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Empirical Evidence from Taiwanese Plant Data"

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Heterogeneous Impacts of a Change in Chinese FDI Regulations on Domestic Market Outcomes: Empirical Evidence from Taiwanese Plant Data*

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Abstract

The domestic market outcomes of firms investing abroad have attracted the attention of both economists and policymakers. In particular, accelerating the relocation of domestic production abroad has raised public concern about the hollowing out of domestic technologies and employment. This study investigates the impact of foreign direct investment (FDI) policies toward China on plant productivity and employment, using Taiwanese manufacturing plant-level data and exploiting an FDI regulation change in China in 2002 as a significant variation. Our difference-in-differences estimates reveal the heterogeneous responses of Taiwanese plants to this regulation change: plants in deregulated industries that newly invested in China after 2000 experienced an increase in their productivity, employment, and sales, while plants in those industries that had already invested in China in 2000 decreased both employment and sales. We do not find any differential trends between plants in deregulated industries and those in other industries before the regulation change. We also check our crucial assumption of whether the regulation change expanded Taiwanese firms' activities in China. We find that the regulation change increased the capital inflows and net sales generated by new entrant subsidiaries in the Chinese market. Furthermore, we do not find statistical evidence of the hollowing out effects on domestic market outcomes in deregulated industries.

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1 Introduction

Accelerating the relocation of domestic production to developing countries through foreign direct investment (FDI) has raised public concern about the hollowing out of domestic technologies and employment in developed economies. This relocation of domestic production by developed economies may be partly induced by the investment promotion policies (i.e., FDI policies) in developing countries. Many governments in developing countries have been pursuing FDI policies that not only open foreign investment but also attract investment in line with their development strategies (UNCTAD, 2003). Indeed, economists have recently begun to focus on whether such FDI policies generate productivity spillovers by promoting foreign investment in key sectors (Harding and Javorcik, 2011; Wang, 2013; Du, Harrison, and Jefferson, 2014). However, there is a lack of empirical evidence evaluating the impact of drastic FDI policy changes that induce a large inflow of foreign capital in developing countries on domestic market outcomes in developed economies.

To extend our understanding of how such FDI policy changes in developing countries affect domestic technologies and employment in developed economies, this study focuses on the impact of an FDI regulation change that occurred in accordance with the protocol on China's World Trade Organization (WTO) accession on the domestic market outcomes of Taiwanese plants. The Chinese government's revision of its detailed foreign investment project list called the "Catalogue for the Guidance of Industries for Foreign Investment" (the Catalogue hereafter; Inada, 2013) made it substantially easier for foreign firms including Taiwanese firms to engage in FDI in the affected industries. The economic significance of examining this Chinese regulation change is straightforward since the affected industries in Taiwan accounted for 48.4 percent of aggregate sales revenue, 47.6 percent of aggregate value added, and 40.6 percent of the aggregate number of employees of all Taiwanese plants in 2000.

In our dataset, we confirm that about 80 percent of the Taiwanese plants that operated in foreign markets were relocated to China in 2003. Moreover, for 1998–2005, their accumulated investment in China rose from 13.2 billion US dollars to 47.2 billion US dollars, accounting for 53.3 percent of total outward FDI. In 2005, according to the report on the FDI of Taiwan's manufacturing sector in 2006 (Department of Statistics, Ministry of Economic Affairs, 2006), Taiwanese firms whose proportion of subsidiaries sales in China relative to total global sales exceeded 50 percent accounted for 36.2 percent of all foreign-investing firms. The same proportion for subsidiaries employment in China accounted for 57.3 percent of all foreign-investing firms. This expansion of Taiwanese subsidiaries' activities in China was accompanied by a rise in the domestic unemployment rate, which doubled to around 4 percent after China's WTO accession compared with around 2 percent in the 1990s. Thus, concerns about the repercussions of outward FDI to

China on domestic outcomes in Taiwan increased.

More specifically, this study examines how new entrants into foreign markets influence the domestic market outcomes of heterogeneous domestic plants, namely FDI new entrants, FDI incumbents, and domestic plants.[1] Economic theory has emphasized that firms investing abroad through offshoring have positive impacts on domestic outcomes, since those firms reduce production costs and create productivity gains by deepening their international division of labor. This avenue for productivity gains is called the "productivity effect" in previous studies (e.g. Sethupathy, 2013).[2] By contrast, the theoretical sources of the negative impacts of outward FDI on the domestic economy can also be considered. Specifically, Sethupathy (2013) argues that there should be winners and losers from offshoring if offshoring is a new source of the gains of trade and considers that productivity effects arise from new entry into foreign markets rather than firms just continuing to invest aboard. In this vein, Sethupathy theoretically investigates how new entrants into foreign markets affect domestic outcomes. Because new entrants expand their activities in domestic markets and, in turn, increase the competition faced by other domestic firms (the so-called business-stealing effect), domestic firms may experience reduced sales and employment loss. Thus, to unravel the broader picture of the economic impact of outward FDI, exploring how it influences different types of firms differently is a crucial research direction.

Taiwanese firms might have formed networked FDI between China and Taiwan. According to the reports on the FDI of Taiwan's manufacturing sector for various years, the major motives for locating Taiwanese plants in China include its lower labor costs and potential local market size. According to Baldwin and Okubo (2014), the local sales share of Taiwanese subsidiaries has been high, rising from 43.3 percent in 1998 to 49.81 percent in 2005. At the same time, Taiwanese subsidiaries' local sourcing share increased from 42.6 percent (raw materials) and 39.1 percent (parts and components) in 1998 to 52.71 and 52.61 percent in 2005, respectively. Taiwanese exports to China contemporaneously rose from 43.2 billion US dollars in 1998 to 71.6 billion US dollars in 2005, accounting for 37.8 percent of total export sales. Consequently, anecdotal evidence shows that the international production structure of Taiwanese firms manufacturing electronic products drastically changed from mainly exporting from Taiwan to OECD countries in 1998 to relocating their production facilities to China and exporting final goods to OECD countries by 2005.[3] Put differently, production "unbundling" between China and Taiwan advanced, resulting in the offshoring of their production processes.[4]

[1] In this study, domestic plants denote plants that do not invest in China. However, we should note that they include plants that invest in other destination economies such as the United States, Europe, and southeast Asia.

[2] Nevertheless, it is important to understand that the theoretical predictions of how offshoring affects domestic employment among those firms are ambiguous because the positive productivity effect can be canceled out when firms reduce their domestic employment by relocating production processes abroad.

[3] See JETRO, 2004, p. 175.

[4] However, we cannot provide direct evidence that Taiwanese firms actively engaged in offshoring to China.

The main challenge of our difference-in-differences (DID) estimation relates to the assumption that there is no endogenous choice for Chinese governments when foreign investors invest in China. That is, more productive plants may engage in foreign production (Helpman, Melitz, and Yeaple, 2004; Wakasugi and Natsuhara, 2012), whereas plants in less productive industries, which cannot fully exploit productivity growth opportunities, may invest abroad. The advantage of this study comes from using Chinese FDI regulation changes, which vary significantly between industries. According to Inada (2013), foreign investors do not receive full information on which industries would have their restrictions lifted until at least half a month or less before the regulation change comes into force. Accordingly, to evaluate the impact of this FDI regulation change on domestic market outcomes, we exploit the 2002 revision of the Chinese FDI regulation as an exogenous variation that affected the investment decisions of Taiwanese plants to enter Chinese markets.

For the analysis, we use Taiwanese plant-level unbalanced panel data between 1998 and 2005, excluding data for 2001, which were unavailable.[5] An advantage of using this dataset is that it contains information about the plant's status on foreign investment in China both before and after the regulation change in China.[6] We can thus evaluate the effects of the regulation change on foreign investment in China for the following three types of plants according to their status and timing of foreign investment: (i) new entrants into the Chinese market after the regulation change, (ii) incumbents in the Chinese market before the regulation change, and (iii) domestic plants.

Methodologically, our approach has two advantages. First, this study addresses the endogeneity of FDI policies by estimating two types of DID analyses in the single equation. The first DID measures the differences between the affected and unaffected industries before and after the regulation change. This method corresponds to the usual DID estimator, which evaluates whether the treatment of the regulation change induces a deviation from the underlying trend before and after the treatment year. As we explain in detail in Subsection 2.3, the treatment group in this study is the group of industries affected by the relaxation or strengthening of the regulation, while the control group is the group of industries unaffected by the regulation change. The second DID measures the difference between the affected and unaffected industries in the early and late pretreatment periods. This approach can serve to corroborate the fact that both treatment and control groups have a common underlying trend in the pretreatment period and provide empirical support that the trend can be extrapolated into control groups in the posttreatment

[5] The government conducts a census of manufacturing and service industries in 2001 every fifth year. However, merging the large-scale census and plant survey is challenging because of the lack of a common identifier across datasets. The sampling unit (i.e., a firm for the census of manufacturing and service industries) also differs across datasets.

[6] As shown in Subsection 2.4, this dataset provides information about foreign investment status at the plant level rather than at the firm level.

period (Angrist and Pischke, 2008).[7]

Second, our DID estimates can capture the broader consequences of FDI on firm performance. To our knowledge, few studies have investigated the effects of FDI on firm performance by conducting DID estimates. Most studies use propensity score matching to deal with the endogenous decision of investing abroad (Navaretti, Castellani, and Disdier, 2010; Hijzen, Jean, and Mayer, 2010; Hayakawa et al., 2013; Ito, 2015). However, according to conventional practice (Angrist and Pischke, 2008), the estimation sample used in propensity score matching is typically restricted to observations just before and after the start of FDI with a predicted probability of treatment (starting FDI) equal to more than 10 percent but no more than 90 percent. Thus, our DID analysis can provide evidence of the domestic outcomes of outward FDI by employing a more comprehensive sample of firms or plants than those used in previous studies.

Our DID estimates reveal the heterogeneous responses of Taiwanese plants to this regulation change, which are consistent with the theoretical prediction by Sethupathy (2013): plants in deregulated industries that newly invested in China after 2000 experienced an increase in their productivity, employment, and sales, while plants in those industries that had already invested in China in 2000 decreased both employment and sales. We do not find any differential trends between plants in deregulated industries and those in other industries before the regulation change. We also find that the regulation change increased the capital inflows and net sales generated by new entrant subsidiaries in the Chinese market. Overall, we do not find statistical evidence of the hollowing out effects on domestic market outcomes in deregulated industries.

Previous empirical studies have focused on analyzing the productivity effects on firms investing abroad. Navaretti and Castellani (2008) investigate the productivity effects of foreign investment by matching investing firms to domestic firms that have similar characteristics and comparing the performances of both firms. They conclude that foreign investment results in an increase in the total factor productivity (TFP) of investing firms. Stiebale and Trax (2011) consider the productivity effects of cross-border mergers and acquisitions on the acquiring firm's domestic outcomes in the United Kingdom and France, finding that acquiring firms increase domestic sales, investment, and employment, although domestic productivity only improves in France. Sethupathy (2013) analyzes the impact of a fall in the marginal cost of offshoring to Mexico on US firms and shows that a falling offshoring cost increases the intra-firm sales of Mexican affiliates as well as operating profits per US worker. For Taiwanese firms, Huang, Hou, and Yang (2013) find that foreign investment in developing countries increases the domestic TFP of investing firms. Liu and Nunnenkamp (2011) also find that the productivity effects of vertical FDI on domestic production become

[7] Moreover, we address the concern of endogenous program placement, suggesting that policy-affected groups are primarily chosen from industries or sectors in the specific locations that possess potential productivity growth (Todd, 2007). Accordingly, to separate the effects of the FDI regulation change from the deviations of preexisting trends, we control for the industry-specific time trend, city-specific time trend, and industry-city specific fixed effects.

larger with the magnitude of foreign investment. The present study is in line with these works in that it investigates the productivity effects of FDI caused by the regulation change on new entrants into foreign markets. However, it extends this body of research by investigating the business-stealing effects of FDI caused by the regulation change on incumbents in the foreign market.

Some studies investigate the effects of outward FDI by examining the relationship between the domestic and foreign operations of multinational enterprises (MNEs). Desai, Foley, and Hines (2009), for example, find little evidence that the greater foreign activities of US MNEs drive out their domestic activity. Specifically, foreign GDP growth rates are associated with an increase in domestic sales, investment, and the number of employees in US MNEs.[8] Muendler and Becker (2010) and Harrison and McMillan (2011) introduce specifications for estimating labor demand elasticities and shed light on how MNE activities influence domestic employment. They allow for the differential impacts on domestic outcomes by type of FDI and destination. Muendler and Becker (2010) show that an increase in domestic industrial wages has a positive impact on foreign employment, especially when changes in the number of affiliates occur in a given location. Harrison and McMillan (2011) find that a 1 percent decrease in the industrial wage in low income countries reduces domestic employment in US parental firms relative to their foreign manufacturing affiliates,[9] while a 1 percent foreign affiliate wage decline in low wage countries increases domestic employment in vertically integrated firms. These complimentary relationships between the domestic and foreign operations of MNEs suggest evidence of a productivity effect. Hummels et al. (2014) provide further evidence that the productivity effects of offshoring have different consequences on wages for skilled and unskilled workers. They conclude that although offshoring increases the wages paid to high skilled workers, it decreases those offered to low skilled workers.[10] While our study does not examine the relationship between the domestic and foreign operations of MNEs directly, these previous studies relate to ours in the sense that they investigate the differential effects on domestic market outcomes of the regulation change that increased Taiwanese FDI. Although the effects of FDI on domestic outcomes can vary across different types of FDI (vertical or horizontal integration), destinations (developing or developed economies), and types of workers (skilled or unskilled), the empirical investigation of the heterogeneous effects of FDI (pro-

[8] Yamashita and Fukao (2010) also find that the expanded overseas operations of Japanese MNEs have a positive impact on MNE employment in Japan.

