Multinational Spillovers on Chinese Exports at Regional Level
Abstract

This thesis focuses on spillovers from foreign multinational corporations (MNCs) in China on Chinese firms’ exports at regional level. There are both positive and negative spillover effects of MNCs on local firms’ exports. The panel data used in this paper is from the period 2003-2011 and it includes the whole 31 regions of the mainland of China. Our empirical results show that the exports of multinational firms have positive correlation with Chinese domestic firms’ exports both in the full sample as well as in the subsamples of the coast area and the interior area. This can conclude that the positive spillovers of MNCs’ exports outweigh the negative spillover effects. After comparing the results of the exports of the coast area and the interior area, the regional disparity between the coast area and the interior area is rather significant because of the geographical location and preferential policies. Some related policies are proposed in this thesis in order to improve the export competitiveness of Chinese firms.
I. Introduction

Since 1978, the policy of reform and opening-up has witnessed remarkable economic growth in China, which has exerted dramatically positive effects on both firms’ operations and the expansion of the international trade. The “reform” refers to the reform of economic system from a planned economy to a socialist market economy. The “opening-up” is that the economy in China opens to the outside world. In order to attract foreign investors, the 1978 reform encourages Chinese governments to conduct positive economic development policies concerning the improvement of the investment environment. Therefore, many foreign investors are attracted to China to build up their affiliated MNCs or joint ventures with Chinese companies because of the higher rates of return to investment and the faster capital reflows compared with other developing countries.

During 1978-2011, foreign direct investment (FDI) has become an important force in China's economic construction and has played an irreplaceable role in promoting economic and social sustainable development (Wang and Zhang, 2011). Figure 1 suggests that the growth of FDI volume has almost increased 26 times during the period 1991-2011 (Phoenix New Media, 2012).

Figure 1: The trend of inflow FDI volume in China from 1991-2011
In terms of employment, investment, output, and balance of payments, foreign direct investment has played a major role in the sustained and rapid growth of China's economy (Cheng, 2011). Firstly, it can create more employment opportunities for the labor force in China and then relieve the employment pressure in China. Secondly, the inflow of capital from FDI is one of the important sources of investment in the fixed assets. Thirdly, it can promote the optimum of industrial structure of China. Foreign enterprises with advanced technical equipment in China can accelerate the development of the basic industries in the National economy and then upgrade the industrial structure of China.

In 2012, China became the largest trading nation in goods in the world (The Guardian, 2013). Figure 2 illustrates that China’s total export volume increased almost 194 times from 1978 to 2011 according to China Statistical Yearbook (2012).

Figure 2: Chinese export volume in the period 1978-2011

As one of the East Asian NICs (Newly Industrialized Countries), China has successfully implemented the key reform strategy, export orientation, through attracting large foreign investments and conducting government intervention. The opening-up reform has actively offered good conditions to foreign enterprises in Special Economic zones where the foreign
company can enjoy good infrastructure and preferential policies.

However, the main reason for attracting foreign direct investment is to improve domestic capabilities through technology transfer from joint ventures to domestic firms (Rodrik, 2006). Domestic firms with higher productivity can obtain more positive spillovers from MNCs. High-productivity domestic firms have the ability to enter the export market, while low-productivity companies can either continue production in the local market or exit from the market (Melitz, 2003).

Several studies have shown that the presence of MNCs has both positive and negative spillover effects on export performances of local firms. For example, Aitken and Harrison (1999) concluded that multinational presence had exerted both negative effects and positive effects on domestic firms with the panel data on Venezuelan plants during the period 1976-1989. The foreign equity participation was positively correlated with the productivity of domestic partners. On the other hand, the increase in foreign ownership negatively affected the productivity of wholly domestically owned firms in the same industry.

In the theoretical part, the positive spillovers from MNCs on domestic firms mainly include technological diffusion, valuable information about foreign markets and strengthening the comparative advantages of export products. There are still some negative effects of MNCs on domestic firms, for example, the limitation of technological innovation of domestic firms and the crowding-out effects on the host country. Foreign enterprises with advanced technology tend to drive up the operating cost and bring about the intensified competition in product markets.

In the era of information, domestic firms tend to construct international trade partnership in the global market. Nolan (2005) mentioned that leading firms chose suppliers with the best performances in every sector of the production networks to accomplish their “industrial planning”. This brings challenges for Chinese suppliers since they have difficulties in satisfying the demand of leading firms and also face fierce competition from other suppliers in the global market.
In order to establish potential international trade partnership and compete with their strong opponents around the world, valuable information about export markets is rather important to Chinese domestic firms. MNCs with export orientation can provide information spillovers based on international partnership. Chinese firms can take advantage of the search model for trade partners as well as the information spillovers from export-oriented MNCs, in order to find more suitable international trade partners in export markets, which can promote the export of Chinese domestic firms (Blomström and Kokko, 1998).

The main contribution in this thesis is as follows. The panel data about the analysis of the effects of MNCs’ exports on Chinese firms’ exports is from 2003-2011, which is the latest data compared with previous studies. For instance, in the paper of Chen and Swenson (2007), the panel data used was from the period 1997-2003.

Another contribution is that this thesis focuses on the analysis of the differences in the exports between the coast area and the interior area. Therefore, the panel data we used is at the regional level. Previous studies about the analysis of Chinese exports were based on the firm level, industry level, or product level. In this thesis, the analysis focuses on two parts: the full sample of 31 regions and the subsamples of the coast and interior area. The 31 regions in the mainland of China where excludes Hong Kong and Macao are divided into the coast area and the interior area. Both fixed-effects (FE) and random-effects (RE) estimation are conducted to analyze the panel data.

The third contribution is some related policies about raising the export competitiveness of Chinese domestic firms. These policies proposed in this thesis can help Chinese firms increase the exporting opportunities and efficiently compete with foreign MNCs in China.

The rest of the thesis is organized as follows. Section II reviews the previous literature. Section III describes the theory about effects of MNCs and information search for trade partnership. Section IV and Section V describe the methodology, the data, the econometric issues and the results. Section VI is about the discussion part about the differences between the coast area and the interior area. The final section VII summarizes the
findings of this thesis and proposes some related policies.

II. Literature Review

A large and growing body of literature has investigated the relationship between the presence of MNCs and local exports of domestic firms in several countries. Based on different kinds of data, such as: firm-level, industry-level, product-level, and country-level, many authors have found different results about export spillovers of MNCs on domestic enterprises as Table 1 shows.

Table 1: Literature reviews of MNCs presence on the exports of domestic firms

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Country</th>
<th>Year</th>
<th>Data</th>
<th>Aggregation</th>
<th>Methods</th>
<th>Results</th>
</tr>
</thead>
</table>

Note:
(i) Data: panel means the panel data.
(ii) Aggregation: The data used in the analysis is firm, product or province level data.
(iii) Results: The analysis shows MNCs has positive influences (+), negative influences (-) on the export of domestic firms or (?) which means that it cannot determine what the influence is or the influence is on the both sides.
Many researchers analyzed the relationship between the exports of MNCs and the exports of domestic firms at the firm level. The paper by Aitken, et al. (1997) was the first to find statistical evidence that foreign enterprises had provided information about foreign export markets and distribution channels for local enterprises. They had used firm-level panel data from 1986 to 1990 on Mexican manufacturing firms and applied fixed-effects estimation. By studying the geographic concentration of industry, they concluded that exporting outlook of domestic firms had positive correlation only with the local concentration of multinational firms, not the total export activities in the area. There were location-specific external spillovers from MNCs to local businesses, such as distribution channels, and foreign technology.

