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Master's Thesis

**Is China's Economic Growth
Dependent on External Sector?**

February 2017

Seoul National University

Graduate School of International Studies

International Area Studies Major

Zhou Mengying

Is China's Economic Growth Dependent on External Sector?

A thesis presented

by

Zhou Mengying

to

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ABSTRACT

**Is China's Economic Growth
Dependent on External Sector?**

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This thesis examines the relationship between economic growth and the external sector in China. It proposes that external sector should be measured from external demand and supply, including foreign trade, investment, employment and technology. Based on this new numerical measurement, this paper argues that the external dependence of China's economy has been overestimated, and it is relatively lower than other Asian countries. Furthermore, a regression analysis was addressed on a cross-province panel,

comparing the contribution of external and domestic sector to economic growth, and their variations before and after 2008. From the empirical evidence, this thesis suggests that China's economic growth has become more dependent on domestic rather than external sector since 2008. This transition can be explained by the resurgence of state owned enterprises, the weakening of foreign funded enterprises and the stimulus policy package to cope with global financial crisis.

Keywords: China, economic growth, external dependency, external sector, domestic sector

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I. Introduction

An East Asian development model has emerged, led by the rapid development of Japan and Four Asian Dragons – Hong Kong, Singapore, South Korea and Taiwan, and followed by the Tiger Cub Economies – Indonesia, Malaysia, the Philippines and Thailand. They have followed a remarkable growth pattern, one of indispensable features of which is outward-orientation, also called *external dependence*. Now here comes a contentious question: whether China, as a late comer, fit in the East Asian development model and shares this feature.

As the world is shrinking, China seems replicated the success of the other East Asian fellow countries since China implemented the open door policy in the late 1970s, mainly promoting international trade and attracting foreign investment. Especially after the accession to the WTO in 2001, China became more open to the world in terms of trade. As a great achievement, except the period of global financial crisis in 2008, the total trade volume kept increasing and playing an important role in driving GDP growth. Kenichi Ohno (2002) provided the evidence of a cross comparison of intra-regional manufactured

export between East Asian countries and the mechanisms of foreign direct investment flows as well as trade in machine parts to emphasize on the organic and dynamic interdependence in East Asian region, where China has also integrated in as a late comer (Ohno, 2002). Terms like the flying geese model, structural transformation chain, and Asian dynamism, to some extent, all highlight the external dependence of East Asian countries where China is included without exception.

However, the success of East Asian Development model has been criticized since the global financial crisis in 2008. The export-oriented economies who relied on American consumption were deeply harmed by the crisis. By the fourth quarter of 2008, the GDP of all four Asian tigers approximately fell by 15% annualized rate, while exports also fell by a 50% annualized rate (Fischer, 2009). This plus the Euro-zone crisis has challenged the sustainability of the external-oriented growth model. Redirecting China's economy from external-oriented to domestic-oriented, particularly stimulating domestic consumption, has been proposed as a strategy to alleviate external shocks and maintain long-run sustainable growth (IMF 2010, ADB 2009). With

the concern about the vulnerability of external dependent growth, the research on the scale and influence of external sector on China's economic growth is of great significance and necessity. In this context, a research question has been raised: is China's economic growth dependent on external sector?

The answer given by this paper is no. Based on our common knowledge, China is a big country. From the aspect of necessity, China has a large market and abundant resources, and does not need to dependent on external market and resources to generate economic growth. From the aspect of feasibility, it is very difficult for such a giant economy to maintain highly external-oriented growth.

Thus, this paper raises two hypotheses:

- a. China is not as externally dependent as other Asian countries.
- b. China's economic growth is not dependent on external sector but domestic sector, especially after 2008.

In order to test these two hypotheses, we will examine the scale of external sector in China, by comparing it with that of other fast-growing Asian countries and with the domestic sector in China. Besides, we will also examine the effect of external sector on economic growth in China, comparing it with that of

domestic sector.

The next section will begin by reviewing previously existing literatures about this topic, especially their measurement of external sector and determinants of economic growth. Then, the data and the comparative method used by this paper will be described, which is followed by the empirical results that support our arguments. Next, the possible interpretations of the results will be discussed in the fifth section. Finally, concluding remarks will summarize our findings on hypotheses testing and discuss the implications for China's economic policy.

II. Literature Review

There are numerous existing literatures expressing different opinions about this controversy. By reviewing the rapid economic growth of China in past three decades, a mainstream of scholars believe that China follows East Asian development model. Baek, (2005) and Boltho et al. (2009), among others, observed that the Chinese developing path shares some key characteristics with those East Asian countries in their high growth eras, especially their striking performances of exporting manufactured goods to the world market. Yao (2011) pointed out that China's economic growth is export-oriented, which is deeply rooted in structural change and demographic transition and will continue for a long time in the future. From a meta-analysis to compare the growth performance of China and that of other countries, Tingvall and Ljungwall (2012) concluded that China depends more on and gain more from exports than other countries do.

In contrast, some scholars disagree with the views of China's high external-dependent. He et al. (2008) compared China's export dependency with other economies using input-output analysis, and found that China's export

dependency is lower than commonly thought. Herrerias et al. (2010) suggest that export is not the only explanation of China's fast growth, while investment (in physical capital and R&D) and the exchange rate policy also contribute to China's long-run economic growth. Inspired by their studies, this paper tends to support this group's point of views. We will re-estimated the export dependency of China and at the same time evaluate the growth effect of other factors besides foreign trade.

As for the measurement of external sector, existing literatures demonstrate various methodologies, depending on different definitions of external sector. In the external sector report of IMF, external sector of each country is measured from aspects of foreign asset and liability position and trajectory, current account, real exchange rate, capital and financial account: flows and policy measures, foreign exchange intervention and reserves level. For the case of China, the official indicator for external dependence rate from China's General Administration of Customs is the total volume of exports and imports as a percentage of GDP, emphasizing on trade. Xing et al. (2013) improved this calculation method by excluding the imports for processing from exports and

adding foreign investment as a percentage of GDP, and found that China is still highly dependent on external sector.

If we can determine a method to measure external sector, now the question becomes how the external sector relates to economic growth and how big its contribution is compared to domestic sector. In other words, our task is to find out what can influence economic growth and what role the external sector plays in it.

According to the Cobb-Douglas production function: $Y = AL^{\alpha}K^{\beta}$, there is no doubt that growth is related to labor, capital and total factor productivity which commonly refers to technological improvement. Besides, in Barro's (2003) growth model, the determinants of per capita GDP growth include education, life expectancy, fertility, democracy, rule of law, international openness, government spending, etc. Moreover, in the financial market, Saymeh et al. (2013), Hansen, et al. (2013), Bosworth (2014) investigated the negative effect of interest rate on growth. In the goods market, Fischer (1993), Mallik et al. (2001) and Hwang (2011) did empirical researches on verifying the correlations between inflation and economic growth. Among these

numerous determinants of economic growth, Osang, T. (2006) implies that deeper determinants fall into two broad categories: internal and external.

Learning from these literatures, in order to find out the mechanism of external sector influencing growth, this paper is going to adopt the determinants in their growth models, then divide them into external and domestic parts, and finally compare their contribution to economic growth in China.

III. Data and method

In a broad sense, the external sector is the portion of a country's economy that interacts with that of other countries. According to this definition, external sector can be approached from two aspects – one country's production outputs for external demands and production inputs supplied by external resources, the representative indicators of which are foreign trade and inward foreign direct investment (FDI) respectively. Furthermore, FDI is the main channel for an economy to affect another by bringing investment, employment and technology. These are exactly the production factors in Cobb-Douglas production function. Thus, in this paper, external sector is defined as foreign trade, investment, employment and technology that exist in the host country.

1. External dependency

The scale of the external portion in each production factor reveals how much the production inputs of one country relies on foreign economies, which is defined as External Dependency. To prove the first hypothesis, we need to compare the external dependency of China with that of other Asian countries.