[9] Kambayashi and Kiyota (2015) also show that changes in wages in China and in other Southeast Asian countries have negative impacts on domestic employment in Japan. Although these negative impacts are negligible, they also find that the decline in the domestic price of investment goods has significantly larger negative effects on domestic employment than on foreign wages.

[10] The effects of outward FDI in developing countries on domestic employment among investing firms have been shown to be mixed. This inconclusive finding can be interpreted as capturing the aggregate effects of outward FDI, namely the positive productivity effects derived from vertical integrated activities and negative effects from relocating domestic employment. Although Debaere, Lee, and Lee (2010) report that outward investment to developing countries has a negative impact on domestic employment growth, we can regard their results as the aggregate effects of FDI since they do not disentangle the countervailing effects of horizontal FDI from those of vertical FDI.

ductivity vs. business-stealing effects) on the domestic market outcomes of different types of plants within industries, which we conduct in this study, remains an open question.

Finally, our study is most closely related to the works by Yang, Wu, and Lin (2010) and Tsou et al. (2013), which examine the impact of Taiwanese FDI regulation changes in investing in Chinese markets. Yang, Wu, and Lin (2010) used the relaxation of an upper limit of the capital stock for the accumulated sum of FDI in China for listed firms to investigate how Taiwanese outward investment in China affects domestic innovation in terms of R&D intensity and patents. Tsou et al. (2013) examine how Taiwanese FDI regulation changes affect investment in China. They construct an employer/employee matched dataset of Taiwanese listed firms and show that the Taiwanese FDI regulation change exacerbated job securities for low skilled workers, although it had no strong impact on employment status for high skilled workers. By contrast, we investigate the effects of FDI policy changes in China. The advantage of this approach may be that policy changes in China are more exogenous for Taiwanese investors that decide to invest in the Chinese market compared with domestic policy changes because Taiwanese investors may be unsure about when Chinese FDI policy changes actually come into force. Therefore, we tackle the endogeneity of FDI policies by checking whether both the treatment and the control groups have a common underlying trend in the pretreatment period.

The rest of this paper proceeds as follows. The next section presents the background and describes the regulation change, construction process of the treatment index, and data. Section 3 explains our econometric strategy and Section 4 shows the baseline results. Section 5 checks the robustness of the baseline results. Section 6 provides evidence of whether the regulation change expanded the affected Taiwanese subsidiaries' activities in China and examines the hollowing out effects on domestic market outcomes in deregulated industries. Section 7 concludes.

2 Background to the Regulation Change and Data

2.1 FDI from Taiwan to China

This subsection describes the shift in China's FDI policy toward Taiwan and that in Taiwan's FDI policy toward China from the late 1970s to the 1990s and then focuses on the FDI policy before and after China's WTO accession in 2001. We begin by describing the FDI policies during the 1970s and 1980s. The Chinese government has implemented various measures to encourage investment from Taiwan since the beginning of its economic reform. These measures have primarily aimed to transfer advanced technologies from surrounding economies that share similar cultural values. It first made a statement called its "message

to compatriots in Taiwan" in January 1979.[11] This statement included an offer to stop the military confrontation between the two sides and sought to improve relations by constructing an information and telecommunication infrastructure, increasing mutual visits, and expanding economic exchanges. In the 1980s, the Chinese government further encouraged foreign investment[12] and implemented measures that offered preferential tax[13] and administrative treatment to Taiwanese invested firms[14] that located their operations in special economic zones or eastern coastal cities. Meanwhile, the Taiwanese government prohibited firms from trading with and investing in China. However, an increasing number of Taiwanese firms engaged in trading and investing in China via a third country without the approval of the Taiwanese government because these restrictive measures had no provision regarding a punitive clause. In summary, China's FDI policies were one of the main determinants of FDI inflows from Taiwan to China during this period and Taiwanese firms responded to them without seeking the approval of the Taiwanese government.

[Insert Figure 1]

In 1990, given that trade and investment to China had accelerated, the Taiwanese government came to a compromise and established its "Regulations Governing Indirect Investment or Technical Cooperation in Mainland China,"[15] which stated that Taiwanese firms were officially permitted to enter the Chinese market via a third country.[16] [17] Moreover, the Chinese government published its "List of Products Permitted for Indirect Investment or Technical Cooperation in Mainland China," which listed information on the 3,353 investment projects permitted by the government.[18] [19] Figure 1 shows that Taiwanese investment in China rapidly increased during the 1990s. This rise coincided with not only the huge upsurge in FDI from various parts of the world after the announcement of China's commitment to re-accelerate economic reform in Deng Xiaoping's 1992 southern tour speech but also the relaxation of investment regulations against China.

[11] People's Daily, January 1, 1979.

[12] See "Provisions of the State Council on the Encouragement of Foreign Investment" published in 1986 (Gazette of the State Council of the People's Republic of China, No. 26, October 1986).

[13] See "Provisions of the State Council on Measures on Special Preferential Treatment for Investment in Special Economic Zones by Compatriots from Taiwan" published in 1983.

[14] See "Provisions of the State Council Concerning the Encouragement of Investment by Compatriots from Taiwan" published in 1988 (Gazette of the State Council of the People's Republic of China, No. 15, July 1988). Subsequently, the Chinese government published another measure that encouraged investment from other Chinese capitals (See "Provisions of the State Council Concerning the Encouragement of Investment by Compatriots from Overseas Chinese, Hong Kong, and Macau").

[15] See Presidential Office Gazette, Vol. 5312, October 1990.

[16] Ishida (2005) points out the background of easing the regulations. Firstly, Taiwanese exporters decreased the competitiveness of their exports because of rapid currency revaluation in accordance with the Plaza Accord on exchange rates. Secondly, increasing political stability such as the acceptance of the establishment of the Democratic Progressive Party and lifting of martial law boosted the economic activities of Taiwanese firms in foreign markets.

[17] The relaxation of trade regulations toward China also occurred contemporaneously with the relaxation of investment rules. For the relaxation of indirect imports from China, see "The Principle of Indirect Import Products from Mainland China." For the relaxation of indirect exports, see the "Regulations Governing Indirect Exports to Mainland China."

[18] See the Ministry of Economic Affairs gazette, Vol. 22, No. 21, November 1990.

[19] The increase in Taiwanese FDI in China might have been caused by establishing "The Law of the Peoples Republic of China On Protection of Investment by Taiwan Compatriots," which protected Taiwanese investment.

[Insert Figure 2]

However, there is a remarkable discrepancy in the number of investment projects and amount of investment between the statistics collected from the Chinese and Taiwanese authorities. Figure 2 depicts data on Taiwanese FDI inflows as collected by the Investment Commission, Ministry of Economic Affairs (MOEA). The data in this figure were aggregated from the amount of Taiwanese investment in China that was formally permitted by the Investment Commission from 1991. These numbers indicate that a considerable number of Taiwanese firms invested in China without going through the formal investment approval process.

Further, Figures 1 and 2 illustrate that FDI decreased in the late 1990s. Both Chinese and Taiwanese FDI policies might have affected this downturn. In terms of the former, the Chinese government adjusted its policies on foreign investment inflows through the implementation of investment guidelines in the "Interim Provisions on Guiding Foreign Investment Direction," and the publication of a detailed investment project list in the Catalogue, which listed information on projects that the Chinese government encouraged, restricted, or prohibited. Around the same time as the implementation of these restrictions, the Lee Teng-hui administration carried out its "no haste, be patient" policy in 1996, which again regulated foreign investment in China. Specifically, it revised the "Rules Governing Applications for Investment or Technical Cooperation in Mainland China" and restricted large-scale investment by placing a ceiling on investment amount.[20] Moreover, this administration expanded the scope of investment projects prohibited in China.[21] Thus, FDI restrictions on both sides could have negatively affected FDI inflows from Taiwan to China.

After a period of slower investment growth rates, Taiwanese FDI inflows in China increased sharply again around 1999, when negotiations for China's WTO accession were beginning and Chinese laws and rules related to foreign-invested companies were under revision. The Taiwanese government also started to negotiate its reinstatement of its membership of the General Agreement on Tariffs and Trade in the early 1990s. Although it concluded negotiations on WTO entry with the United States in February 1997 and the European Union in July 1998, the WTO stated in 1992 that Taiwanese entry should be preceded by Chinese accession. Meanwhile, the Taiwanese government withdrew its "no haste, be patient" policy for violating its national treatment principles and implemented an "active opening, effective management" policy in 2001 that relaxed regulations on foreign investment in China.[22] Then, it re-revised its "Rules

[20] See the Executive Yuan Gazette, Vol. 3, No. 30, July 1997.
[21] See the Executive Yuan gazette, Vol. 3, No. 30, July 1997.
[22] See "Plan for the Implementation of Active Opening, Effective Management Policy for Investment in Mainland China" (passed through the Executive Yuan council on November 7, 2011). The press release is available on the website of the Mainland Affairs Council: http : //www.mac.gov.tw/ct.asp?xItem = 60311&ctNode = 5645&mp = 1 (Retrieved 2 September 2014).

Governing the Applications for Investment or Technical Cooperation in Mainland China" and relaxed the ceiling on the amount of investment.[23] China finally concluded negotiations on its WTO entry with the European Union and United States. Taiwan's WTO entry then came after China's WTO accession on January 1, 2002, after which it expanded the scope of the listed information on permitted investment in China and only 102 manufacturing investment projects remained prohibited by 2002.[24] Consequently, FDI inflows to China reached the unprecedented level of 2.9 billion US dollars (almost 4,000 FDI projects 3,950) in 2002 and 3.1 billion US dollars (over 8,000 FDI projects) in 2003.

[Insert Figure 3]

[Insert Figure 4]

[Insert Table 1]

The Taiwanese government began the ex post verification of investment projects in China to capture the magnitude of investment without official approval.[25] This verification provided firms with investment approval with no penalty if they followed the procedure for verification during a specific period. Accordingly, we see spikes in Figure 2 coinciding with the implementation of this ex post verification process, particularly in 1993, 1997, 2002, and 2003.[26] Table 1 shows Taiwanese FDI inflows toward China that received investment approval through this process. In 1993, the magnitude of investment in China without official approval reached 2 billion US dollars (over 8,000 FDI projects). This table also indicates that the Taiwanese government subsequently encouraged firms to apply for the ex post verification. It finally enacted its "Standards for Administrative Penalties on Illegal Investment or Technical Cooperation in Mainland China" in 2004,[27] which provided penalties for investment in China without official approval. This institution of penalties for illegal investment decreased total ex post verification, although the amount in each case actually increased.

Although Taiwanese investment in China grew steadily in the early 2000s, the Taiwanese economy experienced an economic downturn in 2001 for the first time since the 1970s energy crisis, driven primarily by the ICT industry. Figure 3 shows the long-term trend of the GDP growth rate and the unemployment rate during 1978–2009, showing that the Taiwanese economy maintained high economic growth rates of 8

[23] See the Executive Yuan gazette, Vol. 7, No. 47, November 2001.
[24] See MOEA gazette, Vol. 34, No. 15, May 2002.
[25] This ex post verification process was first stated in the "Regulations Governing the Approval of Investment or Technical Cooperation in Mainland China" published in 1993 (see Presidential Office Gazette, No. 5689, March 1993).
[26] A second round of verification was implemented in accordance with the revision of the "Regulations Governing the Relations between the People of Taiwan and Mainland China" in 1997. For example, see the "Regulations Governing the Relations between the People of Taiwan and Mainland China (Amended on May 14, 1997), the Executive Yuan Gazette, Vol. 3, No. 24, June 1997.
[27] See MOEA gazette, Vol. 36, No. 11, April 2004)

percent during the 1980s and 6 percent during the 1990s as well as low unemployment rates. However, in 2001 it faced a negative GDP growth rate of 1.65 percent and an unemployment rate of about 5 percent. Indeed, while the GDP growth rate bounced back to 4 to 5 percent between 2002 and 2007, the unemployment rate remained unchanged. Figure 4 depicts Taiwanese outward investment and its investment ratio in China during 1991–2009, highlighting that the investment ratio in China relative to total outward investment jumped more than 65 percent during 2002–2005 and reached an average of 50 percent during the 2000s. These facts raise the question of whether accumulated Taiwanese investment in China during the past 20 years as well as the upsurge in FDI after Chinese WTO accession induced a hollowing out effect of domestic market outcomes.

2.2 Regulation Change on Foreign Entry in China

This subsection describes the regulation change on foreign investment in China used in Inada (2013). The Chinese government does not permit all types of inward foreign investment, and its Catalogue provides information on more than 250 foreign-invested projects that are encouraged, restricted, permitted, or prohibited. "Encouraged" projects receive preferential corporate tax rates and can import production equipment duty-free (no value-added tax). "Restricted" projects are not allowed to be controlled by foreign majority ownership, while "Permitted" projects can receive investment with no encouragement and no restrictions. Investment in "Prohibited" projects is unconditionally prohibited.

