Heterogeneous Impacts of Investing China on Domestic Market Outcomes: Empirical Evidence from Taiwanese Plant Level Data*

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Abstract

The domestic market consequences of firms' investing abroad have attracted attentions both of economists and policymakers. In particular, accelerating the movement of domestic production to abroad raised public concern about hollowing out of domestic technologies and employment. This paper investigates the impact of FDI policies towards China on plants' productivity and employment, using Taiwanese representative manufacturing plant-level data and exploiting an FDI regulation change in China in 2002 as a significant variation. Our difference-in-differences estimates reveal a heterogeneity in the response of Taiwanese plants to this change in the regulation: plants in deregulated industries which newly invested in China after 2000 experienced a increase in their productivity, employment and operating sales while plants in those industries which had already invested in China at 2000 decreased both employment and operating sales. We do not find any differential trends between plants in deregulated industries and those in other industries before the regulation change. We also checked our crucial assumption of whether the regulation change expanded Taiwanese firms' activity in China. We found that the regulation change resulted in increased capital inflows and net sales generated by new entrant subsidiaries in the Chinese market. Furthermore, we do not find a statistical evidence on the hollowing out effects on domestic market outcomes in deregulated industries.

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1 Introduction

Accelerating the movement of domestic production through foreign direct investment (FDI) to developing countries have been raised public concern about hollowing out of domestic technologies and employment in developed economies. These movement of domestic production in developed economies may be partly induced by investment promotion policies (FDI policies hereafter) in developing countries. Many governments in developing countries have been pursuing FDI policies that not only open to foreign investment but also attract investments in line with their development strategies (UNCTAD, 2003). In addition, more recently economists pay considerable attention on whether such FDI policies can 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 for 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 domestic market outcomes of Taiwanese plants. The Chinese government revised a detailed foreign investment project list called the Catalogue for the Guidance of Industries for Foreign Investment (Inada 2013). This revision 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. For the period 1998-2005, accumulated amounts on their investment in China have risen from 13.2 billion U.S. dollars in 1998 to 47.2 billion U.S. dollars in 2005, accounting for 53.3 per cent of total amounts of outward FDI. In 2005, according to Report on the Foreign Direct Investment of Taiwan's Manufacturing Sector 2006, Taiwanese firms whose proportion of subsidiaries sales in China to total global sales exceed to 50 percent accounted for 36.2 percent of all foreign investing firms. Moreover, Taiwanese firms whose proportion of subsidiaries employment in China to total global employment exceed to 50 percent accounted for 57.3 percent of all foreign investing firms. These expansion of Taiwanese subsidiaries' activities in China was accompanied by a rise in the domestic unemployment rate during the period, which climbed to around 4 percent after the period of China's WTO accession, nonetheless that the unemployment rates in 1990's have been stable at around 2 percent. Thus, there have been increasing concerns about repercussions of outward FDI to China on domestic outcomes in Taiwan.

More specifically, this study examines how new entrants into foreign markets which have a vertically integrated relationship with parent firms differently influence the domestic market outcomes of heterogeneous domestic plants, that is, FDI new entrants, FDI incumbents and domestic plants.[1] Economic theory has been emphasized that firms investing abroad through vertical FDI or offshoring have a positive impacts on domestic outcomes, since those firms can achieve the reduction of production cost and create the possibility of productivity gains by deepening their international division of labor. These venue for productivity gains is called productivity effect in previous studies.[2] In contrast, theoretical venue of negative impacts of outward FDI on domestic economy can be also considered. Specifically, Sethupathy (2013) argues that there should be winners and losers from offshoring if offshoring is a newly source of the gains of trade and he considers that productivity effects arise from new entry into foreign markets rather than firms just continue to invest aborad. In this vein, Sethupathy develops the theoretical background behind investigating how new entrants into foreign markets affect on domestic outcomes. Because newly entrants expand their activities in domestic markets and they in turn induce a negative competitive effect on other domestic firms (hereinafter calls business-stealing effects), domestic firms may experience their sales and employement loss. Thus, in order to unravel a broader picture of economic impact of outward FDI, exploring how outward FDI influences the different types of firms differently is a crucial research question.

Taiwanese firms might have been formed networked FDI regionally between China and Taiwan. According to Report on the Foreign Direct Investment of Taiwan's Manufacturing Sector from various years, major motives for placing Taiwanese plants in China were: due to lower labour cost and potential local market size. Moreover, in terms of a novel way of measuring motives for placing plants abroad in a sales-sourcing box (Baldwin and Okubo, 2014), Taiwanese subsidiaries' local sales share have been relatively high and have risen from 43.3 percent in 1998 to 49.81 percent in 2005. At the same time, Taiwanese subsidiaries' local sourcing share have been also relatively high and have increased from 42.6 (raw materials) and 39.1 percent (parts and components) in 1998 to 52.71 (raw materials) and 52.61 (parts and components) percent in 2005. Taiwanese exports to China have contemporaneously risen from 43.2 billion U.S. dollars in 1998 to 71.6 billion U.S. dollars in 2005, accounting for 37.8 per cent of total export sales. Consequently, an anecdotal evidence show that the international production structure of Taiwanese electronic products manufacturing during the period 1998-2005 drastically changed from that they mainly export from Taiwan to OECD countries to that they dislocate their production facility to China and they export final goods

[1] In this study, domestic plants denote plants that do not invest in China. However, we should note that they include plants that invest to other destination economies, e.g. USA, Europe, and southeast Asian countries.

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

from China to OECD countries.[3] Put it differently, these may suggest that production "unbundling" between China and Taiwan advanced, resulting in offshoring of their production processes, although we do not 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 of Chinese governments to foreign investors into industries that more productive plants may engage in foreign production (Helpman et al.,2004 and Wakasugi and Natsuhara, 2012) rather than that plants in less productive industries, which cannot fully take advantage of productivity growth opportunities, may invest abroad. The advantage of this study comes from using the Chinese FDI regulation changes as varying significantly between industries. According to Inada (2013), foreign investors did not have full information on which industries would have their restrictions lifted at least until half a month or less before the regulation change was put in to force. Accordingly, to evaluate the impact of this FDI regulation change on domestic market outcomes, we exploit this 2002 revision of Chinese FDI regulation as a exogenous variation to the investment decisions of Taiwanese plants to Chinese markets.

For the analysis, we use the Taiwanese plant-level unbalanced panel data over the period 1998-2005, although the data for the year 2001 was not available.[4] An advantage of using this dataset is that it contains information about the plant's status on foreign investment to China at the time before and after the regulation change was implemented in China.[5] We can thus evaluate the effects of regulation change on foreign investment in China at the following three types of plants according to their status and the timing of foreign investment: (i) new entrants into the Chinese market after the regulation change, (ii) incumbents in Chinese market before the regulation change, and (iii) domestic plants.

Methodologically, this study tackles with endogeneity of FDI policies by estimating two types of DID analysis in the single equation. The first DID measures the differences between affected and unaffected industries before and after the regulation change. This corresponds to the usual DID estimator which evaluate whether the treatment of regulation change induces a deviation from the underlying trend before and after the treatment year.[6] The second DID measures the difference between affected and unaffected industries in the early and late pretreatment period. This can serve to corroborate a fact that both treatment and control groups have a clear underlying common trend in the pretreatment period and provide empirical support that the trend can be extrapolated into control groups in the posttretment

[3] For example, see JETRO, 2004, p. 175.

[4] The government conducted a census of manufacturing and service industries in 2001 which organizes every fifth year. However, merging the broad scale census and plant survey is not successful because of the lack of a common identifier across datasets. The sampling unit is also different across datasets, which is a firm for the census of manufacturing and service industries.

[5] As we will see in Subsection 2.4, the dataset provide us with the information about foreign investment status in plant level, not in firm level.

[6] We explain in detail in Subsection 2.3, the treatment group in this study is the group of industries affected by the regulation relaxation or strengthening, while the control group is the group of industries unaffected by the regulation change.