In this paper, these countries are Japan, South Korea, Hong Kong, Singapore, Malaysia, Thailand and Philippines, which experienced economic fast-growing period. In light of the definition of external sector, the external dependency refers to trade dependency, foreign investment dependency, foreign employment dependency and foreign technology dependency.

According to the data released by China's General Administration of Customs (CGAC), the trade dependence rate is calculated as total volume of imports and exports as a percentage of GDP. However, this calculation did not exclude "foreign contents" – the imported values that were re-export to foreign countries. Since processing trade occupies a significant portion of China's trade. Only if we have the data to domestic value added, we can accurately observe how much the pure domestic production is driven by external demands. Hence, the data of domestic value added as share of gross exports were collected from Trade in Value Added (TiVA) database of OECD.¹ Using this indicator multiplied by gross exports and then divided by GDP, we can obtain the real trade dependency. We expect this number will be less than the official trade

¹ The data from TiVA database are only available in 1995, 2000, 2005, 2008, 2009, 2010, 2011.

dependence rate released by CGAC. Also, when compared with other Asian countries, China's real trade dependency is expected to be relatively lower.

As FDI helps to generate production factors in the host country by establishing enterprises, external production factor dependency can be measured as the proportion of investment, employment and technology brought by foreign funded enterprises (FFE's). (Particularly, in this paper, FFE's in China refer to the FFE's in a broader sense, including the pure foreign funded enterprises and also the enterprises with funds from Hong Kong, Macao and Taiwan.) Therefore, the ideal mechanism to calculate external production factor dependency should be:

- Foreign investment dependency = investment by FFE's / total investment
- Foreign employment dependency = employed persons in FFE's / total employment
- Foreign technology dependency = technologies of FFE's / total technologies

As for foreign investment dependency, although the commonly used indicator is FDI as percentage of gross investment in fixed assets, it is not

accurate enough, because not all the FDI is used to invest in fixed assets. However, since the data of this indicator are available for all the countries in the database of UNCTAD while we have no access to the data of foreign enterprises in other countries, we still adopt this indicator as FDI dependency when comparing China with other Asian countries. They are annual data cover from 1991 to 2014. On the other hand, when compared with domestic investment, the proportion of fix assets investment of FFEs would be a better choice to evaluate foreign investment dependency, while domestic investment dependency can be measured as the proportion of fix assets investment of domestic funded enterprises.

Moreover, to calculate foreign employment dependency of China, annual data for nationwide employed persons in FFEs and total employment are collected from National Bureau of Statistics of China (NBSC), covering from 1991 to 2014. Unfortunately, since we have no access to the data on foreign enterprises in other countries, the comparison can only be made between domestic funded enterprises and FFEs in China. Specifically, the types of domestic funded economic entities include state owned enterprises (SOEs),

collective owned enterprises (COEs), private enterprises (PEs) and Self-employed individuals (SEIs).

In addition, technologies cannot be measured directly but estimated indirectly by using proxies. A commonly used proxy for technological innovation is patent. Hence, this paper adopts the annual data from 1991 to 2014 in World Bank – the number of patent applications as a proxy to represent the technological improvement of various enterprises and individuals. In the database of World Bank, patent applications are those filed through the Patent Cooperation Treaty procedure or with a national patent office, which are distinguished into patents awarded to residents and non-residents. Here, non-residents refer to foreign enterprises and individuals, while residents refer to local enterprises and individuals.

2. External sector, domestic sector and economic growth

2.1 Dataset formation

In order to test the second hypothesis, we run a regression between economic growth and each production factor and then compare the contribution

of each production factor to economic growth. Our main objective is to find out which kind of production factors – domestic or external, contribute more to economic growth. Annual data for last two decades – from 1995 to 2014 – were collected from NBSC. If we adopt nationwide data, for each variable, there will be one data per year. These data will form a time series dataset, containing only 20 observations. Then a small sample problem will occur, leading to an unconvincing regression results. To avoid this problem, we adopt cross-province data² rather than national data to conduct the regression analysis. As a result, each variable has 31 values in one single year, covering all the provinces and municipalities in China. In other words, our dataset is enlarged and becomes a panel, containing 620 observations (20 multiplied by 31). Provincial data can help to reveal the mechanism of economic growth in local China. If the second hypothesis is commonly true for all the provinces, we can still draw a conclusion that China's economic growth is more dependent on domestic sector than external sector.

² The cross-province panel data in this paper cover 31 provinces and municipalities, including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang

2.2 Dependent and independent variables

The dependent variable is China's GDP growth rate. Since the annual GDP index data released by NBSC regard preceding year as a reference, the GDP values of two consecutive years are comparable without the influence of inflation. Thus, the difference of the GDP indexes of two consecutive years can be used as the real annual GDP growth rate. The data of provincial GDP growth rates against year are plotted in Figure 1, where each province displays a similar pattern, which is similar to the national growth rate as well. Again, it means that if the variation of provincial data can be explained by our hypothesis, the trend of national economic growth can also be explained. According to Figure 1, this growth pattern shows an evident turning point in 2007, and its trend has turned downward since 2008. Thus, we are going to run regressions on the data before and after 2008 separately and compare the difference of their variation mechanism. We expect that, for some certain production factors, external sector is the main force driving economic growth before 2008, but after 2008, the whole China's economy mainly relies on the development of domestic sector.

The first group of independent variables are the growth rates of fixed assets investment of all types of enterprises, among which PEs and SEIs are categorized into one group to represent the domestic private sector in China. Their data of annual investment in fixed assets are collected from NBSC covering from 1995 to 2014. Since the price of fixed assets is fluctuating, the nominal data of annual investment are not comparable with each other. Thus we introduce the price index for investment in fixed assets (preceding year = 100) from NBSC to calculate the growth rates of fixed assets investment of each type of enterprises:

$$GRINVEST_t = (INVEST_t / PIFAt \times 100 - INVEST_{t-1}) / INVEST_{t-1} \times 100\%$$

where $GRINVEST_t$ is the growth rate of fixed assets investment in year t , $INVEST_t$ and $INVEST_{t-1}$ are the nominal volume of fixed assets investment in year t and $t-1$ respectively, and $PIFAt$ is the price index for investment in fixed assets in year t . The value of the growth rate of FFEs in Qingdao in 1996, 1184.61%, was deleted from the dataset, since it is extremely high and apparently an outlier. As a result, the growth rates of FFEs, SOEs, COEs and PESEIs respectively peaked at 289.29% in Xizang in 2008, at 80.90% in

Sichuan in 2009, at 453.84% in Xizang in 2005, at 367.08% in Shanghai in 1996; and respectively minimized at -97.26% in Xizang in 2002, at 25.45% in Jilin in 2011, at -7.25% in Hainan in 2006, at -57.83% in Shanghai in 1997; with an average of 20.33%, 15.55%, 17.92% and 27.78% respectively.

The second group of independent variables are the growth rates of employment of external and domestic funded enterprises. The growth rates are derived from the number of total urban employed persons of each types of enterprises. Because usually there are no SOEs or FFEs in rural China, we adopt merely the urban employment data to ensure all types of enterprises are covered and treated evenly. The annual data are also from NBSC covering the years from 1995 to 2014. According to the data, the highest growth rates of employment of FFEs, SOEs, COEs and PESEIs happened respectively in Xizang in 2013 with 3378.26%, Xizang in 2012 with 10.67%, in Tianjin in 2011 with 105.22%, in Beijing in 2002 with 516.13%; the lowest ones were in Gansu in 2009 with -46.00%, in Sichuan in 1997 with -30.85%, in Liaoning in 1998 with -47.30%, in Jilin in 2003 with -38.73%; with an average of 15.90%, -2.72%, -8.42% and 13.21%.

The independent variables in the third group are the growth rates of technological improvement. Here, instead of patent applications of non-residents and residents, we use expenditure of industrial enterprises above designated size for acquisition of foreign technology and for purchase of domestic technology as proxies to represent the external sector and domestic sector in technology respectively, which are collected from China Statistic Yearbook on Science and Technology. Although we have to stay with what is described in calculating technology dependence rate since other relevant data of technology are not available for other countries, we change to the latter measurement for this section since it is more suitable for our study.

