Essays on Foreign Acquisition, Multiproduct firms and International Trade

Evidence from China

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Abstract

Based upon the context of China getting integrated into the global economy, this thesis explores three distinct research questions concerning the effects of foreign direct investment (FDI) on firms' export and import profiles as well as the relationship between working capital management and export participation.

Chapter One introduces the institutional background and the outline for the whole thesis. We describe the distinctive features of China's changing regulatory environment and demonstrate how relevant policies have shaped the patterns of FDI in China. Moreover, we briefly introduce the evolution of FDI-related policies in the three key phases of China's reform and opening up and then evaluate how changes in FDI policy shape the current status of foreign investment. Finally, we present an overview of our three main chapters.

Chapter Two examines whether a causal relationship exists between foreign ownership and firms' export profiles. We use the matched firm transaction data to track down changes in firm ownership and export profiles and combine the propensity score matching with the difference-in-differences technique to identify a causal relationship. Our results show that foreign ownership causes firms to become "meaner and leaner". After foreign acquisition, both the number of products and the number of export destination countries have decreased. In addition, the acquired firms tend to concentrate

sales on their top-sold products and top-exported destinations.

Chapter Three investigates whether a casual link exists between foreign acquisition and firms' import profiles. We use the same databases as in Chapter Two, with the focus on importers only, to measure changes in firm ownership structure and import profiles. We apply the augmented inverse probability weighting method to construct a pseudo-randomised sample and then use the difference-in-differences method to eliminate the time invariant unobservables. We also compare the effects of minority acquisitions with those of majority acquisitions on firm's import profiles. Overall, the results demonstrate a causal relationship between foreign acquisition and firms' import profiles. In addition, we find that different levels of foreign ownership have heterogeneous effects with minority acquired firms showing a "meaner and leaner" import profile restructuring while majority acquired firms showing an expansion import profile restructuring.

In Chapter Four, we explore the relationship between firm-level working capital management and firms' export participation. We particularly look at the role of cash conversion cycle (CCC) in firms' export behaviours. With data from the *Annual Survey of Industrial Firms (ASIF)*, we test whether a causal relationship exists between working capital management and the probability for a firm to become an exporter using the binary choice model with fixed effects (FE Logit model). We then use the Tobit model to estimate the effects of CCC on firm's export intensity. In order to estimate CCC's effects on other firm performance, we apply firm fixed effects to eliminate the time invariant unobservables. Although there is no significant finding showing a casual link between working capital management and the probability of firms' becoming exporters, the results suggest a positive relationship between better working capital management and the increase in firms' export shares. In addition, a shorter CCC can lead to the increase in firms' total and domestic sales. We also find a positive relationship between working capital management and firm performance in terms of return on total assets, income margin and asset turnover.

Chapter Five is a summary of the research findings and points out future research directions.

DEDICATION

To my loved ones, it is them who
make the impossible possible.

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Chapter 1

Introduction

Since the implementation of the reform and openning up policy, China has been increasingly involved in the global economy with ever-growing foreign investment pouring into its domestic market. After China joined the World Trade Organisation (WTO) in 2001, it ranked as the second top exporters in the world (Upward et al., 2013). The rapid growth of China's economy is a unique case given its mixture of market and centrally planned economic structure. Such dramatic growth is ascribed to two factors: first, China's willingness to open up its own market with engagement in the institutional reforms; second, the opportunities accompanied with China's WTO accession to obtain foreign direct investment (FDI) to become one of the leading FDI host countries among the developing economies (Upward et al. (2013); Zheng (2013); Chen (2018)). The salient growth in China has attracted interests from both policy makers and academia. Substantial literatures are produced in fields of international trade and FDI to study the main forces that push the surge. The studies conducted in this thesis follow this research agenda to investigate the effects of FDI and efficient working capital management on firm-level international trade behaviours in China.

As active players in the international trade market, Chinese firms form interesting and important counter examples to the traditional trade theories that only the most productive firms engage in international trade as they had neither developed any sound legal and financial system by then to foster their growth (Allen et al. (2005); Du and Girma (2007)), nor had they owned adequate managerial expertise and technological advancement to nurture their fast-growing international operation (Manova and Yu (2016); Bloom et al.

(2018)). Yet with arguably poorly developed economic, social and legal mechanism, these Chinese firms managed to become the engine of world trade activities and contributed to most of the country's economic growth. To delve into this conundrum, many seek answers from the concomitant growth in FDI inflows. However, some other aspects of the conundrum such as how firms react to the FDI or foreign acquisition, especially how firms' trade strategies change in response to foreign acquisition have not been subjected to rigorous research, which prompts this research.

We plan to approach this issue by first looking at the relationship between FDI and export. After reviewing the literatures on multiproduct firms in trade, we find that the current trade literatures have mainly probed into the link between firm's export profiles and firm productivity. Few have explored the relationship between firms' ownership and export profiles, whereas FDI related literature mainly set its focus on FDI's implications concerning firms' productivity and wage. Only a small body of literature seeks to establish the link between foreign ownership and export. Through identifying these research gaps, we develop our first research question as to whether foreign ownership causes firms to change their export profiles, with a focus on examining how internal export strategies have changed following the acquisition.

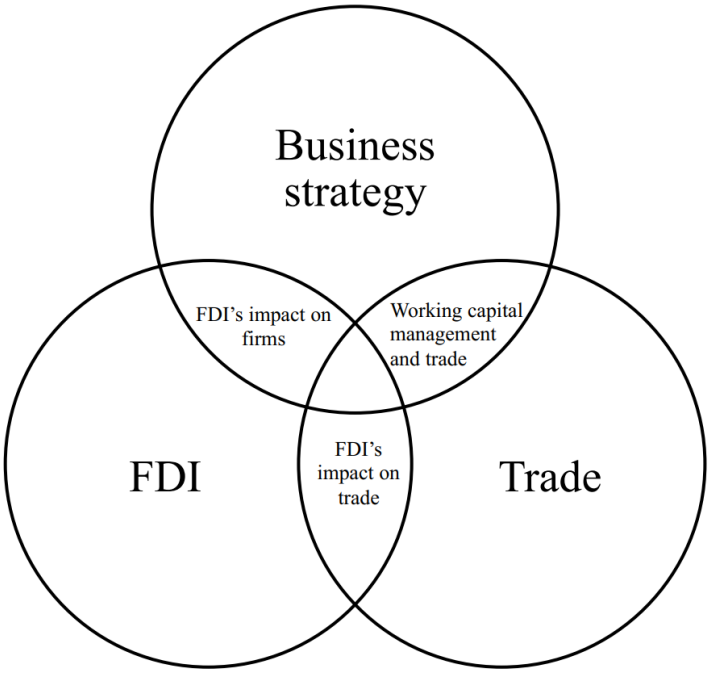
Moving on from studying the linkage between FDI and export, we set out to investigate into whether a causal link exists between FDI and firms' import strategies as import is a crucial component of international trade and firm's sourcing strategy. While there's abundant literature studying firm heterogeneity in export, a comparatively less effort has been devoted to exploring the import side. Neglecting the import side will only yield partial understanding of firms' trade behaviours. Similar to literature on export, import related literature mainly focused on the link between firm productivity and imported inputs, whereas how ownership structure has affected firms' overall import strategies has yet to be placed at the centre of study. To fill in such research gaps, we thus develop our second research question: whether foreign ownership causes firms to change their import strategies, and how the different levels of foreign ownership change acquired firms' sourcing strategies.

After looking into how foreign acquisition has changed firms' trading strategies, we decide to go beyond the subject of FDI and set the research focus on how business strategy, specifically working capital management, could

affect firms' trade activities as working capital management is crucial to business operation and an efficient management of working capital is vital to survival of firms. Nevertheless, little research has, so far, looked directly at how working capital management can affect firms' trade activities. Accordingly, our last chapter is motivated to look at whether efficient working capital has any direct impact on firms' trade activities.

This research studies the conundrum of Chinese firms' trade participation through three different angles, which constitute our three independent research chapters: the first chapter exploring how export strategies are affected by foreign investment and the second chapter examining how sourcing strategies change in response to foreign acquisition, while the final chapter goes beyond the topic of FDI and focuses exclusively on how business strategy, especially firms' working capital management could have a direct impact on Chinese firms' trade activities. The study relates to three main research areas, i.e. Trade, FDI and Business strategy. The following is a graph showcasing the conceptual framework of this research:

Figure 1.1: Conceptual framework of the research



This chapter introduces the institutional background and an overview for the whole thesis. It proceeds as follows. Section 1.1 lists out three FDI-related policies and briefly discusses the evolution of them in China. It then

evaluates how these policies shape the current status of foreign investment. Section 1.2 presents an overview of the thesis including the motivation, the data and method, the key findings and contributions of each core chapter. Section 1.3 provides the structure of the thesis.

1.1 Institutional background

China has gradually integrated itself into world economy through its decades of reform and opening up, especially with its accession to the WTO membership in 2001. China has since attracted a large amount of inward foreign investment, which plays a crucial role in its economic growth. According to data from the *United Nations Conference on Trade and Development* (UNCTAD), FDI net inflows rose from less than 20 billion USD in the 1990s to over 135 billion USD in 2017 (see Figure 1.2). Since the beginning of 2010, China has become the most popular FDI destination and surpassed the US as the largest FDI recipient ever since.

Foreign investment is seen as the driving force of China's increasing participation in the global market, but it had taken quite some time before the perception was driven home in China. According to Zheng (2013), China's opening up to foreign investment can be divided into three phases. The first phase is called Experimental period (1978-1991), a time which witnesses the government launch its program of economic reform but sees a stagnant status of FDI inflows. The second stage (1992-2001) is featured by the readjustment of the opening policy, a phase when FDI starts to favour China as investment destination, while its entry into WTO in 2001 marks the third phase of its opening up and fuels the growth of FDI inflow.

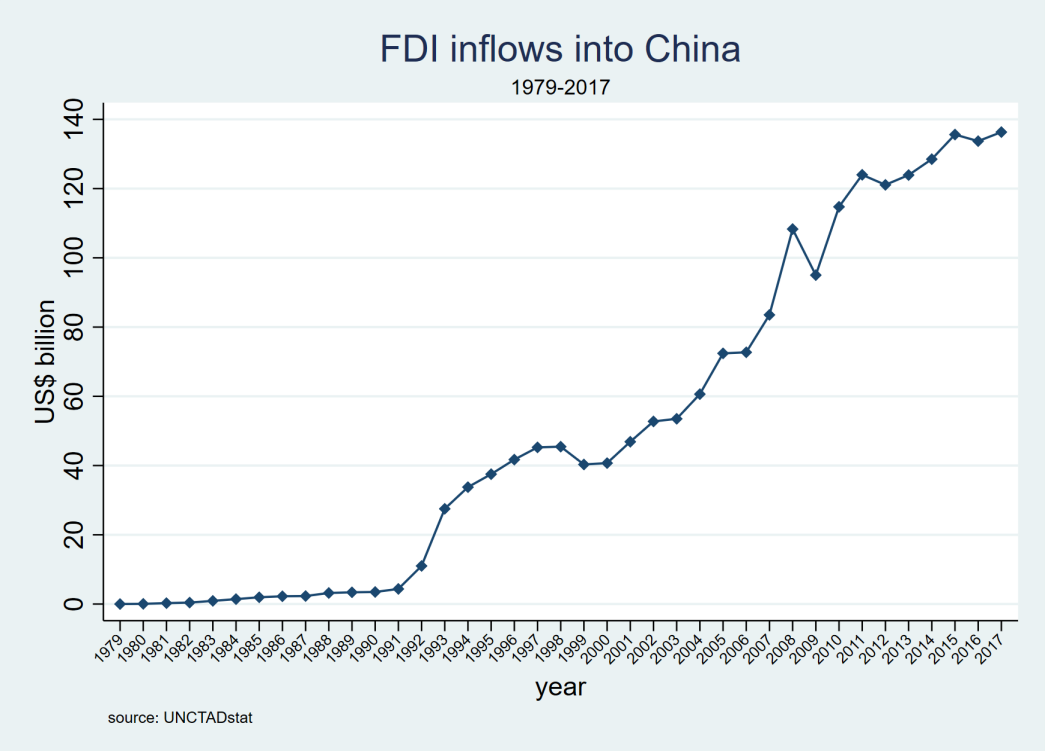
However, reliance on FDI as an economic growth engine was taken as politically risky. To protect the underdeveloped local market, the government imposed some constraints on foreign capital inflows, which resulted in the acute imbalance of FDI in sectors and geographical locations. FDI in China remains concentrated in export-intensive activities and coastal areas (Wei, 2013). Therefore, it is important to look at the regulatory environment in China that shapes FDI activities.

China's FDI policies

As foreign investment is considered highly sensitive to political risk, there are a range of laws and regulations issued to govern the practice of foreign investors and mitigate concerns among conservatives (Zheng, 2013). In a brief summary, there are three major laws and policies that regulate the FDI practice in China:

- "The Law on Sino-Foreign Equity Joint Ventures" (**the Law**) and Subsequent "Detailed Rules on Implementation of the Law Wholly Foreign-Owned Enterprise (**the Detailed Rules**)"
- **The Catalogue** of Industries for Guiding Foreign Investment[1]; and
- Various preferential policies for the **Special Economic Zones (SEZ)**

Figure 1.2: FDI inflow in China, 1979-2017



[1] Also known as **the Guiding Directory** of industries open to foreign investment

Phase I. Experimental period, 1979-1991

In the first phase, the economic reform initiated investment liberalization, but the amount of inward FDI and foreign loans were considered negligible. According to the UNCTAD, the annual average inflow of FDI was only 1.8 billion USD during the first phase. One of the chief reasons is that the introduction of foreign capital into mainland China was highly controversial within the leadership of the country (Zheng, 2013), so the law-makers were very prudent in this regard. However, its then stagnated economy with a severe capital shortage, a dearth of advanced technology, and a lack of managerial and technological know-how (Gallagher, 2007) forced the leadership to initiate liberalization of its economy and allow foreign capital to be made priority of its development strategy (Zheng, 2013).

Accordingly, in July 1979, The *National Congress* passed its first law on foreign investment, The Law on Sino-Foreign Equity Joint Venture[2], to provide a legal framework to govern foreign practice in China, whereby foreign investment can take the form of either joint ventures or wholly foreign owned firms, but the latter were only permitted on stringent terms. Even the 1990 Detailed Rules[3] do not allow solely foreign invested firms to establish their practice in China unless the firm exports certain proportion of their products; or the solely foreign invested firms engage in technological advanced activities (Long (2005); Zheng (2013); Chen (2018)).

This phase is characterized as the experimental period of China's trade liberalization for the recipients of FDI inflows. Affected by the laws mentioned above, foreign investment is confined to the first four special economic zones (SEZ)[4] established in Guangdong and Fujian provinces in 1980 , which marked the inauguration of laboratories for capitalist practice in these selective areas. The initial success of establishing SEZs to apply FDI for economic gains was appreciated and followed by opening up 14 more coastal cities[5] in 1984.

[2] The official definition of joint venture is foreign capital over 25% of the total capital, this requirement is higher than the OECD's 10% foreign capital requirements

[3] Issued by the Ministry of Commerce "1990 Detailed Rules for The Implementation of The Law on Wholly Foreign-Owned Enterprise."

[4] Shenzhen, Zhuhai, Shantou (in Guangdong province), Xiamen (Fujian province).

[5] Dalian (Liaoning), Qinhuangdao (Heibei), Tianjin (Municipal city), Yantai and Qingdao (Shandong), Lianyungang and Nantong (Jiangsu), Shanghai (Municipal city), Ningbo and Wenzhou (Zhejiang), Fuzhou (Fujian), Guangzhou and Zhanjiang (Guangdong), and Beihai (Guangxi).

In the subsequent years, the tangible benefits brought by FDI inflows in the first few experimental years encouraged a further establishment of Open Economic Zones (OEZ) in a set of city clusters to draw more FDI inflows, in Yangtze River Delta, Pearl River Delta and Min Nan (South Fujian) Delta in 1986, later including Shandong Peninsula and East Liaoning Peninsula in its OEZ in 1987, granting full SEZ benefit to Hainan province in 1987, and establishing Shanghai Pudong development Zone in 1989 (Zheng (2013); Chen (2018)). To encourage foreign investment, a set of preferential treatment were granted to these areas, including not only tax relaxations but also simplified administrative procedures to lift practical barriers in the way of effective facilitation.

Phase II. Transitional period, 1992 -2001

It was not until 1992 that FDI inflows started to gain momentum and trended upward steadily as shown in the Figure 1.2 below. The foreign capital inflow reached $ 11 billion in 1992, nearly 10 folds of yearly average FDI inflow in the previous phase (1979-1992) and grew over 150% compared to FDI inflow in 1991 ($4.36 billion). In 1993, inward FDI experienced another surge to $27.5 billion.

This phase is characterized as the transition period due to further and deepened FDI liberalization across China (Chen, 2018). Deng Xiaoping's southern tour marks the start of the second phase of openness. The tour cannot be overstated in the evolution of investment policy liberalization. As stated in Zheng (2013) the southern tour greatly alleviated foreign investors' concerns over repercussions for China's integration into the international society after cracking down of student movement in 1989. It was also during this tour that Deng brought up the concept of "socialist market economy" that removed the ideological obstacles standing in the way of China's state-led economic development. The tour marks an ideological transition from centrally planned socialism towards liberalism the world perceived in the following years.

During the second phase, the restrictions on wholly foreign owned firms were gradually lifted (Gallagher (2007); Long (2005)). **The Laws** for joint venture and wholly foreign owned firms were amended (Chen, 2018). The restrictions on stringent performance requirements were revised from compulsory to encouragement in preparation for WTO accession. In the 2001

Detailed Rules[6], two restrictions were revised on wholly owned foreign firms to encourage them to adopt advanced technology and engage in export-oriented activities.

In 1995, the first Catalogue of Industries for Guiding Foreign Investment was released. The catalogue classified industries into three categories to stipulate foreign investment in industries that were encouraged, restricted, or prohibited. During the transition phase, more cities and regions were opened to foreign investment. The government granted another 52 cities and a set of border cities with SEZ alike preferential treatment to encourage foreign investment.

Phase III. Post WTO period, since 2001-

The third phase of China's FDI liberalization began with its WTO accession in 2001 and saw the release of more comprehensive and liberalised regulations. The inflow of foreign investment gained a greater momentum during this phase and China became the most favoured FDI destination. The average inflow of FDI was $76 billion for the year 2001-2009 (the UNCTAD), constituting approximately 14% of the world FDI inflows (Girma et al. (2015b); Zheng (2013); and Chen (2018)). The average inflow grew to $129 billion for the year 2011-2017 and reached $1.35 trillion by the end of 2017 (the UNCTAD), making China the largest FDI recipient in the world.

With China's gaining a strong competitive edge and the rise of overseas acquisitions by Chinese firms, there was a growing concern over China's investment behaviour (Zheng, 2013) and China was required to remove restrictions that went against its commitments to WTO membership. In response, the Laws and the Detailed Rules[7] were revised concerning previous FDI requirements in terms of export performance and technology transfer. Moreover, the Catalogue has been amended several times in the third phase to better suit the country's industrial and economic development goals.

[6] See Article 3 of the *Detailed Rules* (2001)

[7] See the *Detailed Rules* (2014). The revision focused on the investment methods and removed Article 31-32 in 2001 version

Concluding remarks

The discussion above reflects how the laws and policies have shaped the patterns of FDI inflows in the three particular phases of China. That is, a stagnant status appeared when policies were stringently restrictive in the first phase from 1978 to 1991, whereas the first surge emerged in the second phase from 1992 to 2001 when most restrains were lifted, which suggests a liberal policy environment matters more than otherwise. The steady growth of FDI in the third phase reflects importance of consistence in establishing systematic FDI rules. Besides, the gradual shift in policies from restricting to attracting reflects the Chinese government's important political changes. After reviewing the evolution of FDI-related policies, we identified two distinctive facts about foreign acquisition in China: cluster in foreign-invested location and export-oriented foreign investment.

The choice of SEZs was out of calculative considerations. Guangdong province is adjacent to Hong Kong and Macao. Fujian province is situated across the straits to Taiwan. The two provinces are located on the Southeastern coast, providing an easy access to Southeast Asian countries. The two provinces are also home provinces of many overseas Chinese who were a significant component in the first wave of FDI investment to China. Moreover, firms in China are often assigned with fixed export performance targets by the central government. Therefore, in order to meet their annual targets, many acquired firms have to set their business focus on export (Girma et al. (2015b); Long (2005)).

1.2 Thesis overview

This section provides a sketch of the whole thesis through summarising the specific motivations, key findings and contributions of the three chapters.

Chapter Two investigates whether there is a causal relationship between foreign ownership and export profiles. A literature review on export and international trade reveals that while there is a growing body of literature exploring the effects of FDI on firm characteristics such as productivity, product quality, wages, etc., little is known about the link between firms' ownership structure and their export profiles in terms of the variety of export products and sourcing countries, etc. Having identified this research gap,

we set out to examine the relationship between foreign ownership and firms' export profiles.

In order to do so, we combine transaction level data from the *Chinese Customs Trade Statistics* (CCTS) with firm operational data from the *Annual Survey of Industrial Firms* (ASIF) of the *National Bureau of Statistics* (NBS) to track both changes in export profiles as well as firm ownership. Due to the limitations of data access, hardly has any previous research combined these two datasets as we do. Therefore, this research is able to take advantage of uniqueness of the data to identify if a causal relationship exists between firms export profiles and foreign acquisition. The empirical strategy adopted to identify such a causal relationship relies on a combination of the propensity score matching with the difference-in-differences technique.

Overall, we find that firms become "meaner and leaner" due to foreign acquisition. For instance, the results demonstrate a 7% reduction in the number of firm products and 2% increase in the concentration of sales of the top-sold products due to foreign acquisition. This result shows consistency with theoretical predictions on multiproduct firms in existing literature such as Eckel and Neary (2010), Dhingra (2013) as well as Nocke and Yeaple (2008). Such a "meaner and leaner" process is also found in export destination of acquired firms. We find that after foreign acquisition, firms export to less destination countries and concentrate more of their sales on top-exported destinations.

Chapter Two provides the first empirical evidence on the causal relationship between foreign acquisition and firms' export profiles. Moreover, we newly suggest that foreign acquisition causes firms to become "meaner and leaner". The research therefore bridges the gap in existing literature about multiproduct firms in trade and foreign investment. Specifically, the research provides corroboration to Manova and Zhang (2009)'s research that suggests a potential link between firms' export profiles and their ownership structure. In addition, we find foreign acquisition boost firm's productivity, wage payment, R&D intensity in the short-run and improve acquired firm's financial health in the long-run alongside with the export profile restructure. In doing so, new dimensions of understanding FDI effects can be brought to light. Finally, we provide additional evidence about FDI effects by building up a case in China, the context of a developing country.

Following the investigation into how foreign acquisition affects firms' export profiles, **Chapter Three** examines the effects of FDI on firms' import profiles. After conducting an extensive literature review on the topics of FDI effects and import, we identify two gaps in existing literature: first, although substantial efforts have been made to study firm heterogeneity in export, a comparatively less efforts have been devoted to import structure and its potential links to firm characteristics; second, by now little is known about whether a causal link exists between firms' ownership structure and their import strategies. These findings constitute our motivation of conducting this research.

Similar to the previous chapter, we combine transaction level data from the CCTS with firm operation data from the ASIF of the NBS to investigate the average treatment effect of the minority and majority acquisitions on firms' import profiles and operational changes. In terms of methodology, we construct a pseudo-randomised sample through the augmented inverse probability weighting method and exploit the panel nature of the data to eliminate the time invariant unobservables through the difference-in-differences method.

Our research reveals the causal effect of different levels of foreign ownership on firms' import profiles. Moreover, we find heterogeneous acquisition effects on firms' import profiles by comparing the minority acquired firms and the majority acquired firms. In terms of the minority acquired importers, there appear reductions in the total number of products and the total import value as well as an increase in cheaper products imported from lower-income countries compared with the local firms. In general, the minority acquired importers show a "meaner and leaner" restructuring process. The majority acquired firms, on the other hand, increase the variety of their imported products and tend to import from higher-income countries compared with indigenous firms. Notably, although there shows no significant change in the average unit price of imported products, the majority acquired firms experience a significant increase in the total import value after foreign acquisition.

Chapter Four looks at the relationship between firm-level working capital management and firms' export participation, and in particular it examines the role of cash conversion cycle (CCC) in firms' export activities. The research undertaken in this chapter is intrigued by a Chinese export conundrum. On the one hand, with the flooding of FDI after China's access to the WTO, foreign constraints are imposed to impede many firms in their entry into export activities, while on the other hand China experienced a dramatic export

growth. This phenomenon goes against the traditional belief that a firm has to overcome a sunk cost to engage in export. Such a Chinese conundrum is highly worth investigating to find out how firms manage to overcome the barriers like sunk cost to contribute to the surge of Chinese export boom during the sample time. Our hypothesis is that efficient working capital management may help Chinese firms to mitigate the external financial constraints and to overcome the sunk cost prior to export participation.

In order to test this hypothesis, we apply the data from the ASIF of NBS and use the binary choice model with fixed effect as our identification strategy. Moreover, we estimate the effects of CCC on firms' export intensity using the Tobit model. When estimating CCC's effects on other firm performance, we eliminate the time invariant unobservables using firm fixed effect. This research yields several major results. In terms of export intensity, it demonstrates that firms' export shares increase with better working capital management. In addition, a negative relationship is found out between the length of a firm's CCC and its number of total and domestic sales and exports. Moreover, it finds that more efficient working capital management leads to a better firm performance in terms of income margin, return on total assets and asset turnover. To be noted, however, there is no evidence suggesting a causal relationship between working capital management and the probability for a firm to become an exporter.

The major contributions of this chapter include enhancing the current understanding of working capital management and export and enriching the current literature by working out the links between export and firm's working capital management based on a large firm level database. It also has practical significance of improving firms' export performance through effective working capital management and of helping to mitigate the liquidity risks during firms' export activities.

1.3 Thesis outline

The remainder of the thesis is structured as follows. Chapter 2 examines the effects of FDI on firms' export profiles. Chapter 3 investigates how foreign acquisition affects the way firms organize their production through import so as to further unveil the implications of foreign acquisition on firms' import structure. In Chapter 4, we estimate how firms' working capital management

affects firms' export participation and examine the role of cash conversion cycle (CCC) in the management of internal finance. We conclude in Chapter 5.

Chapter 2

Foreign Acquisition and Multiproduct Exporters

2.1 Introduction

The phenomenal growth of export in China is well documented in literature. Up to now, large numbers of literature have set out to examine the driving force of such rapid growth, among which the concomitant growth in foreign direct investment has drawn considerable attentions and could be interrelated with China's global trade activities (Blonigen and Ma, 2010). Although foreign acquisition's effects on firms' overall trade flows are explored in a number of literatures (Liu et al. (2012); Blonigen (2001)), it remains unclear how firms' trade activities have actually changed after acquisition and whether such strategic changes in export profiles are directly caused by foreign acquisitions. These issues point to the need of studying the export profile changes related to foreign acquisition as mentioned in the previous chapter. In order to delve deeper into the above-mentioned issues, a close examination is performed of the effects of foreign acquisitions on exporting firms' export profiles, with a focus toward understanding how internal strategies have changed in trade following the acquisition.

Literatures on heterogeneous firms and trade models are mostly based on the assumptions that firms produce single product with horizontally differentiated varieties (Bernard et al., 2007b). Recent transaction level customs data uncovered the fact that multiproduct firms dominate both domestic

and international market (Baldwin and Gu (2003); Nocke and Yeaple (2008); Bernard et al. (2009); Manova and Zhang (2009); Neary (2009); Arkolakis and Muendler (2011)). This new fact on multiproduct firms informs the directions of subsequent research in heterogeneous firms and trade, where it extends the assumption from single product firms to multiproduct firms.

Theoretical and empirical literature on multiproduct exporters suggests a robust link between firm characteristics such as firm productivity and firms' export profiles. For instance, studies show that reallocations across products provide additional channels for productivity gain through shedding relatively unproductive products and concentrating on core products (Arkolakis and Muendler (2011); Melitz and Redding (2014)). Yet, despite the efforts made to examine the link between firm productivity and export profiles, the relationship between firms' ownership structure and export profiles has not been thoroughly explored. Although there are studies on multinational firms that tackle the issue of ownership structure, such studies set their focus on the underlying reasons for firms' multinational operation instead of on export profiles (Antras and Yeaple, 2014). Moreover, those studies rely primarily on data from developed countries such as US due to the limited data source and there is little discussion within the context of developing countries to date (Goldberg et al., 2008).

Nocke and Yeaple (2008) are among the first few who mentioned the linkage between export profiles and ownership structure of multinational firms from a theoretical perspective. They base their model on the observed facts that there is a trade-off between the product scope and productivity and elaborate that productivity is affected when one additional product induces higher marginal costs for multiproduct firms. However, firms with better organisation capabilities are able to flatten the increase in marginal cost when adding a new product into their existing product mix compared with other firms. Their model provides a way to understand the mechanism of how ownership structure affects product profile decisions of multiproduct firms.

Empirically, applying a detailed transaction level Customs data from China, Manova and Zhang (2009) find a potential linkage between export profiles and ownership structure. Their results depict a systematic difference in export profiles across firm ownership structure. While they have revealed thought-provoking facts on Chinese exporting firms, their study has focused exclusively on static facts based on a cross-sectional data in 2005. Little is

known about whether the differences in export profiles are caused by foreign ownership or not.

In light of the above motivating facts, the main goal of this research is to identify if a causal link exists between foreign ownership and firms' export profiles. Moreover, we intend to extend current understanding of multiproduct firms by providing additional evidence from China, a developing country's point of view.

To do so, we combine the transaction-level customs data from the *Chinese Customs Trade Statistics* (CCTS) with the firm-level operational data from the *Annual Survey of Industrial Firms* (ASIF)[1] and use the sample spanning from 2000 to 2006 to track down both changes in export profiles and firm ownership.

The distinctive features of our data make it possible to identify such a causal relationship between firms export profiles and firm acquisition. First, the CCTS dataset we apply is provided with detailed transaction level information recorded at a monthly frequency. We are able to generate a series of comprehensive information from the Customs data after aggregating it to the firm-year-product level and the firm-year-destination level, which greatly facilitates a close examination on export profile variations within firm. Second, the firm level data provides information on the source of paid up capital for us to identify whether the firm is a state, private or foreign owned. Being able to observe changes in capital structure in each year allows for identifying the acquired firms during the sample period. Third, having all the balance sheet information available from the ASIF dataset facilitates us in making the identification of causal effects of acquisition through constructing a counterfactual with indigenous firms exhibiting similar pre-acquisition firm characteristics. Last, the panel nature of the data enables us to remove time-invariant unobserved confounders that may potentially influence export profile decisions of acquired firms.

The empirical strategy we apply to identify the causal effect of acquisition on export profiles of acquired firms relies on a combination of the propensity score matching with the difference-in-differences technique. The propensity score matching is applied to tackle the inherent selection problems of observational data through constructing a pseudo-randomised sample which consists of the actual acquired firms and their missing counterfactuals had they

[1] Detailed discussion of the two datasets are provided in Section 2.3

remained domestically controlled. The combination of the propensity score matching with the difference-in-differences approach further removes the time invariant unobserved components that matching fails to eliminate. In so doing, the causal inference is made through comparing the average divergence in export profiles and other firm operational aspects starting from the pre-acquisition year between the acquired firms and the matched firms in the pseudo-randomised sample.

Overall, the results show that firms become "meaner and leaner" because of foreign acquisition. The following is a brief overview of the research findings. First, we find that foreign acquisition leads to 7% reduction in the number of firm products but 2% increase in the concentration of sales of the top-sold products. This result is consistent with the theoretical predictions provided by literature on multiproduct firms (Eckel and Neary (2010); Dhingra (2013); Nocke and Yeaple (2008)). Second, the "meaner and leaner" process is found in export destination of acquired firms. The results show that firms export to 14% fewer destination countries and concentrate 3.48% more of their sales to top exported destinations after foreign acquisition. Third, we find large and significant reductions in the total export value and export intensity of acquired firms. However, there are no significant changes in the total sales due to acquisition. The above results suggest a restructure in market focus of the acquired firms from export to domestic market.

Having looked at changes in export profiles induced by foreign acquisition, we then shift our focus to the operational aspects of the acquired firms. First, the results demonstrate a short-run boost in firm productivity alongside with the export profile restructuring. There is an increase in TFP with a total value added and value added per worker being 5.4%, 6.24% and 4% respectively shortly after the acquisition. Second, we find that foreign acquisition increases average wages by 2%, yet no profound changes are found in the total employment. Third, the results show that the acquired firms reduce the fixed investment by 2.44% on average while the R&D intensity is increased by 0.5% in the year of acquisition. Finally, the foreign acquisition has reduced overall debt level of acquired firms by 4.3%. Overall, the above findings from the firm operational aspects reconfirm the "meaner and leaner" restructuring process within firms due to foreign acquisition.

This chapter proffers the first empirical evidence on the causal relationship between foreign acquisition and the changes in the multiproduct firms' export

profiles. This research contributes to complementing current empirical literature on multiproduct firms and international trade. Different from previous studies that mainly focus on the link between export profiles and firm productivity (Bernard (2004); Eckel and Neary (2010); Nocke and Yeaple (2008)), this research approaches how multiproduct firms adjust their export profiles from the perspective of ownership structure. In particular, our research is in line with Manova and Zhang (2009). They find a systematic difference in firms' export profiles across domestic and foreign firms. Our findings supplement their results by establishing a causal relationship between foreign acquisition and firms' export profiles.

We newly suggest that foreign ownership causes firms to become "meaner and leaner" through adjusting their export profiles. In so doing, this research adds new dimensions to current understanding of FDI effects. Although this research is based on empirical analysis, the study results provide useful insights that inform future design of theoretical models in the research field. Finally, with the availability of data, we are able to provide evidence from a developing country's perspective.

This chapter is structured into 6 sections. Section 2.2 reviews literature on multiproduct firms in trade and foreign acquisition. Section 2.3 describes the data applied, including the source of data, the definition of acquisition, and key variables used in the research. Section 2.4 discusses on methodology applied. Results and discussions are presented in Section 2.5. The last section concludes.

2.2 Literature review

As aforementioned, the question we are interested in is whether foreign ownership causes the strategic changes in firms' exporting profiles. Accordingly, this research is related to two broad strands of studies: first, multiproduct, multi-destination firms in international trade and second, FDI.