As noted earlier, we focus on the FDI regulation change in April 2002 that occurred in accordance with the protocol on China's WTO accession.[28] Paying attention to the Catalogue enables us to construct an explicit index of which industries relaxed or strengthened regulations by capturing project category shifts. Altogether, 118 industries relaxed regulations: 80 industries changed their category from "Permitted" or "Restricted" projects in 1998 to "Encouraged" projects in 2002, while 38 changed from "Restricted" to "Permitted" projects. By contrast, 32 industries strengthened regulations: 28 industries changed their category from "Encouraged" projects in 1998 to "Permitted" projects in 2002, while four changed from "Permitted" to "Restricted" projects. Thus, the magnitude of the regulation change was sufficiently large.

The index used in this study is constructed at the corresponding four-digit Taiwanese Standard Industrial Classification (TSIC) level. We first match projects listed in the Catalogue with the four-digit TSIC industries by using the "MOEA Catalogue of Industrial Products (the 13th revised version conducted in 2001)," which groups products by industry. We then classify projects into the two regulation categories.

[28] For a detailed description of the regulation change before and after China's WTO accession, see Inada (2013).

2.3 Construction of the Treatment Index

[Insert Table 2]

An example of how the index was constructed is shown in Table 2 for the case of transport equipment manufacturing and repair. The classification for motor vehicle manufacturing (TSIC 2931) was assigned to listed projects engaged in automobile assembly. Because this categorization was changed from "Restricted" in 1998 to "Encouraged" in 2002, the *Relaxed* indicator was set to one. Similarly, TSIC 2932 for motor vehicle parts manufacturing also changed from "Restricted" in 1998 to "Encouraged" in 2002. Although TSIC 2932 also corresponds to listed projects producing parts for automobiles, we did not consider this in order to avoid double counting. On the contrary, TSIC 2942 covers listed projects that produce key parts for motorcycles. This project changed from "Encouraged" in 1998 to "Encouraged" or "Permitted" in 2002, suggesting that the *Strengthened* indicator should be set to one. Thus, $Relaxed_{ij}$ equals one if the regulation is relaxed in plant i belonging to industry j and zero otherwise and $Strengthened_{ij}$ equals one if the regulation is strengthened in plant i belonging to industry j and zero otherwise.

It is important to explain how these regulation changes influenced incumbent plants in the Chinese market. In 2002, the Ministry of Finance stated that incumbent foreign-invested firms in China would be exempt from enterprise income tax on additional investment projects for two years and then receive a 50 percent reduction for three years if they engaged in an "Encouraged" project after investing additionally and satisfied one of the following two conditions: (i) invest more than 60 million US dollars as an additional investment and/or (ii) increase the capital amount by 50 percent and invest more than 15 million US dollars as an additional investment. In this regard, incumbent plants in the Chinese market were also affected by the regulation change on foreign entry.[29]

[Insert Table 3]

Table 3 summarizes the indices for regulatory relaxation and strengthening in each of the two-digit industries in 2000. As shown, restrictions were lifted for an average of three projects in each of the Taiwanese two-digit industries. This table also shows that although the index for regulatory relaxation varies significantly among industries, restrictions seemed to be relaxed in Taiwan's leading industries, such as the manufacturing of computers, communications, audio and video products, and electronic parts and components. The affected industries account for 15.5 percent of the aggregated sales of all plants and 10.6 percent of the aggregated employment of all plants in the pretreatment year. Regulations were made more

[29] These regulation changes were commonly recognized among Taiwanese investors given the proliferation of news on this topic in, for example, *Straits Business Monthly*, a major magazine that covers topics about the economic relationship between China and Taiwan, and the *Central Daily News*, the official newspaper of the Chinese Nationalist Party.

restrictive or unchanged in industries where China already had a comparative advantage in terms of their exports, such as basic metal industries and the manufacturing of textiles products (Inada, 2013). Moreover, the indices for regulatory strengthening take relatively high values when those for regulatory relaxation also takes high values in order to promote the introduction of newer and more productive technology while restricting older technology.

2.4 Data

The data in this study were taken from the annual Factory Adjustment and Operation Survey (FAOS) carried out between 1998 and 2005 (except for 2001), a nationwide plant census conducted by the MOEA. The FAOS was not conducted in 2001 because a complete economic census was conducted in that year.[30] This dataset includes every plant registered with the government regardless of its number of employees or sales, and plants are linked over time by a unique identifier. For instance, it contains 82,750 plants for 1998 and 77,845 plants for 2005. This dataset also possesses data on the number of employees, wages, operating revenue (sales), intermediate costs, investment, and capital stock. However, data on capital stock are only available in 1998 and 1999 since the census did not collect data on capital stock in the 2000s. Accordingly, capital stock is calculated as

$$K_{it} = I_{it} + (1 - \delta)K_{it-1}, \tag{1}$$

where i and t denote plants and years, respectively, K capital stock, I annual investment flow, and δ a depreciation rate of 5 percent.

To establish the DID setting, the industrial classification of the sample plants is fixed at the four-digit TSIC level in 2000.[31] To capture the effects of the regulation change measured at the four-digit industry level, we hold the industry code of each plant to that of 2000. Moreover, we focus on sample plants in 2000 because these seem to be intensely affected by the regulation change. Consequently, after implementing a series of data-cleaning processes, our dataset contains an unbalanced panel of 79,073 plants and 456,044 observations.[32]

[30] We cannot link FAOS data with census data because these datasets do not have a common identifier. Further, plant information such as name, address, and CEO name was concealed in both datasets.

[31] A major limitation of this study is that we restricted the sample to plants surviving in 2000 because the four-digit regulation codes reported annually are time-variant.

[32] We dropped irrational observations in four stages. First, we deleted plants whose sales and employment records were zero in any single year. Second, we winsorized the key variables by replacing values in the lower or upper 1 percent tails with values at the 1st or 99th percentiles in accordance with Angrist and Krueger (1999). These included sales, employment, wages, capital stock, investment, and electricity expenses. Third, we restricted the sample to plants in the manufacturing sector. Finally, we deleted plants whose identifier and all observable characteristics were duplicated in the same year. As a result of this data-cleaning process, we dropped 16.2 percent (88,117/544,161) of all observations.

TFP is calculated in log form as the following Cobb–Douglas production function:

$$Y_{it} = \beta_0 + \beta_K K_{it} + \beta_L L_{it} + \omega_{it} + \eta_{it}, \tag{2}$$

where Y denotes value added, L denotes employment, and K denotes capital stock.[33] We apply the estimation framework developed by Levinsohn and Petrin (2003) to control for the endogeneity of input choice caused by the omission of unobserved productivity shock ω_{it}. We use electricity expenses as a proxy for the unobserved productivity shock.

As mentioned in Section 1, our interest is investigating how plants that have a dissimilar FDI status (i.e., new entrants and incumbents in the Chinese market and domestic plants) are affected differently by the positive productivity effects and the negative business-stealing effects of the Chinese regulation change that caused outward FDI from Taiwan. Two key variables distinguish whether plants invested in China and whether plants were new entrants. The first indicator is set to one when the plant invested in China in 2000 and the second is set to one when the plant invested in China in 2003.[34] These indicators allow us to confirm whether plants invested before or after the regulation change in 2002.[35]

[Insert Table 4]

Table 4 shows the descriptive statistics for the key variables in the full sample and the subsample of various types of FDI statuses before and after the regulation change. Column 1 presents the characteristics of all plants and columns 2 to 4 present the characteristics of the different types of outward-investing plants in China. First, we see that foreign-investing plants are larger than domestic plants. This finding is consistent with the recent heterogeneous firm model in the international trade literature (e.g., Melitz, 2003). Second, plants that continued to invest in China during the sample period are the largest and newly invested plants are the second largest compared with other foreign-investing plants. The former finding is plausible because more competitive plants keep investing in foreign markets. The interesting observation of the latter comes from the fact that TFP and labor productivity in 2000 in newly invested plants, which relates to the lifting of the regulation change on foreign entry, are even smaller than those of plants that exited the Chinese market after the regulation change. This trend was reversed in 2005 as TFP and labor productivity in newly invested plants grew over the sample period and became larger than plants that exited the Chinese market. This trend may indicate that newly invested plants in China benefited

[33] Value added is deflated by the two-digit industry-level producer price index. Capital stock is deflated by the capital stock deflator.

[34] These indicators include not only Mainland China but also Hong Kong as an investment destination.

[35] The firm is the economic entity that decides to invest in a foreign market, not the plant. However, the FAOS dataset contains a plant-level indicator of whether each plant in a multi-plant firm invested in a foreign market. Moreover, Aw and Lee (2008) also employ the FAOS dataset to examine the relationship between the plant-level location decisions of Taiwanese MNEs and their productivity.

from productivity effects. Moreover, plants that exited the Chinese market decreased employment and TFP in 2005. It also suggests that exiting plants suffered from the business-stealing effect caused by the expansion of newly invested plants' activities. By contrast, the trends of surviving plants in China are mixed. While TFP and employment decreased or did not change significantly after the regulation change, sales, labor productivity, and wages all increased over the sample period. Finally, although plants that invested in China were affected by the timing of the investment, the outcome variables in the full sample and for domestic plants did not change significantly over time. Overall, these summary statistics support the theoretical prediction that outward FDI affects different types of plants differently.

[Insert Table 5]

[Insert Table 6]

As a further step, we follow the procedure of Eissa and Liebman (1996) to examine whether the discussion above is supported by the comparison between the treatment and control groups. Tables 5 and 6 present employment and TFP for one of the major treatment groups (i.e., the index for the relaxation of the regulation) and control groups before and after the regulation change in 2002. In each panel, the first column shows average employment or TFP before the regulation change; the second column shows the average after the regulation change; and the third column shows the change in employment or TFP. The DID estimates of the regulation change in China are displayed in the last column. Panel A in Tables 5 and 6 compares the treatment group (industries affected by the relaxation of the regulation) and control group (industries unaffected by the relaxation of the regulation) for the full sample. Consistent with the descriptive statistics, neither employment nor TFP changed significantly over time. However, there was a decrease or no substantial change for the control groups.

Panels B to D examine how the regulation change influenced employment and TFP in the subsamples of the different types of foreign-investing plants.[36] Panel B presents employment and TFP for newly invested plants in China in industries affected by the relaxation of the regulation compared with domestic plants in industries affected by the relaxation of the regulation. As shown in Table 5, employment before the regulation change was 100.001 persons for newly invested plants in China and 25.521 for domestic plants. After the regulation change, employment increased significantly by 6.095 persons for newly invested plants in China, while employment for domestic plants also slightly increased by 0.545 (not significant). Consequently, we obtain a DID estimate of an increase in employment by 5.550 persons on average. As

[36] One may think that we could define two control groups: domestic plants in industries affected by the relaxation of the regulation and foreign-investing plants in industries unaffected by the relaxation of the regulation. However, the latter control group would be endogenous because the plants in this group invest in China regardless of whether they are affected by the regulation change. Accordingly, here we compare foreign-investing plants in the affected industries with domestic plants in industries affected by the relaxation of the regulation.

shown in Table 6, TFP before the regulation change was 5.328 for newly invested plants in China and 4.984 for domestic plants (although the coefficient of the difference in means is not significant). After the regulation change, employment increased significantly by 0.196 for newly invested plants in China, while employment for domestic plants also slightly increased by 0.015 (not significant). The DID estimate is thus significant and there is an increase in TFP by 0.181 on average. These results may support the productivity effects on newly invested plants in China and suggest that the regulation change expanded affected plants in Taiwan.

Panel C shows employment and TFP for plants that exited the Chinese market after the regulation change in industries affected by the relaxation of the regulation compared with domestic plants in industries affected by the relaxation of the regulation. As shown in Table 5, while employment before the regulation change was 91.873 persons for newly invested plants in China, employment after the regulation change decreased significantly by 4.045 persons. Our DID estimate shows a decrease in employment by 4.591 persons on average. As shown in panel C of Table 6, TFP did not change significantly during the sample period in either the treatment or the control group. These results may capture the business-stealing effects on incumbent plants in China, suggesting that the regulation change caused not only those plants to exit the Chinese market but also a business contraction in Taiwan.

Panel D reports employment and TFP for surviving plants in the Chinese market in industries affected by the relaxation of the regulation compared with domestic plants in industries affected by the relaxation of the regulation. Although surviving plants after the regulation change increased their TFP by 0.152, they decreased employment by 7.506. The DID estimates show that despite the increase in TFP by 0.152 on average, average employment declined by 7.506 persons. These mixed results are consistent with the descriptive statistics. Nevertheless, they may be plausible because of our data limitations about whether surviving plants actually made additional investment in China after the regulation change. Surviving plants may include both newly invested and conventional businesses in China. We explain how to address this in the econometric analysis of Section 3.

Finally, panel E presents employment and TFP for domestic plants in industries affected by the relaxation of the regulation compared with domestic plants in industries unaffected by relaxation of the regulation. These results are consistent with the descriptive statistics, showing that neither employment nor TFP changed significantly over time. However, there were substantial changes in employment for domestic plants in industries unaffected by the relaxation of the regulation. This is problematic because the DID estimates depend on the quality of the control group. Section 3 describes how to avoid using this control group directly to capture the effect of the regulation change properly.

3 Empirical Strategy

Two empirical questions underlie the heterogeneous impact of the FDI regulation change in China on the different types of Taiwanese plants. The first question is to investigate whether the regulation change expanded the activities of newly invested plants in China. This attempt is important because it is analogous to the test of productivity effects of the regulation change that induced outward FDI from Taiwan. The second question is to examine whether the regulation change reduced the business activities of incumbent plants in China or those of domestic plants. Here, we examine whether the business expansion of newly invested plants in China decreased the business activities of other domestic plants. This question is also analogous to testing the business-stealing effects of the regulation change.