For one thing, patent application is an output concept, measuring the results achieved in innovations. However, what we want to examine is the relationship between economic growth and production factor inputs, and here would be the technological inputs, measuring the research process and activities. For another, patent application is not accurate enough, because the inventions applying for Chinese patent are not necessarily utilized into production in China promoting GDP. For example, a technology invented by a foreign enterprise

located abroad is not used in the production process in China, but they can still file a patent application in China, which is also recorded into patent applications by non-residents, just as other FFEs located in China do. In contrast, the expenditure for acquisition of foreign technology and for purchase domestic domestic technology are better proxies. They not only cover the exact domestic located enterprises that generated GDP, but also break the boundary between different types of enterprises in China. Specifically, no matter FFEs or domestic funded enterprises, all of them can acquire foreign technology and purchase domestic technology as well. For example, data show that the expenditure for acquisition of foreign technology in Beijing in 2014 is 3900.32 million RMB, which means that all of the industrial enterprises above designated size located in Beijing, including both foreign and domestic enterprises, spent 3900.32 million RMB on acquiring foreign technology.

Moreover, in this paper, the expenditure for assimilation of foreign technology, together with that for acquisition of foreign technology, is added to represent the inputs in external sector of technology; and the expenditure for technical renovation, as a part of in-house R&D after purchasing domestic

technology, is added to be a part of the inputs in domestic sector in of technology. In our dataset, the average growth rate of foreign technology is 132.05%, while that of domestic technology is 149.92%.

2.3 Control variables

Besides those independent variables, other variables that can affect economic development should also be considered. We should control the influence of these variables so that we can examine the real influence of independent variables on dependent variables and test its robustness. First of all, as mentioned above, although the influence that trade has on China's economic growth is not so large as it has on other Asian countries, they may still be related, as international trade represents external demands driving economic growth. Total trade volume as a percentage of GDP is commonly defined as the index of international openness. Numerous empirical studies proved this linkage between trade openness and economic development. For example, Barro (2003) and H. Yanikkaya (2003) found that international openness has a positive influence on GDP per capita growth in a cross country

panel data, but the latter also found that trade restrictions had a same effect as well. By conducting regression on a cross-country panel data, Chang et al. (2009) and Vehapi et al. (2014) stated that the growth effect of openness on economic growth is conditioned, while the former found that it is under the condition of complementary reforms and the latter found that it is conditioned by high initial income per capita, high level of FDI and fixed capital formation. By using empirical evidence of China, Liu et al. (2002) and Sun et al. (2010) also concluded that trade positively influence economic growth. All in all, we have adequate reasons to believe that there is a connection between trade and GDP growth, no matter the effect of trade is positive, negative or conditioned. Therefore, we include international openness – the ratio of total trade volume to GDP – as our first control variable. The values of imports and exports are classified into each province by destinations and catchments. Since the trade data are recorded in US dollars, we use another indicator in NBSC – the annual reference exchange rate between RMB and USD – to facilitate the calculation of openness. As a result, from 1995 to 2014, the average international openness in local China is 29.34%.

The second control variable is inflation rate. By conducting a cross-sectional and panel regression, Fischer (1993) found that inflation had a negative effect on economic growth through reducing investment and productivity growth. Barro (2003) also include inflation rate as a measurement of macroeconomic stability into the determinants of per capita GDP growth, and found that growth is negatively depends on inflation rate. However, there other scholars demonstrating different views. For example, Mallik et al. (2001) found that inflation rate exerts a positive influence on GDP growth rate in a long-run for four South Asian countries. As for the empirical analysis on China, Hwang et al. (2011) revealed a significant non-linear effect of inflation on economic growth, first positive and then later negative at the 2.50 percent of threshold. In sum, we expect that inflation is a significant explanatory variable of economic growth, and thus include it into our regression model to control its influence. In this paper, inflation rate is calculated as the difference of the consumer price indexes in two adjacent years (preceding year=100). From 1995 to 2014, the average inflation rate is 3.09%.

In addition, as 2008 was a special year for China with Sichuan earthquake,

Beijing Olympic games and global financial crisis happening, we expect a different pattern of economic growth in China since 2008. Therefore, we add a third control variable named AFTER2008 to control the effect of 2008. All of the observations after 2008 (including 2008) are coded into 1, otherwise they are coded into 0. Consequently, 217 values of this variables are 1 and 403 of them are 0.

In order to make the coefficients comparable with each other, all the variables, including dependent, independent and control variables, should be standardized. If the second hypothesis is correct, we expect that standardized coefficients of the independent variables representing external sectors are smaller than that of those representing domestic sectors, especially after 2008. In other words, domestic sectors contribute more than external sectors do on economic growth in China.

2.4 Selection of regression model

Since Chongqing had not been separated from Sichuan province to become an independent municipality until 1997, there is no any data for Chongqing

before 1997. Furthermore, since Sichuan contained Chongqing area before 1997, it was not geographically or economically identical with the Sichuan province after 1997. Hence we deleted the data of Sichuan before 1997. Consequently, plus some other data availability problems, our dataset is an unbalanced panel. Besides, it reflects both within- and between-province variation, which means that our conclusion driven from this dataset will rest on both cross-provincial difference and time change. Ordinary least squares (OLS) is not a proper estimation model to deal with such a panel. Since this dataset is not formed by sampling, but covers all the province in China, the OLS fixed-effects model (FEM) should be the most appropriate one for this case rather than the generalized least squares (GLS) random-effects model (REM). The conclusion of this paper is mainly drawn from FEM regression.

IV. Results

1. External dependency

Figure 2 in appendix plots the growth rates of GDP and trade volume of China and some other Asian countries, varying by year. For other export-led Asian countries, the variation of GDP growth rates and trade growth rates closely follow each other. However, for the case of China, the two lines exhibit two independent and different trends with a lot of gaps between each other. If the difference is not straightforward enough as shown in the figures, we calculated the average residual squared of two lines to measure their gaps. The results of each country is summarized in table 1 in appendix. It shows that the value of China is the biggest, which means that China's economic growth is the most irrelevant with trade. From this aspect of trade, we can conclude that China's economic growth is not as external-oriented as other Asian countries.

As trade is actually a part of GDP, we cannot say they are not related by comparing their two independently but calculating the portion of trade in GDP. Both official data of trade dependence rate released by CGAC and the real trade dependency are plotted in figure 3-1 in appendix, from which we can see that

the latter is much smaller than the former for every year, keeping within the range between 10% and 30%. When compared with other countries' real trade dependency, China is lower than all of other Asian countries other than Japan (refer to figure 3-2). In other words, China's GDP is relatively less dependent on trade than other Asian countries do.

Figure 4-1 in appendix shows the FDI dependency of China from 1979 to 2014. It rises until 17.14% in 1994 and declines afterwards to lower than 4% until recent years. Figure 4-2 demonstrates the comparison between FDI dependency of China and other Asian countries. Apparently, China's FDI dependency is higher than that of most other Asian countries from 1991 to 2000, but relatively lower than their FDI dependency in the rest of years.

Figure 5-1 demonstrates the portion of employed persons in each type of enterprises in China. Apparently, the proportion of employment of FFEs steadily increases from 1991 to 2014, just as plotted in figure 5-2. As we can see, although foreign employment dependency keeps growing but it still cannot exceed 4%. Likewise, the percentage of FESEIs employment increases during last two decades. In contrast, the ratios of employment of SOEs and

COEs gradually decrease in this period. However, we should noticeable that domestic employment – including employment of PESEIs, SOEs and COES – is still dominant during the whole time, outnumber that of FFEs, no matter how it changes.

Figure 6 plots the foreign technology dependency of China and other Asian countries from 1991 to 2014. In most of the years, China's foreign technology dependency is lower than that of other countries but Japan and South Korea. Nevertheless, it is noteworthy that it has become lower than South Korea since 2011, and lower than Japan since 2013. That is saying, in 2013 and 2014, China's foreign technology dependency is at around 14%, which is lower than that of any of those Asian countries, indicating a great progress of domestic technology dependency.