A number of studies have looked into multiproduct firms in international trade based on customs information released in mid-2000 (Bernard et al. (2009); Manova and Zhang (2009); Antras and Yeaple (2014)). However, due to the restricting access to the transaction level data, most studies are conducted from a developed country's point of view. This research attempts to approach the issue from a different angle, looking at multiproduct firms' exporting behaviours in the Chinese context. In relation to foreign direct investment, a wealth of knowledge and information has been produced by empirical investigations into the determinants and effects of FDI (Conyon et al. (2002); Arnold and Javorcik (2009); Girma et al. (2015a); Girma et al. (2015b)). While substantial efforts have been made to estimate the FDI effects on the operational aspects of acquired firms, the effects on exporting profiles where foreign acquired firms concentrate their activities have yet to be explored. This research is intended to fill this gap by establishing a causal relationship between firms' exporting profiles with foreign acquisition.

The exposition of literature is organized into two sections. The first section is to evaluate critically the central issues and key debates in the research area of multiproduct firms in trade, while the second section is to review foreign investment literature with the focus on the effects and consequences of acquisition. In addition, we clarify the position of this research and the gap it is intended to fill in each section, situating this empirical work within the theoretical context of multiproduct, multi-destination firms in international trade and the empirical context of foreign investment.

2.2.1 Multiproduct firms and trade

Most models of heterogeneous firms and trade are based on the assumption that firms produce single product with horizontally differentiated varieties (Bernard et al., 2007b). It is not until the release of transaction level customs data in 2000 that it is possible to make close examinations of firms' export

profiles. The transaction level data contains several stylised facts of trade by firms in practice. Among them, the fact that firms export multiple products to more than one destination when engaging in international trade informs the directions of extension in theoretical literatures of heterogeneous firm and trade.

Since then collaborative efforts have been made by researchers who focus on multiproduct firm behaviours in international trade. Several theoretical models for multiproduct firms have been developed in the researches notably by Nocke and Yeaple (2008), Eckel and Neary (2010), Dhingra (2013) and Bernard et al. (2011), etc.

Nocke and Yeaple (2008) develop a model to explain how multiproduct firms adjust their product scope in merger and acquisition that is induced by globalisation. In their model, multiproduct firms encounter higher marginal costs when they manage more products. Another key feature of their model is their association of organisational capabilities with marginal cost. In their model, a better organisation enables firms to manage the same number of products at a less cost. With the assumption of trade-off between firm scope and productivity, their model predicts that firms respond to globalization-induced merger wave differently as larger firms divest their products and small firms expand product ranges.

In the model of Eckel and Neary (2010), they allow strategic interplay between multiproduct firms that produce similar products in their oligopolistic market setting. In their model, globalization has brought opportunities of larger market as well as competition from new firms. Their model shows that the product scope are affected less by the market effect compared with the competition effect. In facing competition, firms tend to drop products that induces higher marginal costs and reallocate resources toward products with core competences. As a result of such mechanism brought by globalisation, multiproduct firms alter their production strategy toward a sharper focus on their core products so that they become "meaner and leaner".

Different from Eckel and Neary (2010), Dhingra (2013) set their model under a monopolistic market setting. He points out that opening trade induces a broader market, tougher market as well as higher demand elasticities. Firms tend to conduct process innovation to achieve economies of scales in response to a wider market demand. Provided with the opportunity of a wider market, firms are able to exploit economies of scale in conducting process innovation

and reduce their product lines to achieve efficiency when faced with a tougher market competition.

The multiproduct, multi-destination trade model developed by Bernard et al. (2011) points out the importance of reallocation both within and across firms. Their results show that within firms, distance not only reduces the extensive margin of a number of firms, but also reduces the intensive margin of a given product by a firm. However, distance does not have significant implications on exports by product. Meanwhile, Bernard et al. (2011) suggest that firms compete in the international market by reallocating resources to products with core competencies. In addition, they advocate that firms' productivity level matters for export profiles. More productive firms tend to export more per product to a given destination.

In addition to Bernard et al. (2011)'s model that looks at product scope, Mayer et al. (2014) focus on how market size and destination's geographic location affect multiproduct firms' within-firm distribution of export sales. Their model predicts that the choice of firms' product mix is driven by the level of competition in destination market. Tougher competition leads to a downward shift in mark-ups for all products that only the best performing products sees an increase in relative market share. They test their model using French export data, finding French firms concentrate their export sales toward better performing products in large destination markets with a higher level of global competition. They suggest that exporters may adjust mark-ups according to the characteristics of the destinations by focusing on their best performing products.

Yet, despite the efforts made in theoretical investigations, studies have noted the lack of empirical support in multiproduct firms and trade, since the focus on multiproduct firms and trade is relative nascent which starts from Bernard (2004). Besides, current researches concerning multiproduct firms and trade mainly focus on developed countries such as the US due to the restricting access to the transaction level data. Using the transaction level customs data in the US, Bernard et al. (2009) show that trade in the US is dominated by a few multinational exporters that trade several products to many destinations.

Moreover, the research of multiproduct firms in trade heavily relies on the availability of both customs and firm level data (Manova and Zhang (2009); Upward et al. (2013); Liu and Lu (2015)). Therefore, although theoretical

explorations have been conducted in regard to multiproduct firms' activities in international trade, there are many new avenues for empirical exploration, particularly in developing countries.

Manova and Zhang (2009) explore Chinese customs data in their empirical researches and discover some stylised facts about firm trade behaviours in China that corroborate the findings in Bernard et al. (2009) that a few multiproduct firms dominate trade with a large number of destinations. They investigate in detail China's trade activity over 2003-2005 and the source of Chinese trade growth in this period. They find that surviving firms speeding up trade flows of existing products with existing destinations contribute to 40% to 50% of China's trade growth. They also highlight the importance of foreign ownership for firms' trade decisions.

Their empirical observations suggest a series of distinctive differences in export profiles between exporters with foreign ownership and indigenous exporters. First, they find that firms with foreign ownership export a narrower range of products compared with indigenous firms in China and that the number of exported products decrease with foreign ownership. The average number of exported products in domestic firms is over twice as much as that of firms with foreign ownership. Domestic private firms record a mean number of exported products at 12.5. State owned exporters export an average 22.8 products per firm. However, the mean numbers of exported products for joint venture firms and wholly foreign owned firms are 6.5 and 6.3 respectively. Second, they observe a similar pattern in export destinations. Firms with foreign ownership export to less destination countries than domestic firms and that the number of destinations decrease with foreign ownership.

All of the aforementioned research contributes to a better understanding of how multiproduct firms engage in international trade. However, there are three aspects worth further exploring. First, as mentioned before, the multiproduct firms in international trade are mainly researched from a developed country's point of view. This leads to a second gap in multinational firms trade literature that most researches concerning these multiproduct firms are made from the perspective of their parent country. Third, the transaction level data are limited only to explore the export compositions without information on firms' operation side. This research is an attempt to fill these gaps through first providing a developing country's perspective; second, looking at multinational firms from an FDI recipient point of view instead of multinational firms in parent country; third, with the availability of data, we are able

to establish a causal link between foreign ownership with multiproduct firm's export profiles.

2.2.2 Foreign acquisition and firm performance

After evaluating the central issues and key debates in the research area of multiproduct firms in trade, we come to review and evaluate FDI-related literature. The topic of how FDI affects the target country's economy through firms has always been under the spotlight of economic studies. The FDI literature revolves around three major themes: firstly, the determinants of foreign acquisition; secondly, the mode of foreign acquisition, such as greenfield, joint ventures and the wholly-acquired, and finally, the effects of FDI on acquired firms. The scope of our review is confined to the third theme in consideration of their relevance to this research. The literature that focuses on the causal effects of foreign direct investment on acquired firms mainly falls into two broad areas in operational aspects: research focusing on the implications for acquired firms' productivity and effects on employment decisions (Arnold and Javorcik, 2009). The following review concerns the effects of FDI on firms' export decisions, productivity, beneficiaries, wages etc. from both theoretical and empirical researches.

On the theoretical side, there are studies finding the positive effects of foreign investment on export decisions and beneficiaries but mixed results concerning productivity and performance. In terms of export decisions, the theoretical model of international trade and investment developed by Helpman et al. (2004) shows only the most productive firms choose to engage in overseas investment, the second most productive firms participate in overseas market by exporting, and the remaining less productive firms either serve the domestic market or leave the industry according to the ranking of their productivity. Yeaple (2003) extends the standard FDI model to consider both vertical and horizontal integrations and finds that it is more efficient for multinational firms to arrange and transfer resources.

When it comes to the beneficiaries, FDI is found to benefit both investors as well as recipients. The theoretical stream of multinational firms' literature suggests that there will be intangible asset transfer from parent companies to overseas subsidiaries as their ownership advantages enable them to

transfer easily their firm specific asset, such as know-how, technology, especially knowledge-based capital, across borders from the parent to subsidiaries abroad while a positive performance boost for target firms can be expected (Markusen, 2002).

However, unlike the consistent positive predictions from theoretical studies, empirical studies concerning the effects of FDI on acquired target's performance yield mixed results. The following paragraphs present a summary of studies that demonstrate the mixed results of productivity increase, productivity decrease and productivity without significant changes due to foreign acquisition.

Studies that show positive effects of foreign acquisition on productivity include Conyon et al. (2002), Girma and Gorg (2007a), Girma and Gorg (2007b). Conyon et al. (2002) study the effect of foreign ownership on labour productivity drawing on UK manufacturing firms from 1984 to 1994. Applying a newly constructed dataset, they define foreign ownership according to their registered 'ownership status'. By comparing foreign and domestically acquired firms in their post acquisition period, they find a 13% increase in labour productivity in foreign acquired firms. They also attribute the average 3.4% higher wage payment in foreign acquired firms to the elevation in labour productivity. Girma and Gorg (2007b) use data from *Annual Respondents Database (ARD)* from 1980-1994 to study the impact of foreign ownership on firms' productivity growth. They decompose the productivity advantage of international conglomerate in food and electronic industry into two separate effects: a technology and a scale effect. Their findings show a significant industry heterogeneity in post acquisition productivity growth. They also find that the source of positive impact of foreign acquisition arises from technological improvement as well as from improved plant scale.

Griffith (1999) uses ARD data to look at the productivity changes after foreign acquisition for the UK automobile industry. She finds out that only US acquired firms have higher TFP levels than domestic counterparts. Djankov and Hoekman (2000)study foreign acquired firms in Czech Republic during 1992-1996. Their result shows a positive growth in TFP in acquired firms. However, they find a negative spillover effect (measured as share of foreign assets in total sector assets) from foreign capital involved affiliates (joint venture and wholly owned foreign affiliates) to domestically owned firms. Employing French firm level data from 1993 to 2000, Bertrand and Zitouna (2008) investigate in the cross border takeover effects on firms' profitability

and productivity. Using a combined difference-in-differences with propensity score matching technique, they find a stronger productivity increase for foreign acquired French firms compared with domestically acquired French firms. However, their finding shows no significant improvement on post acquisition profitability.

Blomstrom and Sjoholm (1999) use a detailed Indonesian micro data in 1991 provided by Indonesian Central Bureau of Statistics to compare the productivity of foreign capital involved Indonesian firms and those domestic firms. They examine whether there is technological transfer and spillover effects for foreign acquired affiliates. Their results confirm a higher level of labour productivity in foreign establishments. Nevertheless there is no significant differences exhibited in productivity between different levels of foreign capital involvement. Here, a major concern is that it is difficult to calculate the productivity level for a potential target before and after acquisition using only one year observations. Drawing on the same dataset, with multiple time periods Arnold and Javorcik (2009) examine the post acquisition impacts on acquired Indonesian firms and find that foreign acquisition increase the productivity of acquired firms even in the long run.

Nevertheless, mixed results are yielded concerning the effects of foreign acquisition on firm's productivity. Harris and Robinson (2002) compare UK firms that are acquired by foreign investors in 1987-1992 with domestically owned firms and find that only the most productive firms tend to be the target of foreign acquisition. They also discover a gradual decline in productivity for target firms in the post acquisition period. The results suggest that there could be difficulties in assimilating overseas subsidiaries for newly formed international conglomerate. Benfratello and Sembenelli (2006) estimate the effects of foreign ownership on Italian firms' productivity in 1992-1999. Likewise, their results show no significant changes in acquired firms' productivity except for those firms that are acquired by the US firms. They also fail to provide evidence for intangible asset transfer from parent firms to subsidiaries and that the transfer of technology only take place when large technological gap exists between host and affiliate countries.

Likewise, Chen (2011) studies the effect of origin countries of foreign funds for US firms. Dividing the origin of funding into industrialised country, developing country and local (US), they conclude that acquisition from industrialised country yield the most notable benefit to US firms and that domestic

acquisition and acquisition from developing country provide inconclusive results.

In addition to the above studies that focus on FDI's effects on productivity, another big strand of FDI implication literature studies its potential impacts on wages. Lipsey and Sjoholm (2006) study the post acquisition wage effect of foreign acquisition using Indonesia firm level data from 1975-1999. Assuming that foreign acquisition is exogenous to unobserved shocks to firm level average wages, they use a firm fixed effect model and conclude that foreign acquisition is associated with higher averages wages compared with domestic owned plant. However, they fail to establish a causal effect of foreign acquisition on wage premium by imposing a strong assumption that foreign takeover is exogenous to firm level average wages.

Instead, Girma and Gorg (2007a) and Girma and Gorg (2007b) pursue a propensity score matching with difference-in-differences strategy to identify the causal effect of foreign acquisition on skilled and unskilled workers using ARD data from 1980-1994. Their results show that the origin of the host countries matters for the post acquisition wage effects. Both skilled and unskilled wage groups experience substantial improvement if the firm is acquired by a US firm. Nevertheless, there is no significant impact on both wage groups if the firm is acquired by either EU multinational firm or firms from the rest of the world.

Almeida (2007) uses a mandatory Portuguese yearly survey data compiled by the Ministry of Employment from 1991-1998 and studies the impact of foreign ownership on the labour market. After matching the employer with employee data, she finds only limited increase in wage is caused by foreign acquisition. She also shows that foreign investors target on those domestic firms which have paid higher salaries and exhibited similar characteristics to the existing foreign owned firms.

To sum up, the above review of the existing literature on effects of foreign direct investment mainly focus on two major implications, namely productivity and wage (Arnold and Javorcik, 2009). Only a small body of literature seeks to establish a link between foreign ownership and export. Among these empirical tests, Girma et al. (2015b), Arnold and Javorcik (2009), Wang and Wang (2015), Liu et al. (2017) etc., combined the propensity score matching with the difference-in-differences method. In doing so, they disentangled the

challenges of selection problems to establish causality in the context of foreign acquisition.

This research contributes to bridging the gap in existing literature between multiproduct firms in trade and foreign direct investment. It differs from the existing literature in that it looks at operational decisions of acquired firms by adding a new dimension to acquired firms' export performance. With the availability of transaction level data, this research is able to look beyond the export performance at firm level, and have a closer examination into firms' strategic changes in export profiles caused by foreign acquisitions. Combining firm level operations with exporting profiles yields new dimensions in the knowledge of both foreign acquisition implications and multiproduct firms in trade.

2.3 The data

This research makes use of a combined data of two sources. The first one provides firm level information, drawn from the *Annual Survey of Industrial Firms* (ASIF) which is conducted by the National Bureau of Statistics (NBS). The second data provides transaction level information, extracted from the *Chinese Customs Trade Statistics* (CCTS). With the combined ASIF and CCTS dataset, we are able to explore firm behaviours in international trade in much more details. The following content comprises four major subsections.

First we will briefly introduce the two datasets in section 2.3.1, providing an overview of the data source, sample period, and basic variable information available from each data. Then the matched firm-transaction sample is described in section 2.3.2, covering essential matching procedure and highlighting the important features of the matched data. Section 2.3.3 defines foreign acquisition and Section 2.3.4 clarifies the definition of key variables that are related to our research.

2.3.1 Data source

Firm level data

The firm level information is mainly drawn from the Annual Survey of Industrial Firms (ASIF or the survey here after), also known as the Chinese Industrial Enterprise Database (CIED), compiled by the National Bureau of Statistics of China (NBS). According to the survey description, the data includes "large-scale firms", referring to firms with an annual sale above 5 million Chinese Yuan, equivalent to 700,000 US Dollars[2]. The NBS then aggregates these firm level data to produce key statistics for industrial output in China Statistical Yearbook. For this purpose, firms are required to file reports of their production activities and their accounting information with the NBS.

There are around 200,000 firms on average in the survey each year for the period from 2000 to 2006, spanning around 40 two-digit industries, of which 30 are manufacturing industries. According to the description of the survey,

[2] We applied the latest exchange rate of CNY/USD published in 2019. The exchange rate information is extracted from the Federal Reserve Bank of St. Louis (*the FRED*)

these firms account for only 20% of China's manufacturing firms, which create jobs that account for 71% of China's industrial employment, produce around 95% of China's total industrial output, and provide 98% of China's industrial exports.

The NBS requires firms to report on their basic information such as firm name, location, ownership structure, operating industry, the number of employees, etc. In addition, the firms report their financial status through balance sheet and income statements. The survey also includes exports value, including both exports by the production firms themselves and exports through the third party trade agencies.

Misreporting has long been suspected under a totalitarian system. The data compiled by NBS is considered **reliable** for the following reasons that: The NBS has implemented strict procedures in double-checking reported informations for firms taking part in the survey. It is believed that firms have little motivation to give false information to the NBS, for assurance is given to them that the reported information will not be released to the public and that it will not be used against them by other government agencies (i.e. tax authorities)[3]. Lastly, the survey is collected directly from industrial firms by the central NBS and is less subject to manipulation by local government (Cai and Liu, 2009).

To obtain a clean sample, we exclude observations from the data in case there is missing information on crucial parameters such as the total assets, the total number of employees, the net fixed assets, the total sales, etc. or in case there are unreasonable entries such as the total assets that are smaller than liquid assets, smaller than total fixed assets, or smaller than net fixed assets, and accumulated depreciation smaller than its current year depreciation, etc. The main variables used in the research such as the total sales, the total value added, and the fixed assets, etc. are deflated to ensure comparability over time[4].

Trade data

We generate our export profile information from the Chinese Customs Trade Statistics (CCTS) database, which contains information of trade transac-

[3] See *Regulations on National Economic Census*, Article 33

[4] Deflators are discussed in Appendix A.1

tions across products and countries that pass through the Chinese customs[5]. This data is compiled and maintained by the General Administration of Customs of China (GACC). The CCTS dataset records monthly information on every transaction for each registered firm passing through the Chinese Customs. The data identify each firm through a 10-digit firm code. It also contains other firm identification information such as the firm name, address and ownership. In addition, for each transaction, information is recorded for the products traded, the corresponding quantities, the total value of each transaction, the customs regimes, the transportation type, the customs code, and export destinations (or source countries for import).

Products are classified using the Harmonised Commodity Description and Coding System and are registered at eight-digit level (HS8)[6]. The free-on-board values (FOB) for traded products are reported in US dollars. Quantities for each transaction are recorded in unit according to the products traded. Since the purpose of this study is trading activities of manufacturing firms, the activities of trading intermediaries are not of our research concern. We exclude all trading firms, wholesalers or any trade intermediary companies for they do not engage in the direct manufacturing activities.[7]

All firms in this sample are exporters. We collapse the data to yearly frequency to be consistent with the ASIF data. We generate the number of products, the top exported products and the total export value for each traded product on a firm year level. To have a more comprehensive understanding of manufacturing firms' export profiles, we also calculate the number of destination countries, the top destinations, the firms' export for each firm in each year. The country level information is extracted form the World Bank database. Combining the CCTS data with the country level data, we are able to generate country related variables such as export value weighted average income per capita.

[5] The CCTS dataset has been used in research by Manova and Zhang (2009) Ahn et al. (2011) Manova and Zhang (2012b) Fernandes and Tang (2014) Manova et al. (2015)

[6] The Harmonized System has undergone several amendments in the classification of products in 1996, 2002, 2007, 2012 and 2017. Since our data spans from 2000-2006, the only revision affecting this data period is the one in 2002. To keep consistency throughout the whole sample period in calculating the number of products for each firm-year, it is essential to concordance the old 1996 HS code with 2002 HS code. We provide detailed concordance procedures in Appendix A.2

[7] Identifying intermediary firms is difficult since the data does not flag such firms. The identification of such firms relies solely on descriptive information shown in firm names. The detail identification of trading intermidiaries are discussed in Ahn et al. (2011), Manova and Zhang (2009)and Manova et al. (2015). Ahn et al. (2011) identified approximately 22,000 such "intermediaries firms" using Chinese pinyin (Romanized Chinese). Manova and Zhang (2009) and Manova et al. (2015) identifies around 23,000 such "trading firms".

2.3.2 Matched data

The sample we use spans from 2000 to 2006. We use information of these years for the reasons that firstly, this period is depicted as the most important time throughout China's economic development, when China experienced steadily high economic growth of an average yearly GDP growth at the rate of 10%-13%. This period is also symbolic for China's accession into the WTO in 2001, embracing a golden period for international trade.

Matching process

Matching the ASIF and CCTS allows us to link firms' production information to their trade profiles. However, matching the two datasets is not an easy task since firms are registered in two separate systems[8]. Following Upward et al. (2013), we match firms by their names which uniquely identify firms in each dataset. The matching leads to a substantial loss in the number of matched firms. Only 17% of the firms in the ASIF dataset and 20% of the firms in the CCTS dataset are left in the matched data. According to Upward et al. (2013), two major reasons are responsible for the loss of the substantial number of firms in the matched data. First, the scale composition is different. ASIF dataset comprises large-scale firms whereas CCTS dataset includes firms of all sizes. Second, only a quarter of firms registered in ASIF engage in international trade, and nearly half of exporting firms in the ASIF dataset export through intermediary firms.

Before moving directly to the sample description, a few points worth mentioning for the matched sample: First, the customs registration firm code and ASIF registered firm id are not uniquely identified. For instance, some matched firms have multiple firm codes. This happens when firms in the ASIF data discontinue their international participation and return to the international market after one year or two. Second, the ASIF and the CCTS dataset record trade value using different currency unit. In the ASIF dataset, values are recorded in thousand yuan. In the CCTS dataset, trade values are recorded in one US dollar. We convert the trade values in the CCTS dataset into thousand Chinese yuan to keep trade values statistically con-

[8] For CCTS dataset, firm is identified by their 10-digit firm code (customs registration firm code) whereas in ASIF dataset firm is identified by a different system (ASIF firm id).

sistency[9]. Third, the export values reported in the ASIF dataset are 10% - 25% higher than the export values reported in the CCTS dataset. This may be a consequence of the fact that firms in the ASIF dataset export through intermediary companies. As a result, only a fraction of trade values is left on the firms' CCTS account. We apply trade values from the CCTS dataset to keeping trade values consistent with other trade profile measurements, such as the number of products and the number of destination countries.

Matched sample description

The sample of the matched firms is summarised in Table 2.1. In the matched dataset, there are 72,742 exporters with 247,225 observations across 7 years. The dataset is highly unbalanced with only 11.28% firms (8,202) appearing in all the 7 years. Since the purpose of this research is to study the changes in export profiles caused by foreign acquisition, the research sample is confined only to exporters in the matched data. Table 2.1 below shows the frequency distribution of firms that appear at least 3 years during 2000-2006. Among the 72,742 exporters in the matched dataset, there are 45,582 firms, accounting for 62.22% of the total ASIF firms, that have at least 3 years of observations. The proportion of firms that have more than 4 years of observations drops dramatically to 39.08%, covering only 28,716 firms. Only 20,887 firms, accounting for less than a quarter (27.21%) of the total firms, have more than 5 years of observations. It should be noted that firms appear 3 times in the matched dataset do not necessarily mean that they appear in a consecutive sequence. There could be year gaps between each appearance.

For the purpose of studying the pre- and post- effect, we use the information from the firms that appear at least three years in the matched data. This excludes 39,462 observations in the full sample and leaves a sample with 207,763 observations for further research. The structure of the matched panel is summarised in the Table 2.2. Panel (A) shows the observation appearance pattern for the full sample. As can be seen from the last column of Panel (A), the sample with at least three observations each firm accounts for 84.04% of the full sample. Panel (B) shows the observation appearance pattern across years for those firms with at least 3 observations. As is shown in Panel (B),

[9] We extracted the yearly exchange rate information from the Federal Reserve Bank of St. Louis (*the FRED*). Note that the yearly exchange rate of CNY/USD was fixed around 8.277 till 20 July 2005. The exchange rate was not allowed to fluctuate until then. We applied yearly average exchange rate for 2005 at 8.1936 and for 2007 at 7.9723 respectively.

Table 2.1: Firm appearance in the matched data, 2000-2006: Exporters

	ASIF	ASIF-CCTS matched exporters
Firms survived for more than	num. of firms (percent)	num. of firms (percent)
3 years	248,888 (55.53%)	45,582 (62.22%)
4 years	142,876 (31.88%)	28,716 (39.08%)
5 years	93,735 (20.91%)	20,087 (27.21%)
Total num. firms	448,176	72,742

year 2004 and 2005 have the most abundant information on firms' production and export profiles. The observation appearance pattern also informs us that the matched sample is unbalanced and that a large proportion of firms appear in the sample with year gaps. The unbalanced appearance of firms creates additional difficulties in defining acquisition and is discussed in the next section.

Table 2.2: Structure of the matched panel, 2000-2006: Exporters

Panel A	**Observations per firm** (full sample)		
Frim obs.	Num. of obs	Percent	Cumulative
3	50,598	20.47	20.47
4	34,516	13.96	34.43
5	30,375	12.29	46.72
6	34,860	14.10	60.82
7	57,414	23.22	84.04
other	39,462	15.96	100.00
Total	247,225	100.00	
Panel B	**Observations per year** (sample of firms with at least 3 obs.)		
Year	Num. of obs	Percent	Cumulative
2000	15,329	7.38	7.38
2001	19,628	9.45	16.83
2002	24,445	11.77	28.60
2003	29,803	14.34	42.94
2004	40,969	19.72	62.66
2005	39,728	19.12	81.78
2006	37,861	18.22	100.00
Total	207,763	100.00	

2.3.3 Defining acquisition

The definition of foreign acquisition is crucial to the research question. There are several ways to define foreign acquisition. The most widely applied way to define an acquisition is based on a situation where foreign ownership share increases above a certain share or threshold (0, 15%, 25%, 50%, etc.) (Girma et al. (2015b), Arnold and Javorcik (2009)). Different threshold may result in different samples of acquired and non-acquired observations.

Considering the feature of the panel data, it is normally the case that a firm has different levels of foreign share in each observed year that can rise above or drop below the above-mentioned threshold more than once across all observed years. As a natural consequence, the traditional definition of acquisition will generate an identifier for acquisition which varies across time (D_{it}). Therefore, it is essential for this study to make clear the differences in definition between the firm-year level acquisition (D_{it}) and firm-level acquisition (D_i), and to address the limitations associated with the widely applied firm-year level definition of acquisition (D_{it}) based on the following reasons.

First, firm-year definition makes it complicated to divide firms in the sample into a control group and a treatment group. To be more specific, the firm-year definition pools four distinctive situations of ownership changes into one single treatment group. The four situations are switchers (SW) which have experienced ownership changes several times; localised foreign firms or domestically acquired firms (DA) which have experienced ownership change from foreign to local; foreign enterprises (FE) where there are no ownership changes; and the foreign acquired firms (FA) which are the subject of interests. Second, pooling the above mentioned four situations in a single treatment group makes it difficult to detect the time of acquisition for firms in the treatment group, particularly for switchers (SW), domestic acquired firms (DA) and foreign firms (FE). As a consequence, it makes it infeasible to base any econometric method on the "pre-acquisition" firm characteristics. Moreover, the firm-year definition of acquisition leads to incorrect estimation of firm characteristics in control group ($D_{it} = 0$). Put it another way, if all the non-acquired firm-year observations are treated as control group it will comprises observations from local firms together with any pre acquisition observations of firms from the treatment group.

For the purpose of preciseness, a firm level definition of acquisition (D_i) is applied. Firms are grouped into five mutually exclusive acquisition status

groups based on the time of changes in their firm-year level of foreign status: domestic enterprise (DE), foreign enterprise (FE), foreign acquired firm (FA), domestic acquired firm (DA) and switcher (SW). The Table 2.3 below summarizes the definitions:

The purpose of this research is to assess the causal impacts of acquisition. As a result, the research focus will be placed on the firms that have experienced ownership changes from local to foreign. Naturally, this approach results in substantial reduction in the number of firms considered. To be more precise, the foreign enterprises (FE) are excluded from the estimation sample since the within firm ownership changes by acquisition are not observable throughout the sample years. In addition, the domestic acquired firm (DA) are excluded since they are not the focus of this research. Finally, the switchers are excluded from the estimation sample since multiple acquisitions make it difficult to observe their post-acquisition behaviours. As a consequence, the domestic enterprises (DE) are used as the control group ($D_i = (0 \mid DE)$), the foreign acquired firms are used as the treatment group ($D_i = (1 \mid FA)$). The sample is left with 17,399 exporters consisting of 15,739 domestic enterprises (DE) and 1,660 foreign acquired firms (FA).

Table 2.4 below shows a brief description of the estimation sample by year. The first column shows actual acquisitions by year. It depicts the timeline of how the 1,660 cases of acquisition took place. As is shown in the table, year 2004 and 2005 saw the peaks of foreign acquisition during the sample years. The second and third column shows the observations of the treatment and control groups in each year. The last column shows the total observations of each year in the estimation sample. In summary, the estimation sample consists of all together 72,788 observations with 7,507 observations for 1,660 firms in the treatment group and 65,281 observations for 15,739 firms in the control group. Table 2.5 provides an overview of industry composition of the analytical sample.

Table 2.3: Definitions of acquisition status

Acquisition status	**Firm type**	**Num. of firms**	**Percent**	**Definition**
DE	domestic enterprises	15,739	34.53	Foreign share has remained below the defined threshold (25%);
FE	foreign enterprises	23,913	52.46	Foreign share has remained above the defined threshold (25%);
FA	foreign acquired firms	1,660	3.64	Foreign share has increased from below to above the defined threshold (25%) for only once (domestic to foreign)
DA	domestic acquired firms	1,747	3.83	Foreign share has decreased from above to below the defined threshold (25%) for only once (foreign to domestic)
SW	switcher	2,523	5.54	Foreign share has increased from below to above the defined threshold (25%) for several times
Total firms		45,582	100.00	

Table 2.4: Overview of the estimation sample: Exporters

Year	Acquisition cases	Observations (FA)	Observations (DE)	Total obs.
2000	n/a	519	3,133	3,652
2001	254	737	4,717	5,454
2002	160	936	7,075	8,011
2003	187	1,164	9,504	10,668
2004	392	1,427	14,092	15,519
2005	424	1,395	13,738	15,133
2006	243	1,329	13,022	14,351
Total	1,660	7,507	65,281	72,788

Table 2.5: Industry composition of the analytical sample

	D(0,1): foreign share >25%		
Industry	Non-acquired	Acquired	Total
Food Processing	693	88	781
Food Manufacturing	299	44	343
Beverages	125	18	143
Textiles	2,169	187	2,356
Apparel, Footwear	1,070	188	1,258
Leather, Fur, Feather	614	99	713
Timber	306	33	339
Furniture	248	32	280
Paper	146	16	162
Printing, Reproduction	89	13	102
Articles for Clt,Edu	334	55	389
Processing of Petr,Coal	43	4	47
Raw Chemical	1,323	81	1,404
Drugs	415	29	444
Chemical Fibers	89	9	98
Rubber	253	23	276
Plastics	570	102	672
Non-metallic Mineral	770	76	846
Smelting and Pressing	229	11	240
Smelting and Pressing	320	23	343
Metal Products	915	101	1,016
General Purpose Machinery	1,255	98	1,353
Special Purpose Machinery	722	48	770
Transport Equipent	692	57	749
Electrical Machinery	592	43	635
PC and Electronic Equipent	858	101	959
Measuring Instruments	600	81	681
Total	15,739	1,660	17,399

2.3.4 Measuring trade profiles

Having discussed the definition of acquisition, we will introduce, in this part, the definition of the key outcome variables this research is going to focus on. Table 2.6 below presents a summary of the definition of outcome variables and Table 2.7 provides the descriptive statistics. The outcome variables are classified into five sets. The first set of outcomes depicts the product profiles of each firm in each year. Two measurements are applied, the number of products and the product concentration. The number of products is defined as the log of total exported products. The product concentration is defined as the percentage of the export sales concentrating on the top exported products.

The second set of outcomes concerns the destination profiles. Three measurements are used to trace the restructuring process in firms' destination profiles, including the number of countries, the destination concentration and the destination income. The number of countries is defined as the log of the total number of export destinations. The destination concentration is the percentage of export sales concentrating on the top exported destinations. The destination income is measured by the income per capital of the destination country weighted by the total export value in this particular country.

The third set of outcomes sketches out the firm activities in exports and sales. This set comprises three measurements, namely total export value, export intensity and total sales. The information of the total export value is extracted from the CCTS dataset. The value is converted to currency unit applied in the ASIF dataset using the exchange rate provided by the FRED. The export intensity is defined as the share of the total export value (extracted from the CCTS) to the total sales. The information on the total sales is from the ASIF dataset and is defined as the log of the total sales. All the sales related values are deflated using the ex-factory price index available from the China Statistical Yearbooks.

The fourth set of outcomes relates to the firm performance. Three measurements are applied, productivity, total value added and total value added per worker. For exporters, we believe that the TFP and the total value added can best represent the overall performance of production. The total value added is deflated using the same deflator as that of exports and sales.

The last set of outcomes delves further into the operational aspects of the firms. The measurement we apply to depict the operational aspects consists

of two dimensions. First, we use the total employment and the average wage paid to employees to investigate the hiring activities of the firms. Second, we use the information of the fixed investment, R&D intensity and leverage ratio to look at the investment activities of the firms. The total employment is defined as the log of the total hired employees in each firm year and the average wage is the log of the total wage divided by all the employees. The fixed investment is measured as the log of the total fixed assets. The R&D intensity is the share of R&D expenditure to firm's total sales and the leverage ratio is the total debt as a share of total assets.

The first part will focus on the average treatment effect on the acquired firms over the exporting profiles such as the product scope, product concentration, destinations, destination concentration and sophistication of export. In addition, the acquisition effect with traditional measurements on export performance such as the total export value, export intensity are also estimated and discussed together with the total sales of the acquired firms. The second part of the discussion will focus on the acquisition effects on other firm operational aspects including the firm's productivity, total employment, average wage paid to employees, fixed investment, R&D intensity and leverage ratio.