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

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

The previous empirical literatures has mainly focused on analyzing the productivity effects on firms investing abroad. Navaretti and Castellani (2008) investigated the productivity effects of foreign investment by matching investing firms to domestic firms that was similar characteristics on observables and by comparing the performance of both firms. They conclude that foreign investments resulted in an increase in total factor productivity (TFP) of investing firms. Stiebale and Trax (2011) consider the productivity effects of cross-border mergers and aquisitions (M&As) on aquiring firm's domestic outcomes in UK and France, finding that aquiring firms increased domestic sales, investment and employment, although it improves their domestic productivity only in France. Sethupathy (2013) analyzed the impact of a fall in marginal cost of offshoring to Mexico on US firms, and showed that a falling offshoring cost increased intrafirm sales of Mexican affilicate share and resulted in an increase in operating profits per US worker. As for Taiwanese firms, Huang, Hou and Yang (2013) found that foreign investments toward developing countries resulted in an increase in domestic TFP of investing firms. Liu and Nunnenkamp (2011) also found that productivity effects of vertical FDI on domestic production become larger with the magnitude of foreign investments. This paper is in line with these literature that investigates the productivity effects of FDI that are caused by regulation change on new entrants into the foreign markets and , at the same time, go beyond these literature by investigating the business stealing effects of FDI that are caused by regulation change on incumbents in the foreign market.

Some studies investigate the effects of outward FDI through examining the relationship between the domestic and foreign operations of MNEs. Desai, Forely and Hines Jr. (2009) suggest little evidence that greater foreign activities of US multinational firms push out their domestic activity. Specifically, foreign

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

GDP growth rates is associated with an increase in domestic sales, investments as well as in the number of employees of US MNEs. Muendler and Becker (2010) and Harrison and McMillan (2011) introduce the specifications for estimating labor demand elasticities and shed light on the effects of multinational activity on domestic employment. They allow for different impacts on domestic outcomes by type of FDI or destination. Muendler and Becker (2010) showed that an increase in domestic industrial wage have a positive impact on their foreign employment especially when changes in the number of affiliates occurred in a given location. Harrison and McMillan (2011) found that one percent decrease in industrial wage in low-income countries reduces domestic employment of US parental firms to their foreign manufacturing affiliates, while one percent foreign affiliate wage decline in low-wage countries increased domestic employment at vertically integrated firms. These complimentary relationship between the domestic and foreign operations of MNEs provide a suggestive evidence of a productivity effects. Hummels et al. (2014) provide further evidence that the productivity effects which come from offshoring have different consequences on wage across skilled and unskilled worker types. They conclude that although offshoring increased the high-skilled worker's wage, it decreased the low skilled worker's wage.[8] Our study do not examine directly the relationship between the domestic and foreign operations of MNEs. However, these previous studies relates to our study in the sense that they investigate the differential effects of regulation change that lead to a increase in Taiwanese FDI on domestic market outcomes. Although they has been documented that the effects of FDI on domestic outcomes can vary across different types of FDI (vertical or horizontal integration), different destination (developing or developed economies), or different worker's type (low or high skilled), the empirical investigation of heterogeneous effects of vertical FDI (productivity effects vs. business stealing effects) on domestic market outcomes of different types of plants within industries, which we conduct in this paper, 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 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 affect domestic innovation activity in terms of R&D intensity and patents. Tsou et al. (2013) examines the Taiwanese FDI regulation changes on investment items to China in 2001. They constructed a employer-employee matched data on Taiwanese listed firms and showed that Taiwanese FDI regulation change exacerbated

[8] We should notice that the effects of outward FDI in developing countries on domestic employments among investing firms is mixed. This can be interpreted as capturing the aggregated effects of outward FDI, which is the mixture of the positive productivity effects derived from vertical integrated activity and negative effects from relocating domestic employment. Although Debaere, Lee and Lee (2010) reported that outward investment to developing countries have a negative impact on domestic employment growth, we can regard their results as the aggregate effects of FDI since they did not disentangle countervailing effects of horizontal FDI from that of vertical FDI.

job securities for low skilled workers, although it has no strong impact on employment status for high skilled workers. The major difference of this study is that investigate the effects of FDI policy changes in China. The advantage of using Chinese FDI policy changes may be that policy changes in China is more exogenous for Taiwanese investors to decide to invest in the Chinese market rather than domestic policy changes because Taiwanese investors may be not sure about Chinese FDI policy changes is really put into force. Therefore, we tackle with endogeneity of FDI policies by checking both treatment and control groups have a clear underlying common trend in the pretreatment period.

The rest of this paper proceed as follows. The next section presents background and the details of regulation change, the 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 on whether regulation change induces an expansion of the affected Taiwanese subsidiaries activity in China, and examines hollowing out effects on domestic market outcomes in deregulated industries. Section 7 contains a concluding remarks.

2 Background of the Regulation Change and Data

2.1 Foreign Direct Investment from Taiwan to China

This subsection describes the shift of both Chinese FDI policy against Taiwan and Taiwanese FDI policy against 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 with a description of FDI policies during 70's and 80's. Chinese government has been implemented various measures on encouraging investment from Taiwan since the beginning of its economic reform. These measures primarily aimed at transferring advanced technologies from surrounding dynamic economies which has cultural proximity. They first made a statement called "message to compatriots in Taiwan" on January 1979.[9] It included an offer to stop military confrontation between two sides and sought to improve relations by constructing an information and telecommunication infrastructure, increasing mutual visits, and expanding an economic exchanges between China and Taiwan. In the 1980s, they clearly stated the encouragement of foreign investment[10] and implemented measures on giving preferential tax[11] and administrative treatment to Taiwanese invested firms[12] that locate their

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

[10] 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).

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

[12] See "Provisions of the State Council Concerning the Encouragement of Investments by Compatriots from Taiwan" published in 1988 (Gazette of the State Council of the People's Republic of China, No. 15, July 1988). Subsequestly, Chinese government also published a measure on encouraging investment from other Chinese capitals (See "Provisions of the State Council Concerning the Encouragement of Investments by Compatriots from Overseas Chinese, Hong Kong, and Macau").

operations in special economic zones or eastern coastal cities. Meanwhile, Taiwanese government have prohibited firms from trading with and investing to China on the basis of the three Noes policy (no contact, no compromise, and no negotiation). However, a increasing number of Taiwanese firms engaged in trading and investing to China via a third country without the approval of Taiwanese government because these restrictive measures have had no provision regarding a punitive clause. Thus, FDI policies in China have been one of the main determinant of FDI inflows from Taiwan to China during these period and Taiwanese firms responded to those policies without the approval of Taiwanese government.

[Insert Figure 1]

In 1990, by a series of these Chinese approach and confirming the reality that volume of trade and investment to China has accelerated, Taiwanese government came to a compromise and established "Regulations Governing Indirect Investment or Technical Cooperation in Mainland China",[13] which was the first to state that Taiwanese firms were officially permitted to enter the Chinese market via a third country.[14] [15] Moreover, they first published "List of Products Permitted for Indirect Investment or Technical Cooperation in Mainland China," which listed information on projects that the government permitted a total of 3,353 investment projects.[16] [17] In Figure 1, we can see that Taiwanese investment in China rapidly increased during 1990s. The background of this increase can be considered not only coinciding with a 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 regulation against China.

[Insert Figure 2]

However, there has been a remarkable discrepancy in the number of investment project and the amount of investment between the statistics collected from Chinese and Taiwanese authority. Figure 2 depicts the number of Taiwanese FDI inflows collected by Investment Commission, Ministry of Economic Affairs (MOEA). This figure was calculated by aggregating the number of Taiwanese investment in China that was formally permitted by Investment Commission from the year 1991. These numbers indicated that

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

[14] Ishida (2005) pointed out the background of easing the regulations for two reasons. Firstly, Taiwanese exporters decreased the competitiveness of their exports because of rapid currency revaluation in accordance with Plaza Accord on exchange rates. Secondly, increasing the political stability such as acceptance of the establishment of democratic progressive party and lifting of martial law boosted economic activities of Taiwanese firms in the foreign market.

[15] The relaxation for trade regulation against China also happened to be contemporaneous to the relaxation for investments. For the relaxation of indirect import from China, see "The Principle of Indirect Import Products from Mainland China ". As for the relaxation of indirect exports, see "Regulations Governing Indirect Export to Mainland China".

[16] See Ministery of Economic Affairs gazette, Vol.22, No.21, November 1990.

[17] The increase in Taiwanese FDI in China might be caused by establishing "The Law of the Peoples Republic of China On Protection of Investments by Taiwan Compatriots", which stated explicit Taiwanese investment protection.

a considerable number of Taiwanese firms invested in China without going through a formal process of investment approval.

We can see in Figure 1 and 2 that FDI decreased over the period of the late 1990s. Both Chinese and Taiwanese FDI policies might affect this downturn trend. Chinese government adopted adjustment policies on foreign investment inflows. One of the measures was the implementation of investment guidelines in the "Interim Provisions on Guiding Foreign Investment Direction", and the enactment of a detailed investment project list in the "Catalogue for the Guidance of Industries for Foreign Investment", which listed information on projects that the Chinese central government encouraged, restricted, or prohibited. Around the same time as the implementation of these restriction, Lee Teng-hui administration carried out "no haste, be patient" policy in 1996 that again regulated foreign investment in China. Specifically, they revised "Rules Governing the Applications for Investment or Technical Cooperation in Mainland China " and restricted large scale investment by putting a ceiling on the amount of investment.[18] Moreover, they expanded the scope of projects prohibited for investment in China.[19] Thus, FDI restrictions from both side would negatively affect the volume of FDI inflow from Taiwan to China.