In summary, China's economy is not as dependent on external sector as commonly thought. Especially in the recent years, the foreign dependency of China in each aspect is lower than most of other Asian countries and demonstrates a declining trend. So far, a conclusion can be drawn in this section that the first hypothesis is proved – China is not as externally dependent as other

Asian countries. The results of this part is summarized in table 2 in appendix.

2. External sector, domestic sector and economic growth

Table 3 shows results from FEMs of GDP growth rates on investment growth rates of external funded and domestic funded enterprises, which control for inflation rate, international openness and a dummy of year 2008. Model 1 covers the whole time period from 1995 to 2014, including the dummy variable AFTER2008. It has a significant negative effect on GDP growth. Specifically, provincial GDP growth after 2008 is averagely lower by 0.09% than that before 2008. Moreover, investment growth rates of FFEs, SOEs and PESEIs all have significant positive effects on economic growth. When the growth of external sector – the investment of FFEs– grows by 1 unit, provincial GDP growth rate increases 0.211. Since all the coefficients were standardized, they are comparable to each other. Comparatively, investment growth rates of SOEs and PESEIs, which are clarified as domestic sector, can cause provincial economic growth by 0.231 and 0.191. That is 0.422 in total for the contribution of per unit domestic sector to provincial economic growth, approximately two times of the

contribution of external sector.

When we look into regression results for model 2 and 3, two subsets tell a similar story to what the full model does. Before 2008, every unit growth of fixed assets investment of external enterprises contributes 0.207 GDP growth, while SOEs and PESEIs contribute 0.247 and 0.119 respectively, which is 0.366 for domestic sector in total, outnumbering that of external sector. After 2008, the investment of FFEs becomes not significantly related to GDP growth, while per unit growth of domestic sector in investment leads to 0.790 GDP growth. In summary, since 2008, the influence of external sector has disappeared and the influence of domestic sector has expanded. However, no matter before or after 2008, domestic sector maintains dominant on stimulating economic growth in the field of fixed assets investment.

Table 4 shows results from FEMs of provincial economic growth on employment of each type of enterprises, which control for inflation, openness and a dummy of year 2008. All the data from 1995 to 2014 are included in Model 1, where only domestic sector – SOEs and PESEIs – have significant positive effect on provincial economic growth. However, as shown in model 2,

data before 2008 exhibit a different result. Although employment in domestic sector drives 0.3005 provincial GDP growth per unit, every one more job opportunity offered by external sector (FFEs) alone generates 1.636 provincial GDP growth, about five times bigger than the growth caused by the employment of domestic sector. In contrast, after 2008, while the coefficient of FFE employment becomes negative and insignificant, the employment of SOEs turns out to be the main force driving economic growth, with 0.291 increase per unit. To sum up, in the aspect of employment, before 2008, one person employed by FFEs generates much more GDP growth than the one hired by domestic enterprises, but the situation has been reversed since 2008, when the employment growth of FFEs has no significant influence on economic growth.

Table 5 demonstrates results from FEMs of provincial economic growth on foreign and domestic technology improvement, which control for inflation, openness and a dummy of year 2008. Model 1 is, as usual, a full model. It shows that, during this whole period from 1995 to 2014, both foreign and domestic technology have significant positive effect on economic growth. The former drives 0.106 GDP growth per unit, and the latter only drives 0.0897. By looking

into model 2 and model 3, we find that only foreign technology has significant effect on economic growth before 2008, so does domestic technology after 2008. Specifically, an increase in foreign technology brings 0.114 more GDP growth before 2008, while domestic technology remains no significant influence. On the contrary, foreign technology has a negative but not significant effect on GDP growth, while domestic technology helps increase 0.223 economic growth after 2008. In summary, acquiring and assimilating foreign technology is more effective for driving provincial GDP growth before 2008, while the economic growth after 2008 is dependent on purchasing and renovating domestic technology. So far, our second hypothesis has also been proved. The results of this part is summarized in table 6.

3. Additional controls

The effects of other factors that may explained the variation pattern of economic growth are also estimated in the models mentioned above: the threshold year 2008, inflation and international openness. No matter how the independent variables changed, their coefficients keep a same pattern and stay

significant in all three groups of regressions, which means that the effects of these variables on economic growth are stable and robust.

First of all, the year 2008 has a threshold effect on provincial economic growth. In the full models in three groups of regression results, it maintains negatively significantly correlated with provincial economic growth. In other words, the GDP growth in each province after 2008 became averagely less than before 2008, so does the national GDP growth in reference. The lower GDP growth rate is one of the features of “new regular” in Chinese economy.

Secondly, with a given investment, employment or technology status, inflation rate keeps a strongly significant positive effect on economic growth, both before and after 2008. In other words, although the real GDP growth in our dataset has already excluded the inflation effect numerically, inflation is good for economic growth in China. This result is consistent with Mallick et al.’s study on South Asian countries, but opposite to the studies of Fischer (1993) and Barro (2003).

Thirdly, in the results of full models and the models before 2008, international openness maintains a strong positive effect on economic growth.

That is saying, compared with other province, also compare with the same province in other years, if one province is more open to trade, its GDP grows faster before 2008. However, as shown in the model 3 in each group of regression results, there are no significant influence of openness on economic growth after 2008, which means that China's economic growth has been no longer dependent on international trade since 2008. This brings us extra evidence to support our argument that, different with other trade-oriented Asian countries, China's economy is no longer led by trade – external demands.

V. Discussion

1. Trade dependency

China's relatively low dependency on trade is mainly because of its low domestic value added in exports, which is reflected in China's huge gap between gross export volume and domestic value added. According to Table 7, when compared to other Asian countries, China ranked the 3rd in gross export in 1995 while the share of value added merely ranked the 8th. In 2011, although China's rank of value added share rose to No. 5, it was still ill-matched with its no.2 rank in gross export.

The reason of the low growth of value added is threefold. First of all, the main portion of domestic value added in China mainly lies in labor-intensive industries such as apparel, rather than technology-intensive industries such as computers, electronic devices, and telecommunication equipment (Koopman, Wang, Wei, 2008). Moreover, compared to other types of enterprises, FFEs maintain the highest growing rate in export value added, but always occupy the least share in total domestic value added. In other words, since the improvement of value added depends on FFEs with low proportion, unless domestic

enterprises expand their value added, the situation will not experience significant change. Besides, the subjects who own export license in China are mainly specialized trading companies. They are independent from production enterprises or scientific research institutes, hence are only able to mainly export primary manufactured goods that require low technologies and services. Thus they can hardly add price through value added from technologies and after-sales services.

2. FDI dependency

FDI dependency shows a rising trend until 1994 and followed by a declining trend. The rising trend in the early period reflects the achievement of the open door policy, especially in attracting foreign investment in the special economic zones by providing policy reference. Prompted by Mr. Deng Xiaoping's Southern talk in 1992 and maintained by improving related laws and stock markets, domestic "fever of investment" has emerged. However, despite the fact that domestic investment expanded dramatically in recent years, even the highest dependence rate of 1994 was less than 18%, indicating that

domestic investments are always playing a major role.

3. Foreign employment dependency

Foreign employment dependency demonstrates a constant rising trend, indicating that the job positions generated by foreign funded companies are increasing. Since the implementation of reform and open door policy in 1978, foreign enterprises have emerged in China. In addition, since the state-owned enterprise reform in 1998, the number of foreign funded companies increased along with the privatization of SOEs. Particularly after the accession to the WTO in 2001, multi-national enterprises kept strong performances in China. Nowadays, a large number of college graduates are inclined to find a job in foreign funded companies, due to the higher wages than that of SOEs. Nevertheless, in the meantime, we should also notice that, although the foreign employment dependence rate is increasing, it still cannot top at 4% yet, incomparable with the employment of domestic funded companies.

