ESSAYS ON CHINA'S OUTWARD FOREIGN DIRECT INVESTMENT: 1991-2009

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ABSTRACT

China's outward foreign direct investment (OFDI) grew from a very limited scale prior to the 1990s to reach an annual average growth rate of 67% between 1991 and 2009, placing China as the largest FDI source country among the developing countries, and the fifth largest FDI source country in the world in 2009. China's experience is particularly interesting because it serves to help us further understand OFDI in general and the emergence of investments from the developing countries in particular. This thesis aims to answer a series of unexplored questions about China's OFDI, including its underlying motivations and locational determinants, the dynamic adjustment of China's OFDI and its relationship with China's inward foreign direct investment (IFDI), as well as the displacement effect of China's OFDI on the OECD's OFDI in the host countries.

The first essay of this thesis (Chapter 3) investigates the underlying motivations and the locational determinants of China's OFDI flow in detail, and focuses on the role played by the host country's natural resources and technology. The chapter constructs two datasets, the first one encompasses 157 host countries for the recent period 2003-2009 and the second one includes 171 host countries for the early period 1991-2003. An FDI gravity equation is estimated by using alternative specifications, including Tobit, fixed effects and the Heckman selection model. In the recent period of 2003-2009, the findings provide strong evidence of the natural resources-seeking motivation and the technology-exploiting motivation in Chinese OFDI. In particular, China's OFDI is driven to resources abundant countries with poor governance. The chapter also argues that China's OFDI is promoted when the oil price is growing. In the early period of 1991-2003, however, there is only some evidence that China's OFDI is driven to resources abundant countries with poor governance, and no evidence that the host country's technology plays a role in Chinese OFDI.

The second essay (Chapter 4) introduces a partial stock adjustment model and

provides the first study on the dynamic adjustment of China's OFDI in a dynamic framework. The effect of China's IFDI on China's OFDI within this dynamic framework is also studied. 172 host countries are included for 2003-2009 by using the System GMM, OLS and fixed effects models under an augmented gravity specification. The chapter provides strong evidence to support the dynamic adjustment of China's OFDI. The equilibrium OFDI stock is greater and more volatile than the actual OFDI stock, implying that the underinvestment in China's OFDI and the possible existence of the substantial adjustment costs associated. The findings suggest that the host country, on average, exploits its potential in attracting China's future investments. There is some evidence of the positive correlation between China's IFDI and China's OFDI. In particular, the dynamic adjustment of China's OFDI is stronger for the high-technology host countries, and the positive association between IFDI and OFDI is higher for the high-income host countries.

The third essay (Chapter 5) is the first piece of research to examine whether and how China's OFDI displaces the OECD's OFDI in the given host countries. The chapter examines 33 of the OECD countries' OFDI flow into 155 host countries for 2003-2009. Most importantly of all, the chapter also explores how the OECD countries' OFDI are affected by China's OFDI in these host countries. TSLS and fixed effects estimations are undertaken under an augmented gravity specification. The chapter presents evidence that China's OFDI displaces the OECD's OFDI in general. However, in contrast to the often-cited arguments concerning a 'new colonialism' in Chinese OFDI, no evidence was found that the OECD's OFDI in oil and metal abundant host countries, in particular Africa and Latin America, are displaced by China's OFDI.

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ABBREVIATIONS

FDI	Foreign Direct Investment
OFDI	Outward Foreign Direct Investment
IFDI	Inward Foreign Direct Investment
OLI	Ownership Location and Internalization
KK	Knowledge-Capital
HFDI	Horizontal Foreign Direct Investment
VFDI	Vertical Foreign Direct Investment
FG	Flying Geese
H-O	Heckscher-Ohlin
OEM	Original Equipment Manufacturer
ECM	Error Correction Model
RE	Random Effects
WTO	World Trade Organization
UNCTAD	United Nations Conference on Trade and Development
MOFCOM	Minister of Commerce
NDRC	National Development and Reform Commission
SAFE	State Administration of Foreign Exchange
CNOOC	China National Offshore Oil Company
Chinalco	Aluminum Corporation of China
IT	Information Technology
MOFTEC	Ministry of Foreign Trade and Economic Cooperation
MOFERT	Ministry of Foreign Economic Relations and Trade
R&D	Research and Development
MNCs	Multinational Corporations
OLS	Ordinary Least Square
FE	Fixed Effects
NBS	National Bureau of Statistics
OECD	Organization for Economic Co-operation and Development
ICRG	International Country Risk Guide
CNPC	China National Petroleum Corporation
Sinopec	China Petroleum and Chemical Group
SOEs	Stated-Owned Enterprises
IMF	International Monetary Fund
SAR	Special Administration Region
GDP	Gross Domestic Product
IMR	Inverse Mills Ratio
GMM	Generalized Method of Moments
IDP	Investment Development Path
RGDP	Real Gross Domestic Product
WIR	World Investment Report
LSDV	Least Squares Dummy Variables
TSLS	Two Stage Least Square
IV	Instrument Variable
CPII	Centre d'Etudes Prospectives et d'Informations Internationales
WGI	World Governance Indicators
Inc.	Incorporation
PC	Personal Computer
EIA	Energy Information Administration

FDM	First Difference Model
POLS	Pooled Ordinary Least Square
CRS	Congressional Research Service
LSDV	Least Squares Dummy Variables
CPI	Consumer Price Index

CHAPTER 1

INTRODUCTION

1.1 Background

China has achieved great economic success since the launch of the 'Open Door' policy in 1979. Up to 2009, China's annual average growth rate of gross domestic product (GDP) was 9.9%, which is around four times as much as the comparable figures for the rest of the world (2.9%), the US (2.7%), the UK (2.1%) and Japan (2.3%).[1] China surpassed Japan as the second largest economy in 2010, even though Goldman Sachs (2003) predicted that this would occur no earlier than 2016. To quote *Bloomberg*:

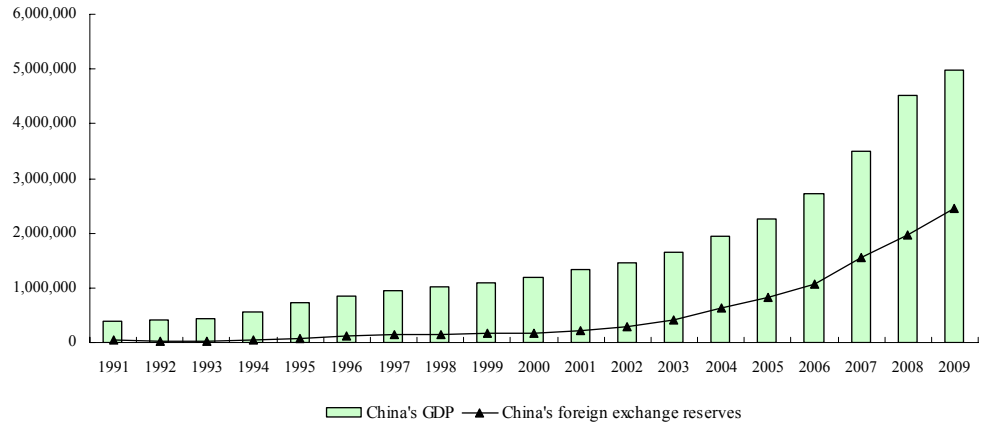
The country of 1.3 billion people will overtake the U.S., where annual GDP is about $14 trillion, as the world's largest economy by 2027, according to Goldman Sachs Group Inc. chief economist Jim O'Neill…China overtook the U.S. last year as the biggest automobile market and Germany as the largest exporter. The nation is the world's No. 1 buyer of iron ore and copper and the second-biggest importer of crude oil, and has underpinned demand for exports by its Asian neighbors. (*Bloomberg*, August 16, 2010)

China's foreign exchange reserves have increased rapidly alongside its fast economic growth and expanding trade surplus. They grew from a very limited scale in the early period of economic reform, to nearly US$2.5 trillion at the

[1] Data obtained from World Bank, *World Development Indicators* (various years).

end of 2009, and China now has the largest foreign exchange reserves in the world. Figure 1.1 presents the fast growth of China's GDP and foreign exchange reserves.

Figure 1.1: Values of China's GDP and Foreign Exchange Reserves (US$, million)

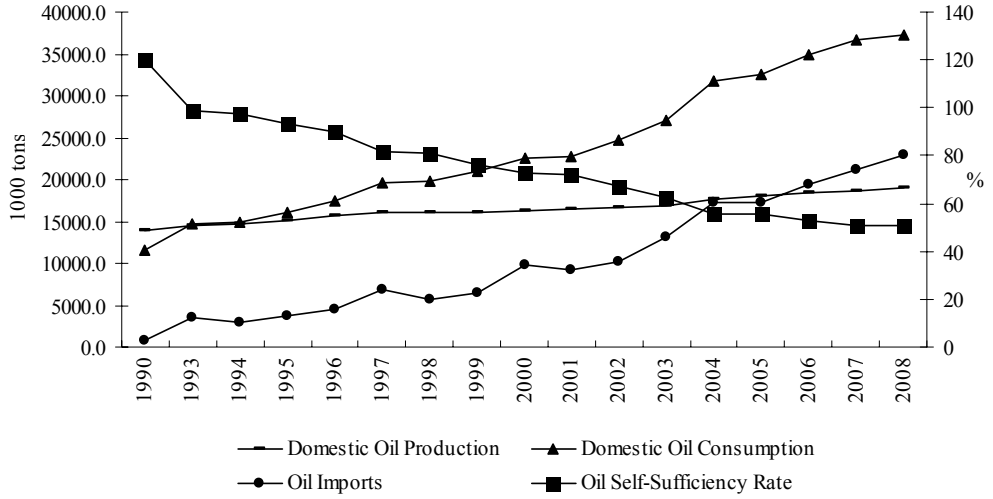


Data Source: World Bank's *World Development Indicators* (various years).

China's fast economic growth has been accompanied by an increasingly large consumption of natural resources, especially oil, ores and metals. However, China's local production lags far behind demand. For example, Figure 1.2 presents China's oil production, oil consumption and the difference between them. Given the relatively stable production of oil, China's oil consumption and imports have continuously increased, while, in contrast, the oil self-sufficiency rate has continuously decreased.[2]

[2] Chen (2008) defined the oil self-sufficiency rate as the share of local oil production in local oil consumption.

Figure 1.2: China's Oil Production, Consumption, Imports and Self-Sufficiency



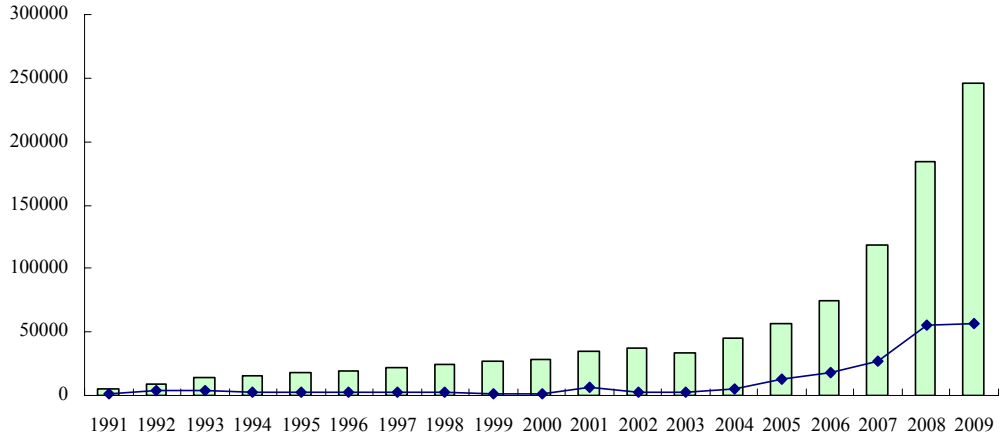
Notes: Volumes of China's oil imports, domestic oil production and consumption (Left Axis). Oil self-sufficiency rate (Right Axis).
Data source: National Bureau of Statistics of China, *China Statistical Yearbook* (various issues).

China's rapid economic development has not only increased the demand for natural resources, but it has also raised the demand for advanced technology. It is anticipated that advanced technology will enhance the economic growth; therefore, China actively establishes overseas R&D centres in developed countries, as well as directly acquiring foreign technology. Furthermore, thirty years of economic growth have also improved China's own technology level, and China now is capable of exploiting and transferring the technology that is embedded into its overseas investments. The investments in the developing countries are usually accompanied by China's own technology, which can often be superior to the local technology. The OECD (2008) analysed China's investments in Africa, and recommended that African countries utilise China's technology which was suitable for local development.

China's fast economic growth, the increasing domestic demand for energy and technology, as well as its accumulating foreign exchange reserves, all play a

significant role in China's recent surge in overseas investments. Between 2003 and 2009, the annual average growth rate of China's outward foreign direct investment (OFDI) was 71%, while the world average OFDI expanded at around a quarter of China's rate.[3] MOFCOM (2009) illustrated China's recent surge in OFDI, and particularly the fact that China outperformed other countries in the post-crisis period. China ranked as the largest FDI source country among developing countries and the fifth largest source country in the world in 2009. UNCTAD (2010a) reported that China will be the second most promising FDI source country, after the US, in the next three years. The development of China's OFDI is illustrated in Figure 1.3, which presents its flow value and stock value between 1991 and 2009.

Figure 1.3: Values of China's OFDI Flow and Stock (US$, million)



Notes: ◆ China's OFDI flow value. ■ China's OFDI stock value.
Data Sources: Data for 1991-2002 are obtained from UNCTAD, *World Investment Report* (various issues). Data for 2003-2009 are obtained from MOFCOM (2009), *Statistical Bulletin of China's Outward Foreign Direct Investment*.

China's OFDI reforms are closely related to China's overall economic reforms. The 'Open Door' policy, which was launched in 1979, was the first policy to provide an institutional framework within which to implement OFDI. In this

[3] Data of China's OFDI obtained from MOFCOM. Data of the world's OFDI obtained from UNCTAD.

primary stage, China's OFDI was mainly motivated by political rather than economic incentives (Cheung and Qian, 2009). And it was also the first reform for China's overseas investments to encourage a more transparent and decentralised approval regime (Voss *et al.*, 2008). OFDI activities were promoted by both central and local administrations after Deng Xiaoping's 'South Tour' in 1992. The launch of the 'Go Global' policy in 2002 and China's accession to the World Trade Organization (WTO) boosted China's overseas investments. The OFDI policy is further liberalised from an approval regime to a supervision and assistance regime by the Ministry of Commerce (MOFCOM).[4] To quote *The Economist*:

Beijing will use its foreign exchange reserves, the largest in the world, to support and accelerate overseas expansion and acquisitions by Chinese companies, Wen Jiabao, the country's premier, said in comments published on Tuesday. "We should hasten the implementation of our 'going out' strategy and combine the utilisation of foreign exchange reserves with the 'going out' of our enterprises," he told Chinese diplomats late on Monday... Qu Hongbin, chief China economist at HSBC, said: "This is the first time we have heard an official articulation of this policy…to directly support corporations to buy offshore assets." (*The Economist*, July 21st 2009).

Yao and Sutherland (2009), Yao et al. (2010) and Xiao and Sun (2005) have pointed out that a distinctive feature of this recent surge has been the Chinese

[4] MOFCOM was established from the former the Ministry of Foreign Trade and Economic Cooperation (MOFTEC) in 2003. MOFTEC was the successor of the former Ministry of Foreign Economic Relations and Trade (MOFERT) in 1993. For simplicity, I use the term MOFCOM throughout the thesis.

government's use of substantially subsidised state-owned enterprises (SOEs) to implement the national interest, such as securing a long-term supply of natural resources. China's OFDI is clearly on a fast track to becoming a crucial driving force for the sustainable growth of the Chinese and global economy. However, there are growing debates about this surge. For some, China's overseas investments have been interpreted as a threat rather than an opportunity; *The Economist* (2008), for instance, has claimed that Chinese investments are undermining the West's existing interests, and that China is stealing natural resources and colonising Africa.

1.2 Motivations and Objectives

This thesis studies the causes and consequences of China's OFDI explosion by examining three broad subjects: a) its underlying motivations and locational determinants; b) the dynamic adjustment of China's OFDI and its relationship with China's inward foreign direct investment (IFDI); and c) the impact of China's OFDI on other countries' OFDI in the third host countries.

Locational Determinants of China's OFDI

Many characteristics of host countries have the potential to affect China's OFDI, with natural resources and technology being among the most important factors.

Firstly, natural resources play a very important role in China's overseas investments because China's economy increasingly depends on the supply of foreign natural resources. For example, the continuously decreasing oil

sufficiency rate, shown in Figure 1.2, has turned China from a net oil exporter to the second largest crude oil importer in the world. An early failed buyout of the California-based oil company Unocal and a recent failed buyout of Rio-Tinto reflect China's desire for natural resources. Ye (1992), Zhan (1995) and Taylor (2007) have pointed out that China's overseas investments have sought to secure supplies of various natural resources. Existing empirical studies on the effect of natural resources on Chinese OFDI have produced mixed results; whereas some studies support a positive and significant association between Chinese OFDI and natural resources (Buckley et al., 2007; Cheung and Qian, 2009), other studies have found that the effect of a host country's natural resources on China's OFDI is insignificant (Zhang, 2009; Kolstad and Wiig, 2009).

Secondly, the host country's technology may also be a key determinant of China's overseas investments. On the one hand, the acquisition of the IBM PC business and the establishment of an R&D centre in the Nottingham Science Park imply that China is interested in acquiring advanced technology in developed countries. Child and Rodrigues (2005) and Mock et al. (2008) argue that the search for advanced technology, brands and management skills is an important motivation for China's overseas investments. On the other hand, although China is still a developing country, thirty years of economic development have significantly improved China's technology level.[5] China's technology is being utilised in developing countries, and the establishment of a motorcycle affiliate in Vietnam and a fridge affiliate in Nigeria imply that

[5] A recent example of this is the fact that China has become the third country in the world with the capability to launch humans into space independently.

China may also be capable of exploiting and transferring its technology to developing countries. Such dual role of technology on China's overseas investment has yet to be systematically investigated.

The first empirical study of the thesis (Chapter 3) aims to examine the underlying motivations and locational determinants of China's OFDI for 2003-2009 and 1991-2003 respectively, with a particular focus on the role of natural resources and technology. The chapter aims to explain whether China's OFDI is driven by an abundance of natural resources in the host country in accordance with a resources-seeking motivation, and how China's OFDI responds to the technology level of the host country under the technology-seeking motivation and the technology-exploiting motivation. The chapter also explores how these motivations and effects vary across two time periods. In terms of the natural resources-seeking motivation, this study sheds light on whether China's OFDI is driven by different types of natural resources and whether China's OFDI distinguishes them among overall resources, such as oil and metal. Furthermore, the chapter examines whether or not China's OFDI is driven toward resource abundant countries with poor governance, as well as how China's OFDI responds to booming mineral prices.

Dynamic Adjustment of China's OFDI and Its Relation with China's IFDI

In addition to studying the determinants of China's OFDI in a static framework, this thesis further examines the dynamic adjustment of China's OFDI and its relationship with China's IFDI in a dynamic framework.

To study the dynamic adjustment of China's OFDI, the chapter adopts a methodology developed by Cheng and Kwan (2000) who introduced a partial stock adjustment model to examine the partial adjustment of FDI in a dynamic framework. This partial stock adjustment model indicates that the adjustment from the actual FDI stock towards the equilibrium FDI stock is gradual rather than instantaneous. The investment inertia takes time to adjust, and hence the adjustment cost smoothes the adjustment process. China's OFDI might also face this dynamic adjustment and adjustment cost, although this has largely been ignored in previous studies. For example, it is very time consuming for the government to approve a new investment. Hence, there might be a significant time lag between the decision to invest and the actual implementation of the project.

Furthermore, China has only become a large FDI source country very recently, but it has long been acknowledged as an important FDI recipient. UNCTAD (2007) reported that China has been the top IFDI host country among developing countries since the mid-1990s and was in the top three of the biggest FDI host countries in the world in 2005. The huge amount of IFDI stock not only provides essential capital but also strengthens China's economic connection with host countries. It is therefore reasonable to expect that China's IFDI might have a relationship to China's OFDI. Potentially, IFDI takes time to affect China's OFDI through the externality, possibly in the form of information spillovers. For example, Chinese firms might gain a better understanding of the foreign market by learning from the foreign country's investments in China. However, as an important host country of inward FDI

and an increasingly significant home country of outward FDI, the relation between China's IFDI and its OFDI has yet to be examined in detail, possibly because of data constraints and the limited scale of OFDI in the early stage of the Chinese reform period (Cheung and Qian, 2009; Buckley et al., 2007).

Therefore, the second empirical study of the thesis (Chapter 4) aims to examine the dynamic adjustment of China's OFDI stock and its relationship with previous IFDI stock for 2003-2009 by adopting the partial stock adjustment model. The chapter examines the agglomeration effect, calculates China's equilibrium OFDI stock, and it also investigates whether and how these effects vary in terms of the characteristics of the host countries, including the technology level, their abundance of natural resource and their income level.

Does China Displace the OECD Countries' OFDI in Third Host Countries?

The surge in China's overseas investments around the world has significant consequences and has triggered an increasing anxiety. *The Economist* (2008) indicated that China undermines Western contributions in poor countries, and hence that Europe and America are losing their competitive advantages in Africa and Latin America.

Presumably, China's overseas investments may have a widespread impact on both the host countries and other FDI home countries. In terms of the host countries, China's investments bring essential capital that can be used for domestic economic development, especially for natural resource abundant countries. China's capital is crucial to help countries like Australia, Zambia,

Brazil and South Africa survive and to recover from the financial crisis. *CNN* (2009) reported that China not only brings capital but also provides an alternative choice for developing countries other than Western investments. However, some FDI host countries have also expressed concern over the expansion of China's investments. SOEs are the main investors of China's OFDI; they are controlled and heavily backed by the government with economic as well as political incentives, and therefore it is not easy to fully explore the true motivations for Chinese investments. In terms of other FDI home countries, China's active engagement in overseas investments has also triggered their anxiety because of the increase in competition. *The Economist* (2010) reported that China was buying up the world and Rosen and Hanemann (2009) have explicitly pointed out that China might be able to challenge international investment patterns, which would have an impact on international relations. China's Western rivals fear being crowded out of foreign markets because Chinese firms are heavily backed by the government. For example, Chinese SOEs benefit from lower financing costs from China's state-controlled banks as well as their considerable diplomatic support. As the world's main FDI source countries, the nations comprising the Organisation for Economic Co-operation and Development (OECD) might be most affected by this challenge. Compared to the rapid growth of China's OFDI for 2003-2009, the OECD's OFDI expands at less than a quarter of China's rate.[6]

In the third empirical study (Chapter 5), the thesis explores China's OFDI flow with the aim of examining the consequences of China's surge in overseas

[6] Data of China's OFDI are obtained from MOFCOM. Data of the OECD's OFDI are obtained from the OECD.

investments to other FDI source countries for 2003-2009, and notably the displacement effect of China's OFDI on the OECD's OFDI. The chapter also sheds light on whether and how this displacement effect varies in terms of the host country's characteristics, the home country's characteristics and both combined, including their oil abundance, metal abundance, their income level and their continental location.

1.3 Contributions and the Structure of the Thesis

This thesis makes the following contributions to existing literature. Firstly, this present work undertakes a comprehensive study concerning the natural resources-seeking motivation for China's OFDI. The thesis distinguishes natural resources between oil and metal, and it also examines in detail the role of governance quality and mineral price growth in China's resources-seeking motivation for OFDI. Secondly, the thesis investigates the dual role of a host country's technology in China's OFDI. This present work examines both the technology-seeking motivation and the technology-exploiting motivation. Thirdly, the thesis compares these effects between the early period of 1991-2003 and the more recent period of 2003-2009 to examine how they have changed as a result of the development of China's OFDI, whereas most studies merely focus on one period. In addition, this thesis includes more host countries than other studies, which merely use a subsample of the data presented in this research. Fourthly, the thesis is the first piece of research to introduce a partial stock adjustment model to examine the dynamic adjustment of China's OFDI. Fifthly, the thesis investigates the relationship between China's IFDI and OFDI. Finally, the thesis provides the first study on the

displacement effect of China's OFDI on the OECD's OFDI in third host countries.

This thesis is organised as follows. Chapter 2 first reviews the major FDI theories and the application of the gravity model in selected empirical studies. The chapter then focuses on the related descriptive and empirical studies on China's OFDI. The main limitations of existing studies are that they use an early and short period, based on data from selective host countries, and they pay little attention to the dynamic adjustment of China's OFDI and the effect of China's OFDI on other source countries' OFDI.

Chapter 3 is devoted to the analysis of the underlying motivations and locational determinants of China's OFDI flow. It constructs two datasets, one encompassing 157 host countries for 2002-2009, and the other encompassing 171 host countries for 1991-2003. The two main variables of interest are the host country's natural resource abundance and its technology level. The Tobit model is introduced to incorporate the data censoring under an augmented gravity specification, together with the fixed effects (FE) model to account for the unobserved country heterogeneity and the Heckman model to correct the selection bias. In the recent period of 2003-2009, there is strong evidence of the natural resources-seeking and technology-exploiting motivations in Chinese OFDI, and there is also weak support for the technology-seeking motivation. In particular, there is some evidence that China's OFDI is driven to resource abundant countries with poor governance. The research also finds that China's OFDI is promoted when global oil prices are growing. However, in the

early period of 1991-2003, in contrast, there is no significant evidence that China's OFDI was driven to countries with high technology or abundant natural resources, although there is only weak evidence that China's OFDI is driven to resource abundant countries with poor governance.

In Chapter 4, the thesis explores the dynamic adjustment of China's OFDI stock and its relationship with previous IFDI stock. The chapter constructs a panel dataset including 172 host countries for 2003-2009. The two main variables of interest are China's previous OFDI stock and China's previous IFDI stock. A system GMM technique is introduced to correct for the endogeneity problem under an augmented gravity specification. There is strong evidence for the dynamic adjustment of China's overseas investments and the agglomeration effect. The chapter finds that the equilibrium OFDI stock is greater and more volatile than the actual OFDI stock, suggesting that the underinvestment in China's OFDI and the possible existence of the substantial adjustment costs associated. The chapter also finds that, on average, the host country exploits its potential in attracting future investments from China. There is some evidence of a positive correlation between China's IFDI and its OFDI. In particular, the dynamic adjustment of China's OFDI is found to be stronger for the high-technology host countries and the positive association with IFDI stock is found to be higher for the high-income host countries.

Chapter 5 analyses the displacement effect of China's OFDI flow on the OECD's OFDI flow in the given host countries. The panel dataset used in the research encompasses 33 OECD countries' OFDI in 155 host countries for the

period 2003-2009. The main variable of interest is China's OFDI in the third country, which is also invested in by the OECD countries. The two stage least square (TSLS) technique is adopted to address the potential endogeneity of the main variable in an augmented gravity specification. The chapter provides evidence that China displaces the OECD's overseas investments in general. However, in contrast to the often heard headline news on China's 'new colonialism', the chapter does not provide any evidence of the displacement effect in oil abundant and metal abundant host countries, or African and Latin American host countries.

The final chapter (Chapter 6) summarises the major findings of this thesis, points out the possible directions for future research and proposes some policy implications.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

China's outward foreign direct investment (OFDI) is a new phenomenon, and studies related to Chinese OFDI are largely underdeveloped. Existing descriptive and empirical studies generally conclude that China's OFDI is relevant to mainstream FDI theories. In other words, the general motivations and determinants of OFDI discovered by the FDI literature are also relevant for understanding China's OFDI. This chapter therefore reviews several mainstream theories on FDI, as well as the theories on OFDI from the perspectives of developing countries. This chapter also provides a critical review of the existing empirical studies on China's OFDI.

This chapter first reviews the literature on two general FDI theories, notably the eclectic paradigm and the knowledge-capital model. The investments emerging from the developing countries are closely related to the development of the home country; therefore, this chapter also reviews the relation between OFDI and development in the second section. In the third section, this chapter also reviews the gravity model, which is a common specification in FDI empirical studies.

In the fourth section, this chapter briefly reviews the history and the

background of China's OFDI. This chapter finds that the reform of OFDI policy has gradually changed China's approval regime to a more transparent and liberalised one. Overseas investments were prohibited in China before the economic reform, and they had to be strictly approved by the government in the early period of economic reform. In the more recent period, China's overseas investments are not only encouraged but are also financially supported by the government. This chapter also reviews some recent descriptive studies on China's OFDI, and finds that most of these studies focus on the history, the patterns, case studies and policy implications. Empirical studies on China's OFDI are very limited; this chapter provides a comprehensive survey of recent research, and a summary table is provided at the end of this chapter. This chapter demonstrates that most existing studies focus on the early period or a short period and use selective host countries. These studies make little effort to examine the dynamic adjustment of China's OFDI and the impact of China's overseas investments on other FDI source countries' investments. The final section concludes this chapter.

2.2 FDI Theories and Empirical Examinations

2.2.1 General Theories and Empirical Examinations

The eclectic paradigm and the knowledge-capital model are the two building blocks used to explain FDI. In this section, this chapter reviews their contents and empirical applications. In addition, the horizontal FDI and the vertical FDI as two general OFDI types are also reviewed.

The Eclectic Paradigm

The eclectic paradigm (OLI theory) was initially developed by Dunning (1977), and a large body of FDI studies have been conducted under this synthesised framework by introducing three necessary conditions. Firstly, multinational corporations (MNCs) possess Ownership-advantage (O). Dunning (1980) pointed out that the Ownership-advantage could be obtained internally and externally, and the MNCs must acquire the propriety rights to use it. Secondly, MNCs internalise the foreign activities in the way of FDI because of the Internalisation-advantage (I). Buckley and Casson (1976) illustrated the benefits from the internalisation in detail. Finally, they choose host countries with Location-advantage (L). Dunning (1996) examined the locational factors that closely relate to regional activities, and pointed out that they played an important role in the trade-off between exports and FDI. Dunning (1977, 1993) further indicated that FDI was mainly driven by three motivations including the market-seeking motivation, the efficiency-seeking motivation (lower labour costs) and the resource-seeking motivation (natural resources and strategic assets).

Although the OLI theory gradually became established as a result of further research by Dunning and his co-authors, the theory is not perfect. Itaki (1991), for instance, has criticised the theory by examining the redundancy of Ownership-advantage, the inseparability and the logical independence between Ownership-advantage and Location-advantage.

This eclectic paradigm is widely applied in empirical studies because of its high applicability and its explanatory power. Dunning (1980) empirically

evaluated the importance of Ownership-advantage and Location-advantage under the OLI framework. He adopted cross sectional firm-level data for American affiliate sales, including 14 manufacturing industries in 7 countries in 1970. The overall explanatory power of the theory was demonstrated by the fact that both Ownership-advantage and Location-advantage were confirmed. König (2003) empirically investigated the assumptions and implications of OLI theory by using firm-level survey data in a log-likelihood specification, the Ownership-advantage was supported while the results for Location-advantage and Internalisation-advantage were vague.

Knowledge-Capital Model

The knowledge-capital model (KK-model) is the other mainstream theory of FDI, and it is built on the base of horizontal FDI (HFDI) (Markusen, 2002). The KK-model integrated MNCs' vertical FDI (VFDI) and HFDI, and is based on three assumptions, namely the fragmentation, the skilled-labour intensity and the jointness.

A large number of empirical studies have been conducted under this framework. Carr et al. (2001) examined the KK-model by incorporating the relationship between affiliate sales and a country's features. Their panel data included both foreign affiliate sales of American MNCs (outward FDI) and local affiliate sales in the US by foreign MNCs (inward FDI) from 1986 to 1994. They found strong evidence to support HFDI and VFDI. Their work was supported and extended by Markusen and Maskus (2001), who deconstructed the total affiliate productions into export sales and local sales. They demonstrated that

American outward FDI was not directed toward low labour cost countries, and they thus dismissed the idea that outsourcing had led to a loss of jobs for unskilled American workers.