Table 2.6: Definition of outcome variables

Outcome Variables	**Definition**
Product profiles	
num. product	log of total number of product
product concentration	the percentage of the export sales concentrating on the top exported product
Destination profiles	
num. country	log of total number of destination countries
destination concentration	the percentage of the export sales concentrating on the top exported destination
destination income	log of total export value weighted income per capita
Export and sales	
export value	log of total export value extracted from the CCTS dataset, converted and deflated
export intensity	the share of export value (CCTS) to total sales (ASIF)
total sales	log of total sales extracted from the ASIF dataset, deflated
Firm performance	
productivity	TFP (Levine and Patrine)
total value added	log of total value added, extracted from the ASIF dataset, deflated
value added per worker	log of total value added per employee
Firm operational aspects	
total employment	log of total employment
average wage	log of average wage per employee
fixed investment	log of total fixed assets
R&D intensity	the share of R&D expenditure to total sales
leverage ratio	total debt as a share of total assets

Table 2.7: Descriptive statistics of outcome variables

	Full		non-acquired		acquired		preacq year		acquisition year		one year later	
Outcome variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
num. product (log)	1.54	0.77	1.54	0.76	1.62	0.79	1.58	0.77	1.61	0.79	1.65	0.78
	(1.39)		(1.39)		(1.39)		(1.39)		(1.39)		(1.61)	
product concentration	0.78	0.23	0.78	0.23	0.78	0.23	0.78	0.23	0.78	0.23	0.77	0.24
	(0.86)		(0.86)		(0.86)		(0.88)		(0.86)		(0.84)	
num. country (log)	1.89	0.90	1.90	0.90	1.81	0.89	1.74	0.88	1.82	0.91	1.84	0.90
	(1.79)		(1.79)		(1.61)		(1.61)		(1.61)		(1.79)	
destination concentration	0.65	0.27	0.64	0.27	0.69	0.27	0.71	0.27	0.69	0.27	0.69	0.27
	(0.63)		(0.63)		(0.72)		(0.76)		(0.72)		(0.70)	
destination income (log)	10.35	1.38	10.29	1.38	10.87	1.28	10.82	1.26	10.86	1.28	10.93	1.29
	(10.42)		(10.37)		(10.83)		(10.78)		(10.79)		(10.94)	
export value (log)	8.67	2.01	8.62	2.01	9.07	1.98	8.88	1.96	9.07	1.99	9.24	1.87
	(8.91)		(8.86)		(9.32)		(9.17)		(9.34)		(9.45)	
export intensity	0.44	15.48	0.43	16.32	0.55	0.94	0.62	1.39	0.52	0.70	0.57	0.86
	(0.18)		(0.17)		(0.37)		(0.36)		(0.37)		(0.43)	
total sales	10.85	1.35	10.87	1.36	10.66	1.28	10.44	1.24	10.67	1.28	10.66	1.25
	(10.71)		(10.73)		(10.53)		(10.29)		(10.55)		(10.56)	
productivity	4.82	1.16	4.82	1.15	4.77	1.20	4.63	1.19	4.80	1.20	4.85	1.16
	(4.87)		(4.87)		(4.82)		(4.72)		(4.83)		(4.95)	
value added (log)	9.45	1.44	9.47	1.44	9.27	1.39	9.02	1.39	9.28	1.40	9.26	1.34
	(9.32)		(9.34)		(9.18)		(8.95)		(9.20)		(9.20)	
value added pp (log)	3.79	1.03	3.79	1.02	3.79	1.12	3.68	1.15	3.84	1.12	3.86	1.10
	(3.75)		(3.75)		(3.73)		(3.64)		(3.77)		(3.79)	
total employment (log)	5.69	1.16	5.71	1.17	5.49	1.06	5.37	1.03	5.44	1.06	5.40	1.03
	(5.61)		(5.63)		(5.48)		(5.33)		(5.41)		(5.38)	
average wage (log)	2.36	0.61	2.36	0.59	2.39	0.71	2.23	0.75	2.44	0.69	2.51	0.63
	(2.38)		(2.38)		(2.41)		(2.27)		(2.45)		(2.53)	
fixed investment (log)	9.42	1.74	9.47	1.74	9.04	1.64	8.80	1.65	9.02	1.64	8.97	1.58
	(9.28)		(9.32)		(8.97)		(8.71)		(8.97)		(8.87)	
R&D intensity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
leverage ratio	0.62	0.26	0.62	0.25	0.57	0.28	0.58	0.26	0.58	0.28	0.56	0.28
	(0.63)		(0.63)		(0.58)		(0.60)		(0.59)		(0.56)	
N	72788		65281		7507		1501		1660		1242	

Note: median value is shown in parentheses

2.4 Methodology

2.4.1 Identification strategy

The aim of this paper is to establish a causal link between foreign acquisition of a domestic firm and the export profiles of the acquired target. To be more specific, the empirical concern is to evaluate the causal effect of foreign acquisition on domestic affiliates' trade profile diversification, such as products and destinations.

The key variable of interest is acquisition, denoted as ACQ_{it} indicating whether a domestic affiliate i is acquired by foreign capital at time t. We denote y^1_{it+s} as the potential outcome, at time $t+s$ after being acquired. Similarly we denote y^0_{it+s} as the counter factual outcome if the same establishment i had not been acquired. The treatment effect of acquisition during the period $t+s$ is therefore defined as follows:

$$y^1_{it+s} - y^0_{it+s} \tag{2.1}$$

Following Heckman et al. (1997) and Dehejia and Wahba (2002), the expected acquisition effect for the acquired firm is expressed as such:

$$E\{y^1_{t+s} - y^0_{t+s} | ACQ_{it} = 1\} = E\{y^1_{t+s} | ACQ_{it} = 1\} - E\{y^0_{t+s} | ACQ_{it} = 1\} \tag{2.2}$$

Based on the observational data, the analysis is subject to a missing data problem that no firm can be observed in the state of being acquired and meanwhile being non-acquired. That is, we can only observe one outcome for each state of either being acquired or of being non-acquired. In this case, we cannot observe y^0_{it+s} for acquired firms. As a result, the key to establish an unbiased estimator of the treatment effect lies in constructing the counterfactual, as in the second term in the above equation.

Essentially, if acquired and non-acquired firms are systematically different prior to the treatment, then the observed $E\{y^0_{t+s} | ACQ_{it} = 0\}$ for non-acquired firms is not a correct estimation of $E\{y^0_{t+s} | ACQ_{it} = 1\}$ for the acquired firms.

As suggested by Girma and Gorg (2007a) and Girma and Gorg (2007b) one way to construct a valid control group is to use matching techniques to reproduce a random experiment[10]. The idea of matching is to pair each foreign acquired firm with a domestic counterpart that could have been a target of acquisition based on some observable characteristics X_{it-1}. By assuming that the treatment assignment is as good as random conditioning on these pretreatment covariates, the trade profile changes in domestic firms can thus be used as an unbiased counterfactual for the acquired firms.

In principle, the drawback of matching is that this method demands a sufficient large control group to ensure each acquired firm is paired with at least one non-acquired counterpart. In addition, the curse of multidimensionality would also impede the matching process since it is difficult to determine along which dimension we can match the acquired firms with non-acquired ones. The possible value for the comparable vector X depends on the number of variables and the possible value for each variable. Suppose all n variables are dummy which takes value of only 0 and 1, the possible value for X will be 2^n. As the number of variables increases, the exponentially increased X value imposes additional difficulty on finding exact matches for each acquired firm (Dehejia and Wahba, 2002). Rosenbaum and Rubin (1983) therefore propose the use of propensity score, which is a single index based on the probability of getting treatment to reduce the multidimensionality problem. To estimate the propensity score for each firm-year, the following logit model is employed to identify the probability of being acquired:

$$P(ACQ_{it} = 1) = F(X_{it-1}, D_{it-1}) \tag{2.3}$$

In the above equation X_{it-1} consists of a set of pre-acquisition covariates that are likely to govern selection into being foreign acquired. D_{it-1} is the full set of control dummies, including industry, region and time. The choice of covariates is motivated by existing literatures. Accordingly, we choose age, size, wage, productivity, capital intensity, and leverage ratio as our covariates based on Conyon et al. (2002), Harris and Robinson (2002) and Lipsey and Sjoholm (2006).

[10] Implicitly, the underlined assumption of SUTVA (stable unit treatment value assumption)should hold (Holland (1986) and Basu (1980)). That is to say, the outcome does not depend on which individual receives the treatment and that no within-group spillover or general equilibrium effects exist.

Based on the estimated propensity score, denoted as p_{it}, caliper matching with replacement is employed. By imposing a pre specified "distance", the nearest non-acquired firm with its propensity score falling within the radius is matched with an acquired firm. The matched non-acquired firm is then put back to the pool of control group and can be matched again to other acquired firms.[11] The caliper matching mechanism can be written as follows:

$$\lambda > |p_{it} - p_{jt}| = min\{|p_{it} - p_{jt}|\} \tag{2.4}$$

In the equation above λ is the pre-specified maximum distance tolerance, which is set to 0.0005[12]. p_{it} is the predicted probability of being acquired for $firm_i$ in the acquired group. p_{jt} is the predicted probability of being acquired for $firm_j$ in the non-acquired group. Common support condition is imposed in the matching process by dropping acquired firms with propensity scores which are outside the propensity score range of the non-acquired firms.

Thanks to the panel nature of the data, a difference in differences (DiD) method can be applied. The combination of propensity score matching with difference-in-differences therefore inherits the legacies from both methods. By constructing the missing counter factual using propensity score matching, we find it possible to make inferences on how those acquired firms would have behaved had they not been acquired. At the same time, any time or individual specific components that may have impacts on profile change that matching methods fail to eliminate are removed by the difference-in-differences method (Blundell and Costa Dias, 2000; Girma and Gorg, 2007b).

The combined estimator is constructed following Girma and Gorg (2007a) and Girma and Gorg (2007b). First, the before and after differences for firms from the acquired group and the non-acquired group are calculated respectively. The change in trade profiles before and after change of ownership for the acquired firms is: $\Delta y_i = y_{it+s} - y_{it}$. The same before and after trade profile change for the non-acquired (comparison) firms: $\Delta y_j = y_{jt+s} - y_{jt}$. Then difference-in-differences estimator is obtained by further comparing the before and after changes for the acquired and non-acquired firms: $\hat{\delta}_{DD} =$

[11] Match with replacement increases bias however improves the precision of the estimates (Dehejia and Wahba, 2002)

[12] The largest distance is only .0009743, which is less than 1%. Imposing any caliper of more than the largest distance will have no effect.

$\Delta y_i - \Delta y_j$. According to Heckman et al. (1997) the combined difference-in-differences matching estimator can be expressed as:

$$\hat{\delta}_{DDPSM} = \sum_{i \in acq} (\Delta y_i - \sum_{j \in com} \omega(p_i, p_j) \Delta y_j) \tag{2.5}$$

In the above equation $\omega(p_i, p_j)$ is the weights placed on matched $firm_j$ in non-acquired group based on the distance between two measured propensity scores. The difference-in-differences matching estimator can thus be perceived as the average change in trade profiles Δy_{it} that happens specifically due to the change of foreign ownership. The expression of a basic difference-in-differences specification is:

$$y_{it} = \alpha_0 + \gamma D_i + \lambda T_t + \delta(D_i \cdot T_t) + \varepsilon_{it} \tag{2.6}$$

Taking first difference of the above specification will wipe out individual level D_i and common time trend T_t. Therefore, a simplified regression specification of the combined difference in differences matching model can be expressed as follows:

$$\Delta y_{it} = \alpha_i + \hat{\delta}_{DDPSM}(D_i \cdot T_t) + \varepsilon_{it} \tag{2.7}$$

For panel data, the above expression is the same as

$$\Delta y_{it} = \alpha_i + \hat{\delta}_{DDPSM} D_{it} + \varepsilon_{it} \tag{2.8}$$

As can be seen from the above specification, regressing the first difference of outcomes while applying propensity score matching will produce the difference-in-differences matching estimator.

2.4.2 Obtaining pseudo-randomised sample

The key purpose for matching is to construct a pseudo randomised sample where the treatment and the control group share ex-ante similarities. In other words, in the matched sample, treatment is quasi random when assigned to firms. In the context of this research, the constructed sample should contain

the local firms and the acquired firms that exhibit similar pre acquisition characteristics.

Defining year of acquisition for non-acquired firms

A key challenge for constructing a pseudo sample for time varying treatment is that no acquisition year can be observed for the non-treated local firms. The treatment happens at any year throughout the sample years for the 1,660 actual cases of acquisition. Therefore, to best simulate acquisition, a random year is picked for local firms as their hypothetical year of acquisition or year zero relative to acquisition.

The process of randomly assigning a year zero to firms in the control group involves three steps. First, a random number is generated for each firm-year observation. Then the random number is ranked within each firm. The firm-year observation assigned with the smallest random value is picked as the hypothetical year zero. The relative year to acquisition is defined as the time difference between the current year and the randomly picked year zero for firms in the control group. Third, scrutinizing on whether the randomly picked observation is the first or the last observation is taken as the last step. The randomly picked firm-year observation can be the first or the last observation among all firm-year observations. Under such circumstances, there would be either no "before treatment" or "after treatment" observations for such firms in the control group. Consequently, there would be no hypothetical "before and after" variations since no hypothetical ownership changes would be observed. Considering this, for those firms whose hypothetical year zero happens to be the first or last observation, the hypothetical year zero is replaced with the firm-year observation associated with the 2nd smallest randomly assigned number.

Matching in panel data

A second challenge stems from the nature of panel data. It creates difficulty for incorporating matching methods. First, it is difficult to decide the unit of matching. Each firm observed over time can be considered as a unit of analysis by which matching can be done on the firm level basis. On the other hand, each individual observation (firm-year) can also be used as unit of analysis for matching. Second, it is possible for matching within firm if

individual observation is applied as matching unit. Unless each observation within a firm is independent of others, observations within a firm in different time periods should have a systematic relationship between them. As a result, matching within firm often occurs considering that observations within the same firm are highly likely to be similar.

Considering the problems stated above and that firm acquisition is conducted at the firm level, we carry out the matching on the firm level based on the pre-acquisition characteristics. The pre-acquisition period is defined as the last observed year before being acquired. The rationale is that the data is an unbalanced panel and that firms in the data may not be observed in some years. If a firm appears to be acquired after one or more years' gap, the exact time of acquisition remains uncertain. In this case, the last observed year before acquisition is used as the pre-acquisition year for matching.

Obtaining propensity score

As the first step of constructing the pseudo-randomised sample, a logit model is applied to obtain the propensity score with pre acquisition characteristics controlled for all firms in a pooled sample. As mentioned in the previous section, foreign investors may base their investment decisions on measurable and observable firm features to narrow down their potential acquisition targets. The choice of matching variables is motivated by a series of literature regarding determinants of FDI (Conyon et al. (2002) Lichtenberg and Siegel (1987) McGuckin and Nguyen (1995) and literatures on the effect of foreign acquisition (Girma and Gorg (2007a); Girma and Gorg (2007b);Arnold and Javorcik (2009);Girma et al. (2015b)).

As suggested in the literature, foreign acquirers may judge the suitability of a potential target based on observed characteristics. McGuckin and Nguyen (1995) find that acquired firms tend to exhibit substantial productivity premiums (measured as TFP) compared with non-acquired firms. Lichtenberg and Siegel (1987) suggest that firms with larger size tend to be the potential target of acquisition. Girma and Gorg (2007a) and Girma and Gorg (2007b) consider firm age as proxy for experience which may potentially influence the propensity of being acquired. Arnold and Javorcik (2009) find acquired firms pay higher wages per employee. In addition, Arnold and Javorcik (2009) state that capital intensity which suggests the available equipment for future production and firm's leverage status which suggests credit level of the potential

targets also matter for the selection into acquisition. Moreover, Conyon et al. (2002) point out the importance of industry foreign presence in affecting the decision of foreign acquisition since it may indicate the perception of other foreign investors about the industry policy environment

Based on the information stated above, the matching variable applied are firm productivity (measured as total factor productivity), firm size (measured as firm total asset), firm age, capital intensity, average wage paid to employee, firm leverage ratio (measured as the total debt level as share of total asset), and industry foreign presence. In addition, the number of existing products and trading partners are also taken into consideration for the selection process. All variables are extracted from the year prior to their acquisition. Table 2.8 presents a brief summary of the matching covariates with related literature. Table 2.9 is a summary statistics of the matching variables for full sample in Column (1), the non-acquired control group in Column (2), for the firms being acquired in Column (3) and the statistics for the foreign acquired firms one year prior to acquisition in Column (4), on the year of acquisition in Column (5) and one year post acquisition in Column (6).

Table 2.8: Definitions of matching covariates

Variable	**Definition**	**References**
X_{it-1}		
productivity	TFP	Girma and Gorg (2007a); Girma and Gorg (2007b); Arnold and Javorcik (2009); Girma et al. (2015b)
size	log of total asset	
age	establishing year	
capital intensity	log of net fixed asset per employee	Arnold and Javorcik (2009)
wage per person	log of average wage per employee	Arnold and Javorcik (2009); Conyon et al. (2002) use relative wage
leverage ratio	total debt relative to total asset	Arnold and Javorcik (2009) uses liquidity
foreign presence	the share of industry employment in foreign companies	Conyon et al. (2002); Arnold and Javorcik (2009) use foreign control; Bandick (2011) uses share of foreign employee
num.products	log of number of products	
num.countries	log of number of destination countries	
D_{it-1}		
industry	2 digit industry code	
year	year dummy	
region	36 province	
ownership	pre acquisition ownership(SOE and private)	

Table 2.9: Descriptive statistics of matching covariates

	Full		non-acquired		acquired		preacq year		acquisition year		one year later	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
productivity	4.82	1.17	4.82	1.16	4.76	1.21	4.62	1.22	4.79	1.21	4.84	1.16
	(4.86)		(4.87)		(4.80)		(4.69)		(4.81)		(4.91)	
size(log)	10.75	1.53	10.78	1.54	10.46	1.40	10.22	1.40	10.46	1.41	10.42	1.33
	(10.54)		(10.57)		(10.33)		(10.07)		(10.30)		(10.32)	
age	12.97	13.96	13.54	14.43	8.25	7.63	6.45	7.21	7.82	7.60	8.12	6.60
	(8.00)		(8.00)		(7.00)		(5.00)		(6.00)		(6.00)	
capital int(log)	3.71	1.21	3.72	1.19	3.62	1.37	3.51	1.45	3.62	1.37	3.61	1.38
	(3.74)		(3.75)		(3.63)		(3.58)		(3.65)		(3.59)	
wagepp(log)	2.45	0.57	2.44	0.56	2.51	0.64	2.40	0.66	2.54	0.64	2.62	0.58
	(2.44)		(2.44)		(2.49)		(2.38)		(2.52)		(2.59)	
lev ratio	0.62	0.26	0.62	0.25	0.57	0.28	0.57	0.26	0.57	0.27	0.55	0.28
	(0.63)		(0.63)		(0.58)		(0.59)		(0.58)		(0.55)	
foreign presence	0.41	0.17	0.41	0.17	0.46	0.17	0.46	0.18	0.46	0.17	0.47	0.16
	(0.36)		(0.35)		(0.47)		(0.47)		(0.47)		(0.47)	
products(log)	1.54	0.77	1.54	0.76	1.62	0.79	1.58	0.77	1.61	0.79	1.65	0.78
	(1.39)		(1.39)		(1.39)		(1.39)		(1.39)		(1.61)	
countries(log)	1.89	0.90	1.90	0.90	1.81	0.89	1.74	0.88	1.82	0.91	1.84	0.90
	(1.79)		(1.79)		(1.61)		(1.61)		(1.61)		(1.79)	
N	72788		65281		7507		1501		1660		1242	

Table 2.10 below shows the marginal effect of the logit estimation in simulating foreign acquisition. As the results show, there are systematic ex-ante differences between the non-acquired domestic firms and those acquired firms. Although foreign investors are interested in plants with higher productivity, the coefficient on the TFP level is not statistically significant. Instead, firms with a smaller asset size are more attractive to foreign acquires. Younger firms are more likely to be the acquisition target. Capital intensity does not play a significant role in acquisition decisions. However, firms that pay higher wages are more attractive to foreign investors. We find that the coefficient on average wage per employee is significant on 1% level. Besides, firms with less debt ratio are more likely to be acquired by foreign investors. It is believed that a moderate level of debt signifies trustworthiness of an establishment. In the case of China a higher level of leverage ratio may have other interpretations while a higher level of leverage may suggest unnecessary risks which foreign acquirers may intend to avoid. In addition, foreign investors are more attracted to firms that are operated in the industry with higher foreign presence, for a higher industry foreign presence indicates a rather open policy environment that may facilitate acquisition and future operation.

The logit model also includes the number of products and destinations prior to acquisition. The inclusion of these two variables ensure that firms in the matched sample are homogeneous in terms of pre-acquisition exporting profiles. It also avoids the possibility for reverse causality that the changes in export profiles take place prior to the acquisition. Firms with more product varieties have higher possibilities to be acquired by foreign investors. However, it appears that the number of exporting destinations matters less for foreign investors. Firms that exports to less exporting destinations are more likely to be foreign acquired.

Table 2.10: Logit estimation of foreign acquisition

	(1) logit	
D(0,1): foreign share > 25%		
productivity	0.0246	(0.0313)
size(log)	0.0020	(0.0241)
age	-0.0322***	(0.0026)
capital int(log)	0.0418	(0.0265)
wagepp(log)	0.2855***	(0.0467)
lev ratio	-0.6822***	(0.1084)
foreign presence	2.9529***	(0.5749)
sez	0.5833***	(0.0885)
products(log)	0.3697***	(0.0387)
countries(log)	-0.0825**	(0.0347)
Observations	16014	
Pseudo R^2	0.091	
AIC	12989.36	
BIC	13319.65	
Year	YES	
Industry	YES	
Ownership	YES	
Estimation	Logit	

Note: standard errors in parentheses

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

Balancing test

The propensity score obtained through predicting the probability of being acquired using the logit model forms the basis of constructing a qusi randomized sample[13]. It should be noted that choosing suitable matching covariates are different from modelling determination of foreign acquisition. Since the goal is to construct a sample with firms that exhibit similar ex ante features, achieving covariate balance should be the first priority. To assess the matching quality, it is essential to check whether the acquisition is randomly assigned in the matched data. In other words, the distribution of covariates should be approximately the same for the control and treatment groups. Following Girma and Gorg (2007b) this paper carries out the following balancing check to assess the quality of matching.

The first one is known as *standardised bias* or *normalised difference* suggested by Rosenbaum and Rubin (1985). For all covariates in X_{it-1}, the standardised bias is defined as difference of sample means between matched treated and control sub-samples as a percentage of the square root of the average of sample variance. As can be seen from the Table 2.11, the standardised bias (% Bias) is negligible for all matching covariates in the matched sample (M) and is reduced substantially compared with that of unmatched sample (U).

The second balancing statistics is variance ratio. The variance ratio is defined as the variance of matching variable in acquired group as a ratio of the variance of the same variable in the domestic firms. (Rosenbaum and Rubin (1985);Smith and Todd (2005)). As the last column of Table 2.11 indicates, variables in the matched sample show less variations between the acquired firms and non-acquired firms. The variance ratios for the matched sample are much closer to 1 compared to those of unmatched sample. As there is hardly any consensus in literature on the exact threshold of a "balanced" sample, we follow the criteria suggested in Rosenbaum and Rubin (1985) that a standardised difference which is smaller than 20% and a variance ratio which lies between 0.5 to 2 suggest a covariates balance. As shown in the balancing test, we can confirm that the matching process conducted above has reduced the covariates differences in the matched sample.

[13] The matching results and overlap diagnoses of the estimated propensity scores are presented in Appendix B.1

Table 2.11: Balancing tests from caliper matching

Variable	Unmatched	Mean		%	%Bias	t-test		Variance ratio
	Matched	Treated	Control	Bias	reduction	t-stat	p>| t |	V(T)/V(C)
productivity	U	4.604	4.7446	-11.9		-4.59	0.000	1.17
	M	4.6502	4.6824	-2.7	77.1	-0.71	0.476	1.33
size (log)	U	10.243	10.612	-25.1		-9.62	0.000	0.85
	M	10.238	10.293	-3.8	85.0	-0.97	0.330	0.92
age	U	6.6957	12.156	-49.0		-16.34	0.000	0.30
	M	7.5166	8.1901	-6.0	87.7	-1.96	0.050	0.78
capital int (log)	U	3.5294	3.6371	-8.1		-3.40	0.001	1.41
	M	3.4182	3.4013	1.3	84.4	0.32	0.746	1.29
wagepp (log)	U	2.3892	2.3795	1.6		0.68	0.499	1.41
	M	2.375	2.3755	-0.1	94.9	-0.02	0.983	1.25
lev ratio	U	.57763	.61945	-15.8		-6.12	0.000	0.91
	M	.59094	.59602	-1.9	87.9	-0.50	0.621	0.94
foreign presence	U	.45423	.40368	28.7		11.52	0.000	1.09
	M	.44803	.44892	-0.5	98.2	-0.12	0.901	0.95
products (log)	U	1.5796	1.4946	11.2		4.15	0.000	1.06
	M	1.5721	1.6261	-7.1	36.4	-1.69	0.091	0.83
country (log)	U	1.7378	1.821	-9.4		-3.46	0.001	0.99
	M	1.7805	1.8203	-4.5	52.2	-1.13	0.257	1.02

2.5 Results and discussion

The aim of this research is to seek for a causal relationship between foreign acquisition and firm export profiles. Using the estimated propensity score from the above logit model, we match the foreign acquired firms and the domestic firms that exhibit similar pre-acquisition characteristics. To be more specific, for each acquired firm, a domestic firm with the propensity score that is closest within the pre set calliper is used as its matched counterpart. This section will present the difference-in-differences matching estimations of foreign acquisition effects on the firms in their first, second and third post-acquisition years.

The first part will focus on the average treatment effect on the acquired firms over exporting profiles such as the product scope, product concentration, destination, destination concentration and sophistication of export. In addition, the acquisition effect with traditional measurements on export performance such as the total export value, export intensity are also estimated and discussed together with total sales of the acquired firms. The second part of the discussion will focus on the acquisition effects on other firm operational aspects including firms' productivity, total employment, total sales, average wage paid to employees, fixed investment, R&D intensity and leverage ratio. The third part provides a synthesised interpretation of all the results presented in the previous two parts.

2.5.1 Export profiles

Product profiles

We begin by estimating the average treatment effect of foreign acquisition on product profiles. The main outcome of interest is the number of export products and the product concentration. Table 2.12 below presents the results. The table consists of 8 panels, showing changes on export profiles due to foreign acquisition. The first column shows the acquisition effects in the year of acquisition, with the second column showing the effect one year after, the third column two years after, and the last column three years after acquisition.

The estimates show that in the year of acquisition, there is on average a 10.22% decline in the target firms' number of products, followed by a 4.95% drop in the product numbers one year after acquisition. Two years later, the number of products decline by 6.4%. There is no significant change in the number of products in the three years after acquisition. The results in Panel (2) of Table 2.12 demonstrate that the firms concentrate their sales on their top-sold products in the year of acquisition by 1.85%. Although there is a trend of increase in product concentration in the year of acquisition, such a trend does not continue in the following years.

The acquired firms have on average dropped 7% products and concentrate 2% more of their sales on their top sold products after foreign acquirement. This result corroborates the predictions from theoretical literature of multi-product firms in international trade, according to which multiproduct firms adjust their products mix by shedding their unproductive products and concentrate on their core products in international market (Dhingra, 2013). The above results are also consistent and findings in Manova and Zhang (2009)[14] that product intensity decreases with foreign ownership for foreign affiliates.

Eckel and Neary (2010) and Dhingra (2013) explain the reasons why firms become "meaner and leaner" in international trade from the perspectives of competition and production efficiency. Eckel and Neary (2010) suggest that there is a "cannibalization effect" among the varieties of products that the multiproduct firms produce, making the multiproduct firms meaner and leaner when facing globalization shocks.

In addition to the competition effect brought by globalisation, Dhingra (2013) elaborates the "meaner and leaner" process further with the focus on the changes in production efficiency. He explains that firms are getting less efficient in producing varieties that are outside their core competence. By dropping those products that are no longer cost efficient, firms are able to reduce input waste and improve production efficiency in global competition.

However, intensified competition does not fully justify how the organisational structure change brought by foreign acquisition affects product adjustment within firm. This research seeks answer from the organisational change perspective. The empirical result is supported by Nocke and Yeaple (2006)'s prediction on product scope reallocation within multiproduct firms. In their

[14] See Manova and Zhang (2009) for their *Stylised fact #3*

model, multiproduct firms encounter higher marginal costs when they manage more products. Nonetheless, compared to firms with weak organisational capability, firms with strong organisational capability are associated with less increased marginal cost induced, for example, by one additional product. Their model predicts that firms adjust their product scope in the process of merger and acquisition to achieve profit maximisation through divesting products for the firms with a wider product range and expanding products for the firms with a smaller product range.

Table 2.12: Acquisition effect on export profiles

	acquisition year	one year later	two years later	three years later
(1) num.product	b/se	b/se	b/se	b/se
acq vs. non-acq	-0.1022**	-0.0495***	-0.0640**	-0.1046
	(0.043)	(0.014)	(0.028)	(0.085)
N	13855	13214	6016	2957
(2) product concentration				
acq vs. non-acq	0.0185***	0.0071	0.0046	-0.0027
	(0.003)	(0.015)	(0.008)	(0.031)
N	13855	13214	6016	2957
(3) num. country				
acq vs. non-acq	-0.1708***	-0.1242***	-0.1267***	-0.2108
	(0.020)	(0.042)	(0.017)	(0.148)
N	13855	13214	6016	2957
(4) destination concentration				
acq vs. non-acq	0.0348***	0.0197*	0.0010	-0.0060
	(0.009)	(0.011)	(0.009)	(0.062)
N	13855	13214	6016	2957
(5) destination income				
acq vs. non-acq	-0.0606	-0.0338**	-0.1109	-0.0030
	(0.070)	(0.015)	(0.129)	(0.051)
N	13830	13194	6004	2952
(6) export value				
acq vs. non-acq	-0.4301***	-0.4401***	-0.5012***	-0.6910***
	(0.041)	(0.154)	(0.042)	(0.211)
N	13855	13214	6016	2957
(7) export intensity				
acq vs. non-acq	-0.4593***	-0.3195***	-0.4196***	-0.5740***
	(0.056)	(0.000)	(0.008)	(0.118)
N	13847	13202	5935	2955
(8) sales				
acq vs. non-acq	-0.0209	-0.0297	-0.0254	-0.0444
	(0.066)	(0.073)	(0.146)	(0.135)
N	14033	13466	6096	3035

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Destination profiles

Having acknowledged the "meaner and leaner" restructuring in multiproduct firms' product composition, next we come to see whether there is restructuring process in destination composition. Specifically, we estimate foreign acquisition's effect on the acquired firms' number of export destinations, the concentration of destination, and the income level of destination. Panel (3) of Table 2.12 shows changes in the acquired firms' number of destinations, Panel (4) shows changes in the destination concentration, and the income level of destination is listed in Panel (5).

The results indicate that the composition of acquired firms' exporting destination profiles has substantially changed due to foreign acquisition. As shown in the Panel (3), the number of destinations is restructured in the acquired firms with a persistent decline over the post-acquisition years. There is an average 17.08% reduction in the number of destinations for the acquired firms as early as the year of acquisition compared with their indigenous counterparts that are not acquired by foreign capital. The number of destinations of the acquired firms declines by 12.42% on average one year after the acquisition, and 12.67% two years after being acquired.

While there is a persistent decline in the number of export destinations, there is a tendency of concentration in the export destination after acquisition. Panel (4) indicates that, on average, the acquired firms concentrate 3.48% more of their export sales in their best performed export destinations where they have generated the highest export sales. The tendency persists until the year after acquisition. The acquired firms continue to concentrate 2% more of their total exports in their top-sold destinations. However, there are no signs of concentration sales in the top-exported destination two years and three years after acquisition compared with their local counterparts.

In terms of the income level of destination countries, there is no robust change due to foreign ownership in post-acquisition period. As is shown in Panel (5) of Table 2.12, the export value weighted average income per capita of the acquired firms' export destinations decreased slightly by 3.38% one year after acquisition. However, the downward shift in the income level of destination countries does not persist in the subsequent years of acquisition.

Measuring the acquisition effect on the acquired firms of their destination portfolio helps us find a similar restructuring process in the destination

composition of the acquired firms. The acquired firms become " meaner and leaner" in terms of export destinations by terminating export sales to an average 14% destination countries and concentrating 3.48% more of their export sales to the top-exported destinations. Although theoretical explanation is scarce in terms of destination restructuring for multiproduct firms in international trade, there is empirical evidence that we can draw inferences from.

The above results of a shrinking destination number and a decline in concentrating sales in the top exported destination in the foreign acquired firms are consistent with the empirical evidence uncovered in the US (Bernard et al. (2009)) and China (Manova and Zhang (2009)). In addition, the acquired firms in China are found to export to less wealthy countries one year after acquisition compared to the domestic firms. One possible explanation of the change in the income composition of destination countries could be that the acquired manufacturing firms in China are usually gateways for overseas investors to access the markets neighbouring China where most of the countries are developing ones and therefore more attractive to them with lower labour cost.

Exports and sales

Another concern of this research is to estimate how overall export performance of the acquired firms are affected by foreign acquisition. To understand the export performance of the acquired firms fully, we estimate that acquisition has effects not only on the total export value and the export intensity, but also on the total sales (including both domestic sales and export sales) of the acquired firms. The results are presented in the last three panels of Table 2.12, with Panel (6) showing acquisition effects on total export value, Panel (7) on export intensity and the last panel on total sales.

The results suggest that the total export value of the acquired firms experiences sharp and persistent declines during the post-acquisition period. The magnitude of export reduction increases steadily over the years. In the year of acquisition, the acquired firms record a 43% decrease in their total export value, approaching half of their exporting sales prior to acquisition. In the following year, the foreign acquired firms see a persistent plunge in their total export value by as much as 44%. The sharp decline in total export value continues in the subsequent years of acquisition and reduces even

further, recording over 50% and 70% of shrinkage in the total export sales of the acquired firms two years and three years after acquisition respectively.

A similar effect emerges with respect to export intensity of the acquired firms. As can be seen from Panel (7), the reductions in export intensity of the acquired firms are persistent and significant throughout the post-acquisition years. As early as the year of acquisition, export intensity of the acquired firms is reduced by 46% compared with that of the would-be acquired indigenous firms. Export intensity of the acquired firms continues to shrink by 32% one year after acquisition and records a 42% decline two years after acquisition. The decline in export intensity continues and reaches its peak three years after acquisition by 57%.

To understand export sales fully, the investigation turns to the changes in the acquired firms' total sales. The results are presented in the last panel of Table 2.12. As is indicated, the profound reductions recorded in both the total export value and the export intensity do not extend to the total sales of the acquired firms.

A question which naturally arises is how the results are reconciled with significant reductions in both the total export value and the export intensity while no significant changes are found in the total sales due to acquisition. One possible explanation could be a restructuring in the acquired firms' market focus. The foreign acquired exporters turned their market focus to the domestic market, while those would-be acquired indigenous exporters remain export-market oriented.

2.5.2 Other firm level performance

The subsequent question we seek to answer is how the acquired firms have been affected by foreign acquisition in terms of other operational aspects. To explore this matter further, we carry on investigation into how changes have emerged in the acquired firm's operational aspects such as productivity, employment and wages, investment and R&D activities, and finally their overall financial health conditions. The ATT results are presented in Table 2.13.