4. Foreign technology dependency

Prior to 1992, China mainly relied on the technologies from the former Soviet Union (SU). After the collapse of the former SU, China suffered a bit but soon found replaced sources of technologies mainly from Japan, US and Western Europe, maintaining a high dependence rate in 1990s. To prepare for the possible negative impacts from the WTO accession, the state encouraged both SOEs and private sectors to launch and expand R&D to improve international competitiveness. As showed in Figure 6, it first time became lower than 50% in 2000 as the expenditure on R&D prevails over that on importing technologies in the 21st century. Besides, the Asian financial crisis in 1997 may also be a possible explanation for the turning point in 1998, since the performance of FDI from other Asian countries was hampered.

5. Competitiveness of SOEs and FFEs

On the one hand, the competitiveness of SOEs have been strengthened through SOE reform. According to the results above, we found an interesting fact that, although the share of investment in fixed assets and the share of employment of SOEs has been constantly shrinking, SOEs still maintain great

influence on economic growth. In other words, SOEs became stronger after reform, which is contradict with what we commonly thought that China's rapid economic growth in recent years is mainly due to the dramatic increase in the number of private domestic- and foreign-owned firms and a decline in the state-owned sector (Elliott, Zhou, 2013). As shown in Figure 7, the increasing number of central SOEs on Fortune 500 list can be another evidence of their strengthened competitiveness, which was 6 in 2003 and jumped to 48 in 2016.

This can be explained by the combination of privatization and modernization of SOEs. Since China implemented a policy of “Zhua Da Fang Xiao” (grasp the big and let go of the small) in 1998, a large number of SOEs has gone after restructuring, takeovers, bankruptcy or even being sold off. However, during the same time, modern enterprise systems were established in the SOEs by improving corporate governance through modern styles of management. One of the means is mergers and acquisitions (M&As). From 2002 to 2015, although the number of subordinate central SOEs in State-owned Assets Supervision and Administration Commission of the State Council (SASAC) has reduced from 198 to 102, their total assets have increased from

7.13 to 119.2 trillion RMB, revenue have increased from 3.36 to 45.5 trillion RMB and profits have increased from 0.24 to 2.3 trillion RMB.

Besides, the resurgence of SOEs can also be explained by the continuous supports from government and state-owned banks. Specifically, other than lower tax rates, government grants, capital injections, Chinese government also provides SOEs with preferential access to production inputs and low-cost capital, though they were allowed to raise capital in foreign market economy capital markets after reform (A. Szamosszegi and C. Kyle, 2011). State-owned banks provided considerable benefits to SOEs, including access to borrowed funds at favorable interest rate, debt forgiveness and loans to uncreditworthy enterprises (A. Szamosszegi and C. Kyle, 2011).

On the other hand, the advantages for FFEs to make profits diminished. The most important reason might be the increase of labor costs. According to the *Employment Promotion Plan (2011 – 2015)* made by Ministry of Human Resources and Social Security (HRSS) et al., Chinese government planned to raise the minimum wage by 13 percent per year, so as it did. In other words, the relatively cheaper labor forces in China that used to attract FFEs is fading out.

Moreover, FFEs lost preferential policies given by Chinese government in the take-off stage of reform and open-up policy. For example, preferential policies in tax rate, employment and site selection were removed in 2010; exemptions to the charge of employees' social insurance were removed in 2011.

6. The threshold effect of 2008

According to the empirical results, since 2008, China's economic growth and exports have been slowing down and become more dependent on domestic sector rather than external sector. Such a change can be regarded as a threshold effect of 2008. This may probably be explained by some big historical events happening to China in 2008, such as Sichuan earthquake and Beijing Olympic games, having significant impacts on China's economy and causing changes. Most importantly, together to the rest of world, China experienced the global financial crisis. To cope with crisis and the negative impacts of those events, since 2008, Chinese government has started to implement a package of stimulus policy, spending approximately 4000 billion yuan to expand domestic demand and promote steady and rapid economic growth. In this stimulus program, 4%

of investment in 2008 and 9% of that in 2009 were spent on technological innovation and structural adjustments, which can explain the significantly strengthened growth effect of domestic technology after 2008. In light of our empirical results, it is effective to some extent. All in all, the mix-effect of global crisis, domestic natural disaster and policy responses of government lead to the threshold in 2008.

VI. Conclusion

This paper proposed a method to measure external dependence from the aspects of trade, investment, employment and technology, and then observed their tendencies during 1991 to 2014. From the empirical evidence, we can see that China's external dependence is relatively lower than that of other Asian countries and is in the trend of declining recently. In particular, the trade dependency is lower than commonly thought, which is mainly because of low value added of China's manufacture industries.

Moreover, using a cross province panel of last two decades, this paper examined the relationship between China's economic growth and external and domestic sector, and then compared their growth effects. becomes more and more dependent on domestic sector rather than external sector. Specifically, before 2008, the main forces driving China's economic growth are domestic investment in fixed assets, employment by FFEs and technology transferred from foreign countries. By contrast, compared with external sector, domestic investment, employment and technology contribute more to economic growth after 2008. This phenomenon is probably caused by the resurgence of SOEs

and the weakening of FFEs.

Besides, we found some other factors that can also explain the variation of economic growth: Inflation always exert positive influence on growth, while the positive growth effect of international openness diminished after 2008. In the economic take-off stage of China, opening door is the road to fortune, but now more open to the world does not necessarily link up with higher growth.

Apparently, there is an evident threshold effect of the year 2008 on growth, which can be interpreted by the events happened to China and the world in 2008. To counteract the negative growth effects brought by global financial crisis and other events like earthquake, China took a series stimulus measures, generating such a transition from external-orientation to internal-orientation.

The main implication of this paper is that we need not be over concerned with China's external dependence, and China's economic growth model is so far sustainable. Besides, the improvement of domestic sector does not conflict with that of external sector. China needs to strengthen domestic demand for certain due to the sustainability problem, but it should also simultaneously improve the structure of export and its growth effect. The technological

innovation is of need in manufacture industry, then China can get involved in the upper level of the global value chain.

Admittedly, this thesis has some limitations and they suggest various direction for future studies. First of all, the calculation of external dependency and regression model proposed in this paper is suitable and only be tested for China's case due the data availability in other countries. Future work should pursue a cross-country comparative analysis, using the same method to evaluate the external sector of other countries and draw a general conclusion. Besides, this paper only tested the threshold effect of the year 2008 when global financial crisis happened. In the future, a research can be conducted to test the structural effect of other financial crisis such as the Asian financial crisis in 1997 and the growth effect of external and domestic effect before and afterwards.

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APPENDIX

Tables and Figures

Table 1. The Gap between GDP Growth and Trade Growth of Asian

Countries

Country	Average of residual squared
China	130.18
Japan	118.15
Philippines	99.77
Korea, Rep.	90.29
Thailand	74.90
Singapore	61.92
Hong Kong	57.56
Malaysia	43.48

Table 2. External Dependency of China

Index	Comparison	Trend
Real trade dependency	Lower than most of other Asian countries	Rise first and then decline
FDI dependency	Obscure	Rise first and then decline
Foreign employment dependency	Less than domestic employment	Rise
Foreign technology dependency	Lower than most of other Asian countries	Rise first and then decline

Table 3. Fixed-effects Regressions on Provincial Economic Growth on Investment in Fixed Assets and Other Covariates, 31 Provinces, 1995-2014.

	(1) Full	(2) Before 2008	(3) After 2008
AFTER2008	-0.0930** (0.0351)		
GRINVESFFE	0.211*** (0.0525)	0.207*** (0.0520)	0.0569 (0.117)
GRINVESSOE	0.231*** (0.0363)	0.247*** (0.0459)	0.197*** (0.0576)
GRINVESCOE	0.0284 (0.0350)	-0.00906 (0.0398)	0.0549 (0.0604)
GRINVESPESEI	0.191*** (0.0354)	0.119*** (0.0338)	0.329* (0.137)
INFLATION	0.480*** (0.0547)	0.464*** (0.0561)	0.593*** (0.130)
OPENNESS	0.521*** (0.110)	0.724*** (0.112)	0.268 (0.402)
Constant	0.0872* (0.0345)	0.151*** (0.0401)	-0.0562 (0.0597)
Observations (n)	564	349	215
R-squared	0.312	0.435	0.186
adj. R-squared	0.264	0.370	0.022

Notes: Standardized coefficients; standard errors in parentheses.