The interrelationship between HFDI, VFDI and the KK-model and their relative significance has also been the subject of a considerable amount of research. Carr et al. (2001) found a positive relation between affiliate sales and the skilled-labour difference under a KK-model. The KK-model integrates the horizontal and vertical FDI, while the latter was mainly driven by differences in skill endowments. They indicated that the effect of this skill difference on promoting affiliate sales could diminish when the country size difference increased. However, Blonigen et al. (2002) argued that this finding was incorrectly derived from a specification error by using the relative skilled-labour endowment, and hence the absolute skill difference should be adopted to replace the relative skill difference.

Furthermore, studies concerning the relative importance among the horizontal FDI, the vertical FDI and the KK-model have been undertaken as well, and they produced mixed results. On the one hand, Markusen and Maskus (2002) rejected the vertical FDI and supported the horizontal FDI in the KK-model, and this finding was consistent with Brainard (1993, 1997). They further indicated that there was no obvious difference between the KK-model and the horizontal FDI, concluding that both the KK-model and the horizontal FDI were better than the vertical FDI in explaining reality. On the other hand, Davis (2002) rejected the horizontal FDI and found evidence in support of the vertical

FDI in the KK-model.

Horizontal FDI and Proximity vs Concentration

Horizontal FDI is one of two major types of OFDI, and it explains the market accession motivation. Markusen (1984) developed a general equilibrium framework to formally present horizontal FDI by associating it is with multi-plant and joint-input. The multi-plant hypotheses states that when MNCs base their headquarter services or 'public goods' at the home country while allocating final productions at other host countries, technical efficiency prevents the quality of these 'public goods' or jointness diminishing in additional plants. HFDI was supported and extended by Brainard (1993) who introduced a trade-off between the proximity advantage and the concentration advantage in a 2-sector and 2-country framework. A firm usually has two options when serving a foreign market for a differentiated product, namely export or internal expansion. A firm would prefer to export if the concentration advantage was dominant, but international expansion would be preferable if the proximity advantage was higher.

The proximity-concentration hypotheses was formally tested by Brainard (1997) by highlighting the idea that a firm preferred internal expansion if the trade cost and trade barriers were high, but exports were preferable if the investment barrier was high and the plant-level scale economies were low.

Vertical FDI

Vertical FDI is the other major type of OFDI, and it explains the production

fragmentation motivation. Helpman (1984) presented a general equilibrium based on the difference in factor endowments. A firm geographically fragmentised its production by locating the headquarter service in a skilled-labour abundant country, while locating the final production in an unskilled-labour abundant country. This fragmentation absorbed the benefit of the difference in the factor endowments if the trade cost was excluded. The fragmentation and the factor intensity were two crucial assumptions of VFDI.

However, the claims associated with VFDI are not widely supported in the literature. Hanson et al. (2001) summarised two major reasons for its failure. Firstly, the dominant trend for world FDI flows is between developed and developed countries, yet VFDI is unable to explain why FDI has increased between similar countries. Secondly, US foreign affiliates sold more productions locally in the host country with high trade costs and trade barriers, but VFDI does not include this market-accessing motivation.

More recently, an increasing amount of research has supported the claims of VFDI. Braconier et al. (2002) strongly supported VFDI with three contributions. Firstly, they chose the skilled-wage difference to measure the relative factor difference, which was the main driving force of VFDI. Secondly, they pooled US and Sweden outward FDI data in order to include more country-pair combinations. Finally, they examined various affiliate sales, such as exports back to the home country, local sales, exports to a third country, total sales and imports from the home country. Yeaple (2003) examined the chain of comparative advantage, and confirmed the significance of VFDI by nesting the

country-specific skill abundance and the industry-specific skill intensity. Hanson et al. (2003) also confirmed VFDI by introducing the role of intermediate inputs in the vertical production network.

2.2.2 Outward Foreign Direct Investment and Development

Alongside the above-mentioned market-seeking motivation and cost-saving motivation, the development of the home country is another important driving force for the OFDI; therefore, the effect of development is examined from various aspects, including the economic growth, the catch-up effect, the switch on the comparative advantage and the adoption of new technology.

Firstly, the relationship between a country's OFDI and economic growth is illustrated by the investment development path (IDP). Dunning et al. (2001) classified 5 stages of the OFDI development, which closely depended on real GDP per capita as well as the strength of Ownership-advantage. A country gradually changed from a net FDI recipient to a net FDI source, before eventually breaking even.

Secondly, there are a series of studies on the relationship between the growth of OFDI and the catch-up effect. Akamatus (1962) was the first to demonstrate the catch-up effect of a latecomer by illustrating the Japanese experience. Kojima (2000) extended the catch-up effect of the flying-geese (FG) model by constructing three crucial components. Kojima Model 1 constructed a 2-goods, 2-factor and 2-country model to test the hypotheses of Akamatsu (1962). The economic development path upgraded a developing country to a higher stage

with continuous production diversification and rationalisation. Kojima Model 2 incorporated with Kojima (1973) who compared the Japanese type of FDI, which was trade-promoted, and the American type of FDI, which was anti-trade, and pointed out that the Japanese type of FDI resulted in a 'win-win' solution. This hypotheses was supported by Goldberg and Klein (1998) who used panel data for Southeast Asian and Latin American countries for 1979-1995, and investigated the long-run impact of inward Japanese and American FDI on trade performance. Kojima Model 3 indicated that the agreed specialisation gained economic efficiency from a detailed international production specification and an economic scale.

Thirdly, the switch between the comparative advantage and the comparative disadvantage is another important driving force of OFDI. Kojima (1973) illustrated this issue by using the industrial sequence of Japanese overseas investments. The OFDI decision was based on the general equilibrium under the Heckscher-Ohlin (H-O) framework. The OFDI sequence was in line with the strength of the home country industry's comparative advantage, where the most disadvantaged industry firstly undertook OFDI in the host country with a comparative advantage. Ozawa (1992) extended the study of Kojima (1973) by integrating FDI growth into economic development and emphasised the interaction between developing countries and developed countries.

Finally, the OFDI triggered by acquiring advanced technologies which contributed a leapfrogging effect was examined by Brezis et al. (1993). They demonstrated that it was possible for a lagging country to overtake the existing

leader country by acquiring a new technology innovated by developed countries. The lagging country utilised the new technology at a lower learning cost because of lower wage costs, and hence it grew faster.

2.3 Gravity Model in FDI Studies

Gravity was initially discovered by Newton in his 'Law of Universal Gravitation' in 1678. Newton's law states that the magnitude of attractive force has a proportional relation with two masses, while it has an inversely proportional relation with the distance between two masses. This relation is illustrated in the following equation (1).

$$F_{ij} = G\frac{M_i M_j}{D_{ij}^2} \tag{1}$$

F_{ij} is the magnitude of attractive force between mass i and mass j. D_{ij}^2 is the distance between them. G is the gravitational constant. This model has been widely applied in social studies in which distance is a decisive factor, including research on migration, tourism, trade and FDI. Nijkamp (1975) specified two conditions when applying a physical theory in social science. One condition is a high correlation between the physical phenomenon and the social phenomenon in question, this first condition can be fulfilled by the high statistical significance of gravity estimations. The other condition is that the social problem in question could be derived formally from a social behaviour hypotheses; this second condition can be fulfilled if the gravity model can be derived from a theoretical foundation.

The gravity model has been criticised on the grounds that it lacks strong

theoretical foundations ever since Tinbergen (1962) first applied it to an international trade study, even though it has strong explanatory power in empirical studies. In the early stage, most studies specified the gravity model intuitively, without formal identifications. Following Anderson (1979), an increasing number of studies have sought to theoretically explain the success of the gravity model. Various theories have surfaced: one strand of theory focuses on the non-trade theory aspect and the other strand of theory focuses on the trade theory aspect. In terms of the first strand of theory, the general equilibrium framework (Linnemann, 1966), the differentiated goods framework (Anderson, 1979), the utility maximisation framework (Nijkamp, 1975) and some microeconomic foundations (Bergstrand, 1985) are all applicable. In terms of the second strand of theory, the Ricardian trade framework (Evenett and Keller, 2002), the Heckscher-Ohlin trade framework (Bergstrand, 1989; Deardorff, 1995) and the New Trade Theory framework (Helpman, 1987; Hummels and Levisohn, 1995, Evenett and Keller, 2002) have been introduced to explain its theoretical derivations.

The gravity model performs like a workhorse model in empirical studies on bilateral economic relations; it accounts for the resistance and the friction factors that are largely ignored, such as distance. In analogy with the broad application of the gravity model in international trade studies, it has also been widely applied to FDI empirical studies. Stone and Jeon (1999) illustrated five commonly used determinants of FDI, including GDP, population, regional membership, distance and trade flows. Brainard (1997) adopted a gravity model to examine her proximity-concentration FDI framework. Braconier et al.

(2002) tested the vertical FDI theory by using the same control variables as those used by Carr et al. (2001) and adopted the log-linear gravity specification, following Brainard (1997). Markusen and Maskus (1999) also used a simple gravity specification to test their knowledge-capital model. It is therefore unsurprising that Blonigen (2005) has claimed that the gravity model is the most frequently adopted specification in FDI empirical studies.

2.4 Studies on China's Outward Foreign Direct Investment

Most studies on China's OFDI are descriptive and focus on the history, the patterns, case studies and the policy implications of Chinese OFDI. Empirical studies are very limited, and the majority of the existing research examines the underlying motivations and the locational determinants for Chinese OFDI. Cai (1999) provided a survey of China's OFDI between 1979 and mid-1990s. This section mainly reviews some recent issues, because the recent surge might provide more significant information about China's overseas investments.

2.4.1 A Brief History and Background of China's OFDI

China's OFDI has gradually adjusted from a restricted, central approval regime towards a more transparent and liberalised regime, and this liberalisation process will continue to be promoted in the future. The relatively short history of China's OFDI accompanies three landmark events, notably the 'Open Door' policy in 1979, the 'South Tour' in 1992 and the 'Go Global' strategy in 2002.[7]

First stage: 1979-1991

[7] Voss et al. (2008) provided a detailed survey for China's OFDI policy change in last 30 years.

The 'Open Door' policy, which was launched in 1979, was the first policy to provide an institutional framework within which to conduct foreign operations; it not only permitted inward FDI, but also outward FDI. Voss et al. (2008) indicated that China's OFDI was not promising and indeed negligible in the early period; however, although at the end of this period, China's OFDI was later encouraged by a more transparent and decentralised approval regime, even Chinese state-owned enterprises (SOEs) were inexperienced in terms of foreign investments. Cheung and Qian (2009) further indicated that in this primary stage, the political incentives played a relatively more important role in China's OFDI than the economic incentives. Guo (1984) reported that China had established more than 100 joint ventures by the end of 1983. The importance of establishing joint ventures abroad was acknowledged in terms of securing supplies of natural resources to assist economic growth, in acquiring advanced technology from developed countries and assisting foreign operations, as well as facilitating exports and acquiring managerial skills through 'learning by doing'. Tan (1999) reported that the number of approved foreign investment projects had increased to 801 by the end of 1990.

Second stage: 1992-2001

China's economy accelerated as a result of Deng Xiaoping's 'South Tour' in 1992. Voss et al. (2008) pointed out that OFDI was promoted by central and local administrations until the Asian Financial Crisis in 1997. Overseas projects were generally underperforming and the Ministry of Commerce (MOFCOM) restricted the approval of OFDI. In the later period of this stage, Cheung and Qian (2009) argued that a further liberalised approval regime was consistent

with a directive launched in 1999. This directive indicated that Chinese government had changed its OFDI policy from encouraging overseas investments to directing overseas investments using economic incentives. Since 1991, MOFCOM has annually published statistics related to the value and number of overseas projects at the bilateral country level in the *Almanac of China's Foreign Economic Relations and Trade*.

Third stage: 2002 to present

The launch of the 'Go Global' policy and China's accession of the Word Trade Organization (WTO) in 2002 boosted the involvement of China in international expansion. The *Country and Industry Catalogue of Outward Foreign Direct Investment,* which was jointly announced by the MOFCOM and the National Development and Reform Commission (NDRC), sketches the investable industries in the host countries.[8] It signals the Chinese government's further shift in OFDI policy from approval to supervision and assistance. The quality of OFDI data has also been improved; the OECD standards and the IMF standards compatible statistics *Statistical Bulletin of China's Outward Foreign Direct Investment* has been published annually by MOFCOM since 2003. A distinctive feature of this rapid growth period is the fact that the government has substantially subsidised SOEs in order to implement its national long-term interests. For example, the recent high-profile investments in natural resources have placed Chinese companies in the spotlight. Xiao and Sun (2005) indicated that the China National Offshore Oil Corporation (CNOOC) has benefited from a zero interest loan provided by the Chinese government for bidding on an

[8] An alternative translation is *Investment in Foreign Countries Industry Sector Guidance Catalogue* (Voss et al., 2008)

American oil company Unocal. PetroChina and China National Petroleum Corporation (CNPC) sold billions of dollars of shares to purchase oil and natural gas in Asia. Yao et al. (2010) and Yao and Sutherland (2009) have also stated that Chinalco took advantage of preferential interest rates from the government to bid on Rio Tinto, and that the government exchanged this generous support for securing metal supplies.

2.4.2 Descriptive Studies on China's OFDI

While China's OFDI was largely motivated by political incentives in the early period, recent descriptive studies find that China's OFDI is relevant to mainstream theories in general, with China's specificities in particular. Child and Rodrigues (2005) examined China's international expansion from exports to original equipment manufacturer (OEM), and finally OFDI. Their case studies revealed that China's international expansion has specific features, although there was no need to develop a new theory to explain this. They made certain theoretical extensions about the latecomer strategies, and indicated that China undertook OFDI to acquire strategic assets, such as advanced technology and management skills, in order to increasing its competitiveness. In addition, the relationship between the Chinese government's OFDI decision, governmental support, institutional factors and the liability of foreignness was also discussed. Similarly, Buckley et al. (2008) found that China's OFDI corresponded with developing countries' OFDI theories in general, but that it also had distinctive features. Both aggregate data from MOFCOM and individually approved project data from the State Administration of Foreign Exchange (SAFE) were reviewed. This explanatory study revealed that the

entry mode of China's OFDI changed from the previously dominant joint-venture mode to the recently fully owned affiliates. In addition, the investment motivation also changed to become more trade-related and strategic assets-seeking. Morck et al. (2008) argued that although China's OFDI was implemented by inefficient SOEs, this inefficiency was compensated for by three external resources, including China's high savings rate, the government-biased corporate structure and the distorted capital market.

A notable specificity of China's OFDI is the role of government in its implementation, from making the policy to assisting with the investments. The institutional effect of the home country is largely omitted in the existing studies, which address the institutional effect of the host country instead, and hence China's experience is thus an interesting case to study. Voss et al. (2008) illustrated the evolution of China's OFDI by focusing on the importance of institutional change and governmental participation. They pointed out that regulatory reform of China's OFDI policy was gradual and continuous, and this decentralised and liberalised decision-making regime accompanied the surge of China's OFDI.

2.4.3 Empirical Studies on China's OFDI

Consistent with the findings of descriptive studies that China's OFDI is relevant to mainstream theories with China's specificities, the existing empirical studies also indicate that China's OFDI is relevant to the common determinants and the common motivations for OFDI more generally. The existing empirical studies on China's OFDI can be classified into two broad

categories based on the sample period.

In terms of the early sample period, Cheung and Qian (2009) examined various motivations for China's OFDI and concluded that the driving forces in developing countries and developed countries were different. The gravity-type fixed effects model was introduced by using the data from MOFCOM between 1991 and 2005 for the top 50 host countries. The results revealed that the market-seeking motivation was an important incentive for China's OFDI in developed countries, whereas the market-seeking motivation was not relevant to China's OFDI in developing countries. An interesting result was that China's OFDI was encouraged by the high labour costs in developed countries, and by the low labour costs in developing countries. China's OFDI was sensitive to the natural resource abundance of the host country, but the study did not find that China's OFDI in Africa was mainly driven by the abundance of natural resources. Buckley et al. (2007) expanded the traditional OFDI theories by adding three explanations to illustrate the specificity of China's OFDI, including the capital market imperfection, the special ownership advantage and the institutional factor. Official data from SAFE for 49 host countries between 1984 and 2001were estimated under the OLS and the random effects (RE) model. The model specification was motivated by various hypotheses proposed by Dunning (1993). The results revealed that China's OFDI generally corresponded with the common motivations of OFDI. Zhang (2009) provided an investigation into China's OFDI flow from 1995 to 2002 for the top 27 countries by using both a static panel estimation method and a dynamic panel estimation method. The results revealed that, in the early stage, China's OFDI

was not driven by market-seeking, strategic asset-seeking or natural resources-seeking motivations, but that, nevertheless, China's OFDI was strengthened by exports. China's overseas investments supplemented exports, and became predominant in the late stage. Interestingly, he found that China's OFDI flowed into the low-income countries to assist exports.

In terms of the recent sample period, Cheng and Ma (2007) investigated China's OFDI by using MOFCOM data, including 90 countries for OFDI flow and 83 countries for OFDI stock from 2003 to 2005 respectively. Using the gravity-type specifications and the OLS estimations they concluded that the host country's GDP and similarities in terms of language had a positive correlation with China's OFDI, while distance and the level of GDP per capita had a negative correlation with China's OFDI. They further took Japan and South Korea as examples to forecast the future patterns of China's OFDI. Kolstad and Wiig (2009) examined China's OFDI by focusing on the effects of institution and natural resource abundance, as well as their joint effect. They constructed a panel dataset that included 104 host countries for 2003-2006. Their results supported the idea that China's OFDI was driven by the real GDP under the market-seeking motivation. Interestingly, they found that neither the governance quality nor natural resource abundance were relevant to China's OFDI; however, their joint effect negatively correlate with China's OFDI, implying that China's overseas investments were driven to countries that are abundant in natural resources and which have poor governance.

Given the concern about China's presence in Africa, Cheung et al. (2011)

focused on China's OFDI in 31 African host countries for 1991-2005 and 33 African host countries for 2003-2007 respectively. They used the Tobit model to account for the data censoring, and the Heckman model to account for the selection bias. The results revealed that China's OFDI in Africa was driven by the same common determinants. The market size, natural resource abundance, governance quality, trade connections and the contracted projects were all relevant factors. In particular, they found that natural resource abundance did not affect the probability that China would undertake investments in Africa. However, once the overseas projects had been undertaken, China's OFDI was particularly driven to oil producing countries.

Departing from examining the locational determinants of China's OFDI in the above-mentioned studies, Liu et al. (2005) sketched China's OFDI differently from the perspective of the IDP theory. Time series data of China's OFDI between 1979 and 2002 were applied to an error correction model (ECM). The results suggested that China's OFDI had a positive correlation to China's GDP per capita, China's inward FDI and China's human capital stock. Hence, they found that China's OFDI development was consistent with IDP theory in general, although they also pointed out that the theory would require certain refinements if it was to be applied accurately to the Chinese case.

Table 2.1 below summarises various specifications and the results of the empirical studies reviewed above.[9] It shows that most studies focus on the early period of Chinese OFDI and that they use selective host countries subject

[9] The study of Liu et al. (2005) was excluded because their study did not focus on locational determinants.

to the availability of data. The implications of their findings are limited by the following four factors. Firstly, given the fast growth of China's OFDI in the recent period – and especially since China has adopted the OECD standards and the IMF standards to record OFDI data since 2003 – an early and a short period might be incapable of fully revealing the causes and consequence of China's OFDI. Secondly, the small number of host countries leads to insufficient information and existing studies are unable to comprehensively reveal the underlying motivations and the locational determinants of China's OFDI. Thirdly, a static framework is unable to examine the dynamic adjustment of China's OFDI. Finally, the impact of China's investments on other FDI source countries' investments is largely ignored.

Table 2.1 Summary of Empirical Studies on China's OFDI

Study	Time Period	Country Coverage	Number of Obs.	Method	Dependent Variable	Explanatory Variables[1]
Cheung and Qian (2009)	1991-2005	50	367	FE	Stock	Nominal GDP(+), Real GDP per capita(-), Wage(-), Resources(+)
Buckley et al. (2007)	1984-2001	49	402	OLS, RE	Flow	Real GDP(+), Metals(+), Political risk(+), Inflation(+), Exports(+), Imports(+), Chinese ethic(+), South Tour(+)
Zhang (2009)	1995-2002	27	189	RE	Flow	Real GDP per capita(-), Exports(+),
	1995-2002	27	162	GMM	Flow	Exports(+)
Cheng and Ma (2007)	2003-2005	90	270	OLS	Flow	Real GDP(+), Distance(-), Language(+), Landlocked(-)
	2003-2005	83	248	OLS	Stock	Real GDP(+), Real GDP per capita(-), Distance(-), Language(+), Landlocked(-)
Kolstad and Wiig (2009)	2003-2006	104	142	OLS	Flow	Real GDP(+)
Cheung et al. (2011)	1991-2005	31	131	Tobit	Flow	Economic risk(+), Corruption risk(-), Projects(+)
	1991-2005	31	194	Heckman	Flow	Nominal GDP(+), Economic risk(+), Political risk (+), Corruption risk(-), Projects(+)
	2003-2007	33	131	Tobit	Flow	Nominal GDP(+), Metals(+), Energy(+), Economic risk(+), Corruption risk(-), Law and order risk(-), Projects(+)
	2003-2007	33	103	Heckman	Flow	Nominal GDP(+), Metals(+), Law and order risk(-), Total trade(+)

Notes: + (-) represents the positive (negative) effect of the relevant variable on China's OFDI which is at least significant at the 10% level. [1] For simplicity, results for the whole sample are reported.

2.5 Conclusion

This chapter reviewed the general FDI theories, the OFDI theories derived from the developing countries and the gravity model. In particular, this chapter provided a critical review of the empirical studies on China's OFDI.

This chapter demonstrated that there are several limitations in the existing empirical studies on China's OFDI. Firstly, the majority of the empirical studies use an early period or a short period and a selective sample of host countries; however, these studies are unable to comprehensively investigate China's OFDI. Secondly, most of the empirical studies merely investigate the common locational determinants of China's OFDI without a detailed examination of some specific factors which might be particularly relevant to China's OFDI, such as natural resources and technology. Thirdly, most studies examine the effects of the host country's characteristics on China's OFDI in a static framework; however, the dynamic adjustment of China's OFDI is rarely examined. Finally, research on the consequences of China's surge in OFDI is largely underdeveloped, and, in particular, there are no studies on the impact of China's OFDI on other source countries' OFDI.

In subsequent chapters, this thesis fills this gap in three empirical studies. This thesis firstly examines the locational determinants of China's OFDI by focusing on the role played by natural resources and technology in Chapter 3. In Chapter 4, this thesis investigates the dynamic adjustment of China's OFDI and its relationship with China's IFDI. Finally, this thesis studies the

displacement effect of China's OFDI on the OECD's OFDI in Chapter 5.

CHAPTER 3

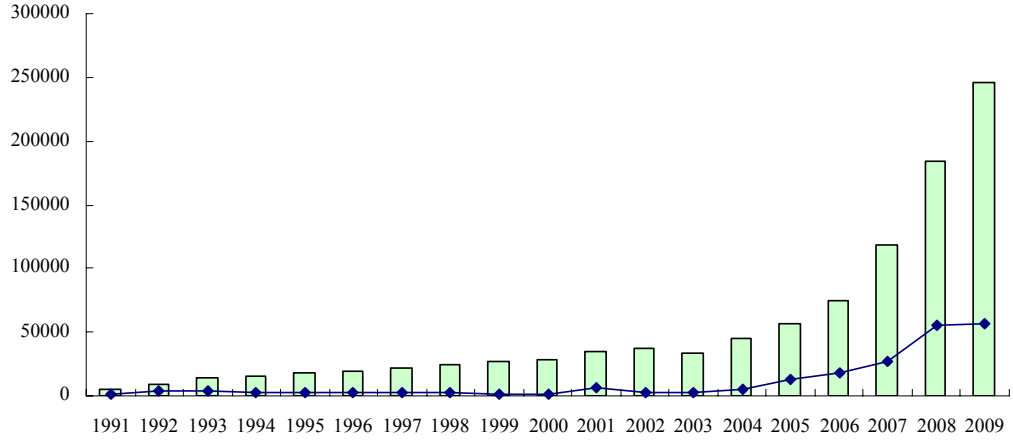
THE LOCATIONAL DETERMINANTS OF CHINA'S OUTWARD FOREIGN DIRECT INVESTMENT: THE ROLE OF NATURAL RESOUCES AND TECHNOLOGY

3.1 Introduction

China has been acknowledged as an important recipient of inward foreign direct investment (IFDI) since the 'Open Door' policy was launched in 1979. However, the rapid integration of China into the world economy has also led it to become a major source of outward foreign direct investment (OFDI).[10] China's OFDI developed from a very limited scale and has surged over the last decade. The entry into the World Trade Organization (WTO) in 2001 and the launch of the 'Go Global' strategy in 2002 greatly shifted the landscape of China's OFDI (Voss et al., 2008). UNCTAD (2010a) reported that China will be the second most promising OFDI source country in the next three years. Indeed, China currently accounts for 5.1% of the world's total OFDI flow and is ranked among the top five FDI source countries in the world, and it became the largest source of FDI among developing countries in 2009 (MOFCOM, 2009). Figure 3.1 presents this surge. China's OFDI flow rose rapidly from US$913 million in 1991 to US$56528.99 million in 2009. China's OFDI stock grew from barely US$5368 million in 1991 to US$245755.4 million in 2009.

[10] From this point onward, the term 'China' refers to the People's Republic of China (PRC). Two Special Administration Regions, Hong Kong and Macao, are treated as OFDI destinations. Taiwan province is separately treated as an OFDI destination.

Figure 3.1: Values of China's OFDI Flow and Stock (US$ million)



Notes: ◆ China's OFDI flow value. ▭ China's OFDI stock value.
Data Sources: Data for 1991-2002 are obtained from UNCTAD, *World Investment Report* (various issues). Data for 2003-2009 are obtained from MOFCOM (2009), *Statistical Bulletin of China's Outward Foreign Direct Investment*.

This study examines the development of China's OFDI across two periods, 1991-2003 and 2003-2009. Chinese economic growth accelerated following Deng Xiaoping's 'South Tour' in 1992, and its overseas activities are promoted by the central and local administrations. China's OFDI regime has evolved from a central approval system towards a more transparent and liberalised regime.[11] Cheung and Qian (2009) indicated that the government has not only changed the OFDI decision-making process from a more politically motivated regime to a more economically motivated regime, but that it has also decentralised the strict approval regime. China's fast economic growth is accelerating China's overseas investments, more importantly, a number of studies indicate that the Chinese government is substantially subsidising OFDI

[11] Overseas investments have to be approved and supervised by several government departments in China. Any OFDI project more than 30 million US$ has to be approved by the National Development and Reform Commission (NDRC), any project less than 30 million US$ has to be registered under NDRC. Any overseas project has to be approved by the Ministry of Commerce (MOFCOM) and any investment more than 10,000 US$ has to be registered under MOFCOM. Chinese MNCs have to apply for foreign exchange from the State Administration of Foreign Exchange (SAFE) under the People's Bank of China.

based on considerations of its national long-term interests, especially in the natural resource sectors (Xiao and Sun, 2005; Yao et al., 2010; Yao and Sutherland, 2009).

China's OFDI might be affected by many factors, such as the host country's market size, exports, governance, distance and cultural proximity (Buckley et al., 2007; Cheung and Qian, 2009; Zhang, 2009). This chapter focuses on the role of two factors, namely the host country's natural resources and technology. They are the often heard 'primary suspects' that have placed China under the spotlight through several high profile overseas projects. In terms of natural resources, two recently failed buyouts have drawn the world's attention: China National Offshore Oil Company's (CNOOC) acquisition of a US company Unocal in the oil industry and Aluminium Corporation of China (Chinalco)'s acquisition of Rio-Tinto in the metal industry.[12] As natural resources are increasingly important in sustaining China's economic growth, investments in oil, ores and metals ensured the supply of these scarce inputs (Zhan, 1995; Ye, 1992; Taylor, 2007). The increasing consumption of natural resources and the expectation of a higher price level in the future have driven China to actively engage in natural resource deals and to conduct bilateral government level co-operation. These efforts may reflect the fact that China is struggling to secure long-term supplies of natural resources and is responding to the variability of mineral prices. The abundance of natural resources provides a country-specific advantage in attracting FDI flows into the host country (Dunning, 1993, 1998; Asiedu, 2006) and takes a large share in the home country's early OFDI

[12] Davis (2010) provided a summary for major events of China's OFDI between 2007 and 2009.

development (Cheng and Ma, 2007; Park, 2003). However, empirical studies on the effect of a host country's natural resources on China's OFDI are inconclusive. Buckley et al. (2007) and Cheung and Qian (2009) judged that it was a significant determinant in China's OFDI, while Zhang (2009) and Kolstad and Wiig (2009) found it had an insignificant effect, although the coefficient was still positive. This chapter focuses on the effect of natural resources on China's OFDI and it distinguishes between the host country's overall resource abundance, oil abundance and metal abundance.

Further, together with the host country's natural resource abundance, the role of technology in China's OFDI is also acknowledged due to recent large-scale acquisitions in the information technology (IT) and manufacturing industries, and especially the automobile industry.[13] The effects of technology on China's OFDI are twofold. On the one hand, the technology-seeking motivation indicates that the international capital flow was driven by the objective of acquiring the host country's technology, and this technology-seeking motivation closely related to the 'reverse spillover' (Driffield and Love, 2003; Fosfuri and Motta, 1999). The technological externality could be diffused from the host country's company to the home country's affiliate in the host country through the 'reverse spillover'. The productivity of home country's affiliate in the host country will be increased and eventually cause the productivity improvement of the parent company in the home country. For example, if the reverse spillover exists, the productivity of China's affiliate in the UK would be increased by the technological externality, and eventually, the productivity

[13] Nanjing Automobile (Group) Corporation purchased assets of MG Rover. Zhejiang Geely Holding Group acquired Volvo.

of the parent company in China will be improved. Case studies on Chinese firms have argued that China's foreign investments were driven by the goal of acquiring advanced technology and brands to increase their competitiveness in the international market (Child and Rodrigues, 2005; Mock et al., 2008). Chang'an Automobile Group established an R&D centre in the Nottingham Science Park, Lenovo acquired the IBM personal computer (PC) business and TCL acquired France-based Thomson Electronics – all of which reflect China's efforts to access advanced technologies in developed countries. On the other hand, the technology-exploiting motivation implies that MNCs undertake OFDI in order to exploit their technology advantage (Driffield and Love, 2003). The traditional OLI theories indicated that as MNCs possessed certain firm-specific assets, such as technology to operate and compete in foreign countries, FDI was chosen to transfer this technology abroad and to internalise it within the company (Dunning, 1981a; Buckley and Casson, 1976). Driffield and Love (2003) have indicated that these theories coincide with the technology-exploiting FDI, which was an important channel to transfer technology internationally. Thirty years of economic growth have upgraded China from a low income to a lower-middle income country, and improvements in technology have been accompanied by income growth, resulting in a relatively superior technology to other developing countries. Kojima (1973) illustrated the sequence of transferring home industries to host countries. The industry in which the home country was losing the competitive advantage was first shifted to the host country, which was gaining the competitive advantage in that industry. China's OFDI not only provides capital but also transfers relatively advanced technology to other developing countries. Chinese MNCs in the

manufacturing industry, such as automobiles and home appliances, have established foreign subsidiaries, mainly in developing countries. Among them, as visible cases, Zongshen Industrial Group established a motorcycle subsidiary in Vietnam, Haier Group established a fridge subsidiary in Nigeria and Jingniu Group launched a ceramics and glass subsidiary in Zimbabwe. These overseas projects show how China's OFDI is driven to developing countries with a low technology level. Overall, the dual effects of the host country's technology level point to another important dimension in examining China's OFDI.