After the period of a slower growth rates of investment, Taiwanese FDI inflows in China increased sharply again since around 1999. This increase occurred contemporaneously with progress in the negotiations for Chinese WTO accession, as well as revisions of Chinese laws and rules related to foreign-invested companies. Taiwanese government had also kept negotiating for reinstatement of their membership in General Agreement on Tariffs and Trade (GATT) since the early 1990's. Although Taiwanese government concluded negotiations on WTO entry with the United States in February 1997 and the European Union in July 1998, WTO had withheld a decisive conclusion on Taiwanese accession because it reached consensus at the general council of GATT held in 1992 that Taiwanese entry should be preceded by Chinese accession. Meanwhile, Taiwanese government withdrew "no haste, be patient" policy that pointed out as violation of national treatment principles, and carried out "active opening, effective management" policy in 2001 that relaxed regulation of foreign investment in China.[20] They revised again "Rules Governing the Applications for Investment or Technical Cooperation in Mainland China" and stated that they relaxed a ceiling on the amount of investment.[21] China finally concluded negotiations on WTO entry with the European Union and the United States. Taiwan's WTO entry came after the Chinese WTO accession on 1 January 2002. After their WTO accession, they expanded the scope of listed information on permitted for investment

[18] See the Executive Yuan Gazette, Vol.3, No.30, July 1997.
[19] See the Executive Yuan gazette, Vol.3, No.30, July 1997.
[20] See "Plan for Implementation of Active Opening, Effective Management Policy for Investment in Mainland China" (pass through the Executive Yuan council on 7 November 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).
[21] See the Executive Yuan gazette, Vol.7, No.47, November 2001.

in China and only 102 manufacturing investment projects remained prohibited in 2002.[22] Consequently, the number and the amount of FDI inflows to China reached to an unprecedented level of 2.9 billion U.S. dollars with the number of FDI projects 3,950 in 2002 and 3.1 billion U.S. dollars with the number of FDI projects 8,268 in 2003.

[Insert Figure 3]

[Insert Figure 4]

[Insert Table 1]

Taiwanese government announced the introduction of ex post verification of investment projects to China to capture the magnitude of investments without official approval.[23] This verification provided firms with a investment approval with no penalty if firms followed the procedure for verification during a specific period of time. Accordingly, we see spikes in Figure 2 coinciding with the implement of ex post verification, particularly in 1993, 1997, 2002, and 2003.[24] Table 1 shows the number of Taiwanese FDI inflows and its total amounts that got investment approval toward China through the ex post verification. The initial implementation of ex post verification in 1993 revealed that the magnitude of investment in China without official approval reached 2 billion U.S. dollars with the number of FDI projects 8,067. The second implementation in 1997 demonstrated a similar magnitude of increase in the number and the amount of FDI projects. A series of the implmentation of ex post verification confirmed the large scale of Taiwanese FDI to China. As indicated in Table 1, Taiwanese government subsequently offered firms to apply for the ex post verification. On the other hand, they finally enacted "Standards for Administrative Penalties on Illegal Investment or Technical Cooperation in Mainland China" in 2004 (See Ministery of Economic Affairs gazette, Vol.36, No.11, April 2004), which provided for penalties for investments in China without official approval. These clarification of penalties for illegal investments decreased the total number of ex post verification, although increased the amount of each case. Thus, a remarkable gap in the number of investment project and the amount of investment between the statistics collected from Chinese and Taiwanese authority has seemed to be filled until the early 2000s.

Although the volume of Taiwanese investment in China grew steadily, Taiwanese domestic economy has experienced an economic downturn in 2001 for the first time since World War II. Figure 3 shows

[22] See Ministery of Economic Affairs gazette, Vol.34, No.15, May 2002.

[23] This ex post verification process first stated in "Regulations Governing the Approval of Investment or Technical Cooperation in Mainland China", which published in 1993 (See Presidential Office Gazette, No. 5689, March 1993).

[24] Ex post verification implemented in accordance with the revision of "Regulations Governing the Relations between the People of Taiwan and Mainland China" since a second round of verification implemented in 1997. For example, see "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.

the long-term trend of GDP growth rate and unemployment rate during 1978-2009. We can see that Taiwanese economy has maintained high economic growth rates on average by 8 percent during 1980s' and by 6 percent during 1990s'. In this period, it has also recorded a low unemployment rate. However, the economy hit by the economic downturn in information and communication technology industry in 2001. They faced a negative GDP growth rate of 1.65 percent and induced a higher unemployment rate of about 5 percent. Subsequently, while the GDP growth rate bounced back quite rapidly to average 4 to 5 percent between 2002 and 2007, the unemployment rate remained unchanged. Figure 4 depict a total amount of Taiwanese outward investment and ratio of investment in China during 1991-2009. It revealed that ratio of investment in China to total amount of outward investment jumped more than 65 percent during 2002-2005 and reached average 50 percent during 2000's. Thus, these facts raise the question of whether not only accumulated Taiwanese investment in China during 20 years but their FDI upsurge after Chinese WTO accession induce a hollowing out effects of domestic market outcomes.

2.2 Regulation Change on Foreign Entry in China

This subsection provides a brief description of the regulation change on foreign investment in China, which was used in Inada (2013). The Chinese government does not always permit all types of inward foreign investment. The "Catalogue for the Guidance of Industries for Foreign Investment" provides a listed information on foreign invested projects that the government encouraged, restricted or prohibited. More than 250 projects are listed in the Catalogue. These are classified into four categories: "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, "Permitted" projects can receive investment with no encouragement and no restrictions. Investment in "Prohibited" projects is unconditionally prohibited.

We focus on an FDI regulation change on April 2002 that occurred in accordance with the protocol on China's World Trade Organization (WTO) accession.[25] Paying attention to the Catalogue enables us to construct an explicit index of which industries have experienced regulation changes by capturing project category shifts. An advantage of paying attention to the Catalogue enables us to construct an explicit index of which industries have experienced the relaxation or strengthening regulation by capturing project category shifts. Industries which relaxed regulation total 118, which include 80 industries changed their category from "Permitted" or "Restricted" projects in 1998 to "Encouraged" projects in 2002, as well as 38 industries changed their category from "Restricted" projects in 1998 to "Permitted" projects in 2002. In contrast, industries which strengthened regulation total 32, which include 28 industries changed their

[25] For detailed description of regulation change before and after the Chinese WTO accession, see Inada (2013).

category from "Encouraged" projects in 1998 to "Permitted" projects in 2002, as well as 4 industries changed their category from "Permitted" projects in 1998 to "Restricted" projects in 2002. Thus, we can see the magnitude of regulation change was sufficiently large.

The index for regulation relaxation and strengthening used in this study is constructed at the corresponding four-digit Taiwanese Standard Industrial Classification (TSIC). We first match projects listed in the Catalogues with the four-digit Taiwanese Standard Industrial Classification (TSIC) industries by using "MOEA Catalogue of Industrial Product (the thirteenth revised version conducted in the year 2001)" which provides a listed information of which product belongs to each industry. We then classify projects into the different regulation categories. We will explain the construction of the treatment index in Subsection 2.3.

2.3 The Construction of the Treatment Index

[Insert Table 2]

An example of the construction process of index for regulation relaxation and strengthening is shown in Table 2 for the case of transport equipment manufacturing and repairing. The TSIC 2931 for motor vehicle manufactruing is assigned to listed projects engaged in automobile assembly. This was changed from Restricted in 1998 to Encouraged in 2002, and so the *Relaxed* indicator is set to a value of one. Similarly, TSIC 2932 for motor vehicle parts manufacturing was also changed from Restricted in 1998 to Encouraged in 2002, and so the indicator for a relaxed regulation is set to one as well. Although TSIC code 2932 also corresponds to listed projects producing parts for automobiles, we did not consider this in order to avoid double counting. On the other hand, TSIC 2942 covers listed projects which produce key parts for motorcycles. This project was changed from Encouraged in 1998 to Encouraged or Permitted in 2002, suggesting that the *Strengthened* indicator should be set to one. Thus, we construct $Relaxed_{ij}$ which denotes that equals to one if regulation is relaxed in plant i belonging to the industry j and is zero otherwise, and $Strengthened_{ij}$ which denotes that equals to one if regulation is strengthened in plant i belonging to the industry j and is zero otherwise.