GRINVESFFE=growth rate of investment by FFEs in fixed assets;

GRINVESSOE=growth rate of investment by SOEs in fixed assets;

GRINVESCOE=growth rate of investment by COEs in fixed assets;

GRINVESPESEI=growth rate of investment by PESEIs in fixed assets.

* p<0.05, ** p<0.01, *** p<0.001

Table 4. Fixed-effects Regressions on Provincial Economic Growth on Employment and Other Covariates, 31 Provinces, 1995-2014.

	(1) Full	(2) Before 2008	(3) After 2008
AFTER2008	-0.128*** (0.0379)		
GREMPFFE	0.0270 (0.0506)	1.636*** (0.375)	-0.0167 (0.0506)
GREMPSOE	0.259*** (0.0483)	0.231*** (0.0669)	0.291*** (0.0749)
GREMPCOE	0.0159 (0.0446)	-0.0675 (0.0824)	0.0668 (0.0534)
GREMPPESEI	0.0976** (0.0352)	0.0695* (0.0336)	-0.0109 (0.0887)
INFLATION	0.360*** (0.0611)	0.369*** (0.0648)	0.275* (0.122)
OPENNESS	0.469*** (0.117)	0.617*** (0.122)	0.549 (0.413)
Constant	0.0511 (0.0366)	0.209*** (0.0464)	-0.153* (0.0667)
Observations (n)	565	353	212
R-squared	0.244	0.385	0.175
adj. R-squared	0.191	0.317	0.055

Notes: Standardized coefficients; standard errors in parentheses.
 GREMPFFE=growth rate of employment of FFEs; GREMPSOE=growth rate of employment by SOEs; GREMPCOE=growth rate of employment of COEs ; GREMPPESEI=growth rate of employment of PESEIs.

* p<0.05, ** p<0.01, *** p<0.001

Table 5. Fixed-effects Regressions on Provincial Economic Growth on Technology and Other Covariates, 31 Provinces, 1995-2014.

	(1) Full	(2) Before 2008	(3) After 2008
AFTER2008	-0.142*** (0.0397)		
GRFORTECH	0.106** (0.0379)	0.114*** (0.0324)	-0.0257 (0.164)
GRDOMETECH	0.0897* (0.0380)	0.0159 (0.0360)	0.223** (0.0837)
INFLATION	0.756*** (0.0769)	0.856*** (0.0795)	0.612*** (0.144)
OPENNESS	0.493*** (0.122)	0.674*** (0.118)	0.330 (0.412)
Constant	0.156*** (0.0418)	0.297*** (0.0515)	-0.0693 (0.0639)
Observations (n)	531	327	204
R-squared	0.270	0.473	0.140
adj. R-squared	0.220	0.414	-0.027

Notes: Standardized coefficients; standard errors in parentheses.

GRFORTECH=growth rate of foreign technology; GRDOMETECH=growth rate of domestic technology.

* p<0.05, ** p<0.01, *** p<0.001

Table 6. Summary of FEMs Regression Results by Comparison between

External and Domestic Sectors

Production factors	Before 2008			After 2008		
	External		Domestic	External		Domestic
Investment in fixed assets	+	<	+	0	/	+
Employment	+	>	+	0	/	+
Technology	+	/	0	0	/	+

Notes: + = positive effect; 0 = no significant effect.

Table 7. The ranks of China's gross export and share of value added in

Asian countries

Year	Gross export	Share of value added
1995	3	8
2000	2	7
2005	2	6
2008	2	4
2009	2	5
2010	2	5
2011	2	5

