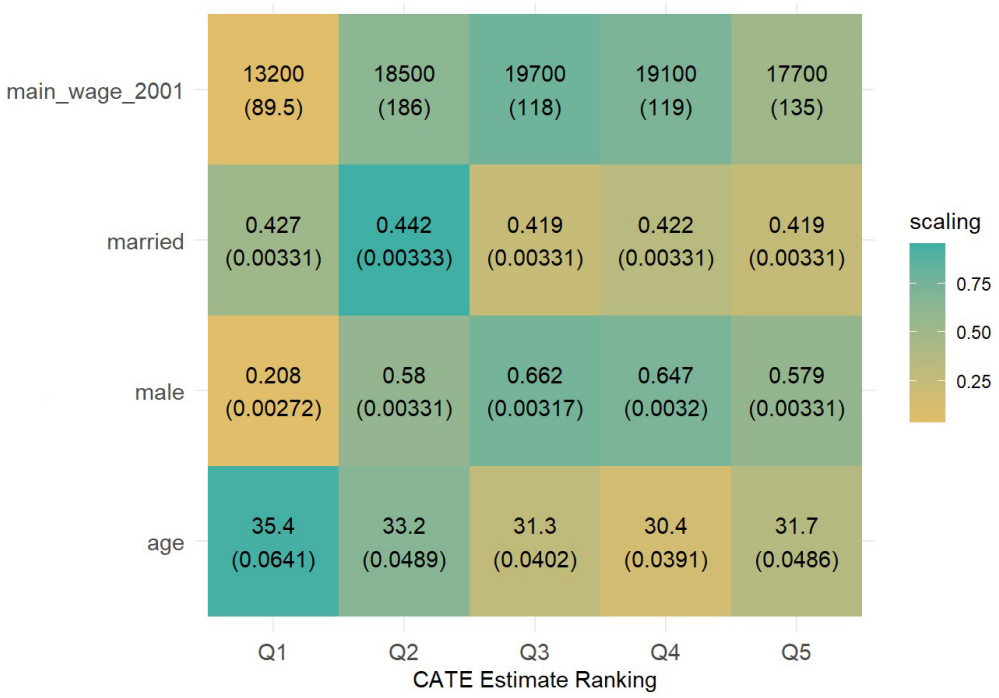
NOTE: The individual CATE estimates are summarized in quintiles and ranked from smallest to largest. Two methods to predict CATE are presented in Panel a: the out-of-bag predictions following the procedure of **?** and the predictions using augmented inverse-propensity weighting (AIPW) following Athey, Tibshirani and Wager (2019). In Panel b, the average worker characteristics are shown, with their standard deviations in parentheses. The unit of the worker's initial wages is USD.

Figure 9: CATE estimates using causal forests: Employment years

(a) Average CATE quintiles by ranking



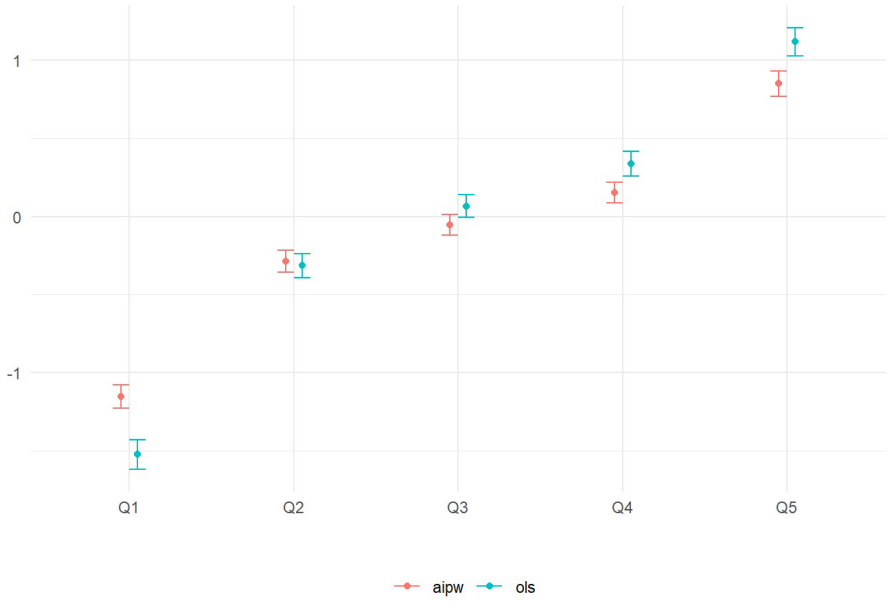
(b) Average covariate values by CATE quintile



NOTE: The individual CATE estimates are summarized in quintiles and ranked from smallest to largest. Two methods to predict CATE are presented in Panel a: the out-of-bag predictions following the procedure of **?** and the predictions using augmented inverse-propensity weighting (AIPW) following Athey, Tibshirani and Wager (2019). In Panel b, the average worker characteristics are shown, with their standard deviations in parentheses. The unit of the worker's initial wages is USD.

Figure 10: CATE estimates using causal forests: Normalized wages

(a) Average CATE quintiles by ranking



(b) Average covariate values by CATE quintile

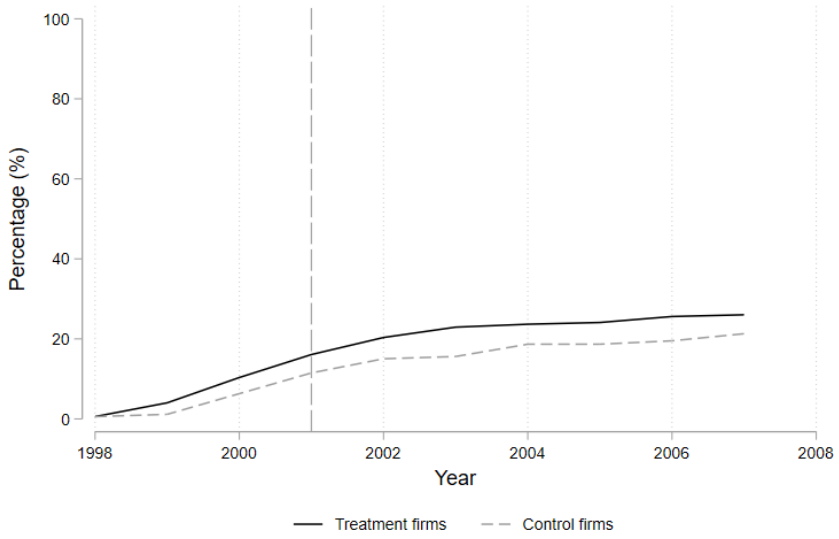
NOTE: The individual CATE estimates are summarized in quintiles and ranked from smallest to largest. Two methods to predict CATE are presented in Panel a: the out-of-bag predictions following the procedure of **?** and the predictions using augmented inverse-propensity weighting (AIPW) following Athey, Tibshirani and Wager (2019). In Panel b, the average worker characteristics are shown, with their standard deviations in parentheses. The unit of the worker's initial wages is USD.