It is important to explain how these regulation change influence on incumbents plants in the Chinese market. Ministry of finance give notice of "circular on preferential policy of enterprise income tax for additional investment of foreign-funded enterprises" on July 2002 and it states that incumbent foreign invested firms in China can be enjoyed exemption from enterprise income tax on additional investment project for two years and then receives 50 percent remission for three years if firms engage in the "Encouraged" category project after investing additionally and satisfied one of the following requirements. To enjoy tax breaks, firms need to satisfy one of the following two conditions: (i) invest total more than 60 million

U.S. dollars as a consequence of an additional investment, (ii) the capital amount increase by 50 percent and reach more than 15 million U.S. dollars as a consequence of an additional investment. Accordingly, incumbents plants in the Chinese market can also be affected by the regulation change on foreign entry.[26]

[Insert Table 3]

Table 3 summarizes indices for regulatory relaxation and strengthening in each of the two-digit industries in the year 2000. As shown, restrictions were lifted for an average of three projects in each of the Taiwanese two-digit industries. It also shows that although index for regulatory relaxation varies significantly among industries, restrictions seemed to be relaxed in Taiwanese leading industries, such as the manufacture of computer, communications, and audio and video electronic products and manufacture of electronic parts and components. These affected industries account for 15.47 percent of aggregated sales of all plants and 10.6 percent of aggregated employment of all plants in the pretretment year. Regulations were made more restrictive or unchanged in industries where China already had a comparative advantage in terms of their exports, such as basic metal industries and the manufacture of textiles products (Inada, 2013). Moreover, the reason why indices for regulatory strengthening takes relatively high values in which regulatory relaxation also takes high values is to promote the introduction of newer and productive technology while to restrict older technology. In the manufacture of computer, communications, and audio and video electronic products, for example, manufacture for honey-comb mobile communications DCS/CDMA system or manufacture of transmission equipment for 2.5GB/S and over optical synchronized and microwave synchronized digital series were changed from Encouraged in 1998 to Permitted in 2002 while manufacture of mobile communication systems (GSM, CDMA, DCS1800, PHS, DECT, IMT2000): mobile telephone, base station, switching equipment and digital colonization system equipment and manufacture of serial transmission equipment of phototiming synchronization of 10 GB/S were changed from Permitted in 1998 to Encouraged in 2002. In the next subsection, we will explain data we used in this study.

[26] We emphasize that these regulation change were commonly recognized among Taiwanese investors. Straits Business Monthly, which a major magazine covers topics about economic relationship between China and Taiwan receiving funding from the Mainland Affairs Council (it is responsible for the policy toward mainland) reported about the progress on the revision of "Catalogue for the Guidance of Industries for Foreign Investment (see "Major economic events" Straits business monthly, June 2001 and "A special feature about Chinese legislative measures in accordance with the protocol on WTO accession", January 2002). After the revised version of Chinese investment list published first on March 2002, the Central Daily News which is the official newspaper of the Chinese Nationalist Party explained the shift on Chinese FDI policy including information on the investment list (see "The central government in Beijing is subject to the commitment of foreign investment policy", 3 March 2002 and "Taiwanese investors must wait and see how Chinese new FDI policy moves", 10 March 2002) and Straits Business Monthly provided a detailed explanation of the new investment catalogue (see "News summary on economic and trade relationship in straits business", April 2002).

2.4 Data

The data in this study derived from Factory Adjustment and Operation Survey (FAOS) during 1998-2005 (except for the year 2001), a nationwide plant census conducted by Ministry of Economic Affairs (MOEA). The survey was not conducted in 2001 because this year coincide with the year in which a complete economic census was conducted.[27] These dataset include every plant registered with the government regardless of number of employees or sales, and plants are linked through time by a unique identifier. For instance, it contains 82,750 plants in 1998 and 77,845 plants in 2005. This dataset collected annually associated with the plant activity such as number of employees, wages, operating sales, intermediate cost, investment, and capital stock. However, we should note that capital stock is 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 usual:

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

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

In addition, the major limitation of this study is that we restrict sample to plants surviving at the year 2000 because four-digit regulation code that each plant report annually are time-variant. In order to establish DID setting, industrial classification of the sample plants is fixed at four-digit TSIC level in the year 2000. This is solely because four-digit industry code which plants report annually are highly time variant. For the purpose of capturing the effects of regulation change measured at the four digit industry level, we hold the industry code of each plants to that of the year 2000. Moreover, the reason for focusing on the sample plants in the year 2000 is that those plants seem to have intensely affected by the regulation change. Consequently, after implementing a series of data cleaning process, our dataset contains unbalanced panel of 79,073 plants and 456,044 observations.[28]

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

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

[27] We cannot link FAOS data with census because these dataset do not have a common identifier and plants information such as plant's name, address, and CEO name, were concealed in both datasets.

[28] We drop irrational observations through a series of the following data cleaning process: First, we deleted plants whose operating sales and number of employment records in zeros 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 a suggestion of Angrist and Krueger (1999). These include number of operating sales, employment, wage, intermediate, capital stock, investment, and energy expense. Third, we restrict sample to plants in manufacturing sector. Finally, we deleted plants whose identifier and all observable characteristics are duplicated in the same year. As a result of cleaning process, we dropped 16.2 percent (88,117/544,161) of all observations.

where Y denotes value added; L denotes employment; K denotes capital stock; and M denotes energy expense. We apply the estimation framework developed by Levinsohn and Petrin (2003) (hereinafter called LP) in order to control for endogeneity of input choice caused by the omission of unobserved productivity shock ω_{it}.

As we mentioned in Section 1, our interest in this study focus on investigating how the heterogeneous domestic plants in FDI status, that is, 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 Chinese regulation change that cause outward FDI from Taiwan. We have two key variables which relates to distinguishing whether plants have invested in China and whether plants were new entrants: (i) indicator which is set to one when the plant has invested in China in the year 2000 and (ii) indicator which is set to one when the plant has invested in China in the year 2003.[29] These allows us to confirm whether plants invested before or after the regulation change occurred in 2002.[30]

[Insert Table 4]

Table 4 shows descriptive statistics for key variables in the full sample and the subsample of various types of FDI status with the time before and after the regulation change. Column 1 presents the characteristics of all plants; column 2 through 4 presents the characteristics of different types of outward investing plants in China; As shown, there are explicitly differences of the size among the different types of plants. First, foreign investing plants are larger in size than domestic plants. This is consistent with the recent heterogeneous firm model in the international trade literatures (e.g. Melitz, 2003). Second, there are also size differences between foreign investing plants. Specifically, plants that continued to invest in China during the sample period are the largest and newly invested plants are the second largest than other foreign investing plants. The former is plausible because more competitive plants keep investing in the foreign market. The interesting observation of the latter comes from the fact that the TFP and labor productivity in the year 2000 in newly invested plants that respond to the lifting of regulation change on foreign entry are even smaller than plants that exit from the Chinese market after regulation change. This was reversed in 2005 in the sense that the TFP and labor productivity in newly invested plants were greater grew over the sample period and became larger than plants that exit from the Chinese market. This trend may indicate that newly invested plants in China benefited from productivity effects. Moreover, plants that exit from the Chinese market decreased in the number of employment and TFP in the year 2005. It also provides

[29] These indicators not only include mainland China but also Hong Kong as an invest destination.

[30] One may think that the firm is the economic subject that decide to invest in foreign market but the plant is not. However, FAOS dataset contains a plant-level indicator whether the plant has invested in foreign market. Moreover, Aw and Lee (2008) also employed FAOS dataset in order to examine the relationship between plant-level location decision of Taiwanese multinationals and their productivity.

suggestive evidence that exit plants are suffered from business stealing effect caused by the expansion of newly invested plants' activity. In contrast, the trends in surviving plants in China are mixed. While TFP and number of employment decreased or did not change significantly after the regulation change, operating sales, labor productivity and wage increased over the sample period. Finally, we can see that although plants that invest in China, as we saw above, affected differently depending on the timing of the investment, outcome variables in the full sample and in domestic plants did not change significantly over years. Overall, these summary statistics may support the theoretical prediction that outward FDI affects the different types of plants differently.