Figure 1. Provincial and National GDP Growth Rates in China, 1995-2014

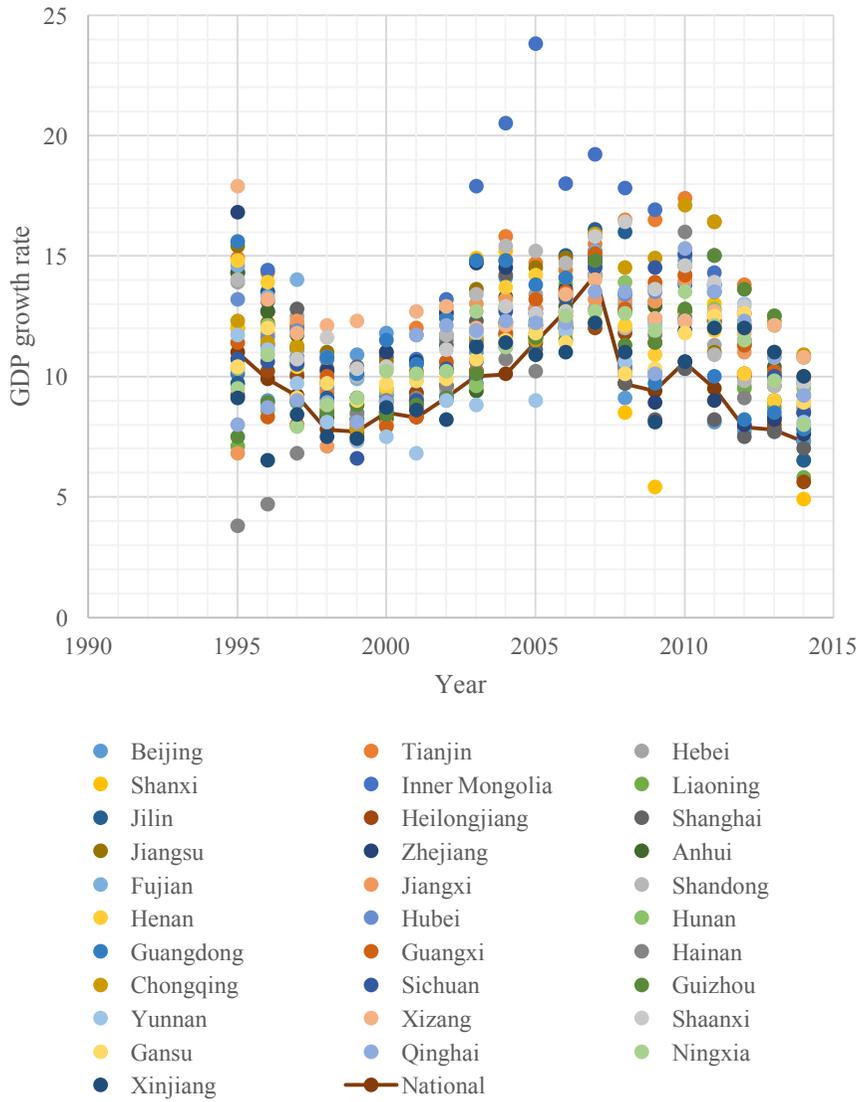


Figure 2. GDP Growth and Trade Growth, China, Korea and Malaysia,

1983-2015

Figure 2-1. China

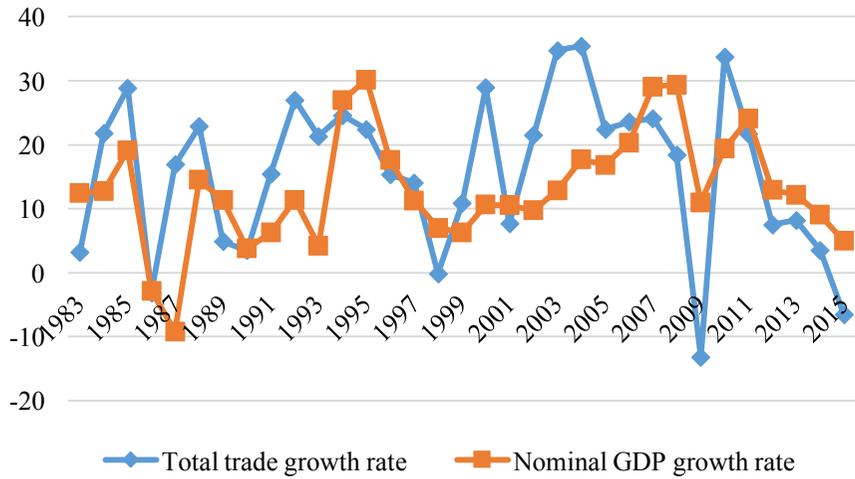


Figure 2-2. South Korea

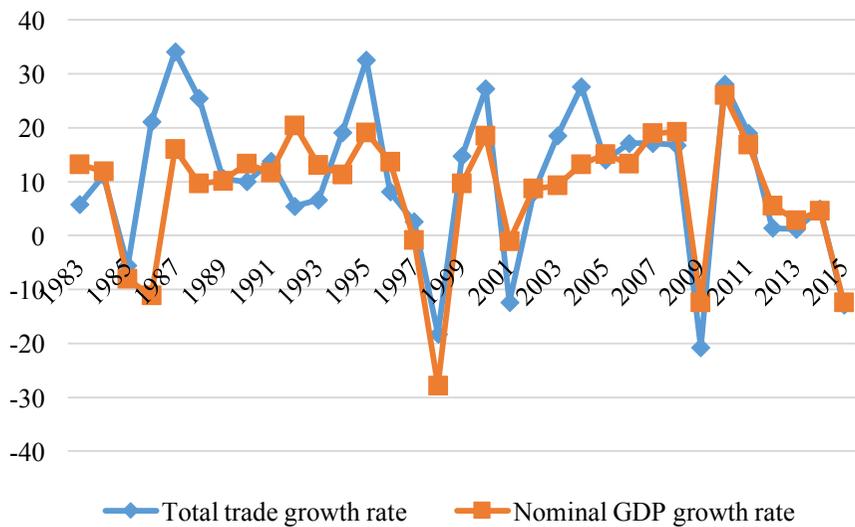


Figure 2-3. Malaysia

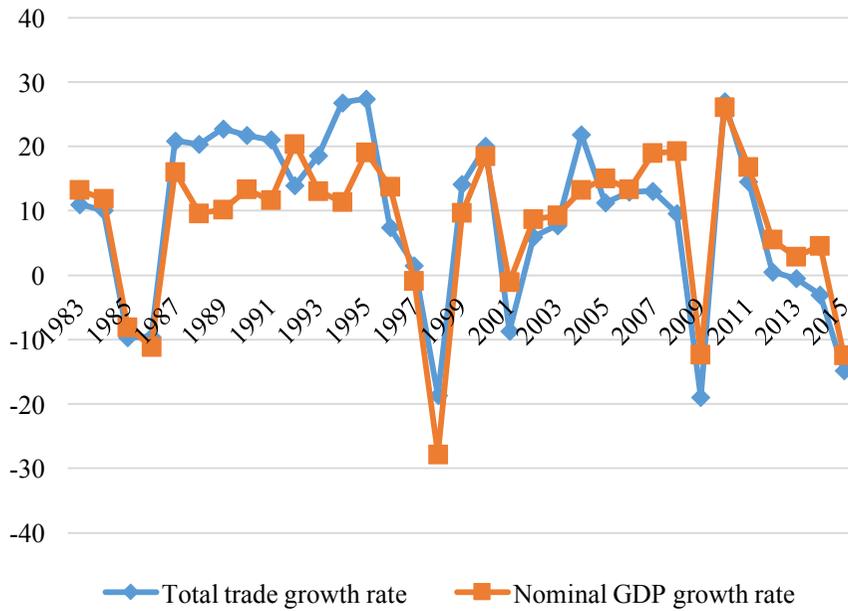


Figure 3. Real Trade Dependency

Figure 3-1. Official and Real Trade Dependency of China

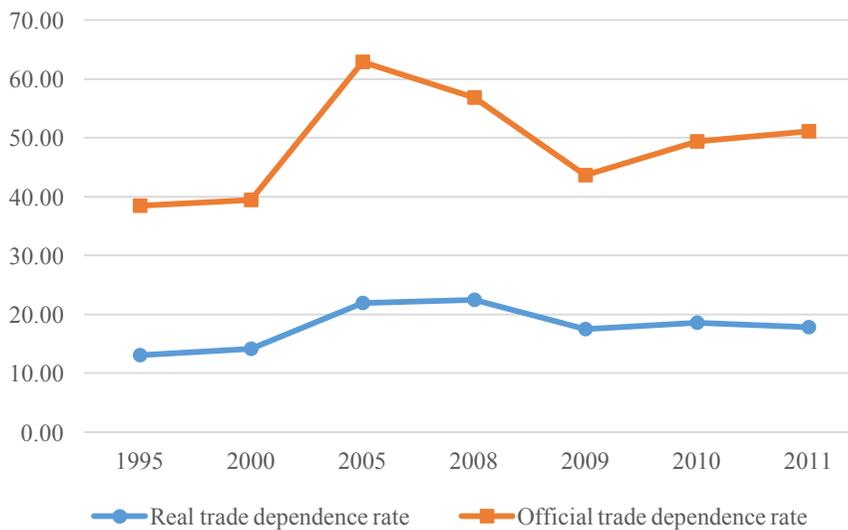


Figure 3-2. Real Trade Dependency of China and Other Asian Countries

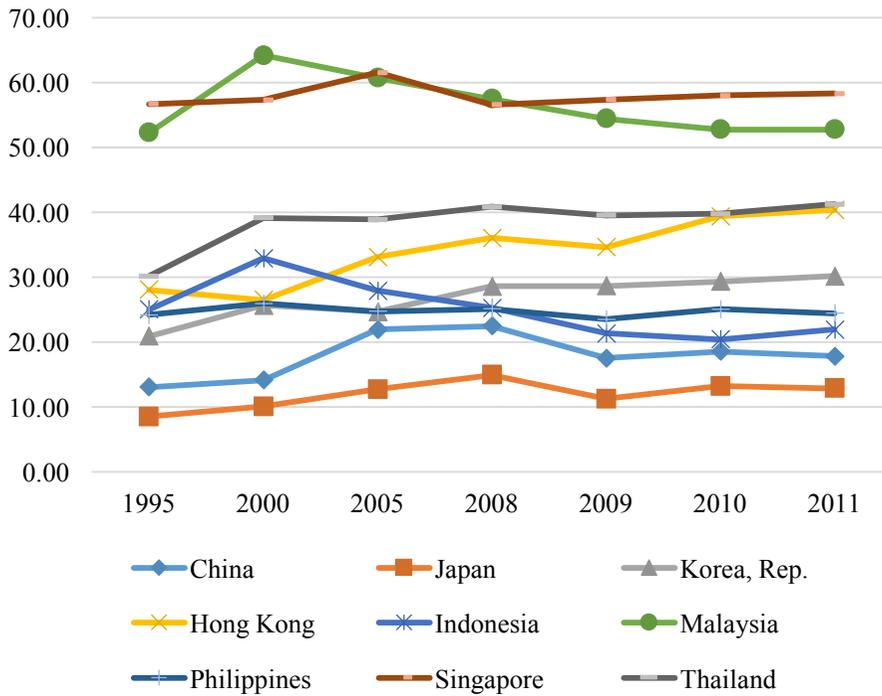