C Additional Robustness Results

C.1 Placebo Test of Investments into Alternative Locations

We use the FDI destination list of Taiwanese public firms provided by the Ministry of Economic Affairs (MOEA) and conduct a placebo test focused on Taiwanese outward FDI to destinations other than China. Based on this data, we construct an indicator that identifies whether a firm from our matched sample invested outside of China in a given year.[9] Figure 11 illustrates the percentage of treatment and control firms with investments outside China between 1998 and 2007. While treatment firms are, on average, slightly more likely to invest in other regions compared to control firms, there is no notable increase before or after 2001.

Figure 11: Non-China FDI for treatment and control firms over 1998-2007



NOTE: The figures show the percentages of treatment and control firms investing outside of China over 1998-2007. The firm sample is obtained via one-to-one propensity score matching.

To determine whether the liberalization policy influenced firm investments in destinations beyond China, we apply the same DID specification. Table 17 presents estimates from various specifications. The results are generally small and statistically insignificant, indicating that

[9] A limitation of this data is the inability to observe when a firm closes down an affiliate. For the purpose of this analysis, we assume that firms do not shut down affiliates during the sample period once they are established.

the policy had no observable impact on FDI to other destinations. However, we do find that firms operating in sectors subject to higher U.S. import tariffs (on exports from China) are more likely to invest in alternative destinations. This observation aligns with the notion that Taiwanese firms use China primarily as an export platform.

Table 17: Placebo test: Non-China FDI

	NON-CN FDI		
Treatment*Post	0.026	0.027	0.027
	(0.031)	(0.028)	(0.029)
CN Import Tariffs			-0.006
			(0.006)
US Import Tariffs			0.056**
			(0.024)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Size*Post FE	No	Yes	Yes
Pre-policy control mean	0.027	0.027	0.027
Observations	3480	3480	3480

NOTE: This table shows the DID estimates α_1 in Equation (1) for firm extensive margin outcomes. "NON-CN FDI" indicates a firm investing in non-China destination countries in a given year. Tariffs are in percentage points. Pre-policy control mean is the mean outcome for the control firms over 1998-2000. Standard errors are clustered at the three-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C.2 Additional Robustness Checks for Worker-level Analysis

Table 18: Summary statistics of the kernel-matching firm sample over 1998-2000

	All	Treatment firm	Control firm	T statistics
CNFDI	0.31	0.35	0.29	(1.58)
CNFDI SIC3	0.03	0.04	0.02	(-1.84)
No. of affiliates	1.22	1.28	1.19	(-0.94)
Parent employment	462.38	440.70	474.10	(0.44)
Parent wage bill per worker	5.19	5.19	5.18	(-0.01)
Parent total sales	47.99	64.14	39.15	(-1.97)*
Parent export sales	34.23	51.51	24.78	(-2.34)*
Affiliate employment	698.66	764.50	647.46	(-0.51)
Affiliate wage bill per worker	1.23	1.35	1.13	(-0.40)
Affiliate total sales	40.88	53.08	31.38	(-0.68)
Affiliate export sales	26.34	28.94	24.31	(-0.28)
Number of firms	496	174	322	

NOTE: This table shows the summary statistics for the firm sample constructed using the kernel matching method. "CN FDI" is an indicator of whether a Taiwanese electronic manufacturer conducted FDI in China, and "CN FDI SIC3" is an indicator of whether a Taiwanese electronic manufacturer conducted FDI in China in the same three-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. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 19: Summary statistics of the kernel-matching worker sample

	All	Treated worker	Untreated worker	T statistics
Male (%)	51.7	54.2	50.6	(14.43)***
Age in 2001	31.9	32.7	31.5	(35.86)***
Wage in 2001	18.0	17.7	18.1	(4.40)***
Wage in 2007	20.7	18.9	21.5	(20.27)***
Left initial firm by 2007 (%)	56.3	67.6	51.0	(69.63)***
Number of workers	195,302	61,578	133,724	

NOTE: The treated workers are workers employed by the treatment firms in 2001. The untreated workers are workers employed by the control firms in 2001. The unit of wages is 1,000 USD. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 20: Robustness check: Worker heterogeneous effect by initial wages (kernel-matching sample)

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated*<p25	0.218***	-0.151**	-0.572***	0.006	0.415**	0.151**
	(0.055)	(0.052)	(0.140)	(0.085)	(0.120)	(0.052)
	0.289***	-0.329***	-0.729***	0.056	0.345**	0.329***
	(0.067)	(0.065)	(0.146)	(0.081)	(0.121)	(0.065)
Treated*p50-p75	0.232***	-0.317***	-0.547***	-0.001	0.231**	0.317***
	(0.042)	(0.066)	(0.096)	(0.043)	(0.075)	(0.066)
Treated*p75-p90	0.044	-0.117***	-0.047	-0.121*	0.052	0.117***
	(0.069)	(0.030)	(0.133)	(0.046)	(0.096)	(0.030)
Treated	0.066	0.073	-0.076	0.213***	-0.064	-0.073
	(0.068)	(0.063)	(0.165)	(0.056)	(0.160)	(0.063)
Control mean in 2007	0.907	6.391	4.825	0.507	1.059	0.609
Observations	195,302	195,302	195,302	195,302	195,302	195,302

(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated*<p25	-0.885*	-1.243***	-0.179	0.537***
	(0.401)	(0.279)	(0.217)	(0.117)
Treated*p25-p50	-1.227***	-1.454***	-0.078	0.305**
	(0.255)	(0.250)	(0.137)	(0.109)
Treated*p50-p75	-1.243***	-1.256***	-0.148	0.161*
	(0.197)	(0.209)	(0.085)	(0.080)
Treated*p75-p90	-0.964***	-0.694***	-0.254**	-0.015
	(0.105)	(0.177)	(0.091)	(0.109)
Treated	0.766**	0.463	0.430**	-0.127
	(0.284)	(0.285)	(0.132)	(0.217)
Control mean in 2007	7.246	5.425	0.642	1.179
Observations	195,302	195,302	195,302	195,302

NOTE: Job transitions, years employed, years unemployed, and wages earned are cumulative outcomes from 2001 to 2007. Job transitions are the total number of job changes from 2001 to 2007. Self-employed individuals are treated as unemployed. The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 21: Robustness check: Worker heterogeneous effect by gender (kernel-matching sample)

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated*Male	-0.193***	0.162***	0.553***	-0.209*	-0.182**	-0.162***
	(0.035)	(0.043)	(0.084)	(0.090)	(0.061)	(0.043)
Treated	0.324***	-0.176*	-0.740***	0.315**	0.250**	0.176*
	(0.070)	(0.070)	(0.170)	(0.101)	(0.080)	(0.070)
Control mean in 2007	0.907	6.391	4.825	0.507	1.059	0.609
Observations	195,302	195,302	195,302	195,302	195,302	195,302