Table 2.13: Acquisition effect on other firm performance

	acquisition year	one year later	two years later	three years later
(1) TFP	b/se	b/se	b/se	b/se
acq vs. non-acq	-0.0046	0.0542***	0.0181	-0.0110***
	(0.068)	(0.003)	(0.175)	(0.002)
N	13536	12860	5782	2847
(2) total value added				
acq vs. non-acq	0.0624***	-0.0115	-0.0454	-0.1827
	(0.014)	(0.024)	(0.091)	(0.190)
N	12197	11759	4822	2012
(3) value added per worker				
acq vs. non-acq	0.0368*	-0.0449	-0.0662	-0.1990
	(0.020)	(0.046)	(0.107)	(0.186)
N	12197	11759	4822	2012
(4) total employment				
acq vs. non-acq	-0.0027	-0.0046	-0.0644	0.0586
	(0.010)	(0.016)	(0.043)	(0.081)
N	14041	13479	6179	3038
(5) average wage				
acq vs. non-acq	0.0363	0.0217***	-0.0144	-0.1046***
	(0.035)	(0.005)	(0.054)	(0.032)
N	14036	13476	6178	3038
(6) fixed investment				
acq vs. non-acq	0.0031	-0.0037***	-0.0092	-0.0829***
	(0.062)	(0.000)	(0.036)	(0.011)
N	14021	13462	6173	3032
(7) R&D intensity				
acq vs. non-acq	0.0057***	0.0098	-0.0162	-0.0154
	(0.001)	(0.011)	(0.012)	(0.013)
N	14041	13479	6179	3038
(8) leverage ratio				
acq vs. non-acq	-0.0184***	-0.0519***	-0.0584**	-0.0467
	(0.006)	(0.005)	(0.025)	(0.057)
N	14041	13479	6179	3038

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Productivity

We first estimate the acquisition effect on productivity, measured as TFP. The results are shown in the first Panel of Table 2.13. As evident from the first panel, there are no significant changes caused by acquisition in the year of acquisition. One year after acquisition, the acquired firms see an average 5.4% growth in TFP compared with their local counterparts. The rising trend in TFP does not continue to the following year. Three years after acquisition, the acquired firms experience an average 1% productivity decline compared with those indigenous firms that are similar to the acquired ones.

As an alternative measure of productivity, we estimate acquisition effect on the total value added and the value added per worker respectively. The results of the total value added are shown in Panel (2) of the same table, with the results for the value added per worker shown in Panel (3). The matched sample shows that foreign acquisition boosts the total value added of the acquired firms in the year of acquisition. The average acquisition effect of the total value added on the acquired firms is 6.24%. The average effect of the total value added per worker is increased by 4% in the year of acquisition. Similar to the acquisition effect on TFP, the rising trend in the total value added and the value added per work does not persist two and three years after acquisition.

The above results suggest an upward adjustment in productivity after foreign acquisition in the short run. The results are consistent with a series of empirical findings. Arnold and Javorcik (2009) find positive boost in TFP and value added per worker due to foreign acquisition for Indonesian firms. However, for acquired Indonesian firms, the magnitude of positive acquisition effect on productivity gain is much larger than that of Chinese firms. A possible reason for the differences arises from the sample of firms. The sample we use contains exporters only whereas the sample Arnold and Javorcik (2009) apply contains both exporters and non-exporters. In order to find out whether the productivity boost brought by foreign acquisition is different from each other, they test the acquisition effects on split samples of exporters and non-exporters. Their results reveal that the boost to TFP in the acquired firms appears to be smaller among exporters than that of non-exporters.

Employment and wage

The discontinuity in the long-run TFP boost leads us to investigate other restructuring processes within the acquired firms alongside with the export profiles. We look at how acquisition has affected the total employment and the average wage paid to employees for the acquired exporters. The results are shown in Panel (4) and (5) of Table 2.13, respectively.

As is indicated in the table, foreign acquisition does not appear to induce any changes on the overall employment of the acquired firms given a significant restructuring process observed in the acquired firms' export profiles and the short-run productivity. Contradict to what is found in Arnold and Javorcik (2009) where foreign acquired firms in Indonesia increase their labour force shortly after acquisition, the acquired exporters in China are not found to change their employment extensively compared to the local exporters. However, this result does not inform us about the composition changes in their employment structure as it masks the fact that the acquired firms may upgrade their labour force by substituting workers with higher education and more experience for existing workers (Lipsey and Sjoholm (2006)).

As far as the average wage paid to employees is concerned, although no significant changes are found in the year of acquisition, foreign acquisition is shown in Panel (5) to raise the average wage paid to their employees by 2% one year after acquisition. However, there is a 10% reduction in the average wage paid to employees three years after acquisition compared with the local exporters. The short-run increase in the average wage paid to employees is consistent with the findings of positive FDI effects on wage by Girma and Gorg (2007a) for the UK, and Lipsey and Sjoholm (2006) and Arnold and Javorcik (2009) for Indonesia, etc. However, different from these researches where persistent positive wage effects are found, the above results show that the average wage paid to employees does not persist in the long run for the acquired exporters. A possible explanation may be that the foreign acquired firms introduce performance-linked pay scale to motivate their local hired employees (Lipsey and Sjoholm (2006)). If this is the case for China, the decline in average payment can be associated with the "meaner and leaner" process and is in line with the earlier observation for the same decline pattern found in productivity three years after acquisition.

Investment and R&D

To see whether foreign investors have brought over their technology know-how together with foreign ownership, next we lay our research focus on investment activities of the acquired firms. In Panel (6) and (7), we examine two elements to see future investment in the acquired firms. The first one is the total investment in fixed asset such as new machinery or any other tangible assets firms use on an operational basis to see whether new and more efficient production lines have been built. The second one is the R&D intensity, the expenditure which firms spend in proportion to their total sales.

As is shown in Panel (6) and (7), there is a tendency of divestment in the fixed asset for the acquired exporters during the post-acquisition period. There is a 0.4% decline in the fixed invest one year after acquisition. The decline extends further three years after acquisition, amounting to an 8% decline in the fixed investment for the acquired exporters, which is different from Arnold and Javorcik (2009) who find the fixed investment grows double for the foreign acquired firms in Indonesia.

One possible explanation for this contradictory result could be the sample of firms that appear in the research. It is worth noting that, different from firms in Arnold and Javorcik (2009)'s sample, firms in our sample of study are existing exporters before acquisition. As a result, it is highly possible that theses exporting Chinese firms may have already established initial production lines prior to the acquisition. That is to say, acquisition of the existing exporters would not induce the same level of changes in equipment as that of Indonesian firms recorded in Arnold and Javorcik (2009). In addition, the divestment in the fixed investment could potentially be attributed to the adjustment in export profiles. A shrink in the number of exported products and destinations requires less production capacity of equipment which could induce a considerable amount of maintenance cost for the firms. Moreover, the decline in the fixed asset investment may suggest a reallocation of capital resources within the acquired firms. The costly and often debt-financed equipment upgrading could be potentially substituted by a less costly managerial and production process upgrading such as training and R&D research, etc. (Girma et al. (2015b); Javorcik et al. (2018))

To look further into whether there are changes in R&D activities, next we turn our focus to the acquisition effect on the R&D intensity of the acquired firms. As is evident from Panel (7) of Table 2.13, the growth in R&D intensity

only emerges in the short run. There is an average 0.5% increase in the R&D intensity in the year of acquisition for the acquired exporters compared with the indigenous exporters in China.

However, the growth in the R&D intensity discontinues after the second year of acquisition. The result is consistent with the findings in Girma et al. (2015b) who find increased the R&D intensity for partially acquired firms that occurs during the first year acquisition.

A subsequent question is where the R&D expenditure goes or what the R&D expenditure is spent on if there is a shrink in product scope. There are two potential explanations. First, the increased R&D expenditure may still be used to develop new products but the R&D in new products may take some time to come into effect. This result is reflected in Panel (1) of Table 2.12: three years after acquisition, the divergences in the number of products disappear between acquired firms and the would-be acquired indigenous firms. Second, the increased R&D expenditure may be applied to the process innovations such as production and managerial changes etc., to achieve higher efficiency through economies of scale as is put by Dhingra (2013). Such investment in process innovation is reflected in the short-run TFP boost one year after acquisition.

Leverage ratio

While the reallocation of capital resources between the fixed investment and the possible process upgrading (e.g. production and managerial upgrade) may provide a plausible explanation for the above results, the overall changes in the debt level which is closely related to investment activities of firms could also be affected by acquisition.

As is shown in the last panel of Table 2.13, acquisition results in a steady decrease in the leverage ratio of the acquired firms with an average leverage ratio decreased by 2% in the year of acquisition. The reduction in the leverage ratio further translates into a 5% decrease one year after acquisition, and the declining trend persists into the third year, with 6% reduction in the leverage ratio of the acquired firms compared with their local counterparts.

The above results suggest that acquisition leads to restructuring in capital structure of the acquired firms by decreasing their overall debt level after

acquisition. In so doing, the acquired firms are able to improve their overall financial health through steadily lowering their overall debt level and will thus face less financial constraints during the credit review when the debt finance is needed in the future. The results are consistent with that of Desai et al. (2004). They find that foreign affiliates are less credit constraint compared with local firms. These results also strengthen our previous findings on the divestment in equipment. Since fixed investment is often debt financed, a steady decrease in overall debt level would not be able to finance the equipment upgrading.

2.5.3 Further interpretation and discussion

Overall, the results reveal that foreign acquisition leads exporting firms to drop export varieties and export destinations and, meanwhile, to concentrate their export on their top sold products in top exported destination country. As suggested by multiproduct firm trade theories, the meaner and leaner strategic adjustment in export aims for improving production efficiency, be it export, total sales or productivity improvement. In fact, however, such adjustment in acquired Chinese exporting firms is accompanied by considerable declines in both export values and export intensity with no significant changes in overall sales and some patchy changes in TFP levels. In addition, foreign acquisition leads to a higher value added, marginally less average payment to employees, less fixed investment, higher R&D and less debt.

A question which naturally arises is how the results are reconciled with the export strategies adjustment and a seemingly "efficiency loss" in production? One possible explanation is that while acquired firms were engaged in production process upgrading such as shedding export varieties and focusing on exporting products with core competence, they would be faced with increasing competition from both within the Chinese market and the international market. Such competition effect offsets the efficiency gain induced by the strategy adjustment and results in a long run decline in overall productivity.

Another possible explanation is that foreign investors would adjust export product ranges and destinations to fit in their international production lines with Chinese firms as export platform. If this is the case, the patchy TFP level changes and seemingly declined export value could be explained through potential intra-firm trade and transfer pricing activities.

A third possible scenario is that acquired Chinese firms are turned away from export-intensive producers to focus on the domestic Chinese market. Since these firms in our research sample are established exporters prior to acquisition, it is highly possible that they are acquired by foreign owners as access to the domestic Chinese market. Consequently, the overall export declines as foreign owners change their global market reorganisation, and increase R&D expenditure on the domestic market research.

In fact, it is more convincing to say that the overall results are the combination of all three possibilities. Indeed, foreign investors have starkly different investment motivations. Some foreign investors are interested in efficiency seeking through exploiting cheap factor pricing. Some foreign investors are motivated by the potential market demand in the recipient country. Others are interested in using acquired entities to engage in intra-firm trade for tax purpose. This empirical research provides a valuable perspective for future theory development.

2.6 Conclusion

This chapter investigates whether foreign ownership has a causal implication on exporting profiles of acquired firms. The uniqueness of our data allows for the identification of causal effect: first, the firm level transaction data enables us to make a close examination on the adjustment in export profiles within firms. Second, the balance sheet data allows for clear identification of the acquired firms. Third, the abundant firm characteristic information greatly facilitates the constructing of counterfactuals through matching the acquired firms with their local counterparts. Last, the panel nature of the data eliminates the time-invariant unobserved confounders that matching fails to control through difference-in-differences estimation techniques.

Our research confirms the prior empirical findings that foreign ownership does play a crucial role in export profile adjustment within firms. More importantly, the acquired firms become "meaner and leaner" through shedding a number of exported products and export destinations while concentrating more on their top-sold products to top-exported destinations. The "meaner and leaner" adjustment is accompanied by a short-run boost in the acquired firms' TFP, labour productivity, average wage and R&D intensity. In addition, we find that acquisition reduces the overall debt level which potentially

enhances the credit level of the acquired firms. Overall, our results reveal the crucial role of foreign ownership in determining within-firm adjustment of export profiles of multiproduct firms.

Our research opens up new areas for future exploration by leaving the questions such as whether the "meaner and leaner" adjustment in export profiles of acquired firms is a result of vertical specialization of multinational firms, and whether acquired firms upgrade the quality of their core products in the process of getting "meaner and leaner", etc.

Chapter 3

Foreign Acquisition and Import Profiles

3.1 Introduction

The previous chapter investigates how foreign acquisition affects firms' exporting profiles with the conclusion that acquired firms conduct product restructure through dropping their unproductive lines or products while concentrating on their core products. While foreign ownership brings over changes in export strategies, it also leads to some patchy TFP changes to acquired firms over time. The seemingly "efficiency loss" after acquisition could be attributed to the increasing activities of intra-firm trade and transfer pricing. Such activities make it difficult to observe the factor prices (Konrad and Lommerud, 2001) and prevent us from understanding the holistic picture of acquired Chinese firms' international operations. Consequentially, these issues point to the need to delve deeper into the changes in firms' trade strategies induced by foreign ownership, but from the perspective of international sourcing or import profiles. To be more specific, we are interested in whether firms have changed their import profiles such as the variety of imported products, their unit value, the sourcing country's restructuring, etc. after being acquired by foreign capital. While substantial efforts have been made to study firm heterogeneity in export, a comparatively less efforts have been devoted to import structure and their potential links to firm characteristics (Castellani et al., 2010), which motivates us to fill this gap considering

the significance of import in shaping the global trade and the strong interplay between export and import.

Import is a crucial composition of international trade. However, there is a paucity of literature on this subject as existing literatures in the field of international trade are mostly concerned with firm heterogeneity and export (Castellani et al., 2010). Given that import is the other side of the coin of the international trade, more efforts should be devoted to the exploration into it. As pointed out by Altomonte and Bekes (2009), export and import are highly correlated for firms engaging in the international trade market. Taking the exporting side alone only provides partial coverage of the study of firm behaviours in international trade, whereas looking at both sides of international trade will add a more comprehensiveness to the understanding of the subject as a whole.

The newly available transaction level data has opened up new areas for empirical investigations in firm heterogeneity and trade through combining the firm characteristics with their export and import structure. A careful review of the current import-related literatures finds that they are mostly concerning the firm heterogeneity and import activities with the focus on the potential relationship between imported input and firm productivity. In this regard, there are two leading arguments, namely, the learning effect (Markusen (1989); Grossman and Helpman (2001); Eaton and Kortum (2001); Acharya and Keller (2009) etc.) and the self-selection effect(Kugler and Verhoogen (2009); Vogel and Wagner (2010); Kasahara and Lapham (2013); Turco and Maggioni (2013)).

However, the above studies on imported input constitute only a fraction of import profiles of importing firms. To obtain a holistic view on firms' import structure, more attention should be devoted to studying import structure and importers' characteristics, especially on how FDI affects importers' profiles. Despite the paucity of import-related literatures, there are some significant contributions made to understand import structure and importers' characteristics (Bernard et al. (2009); Muuls and Pisu (2009); Manova and Zhang (2009)). In particular, Bernard et al. (2009) and Muuls and Pisu (2009) collectively provide a portrait of import structure of firms in developed countries. Meanwhile, Manova and Zhang (2009) investigate firms' import structure from a developing country's point of view based on detailed transaction level data from China and corroborate the findings of Bernard et al. (2009) for importing firms. In addition, Manova and Zhang (2009) differentiated importers

with foreign ownership from domestic importers and discovered systematic differences in import profiles between foreign and indigenous private firms.

Although the above studies sets up a foundation for the current understanding of import structure, they do not tackle the issue from the perspective of ownership structures. According to FDI related literatures, foreign ownership has many important implications, such as technology and knowledge spillovers (Girma et al., 2012), wages (Girma and Gorg, 2007a), firm operational performance (Arnold and Javorcik, 2009) and laboratory for ideological changes (Kodama et al. (2018); Gallagher (2007)). Central to such implications are the roles of foreign ownership played in acquired firms, namely their power of control (Grossman and Hart, 1986) and the channels to information (Gaspar and Massa, 2007). Different levels of foreign ownership may exert different level of control over firms' international operations and affect the level of information asymmetry between the investors and recipients. Level of managerial control and source of information are vital to firms' sourcing strategies. Manova and Zhang (2009) point out firms with different levels of foreign ownership import differently. However, the issues as to whether there exists the link between sourcing strategies and different levels of foreign ownership and whether this link is causal have yet to be explored. The identification of the research gap motivates us to fill it by looking at how foreign acquisition affects the way firms organise their production through import. In so doing, we hope to further unveil the implications of foreign acquisition on firms' import structure as well as to inform policy and decision makers on their engagement in foreign acquisition activities.

In order to examine the relationship between foreign acquisition, particularly different levels of foreign ownership, and firms' import profiles, we use the matched data combining the transaction level data from CCTS with the firm operation data from ASIF. For the methodological approaches, we construct a pseudo-randomised sample using the augmented inverse probability weighting method and exploit the panel nature of the data to eliminate the time invariant unobservables with the difference-in-differences method.

Our results uncover the causal effect of different levels of foreign ownership on firms' import profiles. In addition, we find heterogeneous acquisition effects on firms' import profiles between the minority acquired firms and the majority foreign acquired firms. The minority acquired importers exhibit a "meaner and leaner" restructuring process through reducing the total number of importer products, importing cheaper products from countries of lower

income level, and reducing the total import value after acquisition. On the contrary, the majority foreign acquired firms tend to increase the variety of imported products, import from more sourcing countries with higher income level. In addition, while there are no significant changes in the average unit price of imported products, the total import value levels up significantly for the majority acquired firms. A possible explanation to the heterogeneous effects FDI has on firms' import strategies could arise from their source of foreign capital. The minority foreign share could potentially come from two sources. If the foreign capital from within China through a foreign shell company (also known as the round-trip foreign investment) or from less developed economies, the primary goals for such investment could be for tax purposes, market exploiting and efficiency-seeking. As a result, such investors would have little motivation to expand the varieties of imported products and to source from a wider number of higher-income countries.

In terms of the acquisition effects on firm level aspects, we find a general reduction in productivity and total sales in both the minority and the majority acquired firms. A similar downward adjustment is found in total employment, fixed investment for the minority acquired firms, and average wages for the majority acquired firms. In addition, the overall financial health is found enhanced due to foreign acquisition with significant reduction in debt level for both types of the acquired firms. Moreover, it is worth noting that the minority foreign share and the majority foreign share differ also in the effects on exports and R&D activities. This research provides the first empirical evidence on the casual link between foreign ownership and firms' import profiles.

The remainder of this chapter is structured as follows: Section 3.2 reviews literature on import-related subjects such as FDI and import as well as multi-product importers. In doing so, the section sets the theoretical and empirical contexts for this study. Section 3.3 briefly describes the matched data. Section 3.4 provides an overview of research methodology and the rationale of the methods applied. Section 3.5 presents the results and in addition discusses the results in relation to existing empirical findings. Section 3.6 concludes.

3.2 Literature review

Different from the previous chapter that deals with the effects of foreign acquisition on firms' exporting profiles, this chapter looks at the issue from the perspective of import. This literature review will focus on two strands of studies that relates to import structure of firms. First, we review international trade literature with a specific focus on firm heterogeneity and import. Second, we draw on literature from firm import structure to contextualise the research.

There are two main objectives for writing this literature review. First, we hope to draw a landscape of current research agenda on import through identifying the foremost researchers and the major research themes within the sphere. Second, we intend to find out if there are previous studies that have studied the potential role of firm ownership on firms' import structure. Overall, it provides essential knowledge about current research focuses and trends in the sphere of firm heterogeneity and import. In addition, this chapter helps enhance our understanding of firms' import structure and its potential link with firm ownership structure. Finally, this section helps identify research gaps this research is intended to fill.

3.2.1 Firm heterogeneity and import

The availability of firm level data has greatly facilitated a growing number of literatures focusing on firm heterogeneity in trade. The recent released transaction level data further expands the research frontier to a more disaggregate level, such as product, destination etc. (Bernard et al., 2009). Compared with the almost exclusive focus on the export side, a relative narrower focus has been put on the import side (Bernard et al., 2007a) despite the fact that import is a crucial composition of international trade, especially in an increasingly integrated international production network where trading firms rely heavily on imported input.

The literatures on imported input tend to focus on the discussion of its potential link with firm productivity. There are two leading arguments regarding the potential relationship of imported input and firm productivity: one is that imported input enhances firm productivity through "learning effect" (Kugler and Verhoogen (2009); Markusen (1989)). while the other prevalent view is

the self-selection effect that entails more productive firms in self-selecting into importing (Kugler and Verhoogen (2012); Kasahara and Lapham (2013)).

Theoretically, the direction of causality can be justified from both sides. As for learning effect, Ethier (1979) and Ethier (1982) are among the foregoers to emphasise the role of imported inputs in providing productivity gains and generate aggregate economic growth (Kugler and Verhoogen (2009)). Then a growing body of theoretical literature contributes to the explanation of this mechanism through embodied technology in input, to name a few, Markusen (1989), Rivera-Batiz and Romer (1991), and Grossman and Helpman (2001), etc. As for self-selection effect, Kugler and Verhoogen (2012) extends Melitz (2003)'s model and predicts that more productive firms are larger in size and tend to apply higher quality input, be it foreign or domestic, compared with less productive firms in the same industry. Kasahara and Lapham (2013) states that in the presence of sunk costs of import, firms need to achieve certain productivity threshold to start importing. They also suggest that firms may use cheaper foreign inputs to substitute the domestic ones.

Empirically, collective efforts have been made in a number of imported-related literatures to document a substantial firm heterogeneity in productivity between importers and non-importers. (Muendler (2004); Schor (2004); Amiti and Konings (2007); Halpern and Koren (2007); Kasahara and Rodrigue (2008); Halpern et al. (2015)). Evidence is found in support of both learning-effect and self-selection arguments based on data in a wide variety of countries, which points to the fact that the issue of whether imported inputs enhances productivity or productivity leads to importing remains debatable. On the one hand, there are literatures that advocate productivity enhancing via learning-by-importing. On the other hand, literatures that advocate self-selection effect also find theoretical and empirical support in a wide variety of countries.

Argument for the enhancement of firm productivity via imported input through "learning effect" can find support in a large number of literatures. In their papers, Markusen (1989), Grossman and Helpman (2001), Eaton and Kortum (2001), and Acharya and Keller (2009), etc. argue that the source of productivity gain arise from three major channels. First, it could arise from the embodied advance technology in the imported inputs. second, it could gain productivity from the increased varieties of intermediate inputs from abroad. Last, productivity could also gain from a better fit of input with product features. In support of the learning effect, Amiti and Konings

(2007), Kasahara and Rodrigue (2008) and Halpern et al. (2015), etc. find that importing enhances firms' productivity.

Amiti and Konings (2007) estimate the effects of input tariffs reduction on firm productivity using firm level data from Indonesia. They find strong evidence of positive impact on productivity by reducing input tariffs and that reducing input tariffs are much more effective than cutting output tariffs. They also find larger productivity gains for importing firms compared to non-importers. Similar effects are found in Chile. Kasahara and Rodrigue (2008) find Chilean firms gain productivity after becoming importers of foreign input. Acharya and Keller (2009) look into technology transfer in 16 countries' manufacturing industries since 1970s. Their results show that the impact on productivity brought by international technology transfer normally exceeds that of domestic technology change. Productivity gain through learning effects from imported input are also documented in empirical works of Schor (2004) for Brazilian firm, Loof and Anderson (2010) for Swedish firms, Goldberg et al. (2010), Topalova and Khandelwal (2011) for Indian firms, and Zaclicever and Pellandra (2018) for Uruguayan firms, etc.

What is worth mentioning is that the learning-effect that accompanies imported inputs finds a systematic interpretation in the research by Halpern et al. (2015). Using Hungarian data from 1993 to 2002, Halpern et al. (2015) lay emphasise on the role of imported input variety in the growth of productivity. They state that imported inputs have a significant and large effect on firm productivity. They attribute around a quarter of Hungary's productivity gain to imported inputs. Moreover, they ascribe two thirds of the increase in firm productivity to the increase in a variety of imported input and one third of productivity gain to higher quality of imported input. Furthermore, Halpern et al. (2015) also identify differences in applying imported inputs across ownership structure. They find that foreign firms tend to use imports more effectively and tend to pay lower fixed import costs. Their results also show that importers and foreign firms are very sensitive to tariff cut, implying a complementary relationship among trade liberalization policies such as encouraging FDI, cutting import tariff, and dismantling non-tariff trade barriers.

However, there are different voices in tracking down the causal relationship between imported inputs and firm productivity that argue for the self-selection effect of importing. In support of their argument, Kugler and Verhoogen (2009), Vogel and Wagner (2010), Kasahara and Lapham (2013),

Turco and Maggioni (2013) provide empirical evidence for a positive impact of productivity on importing. Combined Hungarian customs data with firm level data, Halpern and Koren (2007) analyse price dispersion in imported inputs and suggest that buyers with more market power use imported inputs with a higher unit price.

Vogel and Wagner (2010) use German manufacturing data from 2001 to 2005 to investigate the relationship between firm imports and productivity. Their results show that firms with higher productivity self-select into importing but no evidence of productivity gain is found from importing. Similarly, Muendler (2004) also finds little productivity gain through imported input in Brazilian firms.

Nevertheless, Kugler and Verhoogen (2009) use data from Colombian manufacturing census and find positive effect of importing by productive firms. Compared with non-importers, importers are exceptional performers in terms of total factor productivity. In addition, importers tend to use a wider range of imported input than non-importers. Besides, they discover that importers pay higher price for inputs on average than non-importers. The results are consistent with Kugler and Verhoogen (2012)'s model prediction, implying a self-selection effect of more productive firms are more likely to participate in the import market. Kasahara and Lapham (2013) also corroborate the inference of self-selection effect by incorporating fixed costs into import. Their results suggest that more productive firms tend to use more imported intermediaries. However, they cannot eliminate the productivity gain from learning effect of imported inputs.

As can be seen from the above-mentioned literatures, studies on firm heterogeneity and import focus primarily on the link between productivity and imported input. However, imported input constitute only a fraction of import profiles of importing firms. There are other aspects of import profiles that are worth exploring as well. Focusing exclusively on imported input can sometimes impede us from obtaining a holistic view on firm' import structure. Therefore, this research is intended to fill this gap by looking into other aspects of firms' import profiles such as the number of imported products, the unit value of imported product, the sourcing countries of import, etc. The next section will review existing literatures that cover these aspects of firms' import structure.

3.2.2 Empirical evidence on firm import structure

Investigating the import profiles of firms can be challenging due to the constraint in disaggregate transaction level data, which leads to a paucity of related literatures. Bernard et al. (2009) is among the first few researchers that are able to provide an integrated portrait of international trade structure of firms in the US through combining firm level data to comprehensive transaction level data. They discover that importers in the US are associated with better performance than that of non-importers. Importers are generally more productive and have higher chances of surviving over time. In terms of imported products and sourcing countries, they reveal that most importers tend to import relatively a small number of products from a narrow range of high-income countries. In addition, they identify a group of "most globally engaged" (MGE) firms that are highly integrated in the international operational networks and account for approximately 80% of US's imports in 2000. Compared with other trading firms, MGE firms are more likely to import from low-income countries, experience higher growth in total import per worker, and tend to increase import from lower income countries through intra-firm trade over time.

Similar attempt has been made by Muuls and Pisu (2009), who provide some stylised facts on import structure for Belgium firms. They find that importers in Belgium are more productive and larger in terms of value added than non-importers. In terms of imported products, they find that only a few importers import a large number of products and that the majority of firms import relatively a small number of goods. Moreover, the number of imported goods tend to be higher for importers with higher productivity. This phenomenon holds true for importers' import origins. They find that most manufacturing firms import from a small number of origin countries and that importers with higher productivity tend to source from a wider range of origin countries.

Likewise, Bernard et al. (2009) and Muuls and Pisu (2009) collectively provide a portrait of import structure of firms in developed countries that coincide with the above findings. However, Manova and Zhang (2009) investigate firms' import structure from a developing country point of view. With detailed transaction level data from China, Manova and Zhang (2009) corroborate the findings of Bernard et al. (2009) for importing firms. They find a highly distribution concentration in trade flows for Chinese importers, with

a large number of small importers participating in the import market while a few importers dominate large importing flows. As for imported products, different from the results in Bernard et al. (2009) and Muuls and Pisu (2009) who find importers in the US and Belgium import a small variety of goods, Manova and Zhang (2009) find importers in China on average import wider varieties of products. Moreover, in terms of sourcing countries, all the three papers agree on the stylised fact that importers import from a small number of sourcing countries. While Bernard et al. (2009) find US importers tend to import from a small number of high- income countries with the exception of MGE firms in their sample that tend to import from low-income countries, Manova and Zhang (2009) find Chinese importers tend to import from lower-income origins. They attribute this fact to the prevalence of processing trade in China, characterised as importing a wide range of intermediate inputs from a few low-cost sourcing countries for processing and then transferring them into fewer final products.

In addition to the above stylised facts about import structure, one distinctive aspect of Manova and Zhang (2009) is that they distinguish importers with foreign ownership from domestic importers. They discover systematic differences in import profiles between foreign and indigenous private firms. To be more specific, they find the number of imported products for all types of importers is 17.1 on the average. Among all type of importers, state-owned importers play a significant role in importing large numbers of products with an average of 21.5. Among other types of importers, namely, private domestic firms, joint ventures and foreign affiliates[1], they find a positive relationship between the number of imported products and foreign ownership. On average, foreign affiliates import 20.7 products, larger than that of joint ventures (16.9 products) and much more than double that of private domestic firms (8.5 products). A similar pattern is found in the number of sourcing countries for Chinese importers across different ownership structures. State-owned firms import from an average of 5.6 sourcing countries, higher than the average number of sourcing countries of 4.6 and the highest among all types of ownership structures. Among the rest three types of ownership structure, a positive relationship is identified between sourcing countries and foreign ownership. The number of sourcing countries is 4.2 for wholly-owned foreign affiliate, higher than that of joint venture with an average of 4 sourcing

[1] Manova and Zhang (2009) define joint venture as firms with positive foreign ownership but is not wholly owned by foreign investors. They define foreign affiliate as firms with 100% foreign ownership.

countries. The private domestic firms have the most limited source of import origins with only 3 import origins on average.

The findings from above research reinforce the idea that analysing import structure in greater details enables us to gain a better understanding of firm heterogeneity in import and could offer us a more comprehensive view on firms' importing structure. However, the research in firms' import structure can be further enriched by looking at the role that the ownership structure plays in firms' importing structure. While Manova and Zhang (2009) have found the important differences in import profiles across different ownership structures, the causal link of the ownership structure to the importers' profiles is scarcely investigated. Hence, this research is attempted to bridge this gap by establishing a causal link between foreign ownership with importers' profiles.

3.3 The data

3.3.1 The matched data

We use the same process to match the importers from CCTS with the ASIF dataset. Table 3.1 below shows an overview of firms in the matched sample.

Table 3.1: Firm appearance in the matched data, 2000-2006: Importers

	ASIF	ASIF-CCTS matched importers
Firms survived for more than	num. of firms (percent)	num. of firms (percent)
3 years	248,888 (55.53%)	39,875 (67.29%)
4 years	142,876 (31.88%)	26,337 (44,45%)
5 years	93,735 (20.91%)	18,966 (32.01%)
Total num. firms	448,176	59,255

In the main ASIF 2000-2006 dataset, there are 448,176 firms with 1,363,797 observations in 7 years. Among the 448,176 firms in ASIF dataset, 55% (278,888) firms have at least 3 years of observations, 32% firms have at least 4 years of observations with only 21% having 5 years and more observations. In the matched sample, there are 59,255 firms registered with customs as importers, accounting for a total 214,679 observations across the sample period. Among the 59,255 importers, only 67% (39,875) of the registered importers appear at least in 3 years in the ASIF-CCTS matched dataset. Table 3.2 below summarises the structure of observations in the matched panel. The table suggests an unbalanced appearance pattern for the firms in the matched sample.

Panel A depicts the observation appearance pattern by firms for the full sample. As is shown in the last column of Panel A, the observations for firms that appear at least in three years account for 86.69% of the matched sample. It requires at least three years of observations for each firm to estimate the treatment effect. For this purpose, we confine our research subjects to those firms. Keeping the sample with at least three years of observations per firm leads to the exclusion of 28,119 observations (13.11%) from the full sample. The sample is left with 186,560 observations for the 39,875 importers. Panel B shows the observation appearance pattern by year for firms that have at least

Table 3.2: Structure of the matched panel, 2000-2006: Importers

Panel A	**Observations per firm** (full sample)		
Frim obs.	Num. of obs	Percent	Cumulative
3	40,614	18.91	18.91
4	29,484	13.73	32.64
5	27,025	12.59	45.23
6	32,940	15.34	60.57
7	56,497	26.32	86.89
other	28,119	13.11	100.00
Total	214,679	100.00	
Panel B	**Observations per year** (sample of firms with at least 3 obs.)		
Year	Num. of obs	Percent	Cumulative
2000	15,001	8.04	8.04
2001	18,817	10.09	18.13
2002	22,883	12.27	30.39
2003	27,093	14.52	44.92
2004	35,560	19.06	63.98
2005	34,389	18.43	82.41
2006	32,817	17.59	100.00
Total	186,560	100.00	

three observations. The yearly appearance pattern shows that observations from year 2004-2006 account for over 55.08% of all observations.

The analytical sample

Next we construct the initial analytical sample consisting of the domestic firms and the acquired firms. We apply the same firm level definition of acquisition as we did in the previous chapter. The firms are first divided into five mutually exclusive groups according to their acquisition status. Table 3.3 below provides a brief description of firms in each group. As is shown in the table, there are 10,597 domestic firms (DE) and 1,512 foreign acquired firms (FA) in the matched sample. For the research of causal impact of acquisition, only the foreign acquired firms and the domestic firms are kept in the analytical sample. The reasons are stated as follows. First, the foreign enterprises (FE) do not experience ownership changes throughout the sample year, which makes the "before and after" comparison of ownership changes infeasible. Second, the domestically acquired firms (DA) experience ownership changes from being foreign owned to being domestically owned, but that direction of ownership change is not the focus of this research. Third, the switchers (SW) experience multiple ownership changes during the sample pe-

riod, which makes the year of acquisition ambiguous. As a result, all the foreign enterprises (FE), domestic acquired firms (DA) and switchers (SW) are excluded from the analytical sample, which is left with 12,109 importers and 52,672 observations.