This chapter provides an empirical investigation of the locational determinants of China's OFDI flow for the period 1991-2003 and 2003-2009 respectively. Data on China's OFDI at a bilateral country-level was first available in 1991, and they are published annually by the Ministry of Foreign Trade and Economic Cooperation (MOFTEC) using China's alternative standards up to 2003. MOFCOM is the successor of MOFTEC from 2003, and it has published OECD/IMF standards consistent data since 2003. Compared to the majority of the existing literature, which merely focuses on the early period 1991-2003, the added value of this study can be summarised as the following. First, this chapter comprehensively examines the effect of the host country's natural resource abundance on China's OFDI, and also distinguishes among the effects of overall resource abundance, oil abundance and metal abundance. This chapter argues that the resource-seeking motivation is different across these two time periods. The host country's overall natural resource abundance did not affect China's OFDI in the early period of 1991-2003. Yet there is strong

evidence for the natural resources-seeking motivation in the recent period of 2003-2009, and this finding is robust across alternative econometric specifications, as well as the alternative types of natural resources (overall natural resources, oil and metal). Secondly, the effects of governance and mineral prices on China's resource-seeking OFDI are also different across these two time periods. In terms of the role of governance, this chapter provides evidence that China's OFDI is particularly driven to countries with poor governance and which are rich in overall resources and oil for both time periods, and this effect is stronger in the recent period 2003-2009. In terms of mineral prices, this chapter presents evidence that China's oil-seeking OFDI is stimulated by the high growth rate of oil prices, suggesting that China's OFDI is not only driven to secure a long-term oil supply, but also by oil price changes. Thirdly, the host country's technology does not play a role in China's OFDI in the early period 1991-2003. However, there is evidence in support of the technology-exploiting motivation in the recent period 2003-2009. China's OFDI is driven to low-income countries with inferior technology in order to exploit and transfer China's technology. This chapter also argues that there is weak evidence for the technology-seeking motivation of China's OFDI in higher income countries with superior technology. Fourthly, most previous studies use econometric techniques such as pooled OLS, random effects model and fixed effects model. This study uses alternative estimation methods. To obtain robust results, the Tobit and Heckman selection models are introduced to take account of the censoring and selection bias respectively. Finally, most of the previous literature merely uses selected host countries in empirical studies, but the sample used in this chapter includes more than 150 host

countries for both time periods, and this large sample greatly increases the variation in OFDI and makes this chapter's conclusions more robust.[14]

The rest of this chapter is organised as follows. The second section provides the background and a brief review of studies on China's OFDI, and focuses on the effect of natural resources and technology. The third section introduces benchmark specifications. The fourth section describes the data. The fifth section presents regression results and discussions. The sixth section provides various robustness checks. The final section concludes this chapter.

3.2 Previous Research

China's OFDI, as a means of integrating China into the world economy, is seldom studied due to the relatively small amount of OFDI in the early stage (Cheung and Qian, 2009) of the Chinese reform era and the lack of suitable data (Buckley et al., 2008). The insignificant amount of OFDI and data limitations has resulted in a limited number of empirical investigations into Chinese OFDI (Cheung and Qian, 2009, Buckley et al., 2007; Zhang, 2009). The majority of the existing literature is limited to a descriptive analysis of distribution patterns, regulation liberalisations and policy implications (Cai, 1999; Voss et al., 2008; Wong and Chan, 2003; Wu and Chen 2001). The last chapter reviewed the empirical studies on China's OFDI, and this section now focuses on the effects of the host country's natural resources and technology, because they are often reported in the media and play an important role in China's OFDI policy-making. For example, to quote the *Financial Times*:

[14] For three examples, Zhang (2009) selected 27 host countries, Cheung and Qian (2009) selected 50 host countries, and Kolstad and Wiig (2009) selected 4 years.

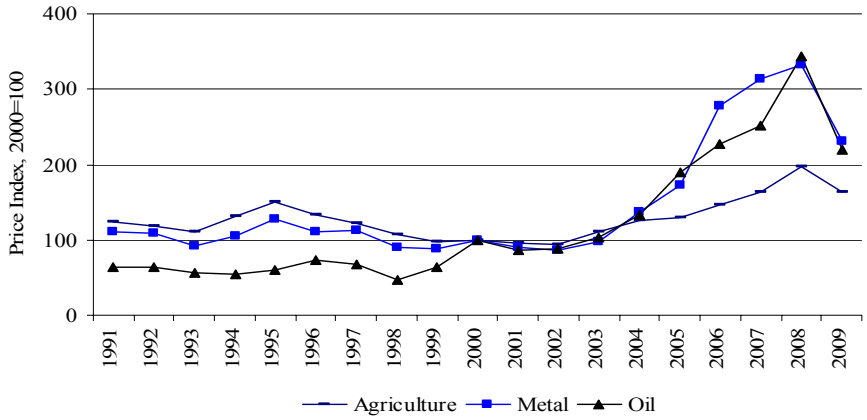
In an interview published in state-controlled media, the chairman of China Development Bank said Chinese outbound investment would accelerate but should focus on resource-rich developing economies. (*Financial Times*, 21st July, 2009).

3.2.1 Studies on Effects of Natural Resources on OFDI

Background of Global Extractive Industries

The most distinctive change in the global extractive industries in the past two decades has been the increase in mineral prices, as shown in Figure 3.2. The price indices of agriculture, metal and oil were all relatively stable during the early period examined in this thesis, 1991-2003. Yet the prices grew rapidly in the recent period 2003-2009, especially for oil and metal. Given a big drop in 2008 due to the financial crisis, the price indices of metal and oil still grew much faster than the agricultural index.

Figure 3.2: Price Indices of Agriculture, Metal and Oil



Notes: Price index equals 100 in 2000. The metals price index includes the following minerals associated with respective weights: phosphate rock (2.67%), manganese ore (1.20%), iron ore (13.65%), aluminium (23.93%), copper (38.89%), nickel (6.70%), lead (2.10%), zinc (7.22%), tin (3.62%), and tungsten ore (0.02%).The crude petroleum price index assumes equal weight for the following oil prices measured by US$ per barrel: Dubai, Brent and Texas.
Data source: UNCTAD (2010b), *Free market commodity price indices.*

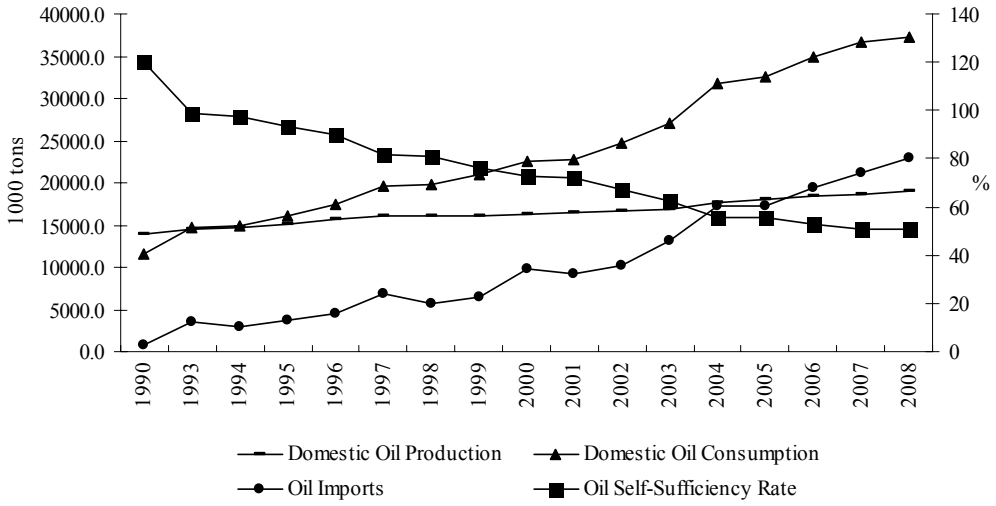
China's Insecurity in Natural Resources

China's insecurity in natural resources has been triggered by both the rising dependence on natural resources from external sources and the rise of import costs due to booming mineral prices. Firstly, China's insecurity in natural resources is projected by the shortage of a long-term supply of resources. China has been challenged by the disparity between its consumption and production of natural resources. On the demand side, the increasingly large demand for all types of natural resources accompanied fast economic growth; however, on the supply side, the scarcity and slow growth of the production capability has constrained domestic supply.

Taylor (2007) pointed out that oil was China's primary interest, together with other ores and metals. The scarcity of oil has turned China from a net oil exporter into the second largest oil importer, following the US, in 2009.[15] Figure 3.3 shows that, on the one hand, domestic oil production grew by just 37.69% between 1990 and 2008, while, on the other hand, oil consumption and imports boomed by 224.78% and 2945.99%. The oil self-sufficiency rate steadily declined, dropping from 120.42% in 1990 to 51.05% in 2008.[16]

[15] Calculated from U.S Energy Information Administration (EIA, 2010).
[16] The oil self-sufficiency rate was defined as the share of local oil production in local oil consumption (Chen, 2008).

Figure 3.3: China's Oil Production, Consumption, Imports and Self-Sufficiency

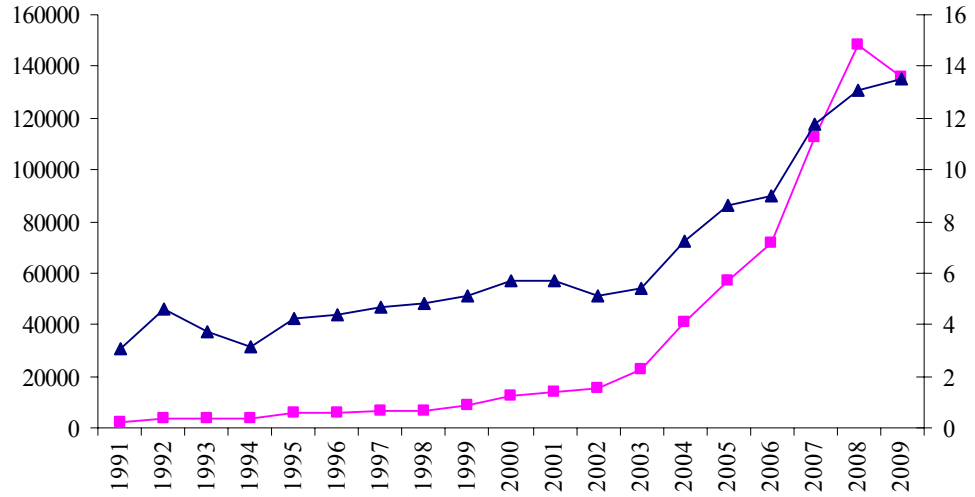


Notes: Volume of China's oil imports, domestic oil production and consumption (left axis). Oil self-sufficiency rate (right axis).
Data source: National Bureau of Statistics of China, *China Statistical Yearbook* (various issues).

Alongside China's growing dependence on oil imports, its increasing dependence on metal imports is shown in Figure 3.4. It presents the absolute value of metal imports and the share of metal imports in China's merchandise imports. This fast growth also reveals an expanding dependence on metal imports. The absolute value of imports increased from US$1939.246 million in 1991 to US$136170.2 million in 2009, and the share in total imports increased from 3.57% in 1991 up to 12.23% in 2009.[17]

[17] Calculated from World Bank, *World Development Indicators* (various years)

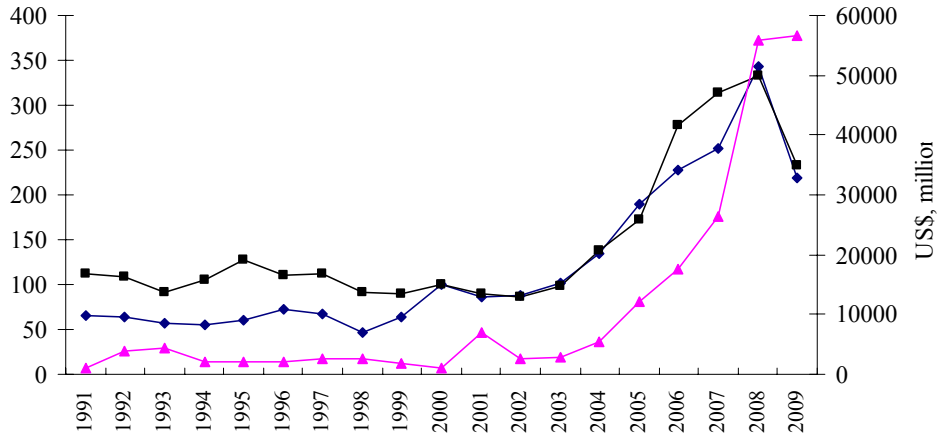
Figure 3.4: Value of China's Metal Imports and Share in Merchandise Imports



Notes: ■ Value of China's metal imports (left axis). ▲ Share of metals imports in China's merchandise imports (right axis).
Data Source: World Bank, *World Development Indicators* (various years).

Secondly, China's insecurity in natural resources is also projected by the booming mineral prices. Figure 3.5 illustrates the co-movement between China's OFDI and mineral prices. The relatively small value of Chinese OFDI was accompanied by relatively stable mineral prices in the 1990s, and the surge in OFDI was associated with skyrocketing mineral prices in the new millennium.

Figure 3.5: Value of China's OFDI, Oil Price Index and Metal Price Index



Notes: ■ Price index of metals and ◆Price index of oil (left axis). ▲ Value of China's OFDI flow (right axis).
Data source: UNCTAD (2010b), *Free market commodity price indices.*

Effects of Governance and Government Support on Natural Resources Seeking

China's overseas investments in seeking natural resources might also be affected by the governance quality of the host country. Kolstad and Wiig (2009) found although the host country's natural resources abundance and governance quality were not important determinants of China's OFDI in general, their joint effect negatively affected China's OFDI. In other words, China's OFDI was particularly driven to natural resource abundant countries with poor governance. Kolstad and Wiig (2009) explained that China's OFDI was only presented with opportunities for investment in resource abundant countries with poor governance as a latecomer.

Interestingly, Yao and Sutherland (2009) pointed out that Chinese MNCs in the extractive industry were not driven by exploiting firm-specific advantages, but were alternatively driven by the political and financial support from the government in serving China's national long-term interest in scarce inputs such as oil and metal. Zweig (2006) illustrated China's resource diplomacy and explained that the Chinese government diplomatically supported natural resource-seeking activities. Cheng and Ma (2007) and Houser (2008) also illustrated the importance of the Chinese government in facilitating oil companies' overseas investments. Xiao and Sun (2005) noted that the government financially supported the CNOOC's acquisition of California-based Unocal.

3.2.2 Studies on Effects of Technology on OFDI

Technology-seeking Motivation

Departing from the neoclassical growth model, which illustrates how economic growth is driven by an exogenous technology change due to the accumulation of capital, the new growth theory addresses the important role played by technology. An endogenous technology change is driven by technology spillovers usually caused by the accumulation of knowledge capital and human capital. Studies focusing on the international capital that has flowed into developed countries has illustrated the importance of the technology-seeking motivation (Kogut and Chang, 1991; Neven and Siotis, 1996; Love, 2003). The explanation for the technology-seeking motivation is twofold.

Firstly, the technology-seeking motivation closely relates to technology spillovers. Koizumi and Kopecky (1977) have pointed out that technology was considered as a public good and technology spillovers were addressed as an important mechanism for technology diffusion (Niosi, 1999; Serapio and Dalton, 1999; Fosfuri and Motta, 1999). Wang and Blomstrom (1992) reported that although technology spillovers were intrinsic, they did not take effect automatically. More learning investments were conducted by a technologically inferior company to absorb advanced technology, with a higher transfer rate of technology spillovers to active investors. Driffield and Love (2003) described the 'reverse spillovers' that were related to OFDI. Their empirical study confirmed that the technological externality could be diffused from the host country's company to the home country's subsidiary in the host country through the 'reverse spillover'. The productivity of the home country's

subsidiary in the host country is increased, as well as the productivity of the parent company in the home country. This argument provides a motivation for China's recent efforts at seeking advanced technology.

Secondly, the technology-seeking OFDI is also largely driven by the latecomer advantage. Matthews (2002) pointed out that latecomers from lagging countries caught up with advanced countries by investing in knowledge-intensive industries. However, the innovation in technology takes a long time and requires large inputs, therefore, Yao and Wei (2007) referred to latecomer advantages as utilising the same technology at lower cost and with better time-efficiency. It is possible for China to exploit the latecomer advantage, fuel this catch-up process and benefit from adopting advanced technology at a lower learning cost. For example, China could utilise a new technology more efficiently than innovators due to lower wages, and thus grow faster than a leading country. Brezis et al. (1993) demonstrated that the adoption of new technology resulted in a leapfrogging effect which is possible for a lagging country to overtake the leading country.

Technology-Exploiting Motivation

Alongside China's desire in seeking advanced technology to promote economic growth, thirty years of fast economic growth has resulted not only in a rise in China's income level but also an improvement in the technology level. Regardless of whether or not it is entirely true that China's technology is a less sophisticated alternative to Western technology but relatively advanced compared to other developing countries, it is plausible that China's technology

which is embodied into OFDI is being widely utilised among developing countries. The explanation for the technology-exploiting motivation is threefold.

Firstly, the technology-exploiting motivation could be explained by Chinese MNCs exploiting the relatively advanced technology in developing countries. Dunning (1993) illustrated that MNCs possess certain firm-specific assets to operate in foreign markets; as licensing was not an optimal channel to transfer these assets subject to intellectual property, FDI was preferred (Buckley and Casson, 1976). Driffield and Love (2003) pointed out that these assets are heavily dependent on technology. Therefore, the technology-exploiting OFDI was important in the transfer of technology internationally. Economic growth improves China's technology level, and hence China's OFDI might be also capable of exploiting and transferring its technology to other developing countries.

Secondly, the technology-exploiting OFDI might be in line with the hypotheses of appropriate technology, implying that it is easier and cheaper for China to exploit and transfer its technology among developing countries. An alternative interpretation is that it is easier and cheaper for developing countries to learn how to use China's technology. To gain a better idea of appropriate technology, two intuitional cases are introduced. A sophisticated aircraft technology was unhelpful in improving rickshaw-pullers' productivity (Lapan and Bardhan, 1973) and a sudden shift from a Stone Age community to a modernised society would cause disaggregation (Findlay, 1978). The wide utilization of China's

technology among developing countries might reflect the similarity between China's technology and a developing country's technology. For example, the OECD (2008) recommended African countries to utilise China's technology which was similar to local technology.

Thirdly, China's technology-exploiting OFDI in developing countries could also be explained by the argument that the bigger the technology spillovers, the smaller the technology gap, and vice versa. Similar income levels, productivities and technology capabilities ensure a smaller technology gap between China and developing countries. Technology spillovers decreased with the technology gap, implying the smaller the technology gap, the greater the productivity gain. Technology spillovers also decreased with the complexity of the transferred technology, implying the less sophisticated the technology that is transferred, the more domestic productivity improved (Kokko, 1994; Haddad and Harrison, 1993; Kokko et al, 1996). Therefore, the rate of diffusion from China's technology to developing countries increases as a result of a smaller technology gap and less complexity.[18]

3.3 Methodology

3.3.1 Benchmark Specifications

To elaborate the econometric estimations used in this chapter, the benchmark specification is motivated by a conventional gravity model. It performs like a

[18] Kokko (1994) defined productivity as the sales per worker and the technology gap as the difference between the foreign firm's and domestic firm's productivity. Haddad and Harrison (1993) defined productivity as the Total Factor Productivity and the technology gap as the difference between the foreign firm's and domestic firm's productivity. Kokko et al. (1996) defined productivity as the labour productivity and the technology gap as the difference between the foreign firm's and domestic firm's productivity.

workhorse model for many empirical studies on bilateral economic relations by accounting for resistance and friction factors that are largely ignored, such as distance and common language. The bilateral FDI flow positively correlates with two economic masses, but negatively correlates with bilateral economic frictions. China's OFDI flow is included as the dependent variable (*lnCOFDIF*), and the host country's natural resource abundance (*Resources*) and technology level (*Technology*) as the two main variables of interest. A range of control variables is also included, such as the host country's characteristics and economic frictions. Hence the base gravity-type specification is given by Equation (1).

$$\begin{aligned}\ln\mathrm{COFDIF}_{it} = {} & \beta_0 + \beta_1 \mathrm{Resources}_{it} + \beta_2 \mathrm{Technology}_{it} + \beta_3 \ln\mathrm{RGDP}_{it} \\ & + \beta_4 \mathrm{RGDP\_Growth}_{it} + \beta_5 HIncome_{it} + \beta_6 UMIncome_{it} \\ & + \beta_7 LIncome_{it} + \beta_8 \ln Exports_{it} + \beta_9 \ln Openness_{it} \\ & + \beta_{10} Governance_{it} + \beta_{11} Inflation_{it} + \beta_{12} \ln Dist_i + \beta_{13} ComLag_i \\ & + \beta_{14} SAR\_Dummy_i + \beta_{15} Africa_i + \beta_{16} Europe_i \\ & + \beta_{17} S\_America_i + \beta_{18} N\_America_i + \beta_{19} Oceania_i + \eta_t + u_{it}\end{aligned} \tag{1}$$

where *i* and *t* denote host country *i* and year *t*.

The host country's overall natural resource abundance (*Resources*) is the first main variable of interest, and it is introduced to examine the effect of the host country's natural resource abundance on China's OFDI. Following Cheung and Qian (2009) and Zhang (2009), the total share of fuels and ores and metal exports in merchandise exports are used to represent the overall natural resource abundance of the host country.[19] Dunning (1993) illustrated that the natural resources-seeking motivation was an important motivation in FDI

[19] Kolstad and Wiig (2009) indicated that the reasons why natural resources export share was a better proxy than natural resources endowments.

decisions. Gastanaga et al. (1998) and Noorbakhsh et al. (2001) have emphasised the importance of including natural resources into FDI analysis, while Aseidu (2006) argues that their omission would cause a biased estimation of FDI in resource abundant African countries. As Chinese OFDI is aimed toward the acquisition of natural resources, the first main coefficient of interest β_1 is expected to be positive, and a positive sign implies that China's OFDI is driven by the natural resources abundance of the host country under the natural resources-seeking motivation.

The host country's technology level (*Technology*) is the second main variable of interest, and it is included to examine the effect of the host country's technology level on China's OFDI. It represents the host country's technology level and is measured by the share of high-technology exports in manufactured exports. [20] The technology-seeking motivation drives China's OFDI to technology-superior economies to access advanced technologies and know-how; this foreign activity coincides with the strategic assets-seeking motivation (Dunning, 1993). Fosfuri and Motta (1999) and Siotis (1999) illustrated theoretical models to indicate that, if a technology laggard invests in a technology leader, positive externalities from technology spillovers will diffuse to the home country's subsidiary in the host country and the parent company in the home country. Kogut and Chang (1991) empirically investigated this motivation and confirmed the technology-seeking motivation in OFDI. If the technological externality is diffused from the host country to the Chinese subsidiary in the host country as well as the parent company in China through

[20] An attempt was also made to use R&D expenditure as a proxy for the technology level, but large missing values significantly reduce the explanatory power of regressions subject to the data availability.

the 'reverse spillovers' (Driffield and Love, 2003), β_2 is expected to be positive, and a positive sign implies that China's OFDI is driven by the technology level of the host country under the technology-seeking motivation.

Real GDP (*lnRGDP*) and the annual growth rate of real GDP (*RGDP_Growth*) represent the economic mass. These are common proxies to control for the market size effect in empirical studies (Yeaple, 2003; Hanson et al., 2001; Buckley et al., 2007). A larger GDP and a fast growth rate imply a bigger market and more opportunities. Therefore, positive coefficients for two control variables should be expected.

The country's income dummies are selected to control for the host country's income level.[21] The World Bank categorises countries into 4 groups: high-income (*HIncome*), upper-middle income (*UMIncome*), lower-middle income and low-income (*LIncome*). Given that China is a lower-middle income country during the recent period of 2003-2009 (World Bank, 2010a), the lower-middle income group has been selected as the base group to avoid the dummy variable trap and in favour of interpretation. Therefore, three income dummies are included as control variables. *HIncome* is 1 if a host country is a high-income country, 0 otherwise. *UMIncome* is 1 if a host country is an upper-middle income country, 0 otherwise. *LIncome* is 1 if a host country is a low- income country, 0 otherwise. As an alternative measurement of real GDP per capita, its effect is indecisive. On the one hand, income may reflect the quality of domestic labour. A high income usually implies a high productivity

[21] Given a potentially strong correlation between the host country's governance and real GDP per capita, real GDP per capita has been replaced with income dummies. The former is a continuous value and the latter is a discrete value.

and has a positive effect on China's OFDI. On the other hand, it also reflects the cost of operating in the host country. High income implies high cost and has a negative effect on China's OFDI. The net effect of income group depends on the interaction between its positive effect as a measurement of labour productivity and its negative effect as a wages cost.

The relationship between exports (*lnExports*) and OFDI has been well documented in the literature. However, this finding is still controversial and the relationship is acknowledged as being either substitution or complementarity. Theoretically, the internalisation theory (Buckley and Casson, 1976) and horizontal FDI (Markusen, 1984) support a substitutional relationship. However, vertical FDI (Helpman, 1984) sustains a complementary relation. Empirically, it has been examined by using both aggregate and disaggregate data at country level (Grubert and Mutti, 1991), industry level (Brainard, 1997), firm level (Head and Ries, 2001) and product level (Blonigen, 2001). Given China's export-oriented economy and the close relation between China's OFDI and exports, a positive coefficient is expected to be obtained in the results.[22]

The effect of trade openness (*lnOpenness*) is also controversial. On the one hand, it reflects the host country's level of openness to attract foreign investment and has a positive effect on China's OFDI. On the other hand, it negatively relates with trade barriers of the host country. If China were to conduct OFDI in a high trade barriers country because of the 'tariff-jumping' motivation, this might have a negative effect on China's OFDI. The net effect

[22] In 2009, the rent and business service industry, the wholesale and retail industry and the transportation industry occupied 36.2%, 10.8% and 3.7% of China's OFDI respectively. Overall, 50.7% of China's OFDI was directed to export- related industries (MOFCOM, 2009).

of trade openness depends on the interaction between its positive effect as a measurement of country openness and its negative effect as a 'tariff-jumping' motivation.

Governance quality is also important in determining China's OFDI. The World Bank uses six indices to individually measure a country's governance, where a higher value indicates better governance. Similarly to Habib and Zurawicki (2002) who chose the level of corruption to represent the governance, one of these six indices, Control of Corruption, has been used in this thesis to represent the host country's governance quality (*Governance*), and a higher value implies a lower degree of corruption.[23] The effect of governance on FDI is controversial. On the one hand, its positive effect is more conclusive in general. Foreign affiliates usually face more uncertainty concerning foreign markets than local ones, so good governance can offset extra costs and make the host country more attractive. Globerman and Shapiro (2002) maintain that the strength of governance infrastructure contributes to a better legal system, which promotes both FDI inflow and outflow. Blonigen (2005) claimed that good governance is important in attracting FDI inflow. A well-constructed, reliable and stabilised environment can ensure returns and reduce risk. On the other hand, a number of studies have emphasised that China is more experienced in dealing with an opaque business environment than its Western

[23] These 6 indices are reported by World Bank (2010b) in *The Worldwide Governance Indicators,* including Control of Corruption, Voice and Accountability, Political Stability No Violence, Government Effectiveness, Regulatory Quality and Rule of Law. There is no synthetical index to measure the overall governance quality, but these 6 indices are highly correlated and any one is representative. For 2003-2009, this thesis uses Control of Corruption to represent governance. Its original value ranges from -2.5 to +2.5, but it has been normalised in this research to a value between 0 and 1. Subject to the data availability for 1991-2003, the Corruption from the International Country Risk Guide (ICRG) *Political Risk Index* has been chosen to represent governance quality. Its original value ranges from 0 to 6, and this has again been normalised to a value between 0 and 1.

rivals (Child and Rodrigues, 2005; Mock et al., 2008). Kolstad and Wiig (2009) illustrated the similarities between China and host countries in the sense that poor governance makes it more likely that China's OFDI will be driven toward them. The net effect of governance depends on the interaction between its positive effect, which provides a good business environment, and its negative effect, which drives China's OFDI to host countries with poor governance.

Inflation (*Inflation*) is also included to control for the effect of the host country's inflation level on China's OFDI, similarly to the approach used by Kolstad and Wiig (2009). Buckley et al. (2007) claim that this is an important control variable in the sense that high inflation would discourage China's OFDI because high economic instability and lower real profit limited China's OFDI, which was driven by the market-seeking motivation. High inflation devalues the local currency and discourages export-oriented OFDI as well. Therefore, a negative sign is expected.

A wide range of time constant variables are also controlled in this chapter. (*lnDist*) measures the geographical distance between China and the host countries. It represents relative costs, OFDI cost increases with distance and a negative coefficient is expected. (*ComLag*) measures the common language and the cultural proximity that prompts China to implement OFDI in countries with a similar culture. The inclusion of a Special Administration Region dummy (*SAR_Dummy*) controls for all the time-invariant effects of Hong Kong and Macao on China's OFDI. The close relationship between the SARs and China is expected to generate a positive coefficient. Continent dummies are

also included to control constant continental effects. Asia has been selected as the base group to avoid the dummy variable trap; therefore (*Africa*), (*Europe*), (*S_America*), (*N_America*) and (*Oceania*) represent Africa, Europe, South America, North America and Oceania respectively.

Year dummy (η_t) is included to control for macro economic effects on all host countries. u_{it} is the error term.

The resource abundance in Equation (1) is measured by the host country's overall natural resource abundance. A distinction is made between oil and metal to examine how the effect of natural resources on China's OFDI varies with oil abundance (*Oil*) and metal abundance (*Metal*) respectively [24]. Therefore, Equation (1) extends to the following forms:

$$\ln \mathrm{COFDIF}_{\mathrm{it}} = \beta_0 + \beta_1 Oil_{it} + \beta_2 Techn \log y_{it} + \delta \overrightarrow{X_{it}} + \gamma \overrightarrow{Z_i} + \eta_t + \varepsilon_{it} \quad (2)$$

$$\ln \mathrm{COFDIF}_{\mathrm{it}} = \beta_0 + \beta_1 Metal_{it} + \beta_2 Techn \log y_{it} + \delta \overrightarrow{X_{it}} + \gamma \overrightarrow{Z_i} + \eta_t + \varepsilon_{it} \quad (3)$$

where

$$X_{\mathrm{it}} = (\ln \mathrm{RGDP}_{\mathrm{it}}, \mathrm{RGDP\_Growth}_{\mathrm{it}}, HIncome_{\mathrm{it}}, UMIncome_{\mathrm{it}}, LIncome_{\mathrm{it}}, \ln Exports_{\mathrm{it}}, \ln Openness_{\mathrm{it}}, Governance_{\mathrm{it}}, Inflation_{\mathrm{it}})$$

$$Z_{\mathrm{i}} = (\ln Dist_i, ComLag_i, SAR\_Dummy_i, Africa_i, Europe_i, S\_America_i, N\_America_i, Oceania_i)$$

[24] For simplicity, metal stands for ores and metals.