(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated*Male	0.109	0.483***	-0.270	-0.104
	(0.134)	(0.087)	(0.147)	(0.075)
Treated	-0.322	-0.832	0.404*	0.107
	(0.203)	(0.217)	(0.163)	(0.131)
Control mean in 2007	7.246	5.425	0.642	1.179
Observations	195,302	195,302	195,302	195,302

NOTE: The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. We set gender = 1 for males and gender = 0 for females. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 22: Robustness check: Worker heterogeneous effect by initial wages with parents' wealth controlled

(a) Job transitions and years employed by destination

	Job transitions	Years employed				Years unemployed
		Overall	Initial firm	Initial industry	Other industries	
Treated*<p25	0.217**	-0.079	-0.638**	0.131	0.428**	0.079
	(0.074)	(0.066)	(0.205)	(0.081)	(0.135)	(0.066)
Treated*p25-p50	0.292***	-0.174***	-0.733***	0.162	0.397**	0.174***
	(0.080)	(0.048)	(0.194)	(0.100)	(0.141)	(0.048)
Treated*p50-p75	0.197**	-0.191***	-0.459***	0.033	0.235*	0.191***
	(0.056)	(0.042)	(0.124)	(0.076)	(0.092)	(0.042)
Treated*p75-p90	-0.010	-0.057	0.042	-0.135	0.034	0.057
	(0.073)	(0.030)	(0.157)	(0.095)	(0.114)	(0.030)
Treated	0.063	0.028	-0.058	0.235**	-0.150	-0.028
	(0.072)	(0.027)	(0.183)	(0.069)	(0.156)	(0.027)
Control mean in 2007	0.950	6.488	4.716	0.548	1.224	0.512
Observations	62,969	62,969	62,969	62,969	62,969	62,969

(b) Normalized wages by destination

	Wages earned			
	Overall	Initial firm	Initial industry	Other industries
Treated*<p25	-0.856**	-1.395***	0.013	0.526***
	(0.290)	(0.280)	(0.213)	(0.136)
Treated*p25-p50	-1.169***	-1.562***	0.069	0.323*
	(0.222)	(0.299)	(0.170)	(0.153)
Treated*p50-p75	-1.332***	-1.327***	-0.125	0.121
	(0.190)	(0.249)	(0.131)	(0.127)
Treated*p75-p90	-1.192***	-0.788**	-0.323	-0.081
	(0.189)	(0.276)	(0.176)	(0.138)
Treated	0.994***	0.589*	0.508***	-0.104
	(0.276)	(0.238)	(0.142)	(0.236)
Control mean in 2007	7.475	5.394	0.699	1.382
Observations	62,969	62,969	62,969	62,969

NOTE: Job transitions, years employed, years unemployed, and wages earned are cumulative outcomes from 2001 to 2007. Job transitions are the total number of job changes from 2001 to 2007. Self-employed individuals are treated as unemployed. The cumulative wages are normalized by wages in 2001. Control variables include the four-digit industry fixed effects, worker age, age squared, gender, and marital status. Standard errors are clustered at the three-digit industry level. The control mean is the mean outcome for untreated workers. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D Original List of the 97 Prohibited Products

C.C.C.Code	Category in English	Category in Chinese
28046120	Silicon rod	矽晶棒
29034500	Trifluorochloromethane	三氟一氯甲烷
29034500	Monofluoropentachloroethane	一氟五氯乙烷
29034500	difluorotetrachloroethane	二氟四氯乙烷
29034500	Heptafluoropropane	一氟七氯丙烷
29034500	difluorohexachloropropane	二氟六氯丙烷
29034500	Trifluoropentachloropropane	三氟五氯丙烷
29034500	Tetrafluorotetrachloropropane	四氟四氯丙烷
29034500	Pentafluorotrichloropropane	五氟三氯丙烷
29034500	Hexafluorodichloropropane	六氟二氯丙烷
29034500	Heptafluorochloropropane	七氟一氯丙烷
29034500	Only other derivatives perhalogenated with fluorine and chlorine	僅與氟及氯全鹵化之其他衍生物
29211900	Di-(2-chloroethyl)ethylamine	雙 (2-氯乙基) 乙胺
29211900	Di-(2-chloroethyl)methylamine	雙 (2-氯乙基) 甲胺
29211900	Ginseng(2-chloroethyl)amine	參 (2-氯乙基) 胺
29309090	2-Chloroethyl chloromethyl sulfide	2-氯乙基氯甲基硫醚
29309090	Di-(2-chloroethyl)sulfide (mustard gas)	雙 (2-氯乙基) 硫醚 (芥子氣)
29309090	Di-(2-chloroethylthio)methane	雙 (2-氯乙基硫基) 甲烷
29309090	1,2-Di-(2-chloroethylthio)ethane (sesqui mustard gas)	1，2-雙 (2-氯乙基硫基) 乙烷 (倍半芥子氣)
29309090	1,3-Di-(2-chloroethylthio)n-propane	1，3-雙 (2-氯乙基硫基) 正丙烷
29309090	1,5-Di-(2-chloroethylthio)n-butane	1，5-雙 (2-氯乙基硫基) 正丁烷
29309090	1,4-Di-(3-chloroethylthio)n-pentane	1，4-雙 (3-氯乙基硫基) 正戊烷
29309090	Di-(2-chloroethylthiomethyl)ether	雙 (2-氯乙基硫甲基) 醚
29309090	Di-(2-chloroethylthioethyl)ether (0-mustard gas)	雙 (2-氯乙基硫乙基) 醚 (0-芥子氣)
29310019	2-Chlorovinyl dichloroarsine	2-氯乙烯基二氯胂
29310019	Di-(2-chlorovinyl)chloroarsine	雙 (2-氯乙烯基) 氯胂