Koenig, et al. (2010) analyzed the effects of exporters’ agglomeration on both export decision and export volume of domestic firms, respectively. They used data on French individual firms from 1998-2003 and analyzed the destination country, firm-level export, and product-level export. The traditional gravity equation on the firm-level export was constructed and analyzed through fixed-effects estimation. They found the existence of strong connection between the presence of local export spillovers and export decision in terms of specific product, as well as destination at a given area. However, the effects of export spillovers on the export volume were not significant. Ma (2006) also found that the export decision of Chinese domestic firms had strong correlations with the proximity to MNCs.

In the paper of Greenaway, et al. (2004), a set of firm-level panel data of the United Kingdom in the period 1992-1996 was used, in order to investigate the effects of MNC presence on export probability and export ratio of domestic entrepreneurs. The result of the OLS estimation showed evidences of positive effects on export outlook of local firms but insignificant effects on export ratio. Moreover, R&D spillovers from MNC activities had positively affected the exporting decision and the export ratio of domestic firms.
Javorcik and Spatareanu (2008) investigated vertical and horizontal spillovers on domestic firms from foreign direct investment by using firm-level data of Romania from 1998 to 2003. In order to examine the effect of foreign presence on productivity of domestic firms, they estimated a log-linear transformation of the Cobb-Douglas production function. They included measurements of foreign presence in the same sector (Horizontal) and in downstream sectors (Vertical). From the fixed-effect estimation, they found that most joint ventures with partly domestic ownership instead of wholly owned foreign companies were correlated with vertical spillovers.

Girma, et al. (2007) used cross-sectional data from UK in the period 1988 to 1996. The OLS estimation was applied to show that acquisition of FDI create productivity spillover on domestic exporters with higher absorption to technology transfer. Karpaty (2005) used a set of firm-level data taken from Swedish manufacturing firms, during the period 1990-2000. He used fixed-effect estimation to analyze the relationship between foreign-owned companies and the productivity of domestic firms. He discovered that the presence of foreign-owned companies had significant effects on productivity of domestic firms through transmission of technical and business know-how.

Swenson (2008) gave a new dimension on MNC activity. She conducted a survey to examine if multinational firm proximity had correlation with expansion of trade networks of domestic exporters, including new export products and the increase in export destinations. She used a panel product-level data set from 1997-2003 and discovered that the presence of MNCs was positively correlated with new Chinese trade linkages, especially in the same sectors of the industry. Moreover, this paper also found that the relationship between MNC activities and local Chinese exports was stronger where MNC contacts offered rich information about differentiated products.

Similarly, Chen and Swenson (2007) used product-level data from 1997-2003 to investigate the relationship between multinational presence and Chinese private firms. They discovered that own-industry multinational contacts were associated with a greater frequency of trade creation and higher trade quality, but other-industry multinational presence had a negative
effect on Chinese trade creation.

Meanwhile, researchers also show interests in how to determine a foreign collaborator in the information environment. Grossman and Helpman (2005) focused on how to determine the location of outsourcing firms that demanded intermediates or components through a general equilibrium model of trade. When the producers used the search model to find suppliers in the global market, they discovered the search for international partnership costly and uncertain. As the search process was preceded, more input suppliers in a market would bring more profits for final-good suppliers. In addition, more customers in the market would benefit suppliers more.

Nicita and Olarreaga (1999) studied about trade spillovers at the country level with the data from four developing countries (Egypt, South Korea, Malaysia and Tunisia). They found that international exporters and importers in the world market had significant effects on international information spillovers. In addition, the spillover effects tended to occur in countries with close geographical location, especially neighboring countries. Geographical concentration of exporters was easily accessible to the construction of transportation infrastructure, such as storage facilities and railway lines. Moreover, they found that public or private export information agencies were helpful to the diffusion of export information across firms, which can exert significant effects on the export performance of a country.

Swenson (2008) examined the information spillovers of MNC activities on Chinese local exports in information-dependent sectors where high-quality information was needed to form the trade relationship. She used the data of differentiated goods industries and she concluded that multinational presence was much more positively correlated with new Chinese trade in industries of differentiated goods compared with homogenous goods industries.

III. Theoretical Arguments

There are both direct and spillover effects of MNCs on the exports of the host country. Direct effect refers to the internal technological transfer from the parent MNCs to their
wholly-owned subsidiaries. Spillover effects refer to both positive spillovers and negative spillovers.

3.1 Direct effect of FDI in the host country

When MNCs establish their wholly-owned subsidiaries in a host country, direct effect from MNCs to their affiliated firms is transferred through technology. Direct effect is related to an internal transfer of technology which is controlled by the multinational parent company. However, the parent multinational companies do not change the ownership or control over the activities of their wholly-owned subsidiaries in the host country. Furthermore domestic firms in the host country will gain technical knowledge and skills to improve their competitiveness on exports (Sheng, 1999).

Vernon (1966) introduced the theory of product life cycle in international investment and international trade which is an early theoretical model to analyze the direct effect of FDI. The four stages of a new product contain development, production, trade and investment. When the product reaches the standardization stage, MNCs will invest in lower-cost factories in developing countries in order to produce and sale the products in the local market and export to developed countries.

A large number of empirical results indicate that the labor productivity of host country substantially increases through MNCs’ technology transfer to their subsidiaries (Haddad and Harrison, 1993; Blomström and Kokko, 1998). The presence of MNCs in the host country has exerted positive effects on domestic firms.

In the developing countries, different policies toward foreign countries have different effects on the direct technology transfer from FDI to enterprises in the host country. Damijan and Knell (2003) study the impact of different privatization methods on international knowledge spillover. In Estonian, enterprises implemented a policy on the privatization with the full liberalization of foreign policy. Thus, they can gain significant direct technology transfer from FDI. However, in Slovenia, the privatization of enterprises mainly faces to
domestic-owned and internal people (employees and managers). Enterprises in Slovenia will be limited to gain international knowledge spillovers through the flow of international trade. Therefore, MNCs tend to make a direct technology transfer to the companies which they own the most equity.

3.2 The Positive Effects of MNCs on the exports of domestic firms

3.2.1 Improvement of comparative advantages of export products

Firstly, subject to capital constraints abundant labor resources, natural resources, and technology resources in the developing countries cannot be completely absorbed. This affects the economic development and the export growth of the host country. One efficient way to eliminate these constraints is to get access to foreign investment (Zhang, 2001). Moreover with inflowing of foreign capital, more savings can be used to investment in the host country. The utilization of resources can be improved and the production capacity will be directly formed.

Secondly, foreign investments not only contain funds, but also involve technology, managerial experience, and marketing skills. Since the spillover effects of the foreign partner in the joint venture on domestic partner depends on the operation of its capital, the capital accumulation from foreign partner will positively affect the production of domestic partner. However, foreign partners use their respective products, technology, and business management to change the allocation of resources in original enterprises and thus the production is more efficient (Jiang, 2002).