We use plant-level unbalanced panel data and estimate the following DID specification as the baseline econometric model:

$$
\begin{aligned}
Y_{ijlt} \quad = \quad & \alpha + \beta Relaxed_{ij} * Post2000_t + \gamma Relaxed_{ij} * Post2002_t \\
& + \delta Strengthened_{ij} * Post2000_t + \zeta Strengthened_{ij} * Post2002_t \\
& + \eta Relaxed_{ij} * 2000Already_{ij} * Post2000_t + \theta Relaxed_{ij} * 2000Already_{ij} * Post2002_t \\
& + \iota Strengthened_{ij} * 2000Already_{ij} * Post2000_t + \kappa Strengthened_{ij} * 2000Already_{ij} * Post2002_t \\
& + \lambda Relaxed_{ij} * 2003New_{ij} * Post2000_t + \mu Relaxed_{ij} * 2003New_{ij} * Post2002_t \\
& + \nu Strengthened_{ij} * 2003New_{ij} * Post2000_t + \xi Strengthened_{ij} * 2003New_{ij} * Post2002_t \\
& + \sum_{k \in K} \sum_{t \in T} \tau_{kt} 2digit\ Industry_k * Year_t + \sum_{l \in L} \sum_{t \in T} \upsilon_{lt} City_l * Year_t \\
& + \sum_{k \in K} \sum_{l \in L} \phi_{kl} 2digit\ Industry_k * City_l + \sum_{i \in I} \psi_i Plant_i + \epsilon_{ijt}
\end{aligned}
\tag{3}
$$

where i, j, k, l, and t index plants, four-digit industries, two-digit industries, cities, and years, respectively. Y_{ijlt} denotes the dependent variables for TFP, wage per worker, employment, and sales. $Relaxed_{ij}$ is the indicator of the index for the relaxation of the regulation for industry j as defined in Section 2.3, while $Strengthened_{ij}$ represents the index for the strengthening of the regulation for industry j. $2000Already_{ij}$ is the indicator of whether Taiwanese plants invested in China before 2000 and $2003New_{ij}$ indicates whether Taiwanese plants newly invested in China during 2001–2003. $Post2000_t$ is a time dummy that represents 2000 and $Post2002_t$ is a time dummy that represents 2002 and after, while ϵ_{jt} is an error term.

As in Besley and Burgess (2004), we control for three types of trend fixed effects. First, we control for the two-digit industry-specific time trends τ_{kt}. If we did not control for the industry time trend, treated

industries could be mechanically performing better than control ones even in the absence of a regulation change because we only capture the consequences of an industrial climate that includes open markets and effective law enforcement as opposed to the effects of the regulation change itself. Second, we also control for the city-specific time trends ν_{lt}. Controlling for city trends is also important because without these controls we cannot separate the effects of the FDI regulation change from the consequences of a preexisting favorable business climate in a city. Third, we include the city-specific industry effects ϕ_{kl} to control for a location-specific industrial climate that includes the establishment of science parks and economic processing zones. In addition, we control for the plant-level fixed effects by using the unique identification code of the plant.[37]

Although we calculated the DID estimates by using the subsample of the different types of plants in the descriptive statistics in Section 2.4, we estimate equation (6) by using the full sample for three reasons. First, we need to control for the index for the strengthening of the regulation. Taiwanese plants' activities in industries belonging to $Strengthened_{ij}$ might be unaffected by the regulation change because plants in these industries are unwilling to invest in China. Accordingly, we must check the robustness of the estimation results of the relaxation of the regulation on the different types of plants by controlling for the respective index simultaneously. Second, we address the problems raised by the descriptive statistics, including whether the control group is valid when investigating domestic plants in industries affected by the relaxation of the regulation and whether the regulation change might capture mixed evidence of outward FDI in the surviving plants. To address the former problem, we capture the effects on domestic plants by checking the coefficients of the full sample (i.e., β, γ, δ, η) after simultaneously controlling for outward-investing plants in China. The latter was caused by our data limitation about whether surviving plants actually made an additional investment in China after the regulation change. We tackle this limitation by including surviving plants in both incumbent plants $2000Already_{ij}$ and newly invested plants $2003New_{ij}$.[38]

The third point relates to the novelty of our estimation. As mentioned above, the DID estimates rely on the common trend assumption. Although we cannot directly test this assumption, we can test it indirectly by estimating simultaneously two double differences in the single equation. The first double difference measures the usual double differences between the affected and unaffected industries before and after the

[37] By capturing such plant-level fixed effects, we control for the plant status of investing in other foreign markets (including the United States, Europe, Japan, and Southeast Asian countries) in 2000 or 2003.

[38] One may think that this research design cannot fully identify the productivity effects and business-stealing effects because surviving plants respond differently to the regulation change. Admittedly, although the ideal identification process would be to divide surviving plants into newly invested plants and incumbent plants, such detailed information is not available in the dataset. In spite of these limitations, our result would still be important if we could provide clear findings to discern the productivity effects and business-stealing effects from the mixed effects of FDI.

treatment:

$$\hat{\beta}_{First\ Diff\ in\ Diffs} = (\bar{Y}^{affected}_{After} - \bar{Y}^{affected}_{Before}) - (\bar{Y}^{unaffected}_{After} - \bar{Y}^{unaffected}_{Before}), \tag{4}$$

where the coefficients of $\hat{\beta}_{First\ Diff\ in\ Diffs}$ correspond to the interaction term between the treatment index and $Post2002_t$. The second double difference relates to checking the common trend assumption in the pretreatment period:

$$\hat{\beta}_{Second\ Diff\ in\ Diffs} = (\bar{Y}^{affected,2000}_{Before} - \bar{Y}^{affected,1998-1999}_{Before}) - (\bar{Y}^{unaffected,2000}_{Before} - \bar{Y}^{unaffected,1998-1999}_{Before}). \tag{5}$$

The coefficients of $\hat{\beta}_{Second\ Diff\ in\ Diffs}$ correspond to the interaction term between the treatment index and $Post2000_t$ and these measure the difference between the affected and unaffected industries in the early and late pretreatment periods. This is called a pseudo DID because we conduct DID estimates by assuming that the regulation change occurs in the late pretreatment period. The procedure closely relates to the triple differences method conducted by Verhoogen (2008) and Frazer and Van Biesebroeck (2010) that controls for the unobserved differential trend of entrepreneurial ability among plants or product-specific trends. However, in this study, since we control for industry, city, and the industry-city specific time trend, we primarily use the second double difference to check the validity of the common trend assumption.

4 Results

[Insert Table 7]

We begin by explaining the estimated results of the productivity effects of the FDI regulation change in China. Table 7 presents the results of the regressions using TFP and wage per worker as the dependent variables. Columns (1)–(4) in Table 7 investigate whether the regulation change on entry affected TFP for each type of domestic plant. Columns (3) and (4) show that the coefficients μ in equation (6) for newly invested Taiwanese plants in industries that relaxed the regulation are 0.0942 and 0.1057, which are significant at the 1 or 5 percent level. These values imply that newly invested plants in industries that relaxed the regulation increased their TFP by 9.42 or 10.57 percent on average from 2002 to 2005 compared with domestic plants in industries that relaxed the regulation. Columns (5)–(8) in Table 7 investigate whether the regulation change on entry affected wage per worker for each type of domestic plant. Columns (7) and (8) also show that the coefficients μ for newly invested Taiwanese plants in

industries that relaxed the regulation are 0.0707 and 0.646, which are significant at the 1 percent level. However, while the coefficient θ in column (6) of Table 7 is significant, it is not robust to the inclusion of the interaction term with newly invested plants in column (8). These findings imply that newly invested plants in industries that relaxed the regulation increased their wage per worker by 7.07 or 6.46 percent on average from 2002 to 2005 compared with domestic plants in industries that relaxed the regulation. These results are consistent with the theoretical prediction by Sethupathy (2013) and suggest that newly invested plants in industries that relaxed the regulation benefited from the productivity effects of the FDI regulation change and increased their wages through rent-sharing effects.[39] Further, all the coefficients with the interaction of $Post2000$ are insignificant, indicating no differential trend between the affected and unaffected industries in the pretreatment period and suggesting that our results satisfy the crucial assumption of the DID estimates. Moreover, all the coefficients for the strengthening of the regulation are also insignificant. Put differently, these findings suggest that regulation changes in China seem to work well for attracting and controlling Taiwanese plants in the Chinese market.

[Insert Table 8]

Table 8 reports the results from the regressions using employment and sales as the dependent variables. Columns (1)–(4) in Table 8 investigate whether the regulation change on entry affected employment for each type of domestic plant. Columns (3) and (4) show that the coefficients μ in equation (6) for newly invested Taiwanese plants in industries that relaxed the regulation are 0.0610 and 0.0830, which are significant at the 1 or 5 percent level. These findings imply that newly invested plants in industries that relaxed the regulation increased their employment by 6.1 or 8.3 percent on average from 2002 to 2005 compared with domestic plants in industries that relaxed the regulation. By contrast, column (4) in Table 8 shows that the coefficient θ for incumbent plants in industries that relaxed the regulation is -0.0478, which is significant at the 10 percent level. This finding implies that incumbent plants in industries that relaxed the regulation decreased their employment by 4.78 percent on average from 2002 to 2005 compared with domestic plants in industries that relaxed the regulation. These results are also consistent with the theoretical prediction and suggest that the regulation change expanded newly invested plants' activities and, in turn, induced a negative business-stealing effect on incumbent plants.[40]

Columns (5)–(8) in Table 8 investigate whether the regulation change affected sales for each type of domestic plant. Columns (7) and (8) show that the coefficients μ in equation (6) for newly invested Taiwanese plants in industries that relaxed the regulation are 0.1704 and 0.2055, which are significant at

[39] Sethupathy (2013) predicts that rent-sharing effects work at the firm level. In line with this prediction, the results in columns (5)–(8) are shown to be robust to using a dataset aggregated at the firm level.

[40] In particular, the business-stealing effect is corroborated by the fact that it is only detected when we include both newly invested plants and incumbent plants simultaneously in the single equation.

the 1 percent level. These findings imply that newly invested plants in industries that relaxed the regulation increased their sales by 17.04 or 20.55 percent on average from 2002 to 2005 compared with domestic plants in industries that relaxed the regulation. By contrast, column (8) in Table 8 shows that the coefficient θ for incumbent plants in industries that relaxed the regulation is -0.0764, which is significant at the 5 percent level. This finding implies that incumbent plants in industries that relaxed the regulation decreased their sales by 7.64 percent on average from 2002 to 2005 compared with domestic plants in industries for that relaxed the regulation. These results suggest that the business-stealing effects among different types of FDI plants occur in the labor market as well as in the product market.

To interpret the estimated results for sales, we should pay attention to the possible violation of our crucial assumption in the following two ways. First, the coefficient η in column (7) of Table 8 is significant, indicating a differential trend in terms of sales between affected newly invested plants and unaffected domestic plants in the pretreatment period. Nevertheless, this point may not be problematic because it is not robust to the inclusion of the interaction term with incumbent plants in column (8). Second, columns (7) and (8) of Table 8 show that newly invested plants in industries that strengthened the regulation also increased their sales by 10.74 or 13.4 percent on average from 2002 to 2005 compared with domestic plants in industries that strengthened the regulation. This means that they also expanded their activities despite the regulation on foreign entry being strengthened in the affected Chinese industries. Although this is a limitation of the present study, newly invested plants in industries that strengthened the regulation may have increased their sales after the regulation change because they were not always prohibited from investing in China. Accordingly, we can conclude that these are not serious violations of our assumption that regulation change attracts Taiwanese capital inflows to the Chinese market and in turn leads to the business expansion of invested plants in China in the domestic economy.

5 Alternative Hypothesis: Tariff Reduction

In this section, we examine whether the baseline results presented in the Results section are robust to including the degree of tariff reduction implemented in accordance with China's WTO entry. Between 1998 and 2005, the Chinese government decreased the average tariff from 17.5 percent to 9.9 percent. It is therefore important to control for tariff reduction in China. Indeed, Qiu and Yu (2014) provide evidence that lowering tariffs in foreign countries can decrease a firm's profit in domestic economies. Tariff reduction may also be related to the regulation change on foreign entry because both investment promotion policies and trade liberalization may be complementary. If so, we would need to control for tariff reduction to avoid omitted variable bias in the estimated effects of the regulation change on domestic market outcomes. The

data used for this exercise are derived from the Trade Analysis and Information System database collected by the United Nations Conference on Trade and Development, the integrated database collected by the WTO.[41] We estimate the following equation:

$$
\begin{aligned}
Y_{ijlt} \quad = \quad & \alpha + \beta Relaxed_{ij} * Post2000_t + \gamma Relaxed_{ij} * Post2002_t \\
& + \delta Strengthened_{ij} * Post2000_t + \zeta Strengthened_{ij} * Post2002_t \\
& + \eta Relaxed_{ij} * 2000Already_{ij} * Post2000_t + \theta Relaxed_{ij} * 2000Already_{ij} * Post2002_t \\
& + \iota Strengthened_{ij} * 2000Already_{ij} * Post2000_t + \kappa Strengthened_{ij} * 2000Already_{ij} * Post2002_t \\
& + \lambda Relaxed_{ij} * 2003New_{ij} * Post2000_t + \mu Relaxed_{ij} * 2003New_{ij} * Post2002_t \\
& + \nu Strengthened_{ij} * 2003New_{ij} * Post2000_t + \xi Strengthened_{ij} * 2003New_{ij} * Post2002_t \\
& + \varphi Tariff_{jt} + \sum_{k \in K} \sum_{t \in T} \tau_{kt} 2digit\ Industry_k * Year_t + \sum_{l \in L} \sum_{t \in T} \upsilon_{lt} City_l * Year_t \\
& + \sum_{k \in K} \sum_{l \in L} \phi_{kl} 2digit\ Industry_k * City_l + \sum_{i \in I} \psi_i Plant_i + \epsilon_{ijt}
\end{aligned}
\tag{6}
$$

[Insert Table 9]

[Insert Table 10]

The results in Tables 9 and 10 are robust to the inclusion of the WTO accession-related tariff reduction in China as controls. The coefficients of tariff reduction in these tables are positive and significant at a reasonable statistical level, although the coefficients in columns 1–4 of Table 10 are not significant. The values shown indicate that a 1 percent tariff decrease resulted in a decrease in wages, TFP, and sales. These results are consistent with those of Qiu and Yu (2014) and suggest that trade liberalization overseas has an adverse impact on domestic market outcomes.