C.C.C.Code	Category in English	Category in Chinese
29310019	Ginseng (2-chlorovinyl)arsine	參 (2-氯乙烯基) 胂
29310040	Organophosphorus compounds (organic phosphorus flame retardants)	有機磷化合物 (有基磷系耐燃劑)
29310040	Organophosphorus compounds (organic phosphorus flame retardants)	有機磷化合物 (有基磷系耐燃劑)
29310040	Organophosphorus compounds (organic phosphorus flame retardants)	有機磷化合物 (有基磷系耐燃劑)
30029090	Saxitoxin (Dinoflagellate toxin)	石房蛤毒素（腰鞭毛蟲毒素）
30029090	Ricin (ricin bean albumin)	蓖麻毒（蓖麻子白蛋白）
38130000	Dispensing of fire extinguishers containing trifluorobromomethane, difluorochlorobromomethane or tetrafluorodibromoethane	滅火器配藥，含有三氟一溴甲烷、二氟一氯一溴甲烷或四氟二溴乙烷者
85312000	LCD or light-emitting diode display indication panel (more than six generations of TFT-LCD panel manufacturers, more than the generation of mass production by domestic companies)	液晶或發光二極體顯示之指示面板 (六代以上 TFT-LCD 面板廠，超過國內該公司量產之世代)
8542320011	Single-stone digital integrated circuit dies and wafers for mask-type read-only memory chips (over 12-inch wafer casting)	光罩式唯讀記憶體晶片之單石數位積體電路晶粒及晶圓（超過十二吋晶圓鑄造）
8542320013	Monolithic integrated circuit dies and wafers for mask-type read-only memory chips (wafer casting over twelve inches)	光罩式唯讀記憶體晶片之單石積體電路晶粒及晶圓（超過十二吋晶圓鑄造）
8542320015	Hybrid integrated circuit dies and wafers for mask-type read-only memory chips (over 12-inch wafer casting)	光罩式唯讀記憶體晶片之混合積體電路晶粒及晶圓（超過十二吋晶圓鑄造）
8542320021	Dynamic random access memory bulk circuit die (over 12-inch wafer casting)	動態隨機存取記憶體積體電路晶粒（超過十二吋晶圓鑄造）

C.C.C.Code	Category in English	Category in Chinese
8542320022	Dynamic random access memory bulk circuit wafers (over 12-inch wafer casting)	動態隨機存取記憶體積體電路晶圓（超過十二吋晶圓鑄造）
8542320031	Static random access memory bulk circuit die (over 12-inch wafer casting)	靜態隨機存取記憶體積體電路晶粒（超過十二吋晶圓鑄造）
8542320032	Static random access memory bulk circuit wafers (over 12-inch wafer casting)	靜態隨機存取記憶體積體電路晶圓（超過十二吋晶圓鑄造）
8542390011	Other single-stone digital integrated circuit dies (over 12-inch wafer casting)	其他單石數位積體電路晶粒（超過十二吋晶圓鑄造）
8542390012	Other single-stone digital integrated circuit wafers (wafer casting over twelve inches)	其他單石數位積體電路晶圓（超過十二吋晶圓鑄造）
8542390021	Other hybrid integrated circuit dies and wafers (over 12-inch wafer casting)	其他混合積體電路晶粒及晶圓（超過十二吋晶圓鑄造）
85427000	Electronic microcomponents	電子微組件
88019090	Other unpowered aircraft (for military use only)	其他無動力之航空器（屬軍事專用者）
88021100	Helicopters with an empty weight not exceeding 2,000 kilograms (for military use only)	直升機，空重量不超過 2000 公斤者（屬軍事專用者）
88021200	Helicopters with an empty weight exceeding 2,000 kilograms (exclusively used for military purposes)	直升機，空重量超過 2000 公斤者（屬軍事專用者）
88022000	Planes and other aircraft with an empty weight not exceeding 2,000 kilograms (For military use only)	飛機及其他航空器，空重量不超過 2000 公斤者（屬軍事專用者）

C.C.C.Code	Category in English	Category in Chinese
88023000	Planes and other aircraft with an empty weight exceeding 2,000 kilograms but not exceeding 15,000 kilograms (for military use only)	飛機及其他航空器，空重量超過 2000 公斤，但不超過 15000 公斤者（屬軍事專用者）
88024000	Planes and other aircraft with an empty weight exceeding 15,000 kilograms (for military use only)	飛機及其他航空器，空重量超過 15000 公斤者（屬軍事專用者）
88031000	Propellers, rotors and their parts (for military use only)	螺旋槳與旋翼及其零件（屬軍事專用者）
88032000	Landing gear and its parts (for military use only)	起落架及其零件（屬軍事專用者）
88033000	Other parts of aircraft or helicopters (for military use only)	飛機或直升機之其他零件（屬軍事專用者）
88039000	Other parts of goods in Section 8801 or 8802 (for military use only)	第 8801 或 8802 節貨品之其他零件（屬軍事專用者）
88040020	Slalom landing gear and its parts and accessories (for military use only)	迴旋降落器及其零件與附件（屬軍事專用者）
88051000	Aircraft take-off devices and their parts; deck interceptor hooks or similar devices and their parts (for military use only)	航空器起飛裝置及其零件；艙面攔截鉤或類似裝置及其零件（屬軍事專用者）
88052900	Other ground flight training devices and their parts (for military use only)	其他地面用飛行訓練器及其零件(屬軍事專用者）
90138030	Liquid crystal device (more than six generations of TFT-LCD panel manufacturers, exceeding the number of generations of mass production by this domestic company)	液晶裝置 (六代以上 TFT-LCD 面板廠，超過國內該公司量產之世代)
29031400	Carbon tetrachloride	四氯化碳
29031910	Trichloroethane	三氯乙烷
29034100	Monofluorotrichloromethane	一氟三氯甲烷
29034200	difluorodichloromethane	二氟二氯甲烷

C.C.C.Code	Category in English	Category in Chinese
29214900	Other aromatic monoamines and their derivatives; their salts	其他芳香族一元胺及其衍生物；其鹽類
29225090	Other amino alcohol phenols, amino acid phenols and other amino compounds containing oxygen functional groups	其他胺醇酚、胺酸酚及其他含氧官能基之胺基化合物
29339990	Other heterocyclic compounds with only nitrogen heteroatoms	其他僅具有氮雜原子之雜環化合物
29349990	Other heterocyclic compounds	其他雜環化合物
29391910	Opium base (raw drug)	鴉片鹼（原料藥）
29391920	Derivatives of opium base; and its salts	鴉片鹼之衍生物；及其鹽類
29394100	Ephedrine and its salts	麻黃鹼及其鹽類
29394200	Pseudoephedrine and its salts	假麻黃鹼及其鹽類
29394990	Other ephedrines and their salts	其他麻黃鹼類及其鹽類
29395990	Theophylline and amphiline (ethylenediamine theophylline) and their derivatives; their salts	茶鹼及胺非林（乙二胺茶鹼）及其衍生物；其鹽類
29396100	Ergometrine and its salts	麥角新鹼及其鹽類
29396200	Ergotamine and its salts	麥角胺及其鹽類
29396300	Lysergic acid and its salts	麥角酸及其鹽類
29396900	Other ergot alkaloids and their derivatives; their salts	其他麥角鹼類及其衍生物；其鹽類
29399910	Cannabis (API)	大麻類（原料藥）
30034011	Opiates	鴉片類製劑
30034012	Indian cannabis preparations	印度大麻類製劑
30034013	Cocaine preparations	古柯鹼類製劑
30034019	Other narcotic drug preparations	其他麻醉藥品製劑