3.2.2 Multinational Spillovers on domestic firms

(i) The spillovers from wholly-owned foreign companies and joint ventures

In terms of FDI ownership structure, multinationals with partial participation of domestic firms tend to generate more productivity spillovers than wholly owned foreign companies in host countries (Javorcik and Spatareanu, 2008). Vertical spillovers may take place when local
suppliers have contacts with partially owned foreign companies. Domestic partners have
good understanding about local policies and comparative advantage of factors (Jiang, 2002).
They would offer knowledge about local suppliers and help foreign investors get access to
cheap labor factors and lower their production cost. This encourages foreign partners to get
involved in local sourcing. On the other hand, horizontal spillovers can happen when local
companies in the same sector or industry imitate managerial experiences and technological
innovations of foreign affiliates (Jiang and Yang, 2006).

Wholly foreign-owned companies which have most advanced technologies always impede
the leakage of technology to local competitors in the same industry while local partners in the
joint venture can directly get access to multinationals’ proprietary technology and managerial
knowledge. Besides, foreign affiliates with partial domestic ownership would generate
greater knowledge dissipation to local firms than wholly foreign-owned companies. Foreign
partners in joint ventures would share less complicated knowledge to domestic partners,
which can be more easily transferred to intra-industry local companies (Ye, 2005).

(ii) Linkages between MNCs and local firms

There are two kinds of linkage between multinational companies and local firms (Blomström
and Kokko, 1998). The relationship between MNCs and local inputs suppliers is called
backward linkage, while forward linkage is referred to as contacts between MNCs and their
customers.

Through the backward linkage of MNCs, local suppliers which have direct contacts with
MNCs would benefit more from multinational activities compared with those without
multinational contacts. Since multinationals have specialized requirements of products and
organizational skills, they would help their local suppliers choose appropriate raw materials
and intermediate products, as well as build production assemble lines to satisfy their needs
(Wang, 2002). Thus local suppliers would improve the quality and diversity of inputs as well
as the speed of delivery through MNCs’ technical assistance and employee training.
Simultaneously, local suppliers would improve technological performance through direct
knowledge transfer from foreign firms (Zhang, 2001). The entrance to the local market of MNCs also brings more demand for production inputs and, thus, scale economies would bring more profits for local suppliers.

As the forward linkage with MNCs, domestic firms in downstream sector receive inputs with better quality and complementary services offered by multinationals as upstream suppliers. This is because multinational corporations in upstream sector possess more advanced R&D to produce inputs than domestic suppliers (Jiang and Yang, 2006). Local suppliers in the similar industry would receive technological knowledge on related input products from the leak of knowledge from forward-linkage domestic firms.

(iii) Technological spillovers from MNCs

As a result of high demand of skilled labor, multinational corporations always lay emphasis on raising the productivity of employees through the training of R&D activities and managerial knowledge. A growing number of MNCs have built R&D laboratories in host countries with local high-skilled employees. R&D spillovers generated from MNCs have positively influenced local firms’ productivity since MNCs possess the world’s most advanced technologies (Wei and Liu, 2003). Local firms can absorb positive spillovers from MNCs’ R&D activities through copying technology, reverse engineering, and absorbing former employees from MNCs (Blomström and Kokko, 1998).

MNCs also play the role of demonstration about technological innovation on domestic firms. Local firms with lack of capital cannot afford the loss of new trial of technology since there is much uncertainty about profits and costs of new products or inputs. MNCs would become the leaders in the aspect of trying the new technology innovations. Thus, local firms would avoid the failure of the risk to new technology through learning from MNCs (Zhang, 2001). In the free-market environment, if local enterprises want to survive, they would accelerate the pace of technological development and upgrading. Competitive pressure generating from multinational companies continuously promotes domestic enterprises to upgrade the technological level.
3.3 The negative effects of MNCs on the export of domestic firms

3.3.1 Limitation of Technological Innovation

The greatest advantages of multinational companies are related to their technical superiority because of their advanced R&D activities. Multinationals always select high technology standard which matches the mainstream demand of the target market and thus produce the technological output with global standards to maximize their benefits. The most concerned problem of multinational companies is the confidentiality of technology (Zhang, 2001). Protecting and controlling the critical technology is an instinctive strategy of multinationals. Thus, the source of technology spillover effects on the host country from FDI has been limited.

The host country tries to attract FDI in order to take the advantage of the technology of MNCs. However, it is still difficult for domestic firms in the host country which learn technology from FDI to catch up or even exceed the level of technology in developed countries (Jiang and Yang, 2006). Moreover, there exists "FDI trap" in technological progress. The technology of the host country would be imitated by the developed countries through foreign direct investment.

Although more and more foreign companies have set up R&D centers in the host country, the vast majority of R&D activities are to improve the technology which is suitable for the host country, or just a part of the chain in developed country (Ying, 2004). The promotion of R&D levels and innovation capability of the host country is very limited.

Moreover, there are substitution effects on the technological innovation of local enterprises. The motivation to attracting FDI is mainly to enhance export competitiveness of the host country through introducing technology from foreign companies to domestic firms. If domestic enterprises overly depend on technology imports, they may spend less cost of money and time with technological innovation and ignore their own technological innovation capability (Jiang and Yang, 2006). The technological innovation capability of enterprises
tends to be destroyed, which is not conducive to long-term industrial competitiveness improvement.

### 3.3.2 The crowding-out effects on the host country

The presence of MNCs will create fierce competition in the local firms since the entrance of MNCs in one sector of the industry of the host country will significantly raise the initial competition between intra-industry domestic firms. Market-oriented multinationals have the ability to lower marginal costs of products with higher technology and deprive the demand of products from local firms. Moreover, employees in foreign firms tend to gain higher wage and more systematic training compared with the domestic firms. Thus a high number of employees are attracted to foreign firms (Lall, 2000).

This mainly happens because the multinational itself has a significant advantage, such as high technologies, competitive brands and international marketing networks, etc. Thus, MNCs are strong competitors in the exporting field. However, they also have a series of preferential policies from the host country, such as tariff, income tax, the use of land and other concessions. Meanwhile, some areas in the host country introduced related preferential terms policies in order to attract more FDI. In terms of the super-national treatment, MNCs have more significant cost advantages than domestic firms. Thus, they crowd out the export share of domestic firms (He, 1998). This results in the decline of competitive advantage of export of domestic firms.

Domestic firms with less efficiency would be forced to go bankrupt, but the efficient local companies will increase their efficiency in technology and marketing to have competition capacities with multinationals. Moreover, heterogeneous firms in intra-industry with more productivity tend to get involved into the export market under trade liberalization as Melitz (2003) mentioned. However, less productive firms will still stay at domestic market and those firms with least productivity will be forced to exit. This leads to an increase in aggregate productivity, since market shares are reallocated towards more productive firms. In comparison with domestic firms, exporting firms must have the capacity to bear the burden of
sunk cost for exporting. When domestic firms make the choice of entering into export markets, they have to afford the sunk cost which includes transportation costs and fixed costs.

3.3.3 Limitation of the promotion of MNCs’ exports

Multinational export has a vital role in promoting competitiveness of the host country, but it is subject to the following specific conditions. Firstly, domestic firms in the host country take a certain risk when they completely depend on the multinational companies in order to improve their export competitiveness. The risk may occur because MNCs can shift their investments when the operating environment of the host country substantially changes, or when the earnings prospects of MNCs are affected a lot (Jiang and Yang, 2006). The reason for the shift in investments is that export-oriented MNCs are very sensitive to production costs, market channels, and the institutional environment of the host country.