Table 3.3: Acquisition status, 2000-2006: Importers

Acquisition status	Num. of firms	Percent	Observations	Percent
DE	10,597	26.58	45,786	24.54
FE	23,756	59.58	113,546	60.86
FA	1,512	3.79	6,886	3.69
DA	1,639	4.11	7,540	4.04
SW	2,371	5.95	12,802	6.86
Total	39,875	100.00	186,560	100.00

3.3.2 The definition of multilevel treatment F_{it}^{s}

As suggested in the empirical findings of Manova and Zhang (2009), the import profiles of firms varies with the level of foreign ownership. They distinguish the level of foreign ownership into partially owned joint ventures and wholly owned firms. Different from their classification of the level of foreign ownership, we argue that a majority share of foreign capital may have different implications on acquired firms compared with a minority share of foreign capital (Girma et al., 2015b). As a result, we use a multilevel treatment through further breaking down acquisition into two levels of acquisition: a minority foreign acquisition and a majority foreign acquisition.

Following the classification of Girma et al. (2015b), we define a firm as minority foreign acquired firm when the firm's total foreign share is larger than 25% but smaller than 50%. We define a firm as majority foreign acquired firm when its total foreign share is larger than or equal to 50%. We do not distinguish partial ownerships from wholly ownerships in the majority acquired group as we believe that 100% foreign shareholding has similar implications in firm operations to a majority shareholding. Table 3.4 below presents a brief overview of the analytical sample. The table includes two panels and the upper panel presents acquisition patterns across years. The lower panel presents the observation overview of the treatment group and control group across the sample years.

As can be seen from the table, there are altogether 1,512 cases of acquisition from 2001-2006. In general, the foreign acquirers prefer holding a

majority share over a minority share. As can be seen from the upper panel, the number of the majority acquired cases exceeds that of minority acquired cases during 2001 to 2005. In addition, the appearance pattern in the lower panel shows that the majority acquired firms appear more frequently in the analytical sample than the minority acquired firms across the sample years[2].

Table 3.4: Overview of the analytical sample: Importers

Acquisition Overview	Acquisition cases	Minor acq.	Major acq.
2001	255	86	169
2002	150	69	81
2003	167	71	96
2004	354	138	216
2005	368	156	212
2006	218	112	106
Total	1,512	632	880

Observations Overview	FA obs.	Minor obs.	Major obs.	DE obs.	Total obs.
2000	499	223	276	2,543	3,042
2001	694	311	383	3,703	4,397
2002	869	372	497	5,403	6,272
2003	1,065	450	615	6,913	7,978
2004	1,296	531	765	9,381	10,677
2005	1,253	511	742	9,159	10,412
2006	1,210	485	725	8,684	9,894
Total	6,886	2,883	4,003	45,786	52,672

Figure 3.1 below shows the spatial distribution of acquisition according to our definition of firm level acquisition. The figure shows that acquisition cases are concentrated in coastal provinces such as Guangdong, Jiangsu, and Zhejiang.

As mentioned in the institutional background, the distinctive political environment of China shapes the acute geographic distribution of foreign acquisition. As is shown in the figure, Guangdong province has the most acquisitions with 431 cases from 2000 to 2006, significantly surpassing Jiangsu which ranks the second with 243 cases of acquisition, and Zhejiang the third with 220 cases of acquisition. The acquisitions from the three provinces account for 59% of the total acquisitions during the sample years. The figure informs us that it is important to take the distinctive facts of China into consideration when modelling the process of foreign acquisition.

[2] See additional sample description across relative year to acquisition in Appendix A.3

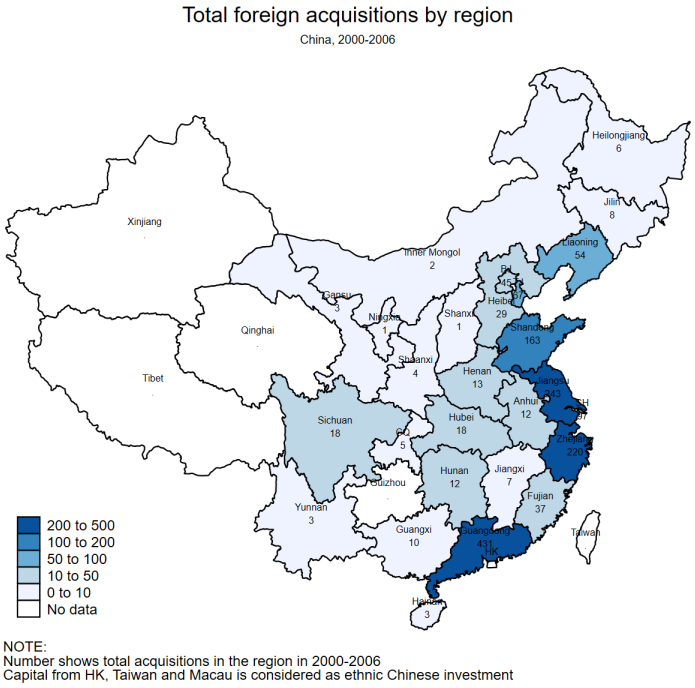


Figure 3.1: Acquisition by region

3.3.3 Summary statistics

Table 3.5 presents the definitions of key variables used in this research. The table comprises two panels. The upper panel defines key variables used as covariates for the propensity score weighting. The lower panel provides the precise definitions of outcome variables that this research intends to investigate[3].

Table 3.6 provides the summary statistics for the key variables used in this research. The statistics for non-acquired sample is reported in the first column. The second column reports the pre-acquisition summary statistics for acquired firms. Column (3) and Column (4) depict the characteristics of the minority acquired firms and the majority acquired firms one year prior to acquisition. The last column presents the summary statistics for the whole sample.

[3] The detailed calculation and descriptive statistics for product unit value is presented in Appendix A.4

Table 3.5: Definition of key variables

Variables	**Definition**
covariates	
productivity	TFP
employment	log of total number of employees
average wage	log of average wage per employee
age	establishing year
total asset	log of total asset
leverage ratio	total debt relative to total asset
capital intensity	log of net fixed asset per employee
exports	log of export value extracted from the ASIF, deflated
Outcome variables	
Product profile	
num. product	log of total number of imported product
product concentration	the percentage of the import value concentrating on the top imported product
unit value	average unit value
Sourcing country profile	
num. sourcing countries	log of total number of sourcing countries
sourcing country concentration	the percentage of the import value concentrating on the top imported country
sourcing country income	log of total export value weighted income per capita
Import and intermediate	
import value	total import value extracted from the CCTS dataset, converted and deflated
intermediate inputs	total intermediate inputs extracted from the ASIF dataset, deflated
Firm operational aspects	
fixed investment	log of total fixed assets
R&D intensity	the share of R&D expenditure to total sales

Table 3.6: Descriptive statistics of key variables

	Non-acquired		Acquired (t-1)		Minor acq. (t-1)		Major acq. (t-1)		Overall	
variables	mean (median)	sd	mean (median)	sd	mean (median)	sd	mean (median)	sd	mean (median)	sd
productivity (tfp)	4.90	1.17	4.62	1.23	4.72	1.23	4.54	1.22	4.88	1.18
	(4.95)		(4.69)		(4.77)		(4.62)		(4.93)	
employment (log)	5.91	1.20	5.37	1.06	5.47	1.09	5.31	1.03	5.86	1.19
	(5.82)		(5.35)		(5.45)		(5.30)		(5.77)	
avg. wage (log)	2.43	0.60	2.28	0.76	2.29	0.71	2.27	0.78	2.43	0.62
	(2.44)		(2.31)		(2.34)		(2.30)		(2.44)	
age	14.60	15.32	6.42	7.01	7.07	7.80	5.96	6.37	13.77	14.69
	(8.00)		(5.00)		(5.00)		(5.00)		(8.00)	
total asset (log)	11.13	1.57	10.33	1.41	10.55	1.46	10.18	1.36	11.06	1.56
	(10.97)		(10.20)		(10.43)		(10.06)		(10.89)	
leverage ratio	0.62	0.25	0.57	0.26	0.59	0.23	0.56	0.28	0.62	0.25
	(0.63)		(0.58)		(0.60)		(0.56)		(0.63)	
capital int(log)	3.92	1.22	3.58	1.47	3.75	1.37	3.46	1.53	3.89	1.25
	(3.95)		(3.58)		(3.77)		(3.45)		(3.92)	
exports (log)	9.83	1.68	9.74	1.59	9.79	1.59	9.70	1.59	9.84	1.67
	(9.97)		(9.85)		(9.87)		(9.79)		(9.97)	
num. of products (log)	1.59	0.94	2.03	1.06	1.75	0.92	2.22	1.10	1.65	0.97
	(1.39)		(1.95)		(1.61)		(2.08)		(1.39)	
num. of countries (log)	1.22	0.58	1.36	0.60	1.29	0.54	1.40	0.62	1.24	0.59
	(1.10)		(1.39)		(1.10)		(1.39)		(1.10)	
unit value	0.18	1.30	-0.05	1.18	0.14	1.21	-0.17	1.15	0.15	1.28
	(0.14)		(-0.10)		(0.10)		(-0.22)		(0.11)	
product concentration	0.76	0.25	0.67	0.26	0.74	0.25	0.63	0.26	0.75	0.25
	(0.84)		(0.68)		(0.78)		(0.61)		(0.81)	
sourcing country concentration	0.82	0.22	0.79	0.22	0.80	0.22	0.78	0.23	0.81	0.22
	(0.95)		(0.87)		(0.88)		(0.86)		(0.93)	
sourcing country income	10.62	1.38	11.17	1.39	10.84	1.27	11.39	1.42	10.70	1.40
	(10.54)		(11.01)		(10.65)		(11.22)		(10.55)	
import value	6.72	3.13	7.65	2.58	7.21	2.74	7.94	2.43	6.86	3.09
	(7.12)		(8.11)		(7.63)		(8.38)		(7.29)	
intermediary input	10.82	1.42	10.19	1.30	10.39	1.31	10.05	1.27	10.76	1.42
	(10.71)		(10.06)		(10.26)		(9.93)		(10.65)	
total sales	11.16	1.40	10.51	1.26	10.68	1.30	10.40	1.21	11.11	1.40
	(11.05)		(10.37)		(10.53)		(10.23)		(10.99)	
fixed investment	9.83	1.78	8.95	1.71	9.22	1.69	8.76	1.69	9.75	1.78
	(9.74)		(8.87)		(9.03)		(8.70)		(9.66)	
R&D intensity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
N	45786		1354		556		798		52672	

The table shows the systematic differences between the domestic non acquired firms and the acquired firms. The acquired firms have a lower productivity level in the pre-acquisition year compared with the non-acquired firms. The pre-acquisition productivity level decrease with foreign ownership. The majority acquired firms have a lower productivity level (with the mean productivity level at 4.54) than the minority acquired firms (with the mean productivity level at 4.72) one year prior to acquisition. The same characteristics extend to other observed pre-acquisition characteristics. First, as is presented in the table, prior to acquisition, the acquired firms seem to have a lower level of total employment and a lower average wages per employee. Second, the acquired firms are substantially younger than the domestic non-acquired firms. Among the acquired firms, the majority acquired firms are younger than the minority acquired firms prior to acquisition. The majority

acquired firms have an average affiliate history of 6 years while the minority acquired firms have an average affiliate history of 7 years. Third, the acquired firms have a lower ex-ante level of total asset, leverage ratios, capital intensity and total exports compared with the non-acquired firms. Moreover, the acquired firms differ from the domestic firms in terms of the number of products and the number of sourcing countries. As the descriptive statistics suggest, the mean number of products increases with the level of foreign ownership. The majority acquired firms have a higher number of products (2.22) than the minority acquired firms (1.75) prior to acquisition, which in turn leads the domestic non-acquired firms in the overall number of products (1.59). The same pattern that the number of sourcing countries increase with foreign ownership is observed for the acquired firms and the non-acquired domestic firms. The distinctive features of firms prior to acquisition suggest the importance of controlling for ex-ante differences between the non-acquired and the acquired firms.

3.4 Methodology

3.4.1 Identification strategy

The purpose of this research is to assess the causal effect of different level of foreign ownership on importers' import profiles. A fundamental problem associated with the identification of the causal effect arises from a non-random selection problem which remains the major obstacle for empirical research based on observational data. For observational data, the essential problem stems from the "missing counterfactual" that is impossible to observe. In the context of this research, how the import profiles would have been changed for the acquired firms had they not been acquired is unobservable in the sample. Failing to control for the missing counterfactuals will lead to biased estimation of the average treatment effect of foreign ownership.

In addressing this issue, this research employs the augmented inverse probability weighting (AIPW), one of the propensity-score based methods, to construct a missing counterfactual in order to ensure an unbiased average treatment effect of foreign acquisition. Although effective in controlling for selection problem, the propensity-score based method relies on the conditional independence assumption (CIA) which assumes random selection is based on observables. For this reason, the selection problem is still vulnerable to the influence of unobserved elements if the propensity-score based method is applied alone. Drawing on the experience from a series of microeconometric evaluation literature (Girma et al., 2015b), this research thus combines the augmented inverse probability weighting with the difference-in-differences method to eliminate the potential influence of time invariant unobservables on acquisition decision while tackling the selection problem.

3.4.2 AIPW with difference-in-differences

The selection problem

Let $y^s_{it+\tau}$ denote potential outcome for firm i acquired by foreign ownership categorized as type- s at a post-acquisition time $t+\tau$. Likewise, let $y^0_{it+\tau}$ denote potential outcome had this firm i not been acquired. For firm i only one outcome is observed, leaving the other outcomes the counterfactuals. For

instance, an acquired firm i with 35% foreign capital is categorized as $s = 1$, the observed outcome one year after acquisition for this firm is y^1_{it+1}. Simultaneously, y^0_{it+1} and y^2_{it+1} become the counterfactuals of the actual observed outcome y^1_{it+1}. The observed outcome $y_{it+\tau}$ thus can be decomposed as follows:

$$y_{it+\tau} = F^s_{it} y^s_{it+\tau} + (1 - F^s_{it}) y^0_{it+\tau} \tag{3.1}$$

To see the impact of each type-s foreign ownership (F^s_{it}), one can use "average treatment effect" (ATE) of F^s_{it}, expressed as follows:

$$\begin{aligned} \theta^s_{t+\tau} &= E[y^s_{it+\tau} - y^0_{it+\tau}] \\ &= E[y^s_{it+\tau}] - E[y^0_{it+\tau}] \end{aligned} \tag{3.2}$$

As can be seen from the above expression, the ATE estimation of F^s_{it} is obtained through comparing the average outcome of all firms acquired by a category of foreign ownership with the average outcome of the same group of firms had all of them remained domestic owned. Taking firm i with 35% foreign capital as an example, the ATE of the 35% foreign ownership F^1_{it} is defined as below:

$$\theta^1_{t+\tau} = E[y^1_{it+\tau}] - E[y^0_{it+\tau}]$$

Note that it is attempting to compare the mean outcomes of acquired firms with those of non-acquired firms for the above ATE estimation (equation 3.3)

$$E[y^s_{it+\tau} | F^s_{it} = 1] - E[y^0_{it+\tau} | F^s_{it} = 0] \tag{3.3}$$

However, the sample difference-in-means estimator is an unbiased estimator of ATE only when the potential outcome $y^s_{it+\tau}$ is independent of treatment F^s_{it}, or treatment independence. When the treatment independence is not assured the fundamental problem associated with the ATE estimation is thus raised through selection bias (Austin and Stuart (2015); Busso et al. (2014); Cameron and Trivedi (2005)). In the presence of selection bias, the simple

mean comparison of the treatment group and the control group leads to a biased ATE estimation.

Now that no firm could be observed to be in both the states of being acquired and meanwhile non-acquired and that only one outcome for either state (either acquired or non-acquired) is observed[4], it is impossible to calculate average outcome if all firms in the sample were acquired by type-s foreign ownership. Neither is it possible to calculate average outcome if all firms were non-treated. As a result, it is inappropriate to use the mean outcomes of indigenous firms as the approximations for the unobserved counterfactuals of acquired firms had they not been acquired. As is shown below, the simple difference in means estimation can be further decomposed into two parts, with the first part (3.5) of the equation showing the average treatment effect on the treated ATT and the second part (3.6) showing the selection bias.

$$E[y_{it}^{s}|F_{it}^{s}=1]-E[y_{it}^{0}|F_{it}^{s}=0] \tag{3.4}$$

$$=E[y_{it}^{s}|F_{it}^{s}=1]-E[y_{it}^{0}|F_{it}^{s}=1] \tag{3.5}$$

$$+E[y_{it}^{0}|F_{it}^{s}=1]-E[y_{it}^{0}|F_{it}^{s}=0] \tag{3.6}$$

Augmented inverse probability weighting

As mentioned before, the selection bias exists when treatment is not randomly assigned in the sample between the treatment and control group. In the context of this research, selection bias arises when the same attributes that determine firms' acquisition also play decisive roles in determining firms' future performance. This is also known as selection on observables.

There are two streams of strategies to address the issue: namely the covariates adjusted regression and the propensity score-based estimations, including stratification, matching, and inverse probability weighting (Girma et al., 2015b). As far as the first strategy is concerned, selection can be addressed through the covariates adjusted regression which includes both the treatment and a function of the confounders in the regression framework. However, an unbiased identification for the first strategy requires correct specification of the regression equation. As for the second strategy, selection can be addressed

[4] To be more specific, for firm i with 35% foreign capital ($F_{it}^{1}=1$), only y_{it+1}^{1} is observed one year after acquisition whereas y_{it+1}^{0} is unobserved simultaneously.

through constructing a pseudo-randomised sample where outcome is independent of treatment assignment (Robins et al., 1994). By assuming that treatment is random depending on a set of observable characteristics, we use the propensity score-based method to deal with the selection issue and compares the outcomes of individuals with the same pre-treatment attributes. However, an unbiased identification requires the propensity score-based strategies to include all relevant confounders in the propensity score estimation model. Following Girma et al. (2015b), we exploit the augmented inverse probability weighting (AIPW) approach or doubly robust estimator to address the selection issue.

The augmented inverse probability weighting (AIPW) or doubly robust estimator can be used to combine the inverse propensity score reweighting estimator (IPW) with covariates adjustment regression (Bang and Robins (2005); Robins et al. (1994); Emsley et al. (2008)). The IPW is a propensity score reweighting technique that is intended to reduce the selection bias through imposing the inverse of the propensity score for each observation getting treated. For this research, firms with higher probability to be acquired by type s of foreign ownership are weighted less according to their propensity score so that the ex-ante differences are eliminated between the acquired and the domestic firms. The AIPW approach is doubly robust since it combines IPW with covariates adjustment regression so that it offers two opportunities to adjust for the selection issue. A great advantage of such combination is that even one of the IPW and covariates adjustment models is miss-specified, it is still possible to produce an unbiased estimation as long as the other one has the correct specification.

Let X_{it-1} denote observed confounders that govern the acquisition F^s_{it}.For each type-s foreign ownership, the propensity score is estimated by the probability of being acquired by type-s foreign ownership relative to the counterfactual case had it remained local using an multinomial logit model conditional on X_{it-1}.

$$p^s = Pr(F^s_{it} = 1|X_{it-1}) = g(X_{it-1}) \tag{3.7}$$

$$Pr(F^s_{it} = 1|X_{it-1}) = \frac{e^{X'_{it-1}\beta^s}}{\sum_{s=1}^{2} e^{X'_{it-1}\beta^s}} \tag{3.8}$$

Where X_{it-1} is a vector of pre-acquisition covariates, p^s is a scalar representing the conditional probability of being acquired under foreign ownership category s. The original conditional probability is measured through a multinomial logit model with $\beta^s = (\beta_1^s, \beta_2^s, ..., \beta_k^s)'$ representing a vector of parameters associated with each foreign ownership category $s = 1, 2$ and $\beta^0 = 0$; $g(\cdot)$ represents the equivalent log linear function of the multinomial logit model.

Following Girma et al. (2015b), the general function of a combined covariate adjusted propensity score weighted regression is expressed as follows:

$$y_{it+\tau} = \beta + \alpha F_{it}^s + g(X_{it-1}) + \varepsilon_{it+\tau} \tag{3.9}$$

In the above expression, $y_{it+\tau}$ denotes the observed outcome. In this research, the import profiles in the post-acquisition period $t + \tau$. F_{it}^s is the multilevel treatment. The treatment $F_{it}^s = 1$ if firm i is acquired at time t in each foreign ownership category $s = 1, 2$. $F_{it}^s = 0$ if the firm has never been acquired throughout the sample period.

As Rosenbaum and Rubin (1983) suggest,the potential outcome should be independent of treatment conditional on the propensity score under the condition of CIA, as expressed below:

$$y_{it+\tau}^s, y_{it+\tau}^0 \perp F_{it}^s | X_{it-1}$$

$$\Leftrightarrow$$

$$y_{it+\tau}^s, y_{it+\tau}^0 \perp F_{it}^s | p^s$$

The average treatment effect can thus be estimated through doubly robust estimator which imposes a weight equal to $\frac{1}{p^s}$ on acquired firms, and a weight equal to $\frac{1}{1-p^s}$ on the counterfactuals. The ATE weights can be expressed as such:

$$w_{it}^{ATE} = F_{it}^s \frac{1}{p^s} + (1 - F_{it}^s) \frac{1}{1 - p^s} \tag{3.10}$$

According to Imbens (2004) and Busso et al. (2014), the IPW average treatment effect is obtained as such:

$$\theta^s_{IPW} = E[y^s_{it+\tau} - y^0_{it+\tau}] \tag{3.11}$$
$$= E[y^s_{it+\tau} - y^0_{it+\tau} | F^s_{it} = 1, X_{it-1}]$$

The first part estimates the average effect on the acquired firms under foreign ownership category s. Imposing weight according to Rosenbaum and Rubin (1983), we can express the first part as follows:

$$E[y^s_{it+\tau} | F^s_{it} = 1, X_{it-1}] = E[y_{it+\tau} \cdot 1(F^s_{it} = 1) | X_{it-1}] \tag{3.12}$$
$$= E[y_{it+\tau} \cdot 1(F^s_{it} = 1) \cdot \frac{1}{p^s(X_{it-1})}] \tag{3.13}$$

The second part estimates the average effect of the same firms had they not been acquired by type-s foreign ownership:

$$E[y^0_{it+\tau} | F^s_{it} = 1, X_{it-1}] = E[y_{it+\tau} \cdot 1(F^s_{it} = 0) | X_{it-1}] \tag{3.14}$$
$$= E[y_{it+\tau} \cdot 1(F^s_{it} = 0) \cdot \frac{1}{1 - p^s(X_{it-1})}] \tag{3.15}$$

In the above equation, $1(F^s_{it} = n)$ is a dummy value which equals one if the F^s_{it} takes the value in the bracket; $1 - p^s(X_{it-1})$ is the conditional probability for not being acquired. The ATE is thus obtained through the expression below:

$$\theta^s_{IPW} = E[y_{it+\tau} \cdot 1(F^s_{it} = 1) \cdot \frac{1}{p^s(X_{it-1})}] \tag{3.16}$$
$$- E[y_{it+\tau} \cdot 1(F^s_{it} = 0) \cdot \frac{1}{1 - p^s(X_{it-1})}]$$

As a result, imposing the inverse weights leads to the IPW estimator of ATE as follows according to Lunceford and Davidian (2004):

$$\hat{\theta}^s_{IPW} = \frac{1}{N} \sum_{i=1}^{N} [\frac{F^s_{it} \cdot y_{it+\tau}}{\hat{p^s}} - \frac{(1 - F^s_{it}) \cdot y_{it+\tau}}{1 - \hat{p^s}}] \tag{3.17}$$

Different from IPW estimator of ATE, the AIPW estimator of ATE is expressed as such:

$$\hat{\theta}^s_{AIPW} = \frac{1}{N}\sum_{i=1}^{N}[\frac{F^s_{it}\cdot y_{it+\tau}}{\hat{p^s}} - \frac{(F^s_{it}-\hat{p^s})\cdot \hat{L^s}(X_{it-1})}{\hat{p^s}}] \\ - \frac{1}{N}\sum_{i=1}^{N}[\frac{(1-F^s_{it})\cdot y_{it+\tau}}{1-\hat{p^s}} + \frac{(F^s_{it}-\hat{p^s})\cdot \hat{L^0}(X_{it-1})}{1-\hat{p^s}}] \tag{3.18}$$

In the equation above, the terms $\hat{L^s}(X_{it-1}) = E[y^s_{it+\tau}|X_{it-1}]$ and $\hat{L^0}(X_{it-1}) = E[y^0_{it+\tau}|X_{it-1}]$ represent the predicted values from the covariates adjusted regression of the outcomes on baseline covariates.

Again, as discussed earlier, the propensity score-based method is only valid if all confounders are observable. As a result, we combine the AIPW regression with a difference-in-differences method in order to eliminate the unobserved time-invariant confounders while addressing the selection issue. The simplified expression of difference-in-differences AIPW estimator of the ATE is as such:

$$\hat{\theta}^s_{DDAIPW} = \frac{1}{N}\sum_{i=1}^{N}(\Delta\hat{y}^s_{it+\tau} - \Delta\hat{y}^0_{it+\tau}) \tag{3.19}$$

Combine APIW and the difference-in-differences method, and the estimated average treatment effect would be obtained through the regression specification as follows:

$$\Delta y_{it+\tau} = \beta + \hat{\theta}^s_{DDAIPW}F^s_{it} + g(X_{it-1}) + \varepsilon_{it+\tau} \tag{3.20}$$

3.4.3 Pseudo-randomised sample

To obtain the pseudo-randomised sample, we first estimate the propensity score using a multinomial logit regression. We then apply linear regression on the propensity score weighted sample. The acquired firms are weighted by $\frac{1}{p^s}$ and the non-acquired firms are weighted by $\frac{1}{1-p^s}$). According to Lechner (2002) and Girma et al. (2015b), any pairwise combination of the categories

$(s = 0, 1, 2)$ within the multilevel treatment (F_{it}^{s}) can be applied to test the treatment effect. In this research, we follow Girma et al. (2015b) to set the domestic firms $(s = 0)$ as the control group and construct the counterfactual outcomes for the acquired firms had they remained domestically owned.

Propensity score

As a first step, we model the selection process of different levels of foreign ownership. We do so by using a multinomial logit model with the observed pre-acquisition year characteristics as explanatory variables to estimate the probability of a domestic firm to be acquired by two types of foreign ownership, a minority and a majority foreign ownership. The choice of covairates is motivated by a number of literatures. As is suggested in Girma and Gorg (2007a), Girma and Gorg (2007b) and Arnold and Javorcik (2009), the observed characteristics from one year prior to acquisition may play a significant role in governing the selection process. First, the existing literature provides evidence on selection over productivities. McGuckin and Nguyen (1995) reveals acquired firms are more productive than non-acquired firms. Girma et al. (2015b) finds general productivity premium across all acquisition types one year prior to acquisition. Second, Lichtenberg and Siegel (1987) advocates a positive influence of employment size on the probability of firms being acquired. In addition, Conyon et al. (2002) suggests acquired firms have a higher wage payment in pre-acquisition period. Moreover, Girma and Gorg (2007b) points out that the target firm's experience also matters for foreign acquirers. Arnold and Javorcik (2009) suggests firms with better credit history is more likely to be the target of acquisition.

Based on the above-stated information, the weighting covariates applied in the multinomial Logit estimation are productivity, total employment, average wage, firm age, leverage ratio, capital intensity and exports. All variables are extracted from the year prior to their acquisition. The marginal effects of the multinomial logit model are presented in Table 3.7. As can be seen from the table, the acquired firms differ systematically in terms of the above-mentioned firm characteristics. The results suggest that the majority foreign ownership tend to acquire less productive plants. However, without a decisive power in the production and managing process, the minority foreign acquirers do not seem to value productivity in their acquisition decisions. Second, the foreign

acquirers tend to avoid firms with large size of employees. One possible explanation could be that acquiring such firms can induce higher redundant bills compared with acquiring small sized firms Conyon et al. (2002). Thirdly, the majority foreign investors seek domestic partnership with the establishments that are able to pay higher wages, for the ability to pay a higher wage suggests a positive past operating performance. Additionally, the younger firms and the financed firms with less debt are more likely to be the targets of acquisition. Moreover, the less capital-intensive firms have a higher propensity to be acquired by the majority foreign ownership. Lastly, firms with higher level of export sales are more likely to be acquired by foreign ownership.

Table 3.7: Multinomial logit estimation of different types of acquisition

	(1) Minor Acquision b/se	(2) Major Acquisition b/se
productivity	-0.0001	-0.0133***
	(0.002)	(0.003)
employment	-0.0100***	-0.0133***
	(0.003)	(0.003)
avg. wage	0.0002	0.0167***
	(0.004)	(0.005)
age	-0.0016***	-0.0020***
	(0.000)	(0.000)
leverage ratio	-0.0191*	-0.0526***
	(0.010)	(0.011)
capital intensity	-0.0002	-0.0137***
	(0.002)	(0.002)
exports	0.0079***	0.0120***
	(0.002)	(0.002)
N	7844	7844

Note: all variables are from the year pre-acquisition;

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Balancing test

To assess whether the estimated propensity score has removed observed systematic differences for the acquired firms and the local firms prior to acquisition, a series of balancing diagnostics are carried out to ensure the balancing of covariates. Since there are no decisive rules by which tests are to be applied, several balancing tests are performed with descriptions and results

listed below[5] .

The first diagnostic applies standardized differences for all the matching covariates according to Rosenbaum and Rubin (1983) and Rosenbaum and Rubin (1985). The standardized difference for a matching variable X_k is defined as the difference in means between the acquired firms and the matched local firms, normalised by the square root of average variance of variable X_k in the unweighted (original) sample.

$$SD(X_k) = 100 \frac{\frac{1}{n_1} \sum_{i \in I_i} [X_{ki} - \sum_{j \in I_0} w(i,j) X_{kj}]}{\sqrt{\frac{var_{i \in I_1}(X_{ki}) + var_{j \in I_0}(X_{kj})}{2}}} \tag{3.21}$$

Since little consensus has achieved on the formal threshold value for a tolerable imbalance, Rosenbaum and Rubin (1985) suggest a SD value exceeding 20% signals a severe imbalance. The second diagnostic tool for covariates balance is the variance ratio. The variance ratio is defined as the variance of matching variable X_{ki} in the acquired sample as a ratio of the variance of X_{kj} in the local sample.

$$varianceration_k = \frac{var_{i \in I_1}(X_{ki})}{var_{j \in I_0}(X_{kj})} \tag{3.22}$$

A variance ratio lies between 0.5 to 2 for all X_k in all the propensity score strata can be considered as a sign for covariate balance.

Given that the aim of this paper is to estimate acquisition effects on a different level relative to the local firms, there are two pairwise comparison groups. Covariates need to achieve balance for each comparison group and this involves calculating 27 (7 continuous covariates and 3 categorical control variables times 2 levels of treatment) standardized differences and another 27 variance ratios in the weighted data.

The balancing results shown in table 3.8 suggest that the inverse probability weighting scheme manages to reduce covariate distribution difference, though there are some weak balance detected in the weighted sample for the majority acquired firms. The standardised difference of age for the majority acquisition are slightly out of the defined threshold of 20%. The variance

[5] The overlap diagnose for minority and majority acquired firms are presented in Figure B.2 of Appendix B.2

ratio of leverage ratio for the majority foreign acquired firms is more than twice dispersed as that of weighted local firms.

Table 3.8: Balancing tests for different types of acquisitions

	Observations	
Treatment	Raw	Weighted
local	6,753	2,297.2
minority	270	2,249.7
majority	369	2,845.1
Total	7,392	7,392.0

minority	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
productivity	-0.075	-0.026	1.160	1.177
employment	-0.282	-0.071	0.702	0.818
wage	-0.089	-0.050	1.237	1.056
age	-0.488	-0.098	0.225	0.709
leverage ratio	-0.196	0.020	1.002	0.887
capital intensity	-0.146	-0.107	1.163	1.093
exports	0.208	0.039	0.841	1.391

majority	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
productivity	-0.229	0.175	1.232	1.208
employment	-0.366	0.204	0.736	1.412
wage	-0.042	-0.056	1.459	1.196
age	-0.571	0.221	0.149	1.172
leverage ratio	-0.260	0.210	1.761	2.605
capital intensity	-0.306	-0.124	1.404	1.162
exports	0.167	0.126	0.818	1.398

3.5 Results and discussion

After establishing a sample of the comparable local firms and the acquired firms conditional on the propensity score, we are able to estimate the average treatment effect of different levels of foreign ownership on firms' import profiles through the DDAIPW estimator. This section presents the acquisition effects of different levels of foreign ownership on the acquired importers' import profiles and other firm level aspects within one year and two years of acquisition.

The first part of the results focuses on the acquisition effects on firms' import profiles. The discussion of this issue is divided into three parts: the acquisition effects on the imported product profiles, sourcing country profiles, and the effects on the total import value and intermediate inputs. The section then proceeds into discussing the treatment effects of different levels of foreign ownership on the importers' operational aspects. The second part of the results discusses firm level changes caused by different foreign ownership and the results are divided into two parts: the average acquisition effects on the importers' overall performance (such as productivity, total sales, and exports) and the average acquisition effects on firm operational aspects (such as total employment, average wage per employee, fixed investment, R&D intensity, and leverage ratio). The final part of this section provides a synthesised interpretation of the results discussed in the previous two parts.

3.5.1 Import profiles

Table 3.9 below reports the average treatment effects of different foreign ownership on firms' import profiles. Table 3.9 consists of 8 panels, showing changes in firms' import profiles one year and two years after acquisition. Each panel contains two sections, with the first section presenting the average treatment effects of minority foreign acquisition and the second section presenting the average treatment effects of majority foreign acquisition.

Product profiles

We first estimate the average treatment effect on the product profiles of importers. We begin by looking at how the number of imported products has

been changed due to minor or major acquisition. As is shown in Panel (1) of Table 3.9, on average, the minor acquired firms reduce the number of imported products by 14.3% one year after acquisition compared to their domestic counterparts. The magnitude of the variety cut in imported products doubles two years after acquisition for the firms acquired by minority foreign share, reaching 28.3%. For the firms acquired by majority foreign share, there is no significant adjustment in the number of products one year after acquisition. However, the firms acquired by majority foreign share increase the number of imported products two years after acquisition by 26.2%.

The above results show a distinctive restructuring process in the number of imported products for the firms acquired by minority foreign share and for the firms acquired by major foreign share compared with the indigenous firms. While the minority foreign acquired firms gradually cut back on the variety of imported products compared to the indigenous firms, the majority foreign acquired firms increase the variety of imported products. Keeping in mind the results of the previous chapter we discover that acquisition leads exporting firms to be "meaner and leaner" in their exported product profiles, we infer that the reduction in corresponding imported products for the minority foreign acquired firms may be explained by the same restructuring production process. As the minority acquired firms tend to shed a number of products and focus on producing their top-sold products, they no longer import as much variety of products as before (Eckel and Neary (2010); Dhingra (2013); Nocke and Yeaple (2006)).