C.C.C.Code	Category in English	Category in Chinese
30039099	Other pharmaceutical preparations (other than those listed in section 3002, 3005 or 3006) containing two or more ingredients mixed for therapeutic use or for disease prevention, without dosage or retail packaging format	其他醫藥製劑（不包括第 3002、3005 或 3006 節所列者），包含兩種或以上之成分業經混合供治療或預防疾病之用，不具有劑量或零售包裝式樣者
30044011	Opiates	鴉片類製劑
30044012	Indian cannabis preparations	印度大麻類製劑
30044013	Cocaine preparations	古柯鹼類製劑
30044019	Other narcotic drug preparations	其他麻醉藥品製劑
30044091	Narcotic drug antidote preparations	麻醉藥品解毒藥製劑
84011000	Nuclear reactor	核子反應器
84012000	Isotope separators and equipment and their parts	同位素分離機與設備及其零件
84013000	Nonradiative fuel elements for nuclear reactors (cartridge type)	核子反應器用之非輻射性燃料元件（匣式）
84014000	Nuclear reactor parts	核子反應器之零件
84101300	Water turbines and water wheels, with a power exceeding 10,000 kW	水力渦輪機及水輪，功率超過 10000 瓩者
84121000	Reaction engines, other than turbojet engines	反作用式引擎，渦輪噴射引擎除外
88020000	Aircraft (for military use only)	航空器（屬軍事專用者）
88026000	Spacecraft (including artificial satellites) and suborbital craft and spacecraft launch vehicles	太空船（包括人造衛星）及次軌道飛行物與太空船發射載具
88030000	Aircraft parts (for military use only)	航空器零件（屬軍事專用者）

E China's Catalogue for the Guidance of Foreign Investment Industries in 1995

Part I. Encouraged Projects For Foreign Investment

I. Agriculture, Forestry, Animal Husbandry, Fishing and Related Industries

1. The reclamation and development of wastelands, barren hills and shoals (except where there are military installations) and transformation of medium and low-yield farm lands and low-yield forests;
2. The development of new high-quality, high-yield strains of food grains, cotton, oil crops, sugar crops, vegetable, flowers and plants, and forage grass crops;
3. Serial non-soil cultivation and production of vegetables and flowers and plants;
4. Forest plantation and the introduction of improved varieties of forest trees;
5. Development of fine breeds of stud stock, birds, and aquatic products (not including China's indigenous precious fine varieties);
6. Breeding of famous, special or fine aquatic products and deep-water fishing;
7. New lines of highly efficient and safe crude agricultural chemicals (which have a pest-killing and bacteria-killing rate of up to 80% and do not harm human beings, animals and crops);
8. High-concentration chemical fertilizers (urea, synthetic ammonia and phosphamidon);
9. New production technology and new kinds of agricultural plastic film (fiber film, photolysis film and multi-function film and raw materials);
10. Veterinary antibiotics (special animal antibiotics, veterinary antibiotics against internal and external parasites, new forms of veterinary antibiotics), veterinary anthelmintics;
11. All-valence compound fodder, additives and the development of fodder protein resources;
12. New technology and equipment for the storage, preservation and processing of vegetables, fruits, meat products and aquatic products;
13. Forestry chemical products and new technology for the comprehensive utilization of inferior, small and fuel forests and new products therefrom;

14. The construction and management of comprehensive water control projects (where the State commands the majority of shares and with more than 300,000 tonnes of daily water supply or with installed capacity of more than 250MW);
15. The manufacture of water-saving irrigation equipment;
16. Agricultural machinery, agricultural tools and related spare parts.

II. Light Industry

1. Mold design, processing and manufacture of non-metal products;
2. Commercial-grade paper pulp;
3. Post dressing and processing of leather;
4. Mercury-free manganese-alkaline batteries, lithium batteries and hydronickelate batteries;
5. High-tech special industrial sewing machines;
6. Polyimide wrap;
7. Enzyme products, synthetic detergent raw materials (straight-chain aldylbenzene);
8. Synthetic spices and single-ion spices;
9. Research and popularization of freon substitution technology.

III. Textile Industry

1. Chemical fibres with such modified properties as being ultra-thin, electrostatic-resistant, fire-retarding and high emulation; special chemical fibers such as aryl, spandex and carbon fiber;
2. Textile dyeing and after-treatment;
3. Highly simulated chemical fiber and fabrics;
4. Oils used in textile industries;
5. Special industrial textile products.

IV. Transport, Post and Communications Industry

1. Railway transport technology and equipment: design and manufacture of locomotives and their major parts; rail line design and construction; technology and equipment manufacturing for fast railways; communication signals and transport safety monitoring equipment manufacturing; electrical-powered railway installation and equipment manufacturing;
2. Construction and management of local railways and associated bridges, tunnels and ferries (off limits to solely foreign-funded enterprises);
3. Road and port machinery and its design and manufacture technology;

4. Construction and management of urban subway and light-duty rail system (where the State should command the majority of shares);
5. Construction and management of roads, bridges, tunnels and ports (the State shall command the majority of shares in public ports projects);
6. Construction and management of civil airports (where the State shall command the majority of shares);
7. Manufacture of 900-MHz digital mobile communication equipment;
8. Synchronous optic fiber of more than five time-groups, microwave communication systems and measurement equipment manufacturing;
9. Manufacture of asynchronous transfer mode (ATM) exchange equipment.

V. Coal Industry

1. Design and manufacture of coal mining, excavation and transportation machinery;
2. Design and manufacture of complete sets of gasification equipment;
3. Manufacturing equipment and additives for high concentration liquid coal;
4. Comprehensive utilization and development of fuels with low calorific value and associated resources;
5. Comprehensive development and utilization of coal.

VI. Power Industry

1. Construction and management of thermal power plants (including conventional thermal power plants and power plants that utilize antipollution coal-burning technology);
2. Construction and management of hydropower stations (the State shall command the majority of shares in those stations with more than 250MW of installed capacity);
3. Construction and management of nuclear power stations (where the State shall command the majority of shares);
4. Construction and management of power stations utilizing new types of energy (including solar energy, wind energy, magnetic energy, geothermal energy and tidal energy).

VII. Ferrous Metallurgical Industry

1. Sponge iron (using coal as reductant);
2. Powder metallurgy (iron powder);
3. Short-process steel and iron production lines of more than 200,000 tonnes; steel and iron production lines of more than 500,000 tonnes;

4. Cold-rolled silicon steel plates, galvanized plates, tinned plates and stainless steel plates;
5. Hot-and cold-rolled slit plates;
6. Bushed steel bearings, steel oil pipes, stainless steel pipes and high-pressure boiler pipes;
7. Tires and nave bosses of locomotives and vehicles;
8. Super-high power electrodes, spicule coke;
9. Aluminium alumine, hard clay pit and grog;
10. Iron ore mining and dressing;
11. Deep processing of tamping coke and coal tar;
12. Ultra-pure magnesium dust (off limits to solely foreign-funded enterprises);
13. High grade special refractory materials for continued casting, ladle and combined blow; special protective cinder.