6 Further analysis

6.1 Results for Taiwanese subsidiaries in China

In this subsection, we check our crucial assumption of whether the regulation change expanded Taiwanese firms' activities in China. We use data from the *Taiwan Economic Journal* during 2000–2007, which provides the largest dataset on Taiwanese subsidiaries in China sourced from Taiwanese listed firms. This

[41] Unfortunately, plant-level import and export data to construct firm-level input tariffs are unavailable. Therefore, we cannot examine the differential impact of input and output tariffs.

dataset contains an unbalanced panel of 2,554 firms and 10,194 observations. However, such a Chinese firm-level dataset cannot distinguish Taiwanese firms from firms coming from Hong Kong or Macau. Moreover, Taiwanese firms often invest in the Chinese market by way of tax havens such as the Cayman Islands and Virgin Islands. Hence, using a Chinese firm-level dataset cannot fully capture Taiwanese firms' activities in the Chinese market.

[Insert Figure 5]

Figure 5 plots net sales by Taiwanese subsidiaries for the treatment (including industries that relaxed and strengthened the regulation) and control industries. The growth trends of net sales in both groups of subsidiaries were reasonably similar until 2002. However, net sales by Taiwanese subsidiaries rose in 2003 for the treatment industries, while net sales for the control industries did not show a significant change. This figure suggests evidence of a common underlying trend for the treatment and control industries and a treatment effect that induces a large deviation from the underlying trend.

We estimate the following DID specification:

$$\begin{aligned} Y_{ijklt} &= \alpha + \beta Relaxed_{ij} * Post2002_t + \gamma Strengthened_{ij} * Post2002_t \\ &\quad + \sum_{k\in K}\sum_{t\in T} \iota_{kt} 2digit\ Industry_k * Year_t + \sum_{l\in L}\sum_{t\in T} \kappa_{lt} Province_l * Year_t \\ &\quad + \sum_{k\in K}\sum_{l\in L} \lambda_{kl} 2digit\ Industry_k * Province_l + \sum_{i\in I} \mu_i Firm_i + u_{ijt}. \end{aligned} \tag{7}$$

We then separate all the subsidiaries in the affected industries into incumbent subsidiaries and newly invested subsidiaries and estimate the following specification:

$$\begin{aligned} Y_{ijklt} &= \alpha + \beta Relaxed_{ij} * 2000Already_{ij} * Post2002_t + \gamma Strengthened_{ij} * 2000Already_{ij} * Post2002_t \\ &\quad + \delta Relaxed_{ij} * 2003New_{ij} * Post2002_t + \zeta Strengthened_{ij} * 2003New_{ij} * Post2002_t \\ &\quad + \sum_{k\in K}\sum_{t\in T} \iota_{kt} 2digit\ Industry_k * Year_t + \sum_{l\in L}\sum_{t\in T} \kappa_{lt} Province_l * Year_t \\ &\quad + \sum_{k\in K}\sum_{l\in L} \lambda_{kl} 2digit\ Industry_k * Province_l + \sum_{i\in I} \mu_i Firm_i + u_{ijt}, \end{aligned} \tag{8}$$

where i, j, k, l, and t index firms, four-digit industries, two-digit industries, provinces, and years, respectively. Y_{ijt} denotes the dependent variables for capital inflows from Taiwan to China and net sales in the Chinese market. u_{jt} is an error term. All other variables are as defined earlier. We again control for the three types of trend fixed effects: two-digit industry-specific time trends, province-specific time trends, and province-specific fixed effects.

[Insert Table 11]

Columns (1) and (2) in Table 11 show the estimation results of equations (7) and (8), respectively. These investigate whether the regulation change on entry affected capital inflows from Taiwan to China for each type of Taiwanese subsidiary. While the coefficient in column (1) is not significant, column (2) shows that the coefficient δ in equation (8) for newly invested Taiwanese subsidiaries during 2001–2003 in industries that relaxed the regulation is 0.4570, which is significant at the 1 percent level. This value implies that newly invested Taiwanese subsidiaries in industries that relaxed the regulation increased their capital inflow to the Chinese market by 45.7 percent on average from 2002 to 2007 compared with newly invested Taiwanese subsidiaries in industries unaffected by the relaxation of the regulation. Columns (3) and (4) in Table 11 also report the estimation results of equations (7) and (8), respectively. These equations investigate whether the regulation change on entry affected net sales in the Chinese market for each type of Taiwanese subsidiary. While the coefficient in column (3) is not significant, column (4) shows that the coefficient δ in equation (8) for newly invested Taiwanese subsidiaries during 2001–2003 in industries that relaxed the regulation is 0.4936, which is significant at the 1 percent level. This value implies that newly invested Taiwanese subsidiaries in industries that relaxed the regulation increased their capital inflow to the Chinese market by 49.36 percent on average from 2002 to 2007 compared with newly invested Taiwanese subsidiaries in industries unaffected by the relaxation of the regulation. By contrast, column (4) shows that the coefficient β in equation (8) for incumbent Taiwanese subsidiaries until 2000 in industries that relaxed the regulation is -0.5070, which is significant at the 1 percent level. This value implies that incumbent Taiwanese subsidiaries in industries that relaxed the regulation decreased their net sales by 50.7 percent on average from 2002 to 2007 compared with incumbent Taiwanese subsidiaries in industries unaffected by the relaxation of the regulation. These findings suggest that the regulation change increased capital inflows and net sales, both of which are generated by new entrant subsidiaries in the Chinese market, although it did not change capital inflows and decreased net sales, both of which are generated by incumbent subsidiaries in 2000.

We should note that the descriptive trend in Figure 5 is not robust to the inclusion of the three fixed trends. Hence, treated industries might be mechanically performing better than the control ones even in the absence of a regulation change. Nevertheless, after controlling for these fixed trends, we found that the regulation change increased the capital inflows and net sales of in new entrant subsidiaries. Moreover, none of the coefficients for the strengthening of the regulation is significant. These results corroborate the finding that the regulation change in FDI had an important impact on Taiwanese subsidiaries' activities during the treatment period.

6.2 Hollowing out effects on the domestic economy

In this subsection, we discuss whether outward FDI to China that accompanied the regulation change induced the hollowing out of domestic technologies and employment in the affected industries. Based on the estimation results of equation (6), we conduct an F-test that the null hypothesis is $H_0 : \gamma + \theta + \mu = 0$. First, the F-statistics for TFP and wage per worker from the regressions shown in Table 7 are 1.62 and 18.88. These tests show that while the

null hypothesis on the coefficient of TFP is not rejected, the null hypothesis on the coefficient of wage per worker is rejected at the 1 percent level. We then check the F-statistics for the results for employment and sales in Table 8. These values are 0.91 and 5.04, showing that while the null hypothesis on the coefficient of employment is not rejected, the null hypothesis on the coefficient of sales is rejected at the 5 percent level. Since the coefficient of θ takes a negative value for sales, we again conduct the F-test that the null hypothesis is $H_0 : \gamma + \theta + \mu \leq 0$. The result of the F-test also holds (rejected at the 5 percent level). These findings imply that there is no statistical evidence that the regulation change lead to the hollowing out of domestic technologies and employment in the affected industries. (Rather, the regulation change increased wage per worker and sales in the affected industries.)

7 Conclusion

This study investigates the impact of the FDI regulation change in China on the productivity and employment of Taiwanese plants, using Taiwanese manufacturing plant-level data and exploiting an FDI regulation change in China in 2002 as a significant variation. Our DID estimates reveal the heterogeneous responses of Taiwanese plants to this regulation change, which are consistent with the theoretical prediction by Sethupathy (2013): plants in deregulated industries that newly invested in China after 2000 experienced an increase in their productivity, employment, and sales, while plants in those industries that had already invested in China in 2000 decreased both employment and sales. We do not find any differential trends between plants in deregulated industries and those in other industries before the regulation change. Furthermore, we do not find statistical evidence of the hollowing out effects of outward FDI caused by the regulation change on domestic market outcomes in deregulated industries. We also examine our crucial assumption of whether the regulation change expanded Taiwanese firms' activities in China by using data on Taiwanese subsidiaries. We found that the regulation change increased capital inflows and net sales, both of which are generated by new entrant subsidiaries in the Chinese market. Overall, these findings suggest that the Chinese FDI regulation change caused a significant reallocation among Taiwanese plants' activities in the affected industries during the treatment period.

These results thus suggest that while policymakers in developed economies may encourage outward FDI induced by FDI policies in developing countries, they should also be aware of the potential negative impact of such FDI policies on the domestic economy. In particular, policies could be formulated for incumbent plants in the foreign market in order to countervail the business-stealing effects of newly outward FDI.

We must acknowledge three major research limitations. First, because of data availability, this study did not focus on the impact of the Chinese FDI regulation change on the entry and exit decisions of Taiwanese plants. However, Kneller et al. (2012) point out that plants that have been shut down by MNEs are relatively productive in the same industry. This consideration is indispensable for understanding the repercussions of the FDI regulation change on the entry and exit of Taiwanese plants. Second, we do not provide evidence of why the regulation change did not affect the employment and productivity of domestic plants in the affected industries. This fact may be relevant to investigating the relationship between outward FDI and exports from home economies. Nishitateno (2013)

shows that FDI by upstream firms in the Japanese automobile industry induces additional exports of intermediate goods from the home economy. This fact could also be the case in Taiwan as we saw in the Introduction. For example, Taiwanese domestic plants might offset the business-stealing effects of new FDI plants by increasing their exports to plants with which they have a transactional relationship. Finally, this study was limited to providing evidence of how newly invested plants enhance their productivity through the productivity effects of the regulation change that causes outward FDI to China. Specifically, newly invested plants may change their product churning before and after the regulation change by dropping their less productive goods and concentrating on or adding more productive goods. Examining the channel of the productivity effect through the change in plants' product churning during the treatment period is therefore an avenue for future research.

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Figures

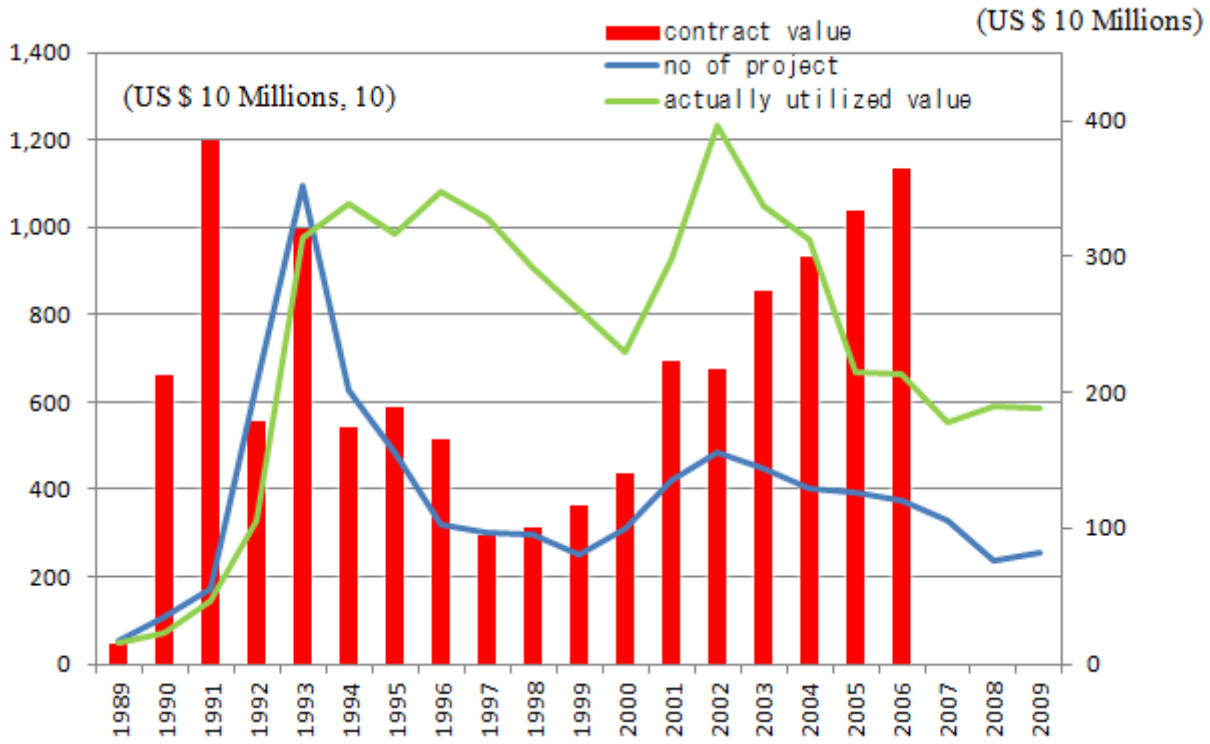

Figure 1: Chinese Statistical Data on Foreign Direct Inflows from Taiwanese Firms in the Chinese market (1989-2009)

Source: Almanac of China 's Foreign Economic Relations and Trade (various years), China Commerce Yearbook (various years), and Statistics on FDI in China (various years).