[Insert Table 5]

[Insert Table 6]

As a further step, we follow the procedure of Eissa and Liebman (1996) and examine whether the discussion above is supported by the comparison between treatment and control group. Table 5 and 6 presents number of employment and TFP for one of the major treatment groups (index for regulation relaxation) and control groups in the years before and after the regulation change of 2002. In each panel the first column shows the average number of employment or TFP prior to the regulation change; the second column shows the average after the regulation change; and the third column shows the change in number of employment or TFP. DID estimates of the regulation change in China displays in the last column. Panel A both in Table 5 and 6 exhibits the comparison between treatment group (industries affected by regulation relaxation) and control group (industries unaffected by regulation relaxation) in the full sample. Consistently with the findings in descriptive statistics, both number of employment and TFP did not change significantly over time. However, it is important to notice that there were a decrease or no substantial change for control groups.

From panel B through panel D examine how regulation change influenced number of employment and TFP in the subsample of the different types of foreign investing plants.[31] Panel B presents the number of employment and TFP for newly invested plants in China in industries affected by regulation relaxation, compared with domestic plants in industries affected by regulation relaxation. In Table 5, the number of employment before the regulation change was 100.001 for newly invested plants in China and 25.521 for domestic plants. After the regulation change, the number of employment increased significantly by 6.095 for newly invested plants in China while the number of employment for domestic plants also slightly

[31] In these attempts, one may think that we could define two types of control group: (i) domestic plants in industries affected by regulation relaxation (ii) foreign investing plants in industries unaffected by regulation relaxation. However, the latter control group would be endogenous because 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 to domestic plants in industries affected by regulation relaxation.

increased by 0.545 but was not significant change. Consequently, we obtain a DID estimate that there is an increase in the number of employment by 5.550 persons on average. 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, the number of employment increased significantly their employment by 0.196 for newly invested plants in China while the number of employment for domestic plants also slightly increased by 0.015 but was not significant change. We then obtain a DID estimate that is 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 regulation change induced an expansion of the affected plants in Taiwan.

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

Panel D reports the number of employment and TFP for surviving plants in the Chinese market in industries affected by regulation relaxation, compared with domestic plants in industries affected by regulation relaxation. Although surviving plants after the regulation change increased their TFP by 0.152, they decreased the number of employment by 7.506. DID estimates show that while there is an increase in TFP by 0.152 on average, there is a decrease in the number of employment by 7.506 persons on average. These are consistent with the descriptive statistics and seem to be mixed. These results may be plausible because of our data limitations about whether surviving plants actually made an additional investment in China after the regulation change. This means that surviving plants may include both newly invested and conventional business in China. We will explain how to deal with this in the econometric analysis of Section 3.

Finally, panel E presents the number of employment and TFP for domestic plants in industries affected by regulation relaxation, compared with domestic plants in industries unaffected by regulation relaxation. These are consistent with the findings in descriptive statistics and both number of employment and TFP did not change significantly over time. However, we should note that there was substantial changes in the number of employment for domestic plants in industries unaffected by regulation relaxation. This is

problematic because DID estimates depends on the quality of control group. In Section 3, we will see how we avoid using this control group directly in order to capture the effect of regulation change properly.

3 Empirical Strategy

Two empirical questions underlie the heterogeneous impact of FDI regulation change in China on the different types of Taiwanese plants. The first question is to investigate whether the regulation change expand the activities of newly invested plants in China. This attempt is important because it directly analogous to the test of productivity effects of regulation change that induce outward FDI from Taiwan. The second question of this study is to examine whether regulation change reduce the business activity of incumbent plants in China or domestic plants. This means that it is examine whether the business expansion of newly invested plants in China results in an decrease in business activities in other domestic plants. This is also analogous to the test of business stealing effects of regulation change.

We use the 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 indexs plants, four-digit industries, two-digit industries, cities, and years respectively. Y_{ijlt} denotes the dependent variables for TFP, wage per worker, number of employment, and operating sales. $Relaxed_{ij}$ denotes the indicator of index for regulation relaxation for industry j as defined in Section 2.3; $Strengthened_{ij}$ denotes the indicator of index for regulation strengthening for industry j; $2000Already_{ij}$ denotes the indicator of whether Taiwanese plants invest in China until the year 2000; $2003New_{ij}$ denotes the indicator of whether Taiwanese plants newly invest in China during 2001-2003; $Post2000_t$ is a time

dummy that represents years 2000; $Post2002_t$ is a time dummy that represents years 2002 and after; ϵ_{jt} is an error term.

As in Besley and Burgass (2004), we control three types of trend fixed effects. First, we control two-digit industry-specific time trends τ_{kt}. If we did not control industry time trend, treated industries could be mechanically performing better than control ones even in the absence of a change in regulation because we did not capture the effects of regulation change in itself but captured the consequences of an industrial climate which includes open markets and effective law enforcement. Second, we also control city-specific time trends ν_{lt}. Controlling for city trends is also important because without these controls we cannot separate out effects of FDI regulation change from the consequences of a pre-existing favorable business climate in a city. Third, we include city-specific industry effects ϕ_{kl} to control for a location-specific industrial climate which includes the set up of science park and economic processing zone. To these ends, we control for these trend fixed effects.

Although we calculated DID estimates using the subsample of the different types of plants in the descriptive statistics in Section 2.4. we estimate equation (6) using the full sample for three reasons. First, we need to control the index for regulation strengthening. Taiwanese plants activities in industries belonging to the $Strengthened_{ij}$ might not be affected by regulation change because plants in industries for regulation strengthening are not willing to invest in China. Accordingly, it is reasonable to check the robustness of the estimation results of regulation relaxation on the different types of plants by controlling for the index of for regulation strengthening simultaneously. Second, we deal with the problems which were raised by the descriptive statistics. These problems include that the validity of the control group when investigating domestic plants in industries affected by regulation relaxation, and that regulation change might capture the mixed evidence of outward FDI in the surviving plants. Addressing the former problem, we capture the effects on domestic plants by checking the coefficients of the full sample (that is β, γ, δ, and 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 with this limitation by including surviving plants into both incumbents plants $2000Already_{ij}$ and newly invested plants $2003New_{ij}$. However, one may think that these research design cannot fully identify productivity effects and business stealing effects because surviving plants generate mixed effects of regulation chage. Admittedly, although the ideal identification process is to divide surviving plants into newly invested plants and incumbents plants but these detailed information are not available in the dataset. In spite of these limitations in this research design, our result will be important if we could provided clear findings to discern productivity effects and business stealing effects from the mixed effects of FDI.

The third point relates to the novelty of our estimation. As we mentioned above, the crucial assumption of the DID estimates are common trend assumption. Although we cannot directly test the 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 affected and unaffected industries before and after the 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 $\hat{\beta}_{First\ Diff\ in\ Diffs}$ are corresponding 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 coefficient of $\hat{\beta}_{Second\ Diff\ in\ Diffs}$ are corresponding to the interaction term between the treatment index and $Post2000_t$ and measures the difference between affected and unaffected industries in the early and late pretreatment period. 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 relate to the triple differences method conducted by Verhoogen (2008) and Frazer and Van Biesebroeck (2010) in order to control for unobserved differential trend of the entrepreneurial ability among plants or product-specific trend. However, in this study, since we control for industry, city and 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 productivity effects of FDI regulation change in China. In Table 7, we present the results from the regressions using TFP and wage per employment as dependent variables. Column (1)-(4) in Table 7 investigate whether the regulation change on entry affect TFP for each type of domestic plants. Column (3) and (4) shows that the coefficient μ in equation (6) for newly invested Taiwanese plants in industries for regulation relaxation are 0.0942 and 0.1057, and are significant at the 1 or 5 percent level. These values imply that newly invested plants in industries for regulation relaxation

increased their TFP by 9.42 or 10.57 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation relaxation. Column (5)-(8) in Table 7 investigate whether the regulation change on entry affect wage per employment for each type of domestic plants. Column (7) and (8) also shows that the coefficient μ for newly invested Taiwanese plants in industries for regulation relaxation is 0.0707 and 0.646, and are significant at the 1 percent level. Although 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 imply that newly invested plants in industries for regulation relaxation increased their wage per employment by 7.07 or 6.46 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation relaxation. These results are consistent with the theoretical prediction by Sethupathy (2013) and suggest that newly invested plants in industries for regulation relaxation benefited from the productivity effects of FDI regulation change and increased their wage through rent sharing effects.[32] It is important to emphasize that all of the coefficients with the interaction of $Post2000$ are insignificant, indicating that there is no differential trend between affected and unaffected industries in the pretreatment period and our results can satisfy the crucial assumption of DID estimates. Moreover, all of the coefficients for regulation strengthening are also insignificant. To put it differently, these suggest that these regulation change in China seems 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 number of employment and operating sales as dependent variables. Column (1)-(4) in Table 8 investigate whether the regulation change on entry affect employment for each type of domestic plants. Column (3) and (4) shows that the coefficient μ in equation (6) for newly invested Taiwanese plants in industries for regulation relaxation are 0.0610 and 0.0830, and are significant at the 1 or 5 percent level. These imply that newly invested plants in industries for regulation relaxation increased their number of employment by 6.1 or 8.3 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation relaxation. In contrast, column (4) in Table 8 shows that the coefficient θ for incumbent plants in industries for regulation relaxation is -0.0478 and is significant at the 10 percent level. This implies that incumbent plants in industries for regulation relaxation decreased their number of employment by 4.78 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation relaxation. These results are also consistent with the theoretical prediction and suggest that regulation change expand newly invested plants' activities and in turn induce