Oil represents the oil abundance and is measured by the share of oil production in nominal GDP. *Metal* represents the metal abundance and is measured by the share of metal exports in merchandise exports. The coefficient of interest is β_1 which represents the marginal effect of oil abundance on China's OFDI in Equation (2) and the marginal effect of metal abundance on China's OFDI in Equation (3) respectively. A positive sign of β_1 implies that China's OFDI is driven by an oil-seeking and a metal-seeking motivation respectively.

A natural starting point for estimating these three base models for Equations (1)-(3) is pooled ordinary least square (POLS) with year dummies. Given the censoring of China's OFDI, a Tobit model is introduced to estimate China's OFDI flow at the bilateral country level. The Tobit model has been widely applied to international trade (Carr et al., 2001) and FDI (Razin and Sadka, 2007) studies. It is favourable when the dependent variable is censored at a common low value, which is usually zero in empirical studies. As China's OFDI is subject to a limited scale, notably in the early stage of development, and small host countries are involved in the dataset, the measurement error refers to China's actual OFDI value is too small to be observed. The omission of these missing OFDI values might reduce efficiency and generate a biased result (Razin et al., 2005), while the Tobit model is a sufficient technique to estimate censored data by accounting for the information of missing values. Therefore, the Tobit model has been chosen as the benchmark estimation technique.[25] Given the possibility that unobserved effects are correlated with explanatory variables, POLS leaves all unobserved effects in the residuals and

[25] Nearly 25% and 65% of China's OFDI observations are censored at zero for the period 2003-2009 and 1991-2003 respectively. See section 3.4.1 for details.

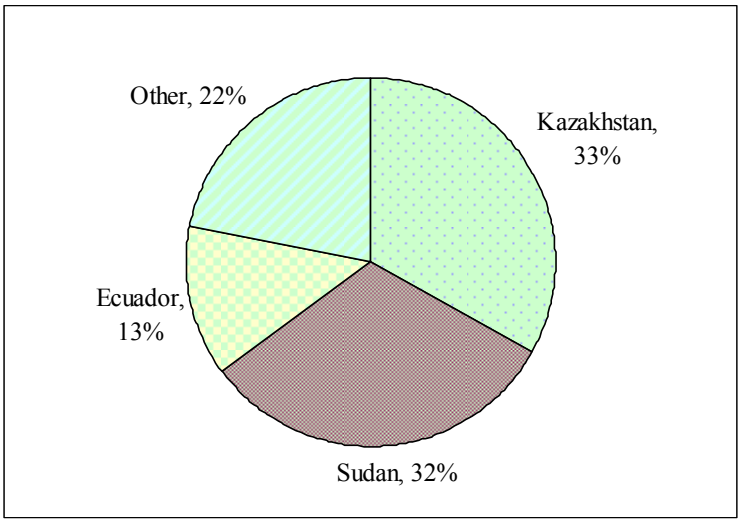
its estimators might be biased and inconsistent. The omission of unobserved heterogeneity is remedied by the fixed effects model (FE), which includes country effects. FE estimations are also reported in order to control for unobserved country heterogeneity.

3.3.2 Resources-Seeking Motivation of China's OFDI: the Role of Governance and Mineral Prices

The Role of Governance in China's Resources-Seeking OFDI

As there are a number of studies that illustrate China's desire to secure a supply of natural resources (Cheng and Ma, 2008; Buckley et al., 2007) and how China is competitive in countries with poor governance (Yeung and Liu, 2008; Morck et al., 2008), there is good reason to believe that these two determinants might jointly affect China's OFDI. An alternative interpretation is that the marginal effect of the host country's resource abundance on China's OFDI is conditional on its governance quality. Figure 3.6 presents shares of host countries in China's overseas oil production in 2006. Kazakhstan and Sudan possessed 33% and 32% of China's foreign oil production respectively, and both of these countries have very poor governance. Chen (2008) illustrated that this high concentration implied that Chinese oil companies invested in host countries shunned by Western oil companies. This risk-taking image reflected the belief that overseas activities were politically and financially backed by the government, and that even a failed deal would be bailed out. In other words, China is less risk averse in a resource abundant country with poor governance.

Figure 3.6: China's Foreign Equity Oil Production, 2006



Sources: Adapted from Downs (2008)

The relationship between a country's resources abundance and governance has been thoroughly discussed in the literature. Mehlum et al. (2006) introduced a rent-seeking model, which illustrated the relationship between resource abundance and governance in the private sector, such as corruption. A country that is rich in resources and high in corruption raises a rent-seeking problem. Robinson et al. (2006) illustrated a patronage model, which presented the patronage problem in a resource abundant country with poor governance. China's competitiveness might be enhanced in a resource abundant country with a corrupt government, because the benefits from operating in a familiar business environment outweigh extra costs. In sharp contrast, Western companies are more averse to investing in poor governance countries. For instance, the U.S Foreign Corrupt Practices Act of 1977 explicitly prohibits bribes in American MNCs' foreign activities. However, China's OFDI might be stimulated by less restrictive regulations (Kolstad and Wiig, 2009). To examine whether China's OFDI is led to resources abundant countries with

poor governance and to facilitate econometric estimations, an interaction has been made between the host country's resource abundance and governance quality in order to investigate their joint effect on China's OFDI, so Equations (1)-(3) expand to:

$$\begin{aligned}\ln\mathrm{COFDIF}_{it} &= \beta_0 + \beta_1 \mathrm{Re}sources_{it} + \beta_2 \mathrm{Re}s_{it} * Gov_{it} + \beta_3 Techn\log y_{it} \\ &\quad + \delta\overrightarrow{X_{it}} + \gamma\overrightarrow{Z_i} + \eta_t + \varepsilon_{it}\end{aligned} \tag{1.1}$$

$$\begin{aligned}\ln\mathrm{COFDIF}_{it} &= \beta_0 + \beta_1 Oil_{it} + \beta_2 Oil_{it} * Gov_{it} + \beta_3 Techn\log y_{it} \\ &\quad + \delta\overrightarrow{X_{it}} + \gamma\overrightarrow{Z_i} + \eta_t + \varepsilon_{it}\end{aligned} \tag{2.1}$$

$$\begin{aligned}\ln\mathrm{COFDIF}_{it} &= \beta_0 + \beta_1 Metal_{it} + \beta_2 Metal_{it} * Gov_{it} + \beta_3 Techn\log y_{it} \\ &\quad + \delta\overrightarrow{X_{it}} + \gamma\overrightarrow{Z_i} + \eta_t + \varepsilon_{it}\end{aligned} \tag{3.1}$$

*Res*Gov*, *Oil*Gov* and *Metal*Gov* in Equation (1.1), (2.1) and (3.1) are interactions between overall resources abundance, oil abundance, metal abundance and governance quality for 2003-2009 and 1991-2003, respectively. The coefficient of interest is β_2 which represents the marginal effect of interaction on China's OFDI. A negative sign implies that China's OFDI is driven to an overall resources abundant, oil abundant or metal abundant country with poor governance.

The Role of Mineral Prices in China's Resources-seeking OFDI

In addition to securing the long-term supply of natural resources, China's OFDI also responds to the variability of mineral prices. The booming mineral prices significantly increase import costs for Chinese local companies and

reduce their profitability, especially as China was the second largest oil importer in 2009. Alternatively, direct access to natural resource production through OFDI largely offsets the negative effects of variable prices. An interaction has been made between oil/metal abundance and the annual growth rate of oil/metal price index respectively to investigate whether China's OFDI is driven by the variability of mineral prices. Equations (2) and (3) extend to the following forms:

$$\begin{aligned}\ln\mathrm{COFDIF}_{it} &= \beta_0 + \beta_1 Oil_{it} + \beta_2 Oil_{it} * Trend_t + \beta_3 Oil_{it} * \mathrm{Pr}ice\_Oil\_Growth_t \\ &+ \beta_4 Techn\log y_{it} + \delta\overrightarrow{X_{it}} + \gamma\overrightarrow{Z_i} + \eta_t + \varepsilon_{it}\end{aligned} \quad (2.2)$$

$$\begin{aligned}\ln\mathrm{COFDIF}_{it} &= \beta_0 + \beta_1 Metal_{it} + \beta_2 Metal_{it} * Trend_t \\ &+ \beta_3 Metal_{it} * \mathrm{Pr}ice\_Metal\_Growth_t + \beta_4 Techn\log y_{it} \\ &+ \delta\overrightarrow{X_{it}} + \gamma\overrightarrow{Z_i} + \eta_t + \varepsilon_{it}\end{aligned} \quad (3.2)$$

$Oil * Trend$ and $Metal * Trend$ are interactions that capture the joint effect of oil/metal abundance and time trend. $Oil * \mathrm{Pr}ice\_Oil\_Growth$ and $Metal * \mathrm{Pr}ice\_Metal\_Growth$ are interactions that capture the joint effect of oil/metal abundance and the growth rate of the price index for oil/metal. The inclusion of $Oil * Trend$ and $Metal * Trend$ is helpful in capturing the trending behaviour of the price index. An additional advantage is that they largely absorb time variant policy effects. The main coefficient of interest is β_3 together with β_2. Equations (2.2) and (3.2) illustrate the marginal effect of time trend and mineral prices on the oil-seeking and metal-seeking motivations respectively. A positive value of β_3 implies that China's OFDI increases with

the growth rate of the mineral price index. For example, China's OFDI expands faster if the growth rate of the oil/metal price index is higher. A positive value of β_2 implies that the oil-seeking and metal-seeking motivation increases with time. In other words, oil abundance and metal abundance play an increasingly important role in China's OFDI.

3.3.3 Dual Effects of Technology on China's OFDI

Having illustrated the technology-seeking motivation of China's OFDI in the base model for the Equation (1), in this section, the technology-exploiting motivation is verified as well. Interaction terms have been made between the host country's technology level (*Technology*) and income dummies (*HIncome, UMIncome, LIncome*). Equation (1) extends to:

$$\begin{aligned}\ln \mathrm{COFDIF}_{it} = {} & \beta_0 + \beta_1 \mathrm{Re}souces_{it} + \beta_2 Techn\log y_{it} + \beta_3 Tech_{it} * HIncome_{it} \\ & + \beta_4 Tech_{it} * UMIncome_{it} + \beta_5 Tech_{it} * LIncome_{it} + \delta\overrightarrow{X_{it}} + \gamma\overrightarrow{Z_i} \\ & + \eta_t + \varepsilon_{it}\end{aligned} \quad (1.2)$$

This illustrates the marginal effect of technology on China's OFDI conditions on the host country's income level. Interactions including *Tech*HIncome, Tech*UMIncome* and *Tech*LIncome* capture the joint effect of the host country's technology level and high-income, upper-middle income and low-income respectively. Note that the omitted base income group is the lower-middle income, which is China's income level, so the income dummies reflect the host countries' income relative to China's income. The main variable of interest is β_5 and if the technology-exploiting mechanism exists, β_5 is expected to be a negative value, which implies that in *low-income host countries*,

China's OFDI is higher if the technology level of the host country is lower. Dunning (1981a) indicated that MNEs occupied certain firm-specific assets to offset disadvantages in competing against local firms. China possesses these ownership advantages and embodies these relatively superior technologies in OFDI. The appropriate technology hypotheses implies that China's technology could be transferred to a technologically inferior country at a lower learning cost due to the similarity in technology. Previously illustrated overseas projects in Vietnam, Nigeria and Zimbabwe were all implemented in low-income countries.

3.4 Data and Summary Statistics

3.4.1 Data

Data Source

China's bilateral country-level OFDI flow data is obtained as the dependent variable for both periods 2003-2009 and 1991-2003.[26] Data are available in MOFCOM's annual publications; 2003-2009 data are obtained from *Statistical Bulletin of China's Outward Foreign Direct Investment*, and 1991-2003 data are obtained from *Almanac of China's Foreign Economic Relations and Trade*. A detailed description of variables and data resources is set out in Table 3.1.

[26] There two reasons for this reverse order. Firstly, data for 2003-2009 use the OECD and IMF statistics consistent standards, but data for 1991-2003 use China's alternative standards, and hence the recent period is more internationally compatible. Secondly, the volume of China's OFDI for 2003-2009 is much larger than the volume for 1991-2003, and this large volume provides more significant information of China's overseas investments.

Table 3.1: Variables Description and Data Sources

Variables	Description	Data Sources
lnCOFDIF	value of China's outward foreign direct investment flow, US$ million, in logarithmic form	MOFCOM (2009), *2009 Statistical Bulletin of China's Outward Foreign Direct Investment* for 2003-2009. MOFCOM (various years), *Almanac of China's Foreign Economic Relations and Trade* for 1991-2003.
Resources	total share of fuels and ores & metals exports in merchandise exports	World Bank, *World Development Indicators*
Technology	share of high-technology exports in manufactured exports	As above
lnRGDP	real GDP at constant 2000 price, US$ million, in logarithmic form	As above
RGDP_Growth	annual growth rate of real GDP	As above
HIncome	binary dummy which is 1 if host country is a high-income country, 0 otherwise	World Bank (2010a), *World Bank Analytical Classifications: GNI per capita in US$*
UMIncome	binary dummy which is 1 if host country is an upper-middle income country, 0 otherwise	As above
LIncome	binary dummy which is 1 if host country is a low-income country, 0 otherwise	As above
lnExports	total value of China's exports of goods and services to a host country in current value, US$ million, in logarithmic form	IMF, *Direction of Trade*
lnOpenness	ratio of total imports and exports divided by GDP, in logarithmic form	Calculated from World Bank, *World Development Indicators*
Governance	control of corruption (2003-2009) and corruption (1991-2003). A higher value indicates a low degree of corruption.	2003-2009 data are obtained from World Bank (2010b) *The Worldwide Governance Indicators (WGI)*. 1991-2003 data are obtained from International Country Risk Guide (ICRG) *Political Risk Index*
Inflation	annual inflation rate	World Bank, *World Development Indicators*
lnDist	distance between China and host countries, in logarithmic form	CEPII

ComLag	binary dummy which is 1 if China and host country share the same language, 0 otherwise	CEPII
SAR_Dummy	binary dummy which is 1 if host region is Hong Kong or Macao, 0 otherwise	
Africa	binary dummy which is 1 if a host country is in Africa, 0 otherwise	
Europe	binary dummy which is 1 if a host country is in Europe, 0 otherwise	
S_America	binary dummy which is 1 if a host country is in South America, 0 otherwise	
N_America	binary dummy which is 1 if a host country is in North America, 0 otherwise	
Oceania	binary dummy which is 1 if a host country is in Oceania, 0 otherwise	
Oil	share of cured oil's production in GDP	Production volume is obtained from Energy Information Administration (2010) *Total Oil Supply*. Price is obtained from UNCTAD (2010c) *Free Market Commodity Price*. Nominal GDP is obtained from World Bank, *World Development Indicators*
Trend	time trend	
Price_Oil_Growth	annual growth rate of oil price index, base year 2000 = 100	Calculated from UNCTAD (2010b), *Free Market Commodity Price Indices*
Metal	share of ores&metals exports in merchandise exports	World Bank, *World Development Indicators*
Price_Metal_Growth	annual growth rate of metal price index, base year 2000 = 100	Calculated from UNCTAD (2010b), *Free Market Commodity Price Indices*

Data Construction and Cleaning

Based on the above sources, a panel dataset of China's OFDI flows to 157 host countries for 2003-2009 and 171 host countries for 1991-2003 was constructed.

The list of host countries is reported in Tables A1 and A2 in Appendix A for these two periods.

The dataset was cleaned and constructed by the following four steps. Firstly, observations with negative OFDI flow value were dropped. China's official statistics do not explain under what circumstances the OFDI value is negative, so the exclusion avoids confusion. Secondly, Chinese OFDI flows to the Cayman Islands and British Virgin Islands were dropped because they are acknowledged as tax havens and suffer from the 'round tripping' FDI problem.[27] Thirdly, missing OFDI values have been replaced with zero, as suggested by Razin and Sadka (2007).[28] Fourthly, the dependent variable ln(COFDIF) is replaced by ln(COFDIF+1). Eichengreen and Irwin (1995) and Yeyati et al. (2003) propose adding 1 to the actual value in favour of interpretation. The rationale for this transformation is ln(COFDIF+1) ≈ ln(COFDIF) for large values of China's OFDI and ln(COFDIF+1) ≈ COFDIF for small values of China's OFDI. The replacement of missing OFDI values results in the censoring of China's OFDI at zero and naturally fits the benchmark Tobit estimations.

Two cleaned datasets were constructed. The first one covers the recent period 2003-2009 with 1032 observations, of which 250 observations (24.22%) are

[27] Hong Kong and Macau, as two Special Administration Regions (SARs), also receive disproportionally large amounts of FDI. They are politically independent from mainland China, but are historically, economically and culturally dependent on mainland China. They have been retained as OFDI destinations in the subsequent analysis subject to this close relation; the inclusion of the SAR dummy (SAR_Dummy) absorbs all time invariant country specific effects which would cause the 'round tripping' problem.

[28] Razin and Sadka (2007) illustrated the rationale for replacing missing FDI values with zero. One was that the setup cost prohibited the home country implementing overseas activities. The other was the measurement error.

censored at zero. The second one covers the early period 1991-2003 with 2214 observations, of which 1406 observations (63.50%) are censored at zero.

Data Issues

Like much data on China, the accuracy of China's OFDI data has been questioned. Firstly, for 1991-2003 data, the approved volume of OFDI may shrink the actual OFDI size by ignoring OFDI activities that took place in other forms. China only records OFDI in equity investment, while earnings re-investments and loans from parent companies are excluded (OECD, 2008). Cheung and Qian (2009) argued that the magnitude of approved OFDI was different from either the contracted or realised data. Secondly, for 1991-2003 and 2003-2009 data, MOFCOM only collected data from local commerce authorities, rather than directly from MNCs, which were required to register foreign investments. However, many MNCs did not report earnings reinvestments (Rosen and Hanemann, 2009) and most private companies did not register their overseas investments either (OECD, 2008). For various reasons, including the substantial underreporting of China's OFDI noted above, OFDI stock data provided by MOFCOM in OECD countries was on average 40% lower than IFDI stock data recorded by individual OECD member countries (OECD, 2008). Finally, there was also an overstatement risk, because MNCs tended to overstate OFDI due to the capital control (Rosen and Hanemann, 2009).

Overall, with these various data constraints, it was not easy to project a large volume of capital out from China due to strict capital controls (Cheung and

Qian, 2009). Therefore, they indicated that the MOFCOM data on China's OFDI were judged suitable to shape China's overseas investments from general economic aspects.

3.4.2 Summary Statistics

Tables 3.2.1 and 3.2.2 give the summary statistics of major variables used in Tobit estimations for 2003-2009 and 1991-2003 respectively. They both include China's OFDI, the host country's overall resources abundance, technology level, real GDP, real GDP growth rate, income groups, China's exports to the host country, the host country's trade openness, governance, inflation, oil abundance, metal abundance and the growth rate of mineral prices.[29]

[29] There are several outliers of explanatory variables in the two periods, notably the values of real GDP growth rate, governance level and oil abundance exceed 1. They are included in the estimations because the corresponding values of China's OFDI are 0 in most cases, and they have been dropped in the robustness check and there is no significant difference. See section 3.6.5 for details.

Table 3.2.1: Summary Statistics for 2003-2009 (7 years, 157 host countries)

Variable	Obs.	Mean	Standard Deviation	Minimum	Maximum
lnCOFDIF	1032	1.695	1.854	0.000	10.562
Resources	759	0.254	0.291	0.000	0.997
Technology	768	0.103	0.130	0.000	0.997
lnRGDP	969	9.883	2.316	4.751	16.261
RGDP_Growth	981	0.047	0.052	-0.413	0.465
HIncome	1032	0.257	0.437	0	1
UMIncome	1032	0.206	0.405	0	1
LIncome	1032	0.278	0.448	0	1
lnExports	1002	6.384	2.390	-1.666	12.440
lnOpenness	933	-0.411	0.591	-2.064	2.777
Governance	1026	0.493	0.205	0.104	1.016
Inflation	914	0.353	8.082	-0.132	244.110
Oil	967	0.116	0.461	0.000	7.239
Price_Oil_Growth	1032	0.169	0.240	-0.363	0.413
Metal	772	0.085	0.150	0.000	0.854
Price_Metal_Growth	1032	0.185	0.264	-0.302	0.603

Notes: Obs. = number of observations. Values are measured in current price in million US dollar (lnCOFDIF, lnExports); in 2000 price in million US dollar (lnRGDP); in percentage (Resources, Technology, RGDP_Growth, Governance, Inflation, Oil, Price_Oil_Growth, Metal, Price_Metal_Growth, lnOpenness); in binary value (HIncome, UMIncome, LIncome).

Table 3.2.2: Summary Statistics for 1991-2003 (13 years, 171 host countries)

Variable	Obs.	Mean	Standard Deviation	Minimum	Maximum
lnCOFDIF	2214	0.413	0.862	0.000	6.132
Resources	1471	0.228	0.287	0.000	0.997
Technology	1416	0.099	0.132	0.000	0.750
lnRGDP	2093	9.354	2.336	4.523	16.143
RGDP_Growth	2111	0.031	0.071	-0.503	1.063
HIncome	2178	0.209	0.407	0	1
UMIncome	2178	0.167	0.373	0	1
LIncome	2178	0.319	0.466	0	1
lnExports	2063	4.111	2.570	-4.017	11.436
lnOpenness	1968	-0.607	0.674	-3.566	3.922
Governance	1604	0.529	0.218	0.000	1.000
Inflation	1796	0.536	6.115	-1.000	237.731
Oil	2051	0.061	0.147	0.000	1.376
Price_Oil_Growth	2214	0.043	0.230	-0.318	0.556
Metal	1518	0.071	0.137	0.000	0.888
Price_Metal_Growth	2214	-0.013	0.127	-0.190	0.212

Notes: Obs. = number of observations. Values are measured in current price in million US dollar (lnCOFDIF, lnExports); in 2000 price in million US dollar (lnRGDP); in percentage (Resources, Technology, RGDP_Growth, Governance, Inflation, Oil, Price_Oil_Growth, Metal, Price_Metal_Growth, lnOpenness); in binary value (HIncome, UMIncome, LIncome).

Tables 3.3.1 and 3.3.2 present the correlation matrix of major variables for the 2003-2009 and 1991-2003 datasets respectively. It is reassuring that the main interested variables, *Resources*, *Technology*, *Oil* and *Metal*, are not highly

correlated with other control variables, which implies the multicollinearity problem is not a major issue in this study.

Table 3.3.1: Pair-Wise Correlation Matrix for 2003-2009 (7 years, 157 host countries)

	lnCOFDIF	Resources	Technology	lnRGDP	RGDP_Growth	HIncome	UMIncome	LIncome	lnExports	lnOpenness	Governance	Oil	Metal
lnCOFDIF	1.000												
Resources	0.163	1.000											
Technology	0.150	-0.213	1.000										
lnRGDP	0.403	0.010	0.317	1.000									
RGDP_Growth	-0.031	0.177	-0.140	-0.069	1.000								
HIncome	0.162	-0.119	0.324	0.519	-0.170	1.000							
UMIncome	-0.046	-0.019	-0.084	0.019	-0.028	-0.300	1.000						
LIncome	0.010	0.049	-0.180	-0.375	0.118	-0.365	-0.317	1.000					
lnExports	0.569	-0.021	0.338	0.869	-0.083	0.454	-0.077	-0.264	1.000				
lnOpenness	-0.003	-0.045	0.162	-0.308	-0.010	0.068	-0.007	-0.080	-0.061	1.000			
Governance	0.078	-0.265	0.313	0.474	-0.226	0.770	0.029	-0.506	0.376	0.084	1.000		
Oil	-0.036	0.358	-0.137	-0.132	0.100	-0.063	-0.019	-0.006	-0.152	0.064	-0.167	1.000	
Metal	0.079	0.376	-0.104	-0.166	0.045	-0.186	-0.048	0.247	-0.149	-0.069	-0.146	-0.103	1.000

Table 3.3.2: Pair-Wise Correlation Matrix for 1991-2003 (13 years, 171 host countries)

	lnCOFDIF	Resources	Technology	lnRGDP	RGDP_Growth	HIncome	UMIncome	LIncome	lnExports	lnOpenness	Governance	Oil	Metal
lnCOFDIF	1.000												
Resources	-0.013	1.000											
Technology	0.150	-0.197	1.000										
lnRGDP	0.304	-0.037	0.319	1.000									
RGDP_Growth	0.022	0.034	0.043	0.001	1.000								
HIncome	0.114	-0.106	0.319	0.503	0.001	1.000							
UMIncome	-0.048	0.014	0.041	0.086	0.002	-0.230	1.000						
LIncome	0.018	0.065	-0.241	-0.379	0.057	-0.352	-0.307	1.000					
lnExports	0.402	-0.092	0.339	0.824	0.033	0.428	-0.005	-0.243	1.000				
lnOpenness	-0.009	0.036	0.291	-0.267	0.129	0.083	0.062	-0.129	-0.040	1.000			
Governance	-0.065	-0.304	0.267	0.390	-0.036	0.552	-0.011	-0.386	0.240	-0.011	1.000		
Oil	-0.032	0.784	-0.114	0.032	0.119	-0.048	0.056	-0.017	-0.008	0.142	-0.244	1.000	
Metal	0.037	0.344	-0.099	-0.175	0.030	-0.146	-0.082	0.200	-0.129	-0.051	-0.104	-0.089	1.000

3.5 Results and Discussions

3.5.1 Baseline Results

This section first estimated the base model for the Equation (1), which uses the overall resources abundance to represent the host country's natural resources abundance, for 2003-2009 and 1991-2003 respectively. The results of pooled OLS are presented in columns (1) and (4) in Table 3.4.1 respectively. As the benchmark specification, estimations of Tobit for 2003-2009 and 1991-2003 are presented in columns (2) and (5) respectively. Estimations of FE are presented in columns (3) and (6) for 2003-2009 and 1991-2003 respectively. Results of these three specifications present a high consistency and hence the main focus is on the benchmark specification, Tobit estimations.

For the period 2003-2009 in column (2), the first main variable of interest, the host country's overall resources abundance, is positive and significant at the 1% level; a 1% rise in the host country's overall resources abundance is associated with an increase in China's OFDI of about 2%. Estimations of pooled OLS and FE in columns (1) and (3) are also positive and significant at 1% level. These findings not only strongly support the natural resources seeking-motivation in order to secure the long-term natural resources supply, but are also consistent with other empirical studies (Buckley et al., 2007; Cheung and Qian, 2009).

Table 3.4.1: Estimations of Pooled OLS, Tobit and FE for Base Model

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Resources	2.382***	2.043***	2.920**	0.144	0.252	-1.536
	(0.322)	(0.223)	(1.416)	(0.399)	(0.208)	(1.118)
Technology	-0.500	-0.389	2.116	-0.761	0.237	0.100
	(0.903)	(0.606)	(1.698)	(0.852)	(0.454)	(1.599)
Time Variant Control Variables						
lnRGDP	-0.204	-0.123	1.478	0.417***	0.248***	-0.401
	(0.141)	(0.0840)	(1.463)	(0.132)	(0.062)	(1.238)
GDP_Growth	-1.895	-1.490	-3.426	-2.195	-2.020	-3.575
	(1.997)	(1.609)	(2.862)	(2.096)	(1.304)	(2.529)
HIncome	-0.454	-0.800***	0.769	-0.972***	-0.774***	2.202*
	(0.400)	(0.274)	(0.939)	(0.354)	(0.184)	(1.327)
UMIncome	0.186	-0.020	-0.150	-0.428	-0.492***	-0.422
	(0.250)	(0.179)	(0.365)	(0.331)	(0.162)	(0.422)
LIncome	0.500*	0.351*	0.141	0.266	0.453***	-0.457
	(0.287)	(0.200)	(0.523)	(0.276)	(0.163)	(0.462)
lnExports	0.788***	0.731***	0.390	-0.048	0.245***	-0.049
	(0.129)	(0.075)	(0.290)	(0.105)	(0.054)	(0.297)
lnOpenness	0.009	-0.029	0.357	0.548**	0.150	-0.131
	(0.253)	(0.159)	(0.477)	(0.248)	(0.135)	(0.556)
Governance	1.925**	2.222***	2.621	-0.557	-0.691*	-0.375
	(0.979)	(0.633)	(2.864)	(0.724)	(0.368)	(1.121)
Inflation	0.137	0.291*	0.009	-0.088	-0.080**	-0.367***
	(0.220)	(0.174)	(1.822)	(0.083)	(0.038)	(0.103)
Time Invariant Control Variables						
lnDist	-1.304***	-1.232***		-0.780***	-0.651***	
	(0.275)	(0.205)		(0.266)	(0.168)	
ComLag	0.685	0.618		0.939*	0.985***	
	(0.616)	(0.480)		(0.479)	(0.298)	
SAR_Dummy	2.123***	2.114***		1.909**	1.631***	
	(0.574)	(0.469)		(0.820)	(0.540)	
Africa	1.783***	1.773***		1.391***	1.294***	
	(0.355)	(0.256)		(0.358)	(0.208)	
Europe	0.139	-0.035		0.158	0.181	
	(0.335)	(0.230)		(0.349)	(0.195)	
S_America	1.797***	1.645***		0.866	1.164***	
	(0.490)	(0.342)		(0.540)	(0.279)	
N_America	2.423***	2.084***		2.013***	2.348***	
	(0.567)	(0.448)		(0.722)	(0.478)	
Oceania	1.986***	1.816***		2.116***	1.961***	
	(0.510)	(0.351)		(0.482)	(0.321)	
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	483	667	483	490	1055	490
Censored Obs.		162			556	
Uncensored Obs.		505			499	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

No evidence was found for the significance of the second main variable of interest, which is the host country's technology level, in column (2) in Table 3.4.1. The implications of its insignificance should be treated with caution. The dual effects of the host country's technology imply not only the technology-seeking motivation but also the technology-exploiting motivation of China's OFDI, and hence the insignificance of technology might reflect the combination of these two motivations. This issue will be discussed further in Section 3.5.4.

In terms of time variant control variables in column (2) in Table 3.4.1, the high-income dummy is negative and significant at the 1% level, while the low-income dummy is positive and significant at the 10% level. This finding is similar to the results of Cheng and Ma (2007) and Cheung and Qian (2009), who found that the host country's real GDP per capita was negative and significant. China's exports to the host country are positive and significant at the 1% level; a 10% rise in China's exports to a host country is associated with an increase in China's OFDI to the same country of 7.3%. Corroborating previous studies show a significant and positive role of exports in China's OFDI (Buckley et al., 2007; Zhang, 2009; Cheung and Qian, 2009), this significant result also coincides with the earlier discussion that China's OFDI is largely distributed in trade-related sectors. Contrary to other findings, which state that China prefers host countries with poor governance, the results suggest that governance is positive and significant at the 1% level, although it is positively insignificant in FE estimations. This finding indicates that China's OFDI is led to host countries with good governance in general. This positive

significance is in line with general empirical studies on the positive effect of governance on FDI (Globerman and Shapiro, 2002; Asiedu, 2006) and is similar to Buckley et al. (2007), who found that China's OFDI was driven to less risky countries.

In terms of time invariant control variables in column (2) in Table 3.4.1, the distance between China and the host country is negative and significant at the 1% level, and a 1% rise in the distance to China is associated with a decrease in China's OFDI of 1.2%. This negative association is consistent with major empirical studies and implies that China's OFDI decreases with distance due to the increasing operational costs. The SAR dummy is positive and significant at the 1% level; China's OFDI flows into Hong Kong and Macao are significantly more than China's OFDI flows into other destinations. Interesting results are revealed from continent dummies by recalling that Asia is the base group. The coefficients of Africa, South America, North America and Oceania are all positive and significant at the 1% level; in contrast, the coefficient of Europe is insignificant.