It is important to note that although all the acquired firms have reduced the product range in exported product profiles, the minority foreign acquired firms differ systematically from the majority foreign acquired firms in imported product profiles. The majority foreign acquired firms increase the imported product range. The increase in imported product for the majority foreign acquired firms is consistent with the findings in Manova and Zhang (2009), where they find a positive link between the number of imported products and foreign ownership through cross sectional observation. Manova and Zhang (2009) find manufacturing firms in China tend to import a wider range of products and export a narrower range of products in general. They attribute this trade pattern to the output-input characteristics that are associated with the sector. They divide the sectors into two types according to the output-input characteristics. The first type of sector only needs a few basic inputs to produce multiple final products such as using cotton to produce various types of apparels, or using a few plastic inputs to produce toys of

different types, etc. while the second type of sectors requires a wider range of intermediate inputs to produce a single or a limited number of complex goods (such as electronic appliance, etc.).

With respect to ownership structure, Manova and Zhang (2009) state that the composition of ownership varies across sectors systematically that domestic firms tend to engage in the first type of sector, while firms with foreign shares tend to engage in the second type of sector. We supplement their findings by pointing out that within foreign acquired firms, minority foreign acquired firms are also different from majority foreign acquired firms in imported product composition. Only the majority foreign acquired firms tend to import a wider variety of products while the minority acquired firms do not.

Panel (2) of Table 3.9 shows the average treatment effects of different types of foreign ownership on the imported product concentration. As can be seen from the table, there is no significant adjustment in the import concentration of top-imported products for the minority foreign acquired firms one year and two years after acquisition compared with similar domestic firms. However, firms which are acquired by majority foreign shares reduce the import value on their top-imported products by 18% compared with their would-be acquired local counterparts. The more dispersed distribution of the import value across imported products is consistent with the above findings on more diversified imported products for the majority acquired firms two years after acquisition. It also attests to the explanation provided by Manova and Zhang (2009) that the majority foreign acquired firms tend to engage in more specialized productions of complex final goods that require a wider range of high skill level inputs.

As discussed above, it is highly possible that the majority foreign acquired firms mostly engage in high-tech processing trade via importing more sophisticated inputs. Upward et al. (2013) suggest that the growing sophistication in products made in China may be inherited from the imported intermediates through processing trade. Following this line of thought, we intend to find out whether foreign acquisition accelerates this process by upgrading their imported inputs. To do so, we look into different levels of foreign acquisitions' impact on the unit value of imported products. Panel (3) of Table 3.9 presents the change in the average unit value of imported products due to minority and majority foreign acquisition.

As can be seen from the table, the average unit value of imported products is reduced by 28% for the minority foreign acquired firms in the first year after acquisition. The reduction in the average unit value persists in the following year for the firms that are acquired by minority foreign share, reduced by another fold and reaching nearly 60% compared with the local firms that would have been acquired. However, there are no significant changes observed in the average unit value of imported products for the majority foreign acquired firms. The results suggest that foreign acquisition does not contribute to the rising sophistication of imported inputs. One explanation could be that the unit cost of imported inputs must be controlled effectively after foreign acquisition. In the post-acquisition period, the integration process can be challenging and often time consuming. Unlike other types of post-acquisition managerial changes (production process, financial management, etc.), the negotiation power inherited directly from the management requires little responsive time. One immediate consequence could be that the negotiation power of the acquired firms is levelled up right after acquisition so that the acquired firms are able to purchase better inputs with more favourable discount. This taken into account, there are always priorities in management's key objectives. Therefore, it can be argued that, as a performance indicator, cost control is more effective and intuitive for justifying a newly restructured managing team than a narrowed profit margin which is associated with expensive inputs.

Table 3.9: Average treatment effect of acquisition type on import profiles

ATE	one year late b/se	two years later b/se
(1) num. product		
minority vs local	-0.1429**	-0.2729***
	(0.072)	(0.095)
majority vs local	-0.0712	0.2619**
	(0.116)	(0.103)
N	3836	1904
(2) product concentration		
minority vs local	0.0370	-0.0421
	(0.033)	(0.033)
majority vs local	-0.0101	-0.1772**
	(0.041)	(0.074)
N	3836	1904
(3) unit value		
minority vs local	-0.2831**	-0.5704**
	(0.112)	(0.227)
majority vs local	0.1354	-0.0710
	(0.113)	(0.212)
N	3814	1890
(4) num. sourcing country		
minority vs local	-0.0452	-0.0793
	(0.057)	(0.065)
majority vs local	-0.0993	0.3888**
	(0.107)	(0.159)
N	3836	1904
(5) sourcing country concentration		
minority vs local	-0.0402	0.0189
	(0.029)	(0.041)
majority vs local	0.0548	-0.1457***
	(0.042)	(0.040)
N	3836	1904
(6) sourcing country income		
minority vs local	-0.1767	-0.4688***
	(0.148)	(0.155)
majority vs local	0.0240	0.4352**
	(0.131)	(0.185)
N	3832	1902
(7) import value		
minority vs local	-0.3901*	-0.6060**
	(0.219)	(0.276)
majority vs local	-0.2569	0.8273**
	(0.334)	(0.378)
N	3836	1904
(8) intermediate inputs		
minority vs local	-0.0492	-0.1392
	(0.079)	(0.105)
majority vs local	-0.0623	-0.0750
	(0.056)	(0.154)
N	4884	2438

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Sourcing country profiles

Having observed the distinctive restructuring process in the acquired importers' product profiles between the minority and majority foreign acquired firms, next we are interested in the investigation into the changes in the profiles of the acquired targets' sourcing country. How have the importers changed their sourcing country portfolio after acquisition? We provide an answer to this question by first looking into how different levels of foreign ownership lead to changes in the number of sourcing countries.

As can be seen from Panel (4) of Table 3.9, the acquired importers adjust their sourcing countries differently across different levels of foreign ownership. The minority foreign acquired firms do not change the number of their sourcing countries significantly compared to the domestic firms. For firms acquired by a majority foreign ownership, there is no significant change in the total number of sourcing countries one year after acquisition taking place. However, two years after acquisition, an average 39% increase in the number of sourcing countries is observed.

We then seek a further answer by asking how different levels of the foreign acquired firms restructure their imports across their sourcing countries. To be specific, we measure the average treatment effects of different levels of foreign ownership on the concentration of trade flow in their top sourcing countries. In so doing, we intend to find out whether the minority and majority foreign acquired firms concentrate their import on their top-imported sourcing country or distribute import dispersedly across sourcing countries instead. The results are presented in Panel (5) of Table 3.9, revealing a remarkably similar concentration pattern as that of imported products.

For firms that are acquired by a minority foreign share, there seems to be no significant change in the concentration of import in their top imported sourcing countries compared with their indigenous counterparts. However, there is a negative adjustment in the concentration of trade flow for the majority acquired firms two years after acquisition. The firms acquired by majority foreign ownership cut back on their imports from their top sourcing countries by an average 15% two years after acquisition. This result is corroborated with the fact that the majority foreign acquired firms import from more sourcing countries across which their imports are dispersed. It also suggests that by sourcing from a wider range of countries, the majority

acquired firms import less per sourcing country compared with the would-be acquired local firms.

We then proceed to investigate how the sourcing country profiles have changed in terms of the income level of sourcing countries due to different levels of foreign acquisition. We want to find out whether different types of foreign acquisitions have changed the importers' sourcing countries from lower to higher income countries or the other way around. To do so, we use income per capita data extracted from the World Bank dataset weighted by the total import value from that particular country as an indicator of the income level of the origin country. The results are shown in Panel (6) of Table 3.9. Again, we observe distinctive reallocation of sourcing countries in terms of income level for the minority and majority acquired firms.

The reallocation of sourcing countries in terms of income level is observed two years after acquisition. The minority foreign acquired firms on average import from less wealthy countries compared with the local firms. The weighted average income level of sourcing countries decreases by an average of 47% for the minority foreign acquired firms compared with their would-be acquired counterparts. Different from firms that are acquired by a minority foreign share, the firms acquired by a majority foreign share import from more wealthy countries two years after acquisition. The weighted average income level of sourcing countries has on average increased by 44% for the majority foreign acquired firms.

Two explanations may account for the differences in the sourcing country profiles between minority acquired firms and majority acquired firms. First, different types of acquisitions may require imported products with different levels of quality. The minority acquired firms require less sophisticated inputs from lower income countries while the majority acquired firms require imported inputs with higher quality or sophistication produced in higher income countries. An alternative explanation could be that foreign acquired firms tend to source from their country of origins. Specifically, minority acquired firms tend to be acquired by foreign capital whose country of origins are less wealthy countries. However, majority acquired firms tend to be acquired by foreign capitals from higher income origins.

Total import value and Intermediate input

Next, we come to firms' import profile adjustment in terms of total import value and total intermediate inputs applied in production. We intend to find out how total import values and total intermediate inputs have changed due to different levels of foreign acquisition. The results are presented in the last two Panels of Table 3.9. As is shown in the results, different patterns of change are observed in the total import value for the minority and majority foreign acquired firms. The total import value decreases by 39% one year after acquisition for the minority foreign acquired firms. The reduction in total import value expands in the following year, reaching an average of 61% for the firms acquired by a minority foreign share compared to the domestic firms with similar characteristics. The majority foreign acquired firms adjust the total import value in a different manner. The total import value increases by 83% two years after acquisition for the firms acquired by a majority foreign share compared with the would-be majority acquired local firms. However, no significant changes are observed in the total intermediate inputs for both types of foreign acquisition.

The above results for sourcing countries profiles are consistent with the findings in Manova and Zhang (2009) where they find foreign owned importers import from a wider range of countries compared with domestic firms. One explanation could be that foreign investors have better information on where to locate different inputs overseas and thus are more efficient at importing inputs from different locations.

The above findings also suggest that the minority acquired firms and the majority acquired firms restructure their import profiles in different manners during the post-acquisition period. On the one hand, the minority foreign acquired firms import fewer varieties of products from lower income countries compared with their domestic counterparts. On the other hand, the majority foreign acquired firms import a wider variety of products from more countries, and start to source from higher income countries. A possible explanation for the differences in firms' post-acquisition import profiles goes back to the source of foreign capital mentioned before. Potentially, there are three sources of foreign capital. First, the source of foreign capital is from developed economies such as the US, Japan, South Korea, or countries from the EU, etc. Second, foreign capital could come from less developed countries, such as Vietnam, Indonesia, or other South Asian countries neighbouring China.

Third, foreign capital could come from within China. The third type of foreign investment is also known as the round-trip acquisition, where Chinese investors set up a foreign account or use a foreign shell company to invest back into the Chinese market. For round-trip foreign investors, their key purpose of investing is to take advantage of the preferential tax policies that apply only to foreign companies. For the second type of foreign investors, exploiting the Chinese market and efficiency-seeking may be their primary goals. As a result, round-trip foreign investors and efficiency-seeking foreign investors have little incentive to import wider varieties of quality inputs from wealthier sourcing countries.

3.5.2 Other firm performance

Having examined the average treatment effect on firms' import profiles, we then investigate how firms' other aspects have changed due to different levels of foreign ownership. To explore this matter further, this section will discuss the average treatment effects on firms in two major aspects: performance and operation. We start by investigating how different foreign ownership has changed the acquired importers' performance, such as productivity, total sales and total exports. We then look at how the acquisition effects of different foreign ownership has changed the acquired importers' operational aspects, such as total employment, average wage paid to employees, fixed investment, R&D intensity and leverage ratio.

We first estimate the average treatment effect on the acquired importers' productivity measured as total factor productivity (TFP). The results are shown in the first panel of Table 3.10. As is reported in the results, both the minority and majority foreign acquired importers experience reductions in TFP. For the minority foreign acquired firms, the TFP is reduced by an average of 17% one year after acquisition. The reduction in TFP only persists in the short term, with no significant changes in TFP compared with their local counterparts two years after acquisition. For the majority foreign acquired firms, while no significant changes in TFP are observed during the first year of foreign acquisition, a sharp reduction in TFP is observed two years after acquisition that amounts to as much as 52% compared with their local counterparts.

Now that we have observed a general reduction in the total factor productivity for the acquired importers in both types of foreign acquisition, next we are interested in how the total sales of the importers have changed due to different levels of foreign ownership. The results are shown in Panel (2) of Table 3.10. While no significant changes in the total sales are observed during the first year of acquisition, there is an average 17% plunge in the total sales two years after acquisition for the firms that are acquired by a minority foreign share. For the majority foreign acquired firms, there is an average 10% reduction in the total sales during the first year of foreign acquisition.

An overall reduction in the total factor productivity and total sales is discovered in both types of the foreign acquired importers one year and two years after acquisition. This result contradicts many treatment-effect literatures of acquisition on firm productivity (Arnold and Javorcik, 2009). One possible reason arises from the sample of firms. While most studies apply samples containing all types of firms regardless of international trade participation, the sample applied in this research consists of importers only. Among these importers, 87% of them engage in both export and import (see details in Appendix A.3). It is highly possible that acquired importers are integrated into international production networks and become more specialized in a certain production process along the global value chain. Future work could be done to further investigate the underlying reasons of the reduction in productivity for acquired importers.

We then proceed to estimate the average treatment effects on the acquired importers' total exports. Different from the TFP and total sales we discuss above, minority and majority foreign acquisition leads to different patterns of change in the total exports for the importers. For the minority foreign acquired importers, there are no significant changes in the total exports induced by the acquisition during the first year of acquisition. However, their total exports experience a sharp decrease of 46% two years after acquisition compared with the would-be acquired local firms. Nevertheless, the majority foreign acquired firms exhibit different patterns. The importers' total export value increases by an average of 19% despite a general reduction found in their total sales during the first year of acquisition but the increase in the total export value does not persist in the long run. No significantly positive effects on the importers' total export values are found two years after acquisition compared with the indigenous firms with similar pre-acquisition characteristics.

The above results reveal a general reduction in the minority foreign acquired importers' overall performance in terms of the total product productivity, total sales and total exports. The majority foreign acquired importers experience similar reductions in TFP and total sales. However, different from the minority acquired firms, the majority acquired importers experience an increase in their total exports by 19% one year after acquisition. One possible explanation could be a restructuring of market focus for different types of acquired firms. The minority acquired importers focus on the domestic markets whereas the majority acquired importers focus on the overseas market.

Table 3.10: Average treatment effect of acquisition type on firm output

	one year later	two years later
ATE	b/se	b/se
(1) TFP		
minority vs local	-0.1696**	-0.2016
	(0.076)	(0.141)
majority vs local	-0.1069	-0.5159***
	(0.078)	(0.160)
N	4678	2320
(2) sales		
minority vs local	-0.0709	-0.1672*
	(0.075)	(0.102)
majority vs local	-0.0999**	-0.2085
	(0.048)	(0.136)
N	4881	2440
(3) exports		
minority vs local	-0.1806	-0.4625**
	(0.120)	(0.206)
majority vs local	0.1924*	-0.0492
	(0.115)	(0.184)
N	4393	2223

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In this final section, we look at how different levels of foreign ownership have affected the operational aspects of acquired importers, such as total employment, average wage paid to employees, fixed investment, R&D intensity and leverage ratio. The results are reported in Table 3.11.

The first panel shows the average treatment effect on the importers' total employment. As is indicated in the results, there is an average 20% reduction in the total employment for the minority acquired firms. The majority foreign acquired firms do not seem to have significant adjustment in their total hiring. On the contrary, the average wage paid to employees displays a converse effect between the two categories of firms. The minority foreign acquired firms do not seem to adjust the average wage paid to employee during post-acquisition period, while the majority foreign acquired firms downwardly adjust an average 12% in average wage one year after acquisition. Contradict to Arnold and Javorcik (2009) who find positive adjustment in labour force for Indonesian firms, the acquired importers in China either reduce the labour force in the minority foreign acquired firms or remain unchanged in the total employment for the majority foreign acquired firms. However, as mentioned in the previous chapter, the results are not able to reveal the compositional change in employment structure for no substitution of more experienced and educated workers for existing ones is observable (Lipsey and Sjoholm, 2006). One possible explanation for the reduction in the average wage in majority foreign acquired firms goes to performance-linked pay scale suggested by Lipsey and Sjoholm (2006). In this sense, the reduction in the average wage may be associated with the earlier observations for the decreased performances in total sales.

For the acquired importers, a divestment pattern is found in the minority acquired firms. The results are reported in Panel (3) of Table 3.11. As is evident in the results, the total fixed investment of minority foreign acquired firms is decreased by an average of 26% one year after acquisition. The divestment persists two years after acquisition, amounting to 29% reduction in the total fixed investment. For the majority foreign acquired firms, there is no significant adjustment in the total fixed investment during the post-acquisition period.

As far as R&D intensity is concerned, the minority foreign acquired importers differ systematically from the majority foreign acquired firms. Panel (4) of Table 3.11 presents the average treatment effect of different levels of foreign acquisition on R&D intensity. For the minority foreign acquired firms,

there is an average 1.67% increase in R&D one year after acquisition. However, for the majority foreign acquired firms, there is an average 5.26% reduction in R&D two years after acquisition. The results are consistent with Girma et al. (2015b) who find only partially acquired firms are more likely to engage in R&D while wholly acquired firms are less likely to undertake R&D activities compared with their local counterparts. They attribute the difference in R&D participation for different levels of foreign acquisition to the technology gap between foreign acquirer and acquired firms. The technology gap between the minority acquired firms and the foreign acquirer may be relatively big so that a positive effect on R&D intensity is observed shortly after acquisition. However, if the technology gap between the majority acquired firms and the foreign acquirer is relatively small, it may be no longer necessary for the acquirer to further engage in R&D activities. In addition to the technology gap, there is another possibility that the majority foreign acquired importers inherit technology upgrade from imported inputs so that they see little incentive to undertake further R&D activities.

Finally, we proceed to estimate the average treatment effects of minority and majority acquisition on importers' leverage ratio. The last panel of Table 3.11 reports the results. Consistent with the findings for the exporters in Chapter 2, acquisition leads to a steady decrease in the leverage ratio for both types of acquired importers. For the minority foreign acquired firms, the leverage ratio sees a reduction of an average 4.8%. The decrease persists and expands in to two years after acquisition, reaching an average 7.5% reduction in the total leverage ratio. The magnitude of reduction in the leverage ratio is more evident in the majority acquired firms. There is on average 8.7% reduction in the leverage ratio in the majority acquired firms compared with their domestic counterparts. The reduction goes into a further 13% decrease in the leverage ratio two years after acquisition for the majority acquired importers. The results are consistent with the findings discovered in previous chapter for the acquired exporters. The implication is that acquisition results in a restructuring in acquired firms' capital structure by decreasing their overall debt level and thus enhances the financial health of the acquired firms. The results are also supported by Desai et al. (2004) who find foreign affiliates are financially healthier than domestic firms.

Table 3.11: Average treatment effect of acquisition type on firm operational aspects

ATE	one year later b/se	two years later b/se
(1) total employment		
minority vs local	-0.0747	-0.2034***
	(0.052)	(0.056)
majority vs local	0.0129	-0.0853
	(0.038)	(0.087)
N	4886	2441
(2) avg wage		
minority vs local	-0.0587	0.0627
	(0.060)	(0.052)
majority vs local	-0.1198***	-0.0659
	(0.042)	(0.086)
N	4886	2441
(3) fixed investment		
minority vs local	-0.2557***	-0.2882***
	(0.071)	(0.103)
majority vs local	-0.0441	0.1770
	(0.086)	(0.176)
N	4881	2440
(4) R&D intensity		
minority vs local	0.0167**	0.0065
	(0.008)	(0.012)
majority vs local	-0.0133	-0.0526***
	(0.010)	(0.019)
N	4886	2441
(5) leverage ratio		
minority vs local	-0.0480**	-0.0759***
	(0.019)	(0.026)
majority vs local	-0.0871***	-0.1305***
	(0.023)	(0.030)
N	4886	2441

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.5.3 Further interpretation and discussion

Overall, the results reveal that foreign acquisition leads importing firms to restructure their import strategies and that the levels of foreign ownership have different implications on such strategical changes.

The majority foreign acquired firms import a greater number of products from a wider range of markets and hence have less concentration in import per product and import per origin. While no evidence suggests a higher cost of import per product, strong evidence shows that the majority acquired firms tend to import more in total value and from richer countries of origin as well. However, except for a sharp increase in total export value and an enhancement in the majority acquired firms' overall financial health, the adjustment in import strategy is accompanied with some degree of "efficiency loss". As suggested by the results, the majority foreign ownership leads to a substantial decrease in TFP and total sales, a cut in average wage payment to employees and expenditure on R&D.

Two possible scenarios contribute to the results. First, the majority foreign shareholding serves as information channels for domestic importers to access to the global market. The acquired firms could become smarter by taking advantage of the majority foreign owners' information in the global value chains. The second scenario is that the majority shareholding has a greater foreign control. Majority investors are motivated by using China as their export platform so that they could guide acquired subsidiaries to import from designated origins or preferred producers (possibly their own subsidiaries). Both the scenarios explain the strong evidence of wider imports accompanied by increased total export value for the majority acquired firms. As for the "efficiency loss" in TFP and total sales, it is highly possible that the majority foreign acquired Chinese firms are incorporated into MNE's intra-firm operations. In the presence of such operation, profits of individual plants are shifted within MNE's international production line, which makes it difficult to observe the actual productivity effect of such operation on individual plant along the production line.

On the contrary, the minority foreign acquired firms import a much narrower range of products from a smaller number of origins. They also import cheaper products from poorer countries of origin. While there's a moderate increase in R&D expenditure and financial conditions, these adjustments in

acquired firms' import strategies are accompanied by a reduction in total import value, TFP, total sales, exports, employment, and fixed investment. So, what has happened?

It can be argued that, the foreign shareholding chiefly serves as the role of access to information. That is to say, a minority foreign share is invested with the primary goal of gaining knowledge of the host market. As price paid to gaining local cooperation, the minority foreign acquired firms have little incentives to expand operations overseas, thus decreasing their total export value. However, such strategic change in restructuring market focus is not without domestic competition. In fact, the domestic competition can be as fierce as that of the international competition. As a result, cost cutting activities such as sourcing cheaper products from less wealthy countries, cutting import varieties are the optimal options for newly acquired firms. The decreased TFP and the shrink in total sales could also be explained by such market restructure when they are faced with fierce domestic competition.

Researchers and policy makers have long recognised the positive effect of FDI to the overall economy of recipient country. However, as the main players in trade, do all types of firms benefit from FDI? Or is it just specific types of firms that can benefit from certain types of FDI? So far, FDI research focus primarily on its impact on employees' benefit, firm performance, overall trade flows, and economic growth as a whole. How FDI actually affects firms' international operations, or more specifically, what specific strategical changes brought by acquisition have not been well understood. This research newly suggests that different levels of foreign acquisition affect import strategies of acquired firms differently. While majority foreign investment could enhance MNE's overall international operation, minority foreign shareholding which aims for the host market may face fierce domestic competition and experience declines in overall productivity over time. The results thus provide a valuable perspective for business practitioners, academic researchers and policy makers the strategical impact of FDI and make informed decisions based on the results.

3.6 Conclusion

This chapter provides the answer to the question of whether there is a causal link between different levels of foreign acquisition and firms' import profiles. We combine transaction level data with firm operation data to investigate the average treatment effect of minority and majority foreign ownership on firms' import structure and operational changes. This research makes use of the abundant firm characteristic information of the combined data to construct a pseudo-randomised sample through the augmented inverse probability weighting method. Moreover, we exploit the panel nature of the data to eliminate the time invariant unobservables through the difference-in-differences method.

We find a causal link between foreign acquisition and firms' import profiles. In addition, the effects of different levels of foreign ownership are heterogeneous. Minority acquisition causes firms to become "meaner and learner" through decreasing their total number of products and the total import value. Moreover, the minority acquired firms tend to import cheaper products from lower-income sourcing countries compared with the indigenous firms. For the majority acquired firms, they tend to increase the variety of products imported after acquisition. Furthermore, compared with the local firms, the majority acquired firms are more likely to import from higher-income countries. Notably, although the total import value of the majority acquired firms increase substantially after acquisition, there is no significant change observed in the average unit price of their imported products.

In this regard, this research opens up new areas for future exploration. In specific, what are the underlying reasons for the reduction in productivity of importers after foreign acquisition? Is the reduction in productivity a result of integration in the international production network? If so, could the reduction in productivity during the manufacturing process be compensated during other processes (such as sales and R&D) along the upper stream of global value chain? Over the long term, it is also worthwhile to look at whether the aggregate productivity has increased for firms engaging in processing trade. If not, is processing trade a sustainable vehicle to depend on for economic development in developing countries?

Chapter 4

Working Capital Management and Firm's Export Participation

4.1 Introduction

Having looked at how FDI affects firms' export and import profiles in the previous two chapters, we move on to examine the relationship between firm-level working capital management and firms' export participation. Financial constraints are barriers heterogeneous firms are faced with in the process of getting entry into international trade as investment activities are highly sensitive to their cash flow level. Firms will have difficulties in investment activities, R&D research, and employment decisions, etc. when they encounter financial constraints (Hubbard, 1998). Firms from a developing country like China with a deficient and underdeveloped financial market is a case in point. Although there has been a rapid increase of inward foreign investment in China since its WTO accession, Chinese firms are still facing severe external financial constraints when engaging in export. According to Claessens and Tzioumis (2006), around 75% of the Chinese firms in the sample of World Bank Investment Climates Survey regard financial constraint as a major obstacle for business developing. This situation is especially evident for China's domestic small and medium enterprises (SMEs). Different from other countries, companies in China suffer from a wider range of financial constraints

regarding their company sizes, geographic locations, the banking system liberalization and their ownership structure (Jarreau and Poncet (2010); Manova et al. (2015)). Huang (2002) also points out that there exists ownership discrimination in China's financing regime. State-owned companies can get easy access to cheap external finance continuously while private-owned SMEs cannot. Moreover, Chinese firms, especially SMEs, face different levels of external credit constraints, which, according to Manova and Yu (2016), restrict them to low value-added stages of production, and deprive them of opportunities for higher gains. Finally, Chinese SMEs that engage in export tend to have relatively low level of productivity.

On the other hand, however, China became one of the top two exporters worldwide in 2001 (Upward et al., 2013) and experienced an export boom between 2000-2007. Evidence finds that SMEs play a principal part in exporting activities that contribute to the export boom in China. According to Manova and Zhang (2009), the entry of new exporting firms contributes half of the export growth despite the financial constraints they encounter. This phenomenon contradicts to the belief that only the most productive firms can overcome the sunk cost so as to engage in export.

The above research background provides an interesting case that is worth exploration. How do financially-restrained firms overcome their finance difficulties meanwhile improving their export performance? What can be learned from their experience? And more importantly, how could we interpret the link between financial constraints and export?

After conducting an extensive literature review on the topics of financial constraints and international trade with a particular focus on export, we have identified a research gap that little is known about the link between financial variables and firms' export decisions. Bloom et al. (2018) are among the few who suggest a causal link between credit constraints and firms' decision on export mode and highlight the role of firms' efficient management in firms' performance and aggregate growth. Moreover, we find that among studies that look at financial variables, few of them focus on the role cash conversion cycle (CCC) plays in firms' export participation. Finally, existing literature on working capital management tends to focus primarily on its effects on firm performance whereas few papers have looked at the link between working capital management and export decision directly. These findings hereupon provide the main motivation for this study.

It is important to fill these research gaps for the following reasons: Firstly, working capital management plays a crucial role in business operation on a day to day basis (Sagan, 1955). According to Guariglia et al. (2011) working capital is defined as the excess current asset over current liabilities. Working capital is a prevalent metric for measuring the liquidity status, the managing efficiency and the overall financial health of a company. It is also a reflection of the results of various company activities, including export decisions apart from payment to suppliers, inventory management and collection of the actual revenue (Jose et al. (1996); Ng et al. (1999)).

A sound management of working capital is vital to maintain firms' healthy financial condition and improve firm performance and productive growth, and therefore is the prerequisite of export decisions. In a developing country like China where firms face severe external financial constraints, efficient working capital management is highly significant for their export activities. As Greenaway et al. (2007) put forward, the sunk costs, which is incurred by entering the exporting market, can be treated as a form of investment and is very likely to be affected by financial variables.

Secondly, to measure the efficiency of working capital management, cash conversion cycle (CCC), one of the liquidity measurements, should not be overlooked. According to Jose et al. (1996), CCC, as an important financial factor that reflects a firm's dynamic status of ongoing liquidity position is the most common way to represent firms' working capital management. CCC is a time lag between the expenditure on raw material and the collection of sales of finished goods. As a measurement of liquidity, CCC has a significant impact on firm performance (Brealey et al., 2011). When facing external financial constraints, most firms tend to maintain a high level of liquidity to ensure its investment activities (Greenaway et al., 2007).

In order to explore whether efficient working capital management causes the increase of the probability for a firm to become an exporter, we rely on the data form the ASIF of NBS that covers the period from 2004 to 2007. We use the Tobit model to estimate the effects of CCC on firms' export intensity and apply firm fixed effects to eliminate the time invariant unobservables prior to estimating CCC's effects on other firm performance.

Regarding export intensity, we find a positive relationship between working capital management and the export shares of firms. Additionally, a positive relationship is also found between efficient working capital management

and firm performance in terms of return on total assets, income margin and asset turnover. Moreover, our results show that a shorter CCC entails a higher level of total and domestic sales. However, the results do not suggest a casual link between efficient working capital management and the probability for a firm to become an exporter. The finding shows consistency with Greenaway et al. (2007) that better ex-ante financial health does not necessarily cause a firm to become an exporter.

This research first contributes to the current understanding of working capital management and export. It tries to investigate the "China export conundrum" from an internal rather than external financial point of view. To the best of our knowledge, no current literature has analysed the links between export and firm's working capital management based on a large firm-level database. In addition to the contribution to existing literature, this research also has practical implications. First, according to our findings, firms, in particular those that are facing financial constraints, can improve their export performance through effective working capital management. Second, from the perspective of policy makers, the research suggests that a better knowledge of working capital management helps to mitigate the liquidity risks firms will be facing during export activities.

The remainder of this chapter is organized as follows: section 4.2 provides literature reviews on the background information about financial constraints and export participation and working capital management. Section 4.3 describes the data and presents some descriptive statistics. Section 4.4 presents the baseline specification and estimation methodology. Section 4.5 describes the main empirical results and analysis. The last section concludes.

4.2 Literature review

As mentioned in the previous section, this research examines the relationship between working capital management and firms' export decision under the condition of facing external financial constraints. The review is therefore related to two strands of literatures: literature on financial constraints and export as well as literature on working capital management. Overall, this section lays the theoretical and empirical underpinnings for this study and points out the research gaps we intend to fill.

4.2.1 Financial constraints and export

A growing number of literatures in international trade have tried to find explanations for exporting decisions from firm heterogeneity point of view. There are theoretical and empirical evidence showing that firm productivity plays a significant role in outstanding export performance; more productive firms generate higher export profits and revenues through exporting more products to more destination countries (Greenaway et al. (2007); Manova (2013)). Recent studies find that successful exporters tend to attach importance to the quality of their products and thereby obtaining greater profitability; they use better quality inputs and more skilled workers to produce better quality products (Manova and Zhang, 2012a).

The above explanations provide multiple angles to understand firm' export decisions and performance. However, they are mainly based on the foundation of a perfect financial market that assumed that each company had equal access to enough funds. However, companies in fact face different levels of financial constraints because of financial market imperfection. There are extensive researches that have studied the effects of financial market imperfections on firms' activities. Given that China is still in the phase of developing its financial market, we intend to approach the export decisions of Chinese firms from another perspective i.e. from the perspective of *financial constraints* with the aim to bring new insights to complement current understanding of export decisions.

There is a large body of evidence corroborating that firms' export activity can be hindered when facing financial constraints (Manova and Yu (2016); Greenaway et al. (2007); Manova (2013); Nagaraj (2014); Forlani (2010); Berman and Hericourt (2010)). Therefore, financial constraints are taken as a contributing factor of firm heterogeneity that might have effects on firms' exporting decisions, export outcomes and ultimately profitability. Empirical evidence backing financial constraints hypothesis can be found in both developing and developed countries (for developing countries there are Bas and Berthou (2012), Berman and Hericourt (2010), and Harris and Robinson (2002). For developed countries there are Fazzari et al. (1988), Whited (1992) for the US, and Benito (2005) for the UK, etc.).

Chaney (2008) is among the first few to incorporate liquidity constraints into heterogeneous firm framework brought up by Melitz (2003). He points

out that firms with high liquidity are subjected to lower level of credit constraints and hence are more likely to cover the up-front sunk cost, which enables them to gain more accessibility to exporting.

Researchers have since tested the effects of financial constraints on companies' export decisions by applying data from both developing and developed countries yet with inconsistent conclusions. Greenaway et al. (2007) apply data from the UK manufacturing firms. They find that ex-ante financial health does not necessarily lead to exporting activities and that participating in exporting activities would make firms better off in financial health. However, Nagaraj (2014) and Forlani (2010) find financial constrains are negatively related to firms' exporting activities by adopting data from Indian Manufacturing companies and Italian SMEs respectively. Berman and Hericourt (2010) also provid supportive evidence for the impact of financial constraints on export decisions by applying data of firms from nine developing countries. Manova (2013) points out that credit constraints for up-front sunk cost is a crucial determinant of international trade.

The above literatures mainly focus on the contributing factor and impeding effects of financial constraints to heterogeneous firms. There are other studies extending it to the causal effect of credit constraints and firm management on production efficiency, product quality and exports. Manova and Yu (2016) develop a mechanism to study the potential effects of credit constraints on firms' export outcomes and profitability. In addition, they address the importance of firms' financial health and efficient management to export performance. It implicitly informs that when firms face different levels of external credit constraints, internal finance become extremely important for its performance and investment activities.

Bloom et al. (2018) further confirm the importance of efficient management to export activities. They find that management efficiency contributes to the probability for firms to engage in export and to their export revenues. Their study suggests the important role management plays in improving production efficiency as well as product quality in both China and the US. Notably, they point it out that management efficiency matters for developing countries such as China than for the US. Our research is close to their study but differs from theirs in that our research is intended to estimate how firm's working capital management affects firms' export participation in China.

4.2.2 Working capital management

Before jumping directly into the discussions on working capital management, it is crucial to clarify the definition of working capital in details. According to the definition given by Berman and Hericourt (2010), working capital refers to the excess current asset over current liabilities. Current asset is constituted of all kinds of liquid assets such as cash, short-term investments, account receivables and inventories. The total of liquid asset is compared to the total of liabilities due in the short run such as account payable, deferred income tax, and any other forms of short term obligations. This measure reveals the net liquid position for a firm to meet immediate due debts or any sudden unexpected expenses.