[32] Sethupathy (2013) predicts that rent sharing effects work in firm level. In line with this prediction, we confirmed that the results in column (5) through (8) are robust to using aggregated firm level dataset.

a negative business stealing effect on incumbent plants.[33]

Column (5)-(8) in Table 8 investigate whether the regulation change affect operating sales for each type of domestic plants. Column (7) and (8) shows that the coefficient μ in equation (6) for newly invested Taiwanese plants in industries for regulation relaxation are 0.1704 and 0.2055, and are significant at the 1 percent level. These imply that newly invested plants in industries for regulation relaxation increased their operating sales by 17.04 or 20.55 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation relaxation. In contrast, column (8) in Table 8 shows that the coefficient θ for incumbent plants in industries for regulation relaxation is -0.0764 and is significant at the 5 percent level. This implies that incumbent plants in industries for regulation relaxation decreased their operating sales by 7.64 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation relaxation. These results suggest that business-stealing effects among different types of FDI plants occur in the labor market as well as the product market.

Finally, in interpreting the estimated results on operating 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 that there is a differential trend in terms of operating sales between affected newly invested plants and unaffected domestic plants in the pretreatment period. Nevertheless, this point may not be as much of a problem because it is not robust to the inclusion of the interaction term with incumbent plants in column (8). Second, in column (7) and (8) of Table 8, newly invested plants in industries for regulation strengthening also increased their operating sales by 10.74 or 13.4 percent on average from 2002 to 2005 compared to domestic plants in industries for regulation strengthening. This means that they also expand their activity despite regulation on foreign entry was strengthened in the affected Chinese industries. Although this is a limitation to the study, it is not implausible that newly invested plants in industries for regulation strengthening increased their operating sales after the regulation change occured because they were not always prohibited from investing in China. Accordingly, we can conclude that these are not serious violation of our assumption that regulation change attract Taiwanese capital inflows to the Chinese market and in turn lead to 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 in Results section is robust to including the degree of tariff reduction implemented in accordance with China's WTO entry. For the period 1998-2005, the Chinese government decreased the average tariff from 17.5 percent in 1998 to 9.9 percent in 2005. It is

[33] In particular, 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.

important to control for tariff reduction in China because Qiu and Yu (2014) have provided evidence that lowering tariffs in foreign countries can decrease firm's profit in home economies. Tariff reduction may also be related to the regulation change on foreign entry because both investment promotion policies and trade liberalization may work in a mutually complementary manner. If so, we would need to control for tariff reduction in order to avoid omitted variable bias in the estimated effects of the regulation change on domestic market outcomes. The data that we used 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. We estimate the following equation:

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

[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 the first through fourth column of Table 10 are not significant. The values shown indicate that one percent decrease in tariff level resulted in a decrease in wage, TFP, and operating sales. These results are consistent with those of Qiu and Yu (2014) and suggest that trade liberalization in the foreign country have adverse impacts 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 regulation change expand Taiwanese firms' activity in China. We use data from Taiwan Economic Journal during 2000-2007, which provide the existing largest information of Taiwanese subsidiary in China sourced by Taiwanese listed firms. It contains unbalanced panel of 2,554 firms and 10,194 observations. To our knowledge, this is the largest database that provides information on Taiwanese subsidiaries in China. One may think that for the purpose of this analysis we can use Chinese firm level manufacturing data which became widely used in recent years. However, Chinese firm level dataset cannot separate Taiwanese firms from firms coming from Hong Kong or Macau. Moreover, Taiwanese firms often invest in the Chinese market by way of tax haven such as the Cayman Islands and the Virgin Islands. If it is the case, by using Chinese firm level dataset, we cannot fully capture the Taiwanese firms activities in the Chinese market.

[Insert Figure 5]

Figure 5 shows plots of net sales by Taiwanese subsidiaries for the treatment (including industries for regulation relaxation and strengthening) and control industries. The growth trend 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 by Taiwanese subsidiaries for the control industries did not show significant change. This graph may suggest evidence of a common underlying trend for treatment and control industries and a treatment effect that induces a large deviation from the underlying trend.

We estimate the following DID specification:

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

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

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

where i, j, k, l, and t indexs 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. $Relaxed_{ij}$ denotes the indicator of index for regulation relaxation for industry j as defined in Section 2.3; $Strengthened_{ij}$ denotes the indicator of index for regulation strengthening for industry j; $2000Already_{ij}$ denotes the indicator of whether Taiwanese firms invest in China until the year 2000; $2003New_{ij}$ denotes the indicator of whether Taiwanese firms newly invest in China during 2001-2003; $Post2002_t$ is a time dummy that represents years 2002 and after; u_{jt} is an error term. We control again for three types of trend fixed effects: two-digit industry-specific time trends, province-specific time trends, and province-specific fixed effects.

[Insert Table 11]

Column (1) and (2) in Table 11 show the estimation results of equation (7) and (8), respectively. These investigate whether the regulation change on entry affect capital inflows from Taiwan to China for each type of Taiwanese subsidiaries. While the coefficient shown 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 for regulation relaxation is 0.4570 and is significant at the 1 percent level. This value implies that newly invested Taiwanese subsidiaries in industries for regulation relaxation increased their capital inflow to the Chinese market by 45.7 percent on average from 2002 to 2007 compared to newly invested Taiwanese subsidiaries in industries unaffected by regulation relaxation. Column (3) and (4) in Table 11 also report the estimation results of equation (7) and (8), respectively. These investigate whether the regulation change on entry affect net sales in the Chinese market for each type of Taiwanese subsidiaries. While the coefficient shown 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 for regulation relaxation is 0.4936 and is significant at the 1 percent level. This value implies that newly invested Taiwanese subsidiaries in industries for regulation relaxation increased their capital inflow to the Chinese market by 49.36 percent on average from 2002 to 2007 compared to newly invested Taiwanese subsidiaries in industries unaffected by regulation relaxation. By contrast, column (4) shows that the coefficient β in equation (8) for incumbent Taiwanese subsidiaries until the year 2000 in industries for regulation relaxation is -0.5070 and is significant at the 1 percent level. This value implies that incumbent Taiwanese subsidiaries in industries for regulation relaxation decreased their net sales by 50.7 percent on average from 2002 to 2007 compared to incumbent Taiwanese subsidiaries in industries

unaffected by regulation relaxation. These suggest that regulation change resulted in an increase in capital inflows and net sales, both of which are generated by newly entrant subsidiaries in the Chinese market, although did not change in capital inflows and decreased net sales, both of which generated by incumbent subsidiaries at the year 2000.

We should note that the descriptive trend shown in Figure 5 is not robust to the inclusion of three fixed trend. This means that treated industries might be mechanically performing better than control ones even in the absence of a change in regulation. Nevertheless, after controlling for these fixed trend, we found that regulation change resulted in an increase in newly entrant subsidiaries' capital inflows and net sales. Moreover, all of the coefficients for regulation strengthening are also insignificant. These corroborate that regulation change in FDI has had an important impact on Taiwanese subsidiaries activities over a period of the treatment.

6.2 Hollowing out effects on domestic economy

In this subsection, we discuss whether outward FDI to China that accompanied regulation change induce hollowing out of domestic technologies and employment in the affected industries. Based on the estimation results of equation (6), we conduct F test that the null hypothesis is $H_0 : \gamma + \theta + \mu = 0$. First, the F-statistics for TFP and wage per employment 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 employment is rejected at the 1 percent level. We then check the F-statistics for the results of number of employment and operating sales that are shown in Table 8. These values are 0.91 and 5.04 and show that while the null hypothesis on the coefficient of number of employment is not rejected, the null hypothesis on the coefficient of operating sales is rejected at the 5 percent level. Since the coefficient of θ takes negative value on operating sales, we conduct F test again that the null hypothesis is $H_0 : \gamma+\theta+\mu \leq 0$. The result of the F test also hold and is rejected at the 5 percent level. These findings imply that there are no statistical evidence that regulation change lead to hollowing out of domestic technologies and employment in the affected industries (Rather, regulation change induce an increase in wage per employment and operating sales in the affected industries).