VIII. Non-Ferrous Metallurgical Industry

1. Single- (more than 5 inches in diameter) and multi-crystal silicon;
2. Hard alloy, chemical tin compound, chemical stibium compounds;
3. Compound materials of non-ferrous metals, new alloy materials;
4. Exploitation of copper, lead and zinc mines (off limits to solely foreign-funded enterprises);
5. Exploitation of aluminium mines (off limits to solely foreign-funded enterprises) and aluminium oxide (more than 300,000 tonnes);
6. Rare-earth minerals application.

IX. Petroleum, Petrochemical and Chemical Industry

1. Ionic membrane caustic soda and new organic chlorine product series;
2. Manufacture of caustic soda ion membrane;
3. Ethylene (with an annual production of more than 300,000 tonnes), acrylics and the comprehensive utilization of C4-C9 products;
4. Engineering plastic products and plastic alloys;
5. Synthetic rubber (liquid styrene-butadiene rubber, butyl rubber, isoprene rubber, acetyl propionyl rubber, butadiene flange duprene rubber, lactoprene rubber, acrylic rubber and alcoholate fluoride rubber);

6. Fine chemical industry: dyes, intermediates, catalysts, auxiliaries and new color products and new technology; commercial processing technology of dyes and colors; high tech chemical products for electronics and paper-making; food additives, fodder additives, leather chemical products, oil field auxiliaries, surfactant, water treatment agents, glues, non-organic fibres, non-organic dust fillings and equipment;
7. Chloride flange phthaleins vanish;
8. Chemical products that use coal as raw material;
9. Necessary raw materials for synthetic materials (bisphenol A, butadiene-styrene latex, pyridine, 4.4 diphenyl methane diisocyanic ester);
10. Basic chemical raw materials: comprehensive utilization of benzene, methylbenzene, para-xylol derivatives, ortho-xylol derivatives and meta-xylol derivatives;
11. Comprehensive recycling of waste gas, liquid and residue;
12. Construction and management of oil and gas pipes, oil depots and ports designated for oil transportation (where the State shall command the majority of shares).

X. Machinery Industry

1. Manufacture of welding robots and highly-efficient welding production lines;
2. Heat-resistant insulating materials (with the F and H insulating grades) and finished insulating products;
3. Manufacture of continued milling machines for slit plates, large cold-and hot-rolling equipment and gasification furnaces for urban supply and antipollution industrial use;
4. Manufacture of trackless collection, loading and transport equipment for underground mines; motorized self-loading-and-unloading mining vehicles that can handle more than 100 tonnes of load; mobile crushers; double-in double-out coal grinders; bucket-wheel excavators with speed higher than 3000 cubic meters per hour; mining loaders of more than 5 cubic meters; whole-section tunnelling machines;
5. Manufacture of container loading and unloading bridge and tubular conveyer;
6. Manufacture of complete sets of large air-separation equipment with the capacity of more than 30,000 cubic meters (including 30,000 cubic meters);
7. Manufacture of multi-color offset printing machines;
8. Manufacture of onshore and offshore oil drilling and extraction equipment of more than 4,500 meters; antiblowout apparatus of more than 70-million-Pascal (including 70 million Pascal); fracturing equipment of more than 105 million Pascal (including 105 million Pascal); well-building machines of more than 50 tonnes (including 50 tonnes);

9. Manufacture of complete sets of turbine compressors, aminomethane pumps and mixer-guarantors used in synthetic ammonia projects with annual production of more than 300,000 tonnes (including 300,000 tonnes), in urea projects with annual production of more than 480,000 tonnes (including 480,000 tonnes); in ethylene projects with annual production of more than 300,000 tonnes (including 300,000 tonnes) (the State shall command the majority of shares in the projects);
10. Manufacture of complete sets of electronics, new spinning machines and new paper-making (including paper pulp) machines;
11. Manufacture of large and precision measurement equipment;
12. Safety monitoring and checking equipment (for detection of vibration, noise, poisonous matters, dust concentration and prediction of gas outburst and shock bump);
13. Components and spare parts of new types of instruments and materials (mainly referring to intelligent instrument sensors, instrument socket connectors, flexible circuit boards, photoelectron switches, proximity switches and other new types of switches; instrument functional materials);
14. Manufacture of large, highly-efficient numerical controlled precision machine tools and their functional parts;
15. Hydraulic components, pneumatic components and sealing elements;
16. Fine punching molds, precision hollow molds and standardized molds;
17. Manufacture of urban sewage treatment equipment that can handle 250,000 tonnes of sewage per day; industrial liquid waste membrane treatment equipment; up-flowing anaerobic fluidized bed equipment and other organic liquid waste treatment equipment, coal ashes building blocks equipment (50,000-100,000 tonnes per year), waste plastics recycling equipment, industrial boiler desulphurization and identification equipment, large heat-and acid-resistant bag-type collectors;
18. Manufacture of large road construction equipment;
19. Manufacture of large (200-430 mm in external diameter), precision and special hearings;
20. Manufacture of major automobile components and spare parts: brake assembly, driving assembly, gearbox, steering gear, diesel engine fuel pump, piston (including piston ring), air valve, hydraulic tappet, axle pad, booster, clarifying filter (triple filter), aluminium radiator, diaphragm clutch, constant-velocity universal joint, shock absorber, car air conditioning system, safety air bag, seat angle adjusting device, car lock, rear-view mirror, glass lift, combined dashboard, engines, lamps and bulbs, special high-strength fasteners, special bearings;

21. Manufacture of automobile molds (including punching molds, injection molds, pressed molds), clamping apparatus (including welding fixture and examination fixture);
22. Automobile casting and forging blanks;
23. Automobile technology research centers and automobile design and development institutions;
24. Highly-specialized vehicles such as those used in airports and in deserts in petroleum industry.

XI. Electronics Industry

1. Production of large-scale integrated circuits;
2. New types of electronic components and spare parts (including sectional components) and power electronic components and spare parts;
3. Manufacture of photoelectronic components and parts, sensitive components and parts, sensors;
4. Manufacture of medium and large computers;
5. Manufacture of top-end 32-bit plus (not including 32-bit) micro-computers;
6. The manufacture of key components of fax machines (heat-sensitive printing heads, image sensors, etc.);
7. Digital cassette recorders and laser disc apparatus compatible with digital television and HDTV;
8. Semiconductor and photoelectronic materials;
9. New types of display devices (color liquid crystal devices, flat panel display devices);
10. Computer aided design (CAD), computer aided tests (CAT), computer aided manufacture (CAM), computer aided engineering (CAE) systems and other computer application systems;
11. Manufacture of special electronic equipment, instruments, tools and molds;
12. Manufacture of hydrologic data collection instruments and equipment;
13. Manufacture of satellite communications telephone earth stations (TES) and personal earth stations (PES) and key components;
14. Manufacture of SDH optical communications systems, cross connection equipment and network management systems;
15. Development and production of (computer and communications) software;
16. Manufacture of air traffic control system equipment;

17. Development and manufacture of large capacity laser disk and magnetic disk storage and related components;
18. Development and manufacture of new types of printing devices (laser printers, etc.)