Tobit estimations for the period 1991-2003 are presented in column (5) in Table 3.4.1, where there are two major changes. One is that the coefficient of the first main variable of interest, the host country's overall natural resource abundance, is insignificant, although it is still positive. Recalling that China's average oil-sufficiency rate for 1991-2003 was more than 80% while the ratio dropped to about 50% for 2003-2009 in Figure 3.3, and the average share of metal imports in merchandise imports was 4.59% for 1991-2003 while it

doubled to 9.81% for 2003-2009 in Figure 3.4, the difference between the estimations for these two periods reflects the increasing importance of the resource-seeking motivation to China's OFDI. The other change is that governance becomes negative and significant at the 10%. This negative significance implies that China's OFDI was led to poor governance countries in the early development stage 1991-2003, but was driven to better governance countries in the recent stage 2003-2009[30].

An estimation was then made as to whether the natural resources-seeking motivation of China's OFDI varies with different types of resources. The second one of three base models for the Equation (2) is first estimated, which presents the effect of oil abundance, for 2003-2009 and 1991-2003, the results are presented in Table 3.4.2. Estimations of pooled OLS, Tobit and FE for the recent period of 2003-2009 are presented in columns (1), (2), and (3) respectively. The host country's oil abundance is positive and significant at the 1% level in all three specifications. These findings strongly support the oil-seeking motivation of China's OFDI. In contrast, no evidence was found for the oil-seeking motivation in the early period of 1991-2003.

[30] The finding of the change in the effect of governance might be affected by the adoption of different data sources for two sample periods. Given WGI (control of corruption) and ICRG (corruption) share a common year 2003, the correlation test between WGI and ICRG presented a high correlation (0.795) in this overlapping year, and therefore, I am confident with this finding.

Table 3.4.2: Effect of Oil Abundance on China's OFDI

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Oil	3.813***	3.773***	8.259***	-1.532	0.206	3.143
	(0.693)	(0.480)	(3.019)	(1.054)	(0.524)	(3.933)
Technology	-0.836	-0.731	2.722*	-1.066	0.152	0.196
	(0.919)	(0.606)	(1.612)	(0.836)	(0.452)	(1.596)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	502	695	502	496	1065	496
Censored Obs.		169			560	
Uncensored Obs.		526			505	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

The third one of three base models for the Equation (3) is also estimated, which presents the effect of metal abundance, for 2003-2009 and 1991-2003; the results are presented in Table 3.4.3. Estimations of pooled OLS, Tobit and FE for the more recent period of 2003-2009 are presented in columns (1), (2), and (3) respectively. The host country's metal abundance is positive and significant at the 10% level or below across three specifications. These findings strongly support the metal-seeking motivation of China's OFDI. Metal abundance is also positive and significant at the 1% level in OLS and Tobit estimation in columns (4) and (5) for 1991-2003 respectively.

Table 3.4.3: Effect of Metal Abundance on China's OFDI

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Metal	3.333***	2.936***	4.559*	2.165***	1.606***	-2.150
	(0.493)	(0.420)	(2.670)	(0.835)	(0.466)	(1.986)
Technology	-1.676*	-1.379**	1.578	-0.922	0.018	-0.016
	(0.864)	(0.587)	(1.706)	(0.816)	(0.437)	(1.610)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	486	674	486	494	1061	494
Censored Obs.		166			558	
Uncensored Obs.		508			503	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Overall, the implications of the above findings for the three base models in Tables 3.4.1-3.4.3 about the effect of natural resources on China's OFDI are threefold. Firstly, for the recent period of 2003-2009, the natural resources-seeking motivation of China's OFDI is strongly supported across alternative econometric specifications, as well as different types of natural resources. This finding results the orientation of government policy. The annual publication *Country and Industry Catalogue of Outward Foreign Direct Investment* has been jointly published by MOFCOM and National Development and Reform Commission (NDRC) since 2004. The catalogue lists the investable industries of each host country, and countries which are rich in natural resources are particularly addressed, especially oil-rich and metal-rich countries. Secondly, the oil-seeking motivation is increasingly important to China's OFDI. It is reflected by the effect of oil abundance on China's OFDI changes from insignificance for the early period of 1991-2003 to positive significance for the recent period of 2003-2009. Finally, the metal-seeking motivation is also increasingly important to China's OFDI in the sense of the increased coefficient in the recent period of 2003-2009.

3.5.2 The Joint Effect of Resources and Governance

The effect of natural resources abundance on China's OFDI for three base models was examined in detail in the last section, now, the joint effect of the host country's overall natural resources abundance and governance quality on China's OFDI is estimated. The results of Tobit are presented in columns (2) and (5) of Table 3.5.1 for 2003-2009 and 1991-2003 respectively. The interaction terms (*Res*Gov*) are negative and significant at the 5% level or

below for both periods. These findings confirm the previous hypotheses and are in line with Kolstad and Wiig (2009), who found that China's OFDI was driven to natural resource abundant countries with poor governance, because China only had an opportunity in countries with the above features as a latecomer. Given the positive and significant role of governance in Table 3.4.1, the findings suggest that China's OFDI is driven to countries with good governance in general and to resource abundant countries with poor governance in particular.

Table 3.5.1 Joint effect of Resources and Governance on China's OFDI

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Resources	4.293***	3.996***	0.652	-0.492	1.093**	-0.951
	(0.849)	(0.554)	(2.839)	(0.775)	(0.461)	(1.571)
Governance	2.992***	3.249***	1.206	-0.899	-0.228	-0.059
	(1.090)	(0.700)	(3.356)	(0.771)	(0.407)	(1.133)
Res*Gov	-4.347**	-4.357***	5.487	1.721	-2.040**	-2.121
	(1.900)	(1.158)	(6.304)	(1.892)	(0.979)	(4.033)
Technology	-0.693	-0.577	2.242	-0.687	0.127	0.131
	(0.901)	(0.582)	(1.693)	(0.854)	(0.451)	(1.597)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	483	667	483	490	1055	490
Censored Obs.		162			556	
Uncensored Obs.		505			499	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Next, an estimation was made as to whether the joint effect of the host country's resource abundance and governance quality on China's OFDI varies with different types of natural resources. An estimation was first made regarding the joint effect of oil and governance on China's OFDI, and the Tobit estimations are presented in columns (2) and (5) in Table 3.5.2 for 2003-2009 and 1991-2003 respectively. Interaction terms (*Oil*Gov*) are negative and

significant at the 1% for both periods. This finding reflects the dominance of Kazakhstan and Sudan in China's overseas oil production in Figure 3.6. In contrast, no evidence was found for significant joint effect of metal and governance on China's OFDI in Table 3.5.3.

Table 3.5.2: Joint Effect of Oil Abundance and Governance on China's OFDI

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Oil	6.836***	7.832***	9.470	1.548	5.285***	3.149
	(1.957)	(1.347)	(7.691)	(2.021)	(1.233)	(4.655)
Governance	1.790*	2.555***	2.269	-0.735	-0.186	-0.181
	(0.994)	(0.643)	(3.130)	(0.791)	(0.371)	(1.121)
Oil*Gov	-7.405*	-9.756***	-3.448	-10.840*	-15.260***	-0.043
	(4.437)	(2.973)	(20.630)	(6.193)	(3.535)	(14.090)
Technology	-0.955	-0.884	2.721*	-1.346	-0.173	0.196
	(0.919)	(0.590)	(1.619)	(0.844)	(0.448)	(1.599)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	502	695	502	496	1065	496
Censored Obs.		169			560	
Uncensored Obs.		526			505	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 3.5.3: Joint Effect of Metal Abundance and Governance on China's OFDI

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Metal	0.538	1.160	1.249	0.715	-0.104	-2.906
	(2.295)	(1.790)	(5.339)	(3.142)	(1.162)	(4.364)
Governance	-1.067	0.215	1.626	-0.932	-1.096***	-0.555
	(1.005)	(0.693)	(3.117)	(0.661)	(0.399)	(1.149)
Metal*Gov	6.981	4.439	8.128	3.178	3.928	1.759
	(5.661)	(4.357)	(10.260)	(6.963)	(2.414)	(9.107)
Technology	-1.511*	-1.297**	1.664	-0.887	0.139	-0.070
	(0.862)	(0.594)	(1.713)	(0.808)	(0.429)	(1.600)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	486	674	486	494	1061	494
Censored Obs.		166			558	
Uncensored Obs.		508			503	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Overall, the results given in Table 3.4.1 and Tables 3.5.1-3.5.3 collectively illustrate that China's OFDI is led to countries with good governance in general; however, China's overseas investments are led to resource abundant countries with poor governance in particular, especially oil rich countries with poor governance.

3.5.3 The Joint Effect of Oil/Metal Abundance and Oil/Metal Price

Further, the sensitivity of China's resources-seeking OFDI to mineral prices was also investigated by the joint effect of resource abundance and the growth rate of the mineral price index. An estimation was firstly made as to the joint effect of oil abundance and the growth rate of the oil price index. The Tobit estimations are presented in column (2) of Table 3.6.1 for 2003-2009. The interaction between oil abundance and time trend ($Oil * Trend$) is positive and significant at the 5% level. This finding reveals that the attractiveness of the host country's oil abundance increases with time. The interaction between oil abundance and the growth rate of the oil price index ($Oil * \mathrm{Pr}ice\_Oil\_Growth$) is also positive and significant at the 5% level and this finding reveals that China's OFDI is stimulated by a fast growth in the oil price index. An estimation was then made concerning the joint effect for 1991-2003 in column (5), and the findings only demonstrate that the interaction between oil abundance and time trend ($Oil * Trend$) is positive and significant at the 10% level.

Table 3.6.1: Joint effect of Oil Abundance and Growth Rate of Oil Price Index

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Oil	1.063	0.603	4.099	-2.859	-1.795	3.871
	(2.250)	(1.320)	(5.847)	(2.477)	(1.378)	(5.632)
Oil*Trend	0.364	0.579**	0.131	0.154	0.233*	0.179
	(0.421)	(0.259)	(0.501)	(0.242)	(0.135)	(0.309)
Oil*Price_Oil_Growth	6.564*	5.185**	4.978	-1.135	-1.261	-3.283
	(3.388)	(2.562)	(3.909)	(2.398)	(1.883)	(2.417)
Technology	-0.875	-0.759	2.792*	-0.983	0.208	0.427
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	502	695	502	496	1065	496
Censored Obs.		169			560	
Uncensored Obs.		526			505	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

An estimation was also made regarding the joint effect of metal abundance and the growth rate of the metal price index. The Tobit results are presented in columns (2) and (5) of Table 3.6.2 for 2003-2009 and 1991-2003 respectively. The findings only show that the interaction between metal abundance and time trend ($Metal * Trend$) is positive and significant at the 5% level for 2003-2009. This finding reveals the increasing importance of the host country's metal abundance to China's OFDI.

Table 3.6.2: Joint effect of Metal Abundance and Growth Rate of Metal Price Index

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Metal	0.232	0.486	0.768	2.198	2.257**	-1.173
	(1.854)	(1.352)	(3.486)	(1.604)	(0.939)	(2.703)
Metal*Trend	0.644*	0.539**	0.478	-0.014	-0.085	-0.223
	(0.342)	(0.254)	(0.296)	(0.230)	(0.116)	(0.287)
Metal*Price_Metal_Growth	2.054	1.308	1.786	-5.814	-2.478	-8.432
	(1.914)	(1.949)	(1.498)	(5.331)	(3.107)	(5.690)
Technology	-1.716**	-1.359**	1.657	-0.969	-0.008	-0.420
	(0.864)	(0.586)	(1.699)	(0.816)	(0.436)	(1.581)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	486	674	486	494	1061	494
Censored Obs.		166			558	
Uncensored Obs.		508			503	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Overall, there is some evidence that oil-seeking motivation and metal-seeking motivations increase with time, and China's OFDI is stimulated by the fast growth of the oil price index for the recent period of 2003-2009 in particular. These findings are consistent with the booming oil price index and surge of China's OFDI for 2003-2009 in Figure 3.5.

3.5.4 The Dual Effects of Technology on China's OFDI

Alongside the effect of the host country's technology level on China's OFDI under the technology-seeking motivation in Table 3.4.1, Table 3.7 shows the results regarding the dual effects of technology on China's OFDI, notably the technology-seeking and technology-exploiting motivations. Tobit estimations are presented in column (2) for 2003-2009.

Table 3.7: Dual Effects of Technology on China's OFDI

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Resources	2.424***	2.084***	3.196**	0.137	0.279	-1.404
	(0.327)	(0.223)	(1.338)	(0.400)	(0.211)	(1.111)
Technology	0.489	0.577	6.133**	-0.516	0.475	1.406
	(1.313)	(0.879)	(2.880)	(0.910)	(0.605)	(1.696)
Tech*HIncome	-0.620	0.013	-3.375	0.773	-0.082	-2.361
	(1.944)	(1.381)	(5.392)	(1.872)	(0.846)	(4.260)
Tech*UMIncome	-3.641*	-1.901	-3.808	-1.906	-0.161	-2.105
	(2.186)	(1.519)	(3.497)	(1.686)	(0.891)	(2.279)
Tech*LIncome	-3.821	-3.623***	-8.609**	-0.880	-2.308	-2.862
	(2.921)	(1.337)	(3.691)	(3.184)	(1.947)	(2.893)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	483	667	483	490	1055	490
Censored Obs.		162			556	
Uncensored Obs.		505			499	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

The interaction between technology level and low-income dummy (*Tech*LIncome*) is negative and significant at the 1% level in column (2) in Table 3.7, and it is negative and significant at the 5% level in the FE estimations in column (3) in Table 3.7. This negative significance in the Tobit estimation implies that, in a low-income country, a 1% decrease in the host country's technology is associated with an increase in China's OFDI of 3.62%. The second main variable of interest, the host country's technology level, is positive and significant at the 5% level in the FE estimations, as shown in column (3). The net coefficient of China's OFDI in FE estimations for a low-income country is -2.746. The value is equivalent to the difference between the coefficient of technology and the coefficient of the interaction term. For example, in a low-income country, the net marginal effect of the host country's technology on China's OFDI is (-8.609+6.133) = -2.746, implying that a 1%

decrease in the host country's technology is associated with an increase in China's OFDI of about 2.7%. Recalling that China is a lower-middle income country and the lower-middle income is selected as the base group, the explanations of the above findings are twofold. Firstly, China's OFDI in a low-income country is driven by the technology-exploiting motivation, which is strongly supported by the negative and significant interaction between technology and the low-income dummy. This technology-exploiting motivation is consistent across two alternative econometric specifications. The appropriate technology hypotheses states that the relatively high similarity of economic development, factor endowments and technology level between China and a low-income technology-lagging country ensures a smaller technology gap and a faster technology spillover. China's technology is appropriate in the sense that it is easier and cheaper to learn, and hence China's OFDI is encouraged. An alternative interpretation is that the relatively smaller technology gap between a technology-leading country among low-income countries and Western countries makes the former prefer to accept Western OFDI rather than China's OFDI, because it is relatively easier and cheaper to utilise Western technology, and hence China's OFDI is discouraged. Secondly, the significance of technology in the FE estimations weakly supports the technology-seeking motivation. For high-income, upper-middle income and lower-middle income countries, increasing the technology level increases China's OFDI. Hence, the dual effects of technology on China's OFDI are weakly supported in FE. In contrast, no evidence was found for the effect of technology for the early period 1991-2003.

3.6 Robustness Check

A range of robustness checks was undertaken in order to examine the sensitivity of the results to various aspects including the selection bias, an alternative censored value of Tobit model, the exclusion of the SARs, the estimation period excluding the 2008 financial crisis, and some outliers of explanatory variables.

3.6.1 Heckman Selection Model

Whereas the Tobit model was a conventional estimation technique when the dependent variable was censored at zero, its reliability was problematic for whether the dependent variable truly censored at zero and whether this plausible censoring was truly triggered by censoring (Sigelman and Zeng, 1999). Compared with a Heckman model, the interpretations of Tobit model face a dilemma. A Tobit estimation relies on observable values which are merely part of the whole sample. It cannot convincingly explain unobservable values by implying estimation results based on observable ones, because these unobservable values are intrinsically excluded from the Tobit estimation. Razin and Sadka (2007) further indicated that Tobit was a special case of a Heckman model when the Selection Equation and Flow Equation were perfectly correlated.

Therefore, the Heckman selection model is applied to overcome the drawbacks of the Tobit model and correct for the biased data caused by the sample selection problem. The two-stage Heckman selection model helps explain China's OFDI from a new dimension, because the interpretation of China's

overseas investments in the context of a Heckman model is naturally twofold. Firstly, whether to implement FDI or not, and secondly, how much to invest.

Heckman (1979) illustrated two reasons for sample selection bias: one was self selection and the other was a sample selection decision that was similar to self selection. Similarly to Damijan et al. (2003), the sample selection bias in the current context referred to the endogenous OFDI decision subject to unobserved effects. Bias arises from the non-random selection, which means China's actual OFDI is only observable if it surpasses a certain threshold that is closely related with unobservable effects, even when the latent OFDI is a small positive value. Therefore, China's OFDI value was not randomly selected and the neglect of zero OFDI values meant the dependent variable was no longer endogenous, and the endogeneity assumption might be violated (Woodridge, 2002). Heckman (1979) explicitly accounted for the selection bias problem by introducing a two-stage procedure: a Selection Equation at the first stage and a Flow Equation at the second stage. First, estimated individual probabilities from a Probit model in the first stage are used to calculate the inverse mills ratio (IMR). IMR accounts for the unobserved effects which affect the decision in the flow equation.[31] Puhani (2000) indicated that an exclusion restriction that only affected the selection equation in the first stage but not the flow equation in the second stage should be added into the selection equation in order to correct the sampling selectivity and obtain credible estimations. Following Razin and Sadka (2007) who used a binary dummy which was 1 if the home country conducted investments in a host country six years ago, 0 otherwise; in

[31] IMR is the ratio of probability density function over the cumulative density function.

this study, *PreviousOFDI_Dummy* was included as the exclusion restriction. This is also a binary dummy: it is 1 if China invested in a host country four years ago, 0 otherwise. Secondly, IMR is added into the second stage as an additional explanatory variable to control for the effects of unobserved factors, which affect the magnitude in the flow equation.

The maximum likelihood estimations of Heckman for the three base models are presented in Tables 3.8.1-3.8.3 for 2003-2009 and 1991-2003 respectively. Overall, results are similar to those reported previously in Tables 3.4.1- 3.4.3.

The base model for the Equation (1) by including the host country's overall natural resources abundance was first examined; results are presented in Table 3.8.1. The flow equation and the selection equation are presented in columns (1) and (2) for 2003-2009 respectively. The Wald test indicates the overall significance of all explanatory variables. The correlation coefficient, ρ, represents that the correlation between the residual in the selection equation and the residual in the flow equation is significantly different from zero at the 5% level, and hence the significant ρ validates the Heckman selection model.

Table 3.8.1: Heckman Estimations of Base Model

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Resources	2.445***	0.802***	0.053	0.111
	(0.303)	(0.272)	(0.395)	(0.183)
Technology	-0.669	0.306	-0.573	0.448
	(0.868)	(0.736)	(0.823)	(0.455)
PreviousOFDI_Dummy		0.569**		0.589***
		(0.275)		(0.112)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	667		1055	
Censored Obs.	162		556	
Uncensored Obs.	505		499	
Log Likelihood	-1239.1		-1495.0	
Wald Chi2	1063.0		151.1	
λ	0.421		0.367	
ρ	0.240		0.210	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=5.971 Prob>$\chi2$=0.015		$\chi2(1)$=1.832 Prob>$\chi2$=0.176	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

The host country's overall resources abundance is positive and significant at the 1% level in both the flow equation in column (1) and the selection equation in column (2) in Table 3.8.1; therefore, the natural resources-seeking motivation is supported. The results show that the host country's overall natural resources abundance not only affects the possibility for China to conduct OFDI but also significantly affects the magnitude of overseas investments. Similarly with the finding in Table 3.4.1 that the effect of the host country's technology level on China's OFDI is insignificant, there is no evidence for the technology-seeking motivation either in the flow equation or in the selection equation. The flow equation and the selection equation are presented in columns (3) and (4) in Table 3.8.1 for 1991-2003 respectively. The Wald test indicates the overall significance of all explanatory variables. The correlation coefficient, ρ, is insignificantly different from zero. Although

the insignificance of ρ implies that the Tobit estimations are more efficient, the two main variables of interest have the same insignificance as in Table 3.4.1.

Next, the second and the third base models for the Equations (2) and (3) by including oil abundance and metal abundance are examined respectively. Maximum likelihood estimations of Heckman model for the effects of oil and metal on China's OFDI are presented in Tables 3.8.2 and 3.8.3 respectively. Similar results are found as results in Tables 3.4.2 and 3.4.3.

Table 3.8.2: Heckman Estimations of Oil's Effect on China's OFDI

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Oil	4.213***	1.880***	-1.309	0.321
	(0.666)	(0.587)	(0.981)	(0.475)
Technology	-0.978	0.233	-0.808	0.441
	(0.871)	(0.726)	(0.816)	(0.450)
PreviousOFDI_Dummy		0.522**		0.579***
		(0.259)		(0.112)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	695		1065	
Censored Obs.	169		560	
Uncensored Obs.	526		505	
Log Likelihood	-1307.4		-1510.9	
Wald Chi2	801.2		149.6	
λ	0.490		0.370	
ρ	0.270		0.213	
Wald test of independence	$\chi2(1)=5.298$		$\chi2(1)=1.792$	
of equation, (ρ=0)	Prob>$\chi2=0.021$		Prob>$\chi2=0.181$	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 3.8.3: Heckman Estimations of Metal's Effect on China's OFDI

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Metal	3.486***	0.949*	2.153***	0.646*
	(0.496)	(0.522)	(0.776)	(0.376)
Technology	-1.884**	0.127	-0.720	0.356
	(0.832)	(0.739)	(0.789)	(0.445)
PreviousOFDI_Dummy		0.522*		0.587***
		(0.267)		(0.113)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	674		1061	
Censored Obs.	166		558	
Uncensored Obs.	508		503	
Log Likelihood	-1265.7		-1500.0	
Wald Chi2	696.0		163.3	
λ	0.392		0.369	
ρ	0.218		0.214	
Wald test of independence	$\chi2(1)=3.251$		$\chi2(1)=2.128$	
of equation, ($\rho=0$)	Prob>$\chi2=0.071$		Prob>$\chi2=0.145$	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

The remaining Heckman estimations are generally compatible with the previous findings as well. The detailed results are reported in Appendix B.

3.6.2 Tobit Censored at an Alternative Value

The benchmark specification, Tobit, was constructed on the assumption that the value of China's OFDI is censored at zero in previous estimations. Similarly to most empirical studies which also conventionally select zero as the low threshold value, the measurement error implies that the actual OFDI value is too small to be observed. To check the sensitivity of Tobit estimations to other censored values, and following Razin and Sadka (2007), the lowest value of China's OFDI was chosen as the lower bound to instead zero. The datasets were re-estimated, which are censored at the lowest value of China's OFDI for 2003-2009 and 1991-2003 respectively, and the results do not alter the sign and

statistical significance of the main variables of interest in the base models and interactions in the augmented models. The magnitudes of the estimated coefficients are also similar. This finding implies that the estimations are very robust to the alternative censored value. Detailed estimations are provided in Appendix C.

3.6.3 Estimations Excluding SARs

The skewness to tax havens and offshore financial centres may affect the actual volume of China's OFDI. The British Virgin Islands and the Cayman Islands have been excluded from the OFDI host countries; however, SARs, including Hong Kong and Macao, have been retained as destinations for OFDI. Data on China's OFDI flow into SARs do not distinguish 'round-tripping' activities. Historically, a large portion of China's OFDI first 'flights' to SARs, and is then invested back to China later to enjoy preferential tax treatments as foreign capital. Recent studies have acknowledged that a large part of China's OFDI faced a round-tripping problem (Wong and Chan, 2003; Xiao, 2004). The SAR dummy has been included in previous estimations to absorb all time invariant effects of SARs on China's OFDI. The SAR dummy was then dropped and Hong Kong and Macao were excluded from China's OFDI destinations to check the sensitivity of estimations to SARs. The datasets for 2003-2009 and 1991-2003 were re-estimated, the results do not alter the sign and statistical significance of the main variables of interest in the base models and interactions in the augmented models. The magnitudes of the estimated coefficients are also similar. This finding implies that the estimations are very robust to SARs. Detailed estimations are provided in Appendix D.

3.6.4 Pre-Crisis China's OFDI

A notable event during the recent period 2003-2009 was the subprime crisis, beginning in 2007 and which continues up to the present day. The subprime crisis, initially triggered by the US real estate market, rapidly spread to the world and substantially changed the global economic landscape. A marked change was the big variability of mineral prices in 2008 and 2009, as shown in Figure 3.3. To examine the effect of the crisis on China's OFDI, the dataset for 2003-2007 was re-estimated by excluding 2008 and 2009. The results do not alter the sign and statistical significance of the main variables of interest in the base models and interactions in the augmented models (the interaction between oil abundance and growth rate of oil price index becomes insignificant but it is still positive). The magnitudes of the estimated coefficients are also similar. Estimations are provided in Appendix E.

3.6.5 Estimations Excluding Outliers

The benefits of the large samples used in this research come at the expense of including some small countries. However, their economic conditions are unstable in the sense that the value of real GDP growth rate, governance quality and oil abundance exceeds 1. These countries have been excluded for the robustness check, although corresponding values of China's OFDI in these countries are 0 in most cases and they have little impact on China's OFDI. The following observations are dropped: Liberia in 1997 because its real GDP growth rate exceeds 1; Finland for 2006-2007 because its governance is bigger than 1; Iraq for 2000-2001 and 2004-2006 because its oil abundance exceeds 1;

and finally East Timor for 2004-2009 because its oil abundance is bigger than unity. The results do not alter the sign and statistical significance of the main variables of interest in the base models and interactions in the augmented models. The magnitudes of the estimated coefficients are also similar.

3.7 Conclusion

This chapter examined the underlying motivations and locational determinants of China's OFDI, with a focus on the role of natural resources and technology. Two datasets were constructed, one encompassing 157 host countries for the recent period of 2003-2009 and the other encompassing 171 host countries for the early period of 1991-2003. This chapter firstly examined the natural resources-seeking motivation and the technology-seeking motivation by investigating whether China's OFDI is driven by the host country's overall resources abundance and technology level respectively. This chapter further examined the role of governance and mineral prices in China's resource-seeking OFDI. In addition to the technology-seeking motivation, the technology-exploiting motivation was also examined. The two main variables of interest, the host country's natural resources and technology, were examined under an augmented gravity model. A Tobit model was adopted as the benchmark model to account for the data censoring. The FE model was also introduced to account for the unobserved country heterogeneity and the Heckman model was further introduced to correct the selection bias.

The findings indicate that the host country's natural resources abundance is a crucial determinant of China's OFDI. There is strong evidence that in 2003-

2009, the host country's overall resources abundance, oil abundance and metal abundance had a positive effect on China's OFDI. In particular, China's OFDI was driven to resources abundant countries with poor governance. This chapter found that oil abundant countries with poor governance are particularly attractive to China's OFDI and the high growth rate of the oil price index stimulates China's oil-seeking motivation. As China's OFDI is driven to oil abundant countries in general, this suggests that China's OFDI is not only driven to secure long-term oil supplies, but also by the oil price variability. There is strong evidence for the technology-exploiting motivation, as the findings demonstrate that China's OFDI is driven to low-income countries with inferior technology. There is weak evidence for the technology-seeking motivation, which implies that China's OFDI is driven to access the host country's high technology.

The present chapter has two implications for understanding China's OFDI. Firstly, natural resources play a crucial role in China's overseas investments, as well as technology. More specific support from the Chinese government would further promote China's overseas investments, for example, a tax reduction on the purchasing of related equipment. Secondly, the implementation of China's OFDI strategy should not be isolated. It offers a good opportunity for China to utilise and diversify its huge foreign exchange reserves, update its industrial structure, promote the growth of small and median size companies, and strengthen its economic presence in the world economy. With respect to future research, an industry breakdown or even firm breakdown data will provide a more detailed examination of China's OFDI. Similarly, the underlying

motivations and the locational determinants of other Chinese investors besides SOEs also requires further investigation.