Secondly, the effects of multinationals on domestic firms of the host country which promotes export competitiveness of these firms depend on certain conditions. The correlation between multinationals and local firms is a very important factor (He, 1998). For example, if multinational companies just form an “island economy” in the host country, domestic firms do not gain useful knowledge, management experience and technology from foreign direct investment. Thus, the promotion of multinational companies to host country's export competitiveness will be very limited.

3.4 Search for the international partnership

An effect of the globalization of the international trade is that information about foreign markets substantially affects the success or failure on building worldwide partnership. As a result of costly and uncertain search, searching for appropriate international partnership around the global market has become a challenge for local firms (Swenson, 2008).

As Grossman and Helpman (2003) mention, when a final-good producer try to find international partners to outsource specialized components or invest directly in a new industry for the inputs, they should consider the following four factors—industry size in the
foreign country, productivity of suppliers, the contracting environment, the relative wage level between home and foreign country.

In terms of search uncertainty, the result from information asymmetries will force home country producers to give up the profit-maximization trade transactions (Swenson, 2008). The valuable information about finding partnership in foreign countries involves labor endowments, geography distance, trade tariff, foreign customer tastes, and so on. If the information about specific professional knowledge and production costs of all potential suppliers is not available for the intermediate or final-good producers, then they may turn down profit-generating foreign sales opportunities and drive them to conduct their sales in their home countries instead (Ye, 2005).

In the process of searching for foreign partners, home country firms have to afford a costly and specific research in order to form new export relationships. After information about potential partners is collected, domestic firms will eliminate the least desired partners who are worst suited for their trade objectives. Grossman and Helpman (2005) indicates that a final-good producer choose his suppliers based on who have the appropriate expertise. The role of suppliers has to fit with producer’s specific requirements about inputs or intermediate products.

Although domestic investors have narrowed their search range to a number of appropriate partners through screening sequence, the failure of search always exists since the most ideal partners may not be discovered in the transactions which have the purpose of maximum profits. Thus, home country producers may make the choice of building up partnership with domestic firms instead of foreign partnership (Ye, 2005).

Before making the decision of whether to construct partnership with domestic firms or international corporations, local firms needs to pay attention to the matching quality with foreign partners (Rauch and Trindade, 2003). The matching quality depends on the net profit of transactions of the local firms after their trade barriers and transport costs are eliminated. Another factor that influences the decision of the matching quality is the extent of the
standards of products according to requirement of trade partners.

IV. Methodology

4.1 Data

The source of the panel data we used is China Statistical Yearbooks (2004-2012), which is compiled by the National Bureau of Statistics of China. This set of books consists of informative yearbooks which fully reflect economic and social development of the People’s Republic of China. It systematically records statistical data about the country and individual provinces including autonomous regions and municipalities. The economic variables that were used in this thesis where retrieved from the following data categories: national accounts, population, foreign trade and economic cooperation, industry, transport, and education.

The individual provinces in the mainland of China where excludes Hong Kong and Macao include 31 regions. A “region” in China is defined as a province such as Sichuan, an autonomous region such as Guangxi, or a municipality which is directly governed under the central government such as Shanghai (Wei and Liu, 2006). The data set of the 31 regions can be broadly divided into two macro areas, the coast area and the interior area. The coast area in China contains the coastal regions along the coastal line while the interior area includes the interior regions which are far from the coastal line.

The coast area refers to as the regions along the South China Sea, the East China Sea, the Yellow Sea and the Bohai Sea. Figure 3 displays the map of China by regions. As shown in the figure, the coast area includes 12 regions, such as Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, and Hainan while the other 19 regions belong to the interior area (Wei and Liu, 2006).

Considering great disparities across regions, regional characteristics with economic significance are included into the estimation models. The regional dummy variables are divided in two categories: coastal and interior regional dummy variables. The reason for this
is to distinguish differences in economic development between the two macro areas.

Figure 3: The map of China by region

Source: China Tourist Maps

The description of variables is showed in Table 2. The subscripts $i$ and $t$ separately denote the region ($i=1,\ldots, 31$) and the year ($t=2003,\ldots,2011$). The dependent variables are $LX_{it}$ which represent the export volume of Chinese domestic firms. As shown in Table 2, we can find that difference of the mean of Chinese export volume and foreign firms on the overall level is about 20 percent.

Based on previous studies (e.g. Swenson, 2008; Chen and Swenson, 2007), we study the following explanatory variables: export volume of MNCs, GDP per capita, educational levels, wage levels, number of population, length of transport routes, regional and year dummy
variables.

Table 2: Description of variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LX&lt;sub&gt;i&lt;/sub&gt;</td>
<td>279</td>
<td>1.61e+10</td>
<td>2.93e+10</td>
<td>1.20e+8</td>
<td>2.07e+11</td>
<td>PP</td>
<td>Export volume of Chinese firms</td>
</tr>
<tr>
<td>MNCX&lt;sub&gt;i&lt;/sub&gt;</td>
<td>279</td>
<td>2.01e+10</td>
<td>4.83e+10</td>
<td>23450</td>
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<td>PP</td>
<td>Export volume of foreign-funded firms</td>
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<td>3255.835</td>
<td>2491.703</td>
<td>435.302</td>
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<td>GDP per capita</td>
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<td>Average wage of employed person per year</td>
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<td>PP</td>
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<td>10504</td>
<td>10,000persons</td>
<td>Population in each region</td>
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<td>279</td>
<td>101639</td>
<td>64145</td>
<td>6484</td>
<td>283268</td>
<td>km</td>
<td>Total length of highways</td>
</tr>
<tr>
<td>waterway&lt;sub&gt;i&lt;/sub&gt;</td>
<td>279</td>
<td>3988</td>
<td>5181</td>
<td>0</td>
<td>24793</td>
<td>km</td>
<td>Length of navigable inland waterways</td>
</tr>
<tr>
<td>railway&lt;sub&gt;i&lt;/sub&gt;</td>
<td>279</td>
<td>2636</td>
<td>1572</td>
<td>221</td>
<td>9161</td>
<td>km</td>
<td>Length of railways in operation</td>
</tr>
</tbody>
</table>

Notes: i denotes region i and t denotes year t from 2003-2011. PP represents USA $ is adjusted by producer price index.

During the period of 2003-2011, great changes have happened in the economic environment. These economic changes affect the price of Chinese exports (Chen and Swenson, 2007). For
that reason is necessary to include year dummy variables in the estimation to explain these systematic effects.

The export volume of MNCs in China is the main explanatory variable to explain the effects of MNCs on Chinese local export volume (Swenson, 2008). The measurement of export volume of MNCs includes all the export value by foreign-owned corporations and joint ventures. This variable is denoted by $MNCX_{it}$.

The presence of MNCs has exerted both positive and negative effects on the productivity of Chinese firms. Local firms which have backward-linkages and forward-linkages with MNCs can enjoy lots of benefits from MNCs, such as the improvement of product quality, technology transfer, and managerial skills. Thus, local firms can improve their productivity and then increase their export prospect through contacts with MNCs. On the other hand, those local firms with least efficiency would be forced to go bankrupt.

The export activities of MNCs have positive and negative influences on Chinese firms’ export. Chinese exporting firms can take advantage of the knowledge of foreign market conditions and distribution channels. However, they have to face the fierce competition from MNCs since MNCs have the ability to lower marginal costs of products and raise the wage level in each region.