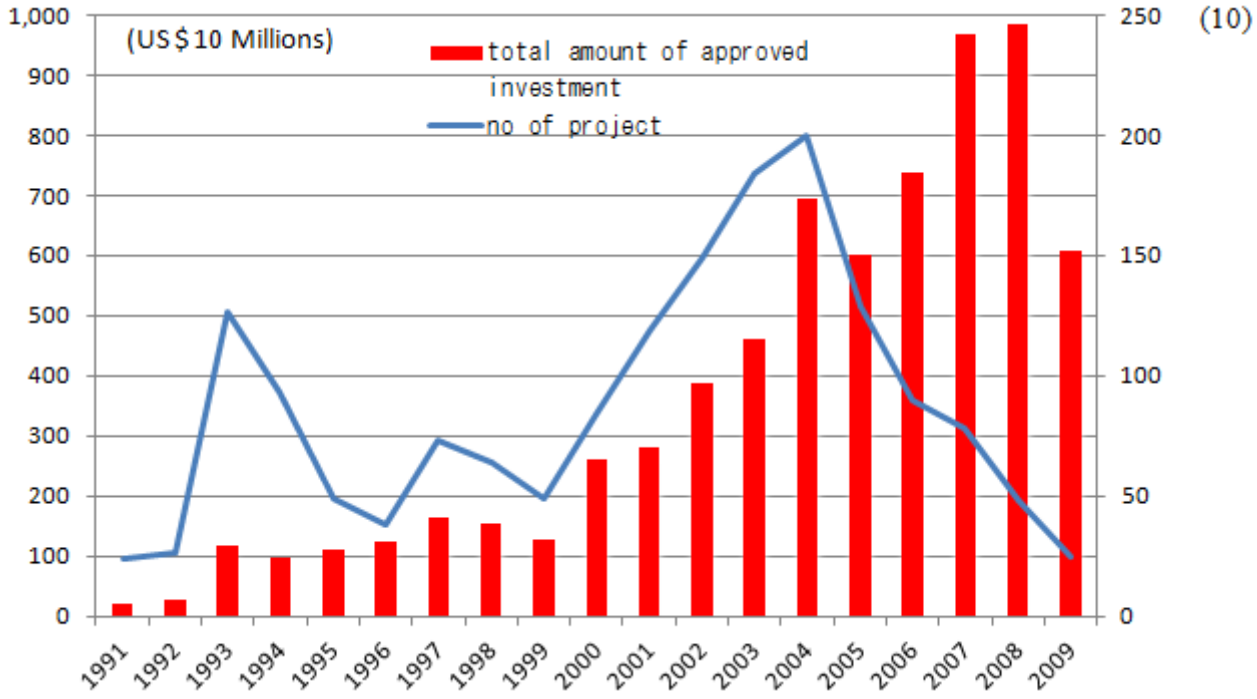

Figure 2: Taiwanese Statistical Data on Approved Investment of Taiwanese firms in Mainland China (1991-2009)

Source: Monthly Statistics on Approved Overseas Chinese and Foreign Investment, Investment Permit to the People of Mainland Area, Approved Outward Investment, and Approved Mainland Investment, December 2010 (2011), Table 3.

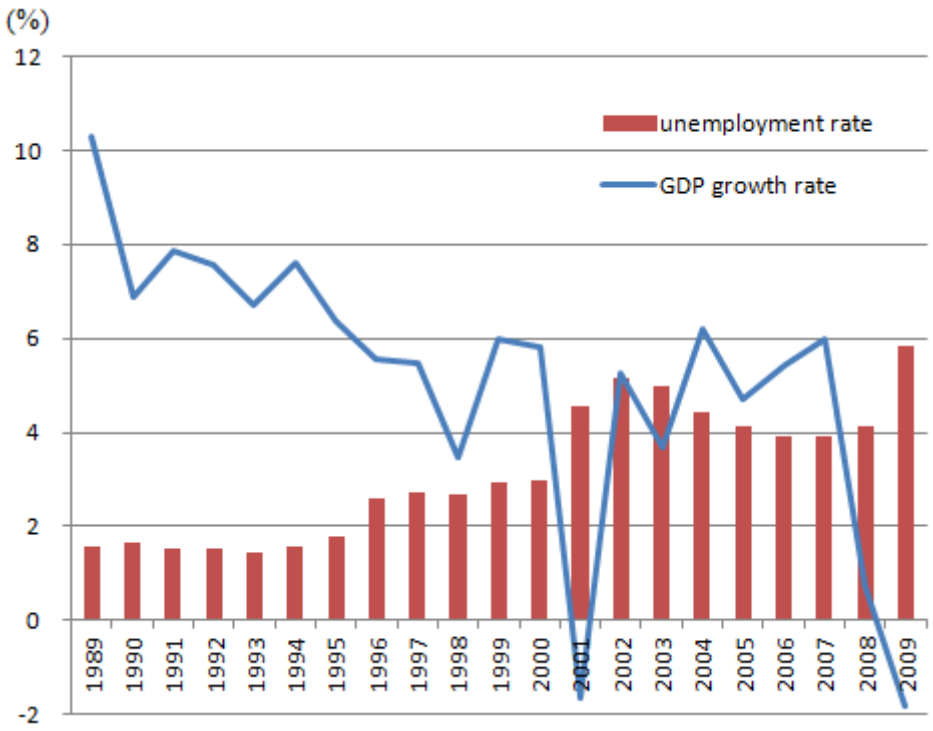

Figure 3: Trends in GDP Growth and Unemployment Rate during 1989-2009

Source: Database on National Income and Labor Statistics in Online National Statistics.
Note: The unemployment rate is defined as the number of individuals unemployed divided by the number of individuals over 15 years old in the labor force. The following individuals are not included in the labor force: students, homemakers, elderlies, hadicapped, and other individuals who were not willing to work or to find a job.

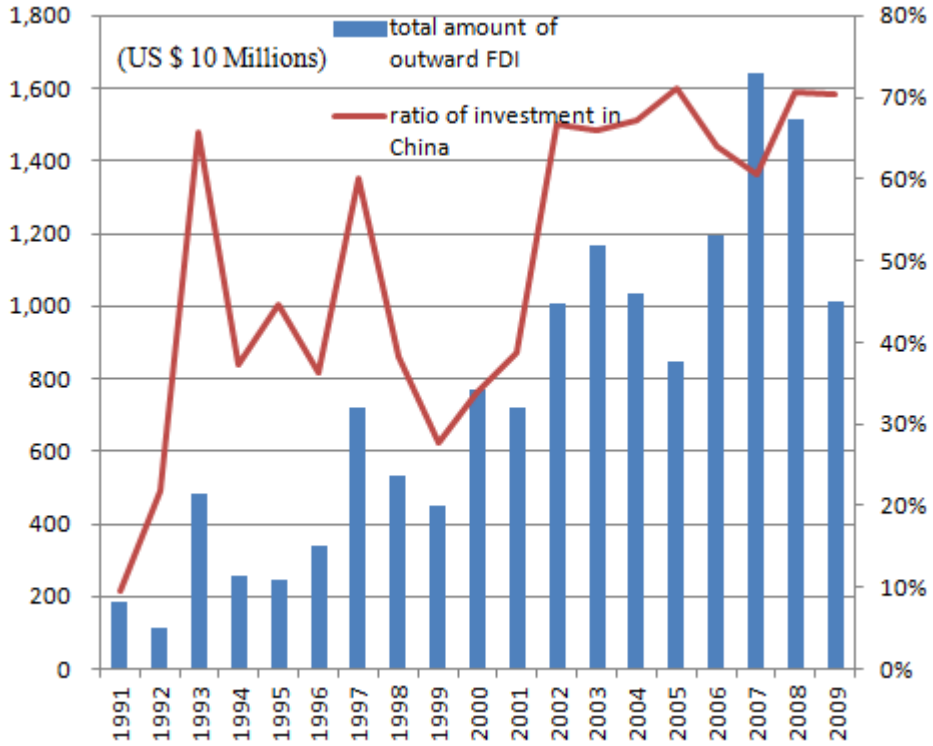

Figure 4: Changes in the Total Amount of Outward Foreign Direct Investment from Taiwan and its Ratio of Investment in China (1991-2009)

Source: Monthly Statistics on Approved Overseas Chinese and Foreign Investment, Investment Permit to the People of Mainland Area, Approved Outward Investment, and Approved Mainland Investment, December 2010(2011), Table 2 and 3.

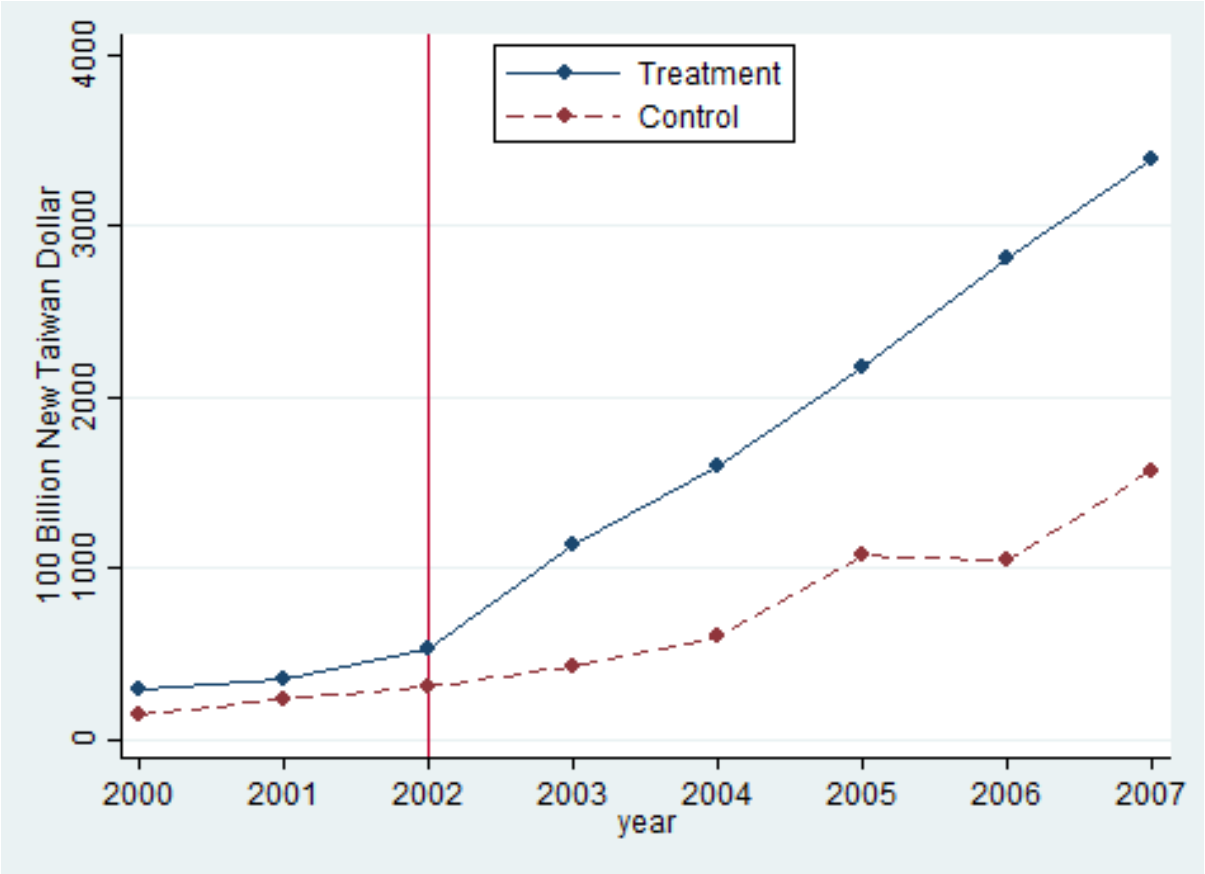

Figure 5: Average Sales by Taiwanese Subsidiaries for Treatment and Control Industries

Source: Calculated by author from Taiwan Economic Journal.

Tables

Table 1: The Number of Ex Post Verification of Investment Projects to China (1993-2009), Unit: Number and US $ Millions

Year	Number of Ex Post Verification	Approved Amount
1993	8067	202.80
1997	7997	271.98
1998	643	51.54
2002	3950	286.43
2003	8268	310.38
2004	4	0.08
2005	10	0.49
2006	193	26.71
2007	217	29.41
2008	161	84.80
2009	341	108.41

Source: Monthly Statistics on Approved Overseas Chinese and Foreign Investment, Investment Permit to the People of Mainland Area, Approved Outward Investment, and Approved Mainland Investment, December 2010 (2011), Table 3.