The financial tools to measure firms' net liquid position are called liquidity ratios, which play an essential role in appraising firms' financial conditions (Gitman, 1974). Those ratios are important to external credit analyst who care the extent to which the firm is covered by its most liquid resources for the upcoming due debts. However, traditional liquidity measurement such as current ratio, quick ratio, ratio of net working capital to current liabilities etc., only provides a static overview on firms' ability to meet short run obligations. Those ratios are not adequate indicators for financial practitioners from within the firms. The limitations of traditional indicators have been noted in Gitman (1974) and Richards and Laughlin (1980).

From an internal financial management point of view, the primary concern for a financial manager is to smoothen the circulation of funds, to monitor the current as well as expected future flows of cash to be able to provide funds when needed and to invest excess funds when appropriate (Guariglia et al. (2011); Jose et al. (1996); Ng et al. (1999)). Hence, the internal operation needs to be based not only on the static working capital ratios but also on a dynamic ongoing liquidity position. However, a satisfactory liquidity ratio does not necessarily imply a sound position of liquidity. For instance, managers may still need to borrow in order to meet the due debts when sizeable working capital is locked up in inventories and account receivables. On the other hand, the borrowing can also be postponed even when no cash are at hand if no payables are immediately due.

Following this line of argument, Gitman (1974) advocates a flowing concept of liquidity measurement using Cash Conversion Cycle (CCC). The measurement is dynamic considering that it is constructed using data from both

balance sheet and income statement and is embedded with a time dimension in the measurement of liquidity position (Jose et al., 1996).

The CCC focuses on the time lag between the outflow and inflow of cash. To be more specific, it measures the net operation cycle for a company from making actual transactions for its purchase of raw materials to the recovery of cash receipts from its customers. It captures explicitly the operation activities from purchasing the material, production, sales for manufacturing firms and their flow of cash payments which are not fulfilled synchronizedly with these activities mentioned before. According to Richards and Laughlin (1980), there are three components in the construction of cash conversion cycle: an inventory conversion period, namely, *Days' Inventory on Hand* (DOH); a receivable collection period, *Days' Sales Outstanding* (DSO); and a payables conversion duration, *Days' Payable Outstanding* (DPO)[1]. The interrelationship among those components of CCC can be illustrated as follows:

$$CCC = DOH + DSO - DPO \tag{4.1}$$

As the operations primarily concerns the flows of cash from the aforementioned activities, the active management of inventories, account receivables and payables is crucial to affect firms' liquidity position. A lower level of CCC is perceived as more efficient in working capital management. The mechanism through which management of inventories, receivables and payables are discussed as bellow:

Firstly, a shorter inventory conversion period (hence shorter DOHs) is preferred[2]. Excessive inventories can drain funds from other profitable activities and may lead to more borrowings in the lock-up period. Keeping a high level of stock will induce expenses such as warehouse rent, and other administrative costs (insurance for the inventory, security costs, etc.) that tend to rise as the increase of inventory levels (Kim and Chung, 1990).

Secondly, a shorter period of recovering revenues from receivable (hence shorter DSOs) is also helpful for improving efficiency in working capital management. It is likely that firms will seek for additional external financing when cash is locked up in receivables. This additional borrowing will involve higher financing costs (Banos-Caballero et al., 2014). In addition to higher

[1] See Appendix A.5 for detailed calculations of DOH, DSO and DPO

[2] Alternatively, a higher *Inventory Turnover Ratio* (ITO), indicating the frequency for rotating inventories into sales is more desirable. See Appendix for calculation of ITO.

financing cost during the lock-up period, firms are more likely to face credit risk as external financing level climbs up. When the net income from business operation is not able to cover the high interest expenses from constant borrowing, firms will fall into financial distress and even worse bankruptcy. As a result firms have incentives to shorten the period of being locked up. Moreover, keeping a high level of working capital also induces opportunity costs for reinvestment of a potential early receipts. Longer locked-up period in inventories and account receivables will hamper the firms from taking up investment opportunities in value-enhancing projects.

Lastly, a longer payables period (hence longer DPOs) is ideal for improving the efficiency in working capital management. Account payable can be perceived as implicit trade credit provided by suppliers (Fisman and Love, 2003). As mentioned in Deloof (2003) firms tend to purchase inputs from suppliers who offer more generous payable policies for undifferentiated products. Emery (1984) also suggest that trade credit from suppliers is cheaper than short term financing in the money market.

Current empirical literatures mainly focus on the relationship between working capital management and firms' profitability. However, the effects of working capital management on firm's overall performance are inconclusive in literatures. Jose et al. (1996) examines how working capital management affects firms' productivity. Specifically, they test the relationship between firms' CCC and different measures of profitability using a large cross sectional data spanning over 20 years. Their results show that a short CCC will enhance firms' profitability over the long run. However, the profitability enhancing effect of CCC does not seem to persist across industry. On the other hand, there's empirical evidence advocating a longer CCC's positive effects on profitability. A longer CCC involves either a longer period of days' inventory on hand (DOH), a longer days' sales outstanding (DSO), or a shorter days' payable outstanding (DPO). Blinder and Maccini (1991) states that a longer CCC potentially enhances profitability through a longer DOH. They argue that a longer DOH is associated with higher sales, a lower cost induced by possible interruption during production, and a stable profit margin against price fluctuations. Ng et al. (1999) attributes the profitability enhancing effect of a longer CCC to a longer DSO or a sales collection period. They demonstrate that a longer sales collection period may lead to a higher sales revenue through strengthening the long-term relationship with customers.

4.3 Data and summary statistics

4.3.1 The dataset

This part provides descriptive information of the data. The dataset in use is the annual report of industrial companies compiled by the National Bureau of Statistics (NBS) over the period 2002-2006. This data includes companies with annual turnover larger than 5M Yuan (approximately $650,000 using average CNY/USD rate during the data period). These companies contained in the dataset operate in the manufacturing sectors and account for most of industry output across all 34 provinces (including 4 province-equivalent municipal cities) in China. The dataset includes main information on three financial reports (balance sheet, income statement, and cash flow statement). Besides it contains firms specific information on the ownership structure, operating industry, geographic location, firm age, and total employment, etc.

We drop observations with unreasonable value including companies with negative sales, those whose fixed/current assets surpass its total assets, whose current depreciation is larger than its accumulated depreciation and whose inventory exceeds its current assets. Additionally, we exclude observations with negative DIO, DSO and DPO. We also eliminate the observations that don't have complete records on the key variables in use. One percent tails of key variables used in the research are trimmed to control for the potential influence of outliers. The panel therefore comprises 404,229 observations for 185,021 firms, covering 2004 to 2007.

Table 4.1 presents the details about the panel data structure by year, export status and ownership structures. The dataset is unbalanced with only 185,021 firms presented in all 4 years. In the sample, 84,154 out of 404,229 firm year observations are continuous exporters (20.82%); 248,869 observations only have domestic sales (61.57%); firms start their exporting business during the sample period have 21,149 observations (5.23%); and firms exit from overseas business have 21,596 observations (5.34%).[3] Table

[3] We define "Cont.Exporters" as those who exported throughout the years they are presented in the sample. It can be the case that the firms just started exporting on the year of observing, or have started ever since establishment. Different sample period can result in different definition of exporting status. To be specific, firms who started exporting from 2004 are defined as continuous exporter when we restricted the sample year from 2003 to 2004. Those firms are defined as "Entrant" if sample period is drawn from 2003-2007. As a result, the denomination of "Cont. Exporter" only refers to firms that kept exporting within the sample period 2004-2007. Similarly, "Entrant" are firms that don't have export

Table 4.1: Description of panel data

	Num of Obsv.	Percent	Cumulative
Year			
2004	62,887	15.56	15.56
2005	106,353	26.31	41.87
2006	111,585	27.60	69.47
2007	123,404	30.53	100.00
Total	404,229	100.00	
Export Status			
Cont. Non exporter	248,869	61.57	61.57
Cont. Exporter	84,154	20.82	82.38
Entrant	21,149	5.23	87.62
Exiter	21,596	5.34	92.96
Switcher	28,461	7.04	100.00
Total	404,229	100.00	
Ownership Structure			
SOEs	6,825	1.69	1.69
Foreign	55,352	13.69	15.38
Private	342,052	84.62	100.00
Total	404,229	100.00	

Table 4.2: Export status by owership structure

	SOEs	Foreign	Private	Total
Cont. Non exporter	5,452	11,850	231,567	248,869
Cont. Exporter	557	30,489	53,108	84,154
Entrant	209	3,836	17,104	21,149
Exiter	226	4,247	17,123	21,596
Switcher	381	4,791	24,906	30,220
Total	6,825	55,352	342,052	404,229

4.2 provides a summary of firms' export status across ownership structures. The table indicates that only 20% SOE (1,373 out of 6,825) exports and less than a third (32.3%) private firms have access to the overseas market. However, nearly three quarters (78.6%) of the foreign firms participate in the export market, indicating that export is the major business activity for most foreign funded firms in China.

4.3.2 Summary statistics

Table 4.3 and 4.4 provide descriptive statistics on firm specific variables and working capital related variables by ownership structure and export status respectively. The statistics show a considerable difference in firm characteristics among different ownership structure. First, foreign funded firms are the largest in size in terms of total assets, SOEs rank the second and private firms are the smallest. This finding is in line with the fact that foreign firms are generally more abundant in capital whereas private firms are more capital restricted. Second, the state-owned firms are generally older with an average age of 17.74 years compared to only 8.7 years for the whole sample, while the foreign and private firms are younger with an average firm history of 7.37 and 8.74 years respectively. Third, SOEs have the lowest productivity level compared with the foreign and private firms. In addition, foreign firms hire more employees than the other two ownership types and treat their employees more generously with higher wage payment. The leverage ratio, indicating how heavily the firm is leveraged by using external finance, is the highest for SOEs among all other ownership structure. This in a way suggests that SOEs have a wider source of external finance and thus are more leveraged in debts.

Panel B of Table 4.3 contains information about working capital management in different ownership. Focusing on the full sample, the days' inventory on hand (DOH) is 55.61 days, indicating that it takes a Chinese firm 56 days on average to sell its stocks from the time of being produced. SOEs have the longest DOH ratio (91.62 days). Private companies have the shortest DOH ratio with only 52.1 days. The average days' sales outstanding (DSO) is 53.89 days for the full sample, implying that it takes a Chinese firm approximately 54 days to claim its revenue after making a sale. The figure is the highest for SOEs and lowest for private enterprises. It might imply either a weaker

on the first year (2004) and start exporting during the sample years. They could be defined as "Switchers" if they had exporting history before the observed period.

Table 4.3: Descriptive statistics by ownership structure

		Full Sample		SOEs		Foreign		Private	
	Definition	Mean	Med	Mean	Med	Mean	Med	Mean	Med
Panel A: General firm characteristics by ownership structure									
Assets	Log of total assets	9.43	9.42	9.75	9.81	9.77	9.81	9.37	9.34
		(0.84)		(0.82)		(0.79)		(0.83)	
Age	Firm age	8.70	6.00	17.74	13.00	7.37	6.00	8.74	6.00
		(7.47)		(13.38)		(4.42)		(7.57)	
Productivity	TFP	4.55	4.56	4.30	4.33	4.65	4.68	4.54	4.55
		(0.91)		(1.02)		(0.95)		(0.90)	
Emp.	Num.of employees	136.43	90.00	162.99	110.00	198.75	130.00	125.81	86.00
		(152.47)		(180.30)		(220.27)		(134.97)	
Wage	Wage per person	15.35	12.67	16.72	13.34	19.94	16.04	14.58	12.25
		(16.12)		(13.74)		(33.24)		(10.98)	
Levg.	Leverage ratio	0.57	0.58	0.58	0.59	0.48	0.47	0.58	0.60
		(0.22)		(0.22)		(0.21)		(0.22)	
Panel B: Working capital related variables by ownership structure									
DOH	Days' inv on hand	55.61	34.27	91.62	68.51	72.84	52.88	52.10	31.33
		(63.28)		(83.92)		(70.94)		(60.75)	
DSO	Days' sales outsd.	53.89	36.37	60.70	42.96	56.87	42.42	53.28	35.29
		(55.76)		(61.10)		(54.74)		(55.79)	
DPO	Days' Payable outsd.	44.49	28.32	55.09	36.90	60.11	44.92	41.75	25.91
		(50.70)		(59.27)		(58.46)		(48.63)	
ITO	Inventory turnover	54.67	10.18	35.12	5.11	45.37	6.64	56.56	11.14
		(622.82)		(465.22)		(880.79)		(273.20)	
CCC	Cash conversion cycle	65.01	47.02	97.22	77.37	69.60	53.57	63.63	45.59
		(74.08)		(91.16)		(77.06)		(73.03)	
N	Number of observations	404,229		6,825		55,352		342,052	

Note: standard deviations are reported in parenthesis

bargaining power (less possible) or more abundant working capital that allowing SOEs to extend its trade credit for its customers. The mean days' payable outstanding (DPO) is the highest for foreign firms (60.11 days) and the second highest for SOEs (55.09 days). The DPO of both ownership types are a lot higher than that of private firms (41.75 days), indicating a much weaker supplier bargaining power for private firms (Better terms of a longer payable period are often granted to SOEs and foreign companies than private firms. This may be due to the fact that private enterprise are considered less credible and have higher propensity to defer payment to suppliers or even default on the signed contract.) Accordingly, the inventory turnover ratio (ITO) is the highest for private firms and the lowest for SOEs. The rationale is that private companies need to increase its inventory turnover to ensure a fast rotating of its inventories into revenues.

Lastly, the average cash conversion cycle (CCC) is 65.01 days for the whole dataset (considerably lower than the value (96.8 days) recorded by Claessens and Tzioumis (2006), who studied 7722 listed firms in 42 countries, both advanced and developing, over 2000 to 2006.), 97.22 days for SOEs, 69.6 days for foreign firms, and only 663.63 days for private firms. The longer the time span is, the less efficient management on working capital will be. Again, SOEs appear to be the least efficient in managing its working capital and private firms are the most efficient in working capital management.

We are now moving on to the descriptive statistics across export participation. Column(1) of Table 4.4 refers to the statistics of the entire sample; Column(2) to the non-exporting firm-year observations; Column(3) to those exporting firm-year observations. Column(4) refers to firms that were not exporting on the first observation year 2004, but started exporting in any of the following years and kept exporting ever since. Lastly, Column(5) refers to those firms that never exported and Column(6) to the firms that always exported throughout the sample period[4]. In line with the prior empirical findings in Bernard and Jensen (1999), exporting firms are larger in size (both in terms of total assets and number of employees) and more productive, represented by a higher average TFP value for "Entrants" (4.62) and "Continuous Exporters" (4.68) than those of "Continuous Non-exporters" (4.47). However, different from international evidence, exporting firms in China tend to be younger. Regarding to leverage ratio, the results are quite similar between exporting groups, with "Entrants" having a slightly higher (0.58) leverage

[4] The sample included "Switchers", defined as firms that changed their exporting status more than once during the period considered, but the statistics are not provided

Table 4.4: Descriptive statistics by export participation

	Full Sample		Exp=0		Exp=1		Entrant		Cont. Non-exp		Cont.Exp	
	Mean	Med	Mean	Med	Mean	Med	Mean	Med	Mean	Med	Mean	Med
Panel A: General firm characteristics by Export Status												
Assets	9.43	9.42	9.37	9.35	9.57	9.58	9.42	9.41	9.36	9.33	9.59	9.61
	(0.84)		(0.83)		(0.85)		(0.85)		(0.83)		(0.85)	
Age	8.70	6.00	8.85	6.00	8.36	7.00	8.35	6.00	8.88	6.00	8.43	7.00
	(7.47)		(7.89)		(6.38)		(6.79)		(8.02)		(6.29)	
TFP	4.55	4.56	4.49	4.50	4.68	4.70	4.62	4.63	4.47	4.48	4.68	4.70
	(0.91)		(0.92)		(0.88)		(0.89)		(0.92)		(0.87)	
Emp.	136.43	90.00	112.23	80.00	193.72	133.00	147.36	102.00	107.52	76.00	207.43	145.00
	(152.47)		(118.51)		(200.92)		(144.16)		(114.09)		(214.23)	
Wage	15.35	12.67	15.03	12.34	16.12	13.48	15.39	12.68	15.00	12.30	16.43	13.80
	(16.12)		(11.98)		(23.13)		(12.16)		(12.01)		(26.56)	
Levg.	0.57	0.58	0.57	0.59	0.56	0.58	0.58	0.60	0.57	0.59	0.56	0.57
	(0.22)		(0.22)		(0.22)		(0.22)		(0.22)		(0.22)	
Panel B: Working capital related variables by Export Status												
DOH	55.61	34.27	54.12	32.21	59.13	39.36	57.09	35.77	53.80	31.89	60.33	40.86
	(63.28)		(63.24)		(63.23)		(63.32)		(63.19)		(63.71)	
DSO	53.89	36.37	56.65	37.57	47.37	34.27	51.90	36.28	57.23	37.80	46.41	34.18
	(55.76)		(58.84)		(47.02)		(52.54)		(59.55)		(45.65)	
DPO	44.49	28.32	43.11	25.87	47.75	33.74	44.90	29.67	42.94	25.47	49.08	35.36
	(50.70)		(50.95)		(49.93)		(49.94)		(51.12)		(50.26)	
ITO	54.67	10.18	56.79	10.78	49.69	8.95	59.24	9.73	55.55	10.89	47.93	8.61
	(622.82)		(654.49)		(541.04)		(703.28)		(553.01)		(589.69)	
CCC	65.01	47.02	67.66	48.73	58.75	43.32	64.09	46.69	68.10	49.09	57.66	42.87
	(74.08)		(75.51)		(70.20)		(73.48)		(75.66)		(69.68)	
N	404,229		284,213		120,016		21,596		248,869		84,154	

Note: standard deviations are reported in parenthesis

ratio than their counterparts (all showing an average leverage ratio around 0.56 and 0.57 across groups). New entrants are highly likely to lever up to fund their upfront sunk cost before engaging in international trade.

Similar differences are observed when we compare working capital management related variables across exporting groups. To be specific, exporting firms ("Cont.Exporters" and "Entrants") display a shorter DSO (46.41 days and 51.9 days respectively compared with 57.23 days for "Cont.Non-exporters") and a longer DPO (49 days and 45 days compared with 43 days for "Cont.Non-exporters"). A shorter DSO for exporters implying there is a shorter lag between sales and receipt of transaction. A longer DPO suggests there is more abundant implicit trade credit from suppliers and thus more abundant working capitals. The inventory operation cycle tells a slightly different story from being expected. Ideally, shorter days' inventory on hand (DOH) may imply a greater efficiency in the operation cycle from production to sales. However, the production cycle is highly dependent on the industry and the sales cycle also depends on the distance of trade destinations. As a result, exporters display a longer DOH than that of non-exporters in the sample with "Cont.Exporters" showing the longest 60.33 days of DOH, and "Cont.Non-exporters" with only 53.80 days on average. Overall, exporters have shorter cash conversion cycles regardless of longer average inventory operation cycles. "Cont.Exporters" have an average CCC of 57.66 days, whereas "Cont.Non-exporters" have an average CCC of 68.10 days.

In summary, descriptive statistics suggest a link between exporting status and firms' working capital management. However, it is not clear whether exporting makes firms more efficient in their working capital management or it is the efficiency in working capital management that leads to active export participation. The following parts will look into this point in depth.

4.4 Methodology

The aim of this chapter is to assess the effect of cash conversion cycle (CCC) on firms' export participation. We intend to find out whether a more efficient working capital management, measured by CCC, leads to a higher propensity for firms to export, higher export intensity and better performance in other firm level aspects such as return on total assets, income margin, total turnover, total sales, domestic sales and total exports.

A major concern for the causal identification is that cash conversion cycle is potentially endogenous. A potential endogeneity problem arises from two sources, namely, a reverse causality problem and a missing data problem. First, the reverse causality problem arises when the observed relationship between firms' export activities and CCC reflects not only the effects of CCC on a firm's export participation but also the effects of export participation on CCC. In other words, although a shorter CCC may lead to a higher possibility of exporting and a higher export share, it could also be true that exporting activities shortens firms' CCC. The second endogeneity concern arises from a missing data problem. It is possible that there are unobserved factors that could affect firms' exporting activities and firms' cash conversion cycle simultaneously. To control the above stated endogeneity issues, all regressors are lagged one period to mitigate the problem of reverse causality. In addition, firm fixed effects are applied to the control of any time invariant unobservable that may potentially affect both firms' cash conversion cycle and firms' export participation. The remainder of this section proposes the estimation strategies applied in this research.

4.4.1 Baseline model

This section describes the baseline empirical model to estimate the impact of cash conversion cycle on the outcome variables of interest, specifically the probability of firms' becoming exporters, export intensity and a series of other firm level outcomes. Based on exporting decision model developed by Bernard et al. (2003), a general linear model is proposed as follows:

$$Y_{it} = \beta_0 + \beta_1 CCC_{it-1} + \beta_2 \mathbf{X}_{it-1} + \beta_3 \mathbf{D}_{it-1} + \beta_4 fin_{it-1} + \epsilon_{it-1} \tag{4.2}$$

In the above equation, Y_{it} is the dependent variable, CCC is the main variable of interest and is defined as the time difference between expending and collection of cash. $\mathbf{X}$ is a vector of firm covariables following a series of previous empirical literature on heterogenous firm and export (Bernard et al. (2003); Greenaway et al. (2007); Girma and Gorg (2007a) etc.), including productivity, TFP, size, age. $\mathbf{D}$ is a full set of control variables such as ownership structure, industry, region, and year. Additionally, firm's leverage ratios are included in the regression model as fin to control its potential influences on firms' export participation (Greenaway et al. (2007)). As in Roberts and Tybout (1997) and Bernard (2004) all variables in $\mathbf{X}$ are lagged by one period to avoid reverse causality.

Table 4.5 below is the correlation matrix for variables used in the subsequent analysis. Formal test of multicollinearity has been carried out for the variables bellow and confirms that multicollinearity is not present in the model. Specifically, variance inflation factor (VIF) for each independent variable in the empirical model is calculated. The mean VIF for all independent variables in use is 1.06 with the highest VIF 1.11 for CCC, which is far from 10 the threshold value for having serious multicollinearity problems according to Studenmund (2017)

Table 4.5: Correlation matrix

	Export int	Exporter	CCC	TFP	Assets(log)	Age	Levg.
Export int.	1.000						
Exporter	0.833***	1.000					
CCC	-0.0746***	-0.0421***	1.000				
TFP	0.0720***	0.0860***	-0.183***	1.000			
Assets(log)	0.0331***	0.108***	0.219***	0.0619***	1.000		
Age	-0.0309***	-0.00844***	0.135***	-0.0397***	0.157***	1.000	
Levg.	-0.00221	-0.00485***	-0.00802***	-0.0222***	0.00852***	0.0452***	1.000

Note: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.4.2 Binary choice model

As stated above, the impact of CCC on international trade participation is of the key interest of this paper. To investigate into this subject, we intend to estimate how firms' CCC affects (1) the probability of a firm becoming an exporter and (2) the exports intensity measured as the share of total sales. It is widely acknowledged that there are potential flaws of using the linear probability model to estimate the probabilities of dichotomous outcomes. The linear probability model cannot ensure that the estimated coefficients are bounded within zero and one, which contradicts the nature of probability. In the context of this research, we use a dummy variable $exporter_{it}$ as the outcome variable to represent exporting status for $firm_i$ in year t. The outcome variable is defined as follows:

$$exporter_{it} = \begin{cases} 1 & \text{if } exports_{it} > 0 \\ 0 & \text{otherwise} \end{cases}$$

In the above equation, $exports_{it}$ is the annual exports value during the sample period spanning from 2004 to 2007. The decision of entering the exporting market can be seen as driven by a latent variable that captures positive gains from exporting. The conditional expectation for $exports_{it}$ is as such:

$$E(exports_{it}|\mathbf{x}_{it}) = Pr(exporter_{it} = 1|\mathbf{x}_{it}) = Pr(exports_{it} > 0|\mathbf{x}_{it}) = F(\mathbf{x}_{it}\beta) \tag{4.3}$$

In the above expression, $\mathbf{x}_i$ is $(t \times k))$ matrix of variables, β is the corresponding $(k \times t)$ matrix of parameters to be measured. $F(\cdot)$ is a cumulative distribution function. For the estimation of the empirical model mentioned above, $F(\cdot)$ is replaced with a cumulative logistic distribution function $\Lambda(\cdot)$. The transformed version of the empirical model for fixed effect Logic estima-

tion is as follows:

$$Pr(exporter_{it} = 1|\mathbf{x}_{it}) = \Lambda(\beta_0+\beta_1 CCC_{it-1}+\beta_2 \mathbf{X}_{it-1}+\beta_3 \mathbf{D}_{it-1}+\beta_4 fin_{it-1}+\epsilon_{it-1}) \tag{4.4}$$

4.4.3 Tobit model

For CCC's impact on export performance, export intensity (ratio of exports to total sales) is used as the dependent variable. Considering that the sample pools both positive values and a large proportion of zeros in the dependent variable, linear models are not adequate to capture the relationship. As a result, a censored Tobit model is applied to separate the estimation into two steps. The first part of the model is similar to the binary decision model addressed above and the estimation of the first part relates to the probability of a firm becoming an exporter. The second part of the model estimates the effect of CCC on export intensity using linear regression function with an upper limit of one.

$$exporter_{it} = \begin{cases} 1 & \text{if } expint_{it} \in (0,1] \\ 0 & \text{otherwise} \end{cases}$$

The first part conditional mean of $expint_{it}$ is:

$$E(expint_{it}|\mathbf{x}_{it}) = Pr(expint_{it} \in (0,1]|\mathbf{x}_{it}) = Pr(exporter_{it} = 1|\mathbf{x}_{it}) = F(\mathbf{x}_{it}\beta) \tag{4.5}$$

The second part of the Tobit model estimates the observed positive value using a latent variable $expint^*_{it}$, the observed $expint_{it}$ takes the value of the latent variable when $expint_{it} > 0$. As a result, the estimation of this part relates only to the intensive margin of trade. The conditional mean for the second part of the model is as follows:

$$E(expint_{it}|\mathbf{x}_{it}, expint_{it} \in (0,1]) = G(\mathbf{x}_{it}\delta) \tag{4.6}$$

In the equation above, δ represents a matrix of coefficients. $G(\cdot)$ is a cumulative distribution function that ensures the model predictions fall within

the bounded zone (0,1]. To further decompose $E(expint_{it})$, the conditional mean of Tobit estimation can be written as:

$$\begin{aligned} E(expint_{it}|\mathbf{x}_{it}) = & E(expint_{it}|\mathbf{x}_{it}, expint_{it} = 0) \cdot Pr(expint_{it} = 0|\mathbf{x}_{it}) \\ & + E(expint_{it}|\mathbf{x}_{it}, expint_{it} \in (0,1]) \cdot Pr(expint_{it} \in (0,1]|\mathbf{x}_{it}) \end{aligned} \tag{4.7}$$

Since the first part equals zero, the above conditional mean presents the following simplified form:

$$\begin{aligned} E(expint_{it}|\mathbf{x}_{it}) &= E(expint_{it}|\mathbf{x}_{it}, expint_{it} \in (0,1]) \cdot Pr(expint_{it} \in (0,1]|\mathbf{x}_{it}) \\ &= G(\mathbf{x}_{it}\delta) \cdot F(\mathbf{x}_{it}\beta) \end{aligned} \tag{4.8}$$

The corresponding Tobit model is thus as follows:

$$\begin{aligned} expint^*_{it} &= \beta_0 + \beta_1 CCC_{it-1} + \beta_2 \mathbf{X}_{it-1} + \beta_3 \mathbf{D}_{it-1} + \beta_4 fin_{it-1} + \epsilon_{it-1}, \\ expint_{it} &= \begin{cases} expint^*_{it} & \text{if } expint^*_{it} \in (0,1] \\ 0 & \text{if } expint^*_{it} \in (-\infty, 0] \end{cases} \end{aligned} \tag{4.9}$$

4.5 Results and discussion

The purpose of this research is to investigate how efficient working capital management affects firms' export participation and other firm level performance. To do so, we estimate the effect of cash conversion cycle (CCC) on the probability of a firm becoming an exporter using the abovementioned binary choice model. Second, we estimate the effect of CCC on export intensity. Considering that export intensity is bounded within (0,1] and that a large proportion of the firms in the sample does not engage in export, we apply the Tobit model to capture the non-linear relationship between CCC and export intensity. Third, we estimate the effects of CCC on other firms' performance such as return on total asset, income margin, total turnover, total sales, domestic sales and exports through firm fixed effects model.

The remainder of this section consists of three parts. The first part presents and discusses the results of CCC's effect on the probability for firms to become exporters. The second part reports the results of CCC's effect on the export intensity of firms. The third part provides the results and discussions of CCC's impacts on firm level performance.

4.5.1 The probability of export participation

Table 4.6 presents the results of CCC's effects on the probability for a firm to become an exporter. The first column shows the results using pooled Logit model. The second column reports the results estimated with pooled Probit model. The third column reports the results estimated with linear probability model (LPM) controlling for firm fixed effects. The last column reports the effect estimated using the fixed effect model.

A negative relationship between the CCC and the probability of exporting is reported using the pooled Logit and Probit Model. However, when controlled for the firm fixed effects, the negative effect of the CCC on the probability of firms' export participation is no longer significant. See Column (3) for the fixed effects LPM estimation and Column (4) for the fixed effect Logit estimation. When controlled for firm fixed effects, a higher debt level no longer leads to a higher probability of exporting. It is worth noting that firms with higher total assets or bigger in size are more likely to engage in

export. As is indicated in Column (4), the probability of exporting increases by 1.81% when firms have 1% higher total assets.

The result implies that a shorter CCC does not have causal effect on firms' decision as to whether to be an exporter. The insignificant impact of CCC on the probability for a firm to become an exporter can be justified for the following reasons:

Firstly, as CCC is a composited variable consisting of days of inventory on hand (DOH), days of receivable outstanding (DSO) and days' payable outstanding (DPO), it is not clear which factor is dominating the overall effect. Secondly, a longer CCC can also contribute to the probability of a firm becoming an exporter. We will discuss the reasons why a longer CCC may positively contribute to the probability for a firm to become an exporter in accordance with the three components of CCC (DOH, DSO and DPO).

A longer period for inventory days on hand can potentially increase future sales and hence create greater propensity of a firm becoming an exporter. According to Blinder and Maccini (1991), larger inventories can reduce firms' risk of losing potential sales due to a costly stock out. Keeping sufficient inventories can also help firms to deal with price fluctuations in their procurement and prevent unpredicted interruptions in their production process. Schiff and Lieber (1974) suggest that sufficient inventory allows better services for their customers and enhances long-run relationships.

A longer period in DSO may enhance relationship with potential customers (Ng et al. (1999) and Wilner (2000)) and hence result in higher probability of building overseas trading relationships. Granting trade credit to customers for a longer period enhances a firm's relationship with customers for the following two reasons. First, as Emery (1984) points out, granting trade credit for longer periods offers customers with operating flexibility to respond to fluctuations in demand. Second, extending trade credit will strengthen firms' long-run relationships with their customers since asymmetric information can be reduced between trade partners by allowing product check before payment (Smith, 1987).

Moreover, it can be argued that firms with shorter periods of days' payable outstanding are more likely to participate in the exporting markets. First, firms that are able to pay their suppliers within a shorter period of time are often less financially constrained. For this reason, a less financially constrained firms may have shorter days' payable outstanding and hence a longer

CCC holding DHO and DSO unchanged. Second, firms are often encouraged by suppliers to shorten the payable periods. Early payment to suppliers is often encouraged with an early payment discount for firms. With such discount from suppliers, the financing barriers of product sourcing are partially alleviated (Ng et al. (1999) and Wilner (2000)) and hence it increases the probability of export participation.

Another explanation is that the insignificant impact of CCC on the probability for a firm to become an exporter after controlling for firm fixed effects can be attributed to the "within" estimator. As suggested by Baltagi and Pinnoi (1995), the "within" estimator provided by Fixed Effects model only reveals the short-run reactions, whereas the "between" estimators provided by pooled Logit and Probit estimations report long-run relationships between CCC and export participation.

Table 4.6: Working capital management effects on the probability of becoming an exporter

Binary Choice Models	(1)	(2)	(3)	(4)
Y_{it} : $Exporter_{it}$	Logit	Probit	FE	FE Logit
Variables				
CCC_{t-1}	-0.0523***	-0.0508***	-0.0002	-0.0008
	(0.0017)	(0.0017)	(0.0015)	(0.0027)
$Leverage_{t-1}$	0.0150***	0.0138**	0.0023	0.0032
	(0.0055)	(0.0055)	(0.0064)	(0.0102)
TFP_{t-1}	-0.0089***	-0.0090***	-0.0010	-0.0012
	(0.0015)	(0.0014)	(0.0015)	(0.0025)
$Size_{t-1}$	0.0582***	0.0588***	0.0079**	0.0181**
	(0.0016)	(0.0016)	(0.0032)	(0.0083)
$Capital\ Int_{t-1}$	-0.0029***	-0.0029***	0.0000	0.0002
	(0.0005)	(0.0005)	(0.0004)	(0.0005)
Age	0.0004**	0.0004**	-0.0092***	0.0004
	(0.0002)	(0.0002)	(0.0008)	(0.0015)
Observations	209924	209924	209958	14473
R^2			0.003	
Year	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES
Report	AME	AME	FE	AME

Note: standard errors in parentheses

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

4.5.2 Export intensity

The subsequent question we intend to answer is whether efficient working capital management enhances the share of export. Table 4.7 shows the parameter estimates for efficient working capital management effect on firms' export intensity using the proposed Tobit model. The first column shows the average marginal effect from the Tobit estimation of CCC's effect on the export intensity for the full sample. The second column reports the effects of CCC on the export intensity for state owned firms. The third column shows how efficient working capital management has impact on the export intensity for foreign firms. The last column shows how the Sexport intensity reacts to a CCC for private firms. Average marginal effects are reported in all four columns.

A negative relationship is revealed across all ownership types, indicating that a shorter CCC is associated with a higher export percentage in the total sales. The average marginal effects shown in the first column suggest that, on average, one day increase in the CCC is associated with 4.18% decrease in the export intensity. For state-owned enterprises, this effect is not as prevalent. CCC does not seem to have any impacts on SOE's total export share. However, for the foreign firms and the private domestic firms, CCC does play a significant role in improving firms' export share. For the foreign firms, one day increase in their CCC is associated with an average 6.22% decrease in the total export share. For the private domestic firms, on average, one day increase in CCC leads to 4.18% reduction in the total export share. The results imply that apart from the state-owned firms, efficient working capital management plays a significant role in firms' export to sales ratio. The results attest to the initial expectation that a shorter CCC assists firms in enhancing export shares when they are facing external financial constraints.