7 Conclusion

This paper investigates the impact of FDI regulation change in China on Taiwanese plants' productivity and employment, using Taiwanese representative manufacturing plant-level data and exploiting an FDI regulation change in China in 2002 as a significant variation. Our DID estimates reveal a heterogeneity in the response of Taiwanese plants to this change in the regulation, that are consistent with the theoretical prediction by Sethupathy (2013): plants in deregulated industries which newly invested in China after 2000 experienced a increase in their productivity, employment and operating sales while plants in those industries which had already invested in China at 2000 decreased both employment and operating 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 a statistical evidence on the hollowing out effects of outward FDI that are caused by regulation change on domestic market outcomes in deregulated industries. We also examine our crucial assumption of whether regulation change expand Taiwanese firms' activity in China by using the data from Taiwanese subsidiaries in China. We found that regulation change resulted in an increase in capital inflows and net sales, both of which are generated by newly entrant subsidiaries in the Chinese market. Overall, these suggest that Chinese FDI regulation change caused a significant reallocation among Taiwanese plants activities in affected industries over a period of the treatment.

These results suggest that while policymakers in developed economies can encourage outward FDI that are induced by FDI policies in developing countries, they should also be aware of the potential negative impact of such FDI policies on 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.

Finally, we should acknowledge that we have three major research limitations. First, because of data limitation, this study did not focus on the impact of the Chinese FDI regulation change on the decision to entry and exit of Taiwanese plants. However, Kneller et al. (2012) pointed out that plants that have been shut by MNEs are relatively productive than others within the same industry. This consideration is indispensable for understanding a comprehensive vision of repercussions from FDI regulation change through the effects of entry and exit of Taiwanese plants. Second, we do not provide evidence why regulation change does not affect employment and productivity of domestic plants in affected industries. This fact may be relevant to investigating the relationship between outward FDI and export from home economies. Nishitateno (2013) shows that FDI by upstream firms in the Japanese automobile industry induce additional exports of intermediate goods from the home economy. This could be the case in Taiwan as we saw in Introduction section. During the period from 1998 to 2005 that changed their production structure, Taiwanese domestic plants might offset business stealing effects from newly FDI plants by increasing their export to newly FDI plants that have a transactional relationship. Finally, this study was limited to providing evidence of how newly invested plants enhance their productivity through productivity effects of regulation change that cause outward FDI to China. Specifically, newly invested plants may change their product churning before and after the regulation change in the sense that drop their less productive goods and concentrate or add more productive goods. Examining the channel of productivity effect through the change in plants' product churning over a period of the treatment will be included in our future study.

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Figures

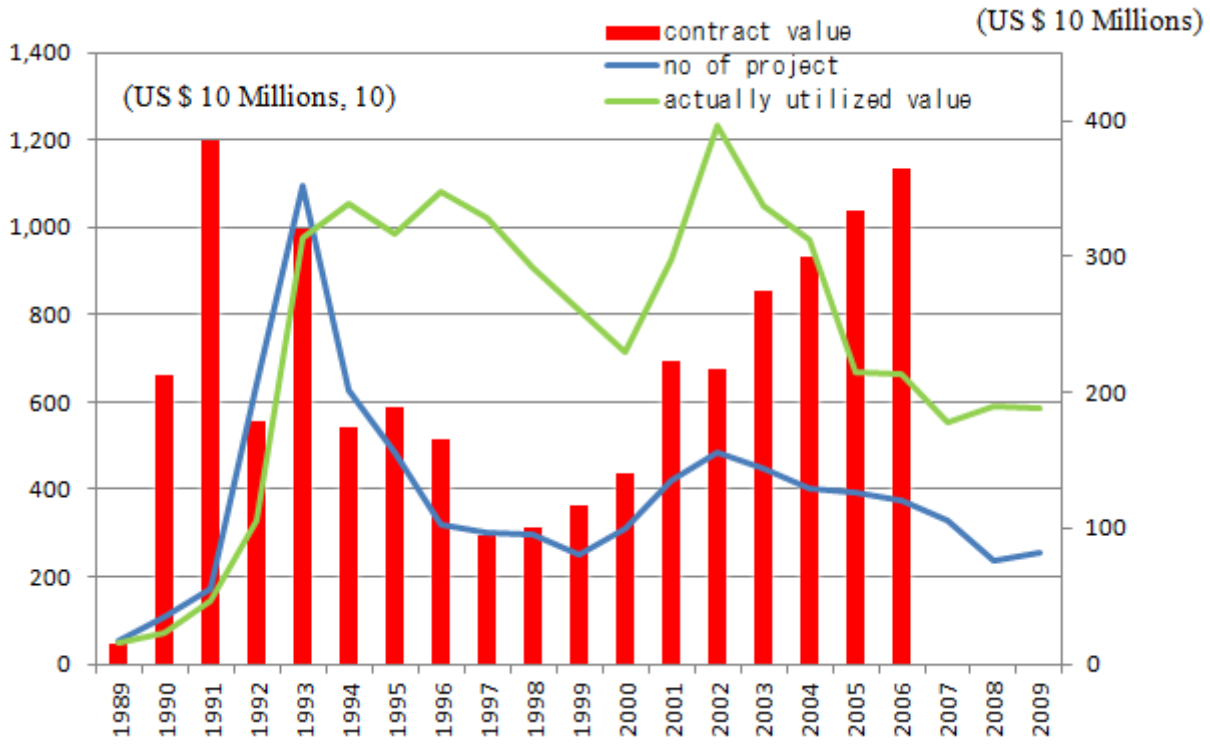

Figure 1: Chinese Statistical Data on Foreign Direct Inflows from Taiwanese Firms in the Chinese market (1989-2009)

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).

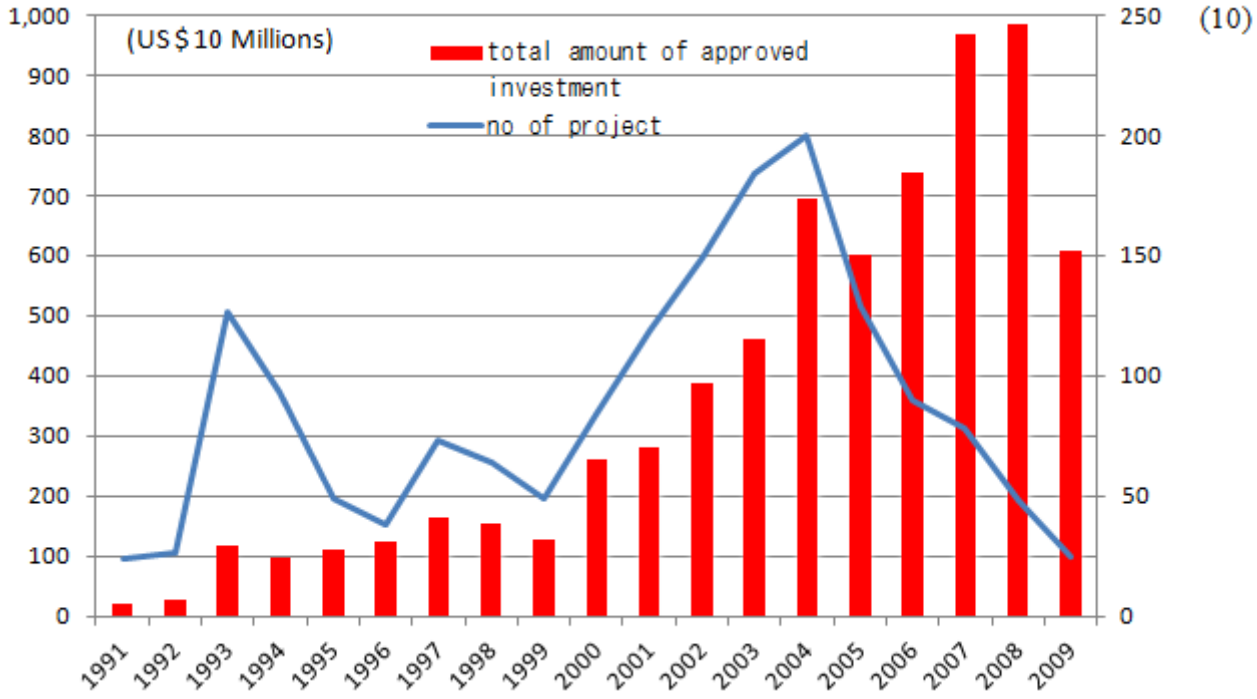

Figure 2: Taiwanese Statistical Data on Approved Investment of Taiwanese firms in Mainland China (1991-2009)

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.