Table 2: The Case of Transport Equipment Manufacturing and Repairing

Project	4-digit SIC code	4-digit SIC	Category transition	Relaxed	Strengthened
1. Manufacture of complete automobiles and	2931	Motor Vehicles Manufacturing	Restricted→ Encouraged	1	0
complete motorcycles	2941	Motorcycles Manufacturing	Restricted→ Encouraged	1	0
2. Manufacture of engines for automobiles and	2932	Motor Vehicle Parts Manufacturing	Restricted→Encouraged	1	0
motorcycles	2942	Motorcycle Parts Manufacturing	Restricted→ Encouraged	1	0
3. Manufacture of key spare parts for automobiles	2932	Motor Vehicle Parts Manufacturing	Encouraged→ Encouraged, Permitted	0	1
	2942	Motorcycle Parts Manufacturing	Encouraged→ Encouraged, Permitted	0	1
4. Electronic controlled brake and locking-prevention	2932	Motor Vehicle Parts Manufacturing	Restricted→Encouraged	—	—
systems safety aerocysts and other electronic equipment					
5. Reconditioning of old automobile and motorcycle	2931	Motor Vehicles Manufacturing	Restricted→ Permitted	—	—
and their engines	2941	Motorcycles Manufacturing	Restricted→ Permitted	—	—
	2932	Motor Vehicle Parts Manufacturing	Restricted→ Permitted	—	—
	2942	Motorcycle Parts Manufacturing	Restricted→Permitted	—	—
6. Manufacture of key spare pans for motorcycles	2942	Motorcycle Parts Manufacturing	Encouraged→ Encouraged	0	0
7. Manufacture of vehicles for special-purpose	2990	Other Transport Equipment Manufacturing	Encouraged→ Encouraged	0	0
in petroleum industry					
8. Technology and equipment for railway transportation	2921	Tramway Cars Manufacturing and Repairing	Encouraged→Encouraged	0	0
9. Equipment for urban rapid transit track transportation	2921	Tramway Cars Manufacturing and Repairing	Encouraged→ Encouraged	—	—
10. Design and manufacture of civil planes	2961	Aircraft Manufacturing and Repairing	Encouraged→Encouraged	0	0
11. Production of spares parts for civil planes	2962	Aircraft Parts Manufacturing	Encouraged→Encouraged	0	0
12. Design and manufacture of civil helicopters	2961	Aircraft Manufacturing and Repairing	Permitted→Encouraged	1	0
13. Design and manufacture of aeroplane engines	2961	Aircraft Parts Manufacturing	Encouraged→ Encouraged	—	—
14. Design and manufacture of civil air-borne equipment	2962	Aircraft Parts Manufacturing	Encouraged→ Encouraged	—	—
15. Manufacture of light gas-turbine engine	2962	Aircraft Parts Manufacturing	Encouraged→ Encouraged	—	—
16. Design and manufacture of crankshafts of low-speed	2912	Ship Machinery and Parts Manufacturing	Permitted→ Encouraged	1	0
diesel engine for vessel					
17.Repairing, design and manufacture of special vessels,	2911	Ship Building and Repairing	Restricted→ Encouraged	1	0
high-performance vessels					
18. Design and manufacture of the equipment and	2912	Ship Machinery and Parts Manufacturing	Restricted→ Encouraged	—	—
accessories of high-speed diesel engines, auxiliary engines,					
radio communication and navigation for vessels					
19. Manufacture of fishing boats and yachts made	2911	Ship Building and Repairing	Permitted→ Encouraged	—	—
of glass fiber reinforced plastic					

Source: General Office of the State Council of the People's Republic of China (1997, 2003).
Note: "—" denotes an omission due to avoiding the double counting.

Table 3: Details of Regulation Change at TSIC 2-digit Industry in 2000, Unit: Number of Industries, Percent

TSIC 2-digit industry name	No. of TSIC 4-digit categories	Relaxed	Strengthened	Sales_Relax	Sales_Strength	Emp_Relax	Emp_Strength
Total	245	80	29	43.49	20.88	34.38	18.50
Food and Beverage Manufacturing	28	9	1	2.36	0.08	2.28	0.09
Tobacco Manufacturing	1	0	0	0	0	0	0
Textiles Mills	16	2	2	0.04	1.71	0.02	2.11
Apparel, Clothing Accessories and Other Textile Product Manufacturing	10	0	0	0	0	0	0
Leather, Fur and Allied Product Manufacturing	4	1	0	0.45	0	0.33	0
Wood and Bamboo Products Manufacturing	6	0	0	0	0	0	0
Furniture and Fixtures Manufacturing	5	0	0	0	0	0	0
Pulp, Paper and Paper Products Manufacturing	7	4	1	0.84	0.04	0.73	0.02
Printing and Related Support Activities	4	0	0	0	0	0	0
Chemical Material Manufacturing	7	5	2	3.80	2.43	2.05	1.15
Chemical Products Manufacturing	10	7	3	1.96	1.92	1.91	1.50
Petroleum and Coal Products Manufacturing	2	1	1	0.16	0.16	0.18	0.18
Rubber Products Manufacturing	3	1	0	0.34	0	0.32	0
Plastic Products Manufacturing	7	1	2	0.08	0.55	0.13	0.72
Non-metallic Mineral Products Manufacturing	20	5	1	0.99	0.09	0.93	0.09
Basic Metal Industries	16	5	4	5.12	4.58	2.58	2.22
Fabricated Metal Products Manufacturing	14	1	0	0.34	0.00	0.51	0
Machinery and Equipment Manufacturing and Repairing	29	12	4	2.59	2.18	3.11	3.52
Computer, Communications, and Audio and Video Electronic Products Manufacturing	11	8	3	9.48	2.13	6.05	1.48
Electronic Parts and Components Manufacturing	6	3	0	5.99	0	4.55	0
Electrical Machinery, Supplies and Equipment Manufacturing and Repairing	11	5	1	3.55	1.24	2.78	0.82
Transport Equipment Manufacturing and Repairing	14	7	2	4.31	3.20	4.83	3.85
Precision, Optical, Medical Equipment, Watches and Clocks Manufacturing	7	3	2	1.08	0.59	1.11	0.76
Other Industrial Products Manufacturing	7	0	0	0	0	0	0
Average	10.21	3.33	1.21	1.81	0.87	1.43	0.77

Source: Calculated by author from data published by Gazette of the State Council of the People's Republic of China, No. 40, January 1998 and No. 3, January 2003.

Note: Sales_Relax (or Emp_Relax) denotes the ratio of plant's sales (or employment) in industries affected by regulation relaxation to aggregated sales (or employment) of all plants, Sales_Strength (or Emp_Strength) the ratio of plant's sales (or employment) in industries affected by regulation strengthening to aggregated sales (or employment) of all plants.

Table 4: Descriptive Statistics

Variable	All	FDI new entrants	FDI incumbents FDI exits	FDI surviving plants	Purely domestic plants
Number of employment					
2000	23.57	85.19	70.09	146.32	19.47
	(44.91)	(91.46)	(89.16)	(113.90)	(35.03)
2005	23.87	88.60	67.60	137.33	19.21
	(47.10)	(96.21)	(86.86)	(113.13)	(36.39)
Full sample	23.99	87.00	70.01	141.75	19.62
	(45.82)	(93.21)	(88.06)	(112.80)	(35.56)
Operating revenue (sales)					
2000	82,090.29	394,476.3	352,947.1	757,329.3	59,587.71
	(251,031)	(553,120.8)	(558,183.3)	(718,822.7)	(186,343.1)
2005	95,906.52	490,220.90	358,862.00	806,369.30	67,244.54
	(283,683.2)	(626,526)	(566,260.80)	(747,984.9)	(207,346.7)
Full sample	85,333.97	425,777.5	344,743.6	756,500.2	60,844.27
	(259,161.30)	(576917.00)	(551,591.5)	(721,633.2)	(190,223.50)
Log TFP					
2000	5.00	5.32	5.33	5.42	4.97
	(0.70)	(0.74)	(0.78)	(0.62)	(0.70)
2005	4.96	5.39	5.21	5.44	4.93
	(0.75)	(0.76)	(0.78)	(0.75)	(0.74)
Full sample	4.96	5.34	5.23	5.42	4.93
	(0.70)	(0.73)	(0.76)	(0.66)	(0.69)
Labor productivity					
2000	1,049.85	1,821.54	1906.57	2,110.47	998.35
	(2,372.25)	(1,912.57)	(2389.5)	(1,631.62)	(2,377.96)
2005	1,087.41	2,218.21	1,815.31	2,435.43	1,019.25
	(1,518.28)	(3524.82)	(2,531.58)	(2,228.70)	(1,361.30)
Full sample	1,018.83	1,933.72	1,766.62	2,262.68	961.36
	(1,629.38)	(2,325.36)	(2,309.97)	(2,128.76)	(1,563.17)
Wage per worker					
2000	315.66	437.21	425.97	486.60	308.14
	(162.77)	(200.55)	(208.39)	(174.98)	(157.13)
2005	317.71	472.91	425.26	517.15	307.90
	(172.58)	(204.26)	(197.85)	(199.10)	(165.64)
Full sample	315.72	449.31	416.48	494.18	307.58
	(163.15)	(195.75)	(193.40)	(186.84)	(157.40)
Observations					
2000	79,034	1,289	1,958	1,107	74,680
2005	54,633	1,149	1,166	1,001	51,317
Full sample	456,044	8,352	10,576	7,357	429,759

Table 5: Comparison of number of employment between treatment and control group

	Pre-regulaction change (1)	Post-regulation change (2)	Difference (3)	Difference-in-differences (4)
A. *Treatment group*:				
Plants in industries affected by regulation relaxation	33.194 (2.990) [53,420]	34.746(3.246) [57,647]	1.553(0.578)	
Control group:				
Plants in industries unaffected by regulation relaxation	20.824(1.927) [166,821]	20.716(1.912) [178,156]	-0.108(0.184)	1.661(0.599)
B. *Treatment group*:				
FDI newly entrants in industries affected by regulation relaxation	100.009(7.253) [1,288]	106.105(9.371) [1,904]	6.095(3.436)	
Control group:				
Purely domestic plants in industries affected by regulation relaxation	25.521(2.039) [48,803]	26.066(2.198) [52,064]	0.545(0.428)	5.550(3.393)
C. *Treatment group*:				
FDI exits in industries affected by regulation relaxation	91.873(7.546) [1,999]	87.828(7.324) [1,863]	-4.045(2.615)	
Control group:				
Purely domestic plants in industries affected by regulation relaxation	25.521(2.039) [48,803]	26.066(2.198) [52,064]	0.545(0.428)	-4.591(2.568)
D. *Treatment group*:				
FDI surviving plants in industries affected by regulation relaxation	161.844(8.429) [1,330]	154.338 (9.264) [1,816]	-7.506(3.242)	
Control group:				
Purely domestic plants in industries affected by regulation relaxation	25.521(2.039) [48,803]	26.066(2.198) [52,064]	0.545(0.428)	-8.051(3.155)
E. *Treatment group*:				
Purely domestic plants in industries affected by regulation relaxation	25.521(2.030) [48,803]	26.066(2.188) [52,064]	0.545(0.426)	
Control group:				
Purely domestic plants in industries unaffected by regulation relaxation	17.924(1.471) [159,427]	17.530(1.394) [169,465]	-0.393(0.158)	0.938(0.452)

Note: Pre-regulation years are 1998-2000. Post-regulation years are 2002-2005. Standard errors are adjusted for clustering by industry and in parentheses. Sample size are in square brackets.

Table 6: Comparison of log total factor productivity between treatment and control group

	Pre-regulaction change (1)	Post-regulation change (2)	Difference (3)	Difference-in-differences (4)
A. *Treatment group*:				
Plants in industries affected by regulation relaxation	5.017(0.044)	5.047(0.046)	0.029(0.029)	
		[53,420]	[57,647]	
Control group:				
Plants in industries unaffected by regulation relaxation	4.930(0.018)	4.932(0.024)	0.002(0.019)	0.027(0.032)
		[166,821]	[178,156]	
B. *Treatment group*:				
FDI newly entrants in industries affected by regulation relaxation	5.328(0.049)	5.524(0.063)	0.196(0.051)	
		[1,288]	[1,904]	
Control group:				
Purely domestic plants in industries affected by regulation relaxation	4.984(0.044)	4.999(0.043)	0.015(0.029)	0.181(0.040)
		[48,803]	[52,064]	
C. *Treatment group*:				
FDI exits in industries affected by regulation relaxation	5.371(0.064)	5.375(0.070)	0.004(0.038)	
		[1,999]	[1,863]	
Control group:				
Purely domestic plants in industries affected by regulation relaxation	4.984(0.044)	4.999(0.043)	0.015(0.029)	-0.012(0.038)
		[48,803]	[52,064]	
D. *Treatment group*:				
FDI surviving plants in industries affected by regulation relaxation	5.414(0.040)	5.566(0.057)	0.152(0.048)	
		[1,330]	[1,816]	
Control group:				
Purely domestic plants in industries affected by regulation relaxation	4.984(0.044)	4.999(0.043)	0.015(0.029)	0.137(0.049)
		[48,803]	[52,064]	
E. *Treatment group*:				
Purely domestic plants in industries affected by regulation relaxation	4.984(0.044)	4.999(0.043)	0.015(0.029)	
		[48,803]	[52,064]	
Control group:				
Purely domestic plants in industries unaffected by regulation relaxation	4.916(0.019)	4.914(0.024)	-0.002(0.019)	0.017(0.032)
		[15,9427]	[16,9465]	

Note: Pre-regulation years are 1998-2000. Post-regulation years are 2002-2005. Standard errors are adjusted for clustering by industry and in parentheses. Sample size are in square brackets.