Figure 4. FDI Dependency

Figure 4-1. FDI Dependency of China

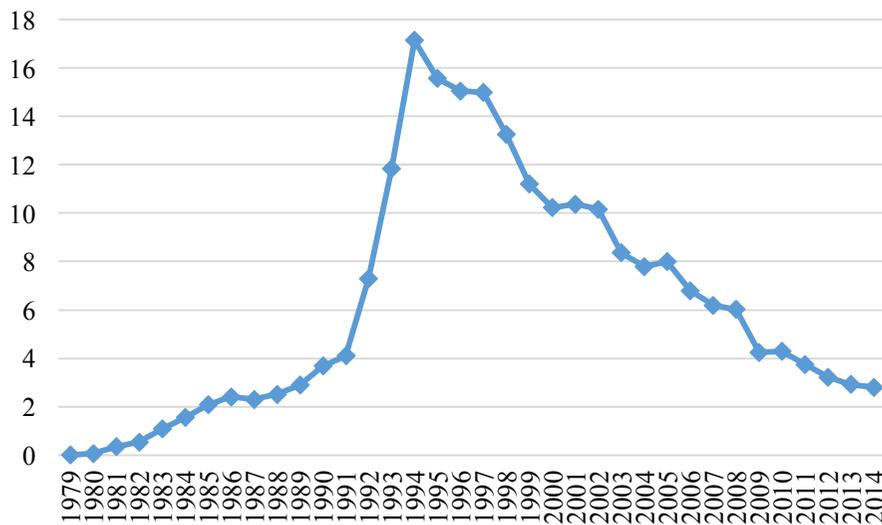


Figure 4-2. FDI Dependency of China and Other Asian Countries

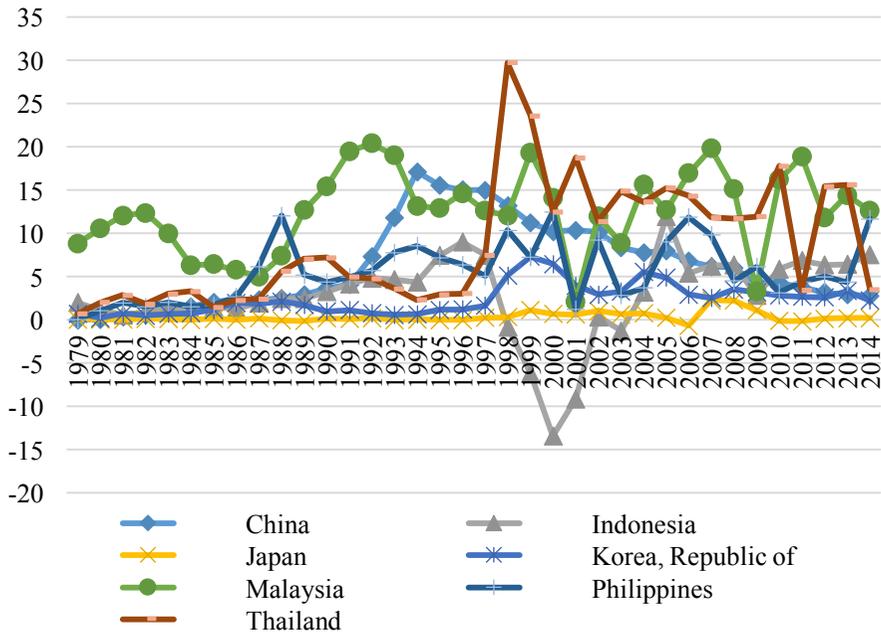


Figure 5. Employment Dependency

Figure 5-1. Employment by type of enterprises in China

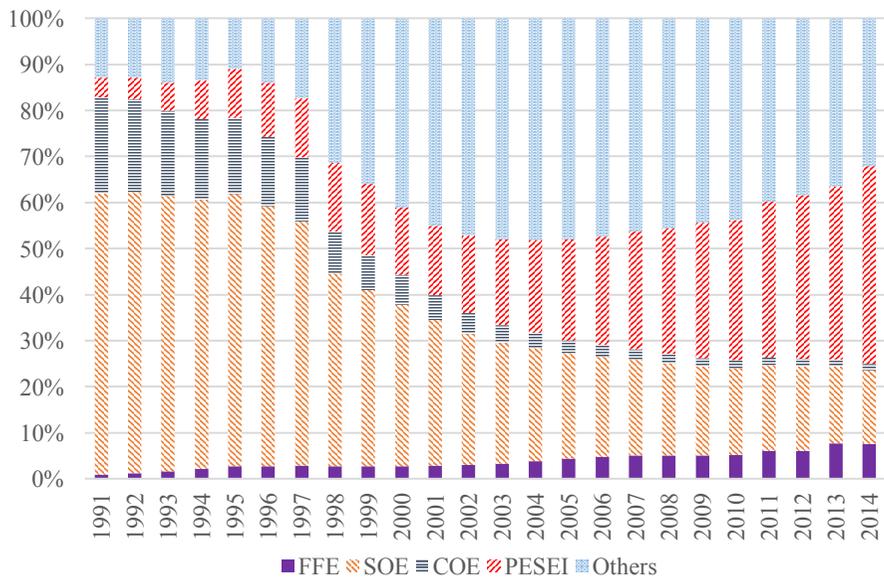


Figure 5-2. Foreign Employment Dependency of China

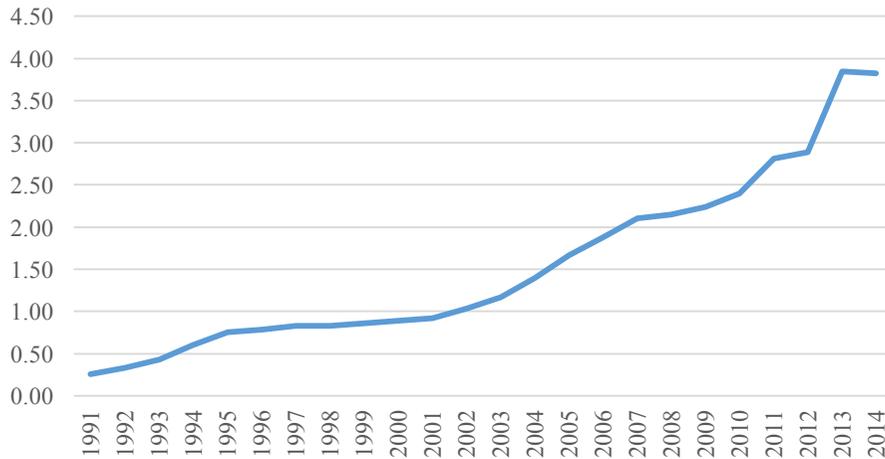


Figure 6. Foreign Technology Dependency of China and Other Asian Countries

Countries

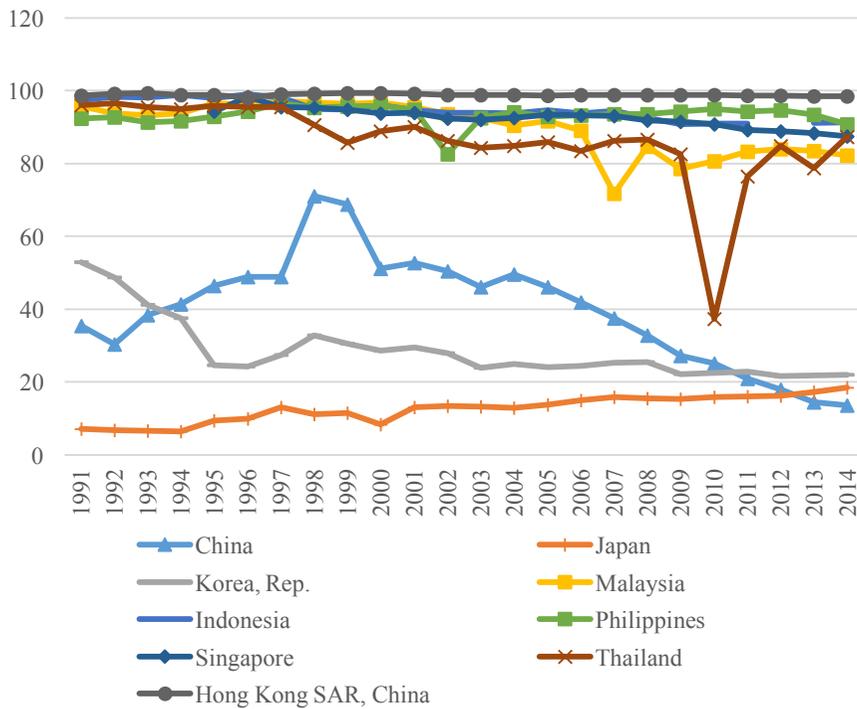


Figure 7. Number of central SOEs subordinate to SASAC in the Fortune

500 list