XII. Building Materials and Equipment and Other Non-Metallic Minerals Industries

1. Float glass production lines with daily melting output of 500 tonnes or more;
2. High-grade sanitary ceramics production lines with annual output of 500,000 pieces;
3. New types of building materials;
4. Special cement;
5. Cement additives;
6. Storage and transport facilities for bulk cement;
7. Manufacture of special urban sanitary equipment;
8. Manufacture of tunnel excavators, urban subway entry-driving machines;
9. Manufacture of tree transplanting machinery;
10. Manufacture of road milling and repairing machinery;
11. Glass fiber and glass fiber reinforced plastic products;
12. Inorganic, non-metal materials and products;
13. Non-metallic mineral deposits and deep processing.

XIII. Medical and Pharmaceutical Industries

1. Chemical raw materials that are within the patented period under the protection of China's administration; special medical intermediates that need to be imported;
2. Antiphlogistics and fever-allaying medicines: new varieties that have good curative effects and have not been produced domestically;
3. Vitamins: vitamin D3, dextropantothenic calcium, niacin;
4. New types of anti-cancer, cardio-and cerebral-vascular medicines;
5. Medicine agents: slow-releasing agents, release controlling agents, targeting agents, skin-penetrating and other new types of forms of medicines and related supplements;
6. Amino acids: serine, tryptophan proteinochromogen, histamine, etc.;
7. New types of medicine packaging materials, containers and advanced pharmaceutical equipment;
8. New types of highly efficient and economic contraceptive medicines and devices that have not been produced domestically;

9. New technologies and equipment that can improve the quality of patent traditional Chinese medicines and that can improve the packaging of the medicines;
10. New techniques of analyzing traditional Chinese medicine's active agents and extraction;
11. New types of medicine manufactured by biological engineering technology.

XIV. Medical Equipment

1. X-ray machines of more than 800 milliamperes;
2. Digital subtraction angiography apparatus;
3. Biochemical analysis instrument;
4. Electronic endoscopes;
5. Medical monitoring instrument;
6. Multi-function anesthesia apparatus;
7. Medical tubes.

XV. Space and Aviation Industries

1. Civilian aircraft manufacturing;
2. Aircraft engines;
3. Airborne equipment;
4. Light combustion turbines;
5. Civilian satellite manufacturing;
6. Manufacture of satellite pay loads;
7. Satellite application (the State shall command the majority of shares).

XVI. Shipbuilding Industry

1. Manufacture and repairing of special ships, high performance ships and ships larger than 35,000 tonnes;
2. Manufacture of necessary ship accessories.

XVII. New and Developing Industries

1. Micro-electronic technology;
2. New materials;
3. Bioengineering technology;
4. Information and communications networking technology;
5. Isotope radiation and laser technology;
6. Ocean development and oceanic energy development;
7. Energy-saving technology development;

8. Resources regeneration and comprehensive utilization technology;
9. Engineering and technology for the control of environmental pollution.

XVIII. Service Industry

1. International economic and scientific and technological information consultation services;
2. Repairing and after-sale services of precision instrument and equipment.

Part II. Projects Restricted For Foreign Investment

A. I. Light Industry

1. Assembling of movements of mechanical and electronic watches and finished watches; bicycles and sewing machines for household use;
2. Home appliances: washing machines, refrigerators, freezers;
3. Disposable aluminum cans.

II. Textile Industry

Long polyester fiber with annual production under 5,000 tonnes.

III. Coal Industry

Local method coke making.

IV. Ferrous Metallurgical Industry

1. Silicon iron, ordinary carbon electrodes;
2. Electric furnace steel processing projects under 30 tonnes; revolving furnace steel processing projects under 30 tonnes; blast furnace smaller than 300 cubic meters and their related sintering and coal carbonization;
3. Welded steel pipe of 100 millimeters or thinner, rolling mills, ordinary steel primary rolling mills and rough mills for steel pipes thinner than 76 millimeters.

V. Non-Ferrous Metal Industry

Aluminum materials and aluminum doors and window frames.

VI. Petrochemical and Chemical Industries

1. Barium salts, naphthalene flange benzene anhydride;
2. Oil refineries smaller than 2.5 million tonnes;
3. The renovation of cross-ply, old tires (except meridian tires) and low performance industrial rubber replacements;

4. Iodine extraction from kelps.

VII. Machinery Industry

1. Ordinary long polyester fiber and short fiber equipment;
2. Manufacture of ordinary passenger and cargo ships, ship diesel engines and diesel electricity generating sets;
3. Processing of carbon silicon raw materials;
4. Power station, electricity-powered grinders;
5. Ordinary carbon steel welding rods;
6. Ordinary grade standard fasteners, small and medium-small ordinary bearings;
7. Ordinary lead acid batteries;
8. Containers;
9. Elevators.

VIII. Electronics Industry

1. Radio cassette recorders, radios;
2. Black-white television sets and black-white kinescopes;
3. Computers below 16-bits (including 16-bits);
4. Wireless telephone systems under 450 MHz;
5. Broadcast and television transmitting systems.

IX. Building Materials and Equipment and Other Non-Metallic Mineral Industries

1. Cement production lines with annual output of less than 300,000 tonnes;
2. Ordinary building plate glass production lines with daily melting output lower than 200 tonnes.

X. Medical and Pharmaceutical Industry

1. Antibiotics: chloromycetin, lincomycin, gentamicin and dihydrostreptomycin;
2. Synthetic chemical medicines: anlagin, vitamin B1, vitamin B6;
3. Traditional Chinese medicine decoction (except traditional preparation techniques);
4. Traditional Chinese medicine products and semi-finished products.

XI. Medical Devices

1. Non-self-destructible disposable syringes;
2. Medium and low-grade B ultrasonic imaging devices;
3. Electrocardiongraphs.

XII. Service Industry

1. Taxi (cars can only be purchased domestically);
2. Gas stations (restricted to the construction and management of related projects).

B. I. Agriculture, Forestry, Animal Husbandry, Fishing and Related Industries

1. Processing and export of rare trees and timbers (off limits to solely foreign-funded enterprises);
2. Aquatic fishing in offshore and inland waters (off limits to solely foreign-funded enterprises).

II. Light Industry

1. Table salt, industrial salt;
2. Foreign brand non-alcoholic beverages (including solid drinks);
3. Famous brand white spirit;
4. Cigarette diacetin cellulose and tows;
5. Tobacco processing industries such as those in the manufacture of cigarettes and filters;
6. Processing and production of pig, ox and goat hides;
7. Natural spices.

III. Textile Industry

1. Wool and cotton spinning;
2. Raw silk and blank silks;
3. Chemical fibers and their raw materials (polyester, acrylnitrile, caprolactam, nylon 66 salts, etc.).