GDP per capita is the main economic indicator that represents general economic activity in every region (e.g. Swenson, 2008; Démurger, et al., 2002). The standard of economic development in each region also has played an important role in influencing Chinese firms’ export. From the macroeconomic perspective, GDP per capita by region is used to show the regional inequality between different regions (Démurger, et al., 2002). In this thesis it is represented by $gdp_{it}$.

Figure 4 illustrates the gap in the average GDP per capita between the coast area and the interior area, which is large in the period 2003-2011. This indicates that the income level and the income growth rate are different in the two kinds of area from 2003 to 2011. It is obvious
to show how intense the difference is between the coast and the interior area.

Figure 4: Average GDP per capita by the coast area and the interior area in the period 2003-2011

Although fixed-effects estimation can be used to control the time-invariant regional characteristics, it may not capture all obvious regional characteristics. The reason that fixed effects estimation will not be suitable to capture all the regional characteristics is the remarkable evolution of opportunities that happened in recent years (Chen and Swenson, 2007). For example, the unemployment rate in urban areas dropped from 4.3% in 2003 to 4.1% in 2011; the average wage of employed persons in urban units rose from 1,687 dollar in 2003 to 6,471 dollar in 2011 (China Statistical yearbook, 2012).

In order to capture regional characteristics which are correlated with the characteristics of trade, we include R&D activity, education level, wage level, number of population, employment, and length of transport routes into the estimation (e.g. Chen and Swenson, 2007; Swenson, 2008).

Since R&D spillovers from foreign firms will elevate the whole R&D level in each region according to Görg and Greenway (2004), it is important to represent regional characteristics. In terms of measuring R&D activity, some previous studies use input indicators of technology such as R&D expenditures and patents, whereas other studies use output indicators such as
intangible assets. In this study, we choose the patents to represent R&D activity level by region and it is denoted by $RD_{it}$.

The proportion of college and high school students in the population of each region represents the higher educational levels in different regions. They are denoted by $%college_{it}$ and $%highschool_{it}$. Table 2 shows that the mean values of the percentage of college and high school students by each region and each year are very low, 1.77% and 2.33% separately. In China, a system of nine-year compulsory education is applied. But the higher education is not free and compulsory. Moreover, the number of the population in each region is very high, which is denoted by $POP_{it}$.

In order to show the negative spillovers of MNCs, we include foreign wage level by region and average regional wage level to represent the competition effects on Chinese firms brought by MNCs. They are denoted by $wage_{foreign_{it}}$ and $wager_{region_{it}}$. The wage level in MNCs is used to represent the competition effects from MNCs on Chinese domestic firms since the wage level in foreign firms is usually higher than in local firms (Görg and Greenway, 2004). From the data we omit the years 2004 and 2005 in Qinghai as the data were not available. That lack of data did not influence our results.

As the geographical locations differ a lot between the coast area and the inland area, we used length of transport routes to explain these differences. Transport routes are referred to three means of transportation: navigable inland waterways, highways and railways in operations. They are separately denoted by $waterway_{it}$, $highway_{it}$, and $railway_{it}$.

As for deflators, producer price indices for industrial products are used to adjust the values of industrial output which is denoted by $PP_{it}$.

4.2 Methodology

A simple model about the relationship between the export volume of MNCs and Chinese local firms is expressed as follows:
\[ LX_{it} = MNCX_{it} + \varepsilon_{it} \]  
\[ \varepsilon_{it} = \alpha_i + u_{it} \]  
\[ \varepsilon_{it} = \alpha + w_{it}, \text{ where } \alpha_i = \alpha + \gamma_i, \ w_{it} = \gamma_i + u_{it} \]

Where \( LX_{it} \) represents export volume of Chinese domestic firms in region \( i \) (1,..., 31) and in year \( t \) (2003,..., 2011); \( MNCX_{it} \) represents the export value of multinational corporations in region \( i \) and year \( t \). The unobservable error term is denoted by \( \varepsilon_{it} \).

The model (2) and (3) is the error-components model which is frequently used for the panel data (Hayashi, 2000). In the panel model with fixed effects, the first unobservable component \( \alpha_i \) in the model (2) is called the individual effect, the individual heterogeneity, or the fixed effects. The variable \( \alpha_i \) captures all unobserved, time-constant factors that affect \( LX_{it} \). It is fixed over time. The error \( u_{it} \sim \text{IID } (0, \sigma^2) \) is homoscedastic and uncorrelated, both over time and across firms.

In this thesis, each region has unique time-invariant characteristics which are not correlated with other regions’ individual characteristics. Fixed-effects estimation is used to eliminate the effects of the time-invariant unobserved factors that have influences on attracting MNCs and promoting local export.

Figure 5 shows the individual heterogeneity across the 31 regions and Figure 6 displays the individual heterogeneity across years from 2003 to 2011. Heterogeneity or the fixed effects refers to as unobserved variables that do not change over time. For instance, geographical locations in different regions may become the unobserved factors.

As shown in Figure 5, we can find that several coastal regions, such as Guangdong, Jiangsu, Shandong, Shanghai, and Zhejiang, have greater export volume of Chinese firms compared with that in other regions. Figure 6 represents that the mean value of export volume of Chinese firms in each region has a downward trend in 2008. This is because the global financial crisis happened in 2008, which had negative effects on local exports of China.
In the panel model with random effects, assume that the units in the sample are randomly drawn from a larger population of units (Heij et al., 2004). This is because that the individual-specific characteristics cannot be estimated in the fixed-effects model. For example, the variables like the sex and the living area of the consumer cannot be discriminated in a consumer panel. If these variables are included as additional regressors, there is the problem of perfect collinearity. Therefore, the constant terms $\alpha_i$ need to be adjusted. In the model (3), suppose that $\alpha_i \sim \text{IID} (\alpha, \sigma_{\alpha}^2)$ and $\gamma_i \sim \text{IID} (0, \sigma_{\gamma}^2)$, these effects are independent of the disturbances $u_{it}$.

**Figure 5: Fixed effects: Heterogeneity across regions**

![Graph showing heterogeneity across regions](image)

**Figure 6: Fixed effects: Heterogeneity across years from 2003 to 2011**

![Graph showing heterogeneity across years](image)
The panel fixed-effects (FE) and random-effects (RE) estimation are used to analyze the relationship between the exports of Chinese domestic firms and the exports of MNCs. The baseline model which has applied into the paper of Chen and Swenson (2007) can be written as follows.

\[
\ln L_{Xit} = \ln M_{NXCit} + \ln gdp_{it} + \ln RD_{it} + %college_{it} + %highschool_{it} + \ln highway_{it} + \ln waterway_{it} + \ln railway_{it} + \ln POP_{it} + \ln wageregion_{it} + \ln wageforeign_{it} + \varepsilon_{it}
\]

(4)

Regional and year dummy variables are considered into the model in order to remove those unobserved time-invariant factors. Moreover, dummy variables also can capture the influence of certain periods of time on growth, such as recession and financial crisis. The general economic activity, GDP per capita, also has effects on the exports of Chinese firms. Besides, the regional characteristics are also included into the baseline model in order to explain the exports of Chinese firms, such as R&D activity, educational levels, regional wage level, foreign wage level, the number of population, or length of transport routes.