Appendix A: Host Countries List

Table A1: List of Host Countries for 2003-2009 (7 years, 157 Countries)

1	Afghanistan	44	Egypt
2	Albania	45	Equator Guinea
3	Algeria	46	Eritrea
4	Angola	47	Ethiopia
5	Argentina	48	Fed St. Micronesia
6	Australia	49	Fiji
7	Austria	50	Finland
8	Azerbaijan	51	France
9	Bahamas	52	Gabon
10	Bahrain	53	Gambia
11	Bangladesh	54	Georgia
12	Barbados	55	Germany
13	Belarus	56	Ghana
14	Belgium	57	Greece
15	Belize	58	Grenada
16	Benin	59	Guinea
17	Bermuda	60	Guyana
18	Bolivia	61	Honduras
19	Bosnia and Herzegovina	62	Hong Kong
20	Botswana	63	Hungary
21	Brazil	64	India
22	Brunei	65	Indonesia
23	Bulgaria	66	Iran
24	Burundi	67	Iraq
25	Cambodia	68	Ireland
26	Cameroon	69	Israel
27	Canada	70	Italy
28	Cape Verde	71	Jamaica
29	Chad	72	Japan
30	Chile	73	Jordan
31	Colombia	74	Kazakhstan
32	Congo	75	Kenya
33	Congo DR	76	Korea Rep.
34	Cote d'lvoire	77	Korea, DPR
35	Croatia	78	Kuwait
36	Cuba	79	Kyrgyzstan
37	Cyprus	80	Laos, PDR
38	Czech Republic	81	Latvia
39	Denmark	82	Lebanon
40	Djibouti	83	Lesotho
41	Dominican Republic	84	Liberia
42	East Timor	85	Libyan
43	Ecuador	86	Liechtenstein

87	Luxembourg	133	Sudan
88	Macau	134	Suriname
89	Madagascar	135	Sweden
90	Malawi	136	Switzerland
91	Malaysia	137	Syrian Arab Rep.
92	Mali	138	Taiwan
93	Malta	139	Tajikistan
94	Mauritania	140	Tanzania
95	Mauritius	141	Thailand
96	Mexico	142	Togo
97	Mongolia	143	Tunisia
98	Morocco	144	Turkey
99	Mozambique	145	Turkmenistan
100	Myanmar	146	Uganda
101	Namibia	147	Ukraine
102	Nepal	148	United Arab Emirates
103	Netherlands	149	United Kingdom
104	New Zealand	150	United States
105	Niger	151	Uruguay
106	Nigeria	152	Uzbekistan
107	Norway	153	Venezuela
108	Oman	154	Vietnam
109	Pakistan	155	Yemen
110	Palau	156	Zambia
111	Panama	157	Zimbabwe
112	Papua New Guinea		
113	Paraguay		
114	Peru		
115	Philippines		
116	Poland		
117	Qatar		
118	Romania		
119	RP. Marshall Is		
120	Russia		
121	Rwanda		
122	Saint Vincent & Grenadines		
123	Samoa		
124	Saudi Arabia		
125	Senegal		
126	Seychelles		
127	Sierra Leone		
128	Singapore		
129	Slovakia		
130	South Africa		
131	Spain		
132	Sri Lanka		

Table A2: List of Host Countries for 1991-2003 (13 years, 171 Countries)

1	Afghanistan	46	Dominican Republic
2	Albania	47	East Timor
3	Algeria	48	Ecuador
4	Angola	49	Egypt
5	Antigua and Barbuda	50	El Salvador
6	Argentina	51	Equator Guinea
7	Australia	52	Eritrea
8	Austria	53	Estonia
9	Azerbaijan	54	Ethiopia
10	Bahamas	55	Fed St. Micronesia
11	Bahrain	56	Fiji
12	Bangladesh	57	Finland
13	Barbados	58	France
14	Belarus	59	Gabon
15	Belgium	60	Gambia
16	Belize	61	Georgia
17	Benin	62	Germany
18	Bermuda	63	Ghana
19	Bolivia	64	Greece
20	Bosnia and Herzegovina	65	Grenada
21	Botswana	66	Guinea
22	Brazil	67	Guinea-Bissau
23	Brunei	68	Guyana
24	Bulgaria	69	Honduras
25	Burundi	70	Hong Kong
26	Cambodia	71	Hungary
27	Cameroon	72	India
28	Canada	73	Indonesia
29	Cape Verde	74	Iran
30	Central African Republic	75	Iraq
31	Chad	76	Ireland
32	Chile	77	Israel
33	Colombia	78	Italy
34	Comoros	79	Jamaica
35	Congo	80	Japan
36	Congo DR	81	Jordan
37	Costa Rica	82	Kazakhstan
38	Cote d'lvoire	83	Kenya
39	Croatia	84	Korea Rep.
40	Cuba	85	Korea, DPR
41	Cyprus	86	Kuwait
42	Czech Republic	87	Kyrgyzstan
43	Denmark	88	Laos, PDR
44	Djibouti	89	Latvia
45	Dominica	90	Lebanon

91	Lesotho	137	Seychelles
92	Liberia	138	Sierra Leone
93	Libyan	139	Singapore
94	Liechtenstein	140	Slovakia
95	Lithuania	141	Solomon Islands
96	Luxembourg	142	South Africa
97	Macau	143	Spain
98	Madagascar	144	Sri Lanka
99	Malawi	145	Sudan
100	Malaysia	146	Suriname
101	Mali	147	Sweden
102	Malta	148	Switzerland
103	Mauritania	149	Syrian Arab Rep.
104	Mauritius	150	Taiwan
105	Mexico	151	Tajikistan
106	Mongolia	152	Tanzania
107	Morocco	153	Thailand
108	Mozambique	154	Togo
109	Myanmar	155	Trinidad and Tobago
110	Namibia	156	Tunisia
111	Nepal	157	Turkey
112	Netherlands	158	Turkmenistan
113	New Zealand	159	Uganda
114	Niger	160	Ukraine
115	Nigeria	161	United Arab Emirates
116	Norway	162	United Kingdom
117	Oman	163	United States
118	Pakistan	164	Uruguay
119	Palau	165	Uzbekistan
120	Palestine	166	Vanuatu
121	Panama	167	Venezuela
122	Papua New Guinea	168	Vietnam
123	Paraguay	169	Yemen
124	Peru	170	Zambia
125	Philippines	171	Zimbabwe
126	Poland		
127	Portugal		
128	Qatar		
129	Romania		
130	RP. Marshall Is		
131	Russia		
132	Rwanda		
133	Saint Vincent & Grenadines		
134	Samoa		
135	Saudi Arabia		
136	Senegal		

Appendix B: Heckman Estimations

Table B1.1: Heckman Estimations on Joint Effect of Resources and Governance

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Resources	4.495***	2.391***	0.567	1.264***
	(0.801)	(0.758)	(0.880)	(0.482)
Governance	3.186***	2.317***	-0.275	-0.045
	(1.019)	(0.696)	(0.797)	(0.379)
Res*Gov	-4.683***	-3.269**	-1.341	-2.631***
	(1.781)	(1.393)	(2.426)	(1.020)
Technology	-0.875	0.129	-0.656	0.300
	(0.868)	(0.704)	(0.831)	(0.453)
PreviousOFDI_Dummy		0.543*		0.584***
		(0.278)		(0.113)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	667		1055	
Censored Obs.	162		556	
Uncensored Obs.	505		499	
Log Likelihood	-1232.7		-1491.1	
Wald Chi2	1032.3		148.1	
λ	0.396		0.309	
ρ	0.227		0.178	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=4.742 Prob>$\chi2$=0.029		$\chi2(1)$=1.224 Prob>$\chi2$=0.269	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table B1.2: Heckman Estimations on Joint Effect of Oil and Governance

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Oil	7.566***	5.046***	3.977*	5.304***
	(1.875)	(1.855)	(2.184)	(1.249)
Governance	2.258**	1.910***	-0.431	-0.142
	(0.929)	(0.647)	(0.757)	(0.351)
Oil*Gov	-8.152*	-6.984*	-17.790**	-13.680***
	(4.254)	(3.611)	(7.208)	(3.335)
Technology	-1.116	0.116	-1.213	0.161
	(0.872)	(0.713)	(0.830)	(0.446)
PreviousOFDI_Dummy		0.514**		0.543***
		(0.260)		(0.112)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	695		1065	
Censored Obs.	169		560	
Uncensored Obs.	526		505	
Log Likelihood	-1304.2		-1498.0	
Wald Chi2	810.4		165.0	
λ	0.510		0.404	
ρ	0.281		0.233	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=5.777 Prob>$\chi2$=0.016		$\chi2(1)$=2.649 Prob>$\chi2$=0.104	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table B1.3: Heckman Estimations on Joint Effect of Metal and Governance

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Metal	1.354	4.068	1.243	-0.297
	(2.218)	(2.501)	(1.716)	(1.091)
Governance	-0.758	1.505**	-0.826	-0.864**
	(0.948)	(0.698)	(0.659)	(0.371)
Metal*Gov	5.259	-8.227	2.114	2.181
	(5.415)	(6.411)	(4.148)	(2.247)
Technology	-1.758**	0.031	-0.668	0.432
	(0.834)	(0.727)	(0.787)	(0.442)
PreviousOFDI_Dummy		0.519*		0.581***
		(0.268)		(0.112)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	674		1061	
Censored Obs.	166		558	
Uncensored Obs.	508		503	
Log Likelihood	-1264.6		-1499.2	
Wald Chi2	694.7		167.6	
λ	0.308		0.393	
ρ	0.172		0.227	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=1.868 Prob>$\chi2$=0.172		$\chi2(1)$=2.488 Prob>$\chi2$=0.115	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table B2.1: Heckman Estimations on Joint Effect of Oil and Growth Rate of Oil Price Index

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Oil	1.250	-0.027	-4.047	-1.844
	(2.181)	(1.765)	(2.575)	(1.235)
Oil*Trend	0.436	0.903*	0.298	0.240*
	(0.408)	(0.485)	(0.235)	(0.126)
Oil*Price_Oil_Growth	6.489**	-1.610	-1.110	0.349
	(3.265)	(5.358)	(2.410)	(1.694)
Technology	-1.007	0.224	-0.668	0.508
	(0.871)	(0.727)	(0.816)	(0.455)
PreviousOFDI_Dummy		0.502*		0.592***
		(0.262)		(0.112)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	695		1065	
Censored Obs.	169		560	
Uncensored Obs.	526		505	
Log Likelihood	-1304.3		-1508.1	
Wald Chi2	801.4		150.6	
λ	0.489		0.363	
ρ	0.270		0.209	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=5.993 Prob>$\chi2$=0.014		$\chi2(1)$=1.776 Prob>$\chi2$=0.183	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table B2.2: Heckman Estimations on Joint Effect of Metal and Growth Rate of Metal Price Index

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Metal	0.794	-0.156	2.063	2.251**
	(1.824)	(1.477)	(1.544)	(0.911)
Metal*Trend	0.596*	0.132	0.003	-0.205**
	(0.337)	(0.278)	(0.223)	(0.104)
Metal*Price_Metal_Growth	1.078	2.379	-5.658	0.944
	(2.123)	(2.913)	(5.243)	(2.451)
Technology	-1.911**	0.148	-0.751	0.326
	(0.830)	(0.740)	(0.785)	(0.447)
PreviousOFDI_Dummy		0.531**		0.606***
		(0.266)		(0.113)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	674		1061	
Censored Obs.	166		558	
Uncensored Obs.	508		503	
Log Likelihood	-1263.9		-1497.0	
Wald Chi2	696.2		173.5	
λ	0.390		0.383	
ρ	0.218		0.222	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=3.104 Prob>$\chi2$=0.078		$\chi2(1)$=2.461 Prob>$\chi2$=0.117	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table B3: Heckman Estimations on Dual Effects of Technology

Dependent:	2003-2009		1991-2003	
	Flow	Selection	Flow	Selection
lnCOFDIF	(1)	(2)	(3)	(4)
Resources	2.457***	0.794***	0.057	0.136
	(0.306)	(0.281)	(0.395)	(0.185)
Technology	0.406	5.605**	-0.312	0.726
	(1.263)	(2.364)	(0.914)	(0.752)
Tech*HIncome	-0.796	-4.889*	0.797	-0.369
	(1.872)	(2.730)	(1.731)	(0.990)
Tech*UMIncome	-3.533*	-3.654	-1.769	-0.140
	(2.104)	(2.810)	(1.615)	(1.053)
Tech*LIncome	-3.847	-7.416***	-1.334	-2.008
	(2.825)	(2.579)	(2.980)	(2.043)
PreviousOFDI_Dummy		0.585**		0.579***
		(0.283)		(0.111)
Control Variables	Yes		Yes	
Year Dummy	Yes		Yes	
Number of Obs.	667		1055	
Censored Obs.	162		556	
Uncensored Obs.	505		499	
Log Likelihood	-1232.5		-1493.1	
Wald Chi2	839.0		159.5	
λ	0.232		0.379	
ρ	0.134		0.217	
Wald test of independence of equation, (ρ=0)	$\chi2(1)$=0.962 Prob>$\chi2$=0.327		$\chi2(1)$=2.017 Prob>$\chi2$=0.156	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Appendix C: Alternative Tobit Estimations

Table C1.1: Alternative Tobit Estimations of Base Model

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Resources	2.031***	0.246
	(0.223)	(0.209)
Technology	-0.412	0.235
	(0.610)	(0.454)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	667	1055
Censored Obs.	166	557
Uncensored Obs.	501	498

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C1.2: Alternative Tobit Estimations on Effect of Oil

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Oil	3.776***	0.198
	(0.480)	(0.524)
Technology	-0.753	0.151
	(0.610)	(0.452)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	695	1065
Censored Obs.	173	561
Uncensored Obs.	522	504

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C1.3: Alternative Tobit Estimations on Effect of Metal

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Metal	2.899***	1.591***
	(0.424)	(0.468)
Technology	-1.397**	0.020
	(0.591)	(0.437)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	674	1061
Censored Obs.	170	559
Uncensored Obs.	504	502

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C2.1: Alternative Tobit Estimations on Joint Effect of Resources and Governance

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Resources	3.973***	1.093**
	(0.555)	(0.461)
Governance	3.219***	-0.241
	(0.709)	(0.408)
Res*Gov	-4.331***	-2.057**
	(1.158)	(0.981)
Technology	-0.597	0.124
	(0.586)	(0.452)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	667	1055
Censored Obs.	166	557
Uncensored Obs.	501	498

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C2.2: Alternative Tobit Estimations on Joint Effect of Oil and Governance

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Oil	7.846***	5.261***
	(1.347)	(1.233)
Governance	2.547***	-0.202
	(0.651)	(0.373)
Oil*Gov	-9.780***	-15.210***
	(2.973)	(3.534)
Technology	-0.906	-0.173
	(0.594)	(0.448)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	695	1065
Censored Obs.	173	561
Uncensored Obs.	522	504

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C2.3: Alternative Tobit Estimations on Joint Effect of Metal and Governance

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Metal	1.069	-0.084
	(1.796)	(1.162)
Governance	0.186	-1.100***
	(0.698)	(0.399)
Metal*Gov	4.573	3.849
	(4.359)	(2.417)
Technology	-1.312**	0.138
	(0.597)	(0.430)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	674	1061
Censored Obs.	170	559
Uncensored Obs.	504	502

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C3.1: Alternative Tobit Estimations on Joint Effect of Oil and Growth Rate of Oil Price Index

Dependent: lnCOFDIF	2003-2009 (1)	1991-2003 (2)
Oil	0.600	-1.816
	(1.327)	(1.378)
Oil*Trend	0.582**	0.234*
	(0.260)	(0.135)
Oil*Price_Oil_Growth	5.150**	-1.273
	(2.565)	(1.883)
Technology	-0.781	0.208
	(0.608)	(0.456)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	695	1065
Censored Obs.	173	561
Uncensored Obs.	522	504

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C3.2: Alternative Tobit Estimations on Joint Effect of Metal and Growth Rate of Metal Price Index

Dependent:	2003-2009	1991-2003
lnCOFDIF	(1)	(2)
Metal	0.595	2.289**
	(1.356)	(0.942)
Metal*Trend	0.519**	-0.091
	(0.255)	(0.117)
Metal*Price_Metal_Growth	1.020	-2.369
	(1.983)	(3.119)
Technology	-1.377**	-0.007
	(0.590)	(0.436)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	674	1061
Censored Obs.	170	559
Uncensored Obs.	504	502

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table C4: Alternative Tobit Estimations on Dual Effects of Technology

Dependent:	2003-2009	1991-2003
lnCOFDIF	(1)	(2)
Resources	2.072***	0.272
	(0.224)	(0.212)
Technology	0.533	0.477
	(0.879)	(0.606)
Tech*HIncome	0.050	-0.090
	(1.386)	(0.846)
Tech*UMIncome	-1.811	-0.173
	(1.530)	(0.891)
Tech*LIncome	-3.610***	-2.312
	(1.341)	(1.948)
Control Variables	Yes	Yes
Year Dummy	Yes	Yes
Number of Obs.	667	1055
Censored Obs.	166	557
Uncensored Obs.	501	498

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Appendix D: Estimations Excluding SARs

Table D1.1: Estimations of Base Model by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Resources	2.350***	2.014***	2.861**	0.160	0.255	-1.620
	(0.323)	(0.224)	(1.409)	(0.399)	(0.208)	(1.092)
Technology	-0.488	-0.395	2.101	-0.728	0.265	0.162
	(0.898)	(0.603)	(1.740)	(0.850)	(0.451)	(1.602)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	473	657	473	478	1043	478
Censored Obs.		162			556	
Uncensored Obs.		495			487	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D1.2: Estimations on Effect of Oil by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Oil	3.715***	3.705***	8.059***	-1.502	0.209	3.602
	(0.705)	(0.485)	(3.049)	(1.059)	(0.523)	(3.935)
Technology	-0.809	-0.735	2.673	-1.036	0.179	0.275
	(0.914)	(0.603)	(1.640)	(0.833)	(0.450)	(1.599)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	492	685	492	484	1053	484
Censored Obs.		169			560	
Uncensored Obs.		516			493	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D1.3: Estimations on Effect of Metal by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Metal	3.304***	2.903***	4.563*	2.169***	1.602***	-2.343
	(0.490)	(0.420)	(2.683)	(0.836)	(0.466)	(2.011)
Technology	-1.631*	-1.369**	1.546	-0.898	0.045	0.037
	(0.858)	(0.585)	(1.743)	(0.813)	(0.434)	(1.613)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	476	664	476	482	1049	482
Censored Obs.		166			558	
Uncensored Obs.		498			491	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D2.1: Estimations on Joint Effect of Resources and Governance by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Resources	4.273***	3.988***	-0.240	-0.440	1.104**	-0.933
	(0.849)	(0.554)	(2.903)	(0.780)	(0.462)	(1.549)
Governance	2.867***	3.155***	-0.645	-0.907	-0.267	-0.114
	(1.104)	(0.704)	(3.871)	(0.789)	(0.411)	(1.199)
Res*Gov	-4.382**	-4.407***	7.483	1.619	-2.057**	-2.487
	(1.900)	(1.158)	(6.552)	(1.902)	(0.980)	(4.056)
Technology	-0.680	-0.584	2.300	-0.658	0.155	0.201
	(0.895)	(0.579)	(1.731)	(0.851)	(0.449)	(1.600)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	473	657	473	478	1043	478
Censored Obs.		162			556	
Uncensored Obs.		495			487	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D2.2: Estimations on Joint Effect of Oil and Governance by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Oil	6.827***	7.806***	8.446	1.596	5.285***	3.694
	(1.972)	(1.363)	(7.864)	(2.014)	(1.227)	(4.648)
Governance	1.626	2.446***	1.182	-0.753	-0.226	-0.273
	(1.010)	(0.648)	(3.588)	(0.808)	(0.374)	(1.181)
Oil*Gov	-7.633*	-9.862***	-1.101	-10.880*	-15.230***	-0.657
	(4.471)	(2.999)	(21.19)	(6.079)	(3.500)	(13.86)
Technology	-0.930	-0.890	2.674	-1.317	-0.145	0.276
	(0.912)	(0.587)	(1.643)	(0.838)	(0.445)	(1.601)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	492	685	492	484	1053	484
Censored Obs.		169			560	
Uncensored Obs.		516			493	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D2.3: Estimations on Joint Effect of Metal and Governance by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Metal	0.611	1.379	0.097	0.882	-0.114	-2.907
	(2.300)	(1.804)	(5.468)	(3.143)	(1.156)	(4.386)
Governance	-1.194	0.152	0.138	-0.947	-1.151***	-0.674
	(1.023)	(0.698)	(3.544)	(0.673)	(0.402)	(1.217)
Metal*Gov	6.729	3.811	10.990	2.821	3.944	1.308
	(5.690)	(4.407)	(10.760)	(6.969)	(2.405)	(9.142)
Technology	-1.470*	-1.298**	1.706	-0.867	0.167	-0.004
	(0.857)	(0.591)	(1.757)	(0.805)	(0.427)	(1.604)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	476	664	476	482	1049	482
Censored Obs.		166			558	
Uncensored Obs.		498			491	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D3.1: Estimations on Joint Effect of Oil and Growth Rate of Oil Price Index by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Oil	0.864	0.448	3.845	-3.296	-1.970	3.551
	(2.270)	(1.336)	(5.884)	(2.410)	(1.370)	(5.533)
Oil*Trend	0.378	0.596**	0.078	0.204	0.252*	0.246
	(0.423)	(0.262)	(0.511)	(0.236)	(0.134)	(0.301)
Oil*Price_Oil_Growth	6.755*	5.289**	5.365	-1.237	-1.299	-3.373
	(3.443)	(2.621)	(3.981)	(2.412)	(1.878)	(2.415)
Technology	-0.849	-0.766	2.780*	-0.924	0.241	0.616
	(0.916)	(0.600)	(1.638)	(0.834)	(0.454)	(1.595)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	492	685	492	484	1053	484
Censored Obs.		169			560	
Uncensored Obs.		516			493	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D3.2: Estimations on Joint Effect of Metal and Growth Rate of Metal Price Index by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Metal	0.193	0.451	0.702	2.044	2.159**	-1.465
	(1.858)	(1.348)	(3.481)	(1.607)	(0.940)	(2.710)
Metal*Trend	0.645*	0.538**	0.488	0.005	-0.074	-0.202
	(0.342)	(0.253)	(0.296)	(0.230)	(0.116)	(0.288)
Metal*Price_Metal_Growth	2.073	1.340	1.724	-6.076	-2.553	-8.796
	(1.913)	(1.943)	(1.498)	(5.356)	(3.120)	(5.705)
Technology	-1.673*	-1.350**	1.621	-0.941	0.022	-0.353
	(0.858)	(0.584)	(1.735)	(0.813)	(0.433)	(1.580)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	476	664	476	482	1049	482
Censored Obs.		166			558	
Uncensored Obs.		498			491	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table D4: Estimations on Dual Effects of Technology by Excluding SARs

Dependent:	2003-2009			1991-2003		
	OLS	Tobit	FE	OLS	Tobit	FE
lnCOFDIF	(1)	(2)	(3)	(4)	(5)	(6)
Resources	2.396***	2.057***	3.153**	0.151	0.281	-1.475
	(0.327)	(0.224)	(1.332)	(0.400)	(0.211)	(1.091)
Technology	0.574	0.650	6.030**	-0.495	0.484	1.478
	(1.320)	(0.883)	(2.882)	(0.903)	(0.602)	(1.679)
Tech*HIncome	-0.863	-0.236	-3.296	0.881	-0.011	-1.516
	(1.974)	(1.401)	(5.824)	(1.875)	(0.843)	(4.215)
Tech*UMIncome	-3.720*	-1.966	-3.578	-1.894	-0.138	-2.356
	(2.189)	(1.525)	(3.532)	(1.683)	(0.882)	(2.301)
Tech*LIncome	-3.879	-3.672***	-8.584**	-0.908	-2.311	-2.850
	(2.857)	(1.330)	(3.667)	(3.161)	(1.937)	(2.900)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	473	657	473	478	1043	478
Censored Obs.		162			556	
Uncensored Obs.		495			487	

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Appendix E: Estimations for Pre-Crisis China's OFDI

Table E1.1: Estimations of Base Model for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Resources	2.066***
	(0.239)
Technology	0.175
	(0.646)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	533
Censored Obs.	141
Uncensored Obs.	392

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E1.2: Estimations on Effect of Oil for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Oil	3.914***
	(0.505)
Technology	-0.243
	(0.648)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	540
Censored Obs.	145
Uncensored Obs.	395

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E1.3: Estimations on Effect of Metal for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Metal	2.743***
	(0.476)
Technology	-0.910
	(0.646)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	540
Censored Obs.	145
Uncensored Obs.	395

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E2.1: Estimations on Joint Effect of Resources and Governance for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Resources	4.267***
	(0.564)
Governance	2.977***
	(0.770)
Res*Gov	-4.934***
	(1.145)
Technology	-0.168
	(0.623)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	533
Censored Obs.	141
Uncensored Obs.	392

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E2.2: Estimations on Joint Effect of Oil and Governance for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Oil	7.614***
	(1.386)
Governance	2.169***
	(0.745)
Oil*Gov	-8.757***
	(2.982)
Technology	-0.437
	(0.638)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	540
Censored Obs.	145
Uncensored Obs.	395

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E2.3: Estimations on Joint Effect of Metal and Governance for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Metal	2.984
	(2.088)
Governance	-0.144
	(0.799)
Metal*Gov	-0.609
	(5.022)
Technology	-0.924
	(0.652)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	540
Censored Obs.	145
Uncensored Obs.	395

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E3.1: Estimations on Joint Effect of Oil and Growth Rate of Oil Price Index for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Oil	0.131
	(1.497)
Oil*Trend	0.941***
	(0.304)
Oil*Price_Oil_Growth	3.467
	(3.864)
Technology	-0.267
	(0.645)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	540
Censored Obs.	145
Uncensored Obs.	395

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E3.2: Estimations on Joint Effect of Metal and Growth Rate of Metal Price Index for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Metal	0.061
	(1.392)
Metal*Trend	0.745**
	(0.324)
Metal*Price_Metal_Growth	0.667
	(2.542)
Technology	-0.887
	(0.643)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	540
Censored Obs.	145
Uncensored Obs.	395

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table E4: Estimations on Dual Effects of Technology for Pre-Crisis China's OFDI

Dependent: lnCOFDIF	2003-2007 (1)
Resources	2.107***
	(0.237)
Technology	0.633
	(1.038)
Tech*HIncome	0.512
	(1.397)
Tech*UMIncome	-1.017
	(1.556)
Tech*LIncome	-3.239*
	(1.804)
Control Variables	Yes
Year Dummy	Yes
Number of Obs.	533
Censored Obs.	141
Uncensored Obs.	392

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

CHAPTER 4

THE DYNAMIC ADJUSTMENT OF CHINA'S OUTWARD FDI AND ITS RELATION TO INWARD FDI

4.1 Introduction

The previous chapter examined the underlying motivations and locational determinants of China's outward FDI (OFDI). As do the majority of existing empirical studies on China's OFDI, the previous chapter focused on the effects of host country characteristics in a static framework.[32] This present chapter alternatively focus on the dynamic adjustment of China's OFDI in a dynamic framework.

In a related study, Cheng and Kwan (2000) focused on the determinants of China's inward FDI (IFDI) stock, and used a partial stock adjustment model to examine the dynamic adjustment of IFDI across Chinese provinces. Cheng and Kwan (2000) and Campos and Kinoshita (2003) argued that the existing IFDI stock had 'positive feedback' on future investment and triggered the adjustment towards the equilibrium stock; in other words, the partial stock adjustment model was in line with self-perpetuating growth or natural growth. It could be reflected by the lagged IFDI stock as the lagged dependent variable. Thus, the partial stock adjustment model naturally fitted a dynamic framework, just like a standard partial adjustment model. The partial stock adjustment model addressed several issues that could not be explained in a static

[32] Two exceptions are Zhang (2009), who used a dynamic model to examine the flow of China's OFDI, and Cheung and Qian (2009), who examined the agglomeration effect of China's OFDI stock.

framework. For example, this model exclusively integrated with an adjustment process, implying that the IFDI stock adjusted gradually towards its equilibrium stock because of the convex adjustment cost. Although the adjustment cost and the self-reinforcing effect affected the actual investment, they did not alter the equilibrium stock.

Similar to the above-mentioned dynamic adjustment of IFDI, OFDI could also be considered as a gradual adjustment process (Wagner and Timmins, 2009) and examined under a dynamic framework (Barrell and Pain, 1999). Head and Ries (1996) argued that a static model was helpful in revealing the underlying incentives for FDI, and a dynamic model further contributed to the agglomeration effect, which has long been discussed in theories and empirical studies. The agglomeration effect was first studied by Marshall (1890) and further developed by Porter (1990) and Krugman (1991a). This self-reinforcement effect promoted future OFDI to be undertaken in the same destination where it had been invested in heavily (Wheeler and Mody, 1992; Disdier and Mayer, 2004; Head and Mayer, 2004).

In addition to being an increasingly significant FDI source country, the important role of China in attracting FDI has been acknowledged ever since the 'Open Door' policy was launched in 1979. UNCTAD (2007) indicated that China has been the largest inward FDI (IFDI) recipient among the developing countries since the mid-1990s, and that China was in the top three recipients in the world in 2005. China's experience provides a unique opportunity to study the relationship between IFDI and OFDI, especially as both have expanded

rapidly to read significant volumes in a very short period. Interestingly, this relationship is largely underexplored in the existing literature, possibly because China's economic relations to foreign countries were not close in the early stage of economic reform. Bell et al. (1993) argued that China was a relatively closed economy before and during the early stage of economic reform. As international cooperation is a potential mechanism to assist economic development and connect with foreign markets, the prohibition of foreign business results in a very low level of openness. However, China's continuous economic reforms have inevitably changed the landscape of China's foreign economic relations, and its accession to the WTO symbolises China's efforts to be deeply integrated within the world economy. The implications of China's increased foreign economic relations in the context of FDI are twofold. Firstly, the 'Open Door' policy liberalised the Chinese market and foreign companies are now encouraged to invest in China, which has resulted in the rapid growth of IFDI.[33] IFDI is considered as a package of capital, know-how and information about foreign consumer preferences, foreign culture and foreign business environments; therefore, it is an important mechanism for China in linking to the outside world. Secondly, the launch of the 'Go Global' policy reflects China's deeper integration within the global economy. The effect of the huge amount of accumulated IFDI might be reflected as the externality that potentially impacts on China's OFDI. For example, it is plausible that the accumulated knowledge learned from IFDI allows China to understand foreign markets better and eventually promotes its overseas investments in the later stage.

[33] It is beyond the scope of this thesis to discuss the spillover effect of inward FDI on the host country. Görg and Greenaway (2003) have provided a good survey.

Compared with the majority of the existing literature, which examines the effects of the host country's characteristics on China's OFDI, there are few systematic studies on the dynamic adjustment of Chinese OFDI. The present work fills this research gap by examining this issue under the partial stock adjustment model outlined by Cheng and Kwan (2000). Furthermore, the relationship between China's IFDI and its OFDI has also been largely ignored in the literature, and the present chapter also examines this issue. Therefore, this chapter constructs a dynamic framework and uses a panel dataset including China's OFDI stock in 172 host countries for the recent period of 2003–2009. The main contributions of this chapter are twofold. Firstly, China's previous OFDI stock is added as the first main interested variable; this is also the lagged dependent variable to capture the dynamic adjustment of China's OFDI and the agglomeration effect. Its significance supports the dynamic adjustment of China's OFDI; more importantly, it implies that the actual OFDI stock gradually adjusts towards the equilibrium OFDI stock due to the possible existence of the convex adjustment cost. Secondly, China's previous IFDI stock is added as the second main interested variable to capture the correlation between IFDI and OFDI. Its significance might reflect the externality derived from the previous IFDI stock. The involvement of the lagged dependent variable, China's previous OFDI stock, triggers an endogeneity problem and naturally fits into a dynamic estimation; therefore, a system generalised method of moments (system GMM) technique is introduced under an FDI gravity specification.

The main findings can be summarised as follows. Firstly, there is strong evidence for the dynamic adjustment of China's OFDI and the agglomeration effect, which are consistent across alternative econometric specifications. Secondly, the estimation of the partial stock adjustment model is used to restore the unobservable equilibrium OFDI stock, and the results indicate that the equilibrium OFDI stock is bigger than the actual OFDI stock, suggesting the existence of underinvestment in China's OFDI. The equilibrium OFDI stock is more volatile than the actual OFDI stock, because the former is more easily affected by an exogenous change in the absence of the possible effect of the convex adjustment cost and the self-reinforcing effect. Thirdly, this chapter examines the potential of the host country to absorb China's future investments. The findings reveal that the dispersion of the difference between China's actual OFDI stock and equilibrium OFDI stock among the host countries is shrinking over time. This implies, on average, that the host country exploits its potential to absorb China's future investments and that the existing OFDI stock does adjust towards its equilibrium OFDI stock. Fourthly, this study reveals that there is some evidence for the positive association between China's IFDI and its OFDI. One possible explanation for this is that the IFDI stock generates a positive externality, possibly in the form of information spillovers. Chinese companies may learn from foreign investors about the foreign market, leading it to promote overseas investments. Finally, the chapter examines whether the dynamic adjustment of China's OFDI and its relation to China's IFDI vary across the host country's technology level, natural resources abundance and income level. The dynamic adjustment and the agglomeration effect are stronger in high-technology countries than in low-technology countries,

implying that the adjustment cost might be higher in former. In contrast, they do not vary with the host country's natural resources abundance and income level. This chapter sets out some evidence for the positive association between IFDI and OFDI for high-income countries, but not for low-income countries, possibly because China understands consumer preferences better through high-income countries' investments in China and conducts more subsequent overseas investments.

The rest of this chapter is organised as follows. The second section provides a brief review of studies on the partial stock adjustment model, the agglomeration effect and the relation between China's IFDI and its OFDI. The third section specifies the partial stock adjustment model and benchmark specifications. The fourth section describes the empirical data. The fifth section presents the regression results and discussions. The sixth section provides a range of robustness checks. The final section concludes this chapter.

4.2 Previous Research

To the best of the current author's knowledge, there are few systematic studies on the dynamic adjustment of China's OFDI. This chapter sheds some important light on this subject by first introducing the partial stock adjustment model outlined by Cheng and Kwan (2000). This section reviews the partial stock adjustment model and the agglomeration effect on FDI. In addition, the relationship between China's IFDI and its OFDI is also reviewed.