Table 7: Impact on Log Total Factor Productivity (TFP) and Wage per Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TFP	TFP	TFP	TFP	Wage	Wage	Wage	Wage
Relaxed*Post2000	0.0106	0.0112	0.0094	0.0103	-0.0011	-0.0021	-0.0019	-0.0023
	(0.0086)	(0.0088)	(0.0086)	(0.0088)	(0.0056)	(0.0054)	(0.0056)	(0.0054)
Relaxed*Post2002	-0.0072	-0.0084	-0.0122	-0.0113	-0.0070	-0.0094	-0.0107	-0.0111
	(0.0126)	(0.0130)	(0.0131)	(0.0132)	(0.0094)	(0.0094)	(0.0098)	(0.0096)
Strengthened*Post2000	-0.0056	-0.0067	-0.0042	-0.0055	0.0043	0.0032	0.0037	0.0031
	(0.0065)	(0.0065)	(0.0064)	(0.0064)	(0.0044)	(0.0043)	(0.0044)	(0.0043)
Strengthened*Post2002	0.0042	0.0050	0.0025	0.0038	0.0047	0.0042	0.0036	0.0037
	(0.0182)	(0.0181)	(0.0182)	(0.0182)	(0.0119)	(0.0116)	(0.0120)	(0.0118)
Relaxed*2000Already*Post2000		-0.0134		-0.0306		0.0144		0.0092
		(0.0199)		(0.0222)		(0.0160)		(0.0205)
Relaxed*2000Already*Post2002		0.0219		-0.0235		0.0419***		0.0138
		(0.0472)		(0.0398)		(0.0127)		(0.0160)
Strengthened*2000Already*Post2000		0.0265		0.0473		0.0228		0.0201
		(0.0306)		(0.0358)		(0.0189)		(0.0210)
Strengthened*2000Already*Post2002		-0.0223		-0.0496		0.0042		-0.0079
		(0.0423)		(0.0434)		(0.0160)		(0.0177)
Relaxed*2003New*Post2000			0.0361	0.0493			0.0184	0.0140
			(0.0290)	(0.0320)			(0.0133)	(0.0186)
Relaxed*2003New*Post2002			0.0942**	0.1057***			0.0707***	0.0646***
			(0.0409)	(0.0318)			(0.0194)	(0.0229)
Strengthened*2003New*Post2000			-0.0436	-0.0629			0.0146	0.0051
			(0.0434)	(0.0503)			(0.0156)	(0.0172)
Strengthened*2003New*Post2002			0.0290	0.0534			0.0214	0.0244
			(0.0394)	(0.0419)			(0.0199)	(0.0221)
Two-digit industry specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-two-digit industry specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.6298	0.6298	0.6298	0.6298	0.6050	0.6050	0.6050	0.6050
No. of observations	456,044	456,044	456,044	456,044	456,044	456,044	456,044	456,044

Standard errors are clustered at industry level. Significance level: *10%, **5%, ***1%.

Table 8: Impact on Log Employment and Operating Sales

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Employment	Employment	Employment	Employment	Sales	Sales	Sales	Sales
Relaxed*Post2000	0.0005	-0.0003	0.0004	-0.0001	0.0138	0.0119	0.0114	0.0110
	(0.0077)	(0.0076)	(0.0079)	(0.0077)	(0.0135)	(0.0131)	(0.0136)	(0.0132)
Relaxed*Post2002	0.0056	0.0062	0.0021	0.0038	0.0036	0.0028	-0.0056	-0.0029
	(0.0221)	(0.0218)	(0.0220)	(0.0218)	(0.0308)	(0.0310)	(0.0313)	(0.0313)
Strengthened*Post2000	-0.0142	-0.0137	-0.0149	-0.0142	-0.0149	-0.0161	-0.0157	-0.0161
	(0.0147)	(0.0147)	(0.0150)	(0.0148)	(0.0169)	(0.0170)	(0.0173)	(0.0173)
Strengthened*Post2002	0.0097	0.0097	0.0071	0.0082	0.0197	0.0190	0.0147	0.0162
	(0.0218)	(0.0218)	(0.0224)	(0.0222)	(0.0387)	(0.0389)	(0.0396)	(0.0395)
Relaxed*2000Already*Post2000		0.0166		0.0167		0.0318		0.0106
		(0.0260)		(0.0315)		(0.0236)		(0.0298)
Relaxed*2000Already*Post2002		-0.0104		-0.0478*		0.0136		-0.0764**
		(0.0256)		(0.0287)		(0.0420)		(0.0373)
Strengthened*2000Already*Post2000		-0.0138		-0.0271		0.0221		0.0136
		(0.0345)		(0.0405)		(0.0363)		(0.0406)
Strengthened*2000Already*Post2002		0.0009		-0.0333		0.0136		-0.0492
		(0.0394)		(0.0435)		(0.0456)		(0.0502)
Relaxed*2003New*Post2000			0.0033	-0.0024			0.0598**	0.0569
			(0.0180)	(0.0253)			(0.0283)	(0.0347)
Relaxed*2003New*Post2002			0.0610**	0.0830***			0.1704***	0.2055***
			(0.0288)	(0.0315)			(0.0493)	(0.0494)
Strengthened*2003New*Post2000			0.0223	0.0347			0.0204	0.0149
			(0.0247)	(0.0330)			(0.0458)	(0.0516)
Strengthened*2003New*Post2002			0.0584	0.0763			0.1074*	0.1340**
			(0.0451)	(0.0490)			(0.0604)	(0.0671)
Two-digit industry specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-two-digit industry specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.8878	0.8878	0.8878	0.8878	0.9093	0.9093	0.9093	0.9093
No. of observations	456,044	456,044	456,044	456,044	456,044	456,044	456,044	456,044

Standard errors are clustered at industry level. Significance level: *10%, **5%, ***1%.

Table 9: Impact on Log Total Factor Productivity (TFP) and Wage per Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TFP	TFP	TFP	TFP	Wage	Wage	Wage	Wage
Relaxed*Post2000	0.0113	0.0118	0.0100	0.0109	-0.0011	-0.0021	-0.0019	-0.0023
	(0.0087)	(0.0089)	(0.0087)	(0.0088)	(0.0056)	(0.0054)	(0.0056)	(0.0054)
Relaxed*Post2002	0.0004	-0.0006	-0.0044	-0.0035	-0.0070	-0.0094	-0.0107	-0.0111
	(0.0124)	(0.0130)	(0.0129)	(0.0131)	(0.0094)	(0.0094)	(0.0098)	(0.0096)
Strengthened*Post2000	-0.0069	-0.0080	-0.0055	-0.0067	0.0043	0.0032	0.0037	0.0031
	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0044)	(0.0043)	(0.0044)	(0.0043)
Strengthened*Post2002	0.0018	0.0026	-0.0000	0.0013	0.0047	0.0042	0.0036	0.0037
	(0.0215)	(0.0215)	(0.0215)	(0.0215)	(0.0119)	(0.0116)	(0.0120)	(0.0118)
Relaxed*2000Already*Post2000		-0.0126		-0.0298		0.0144		0.0092
		(0.0199)		(0.0221)		(0.0160)		(0.0205)
Relaxed*2000Already*Post2002		0.0195		-0.0238		0.0419***		0.0138
		(0.0471)		(0.0397)		(0.0127)		(0.0160)
Strengthened*2000Already*Post2000		0.0256		0.0463		0.0228		0.0201
		(0.0306)		(0.0359)		(0.0189)		(0.0210)
Strengthened*2000Already*Post2002		-0.0198		-0.0490		0.0042		-0.0079
		(0.0420)		(0.0430)		(0.0160)		(0.0177)
Relaxed*2003New*Post2000			0.0364	0.0493			0.0184	0.0140
			(0.0290)	(0.0320)			(0.0133)	(0.0186)
Relaxed*2003New*Post2002			0.0892**	0.1007***			0.0707***	0.0646***
			(0.0410)	(0.0318)			(0.0194)	(0.0229)
Strengthened*2003New*Post2000			-0.0437	-0.0626			0.0146	0.0051
			(0.0434)	(0.0504)			(0.0156)	(0.0172)
Strengthened*2003New*Post2002			0.0338	0.0579			0.0214	0.0244
			(0.0392)	(0.0416)			(0.0199)	(0.0221)
Tariff	0.0038***	0.0037***	0.0037***	0.0037***				
	(0.0012)	(0.0013)	(0.0013)	(0.0013)				
Two-digit industy specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-Two-digit industy specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.6299	0.6299	0.6300	0.6300	0.6050	0.6050	0.6050	0.6050
No. of observations	456,044	456,044	456,044	456,044	456,044	456,044	456,044	456,044

Standard errors are clustered at industry level. Significance level: *10%, **5%, ***1%.

Table 10: Impact on Log Employment and Operating Sales with Industrial Tariff Change as a Control Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Employment	Employment	Employment	Employment	Sales	Sales	Sales	Sales
Relaxed*Post2000	0.0008	-0.0001	0.0006	0.0001	0.0145	0.0126	0.0121	0.0117
	(0.0077)	(0.0076)	(0.0079)	(0.0077)	(0.0136)	(0.0132)	(0.0137)	(0.0133)
Relaxed*Post2002	0.0081	0.0088	0.0047	0.0064	0.0123	0.0116	0.0032	0.0056
	(0.0221)	(0.0218)	(0.0220)	(0.0218)	(0.0308)	(0.0310)	(0.0315)	(0.0314)
Strengthened*Post2000	-0.0146	-0.0141	-0.0153	-0.0146	-0.0164	-0.0175	-0.0172	-0.0175
	(0.0147)	(0.0146)	(0.0149)	(0.0148)	(0.0166)	(0.0167)	(0.0170)	(0.0170)
Strengthened*Post2002	0.0089	0.0089	0.0063	0.0073	0.0171	0.0162	0.0119	0.0134
	(0.0230)	(0.0229)	(0.0235)	(0.0233)	(0.0425)	(0.0427)	(0.0433)	(0.0433)
Relaxed*2000Already*Post2000		0.0168		0.0169		0.0327		0.0115
		(0.0260)		(0.0316)		(0.0236)		(0.0298)
Relaxed*2000Already*Post2002		-0.0112		-0.0479*		0.0109		-0.0767**
		(0.0256)		(0.0287)		(0.0418)		(0.0373)
Strengthened*2000Already*Post2000		-0.0141		-0.0274		0.0211		0.0125
		(0.0346)		(0.0406)		(0.0363)		(0.0408)
Strengthened*2000Already*Post2002		0.0017		-0.0331		0.0164		-0.0485
		(0.0393)		(0.0434)		(0.0454)		(0.0501)
Relaxed*2003New*Post2000			0.0034	-0.0024			0.0602**	0.0569
			(0.0180)	(0.0253)			(0.0283)	(0.0347)
Relaxed*2003New*Post2002			0.0593**	0.0814***			0.1644***	0.1999***
			(0.0287)	(0.0313)			(0.0490)	(0.0490)
Strengthened*2003New*Post2000			0.0223	0.0348			0.0203	0.0152
			(0.0247)	(0.0330)			(0.0456)	(0.0516)
Strengthened*2003New*Post2002			0.0600	0.0778			0.1128*	0.1391**
			(0.0450)	(0.0489)			(0.0601)	(0.0666)
Tariff	0.0013	0.0013	0.0012	0.0012	0.0043**	0.0043**	0.0042**	0.0042**
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0016)	(0.0016)	(0.0017)	(0.0017)
Two-digit industy specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-Two-digit industy specific trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.8878	0.8878	0.8878	0.8878	0.9093	0.9093	0.9093	0.9093
No. of observations	456,044	456,044	456,044	456,044	456,044	456,044	456,044	456,044

Standard errors are clustered at industry level. Significance level: *10%, **5%, ***1%.

Table 11: Impact on Log Capital Inflows in China and Log Net Sales by Taiwanese Subsidiaries in China

	(1)	(2)	(3)	(4)
	Capital Inflow	Capital Inflow	Net Sales	Net Sales
Relaxed*Post2002	0.0095		-0.0975	
	(0.1143)		(0.1298)	
Strengthened*Post2002	0.0977		0.0833	
	(0.1264)		(0.1092)	
Relaxed*2000Already*Post2002		-0.3617		-0.5070***
		(0.2579)		(0.1600)
Strengthened*2000Already*Post2002		0.1703		0.2124
		(0.1685)		(0.1607)
Relaxed*2003New*Post2002		0.4570***		0.4936***
		(0.1356)		(0.1687)
Strengthened*2003New*Post2002		0.0038		-0.0832
		(0.1679)		(0.1868)
Two-digit industry specific trend	Yes	Yes	Yes	Yes
Province specific trend	Yes	Yes	Yes	Yes
Province-two-digit industry specific trend	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
R-squared	0.9249	0.9433	0.8207	0.8220
No. of observations	10,194	10,194	10,194	10,194

Standard errors are clustered at industry level. Significance level: *10%, **5%, ***1%.