Since the magnitude of all the variables in the baseline model is great, such as the export volume of MNCs and Chinese domestic firms, the number of population, all the variables except \( %college_{it} \) and \( %highschool_{it} \) appear in logarithmic form. The variables of \( %college_{it} \) and \( %highschool_{it} \) appear in their original form because the unit is the percentage.

### 4.3 Econometric issues

As can be seen from Table 3 of correlation matrix, the dependent variable of \( LX_{it} \) has high correlation with \( MNCX_{it} \) and \( RD_{it} \), around 0.9. Moreover, there exist high correlations among the independent variables. The variable of \( MNCX_{it} \) has strong correlation with the aggregate level of R&D. There is also strong correlation between \( wageregion_{it} \) and \( wageforeign_{it} \).

Therefore, the variance inflation factors (VIF) is applied to test multicollinearity (Wooldridge, 2009). It is used to measure the extent of the variances of the regression model. In many
previous econometric books, a cutoff value for VIF is arbitrary, when VIF is either 5 or 10. If the value of $R^2$ is larger than 0.9, the cutoff value for VIF should be 10. The way to solve the multicollinearity problem among variables is to drop related variables one by one and get a smaller VIF coefficient which is less than 10.

After applying the VIF method in the baseline model, the result shows that the VIF coefficients of $RD_{it}$, $POP_{it}$ and $gdp_{it}$ are larger than 10. However, the mean value of all VIF coefficients is less than 10, which indicates that there is no multicollinearity problem in the baseline model. Moreover, the variables, $RD_{it}$, $POP_{it}$ and $gdp_{it}$, have the economic significance in the baseline model as the data description shows before. Therefore, it is not necessary to drop the three variables from the model.

In the analysis of the baseline model, one important econometric issue is the possibility of the endogeneity problem. If the random variation in the independent variable is correlated with the disturbance terms in $LX_{it}$, one or more of the regressors is endogenous (Heij et al., 2004). According to previous studies (Swenson, 2008), macro variables, such as $MNCX_{it}$ and $gdp_{it}$, have simultaneity problem with the dependent variable, $LX_{it}$.

The Hausman LM-test on exogeneity is applied to test the endogeneity of the two regressor variables, $MNCX_{it}$ and $gdp_{it}$. It is performed under the null hypothesis of exogeneity (Heij et al., 2004). According to the economic insights and previous studies (e.g. Chen and Swenson, 2007), the instruments of $MNCX_{it}$ are the lagged one and two periods of $MNCX_{it}$, $MNCX_{it-1}$ and $MNCX_{it-2}$. And the instruments of $gdp_{it}$ are the lagged one period of $gdp_{it}$ or the square of $gdp_{it}$. As the results show, the null hypothesis of exogeneity is not rejected even at 10% significance level, which displays that both $MNCX_{it}$ and $gdp_{it}$ are exogeneous in the baseline model.

Sargan test is applied to test the validity of instruments (Heij et al., 2004). If the instruments are not exogenous which is correlated with the error term, the instrumental variable (IV) estimator and the Hausman LM-test on exogeneity are not correct. The null hypothesis is that the instruments are exogenous. For the 2SLS estimator, the test statistic is Sargan’s statistic,
typically calculated from a regression of the IV residuals on the full set of instruments (Hayashi, 2000).

The results of Sargan test show that we should not reject the null hypothesis under which the instruments are valid when testing the instruments of $MNCX_{it}$ and $gdp_{it}$. However, when using the instrument of $gdp_{it}$, the square of $gdp_{it}$, the result shows that this instrument is not valid. Instead, the instrument, the lagged one period of $gdp_{it}$, is valid under the Sargan test.

V. Results

Table 4 illustrates the results of the effects of MNCs’ exports on Chinese firms’ exports. Both fixed-effects and random-effects estimation are applied to analyze the baseline model (4). Fixed-effects estimation for the baseline model is showed in the column (1) and (2) of Table 4. The difference between them is that the column (1) adds both 31-regional dummy variables and year dummy variables into the model. After dropping the 31-regional dummy variables from the column (1), there are different results of the effects of $gdp_{it}$, $RD_{it}$, $POP_{it}$, $%college_{it}$, $%highschool_{it}$ and $wageforeign_{it}$ on $LX_{it}$ in the column (2).

The coefficients of $lnMNCX_{it}$ in both column (1) and (2) are significant and positive, which shows that the effects of the exports of MNCs have significantly positive influences on Chinese domestic firms’ exports. However, the coefficients of $lngdp_{it}$ are negative in Column (1) and positive in the column (2). This shows that the effects of the 31 regional dummy variables have deprived the effects of the variable of GDP per capita on the dependent variable. In this case, the fixed-effects estimation in the column (2) is preferred to that in the column (1).

In the column (2), the effects of R&D activity on exports of Chinese firms is positive and significant at 1% level, which shows that MNCs indeed have technological spillovers on the level of R&D activity of Chinese firms. A growing number of MNCs have built R&D laboratories in China and they also hire Chinese local high-skilled employees. Chinese local firms absorb positive spillovers from MNCs’ R&D activities through copying technology and
absorbing former employees from MNCs (Blomström and Kokko, 1998).