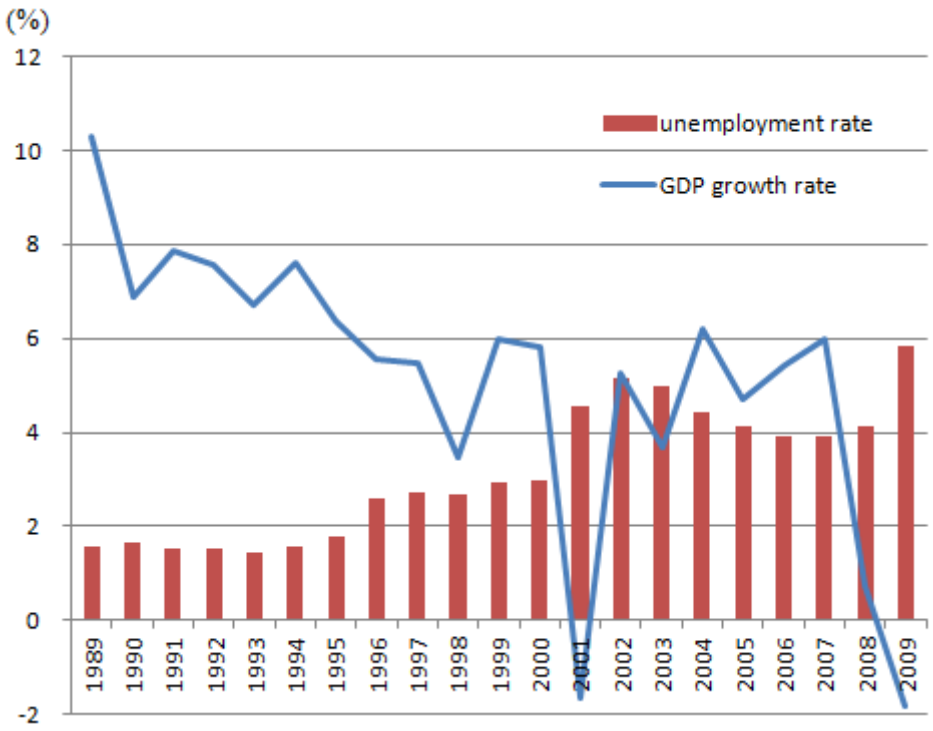

Figure 3: Trends in GDP Growth and Unemployment Rate during 1989-2009

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.

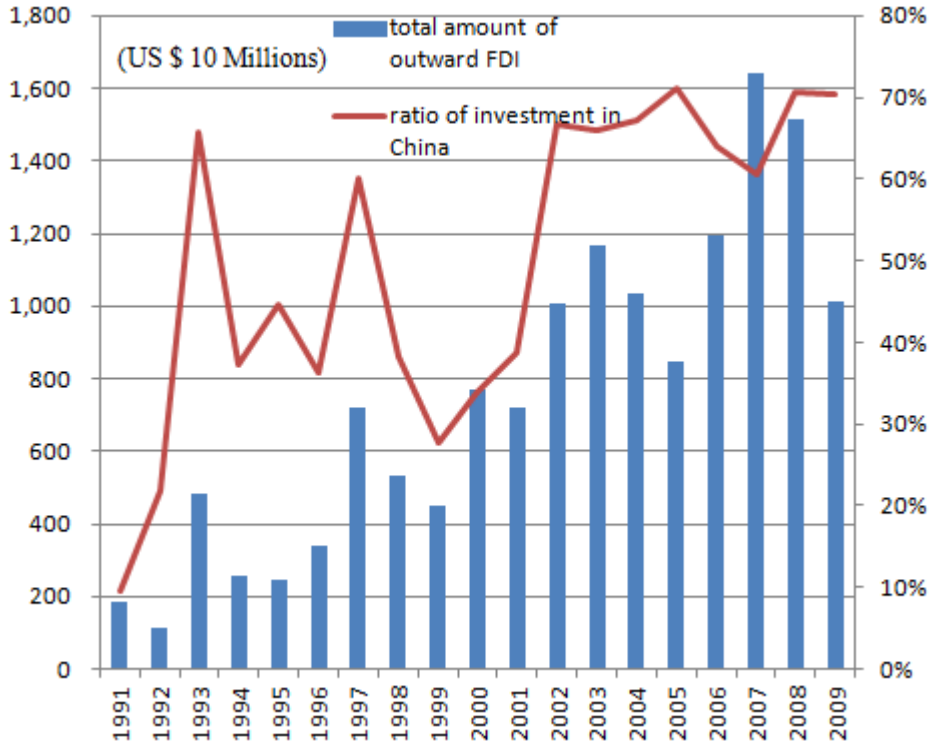

Figure 4: Changes in the Total Amount of Outward Foreign Direct Investment from Taiwan and its Ratio of Investment in China (1991-2009)

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.

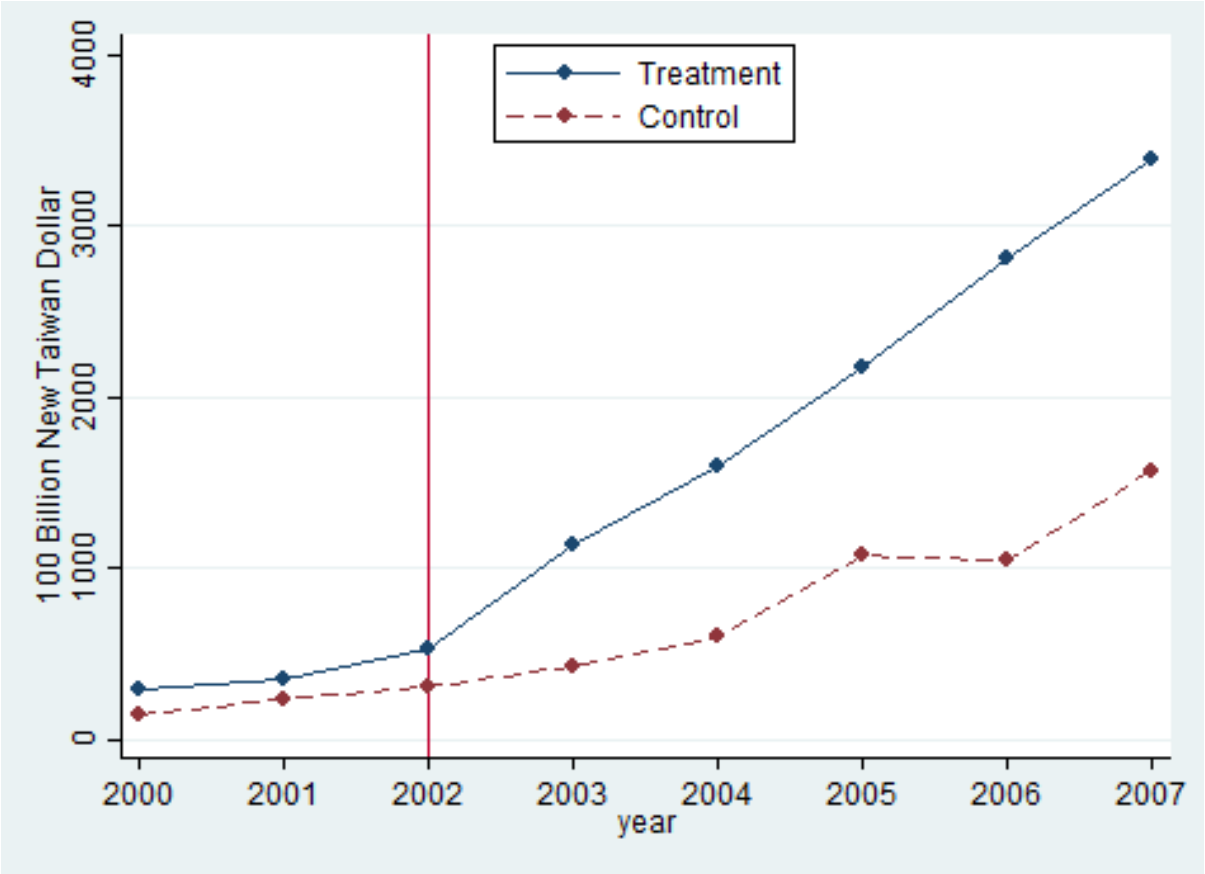

Figure 5: Average Sales by Taiwanese Subsidiaries for Treatment and Control Industries

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 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***				
Tariff	(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%.