4.2.1 The Dynamic Adjustment of IFDI

In a related study, Cheng and Kwan (2000) investigated the determinants of China's IFDI stock by applying a partial stock adjustment model in a dynamic framework. They used 29 Chinese provincial IFDI stock data from 1985 to 1995, with a focus on the agglomeration effect, the dynamic adjustment and the equilibrium stock. They argued that the existing investments had 'positive feedback' on future investments and the actual investments adjusted gradually towards the equilibrium stock, even without the influence of an exogenous change or other determinants of IFDI. In other words, the agglomeration effect led to natural growth. A distinctive characteristic of the partial stock adjustment model was the dynamic adjustment process, suggesting that the difference between IFDI contemporaneous and IFDI previous stock was a share of the difference between equilibrium and previous stock, and the 'positive feedback' triggered the actual stock to adjust towards the equilibrium stock. As the agglomeration effect could be reflected by the lagged IFDI stock, which was the lagged dependent variable, the partial stock adjustment model naturally incorporated a dynamic framework. Cheng and Kwan (2010) selected the GMM technique to correct for the endogeneity problem, and they found evidence for the agglomeration effect and the dynamic adjustment.

This partial stock adjustment model answered a series question that could not be examined under a static framework. Firstly, it addressed the dynamic adjustment process, suggesting that the actual stock takes time to adjust towards the equilibrium stock. The convex adjustment cost induced a gradual adjustment rather than an instantaneous one. Secondly, it restored the

unobservable equilibrium stock, which was altered by the change in its detriments. Given an exogenous change, the equilibrium stock was more volatile than the actual stock because the former did not account for the adjustment cost or the self-reinforcing effect, while the latter explicitly accounted for them. Finally, the diminishing difference between the actual and the equilibrium stock implied that the actual stock adjusted towards its equilibrium stock, and on average, an individual province exploited its potential in attracting more investments.

The partial stock adjustment model was later applied by Campos and Kinoshita (2003), who examined the IFDI stock in 25 transition economies from 1990 to 1998. They also used the GMM technique and found evidence for the adjustment process.

4.2.2 The Agglomeration Effect on FDI

In addition to the effects of the host country's characteristics on OFDI as illustrated in the conventional empirical studies, the home country's self-reinforcement effect, notably the agglomeration effect, is also addressed heavily.[34] It is an increasing function of the home country's previous investments in the same host country; in other words, home countries tend to continuously invest in the same host countries where they have already undertaken investments. Head et al. (1995) and Barrell and Pain (1999) emphasised the importance of investigating the self-reinforcement effect. An

[34] There are three major reasons for the agglomeration including local knowledge spillovers, local specialised labour and the local linkage between suppliers and demanders (Krugman, 1991b). For early empirical studies see Wheeler and Mody (1992) and Barrell and Pain (1999). For recent empirical studies see Disdier and Mayer (2004) and Head and Mayer (2004).

accidental event and a government policy in the host country could substantially change the FDI inflow in the long term, because future investments are closely related to the previous investment.[35] In other words, the location decision of the home country's investments in the host country did not mimic the pattern of local investments or other countries' investments; alternatively, it closely followed their previous investments in the same host country.[36]

4.2.3 China's IFDI and its Relation with OFDI

Similar to the growing importance of China's OFDI, IFDI has played a crucial role in China's economic development since the reforms of 1979. Naughton (2007) has illustrated in detail the significance of IFDI to the Chinese economy. Nearly 200 home countries had invested in China by the end of 2005, and foreign-owned companies had created more than 24 millions jobs in China. Tseng and Zebregs (2002) argued that IFDI had contributed to China's productivity and increased its annual growth rate by around 3%. Fung et al. (2004) have pointed out that with the surge in IFDI accompanied by continuous changes in policy, the government has gradually liberalised its IFDI policy to attract more investments. UNCTAD (2006) has further indicated that China recently intended to upgrade its industry structure and direct IFDI to more capital intensive and high-technology industries.

[35] A discussion of the relationship between inward FDI and growth is beyond the scope of this thesis. De Mello (1997, 1999) has discussed it and provided further evidence.
[36] Caves (1996) argued that foreign owned companies faced having less information about the host market and higher search costs than local companies. Crozet et al (2004) indicated that different home countries had various sensitivities to the locational factors of the same host country.

There are a large number of empirical studies on the motivations and locational determinants of China's IFDI. For example, the market-seeking motivation and low labour cost (Cheng and Kwan, 2000), the improvement of the infrastructure (Coughlin and Segev, 2000), a high degree of openness (Berthélemy and Démurger, 2000) and the accession of external capital (Havrylchyk and Poncet, 2007) have all been cited as relevant factors.

Given a large number of studies on China's IFDI and increasing studies on China's OFDI, interestingly, the relationship between China's IFDI and its OFDI is largely unexplored. Some studies have empirically investigated this relationship using the investment development path (IDP) framework (Liu et al., 2005; Katherin and Cornelia, 2007); they found that the increasingly large IFDI flow to China has enhanced China's Ownership-advantage, which eventually played a role in promoting China's OFDI. Other studies have descriptively examined the relationship between Chinese IFDI and its OFDI (Sauvant, 2011; Sauvant et al., 2011).

4.3 Methodology

4.3.1 A Partial Stock Adjustment Model

To examine the dynamic adjustment and equilibrium stock of China's OFDI, this chapter follows Cheng and Kwan (2000) and Campos and Kinoshita (2003), who used a partial stock adjustment model to investigate the investment path towards an equilibrium stock.[37] Similar to a standard partial adjustment model, the partial stock adjustment model encompasses two

[37] Cheng and Kwan (2000) studied the stock of China's inward FDI, and Campos and Kinoshita (2003) studied the stock of inward FDI in transition economies.

components: one is a dynamic model that accounts for the partial adjustment process and the other is a static model that accounts for the determinants of the equilibrium stock.

The first component of the partial stock adjustment model, the dynamic model, is illustrated in Equation (1) as:

$$\ln COFDIS_{it} - \ln COFDIS_{i,t-1} = \alpha(\ln COFDIS_{it}^{*} - \ln COFDIS_{i,t-1}) \quad (1)$$

$\ln COFDIS_{it}$, $\ln COFDIS_{i,t-1}$ and $\ln COFDIS_{it}^{*}$ are China's contemporaneous, previous and equilibrium (steady-state) OFDI stock in a host country *i* at time *t*, *t-1* and *t*, respectively. Equation (1) presents an adjustment process, suggesting that the difference between China's contemporaneous and its previous OFDI stock is a share of the difference between its equilibrium and its previous stock. α is the adjustment speed and falls between 0 when there is no adjustment and 1 when there is a full adjustment. A bigger value of α reflects a higher adjustment speed and might imply a lower adjustment cost, and vice versa. China's overseas investment adjusts gradually rather than instantaneously because the investment inertia takes time to adjust towards the equilibrium stock. The installation of new investment might be slowed down by a convex adjustment cost whose marginal cost increases with the capital stock. Equation (1) has been rewritten as:

$$\ln COFDIS_{it} = (1-\alpha)\ln COFDIS_{i,t-1} + \alpha \ln COFDIS_{it}^{*} \quad (2)$$

China's actual OFDI stock ($\ln COFDIS_{it}$) is represented as a weighted value of its previous stock ($\ln COFDIS_{i,t-1}$) and equilibrium stock ($\ln COFDIS_{it}^{*}$). Campos and Kinoshita (2003) indicated that a positive and less than unity α implied stability. Cheng and Kwan (2000) indicated that the actual FDI stock depended on its previous stock.

The second component of the partial stock adjustment model, the static model, in Equation (3) shows that the equilibrium stock is determined by a range of explanatory variables.

$$\ln COFDIS_{it}^{*} = \gamma_0 + \gamma \overrightarrow{X_{it}} + \varepsilon_{it} \tag{3}$$

X_{it} is a vector of explanatory variables which are the same as were illustrated in Chapter 3 and ε_{it} is the error term. Equation (3) implies that China's equilibrium OFDI stock solely depends on the change in its determinants, and the equilibrium stock is not affected by the adjustment cost. Integrating Equation (2) into Equation (3), a partial stock adjustment model is rewritten in Equation (4).

$$\ln COFDIS_{it} = \alpha\gamma_0 + (1-\alpha)\ln COFDIS_{i,t-1} + \alpha\gamma \overrightarrow{X_{it}} + \alpha\varepsilon_{it} \tag{4}$$

which can be rewritten as:

$$\ln COFDIS_{it} = (1-\alpha)\ln COFDIS_{i,t-1} + \lambda \overrightarrow{X_{it}} + \eta_t + \eta_i + u_{it} \tag{5}$$

where $\lambda = \alpha\gamma$ and $(\alpha\gamma_0 + \alpha\varepsilon_{it}) = \eta_t + \eta_i + u_{it}$. η_t are the time dummies to capture all the time-specific effects. η_i is the host country dummies to capture all the country-specific effects. u_{it} is the error term. As suggested by Cheng and Kwan (2000) and Campos and Kinoshita (2003), the lagged dependent variable on the right-hand side implies the self-reinforcing effect or the agglomeration effect. Therefore, Equation (5) fits a dynamic specification. The positive value of $(1-\alpha)$ implies self-perpetuating growth or natural growth. Finally, the partial stock adjustment model in the context of China's OFDI stock is represented in Equation (5).

4.3.2 The Gravity Model and Augmented Gravity Specification

The partial stock adjustment model has been applied to empirical FDI studies incorporating a dynamic adjustment (Cheng and Kwan, 2000; Campos and Kinoshita, 2003; Wagner and Timmins, 2009). To facilitate the discussions and elaborate econometric estimations, the explanatory variables in Equation (5) are motivated from a gravity model. China's contemporaneous OFDI stock in host countries has been included as the dependent variable (*lnCOFDIS*) and China's previous OFDI stock in host countries ($lnCOFDIS_{t-1}$) and the previous IFDI stock of host countries in China ($lnCIFDIS_{t-1}$) as the two main interested variables. A range of control variables has also been included, and hence the base gravity-type specification is given by Equation (6).

$$\begin{aligned}\ln\mathrm{COFDIS}_{it} =& \beta_1 \ln\mathrm{COFDIS}_{i,t-1} + \beta_2 \ln CIFDIS_{i,t-1} + \beta_3 \ln \mathrm{Imports}_{i,t-1} + \beta_4 \ln\mathrm{RGDP}_{it} \\ &+ \beta_5 \mathrm{RGDP\_Growth}_{it} + \beta_6 \ln RGDPPC_{it} + \beta_7 \ln Exports_{it} \\ &+ \beta_8 \ln Openness_{it} + \beta_9 Governance_{it} + \beta_{10} Inflation_{it} + \beta_{11} \mathrm{Resources}_{it} \\ &+ \beta_{12} \mathrm{Technology}_{it} + \eta_t + \eta_i + u_{it}\end{aligned} \tag{6}$$

where *i* and *t* denote host country *i* and year *t*.

$lnCOFDIS_{i,t-1}$ is the previous stock of China's OFDI in country *i* at time *t-1*. It is the first main variable of interest, β_1 represents the dynamic adjustment of China's OFDI and the agglomeration effect. OFDI stock is commonly used in empirical studies to represent the agglomeration effect (Wheeler and Mody, 1992; Barrell and Pain, 1999; Cheung and Qian, 2009; Wagner and Timmins, 2009). Cheng and Kwan (2000) argued that the implications of including lagged FDI stock were threefold. Firstly, it functioned as an agglomeration effect. It generated 'positive feedback' and externalities so that further investments would be self-reinforced and there would be natural growth. Secondly, it was associated with an adjustment process, as was illustrated in the above partial stock adjustment model. Finally, it was helpful to calculate the unobservable equilibrium stock. A positive and less than unity β_1 supports the self-reinforcement effect and the dynamic adjustment of China's OFDI.

$lnCIFDIS_{i,t-1}$ is the second main interested variable. It is the previous stock of IFDI from country *i* at time *t-1* in China. There are two reasons to use the lagged stock value to present the association between China's IFDI and its OFDI. Firstly, Driffield and Love (2003) argued that the stock of IFDI rather

than the flow was more likely to include the accumulated knowledge. Similarly, it can be assumed that IFDI stock takes time to generate the externality and it also takes time for IFDI to take effect on China's OFDI. There are many restrictions to prohibit this externality generation; however, they diminish over time. Therefore, the IFDI stock is more likely to generate the positive externality to promote China's OFDI. Secondly, the lagged value is introduced to avoid any spurious correlation. In similar studies, Oulton (1996) and Driffield and Love (2003) demonstrated that the usage of lagged IFDI was a tightly defined source of spillovers; it was less likely that the contemporaneous residuals would relate to the previous IFDI and hence the estimation was not spurious. If the contemporaneous value of China's IFDI stock is used, unobserved factors left in the error term might simultaneously affect China's contemporaneous IFDI and China's contemporaneous OFDI. They may take the form of a common shock; for example, the liberalisation of China's foreign economic policy might simultaneously stimulate IFDI and OFDI. Overall, one-year lagged values of IFDI stock are introduced to present the correlation between China's IFDI and its OFDI, and avoid a spurious estimation. β_2 is expected to be positive; a positive sign reflects a positive association, suggesting that China's previous stock of IFDI promotes its contemporaneous OFDI stock.

$lnImports_{t-1}$ is the previous value of imports from host countries to China and it is added to control the effect of previous IFDI on contemporaneous OFDI. As another potential source to generate externality, the lagged value is also introduced to avoid the spurious correlation.

The remaining control variables are the same as were measured in Chapter 3. The year dummy (η_t) is included to control for macro-economic effects on all the host countries.[38] The host country dummy (η_i) is included to capture all the time-constant unobserved country heterogeneities. u_{it} is the error terms.

4.3.3 Dynamic Panel Estimations: GMM

A natural starting point for estimating Equation (6) is pooled OLS (OLS); however, one shortcoming of conventional OLS is that the inclusion of the lagged dependent variable, $lnCOFDIS_{i,t-1}$, on the right-hand side makes the exogeneity assumption volatile (Wooldridge, 2002). $lnCOFDIS_{i,t-1}$ raises the dynamic panel bias (Nickell, 1981), because it is endogenous and correlated with the country-specific effects (η_i) in Equation (6). Hence, the OLS estimations are biased. The country-specific effects have been eliminated by taking the first difference, and Equation (6) changes to

$$\begin{aligned}\Delta \ln COFDIS_{it} =& \beta_1 \Delta \ln COFDIS_{i,t-1} + \beta_2 \Delta \ln CIFDIS_{i,t-1} + \beta_3 \Delta \ln Imports_{i,t-1} \\ &+ \beta_4 \Delta \ln RGDP_{it} + \beta_5 \Delta RGDP\_Growth_{it} + \beta_6 \Delta \ln RGDPPC_{it} \\ &+ \beta_7 \Delta \ln Exports_{it} + \beta_8 \Delta \ln Openness_{it} + \beta_9 \Delta Governance_{it} \\ &+ \beta_{10} \Delta Inflation_{it} + \beta_{11} \Delta Resources_{it} + \beta_{12} \Delta Technology_{it} \\ &+ \Delta \eta_t + \Delta u_{it}\end{aligned} \quad (7)$$

$\Delta lnCOFDIS_{i,t-1}$ is still endogenous because it is correlated with Δu_{it}, and the estimations are still biased.[39] Equation (7) incorporates a lagged dependent

[38] Time dummies were included to increase the likelihood of preventing the cross-sectional correlation in GMM estimation (Roodman, 2006).

[39] $\Delta lnCOFDIS_{i,t-1}$ ($=lnCOFDIS_{i,t-1} - lnCOFDIS_{i,t-2}$) is correlated with Δu_{it} ($= u_{it}-u_{i,t-1}$).

variable on the right-hand side; therefore, a dynamic panel estimation is preferable.

A difference GMM proposed by Arellano and Bond (1991) is an option to correct the endogeneity bias.[40] Departing from OLS which uses the least-square criterion (Gujarati, 2003), GMM uses the moment condition which states that the regressor is orthogonal to the error, and GMM estimations are consistent if the coefficients meet these moments. Following Anderson and Hsiao (1982), $lnCOFDIS_{i,t-2}$ is introduced as a natural instrument for $\Delta lnCOFDIS_{i,t-1}$ in Equation (7), because it is correlated with $\Delta lnCOFDIS_{i,t-1}$ ($=lnCOFDIS_{i,t-1} - lnCOFDIS_{i,t-2}$).[41] Holtz et al. (1988) extended this by using further lags of the dependent variable to generate extra instruments; therefore, control for the endogeneity of the first main interested variable ($lnCOFDIS_{i,t-1}$) on the right-hand side of Equation (6) is provided by using levels dated t-2 and earlier as internal instruments. It is assumed that the second main interested variable ($lnCIFDIS_{i,t-1}$) together with other explanatory variables are strictly exogenous. As the emergence of China's foreign investments is merely a new phenomenon and there is a limited scale in the absolute amount, China's OFDI stock in a host country is less likely to affect in reverse the host country's investment stock in China. Similar reasons could also be applied to the rest of the explanatory variables, as the host country's characteristics are less likely to be affected by a single foreign country's investments alongside China's investments. Following Roodman (2006), who pointed out that strictly

[40] Roodman (2006) provided a good review of the difference GMM and system GMM.

[41] Roodman (2006) indicated that $lnCOFDIS_{i,t-2}$ was preferable to $\Delta lnCOFDIS_{i,t-2}$ as an instrument, because the former started from time=3 but the latter started from time=4; therefore, $lnCOFDIS_{i,t-2}$ involved more information, especially in a short panel.

exogenous variables ordinarily instrumented themselves, differences in the previous stock of IFDI and all the explanatory variables in Equation (7) are imposed as instruments.

The validity of difference GMM estimations hinges on the following two specification tests. Firstly, in addition to the instrument relevance, the validity of instruments also depends on the test of instrument exogeneity. This states that instruments are not correlated with differenced residuals such as Δu_{it} when the residuals themselves are not serially correlated. The validity of GMM estimation closely depends on the exogeneity of instruments. It cannot be tested under the exact identification, but it can be tested if the model is over-identified. The Hansen statistic is introduced to test the overall validity of the instruments; it is asymptotically χ^2 under the null hypotheses that the instruments are jointly valid and there is no misspecification. Baum (2006) indicated that the Hansen statistic was the most common diagnostic tool used test the overall validity of instruments. Secondly, the test of autocorrelation is especially important when lags are introduced as instruments after the transformation, as in Equation (7). Arellano and Bond (1991) proposed the use of the second-order autocorrelation in the transformed equation to examine whether the level equation was serially correlated at order 1; therefore, the Arellano–Bond test for AR(1) and AR(2) in the transformed equation is used to test whether there is a first-order correlation of residuals in the level equation, as in Equation (6). They are normally distributed under the null of zero AR(1) and AR(2) in the transformed equation, respectively; a significant Arellano–Bond AR(1) statistic and an insignificant Arellano–Bond AR(2) indicate that

the level equation is not serially correlated at order 1, otherwise invalid instruments might be present because of the serial correlation of residuals in the level equation, for example, $lnCOFDIS_{i,t-2}$ is under the risk of endogeneity and it might be an invalid instrument for $\Delta lnCOFDIS_{i,t-1}$.[42]

Whereas difference GMM corrects the endogeneity bias, it suffers from an efficiency loss by omitting informative moment conditions. Blundell and Bond (1998) indicated that it performs poorly if the coefficient of the lagged dependent variable is close to 1 as a random walk, because the instruments do not provide much information about future changes. For example, $lnCOFDIS_{i,t-2}$ is not helpful for predicting the change in future values $\Delta lnCOFDIS_{i,t-1}$ ($=lnCOFDIS_{i,t-1} - lnCOFDIS_{i,t-2}$), although it is a valid instrument. Blundell and Bond (1998) and Bond et al. (2001) further indicated that difference GMM estimation is downward-biased. Subjected to the relatively short time period of the panel data set (T=7), the finite-sample bias might rise and weak instruments might invalidate the estimations. Difference GMM relies on the first-difference transformation, which differences out the country fixed effect in Equation (7); however, this transformation loses efficiency. Roodman (2006) pointed out that in an unbalanced dataset, difference GMM magnified the gaps. For example, if $lnCOFDIS_{it}$ is missing, then $\Delta lnCOFDIS_{it}$ is also unavailable. Arellano and Bover (1995) alternatively

[42] The insignificant correlation between $u_{i,t-1}$ in $\Delta u_{it}(=u_{it}-u_{i,t-1})$ and $u_{i,t-2}$ in $\Delta u_{i,t-2}(=u_{i,t-2}-u_{i,t-3})$ shows that the level equation is not serially correlated at order 1 (AR(1)). It is meaningless to find evidence for AR(1) in the transformed equation, because $\Delta u_{it}(=u_{it}-u_{i,t-1})$ and $\Delta u_{i,t-1}(=u_{i,t-1}-u_{i,t-2})$ are always serially correlated at order 1 by mythically sharing the common term $u_{i,t-1}$. The existence of AR(1) implies that $u_{i,t-1}$ is correlated with $u_{i,t-2}$; therefore, $lnCOFDIS_{i,t-2}$ and $u_{i,t-1}$ are correlated. As $lnCOFDIS_{i,t-2}$ is the instrument for $\Delta lnCOFDIS_{i,t-1}$, which accompanies with the differenced error $\Delta u_{it}=(u_{it}-u_{i,t-1})$, $lnCOFDIS_{i,t-2}$ is endogenous to Δu_{it} and it is an invalid instrument.

used the forward orthogonal difference to minimise the loss of data.[43] Overall, these weaknesses motivate the inclusion of more moment conditions in order to increase the efficiency.

Blundell and Bond (1998) further developed the system GMM that was proposed by Arellano and Bover (1995). System GMM largely improves the estimation efficiency; more instruments are imposed to include more information. In addition to using levels as instruments for differences in difference GMM, system GMM further uses differences as instruments for levels, for example $\Delta lnCOFDIS_{i,t-1}$ is also introduced as an instrument for $lnCOFDIS_{i,t-1}$ in the level equation. System GMM makes an additional assumption that the additional instruments are not correlated with country-specific effects in the level equation . Blundell and Bond (1998) and Roodman (2006) illustrated that this additional assumption depends on the steady state, suggesting that the difference from the long-term convergent value is not correlated with the fixed effects. This assumption could be examined by the coefficient of the lagged dependent variable. A less than unity value is expected, otherwise system GMM is not valid. In addition to the Hansen test, which examines the joint validity of augmented instruments, the validity of system GMM hinges on an additional specification test, notably the difference-in-Hansen test. It examines the difference between the Hansen statistic with more moment conditions and subset instruments and the Hansen statistic with fewer moment conditions. The null hypotheses is that these additional moment conditions are met and the subset instruments are exogenous.

[43] The forward orthogonal deviation or orthogonal deviation subtracts a current value by using the average value of all future values; on the contrary, conventional first-difference transformation subtracts a current value from a previous value.

System GMM reduces the finite-sample bias (Baltagi, 2008), the estimations are consistent and more efficient than other dynamic panel estimations; therefore, it is motivated as the benchmark specification.[44] The main interested coefficients are still β_1 and β_2, which represent the effect of China's previous OFDI stock in host countries and China's previous IFDI from host countries on China's contemporaneous OFDI stock, respectively.

Before reporting and discussing the results in the next section, it is worth noting that a finite sample might underestimate the standard errors (Baltagi, 2008); therefore, two-step robust standard errors have been used to correct the finite-sample bias as proposed by Windmeijer (2005). Furthermore, Bond (2002) and Roodman (2006) indicated that although OLS and FE estimations for a dynamic panel are biased, they provide a good check of the validity of GMM estimation by providing the upper bound and the lower bound, respectively. OLS overestimates the coefficient of the lagged dependent variable because it is positively correlated with errors (Hsiao, 1986) and the FE estimations underestimate the coefficient in a short panel (Nickell, 1981). The validity of system GMM estimation is assured if β_1, the coefficient of lagged dependent variable, lies between the estimation of OLS and FE; therefore, the estimations of OLS and FE are reported by including the lagged dependent variable as well.

[44] Time-invariant control variables in the system GMM estimation, such as the SAR dummy in Chapter 3, have not been included, although they are allowed under system GMM, because Roodman (2006) pointed out that the inclusion of any dummy that is 1 for almost all countries or 0 for almost all countries causes bias.

4.4 Data and Summary Statistics

4.4.1 Data

Data Sources

China's bilateral country-level OFDI stock data are obtained as the dependent variable for 2003–2009, which is defined as the accumulative OFDI value up to the end of each year by MOFCOM. China's previous OFDI stock is included as the first main interested variable, and is equivalent to the one-year lagged value of the dependent variable. China's bilateral country-level lagged IFDI stock is the second main interested variable, and is defined as the one-year lagged value of the accumulative IFDI up to the end of each year.[45] A detailed description of the variables and data resources is set out in Table 4.1.

Table 4.1: Variables Description and Data Sources

Variables	Description	Data Sources
lnCOFDIS	value of China's outward foreign direct investment stock, US$ million, in logarithmic form	MOFCOM (2009) *2009 Statistical Bulletin of China's Outward Foreign Direct Investment*
$lnCOFDIS_{t-1}$	one-year lagged value of China's outward foreign direct investment stock, US$ million, in logarithmic form	as above
$lnCIFDIS_{t-1}$	one-year lagged value of China's inward foreign direct investment stock, US$ million, in logarithmic form	NBS (2007, 2010) *China Trade and External Economic Statistical Yearbook*
$lnImports_{t-1}$	one-year lagged value of China's total imports of goods and services from a host country in current value, US$ million, in logarithmic form	IMF, *Direction of Trade*
lnRGDP	real GDP at constant 2000 price, US$ million, in logarithmic form	World Bank, *World Development Indicators*

[45] MOFCOM has published OECD and IMF standards compatible OFDI stock data since 2003, and NBS has published China's IFDI stock data at the bilateral country-level since 1999; therefore, this study starts from 2003.

RGDP_Growth	annual growth rate of real GDP	as above
lnRGDPPC	real GDP per capita, in logarithmic form	as above
lnExports	total value of China's exports of goods and services to a host country in current value, US$ million, in logarithmic form	IMF, *Direction of Trade*
lnOpenness	ratio of total imports and exports divided by GDP, in logarithmic form	calculated from World Bank, *World Development Indicators*
Governance	control of corruption and a higher value indicates a lower degree of corruption	World Bank (2010b), *The Worldwide Governance Indicators*
Inflation	ratio of annual inflation rate	World Bank, *World Development Indicators*
Resources	total share of fuels and ores & metals exports in merchandise exports	as above
Technology	share of high-technology exports in manufactured exports	as above

Data Construction and Cleaning

Based on the above sources, a panel dataset of China's OFDI stock in 172 host countries for 2003–2009 was constructed. A list of the host countries is reported in Table F1 in Appendix F.

The dataset was cleaned and constructed by following two steps. Firstly, China's OFDI stocks in the Cayman Islands and British Virgin Islands are dropped because they are acknowledged as tax havens and suffer from the 'round-tripping' problem.[46] Secondly, host countries that appear fewer than 3 times in the destination list were dropped in order to avoid a disturbance from

[46] Hong Kong and Macau, as two Special Administration Regions (SARs), also receive a disproportionately large amount of FDI stock. They are politically independent from mainland China; however, they are historically, economically and culturally dependent on mainland China. They have been retained as OFDI destinations in the subsequent analysis subject to this close relation, whilst the inclusion of individual dummies absorbs all the time-invariant region-specific effects that would cause the 'round-tripping' problem.

random observations and to obtain a stable relation. The cleaned dataset includes 1110 observations and accounts for 83.54% of China's initial total OFDI stock value. It encompasses 172 host countries and 7 years, the number of countries outweighing the number of years, and it naturally fits into a dynamic panel estimation to correct the dynamic panel bias (Nickell, 1981; Roodman, 2006).

4.4.2 Summary Statistics

Table 4.2 gives the summary statistics of all the variables used for 2003–2009. It includes China's OFDI stock, lagged OFDI stock, lagged IFDI stock, lagged imports, real GDP, real RGDP growth rate, real GDP per capita, exports, trade openness, governance, inflation, resources and technology.[47]

Table 4.2: Summary Statistics for 2003–2009 (7 years, 172 host countries)

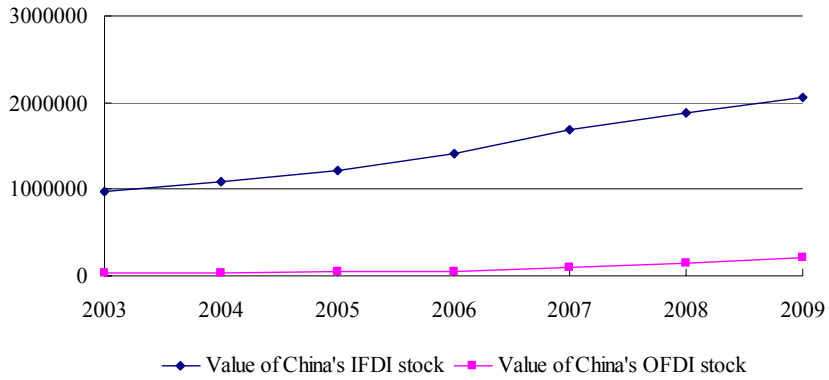
Variable	Obs.	Mean	Standard Difference	Minimum	Maximum
lnCOFDIS	1110	2.716	2.550	-4.605	12.011
$lnCOFDIS_{t-1}$	939	2.521	2.521	-4.605	11.660
$lnCIFDIS_{t-1}$	958	4.625	3.073	-3.912	13.754
$lnImports_{t-1}$	966	4.773	3.561	-6.908	11.924
lnRGDP	1134	9.679	2.332	4.751	16.261
RGDP_Growth	1146	0.046	0.053	-0.413	0.465
lnRGDPPC	1134	7.823	1.643	4.419	11.326
lnExports	1160	6.183	2.419	-1.666	12.440
lnOpenness	1088	-0.422	0.731	-12.482	2.777
Governance	1195	0.499	0.205	0.104	1.025
Inflation	1061	0.311	7.502	-0.132	244.110
Resources	873	0.255	0.286	0.000	0.997
Technology	885	0.101	0.129	0.000	0.997

Notes: Obs. = number of observations. Values are measured in current prices in million US dollars (lnCOFDIS, $lnCOFDIS_{t-1}$, $lnCIFDIS_{t-1}$, $lnImports_{t-1}$, lnExports); in 2000 prices in million US dollars (lnRGDP, lnRGDPPC); and in percentages (RGDP_Growth, Governance, Inflation, Resources, Technology, lnOpenness).

[47] There are several outliers of explanatory variables. The governance of Finland exceeds 1 in 2006 and 2007. The governance of Iceland exceeds 1 in 2005 and 2007. However, the corresponding Chinese OFDI stock values are very small, of which the highest is 0.095. See the details in section 4.6.3.

Figure 4.1 illustrates preliminary evidence for the correlation between China's IFDI stock and its OFDI stock. It presents a co-movement, suggesting a possible positive association between IFDI and OFDI.

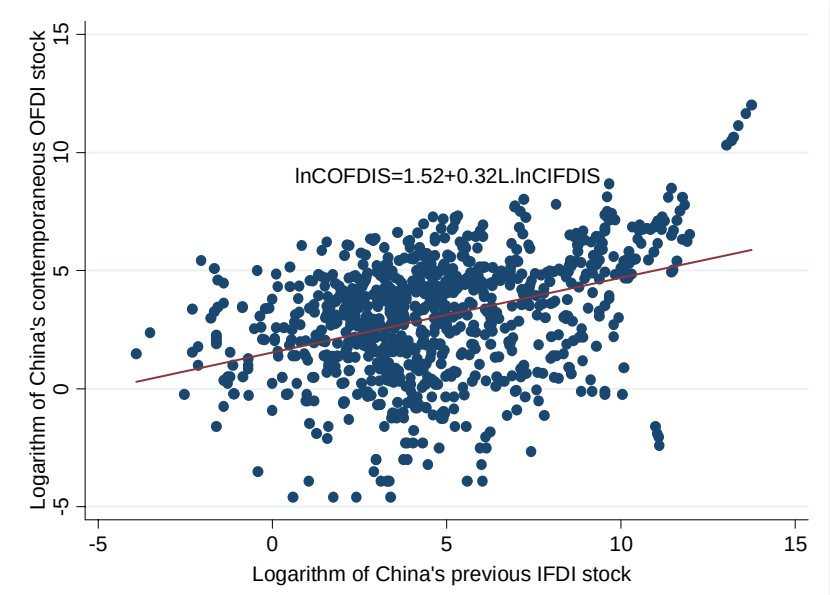
Figure 4.1: Values of China's IFDI and its OFDI Stock (US$, million)



Data Source: MOFCOM (2009), NBS (2007, 2010).