Table 4: The effects of MNCs’ export on Chinese domestic firms’ exports

<table>
<thead>
<tr>
<th></th>
<th>(1)FE</th>
<th>(2)FE</th>
<th>(3)RE</th>
<th>(4)coast</th>
<th>(5)interior</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnMNCX_{it}</td>
<td>0.208***</td>
<td>0.244***</td>
<td>0.352***</td>
<td>0.517***</td>
<td>0.353***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.029)</td>
<td>(0.034)</td>
<td>(0.095)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>lnGDP_{it}</td>
<td>-0.580***</td>
<td>0.511***</td>
<td>0.166</td>
<td>0.094</td>
<td>-0.106</td>
</tr>
<tr>
<td></td>
<td>(0.197)</td>
<td>(0.136)</td>
<td>(0.151)</td>
<td>(0.245)</td>
<td>(0.226)</td>
</tr>
<tr>
<td>lnRD_{it}</td>
<td>0.043</td>
<td>0.505***</td>
<td>0.162***</td>
<td>0.039</td>
<td>-0.023</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.055)</td>
<td>(0.058)</td>
<td>(0.077)</td>
<td>(0.090)</td>
</tr>
<tr>
<td>%college_{it}</td>
<td>-0.042</td>
<td>-0.278***</td>
<td>-0.119</td>
<td>0.041</td>
<td>-0.223</td>
</tr>
<tr>
<td></td>
<td>(0.118)</td>
<td>(0.055)</td>
<td>(0.095)</td>
<td>(0.141)</td>
<td>(0.203)</td>
</tr>
<tr>
<td>%highschool_{it}</td>
<td>-0.148**</td>
<td>-0.167***</td>
<td>0.023</td>
<td>-0.0214</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td>(0.079)</td>
<td>(0.055)</td>
<td>(0.069)</td>
<td>(0.106)</td>
<td>(0.121)</td>
</tr>
<tr>
<td>lnhighway_{it}</td>
<td>-0.058</td>
<td>0.005</td>
<td>0.044</td>
<td>0.039</td>
<td>-0.205</td>
</tr>
<tr>
<td></td>
<td>(0.096)</td>
<td>(0.087)</td>
<td>(0.08)</td>
<td>(0.117)</td>
<td>(0.158)</td>
</tr>
<tr>
<td>lnwaterway_{it}</td>
<td>0.007</td>
<td>0.003</td>
<td>0.034</td>
<td>-1.033</td>
<td>0.108</td>
</tr>
<tr>
<td></td>
<td>(0.104)</td>
<td>(0.023)</td>
<td>(0.026)</td>
<td>(0.941)</td>
<td>(0.142)</td>
</tr>
<tr>
<td>lnrailway_{it}</td>
<td>-0.191*</td>
<td>0.049</td>
<td>-0.161*</td>
<td>-0.450***</td>
<td>-0.084</td>
</tr>
<tr>
<td></td>
<td>(0.106)</td>
<td>(0.063)</td>
<td>(0.088)</td>
<td>(0.137)</td>
<td>(0.181)</td>
</tr>
<tr>
<td>lnPOP_{it}</td>
<td>-2.086***</td>
<td>0.069</td>
<td>0.403***</td>
<td>0.196</td>
<td>-4.268***</td>
</tr>
<tr>
<td></td>
<td>(0.585)</td>
<td>(0.112)</td>
<td>(0.164)</td>
<td>(0.574)</td>
<td>(1.404)</td>
</tr>
<tr>
<td>lnwageregion_{it}</td>
<td>-0.126</td>
<td>0.039</td>
<td>0.217**</td>
<td>-0.098</td>
<td>0.619***</td>
</tr>
<tr>
<td></td>
<td>(0.178)</td>
<td>(0.199)</td>
<td>(0.111)</td>
<td>(0.142)</td>
<td>(0.208)</td>
</tr>
<tr>
<td>lnwageforeign_{it}</td>
<td>0.052</td>
<td>-0.276**</td>
<td>0.0004</td>
<td>0.677**</td>
<td>0.207</td>
</tr>
<tr>
<td></td>
<td>(0.138)</td>
<td>(0.136)</td>
<td>(0.146)</td>
<td>(0.287)</td>
<td>(0.192)</td>
</tr>
<tr>
<td>R²</td>
<td>0.9842</td>
<td>0.9540</td>
<td>0.9270</td>
<td>0.9929</td>
<td>0.9452</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Region FE</td>
<td>YES</td>
<td>-</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

**Notes:** Standard errors in parentheses. The superscripts *, **,***, denotes statistical significance at the 10%, 5% and 1% levels. The variable of MNCs export volume takes lagged one year. Year FE is year dummies which denotes the yearly fixed effects from 2003-2011; Region FE is region dummies which represent regional fixed effects in 31 regions or coastal regions, interior regions. And i denotes region i and t denotes year t from 2003-2011. The observation number n is 279.

Both %college_{it} and %highschool_{it} have negative and significant effects on LX_{it}. This shows that the higher the educational level in the mainland of China, the lower the export volume of domestic firms. People with higher educational level have the ability to consume the products of Chinese firms, which decreases the export volume of domestic firms. Moreover, the increase in the number of college and high school students brings more skilled employees,
which elevates the economic level of each region and then promotes local economic development.

The coefficient of $\ln{\text{wageforeign}}_{it}$ is negative and significant at 5% level in the column (2) because of the competition effects from MNCs. MNCs in China always raise the wage level of their employees to attract the talents with professional performance, which leads to the transfer of employees from Chinese companies to foreign companies and thus declines the exports of Chinese firms.

The coefficients of $\ln{\text{highway}}_{it}$, $\ln{\text{waterway}}_{it}$ and $\ln{\text{railway}}_{it}$ are insignificant at 5% level. However, in the analysis of the effects in the period 1997-2003, the three variables had significant effects on $LX_{it}$ in the full sample (Chen and Swenson, 2007). The length of transport routes of highway, waterway and railway has no influence on Chinese firms’ export in the full sample. Moreover, the number of population in each region has also no significant effects.

In the column (3), the random-effects estimation is also applied to estimate the baseline model. Hausman test is used to compare the estimation results from fixed-effects and random-effects models and then choose more suitable estimation for the baseline model. The null hypothesis $H_0$ is that random effects would be consistent and efficient; the alternative hypothesis $H_1$ is that random effects would be inconsistent (Frees, 2004).

After using the Hausman test under the null hypothesis that random-effects estimation is preferred to the fixed-effects estimation, the null hypothesis is rejected. Therefore, the fixed-effects estimation of the column (2) is more suitable for the baseline model.

In order to compare the effects of $\text{MNCX}_{it}$ on $LX_{it}$ between the two macro areas, the coast area and the interior area of China, the subsamples of the coast area and the interior area are taken from the full sample to make the analysis of the regional disparity between the two areas.

The column (4) and (5) of Table 4 show the estimation of the coast area and interior area, separately. The results show that the positive spillovers of the exports of MNCs have
outweighed the negative spillovers of MNCs’ exports on Chinese firms’ exports both in the coast area and the interior area. This is the same as that in the full sample.

In comparison with the effects of other economic variables on the full sample in column (2), these results are totally different from those in the coast area and the interior area. Most of related economic variables in the column (2) of the full sample are insignificant at 10% level both in the column (4) and (5), such as GDP per capita, educational level, R&D activity.

As shown in the column (4) and (5) of Table 4, the results show that the export volume of Chinese firms will increase 0.517% in the coast area and 0.353% in the interior area when there is one percent increase in the export volume of MNCs. The effects of MNCs’ exports on Chinese domestic firms’ exports in the coast area are greater than that in the interior area.

In addition, some variables are significant in the coast area but the other variables are significant in the interior area. The variables of railway_{it} and wage_{foreign_{it}} have significant influence on LX_{it} in the column (4) of the coast area while POP_{it} and wageregion_{it} are significant in the column (5) of the interior area. However, the variables of gdp_{it}, %college_{it}, %highschool_{it} and wage level were all significant both in the coast area and in the interior area in the paper of Chen and Swenson (2007).

In the coast area, the effects of railway_{it} are negative and significant at 1% level while the other two variables of waterway_{it} and highway_{it} have no significant influence on the exports of Chinese domestic firms. The advantage of the coast area is that there are export platforms near the coastal line to promote the exports of MNCs and Chinese domestic firms. But the development of the railway lessens the advantage of the coast area, which leads to the decrease of the export activities.

The wage level of foreign companies has significant and positive effects on LX_{it} in the coast area. Compared with the number of foreign companies in the coast area and the interior area, the data show that the average number in each region of the coast area is almost four times larger than that in the interior area. Although foreign companies in the coast area have
competition effects on local firms, foreign companies have created great economic development in the coast area through their export activities.

In the column (5) of the interior area, the number of population in each region has negative and significant effects on $LX_{it}$ while the wage level of each region has positive and significant effects on $LX_{it}$. The increase in the number of the population in the interior area will significantly decrease the exports of Chinese domestic firms. This is because that the more people in the interior area will increasingly consume domestic products. Since the number of MNCs in the interior area is less than that in the coast area, the wage level of each region in the interior area instead of the wage level of foreign companies can promote the development of the export activity.

VI. Discussion

As can be seen from the results in Table 4, the coast and interior area have great differences in economic development and geographic characteristics. There are differences in infrastructure development, the extent to openness, geographical location and regional preferential policies. China's reform and opening up created more export preferential policies for the coastal regions in the coast area. The coast area which is regarded as the export platform can easily take part in the international trade and increase their export activities.