IV. Coal Industry

1. Extraction of coking coals (off limits to solely foreign-funded enterprises).

V. Non-Ferrous Metal Industry (Off Limits to Foreign-Funded Enterprises)

1. Copper processing;
2. Extraction, dressing, smelting and processing of precious metal ores (gold, silver, platinum);
3. Extraction of non-ferrous metal ores such as wolfram, tin and stibium;
4. Rare earth extraction and smelting.

VI. Petrochemical and Chemical Industries

1. Color and black and white film;
2. Extraction and processing of ludwigite;

3. Strontium salts;

4. Benzidine.

VII. Machinery Industry

1. Whole cars (the State shall command the majority of shares);

2. Whole motorcycles (the State shall command the majority of shares);

3. Whole light vehicles (light passenger vehicles, vans) (the State shall command the majority of shares);

4. Automobile and motorcycle engines (the State shall command the majority of shares);

5. Automobile air-conditioning compressors, electronically controlled fuel injection system;

6. Renovation, dismantling and reassembling of old cars and motorcycles;

7. Compressors for air conditioners and refrigerators (excluding those used in automobile air conditioners) with power of 2 kilowatts or less;

8. Decentralized control systems (including programmable controllers);

9. Desktop electrostatic copiers;

10. Thermal power generation equipment: manufacture of generation set (generators, steam turbines, boilers, auxiliaries and control devices) of 100MW or above; combustion turbines combined circulating power generating equipment; circulating fluidized bed boilers; gasification combined circulatory technology and equipment (IGCC), pressurizing fluid bed (PFBC); desulphurization and denitrification equipment (off limits to solely foreign-funded enterprises);

11. Hydropower equipment: manufacture of hydropower sets (including hydropower auxiliary equipment and control devices) with runners of 5 meters in diameter and larger; large pumped storage generating sets of 50MW or larger; tubular turbine generating sets of 10MW or larger (off limits to solely foreign-funded enterprises);

12. Nuclear power generation sets: manufacture of generation sets of 600MW or larger (off limits to solely foreign-funded enterprises);

13. Power transmission and conversion equipment: transformers of 220,000 volts or above, high-voltage switches, mutual-inductors and the manufacture of cable equipment (off limits to solely foreign-funded enterprises).

VIII. Electronics Industry

1. Color television sets and tuners, remote controllers, flyback transformers;

2. Color kinescopes and glass shells;

3. Camcorders (including camcorder-recorders), video recorders;

4. Video recorder magnetic heads, drums and movements;

5. Emulated mobile communications system (comb, trunk, pagers, wireless telephones);
6. Facsimile machines;
7. Satellite television receivers and key components;
8. Microwave relay communications equipment below 4 time group.

IX. Building Materials and Equipment and Other Non-Metallic Mineral Industries

Exploration, extraction and processing of precious non-metal minerals such as diamonds and other natural gemstones (off limits to solely foreign-funded enterprises).

X. Medical Industry

1. Traditional Chinese medicines administrated by the export licensing system;
2. Narcotic precursors: ephedrine, pseudoephedrine, ergobasine, ergotamine, lysergic acid;
3. Penicillin G, artemisinin anti-malaria drugs;
4. Addictive narcotics and psychotropic drugs;
5. Vitamin C;
6. Blood products.

XI. Transportation, Post and Telecommunications Industries

1. Construction and management of arterial railways (the State shall command the majority of shares);
2. Overwater transportation (off limits to solely foreign-funded enterprises);
3. Cross-border car transportation (off limits to solely foreign-funded enterprises);
4. Aerial transportation (the State shall command the majority of shares);
5. Interchangeable aviation (the State shall command the majority of shares in industrial aviation projects; agricultural and forestry aviation projects are off limits to solely foreign-funded enterprises);
6. Manufacture of digital program-controlled exchanges.

XII. Domestic and Foreign Trade, Tourism, Real Estate and Service Industries (Off Limits to Solely Foreign-Funded Enterprises)

1. Retail and wholesale business;
2. Goods supply and sales;
3. Foreign trade;
4. Construction and management of State-level tourist zones;
5. High grade hotels, villas and office buildings;

6. Golf courses;
7. Travel agencies;
8. Accounting, auditing and legal consultancy and broker services;
9. Representative services (shipping, freight, futures, sales and advertisements);
10. Education and translation services.

XIII. Financial and Related Services

1. Banks, financial companies, trust investment companies;
2. Insurance companies, insurance brokerage and representative companies;
3. Securities companies, investment banks, merchant banks, fund-management companies;
4. Financial leasing;
5. Foreign currency dealing;
6. Financial, insurance and foreign currency consultancy;
7. Production, processing, wholesale and retail sale of gold and silver, jewelry and ornaments.

XIV. Miscellaneous

1. Printing and publishing and distribution services (off limits to solely foreign-funded enterprises);
2. Inspection and verification of import and export commodities (off limits to solely foreign-funded enterprises);
3. Manufacture, publication and distribution of audio and video products.

Part III. Other Projects that Are Restricted by the State and by International Accords that China Joined

PROJECTS PROHIBITED TO FOREIGN INVESTMENT

I. Agriculture, Forestry, Animal Husbandry and Related Industries

1. Wild animal and plant resources protected by the State;
2. China's rare fine strains (including fine genes in crop planting, animal husbandry, and aquatic industries);
3. Construction of natural animal and plant conservation regions;
4. Processing of green tea and other special tea products (famous brand tea, black tea, etc.).

II. Light Industry

1. Ivory carving and processing of tiger bones;
2. Hand-made rugs;
3. Bodiless lacquerware;
4. Enamel and hawksbill turtle products;
5. Blue and white exquisite porcelain;
6. Xuan paper, ink sticks.

III. Power Industry and Urban Public Facilities

1. Construction and management of electric network;
2. Construction and management of urban water supply and drainage, gas and heat supply networks.

IV. Mining, Dressing and Ore Processing

Extraction, dressing and smelting of radioactive minerals.

V. Petrochemical and Chemical Industry

1. Extraction and processing of szaibelyite;
2. Extraction of celestite.

VI. Medical and Pharmaceutical Industry

1. Traditional Chinese medicines protected by the State (muck, licorice root, the bark of eucommia and magnolia);
2. Preparation techniques of patent traditional Chinese medicines and traditional medicines prepared by secret recipes.

VII. Post, Telecommunication and Transportation Industries

1. Management and administration of postal and telecommunications services;
2. Air traffic control.

VIII. Trade

Futures trade.

IX. Broadcast, Television and Film-making

1. Broadcasting and television stations (including cable television networks and transmitting and relay stations at any level);
2. Production, publication and circulation of broadcast and television programs;
3. Shooting, circulation and screening of movies;

4. Video projection.

X. News Media

XI. Military Arms Production

XII. Others

1. Projects endangering military facilities and their effectiveness;
2. Raw materials that can cause cancer, deformity and sudden mutation and their processing;
3. Racing rings, casinos;
4. Pornographic services.

XIII. Other Projects that Are Banned by the State and by International Accords that China Joined