The relationship between leverage ratio and export to sales ratio is found to be different across ownership types. In general, as is shown in Column (1), an average 1% increase in the leverage ratio is related to 1.04% rise in firms' export proportion to the total sales. For the state-owned firms, the leverage ratio does not have any significant impacts on their export share. The foreign firms react differently in terms of leverage ratio. The results in a way suggest that the export share of the state-owned firms does not depend on external finance. As evident from Column (3), 1% increase in the leverage ratio is associated with 7.67% drop in the export shares. It implies that the foreign

firms are more reluctant to depend on external debt to finance their exports compared with other types of ownership structure. For the domestic private firms, a positive relationship between leverage ratio and export intensity is observed Column (4). On average, 1% increase in the leverage ratio boosts export share by 2.48% for the domestic private firms. It can be implied from the results that abundant external finance is one of the crucial elements to help the domestic private firms to increase export share in total sales.

The effect of TFP in Chinese firms are found contradictory to the theoretical predictions for heterogeneous firms in trade. The results show that less productive firms in China have larger portions of exports in their total sales. Similar empirical results are found in Egger and Kesina (2014) and Dai et al. (2016). Dai et al. (2016) attribute this paradoxical phenomenon to processing trade. They uncover the fact that processing exporters are the least productive type of firms among firms conduct non-processing exports and non-exporters. Accordingly, it is highly possible the firms observed exporting with a high level of export share consist a large proportion of processing exporters with a low level of productivity.

In line with theoretical predictions of size effect (Melitz and Ottaviano, 2008), the result uncovers a positive relationship between firm size and export intensity. Across all types of ownership structure, firms with 1% higher in the total assets tend to have 2.95% more portion of sales delivered overseas. One way to interpret this result is that a firm having a larger asset size often implies that it has a more abundant capital stock, which in turn can be used as collateral for it to get external financing. Hence it is more likely to have more exports in sales.

The Tobit estimation reveals a negative effect of capital intensity on firms' export share. As is shown in Table 4.7, 1% increase in capital intensity is associated with 0.2% reduction in export intensity for all firms. The negative impact of capital intensity is more pronounced for foreign firms with 1% additional capital intensity resulting in 0.25% decrease in export share compared with private owned enterprises. The private firms experience 0.2% reduction with 1% increase in capital intensity. The negative impact of capital intensity on firms' export share implies that firms with more share in exports may concentrate on less capital-intensive sectors.

Lastly, the Tobit estimator predicts a positive relationship between firms' age and their export intensity overall. However, the age effect is mixed when

estimated separately for different types of ownership. Only the younger state-owned firms tend to have a higher export intensity. The foreign firms with more market experience are associated with higher export shares. For the domestic private firms, the age effect is not pronounced as much as that of the foreign and the state-owned firms.

Table 4.7: Working capital management effects on export intensity

Tobit Estimation	(1)	(2)	(3)	(4)
Y_{it} : $Export\ Intensity_{it}$	Full Sample	SOEs	Foreign	Private
Variables				
CCC_{t-1}	-4.1877***	0.0190	-6.2238***	-4.1834***
	(0.1141)	(0.5193)	(0.3405)	(0.1291)
$Leverage_{t-1}$	1.0397***	-1.2203	-7.6806***	2.4822***
	(0.3695)	(2.1730)	(1.1815)	(0.4053)
TFP_{t-1}	-0.7064***	-1.7311***	-2.0449***	-0.3095***
	(0.0957)	(0.4604)	(0.2852)	(0.1140)
$Size_{t-1}$	2.9504***	4.4771***	1.6756***	3.1377***
	(0.1040)	(0.6118)	(0.3441)	(0.1120)
$Capital\ Int_{t-1}$	-0.1998***	-0.0584	-0.2464**	-0.2029***
	(0.0313)	(0.1669)	(0.1024)	(0.0340)
Age	0.0198*	-0.0944**	0.4567***	0.0107
	(0.0119)	(0.0390)	(0.0582)	(0.0122)
Observations	209958	3243	28906	177809
Uncensored Obsv.	65121	450	19774	44897
Pseudo R2	0.087	0.100	0.028	0.072
/sigma	9.360***	12.054***	6.024***	10.646***
Log-Likelihood	-300,302	-2413	-72,410	-220,928
Year	YES	YES	YES	YES
Report	AME	AME	AME	AME

Note: standard errors in parentheses

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

4.5.3 Firm performance

In this final section, we estimate the effects of CCC on other firm level performance. Specifically, we intend to see how working capital management affects the overall profitability of the firms, such as the return on total assets, the income margin of firms, and total turnover of the firms. In addition, we are interested in finding out how CCC affects the sales activity of firms. We further decompose the sales into domestic sales and export sales. Table 4.8 and Table 4.9 below present the above results.

We look at CCC's impacts on firm performance through the lens of firm fixed effect estimation. We use return on total asset (ROA) as a tool to evaluate the firms' performance. Return on total asset is arguably one of the most important indicators to assess the profitability of the firms. It informs the analyst about how efficiently a firm is generating net earnings with available assets. As is evident from Column (1) of Table 4.8, CCC has a negative impact on firms' ROA. One day increase in CCC results in a decrease in firms' return on total assets by 0.02%. The leverage ratio has a positive impact on firms' return on the total assets. The results show that 1% increase in the leverage ratio enhances firm's ROA by 0.13%. The total factor productivity does not seem to have any significant impact on the net income over the total assets. A higher level of asset size helps to enhance the efficiency in generating net income. As is shown in the results, a 1% increase in total asset will enhance the firms' ROA by 0.05%.The capital intensity does not seem to play an important role in enhancing the performance of firms. But the firm age has a positive impact on ROA. The return on asset is increased by 0.02% with one-year increase in firm age.

As a next step of evaluating firms' performance, we decompose the firm's return on assets into the net income margin and an asset turnover. The decomposing of the single measurement of return on asset allows for a deeper delve into the profit engines of the firms. First, we look at how efficiently working capital management affects the net income margin of a firm. The profit margin is defined as net income as a ratio of total sales revenue. It provides a direct measurement of the profitability of firms. This measurement reveals the pricing strategies as well as cost management strategies of the firms. As is indicated in the second column of Table 4.8, efficient working capital management enhances the firms' profit margin. The results show that one day increase in the CCC leads to 0.016% reduction in profit margin. It

can be interpreted that working capital management is closely link to the production process that a shorter CCC helps firms to keep tight control of cost. The leverage ratio has a positive impact on firms' income margin. The income margin is increased by 0.12% if the leverage ratio is increased by 1%. However, TFP, asset size and capital intensity do not have significant impact on firms' net income margin except that one-year increase in firm age increases the income margin by 0.006%.

Second, we look at how working capital management affects the asset turnover of firms. The asset turnover measures how efficiently the firms generate sales using the available assets. As indicated in the third column of Table 4.8, an efficient working capital also plays a significant role in enhancing the asset turnover. The turnover is decreased by 0.006% if the CCC is increased by one day. The result suggests that a shorter CCC can help the firm generate sales more efficiently with available assets. But the leverage ratio does not play a significant role in enhancing firms' asset turnover. It can be inferred that debt level does not directly assist in the sales activities of firms. Instead, it plays a much more important role in improving firms' overall performance through a net income margin. The total factor productivity is positively related to the turnover. The result suggests that more productive firms are more efficient in generating sales using available assets. The result also states that larger firms are more efficient in generating sales with available assets and that 1% increase in the total asset size leads to 0.056% increase in firms' asset turnover. Lastly, the result also shows that the asset turnover is enhanced through accumulating market experience. One-year increase in firms' age leads to a 0.014% increase in firms' asset turnover.

Table 4.8: Working capital management effects on firm performance

FE	(1)	(2)	(3)
Y_{it}:	ROA	Inc Margin	Turnover
Variables			
CCC_{t-1}	-0.0220***	-0.0157***	-0.0062***
	(0.0049)	(0.0045)	(0.0024)
$Leverage_{t-1}$	0.1314***	0.1222***	0.0115
	(0.0196)	(0.0175)	(0.0099)
TFP_{t-1}	0.0040	-0.0045	0.0069***
	(0.0049)	(0.0045)	(0.0021)
$Size_{t-1}$	0.0536***	-0.0009	0.0560***
	(0.0095)	(0.0083)	(0.0052)
$Capital\,Int_{t-1}$	0.0002	0.0006	-0.0003
	(0.0011)	(0.0010)	(0.0006)
Age	0.0218***	0.0062***	0.0146***
	(0.0026)	(0.0024)	(0.0013)
Observations	203882	203882	209958
R^2	0.004	0.001	0.009
Year	YES	YES	YES
Firm FE	YES	YES	YES
Estimation	FE	FE	FE

Note: standard errors in parentheses

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

4.5.4 Sales activities

As discussed in the above section, efficient working capital management plays an important role in enhancing firms' overall performance through both increasing the net income margin and improving efficiency in turning the available total assets into sales. In the following section, we investigate further into how working capital management affects firms' sales activities. We then decompose total sales into domestic sales and export sales to have a better understanding of how cash conversion cycle affects sales activities in both domestic and export markets. The results are shown in Table 4.9.

Column (1) of Table 4.9 shows the fixed effect estimator of cash conversion cycle (CCC) on total sales. As is evident in the result, the CCC is negatively related to total sales. The result shows that one day increase in the CCC has a negative impact of 0.02% on firms' total sales. The result is consistent with the prior expectation that a shorter CCC enhances a firms' sales activities through a shorter time lag between the collection of cash and payment of cash. A more efficient working capital management appears to enhance firms' domestic sales. As is shown in the second column, one day increase in the CCC leads to 0.019% decrease in domestic sales. The effect of efficient working capital management is more pronounced for exporters in enhancing export sales as one day increase in the CCC leads to a reduction in total export sales by 0.023% for exporters. However, the effect of leverage ratio on sales activities is not pronounced as much as efficient working capital management. The results show that the leverage level of firms does not have significant impacts on firms' sales activities, be it domestic or overseas. The results may imply that a more efficient internal capital management matters more for firms' sales activities compared with external capital financing.

In terms of the effects of productivity and size on firms' sales activities, the results are consistent with theoretical predictions in Melitz (2003). More productive firms tend to generate more sales, and have more sales in the export markets. As is shown in the results, 1% increase in TFP increases the total sales by 0.025% and increases the total exports for exporters by 0.039%. The results are also in line with the theory by revealing that firms with a bigger size in the total assets are more capable in generating both domestic and export sales. Notably, the magnitude of effects on sales activities are the most pronounced for the total asset size among other factors. As is evident from Table 4.9, 1% increase in total asset results in an 0.15% increase in total

sales, an 0.16% increase in domestic sales, and an 0.20% increase in export sales for exporters.

Lastly, firm age is found to have a positive effect on firms' sales activities. An additional year of market experience leads to 0.11% increase in total sales. The experience of firms matters more for domestic sales than for export sales. As is suggested in the results, one additional year of experience increases domestic sales by 0.13% for all firms but increases export sales by 0.07% for exporters. One explanation for the negative effect (Column (3)) of firm age on exports is that firms that engage in export are generally younger than those who don't. As a result, when estimating is done by using a pooled sample with exporters and non-exporters, a negative effect of firm age on export sales is observed.

Table 4.9: Working capital management effects on sales activities

FE	(1)	(2)	(3)	(4)
Y_{it}:	Sales	Dom Sales	Exports	Exports (Exporter only)
Variables				
CCC_{t-1}	-0.0211***	-0.0187**	-0.0053	-0.0228**
	(0.0022)	(0.0094)	(0.0126)	(0.0089)
$Leverage_{t-1}$	0.0049	-0.0340	0.0339	0.0128
	(0.0084)	(0.0426)	(0.0553)	(0.0322)
TFP_{t-1}	0.0248***	0.0048	0.0053	0.0389***
	(0.0019)	(0.0094)	(0.0125)	(0.0076)
$Size_{t-1}$	0.1519***	0.1560***	0.1289***	0.2016***
	(0.0042)	(0.0216)	(0.0276)	(0.0160)
$Capital\,Int_{t-1}$	0.0001	0.0019	-0.0000	-0.0002
	(0.0005)	(0.0026)	(0.0033)	(0.0017)
Age	0.1142***	0.1251***	-0.0486***	0.0650***
	(0.0012)	(0.0059)	(0.0072)	(0.0042)
Observations	209958	209958	209958	65153
R^2	0.229	0.012	0.001	0.037
Year	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Estimation	FE	FE	FE	FE

Note: standard errors in parentheses

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

4.6 Conclusion

This chapter explores the role of working capital management in firms' performance and activities in export and sales. The data applied are from the ASIF of NBS. In order to estimate the effects of CCC on the probability for a firm to become an exporter, we use the binary choice model with firm fixed effects. In terms of CCC's effects on export intensity, the Tobit model is applied. For other performance of firms, we use firm fixed effect model to control for the unobserved time invariant factors.

The research yields four main findings. Firstly, for export intensity, we find that there is a positive relationship between working capital management and the export shares of firms. Moreover, a shorter cash conversion cycle leads to a higher level of total and domestic sales and an increase of exports for exporters as well. Thirdly, more efficient working capital management results in higher firm performance, particularly a higher return on total assets, a higher income margin and a higher asset turnover. Finally, however, no evidence shows that efficient working capital management will increase the probability for a firm to become an exporter. The finding is consistent with Greenaway et al. (2007) that better ex-ante financial health does not necessarily contribute to a firm becoming an exporter.

The researcher is aware of the endogeneity problem when estimating cash conversion cycle's effect on export intensity. Due to lack of data, the problem has not yet been solved at this stage. However, our research has laid a foundation for future research to look into the issue by combining an instrument variable method with the Tobit model to estimate the effects of cash conversion cycle on export intensity.

Chapter 5

Conclusion

This thesis has studied the effects of foreign acquisition on firms' export and import profiles as well as the relationship between working capital management and export participation. We first investigate whether there exists a causal relationship between foreign ownership and export profiles. We find that foreign ownership causes firms to become "meaner and leaner". In particular, there are reductions observed in both the amount of firm products and the number of destination countries due to foreign acquisition. Moreover, acquired firms tend to concentrate their sales on the top-sold products and top-exported destinations. We then explore the relationship between foreign acquisition and firms' import profiles. The results suggest a causal link existing between the two. We also make a comparison between the minority acquired and the majority acquired firms and find that different levels of foreign ownership have heterogeneous acquisition effects on firms' import profiles. On the one hand, the minority acquisitions causes firms to reduce their total number of products and the total import value as well as to import cheaper products from lower-income countries compared with indigenous firms. On the other hand, the majority acquisitions leads firms to increase the variety of their products and to import from higher-income countries compared with their local counterparts.

The implications of these results involve two distinctive levels: the academic level and the practical level. At a practical level, we newly suggest that foreign acquisition causes exporters and minority acquired importers to become "meaner and leaner". Knowing this information facilitates evidence-based decision-making. Before being acquired, a local firm can predict the

potential changes of their export/import strategies with our findings as a point of reference; an acquired firm can adjust their export/import strategies to achieve better performance based upon the evidence provided by this research. From an academic perspective, Chapter Two and Three provide the first empirical evidence on the causal relationship between foreign acquisition and firms' export/import profiles. In doing so, the research bridges the gap in existing literature between multiproduct firms in trade and foreign direct investment. Moreover, instead of focusing primarily on firm characteristics such as productivity and wage, we approach FDI effects through looking at other aspects of firm performance such as total sales, R&D intensity, investment and leverage ratio. The research therefore provides additional perspectives to the understanding of the FDI effects. Overall, with China as the focus of this study, the thesis adds new evidence of FDI effects from the perspective of a developing country.

After studying how FDI influences firms' export and import strategies, we examine the relationship between firm-level working capital management and firms' export participation. In particular, we focus on the role the cash conversion cycle (CCC) plays in firms' export activities. The results show that a better working capital management leads to the increase in firms' export shares. Moreover, the shorter a firm's CCC is, the more total and domestic sales the firm generates. We also find a positive relationship between working capital management and firm performance in terms of return on total assets, income margin and asset turnover. However, a casual link between working capital management and the probability for a firm to become an exporter has not yet been found. These findings imply that effective working capital management plays an important role in improving firms' export performance and helping exporters to mitigate the liquidity risks when engaging in export activities. This chapter contributes to the current understanding of working capital management and export via analysing the relationship between these two using a large firm-level dataset.

This thesis bases its empirical analysis on two main data sources, namely, the *Chinese Customs Trade Statistics* (CCTS) and the *Annual Survey of Industrial Firms* (ASIF) of *National Bureau of Statistics* (NBS). Throughout the second and third chapters, we use the matching data to combine transaction level data from CCTS with firm operational data from ASIF to track down changes in export/import profiles and firm ownership. CCTS is a data source that is rarely utilised by previous researches due to the restriction of accession. Moreover, to our knowledge, hardly have any existing studies

combined these two datasets. The unique features of the data allow us to explore whether a casual link exists between foreign acquisition and firms' export/import profiles. Chapter Three, in particular, utilises the matching results to investigate further into the heterogeneous effects of the minority and majority acquisitions on firms' import profiles and operational changes. Chapter Four relies mainly on data from the ASIF of NBS over the period between 2004-2007.

In order to better address the research questions, we apply various micro-econometric techniques. In Chapter Two, we combine the propensity score matching with the difference-in-differences technique to identify the causal relationship between foreign acquisition and firms' export profiles. To rigorously test if such a causal link also exists between foreign acquisition and firms' import profiles in Chapter Three, we first construct a pseudo-randomised sample through the augmented inverse probability weighting method and then exploit the panel nature of the data to eliminate the time invariant unobservables using the difference-in-differences method. In Chapter Four, we use the binary choice model with fixed effects to test the causal relationship between working capital management and the probability of firms becoming exporters. In addition, we use a Tobit model to estimate the effects of CCC on firms' export intensity and apply firm fixed effects to eliminate the time invariant unobservables when estimating CCC's effects on other firm performances. The methodologies used in this thesis present certain limitations. Particularly in Chapter Four, the researcher is encountered with an issue of the endogeneity problem when estimating the effects of CCC on export intensity. The issue has not yet been solved due to the lack of data. Future research on the same topic is supposed to consider using a combination of an instrument variable method with the Tobit model to solve the endogeneity problem.

While we study the case of Chinese firms, the issues addressed in this thesis are also important for firms in other developing countries. Particularly in recent years when a large number of foreign production lines enter into South-east Asian countries such as Vietnam and Thailand. The evidence found in the case of China can serve as a reference point for these countries. Studies in this research could be explored further through, for instance, an investigation of whether the "meaner and learner" adjustment the acquired firms made in their export strategies is a result of vertical specialization of multinational firms. The research could also be extended to study the underlying reasons for the reduction in productivity of importers after foreign acquisition. A possible direction is to look at the relationship between productivity reduction and

firm integrating in the international production network. Questions could be asked within this research agenda are, for example, whether the productivity reduction during the manufacturing process could be compensated during other processes involved in the upper stream of the global value chain such as R&D and sales. Another interesting research question is whether firms that engage in processing trade would increase their aggregate productivity over the long term.

Appendix A

Appendix A Data information

A.1 Deflators

The mian deflator we apply is *ex-factory price index* extracted from the yearly published China Statistical Yearbooks. Following Upward et al. (2013), we apply the deflator at 2-digit industry level. Variables such as value added, total sales, total exports and total imports are deflated using this deflator. Since the data do not contain detailed information on the type of intermediate inputs, we apply the nominal value extracted from the ASIF dataset when estimating the acquisition effects.

A.2 Product code concordance

The Harmonized System was introduced in 1988 and has been adopted worldwide. It underwent several amendments in the classification of products in 1996, 2002, 2007, 2012 and 2017. The Harmonized commodity coding system (HS) for classifying international goods is at six-digit level. The first two digits (HS-2) identify the goods (tea, coffee, dairy product etc.). The next two digit (HS-4) identify subgroups of each good (e.g. dairy product with or without cream). The next two digits (HS-6) identify more specific characters for subgroup of a product (whether the product contains added sugar or not). Up to the HS-6 level, all countries classify products in a universal way.

Since our data spans from 2000-2006, the only revision affecting this data period is the one in 2002. As a result we need to concord the old six-digit-level product code in 1996 with new six-digit-level product code in 2002 and use the new HS-6 system in 2002 throughout the whole sample period. We produce a concordance file containing all new changes to 1996 HS-6. Having this file at hand we are able to replace all old 1996 HS-6 codes appearing in the CCTS dataset with their new 2002 codes. Table A.1 provides a short sample of the product code concordance file. The file is available upon request. The concordance avoid unnecessary complications for accumulating product related information in the research. For example, as is shown in Table A.1, product "010600" is coded differently in year 1996 and 2002. If the product codes are not updated properly, miscalculation for the total number of products could arise for firms engaging in trade activities between 2000-2006.

Table A.1: Product code concordance

hs96	hs96part	hs02	hs02part
010111	0	010110	1
010119	0	010190	1
010120	1	010110	1
010120	1	010190	1
010210	0	010210	0
010290	0	010290	0
010310	0	010310	0
010391	0	010391	0
010392	0	010392	0
010410	0	010410	0
010420	0	010420	0
010511	0	010511	0
010512	0	010512	0
010519	0	010519	0
010592	0	010592	0
010593	0	010593	0
010599	0	010599	0
010600	1	010611	0
010600	1	010612	0
010600	1	010619	0
010600	1	010620	0
010600	1	010631	0
010600	1	010632	0
010600	1	010639	0
010600	1	010690	0
020110	0	020110	0
020120	0	020120	0
020130	0	020130	0
020210	0	020210	0
020220	0	020220	0

A.3 Additional sample description

Table A.2: Overview of the analytical sample by relative years to acquisition: Importers

relative year to acquisition	FA obs	Minor obs	Majar obs	DE obs	Total
-6	33	12	21	0	33
-5	92	52	40	228	320
-4	206	118	88	614	820
-3	357	190	167	1,303	1,660
-2	638	320	318	2,681	3,319
-1	1,354	556	798	10,162	11,516
0	1,512	632	880	10,595	12,107
1	1,129	441	688	10,195	11,324
2	737	276	461	5,149	5,886
3	400	145	255	2,797	3,197
4	256	89	167	1,438	1,694
5	172	52	120	624	796
Total	6,886	2,883	4,003	45,786	52,672

Table A.3: Overview of the analytical sample by two-way trade importers

importers with positive export value	FA	Minor acq.	Major acq.	DE	Total (pct.)
non exporter	178	76	102	1,361	1,539 (12.71%)
exporter	1,334	556	778	9,234	10,568 (87.29%)
Total	1,512	632	880	10,595	12,107 (100%)

observations	FA obs.	Minor obs.	Major obs.	DE obs.	Total (pct.)
export= 0	1,699	648	1,051	11,007	12,706 (24.12%)
export> 0	5,187	2,235	2,952	34,779	39,966 (75.88%)
Total	6,886	2,883	4,003	45,786	52,672 (100%)

A.4 Product unit value

The unit value on firm-year-product level is calculated as the residual of predicted unit value, controlling for product fixed effect.

$$unitv_{itp} = \hat{y}_{itp} - \hat{\beta}(hs6 = 1) \tag{A.1}$$

The firm-year simple average product unit value is calculated as:

$$smp.unitv_{it} = \frac{1}{p}\sum_{1}^{p} unitv_{itp} \tag{A.2}$$

The firm-year import value weighted average product unit value is calculated as:

$$wavg.unitv_{it} = \sum_{1}^{p} w_{it}^{impv} * (unitv_{itp}) \tag{A.3}$$

In the above expression w_{it}^{impv} is the product import value as a fraction of total import value of the firm year.

Table A.4 below shows an overview of firm year level unit value. The average unit value for all firms is 0.15, weighted average is at 0.25. The within variation of unit value can be as large as 6.49 or 7.37 and as small as -5.98 or -5.88. Standard deviation is very high compared to the mean on both within and between levels, signalling a widely spread out product mix both within firms and between firms.

Table A.4: Overview of firm-year level average unit value

	max	min (within)	sd	max	min (between)	sd	max	min (overall)	sd	mean	$\bar{T}$	n	N
Simple mean log(unitv)	6.49	-5.98	0.74	6.80	-6.77	1.18	11.64	-10.07	1.28	0.15	3.12	12,072	37,694
Simple mean log(unitv+1)	6.44	-4.82	0.66	6.44	-6.55	1.04	9.30	-6.69	1.13	0.13	3.12	12,072	37,694
Weighted avg log(unitv)	7.37	-5.88	0.83	8.86	-6.77	1.29	11.64	-10.07	1.44	0.25	3.13	12,109	37,846
Weighted avg. log(unitv+1)	7.22	-5.07	0.76	8.77	-6.55	1.15	9.89	-7.72	1.31	0.23	3.13	12,109	37,846

A.5 Working capital management related variables

The following equations present the detailed calculations for working capital management related variables. Equation A.4 shows how inventory turnover is calculated. Equation A.5 demonstrates the calculation for days' inventory on hand. Equation A.6 shows the calculation for days' sales on hand. Equation A.7 shows how days' payable outstanding is obtained. Equation A.8 presents the calculation for cash conversion cycle.

$$ITO = \frac{cost\,of\,good\,sold}{inventories} \tag{A.4}$$

$$\begin{aligned} DOH &= \frac{inventories}{cost\,of\,good\,sold} \times 365days \\ &= \frac{1}{ITO} \times 365days \end{aligned} \tag{A.5}$$

$$DSO = \frac{account\,receivables}{cost\,of\,good\,sold} \times 365days \tag{A.6}$$

$$DPO = \frac{account\,payable}{cost\,of\,good\,sold} \times 365days \tag{A.7}$$

$$CCC = DOH + DSO - DPO \tag{A.8}$$

Appendix B

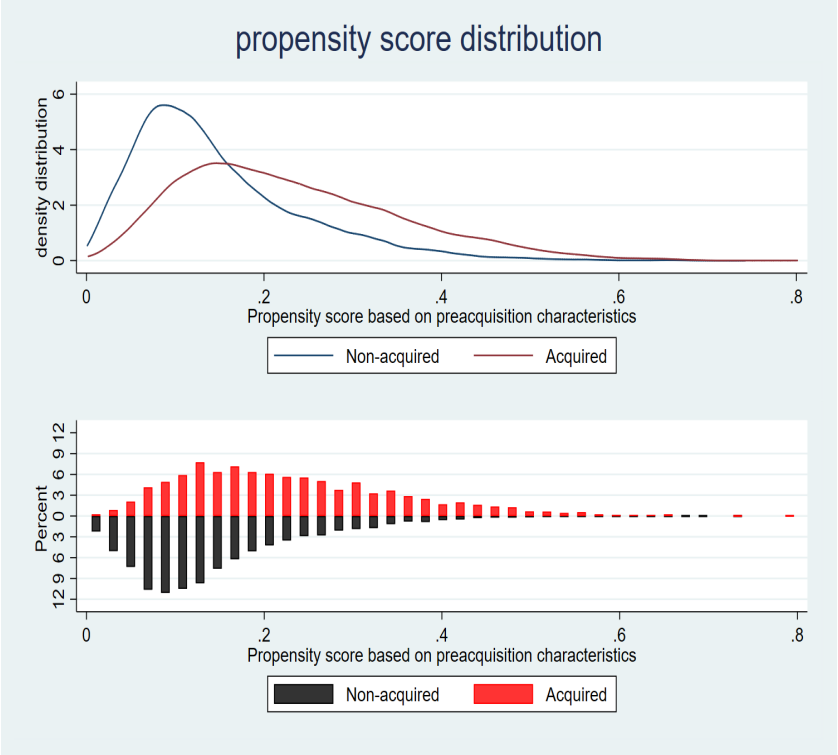
Appendix B Additional results

B.1 Matching results and overlap diagnoses

Table B.1: Matching results

Treatment assignment	Common support		Total
	Off support	On support	
Untreated	0	10,429	10,429
Treated	100	1,268	1,368
Total	100	11,697	11,797

Figure B.1: Overlap diagnose of the estimated propensity scores for acquired firms



B.2 Overlap diagnoses of multilevel acquisition

Figure B.2: Overlap diagnose for minority and majority acquired firms

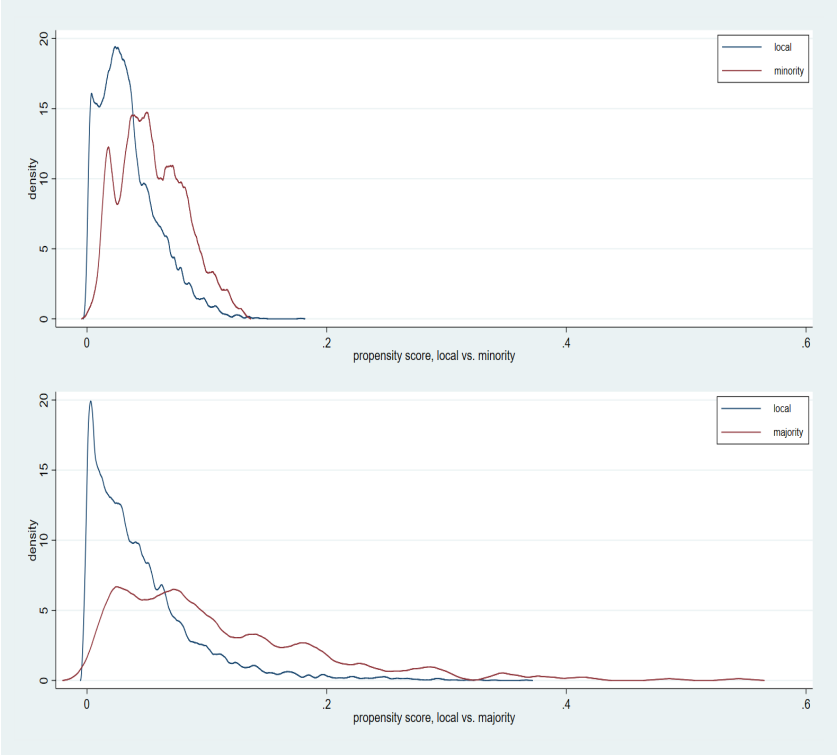


Table B.2: Logit result, prediction of acquisition

	(1)
D(0,1): foreign share > 0	
productivity	-0.0603
	(0.0968)
employment	0.0277
	(0.0250)
avg wage	0.3073***
	(0.0407)
age	-0.0148***
	(0.0025)
leverage ratio	-0.6699***
	(0.0994)
SOE	-0.5373***
	(0.0993)
Observations	16088
Prob>Chi2	0.0000
Pseudo R2	0.063

B.3 Robustness checks for the effect of CCC on export intensity

There are two possible sample selection biases. First, firms may self-select into the exporting market. The observed exports value for certain firms may be due to a higher gain in exporting activities than in domestic activities. It does not necessarily mean that more productive firms are the ones observed exporting. The second selection bias may also arise from the nature of data obtaining procedure or analysing treatment. Considering the above stated sample selection bias, a Heckman selection model is proposed as follows:

The selection equation is as follows:

$$\begin{aligned} & E_{it}^{*} = \gamma_0 + \gamma_1 \mathbf{z}_{it-1} + u_{it}; \\ & i = 1, ..., N \, and \, u_{it} \sim N(0,1) \\ & E_{it} = \begin{cases} 1 & \text{if } E_{it}^{*} > 0 \\ 0 & \text{if } otherwise \end{cases} \end{aligned} \tag{B.1}$$

The linear equation is as such:

$$\begin{aligned} & E(Y_{it} | E_{it}^{*} > 0) = \beta_0 + \beta_1 CCC_{it-1} + \beta_2 \mathbf{X}_{it-1} + \beta_\lambda \lambda_{it} + \mathbf{D}_{it} + \epsilon_{it} \\ & i = 1, ..., n; \; N > n; \; and \, \varepsilon_{it} \sim N(0, \sigma^2) \end{aligned} \tag{B.2}$$

In the above equation λ_{it} is the Inverse Mills Ratio (IMR) which depends on the coefficient of the selection equation γ. The selection bias occurs when $corr(u_{it}, \varepsilon_{it}) = \rho \neq 0$. The results of CCC's effects on the export intensity estimated by the selection model is reported in the Table B.3 and B.4 below.

Table B.3: Heckman sample selection model on export intensity

Heckman Selection	(1)	(2)	(3)	(4)
Y_{it} : $Export\ Intensity_{it}$	Full Sample	SOEs	Foreign	Private
Variables				
CCC_{t-1}	-7.1165***	-3.7989*	-6.8520***	-7.2474***
	(0.2524)	(2.1857)	(0.4169)	(0.3136)
$Leverage_{t-1}$	-0.2071	5.1570	-4.0015***	2.0714**
	(0.7945)	(10.4380)	(1.3834)	(0.9619)
TFP_{t-1}	-1.0717***	-5.0118**	-1.7178***	-0.4855*
	(0.2050)	(2.0998)	(0.3428)	(0.2649)
$Size_{t-1}$	-4.6903***	3.5148	-2.5255***	-5.5652***
	(0.2151)	(3.8123)	(0.3930)	(0.2550)
$Capital\ Int_{t-1}$	-0.1704***	0.1309	-0.2015*	-0.1568**
	(0.0554)	(0.3928)	(0.1033)	(0.0660)
Age	-0.0194	-0.4161**	0.2384***	-0.0442
	(0.0278)	(0.1848)	(0.0674)	(0.0307)
Observations	209958	3243	28906	177809
Censored Obsv.	144805	2792	9131	132882
λ	1.0854	31.3061	0.5494	0.8451
p-value	0.0000	0.0188	0.0007	0.0002
ρ	0.0349	0.8175	0.0183	0.0271
Year	YES	YES	YES	YES
Estimation	ML	ML	ML	ML

Note: standard errors in parentheses; selection on all regressors, reported in appendix

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

Table B.4: Heckman selection table continued

Heckman Selection	(1)	(2)	(3)	(4)
Y_{it} : $Export\ Intensity_{it}$	Full Sample	SOEs	Foreign	Private
Select				
$Leverage_{t-1}$	-0.1927***	-0.2058	-0.2169***	0.1687***
	(0.0181)	(0.1588)	(0.0489)	(0.0203)
TFP_{t-1}	-0.1045***	-0.0811**	-0.0610***	-0.0088*
	(0.0044)	(0.0340)	(0.0099)	(0.0052)
$Size_{t-1}$	0.2280***	0.2970***	0.0861***	0.1448***
	(0.0052)	(0.0485)	(0.0138)	(0.0058)
$Capital\ Int_{t-1}$	-0.0306***	-0.0089***	-0.0233***	-0.0270***
	(0.0004)	(0.0032)	(0.0009)	(0.0005)
Age	-0.0088***	-0.0091***	0.0153***	-0.0042***
	(0.0006)	(0.0030)	(0.0025)	(0.0006)
Observations	209958	3243	28906	177809
Censored Obsv.	144805	2792	9131	132882
λ	1.0854	31.3061	0.5494	0.8451
p-value	0.0000	0.0188	0.0007	0.0002
ρ	0.0349	0.8175	0.0183	0.0271
Year	YES	YES	YES	YES
Estimation	ML	ML	ML	ML

Note: standard errors in parentheses

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

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