From Figure 7, we can see that most of the coastal regions have an upward trend in the growth of Chinese and multinational exports during the period 2003-2011, such as Shanghai, Jiangsu, Guangdong, Shandong, and Zhejiang. For example, Jiangsu has experienced the largest percentage change during this period. The exports of MNCs in Jiangsu have increased almost five times during 2003-2011. Especially, MNCs’ export values of the four coastal regions, Shanghai, Jiangsu, Zhejiang, Guangdong, have tremendous upward growth. These regions belong to the Yangtze River Delta and Pearl River Delta region which are national financial and economic centers in China. They have become important export platforms since important port hubs in these regions are built to connect with other regions’ ports.
However, none of the interior regions show the tremendous increase in the exports of MNCs and domestic firms. But there are still some interior regions showing the upward trend, such as Anhui, Jiangxi, Jilin and Xinjiang. However, there is no growth of MNCs’ exports and Chinese firms’ exports in Ningxia, Tibet and Shanxi during the period.

The preferential policies included in the reform and opening-up policy contain lots of benefits for MNCs in the Special Economic Zone which is built in the coast area. For instance, foreign firms can get duty-free intermediate inputs for export activity and exempt the confiscatory taxation for social subsidies (Démurger et al., 2002). Therefore, an increasing number of multinational corporations tend to locate in the economic zones in order to benefit from these advantages. This brings more chances for Chinese firms in the coast area to learn from MNCs and construct partnership with them. Thus, export preferential policies have played a vital role in promoting regional economic development.
In terms of geographical location, there are apparent disparities between the coast area and interior area in China. The regions with mountains and hills imply higher transportation costs for trade and need more investment in physical infrastructure than those near coastal lines (Démurger et al., 2002). Along navigable rivers, the coastal regions can enjoy the low cost of sea transportation and are more suitable to become platforms for export-oriented manufacturing industries. Thus, the coastal dummies represent the combination of “geographical location” and “preferential-policy effects” (Démurger et al., 2002).

There are still some policies can be raised to improve the exporting environment in the interior area of China. Although the Chinese central government has proposed the “Go West” campaign to develop economic growth in the central and western area of China in 1999, the campaign was not effective in promoting the development of exports in the interior area. However, in recent years, a growing number of export processing zones have been built up by foreign investors in the interior area. Land ports have begun to build in some interior regions. They are logistics centers in inland regions offering port services, which can expand the scope of the opening-up policy and have great influences on the expansion of exports in interior regions.

Although there are negative effects of MNCs on Chinese firms’ exports, the positive spillovers have outweighed the negative. Chinese domestic firms really gain great advantages from the cooperation with MNCs. The government should continue to encourage domestic firms to cooperate with MNCs in the form of backward-linkage, forward-linkage or joint ventures.

Additionally, the government should also consider the benefits of those small-sized and medium-sized domestic firms which have less than 500 employees and get low productivity. The competition effects of MNCs may prevent these firms from growing further and make them bankrupt easily. This may generate serious problems in the economic development of China since there are a number of small and medium-sized companies in China. Therefore, the government should strive to protect the benefits of those small or medium developing firms. For instance, the government can offer interest-free loans to support small and medium
firms and provide special institutions for them to develop their capabilities to compete with MNCs. Moreover, certain local financial policies can be applied to encourage local suppliers to cooperate with MNCs in order to help local firms develop faster and more steadily.

**VII. Conclusion**

Multinational corporations have obtained great benefits from the reform and opening-up policy of China. That policy also increases the rhythm of China’s economic development. The preferential policies encourage foreign companies to enter the exporting markets and build up affiliated MNCs or joint ventures to promote the economic growth of China. Therefore, a growing number of MNCs have appeared in Chinese markets with the purpose to gain special advantages, which can generate both positive and negative spillovers on the exports of Chinese domestic firms.

With the increasing number of multinationals and advanced information technology, China has made great advancement in connecting international trade partnership. The spillovers of export-oriented MNCs include information about foreign market conditions and distribution channels. As a result, local firms can reduce the costly and uncertain search when they are looking for international partnership in the global market. This will give Chinese exporting firms an advantage in order to find more suitable export markets and produce more appropriate inputs or intermediates, which are required by the foreign customers.

The exports of MNCs have created both positive and negative spillovers on Chinese firms’ exports. Local firms which have backward-linkages or forward-linkages with MNCs or partnership with foreign firms can directly get access to multinationals’ proprietary technology and managerial knowledge. Local firms’ productivity will be raised since local firms can copy technology, reverse engineering, and absorb former employees from MNCs. As a result the export prospect of local firms will expand.

We used the panel data of 31 regions from 2003 to 2011 to estimate the impact of exports of foreign MNCs on the exports of Chinese domestic firms. Compared with random-effects
estimation, the fixed-effects estimation is preferred to conduct the investigation how the export volume of MNCs has created effects on Chinese firms’ exports.

In our results, the positive effects of MNCs’ spillovers outweigh the negative effects. From the column (2), (4) and (5) of Table 4, the results show that the exports of MNCs have significant and positive influences on the exports of domestic firms both in the full sample and the subsample of the coast area and the interior area at 1% significance level. In the estimation, some economic variables and the variables of regional characteristics are also included to explain Chinese firms’ exports, such as: GDP per capita, education level, length of transport routes.

Moreover, we divide the 31 regions into two parts, coastal region and interior region, to analyze the differences between these two big regions. There are great disparities between them in terms of geographical location and preferential policies. The effects of MNCs’ exports on Chinese firms’ exports are larger in the coast area than the effects in the interior area.

From the theoretical point of view, the entry of multinationals can promote the quality and quantity of Chinese export. MNCs fully exploit the advantage of labor and resource, and at the same time improve the technology and increase the capital in China. Thus, it enhances the possibility of increasing export competitiveness of Chinese firms. On the other hand, based on the characteristics of domestic economy and the development strategies of FDI, the upgrade of export competitiveness of Chinese firms could be weakened. Considering the factors above, China can adjust some relevant policies:

Firstly, China should attract more competitive investment of large MNCs, more specific the MNCs with the latest and most advanced technology. In the industry field where MNCs have entered, the policy should make domestic firms and MNCs equally competitive. China can offer subsidy to domestic enterprises which have the ability to compete with multinational companies in order to raise the competitiveness of domestic firms. Meanwhile, in the monopolized industry of MNCs, China can attract more competitive foreign investment to
attend the market. This kind of policy will force the multinationals to take use of advanced production technology and management under the high pressure of competition. At the same time, domestic firms can benefit more from technology spillovers and improve their export competitiveness.

Secondly, China should search for more efficient approaches to make MNCs more involved into Chinese economy and also accelerate the speed of Chinese firms globally. The continuously improvement of China’s participation in the international division of labor will have the following results: Firstly China will enhance a higher position in the international division of labor. Secondly the technological content of export products will be improved. Lastly technological progress of related industries will be achieved.

Finally, in order to be transformed into the self-growth mode, it is a suggestion that the growth of exports in China gradually minimizes the dependence of foreign capital. Moreover domestic firms can enhance the learning ability of foreign advanced technology and improve the innovation capacity of independent research. This may enable Chinese domestic firms raise their competitiveness of exports.
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### Appendices

#### Table 3: Correlation Matrix

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