The relation between a host country's previous IFDI stock in China and China's contemporaneous OFDI stock in that host country is more clearly revealed in Figure 4.2, and their relation is reflected in an upward trend.

Figure 4.2: The Relation between China's IFDI and its OFDI Stock



Notes: The logarithm of China's annual IFDI and its OFDI was calculated by myself.
Data Sources: MOFCOM (2009) and NBS (2007, 2010).

4.5 Results and Discussions

4.5.1 Baseline Results

An estimation was first made for the whole sample; the results are presented in Table 4.3. Column (1) presents the OLS estimations without controlling for country-specific effects. Column (3) presents the FE estimations with controlling for country-specific effects. Column (5) presents the system GMM estimations by treating $lnCOFDIS_{t-1}$ as endogenous. As primary evidence for the validity of the benchmark specification, system GMM, the coefficient of China's previous OFDI stock is less than unity and the steady-state assumption is held. The coefficient 0.649 lies comfortably below the corresponding upper bound of OLS estimation, 0.790, and above the corresponding lower bound of FE estimation, 0.326; it provides additional evidence for a valid estimation. The validity of system GMM hinges on statistical diagnostics. The F test rejects the null and the joint significance is supported. The rejection of the Arellano–Bond AR(1) test and the failure to reject the AR(2) test indicate that the transformed equation does not serially correlate at the second order; the model is correctly specified. The failure to reject the Hansen static confirms the overall validity of the augmented instruments. The failure to reject the difference-in-Hansen test confirms the validity of the subset instruments, and hence the additional instruments are very informative. Overall, the system GMM estimations pass all the tests, suggesting that the estimations are valid and the model is correctly specified.

Table 4.3: Dynamic Panel Estimations of OLS, FE and System GMM

Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
lnCOFDIS	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
$lnCOFDIS_{t-1}$	0.790***	(0.035)	0.326***	(0.073)	0.649***	(0.109)
$lnCIFDIS_{t-1}$	0.074***	(0.020)	-0.024	(0.058)	0.098*	(0.052)
$lnImports_{t-1}$	0.034	(0.029)	-0.007	(0.065)	0.026	(0.035)
lnRGDP	-0.056	(0.063)	-0.194	(2.074)	-0.089	(0.108)
RGDP_Growth	0.031	(0.880)	0.748	(1.244)	0.398	(1.112)
lnRGDPPC	-0.137**	(0.055)	-0.917	(2.134)	-0.243**	(0.106)
lnExports	0.164***	(0.061)	0.055	(0.190)	0.279**	(0.115)
lnOpenness	0.057	(0.105)	0.118	(0.246)	-0.022	(0.211)
Governance	0.042	(0.340)	2.854	(1.880)	0.066	(0.531)
Inflation	-0.104	(0.084)	-0.400	(0.941)	0.006	(0.140)
Resources	0.639***	(0.185)	-0.240	(0.860)	0.804***	(0.273)
Technology	-0.660**	(0.314)	0.301	(0.616)	-0.202	(0.459)
Country dummy	No		Yes		Yes	
Year dummy	Yes		Yes		Yes	
Number of obs.	554		554		554	
F statistic	252.80		33.51		80.31	
AR(1) test					0.001	
AR(2) test					0.508	
Hansen J test					0.570	
Difference-in-Hansen					0.385	

Notes: Significant at * 10%, ** 5% and *** 1%. S.E. is robust standard errors in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous; the levels dated t-2 and earlier are instruments for the transformed equation and the differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) test examines whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

Now, an interpretation is made of the results of the benchmark specification, system GMM, in column (5) in Table 4.3. The coefficient of the first interested variable, China's previous OFDI stock, is positive and significant at the 1%

level. If other things are equal, on average, a 10% rise in China's previous OFDI stock in a host country is associated with an increase in China's contemporaneous OFDI stock of 6.49%. The significance is consistent across alternative econometric specifications, and the agglomeration effect is strongly supported. The positive feedback and self-reinforcement effect of China's previous investments drive its further investments to the same destination. This finding is consistent with the result of Cheung and Qian (2009).[48] They also found that China's OFDI stock was driven to the host country in which China had already invested heavily. More importantly, the significance of the lagged dependent variable strongly supports the dynamic adjustment of China's OFDI. This will be discussed later in detail.

The results provide evidence that the second main interested variable, the previous stock of IFDI from host countries in China, is positive and significant at the 10% level in column (5) in Table 4.3. If other things are equal, on average, a 10% rise in the previous stock of IFDI from the host countries is associated with an increase in China's contemporaneous OFDI stock in that country of 0.98%. This significant effect of previous IFDI is also found in OLS estimation in column (1). A positive association between China's IFDI and its OFDI is found, and one possible explanation for this is the positive externality, possibly in the form of information spillovers. As a potential channel of the information diffusion, the IFDI stock might spread the information about host countries to China and the diffused information compensates for China's insufficient knowledge about foreign markets. This positive association implies

[48] Cheung and Qian (2009) used the share of China's OFDI stock in a host country in China's total OFDI stock as the measurement of agglomeration. China's foreign investments in 50 host countries for 1991–2005 were examined by using the FE model.

that Chinese companies might learn from the foreign investments in China about the foreign market and subsequently promote overseas investments.

The results for the other explanatory variables in column (5) in Table 4.3 have the expected signs and significances, and they are also consistent with the existing literature. The real GDP per capita is negative and significant at the 5% level; this finding is consistent with the results of Cheng and Ma (2007) and Zhang (2009). China's exports to a host country are positive and significant at the 5% level; a 10% rise in China's exports to a host country is associated with an increase in China's OFDI to the same country of 2.79%. There are corroborating previous studies that generate the positive and significant role of exports in China's OFDI (Buckley et al., 2007; Cheung and Qian, 2009; Zhang, 2009); this significant result coincides with the earlier discussion that China's OFDI is largely distributed in trade-related sectors. The host country's overall resources abundance is positive and significant at the 1% level, and a 10% rise in the host country's overall resources abundance is associated with an increase in China's OFDI stock in that country of 8.04%. This finding is consistent with the natural resources-seeking motivation illustrated in Chapter 3 and other empirical studies (Buckley et al., 2007; Cheung and Qian, 2009).

The Dynamic Adjustment of China's OFDI

The coefficient of China's previous OFDI stock is 0.649 in column (5) in Table 4.3, implying that the speed of adjustment is 1-0.649=0.351. If the steady state of China's OFDI stock holds, the adjustment process implies that it will take

about 1/0.351≈3 years to close the gap between the equilibrium OFDI stock and the actual OFDI stock, and this gradual adjustment might reflect the possible existence of the adjustment cost[49].

In a related study, Cheng and Kwan (2000) illustrated the estimation of a partial stock adjustment model enabled to restore the unobservable equilibrium stock and compare it with the actual stock. The adjustment process has been rewritten in Equation (1) as:

$$\ln COFDIS_{it}^{*} = \frac{1}{\alpha}(\ln COFDIS_{it} - (1-\alpha)\ln COFDIS_{i,t-1}) \quad (8)$$

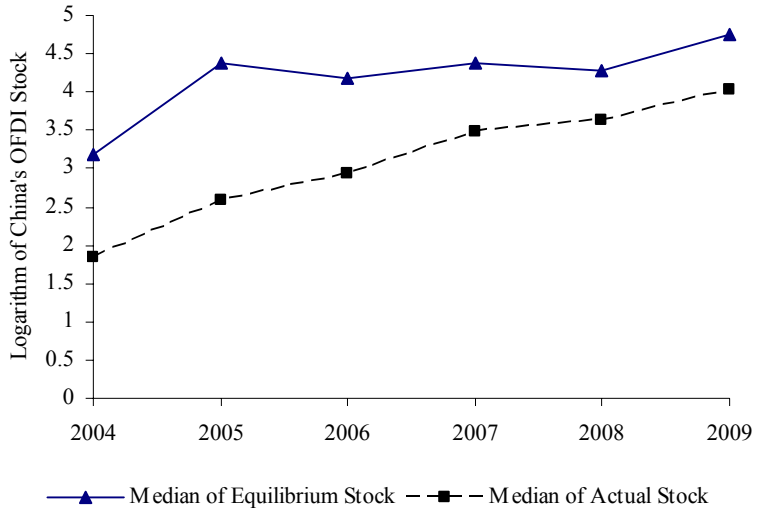
Therefore, the equilibrium OFDI stock is calculated from Equation (8) by replacing α with 0.351. After restoring the equilibrium stock, Cheng and Kwan (2000) made two further distinctive applications by using the restored equilibrium stock.

The first application was to use the change in the equilibrium stock to reflect the influence of an exogenous change without the intervention of the adjustment cost or the agglomeration effect, and they found that the equilibrium stock was more volatile than the actual stock. To give some ideas about the change in China's equilibrium OFDI and actual OFDI stocks, Figure

[49] Other unobservable omitted variables could also affect the difference between the equilibrium OFDI stock and the actual OFDI stock; therefore, this difference may not be fully explained by the effect of the adjustment cost.

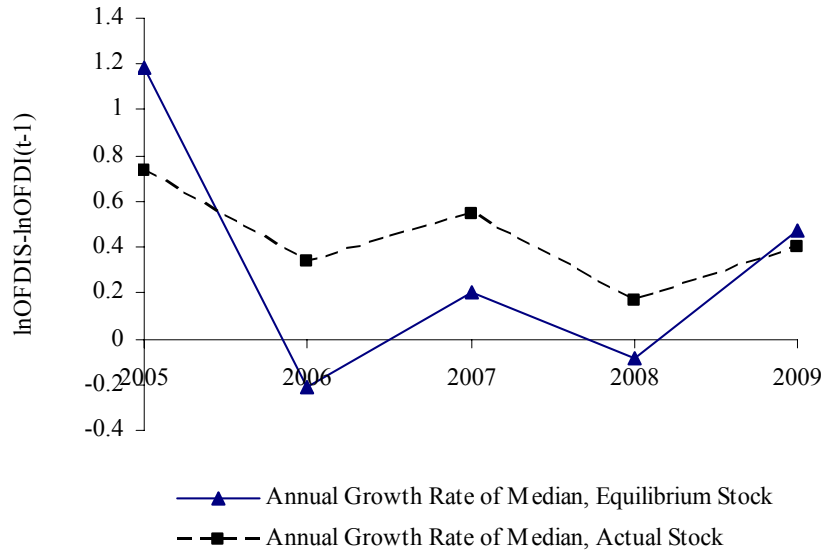
4.3.1 presents their medians and Figure 4.3.2 presents the annual growth rates of their medians, respectively.[50]

Figure 4.3.1: Medians of Equilibrium and Actual Stock of China's OFDI



Notes: The median of the equilibrium stock is calculated by myself.
Data Source: MOFCOM (2009)

Figure 4.3.2: Annual Growth Rates of Medians



Notes: The annual growth rates of medians are calculated by myself.
Data Source: MOFCOM (2009)

[50] Thereafter, the median and the annual growth rate of the median of the equilibrium stock are calculated from the restored equilibrium stock from Equation (8).

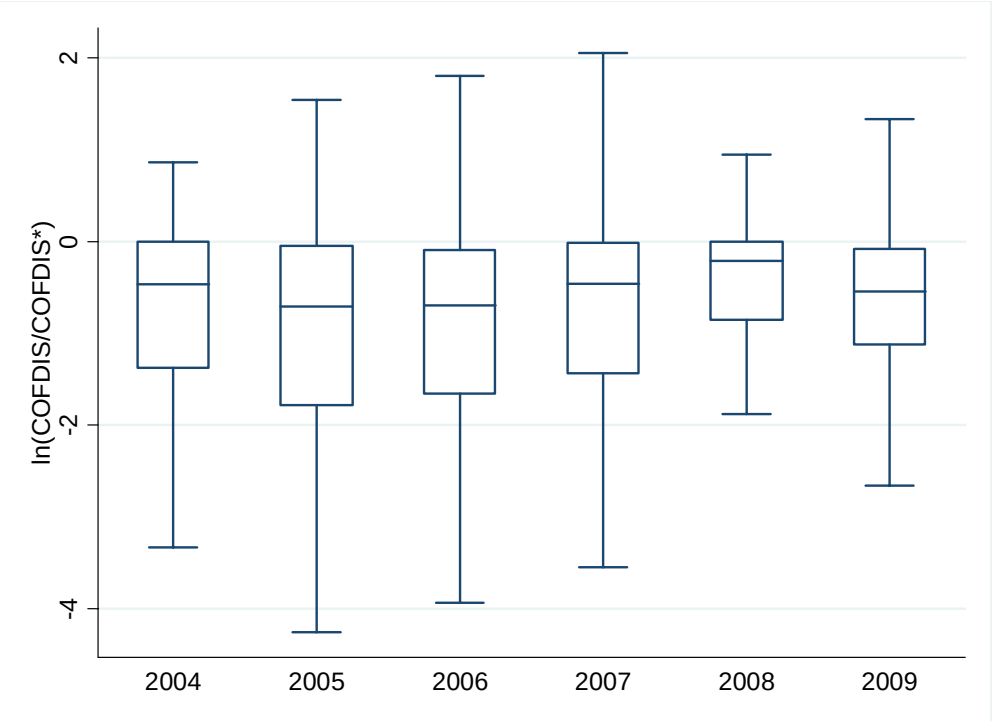
The findings of Figures 4.3.1 and 4.3.2 are threefold. Firstly, the equilibrium stock is always bigger than the actual stock in Figure 4.3.1, implying that China's real OFDI stock was underinvestment in general; therefore, there was still huge investment potential and China's OFDI would expand continuously. Secondly, the subprime crisis in 2007 did not have a significant impact on China's OFDI. The median of equilibrium OFDI stock and the median of actual OFDI stock remained stable in 2008 and they continuously increased in 2009 in Figure 4.3.1, implying that China's reintegration within the world economy through overseas investments was a long-term strategy and it was not fundamentally altered by a short-term shock. Finally and most importantly, both Figure 4.3.1 and Figure 4.3.2 deliver a similar pattern to the finding of Cheng and Kwan (2000) that the equilibrium stock was relatively more volatile than the actual stock. The equilibrium OFDI stock is estimated in the absence of the self-reinforcing effect and the adjustment cost; the costless adjustment makes it respond faster to an exogenous change and hence the consequent change is relatively bigger. On the contrary, the actual OFDI stock is implemented in the presence of the self-reinforcing effect and the possible existence of the convex adjustment cost, which could smooth the actual investments. For instance, the investment inertia causes China to take time to respond to an exogenous change, this costly adjustment slows down the new investment and hence the consequent change is relatively smaller. There are various sources for the adjustment cost: two studies on the time-to-plan (Christiano and Todd, 1996) and time-to-build (Casares, 2002) provide macro evidence. China's relatively stable actual OFDI stock provides evidence that China's overseas investments might also be affected by the investment

adjustment cost; a simple example for this possible effect of the adjustment cots is that China's overseas investments have to be approved and registered by a series of government departments, and hence this bureaucratic cost slows down the response of the actual OFDI stock, but the equilibrium OFDI stock could respond much more quickly.[51]

The second application made by Cheng and Kwan (2000) was to use the difference between the actual and the equilibrium stock to reflect the potential of the host country to attract future investments. A decreasing difference suggested that the host country exploited its potential to reach the equilibrium stock; in other words, the 'positive effect' of existing investments enhanced the actual stock to adjust towards its equilibrium stock. The difference between China's actual OFDI stock and its equilibrium OFDI stock in Figure 4.3.1 is more clearly illustrated by the box plots in Figure 4.3.3. This difference is alternatively measured by taking the logarithm of the ratio of the actual OFDI stock over the equilibrium OFDI stock. A negative logarithmic value indicates that the actual OFDI stock did not reach the equilibrium OFDI stock and China's OFDI was underinvestment, but a positive value means that the actual OFDI stock exceeded the equilibrium OFDI stock and China's OFDI was overinvestment. The box plots present the dispersion of the difference between the actual OFDI stock and the equilibrium OFDI stock.

[51] Overseas investments have to be approved, registered and supervised by a series of government departments in China. Any OFDI project of more than US$30 million has to be approved by the National Development and Reform Commission (NDRC), and any project less than 30 million US dollars has to be registered with the NDRC. Any overseas project has to be approved by the Ministry of Commerce (MOFCOM) and any investment more than 10,000 US dollars has to be registered with MOFCOM. Chinese MNEs have to apply for foreign exchange from the State Administration of Foreign Exchange (SAFE) under the People's Bank of China.

Figure 4.3.3: Difference between China's Actual OFDI and its Equilibrium OFDI Stock



Notes: OFDIS is the actual Chinese OFDI stock. OFDIS* is the equilibrium OFDI stock and it is calculated by myself. Outside values are excluded.
Data Source: MOFCOM (2009)

The findings of Figure 4.3.3 are twofold. Firstly, it shows a similar pattern to the result in Figure 4.3.1 that China's OFDI stock in the host country was generally underinvestment and it was witnessed by a negative median of the logarithmic value. Secondly and more importantly, the over time shrinking dispersion of the difference between China's actual OFDI stock and its equilibrium OFDI stock, as well as the stable median, implied a trend of convergence in Figure 4.3.3. They suggest that, on average, a host country exploited its potential to attract China's investments and the existing OFDI stock adjusted towards its equilibrium OFDI stock. This convergence will be more clearly revealed in the following split samples.

4.5.2 Do the Host Country's Characteristics Matter?

An examination is now made as to whether the dynamic adjustment of China's OFDI and the effect of China's IFDI vary with the host country's characteristics. To coincide with the interests set out in the previous chapter, host countries are classified by three criteria including the technology level, natural resources abundance and income level. For all the classifications, the system GMM estimations pass all the tests in all the split samples, implying that the estimations are valid and the split samples are correctly specified. In particular, in any split sample estimation, as the primary evidence for the validity of system GMM, the coefficient of China's previous OFDI stock is less than unity and the steady-state assumption is held. It also lies comfortably below the corresponding upper bound of OLS estimation and above the corresponding lower bound of FE estimation. The F test rejects the null and the joint significance is supported. The rejection of the Arellano–Bond AR(1) test and the failure to reject the AR(2) test indicate that the transformed equation does not serially correlate at the second order. The failure to reject the Hansen static confirms the overall validity of the augmented instruments. The failure to reject the difference-in-Hansen test confirms the validity of the subset instruments.

The Role of the Host Country's Technology

The Dynamic Adjustment and Host Country's Technology

Host country's technology is selected as the first criterion to examine whether the dynamic adjustment of China's OFDI varies with the host country's

technology level.[52] System GMM estimations for high-technology and low-technology countries are presented in columns (5) and (6) in Table 4.4, respectively; the coefficients of the first main interested variable, China's previous OFDI stock, are positive and significant at the 5% level or below, and these significances are consistent across alternative econometric specifications. If other things are equal, on average, a 10% rise in China's previous OFDI stock in high-technology and low-technology countries is associated with an increase in China's contemporaneous OFDI stock of 6.28% and 3.85%, respectively. The agglomeration effect is strongly supported in both split samples and it is bigger in high-technology countries, implying that the dynamic adjustment of China's OFDI is stronger in high-technology host countries.

[52] The technology level is measured by the share of high-technology exports in manufactured exports. A host country is a high-technology country if this value exceeds the median value; otherwise, it is a low-technology country.

Table 4.4: Estimations for High-Technology and Low-Technology Host Countries

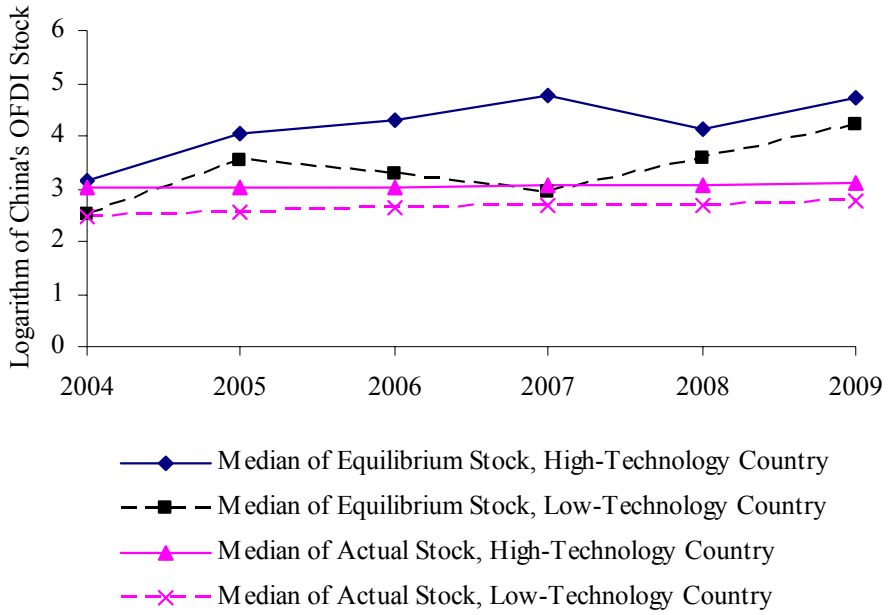
Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
lnCOFDIS	High	Low	High	Low	High	Low
$lnCOFDIS_{t-1}$	0.819***	0.755***	0.383***	0.258***	0.628***	0.385**
	(0.043)	(0.055)	(0.133)	(0.094)	(0.133)	(0.163)
$lnCIFDIS_{t-1}$	0.096***	0.070***	-0.053	-0.004	0.158**	0.140*
	(0.036)	(0.022)	(0.113)	(0.075)	(0.074)	(0.077)
Country dummy	No	No	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	302	252	302	252	302	252
F statistic	200.50	76.17	29.31	8.245	48.27	23.73
AR(1) test					0.014	0.060
AR(2) test					0.750	0.259
Hansen J test					0.515	0.780
Difference-in-Hansen					0.439	0.605

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous; levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

The coefficients of China's previous OFDI stock in high-income and low-income countries are 0.628 and 0.385 in columns (5) and (6) in Table 4.4, respectively, implying that the speed of adjustment is 1-0.628=0.372 and 1-0.385=0.615. If the steady state of China's OFDI stock holds, the adjustment process implies that it will take about $1/0.372 \approx 3$ and $1/0.615 \approx 2$ years to close the gap between the equilibrium OFDI stock and the actual OFDI stock in these two split samples, respectively; therefore, the adjustment speed is lower for high-technology countries, and this slower adjustment implies that the adjustment cost might be higher. The equilibrium OFDI stocks in high-technology and low-technology countries are calculated from Equation (8) by replacing α with 0.372 and 0.615, respectively. Figure 4.4.1 presents the

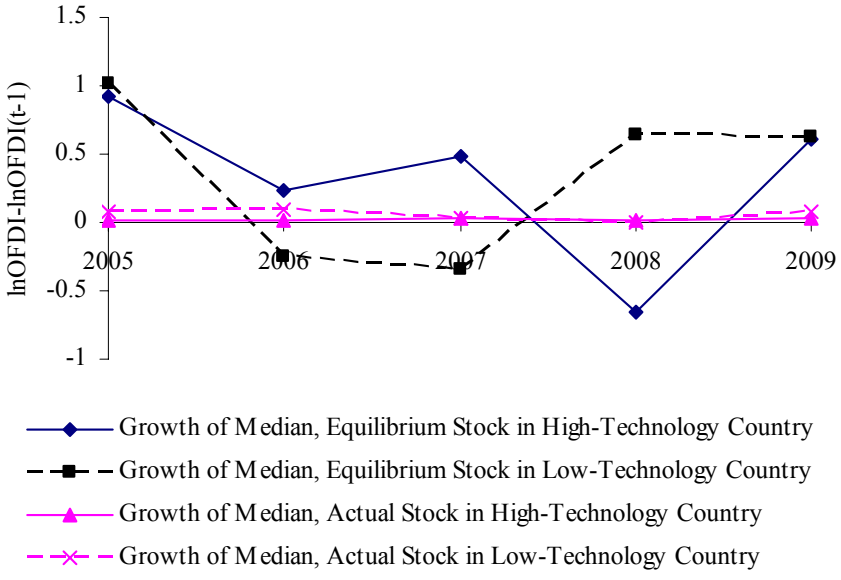
medians of the equilibrium OFDI stock and actual OFDI stock, and Figure 4.4.2 presents the annual growth rates of their medians in both split samples, respectively.

Figure 4.4.1: Medians of China's Equilibrium and Actual OFDI Stock in High-Technology and Low-Technology Countries



Notes: The median of the equilibrium stock is calculated by myself.
Data Source: MOFCOM (2009)

Figure 4.4.2: Annual Growth Rates of Medians in High-Technology and Low-Technology Countries



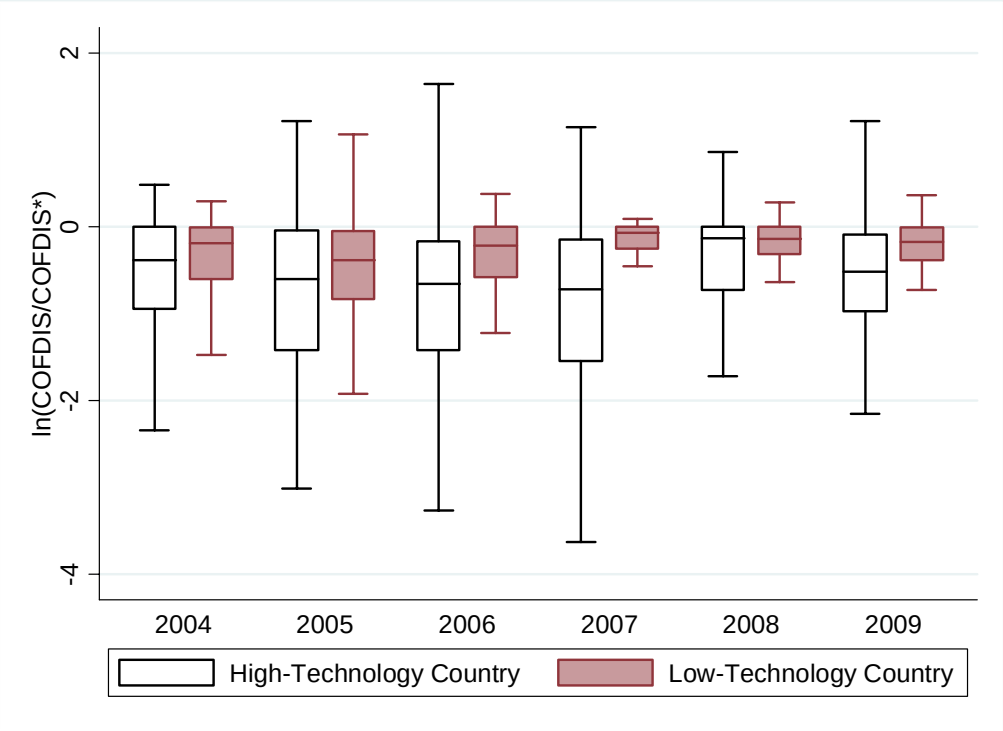
Notes: The annual growth rate of the median is calculated by myself.
Data Source: MOFCOM (2009)

The findings of Figures 4.4.1 and 4.4.2 are consistent with the results in Figures 4.3.1 and 4.3.2. In particular, firstly, the equilibrium OFDI stock in the high-technology country was bigger than it was in the low-technology country, implying that the equilibrium OFDI stock that China would eventually achieve was bigger in high-technology countries. One possible explanation for this is the technology-seeking motivation drives China's OFDI to the high-technology host countries, as was illustrated in Chapter 3. Wang and Blomstrom (1992) have explicitly pointed out that, although technology spillovers were intrinsic, they did not take effect automatically. The more learning investments were conducted by a technologically inferior company in absorbing advanced technology, the higher the transfer rate of technology spillovers to active investors. Therefore, China's final OFDI stock in the high-technology host countries might be higher. Secondly, the equilibrium OFDI stock was also found to be more volatile than the actual OFDI stock in both split samples, which coincided with the previous finding that the adjustment cost might exist in general. Interestingly, the difference between the equilibrium OFDI stock and the actual OFDI stock in high-technology countries was generally bigger than the difference in low-technology countries. This finding is consistent with the slower adjustment speed for high-technology countries (0.372) than it is for low-technology countries (0.615), suggesting that the adjustment cost in high-technology countries might be higher. For example, the adjustment cost might refer to the set-up cost, such as the labour cost. In terms of the high-technology countries, the set-up cost might be higher for China in conducting a new investment such as employing skilled labour and experts. In terms of the low-

technology countries, the set-up cost would be lower because the labour cost is lower.

Further, the difference between China's actual OFDI stock and its equilibrium OFDI stock in high-technology and low-technology countries in Figure 4.4.1 is alternatively illustrated by the box plots in Figure 4.4.3. Similarly, this difference is also measured by taking the logarithm of the ratio of the actual OFDI stock over the equilibrium OFDI stock.

Figure 4.4.3: Differences between Actual and Equilibrium OFDI Stock in High-Technology and Low-Technology Countries



Notes: OFDIS is China's actual OFDI stock. OFDIS* is the equilibrium OFDI stock and it is calculated by myself. Outside values are excluded.
Data Source: MOFCOM (2009)

The finding of Figure 4.4.3 is consistent with the result in Figures 4.4.1 and 4.3.3. In particular, firstly, the medians of the logarithmic value for high-technology and low-technology countries were both negative, although the

median of high-technology countries was smaller. This implies that China's OFDI was underinvestment in these two split samples but that China's investments faced greater potential in high-technology countries, as suggested in Figure 4.4.1. Secondly, the over time shrinking dispersion of the difference between China's actual OFDI stock and its equilibrium OFDI stock is found, as well as a stable median, in both split samples in Figure 4.4.3, as suggested in Figure 4.3.3. This implies that the convergence existed and the host country, on average, exploited its potential to attract China's future investments. Finally and most importantly, the dispersion for high-technology countries was bigger than it was for low-technology countries in Figure 4.4.3. A bigger dispersion refers, as a whole, to the actual OFDI stock being much less than the equilibrium OFDI stock in the high-technology host countries. An alternative interpretation is that, as a whole, the actual OFDI stock adjusted more slowly towards the equilibrium OFDI stock in the high-technology host countries, implying that the adjustment cost might be higher in the high-technology host countries. Therefore, the greater dispersion among high-technology countries in Figure 4.4.3 was consistent with the more volatile equilibrium OFDI stock in the high-technology countries in Figures 4.4.1 and 4.4.2 might because of the higher adjustment cost.

The Effect of IFDI and the Host Country's Technology

Alongside examining the variation of the dynamic adjustment of China's OFDI with host country's technology level, an examination was also made regarding whether the positive effect of China's IFDI on its OFDI varies with the host country's technology level. The system GMM estimations for high-technology

and low-technology countries are presented in columns (5) and (6) in Table 4.4; the coefficients of the second main interested variable, China's previous stock of IFDI, are positive and significant at the 5% and 10% level, respectively. If other things are equal, on average, a 10% rise in China's previous stock of IFDI in high-technology and low-technology countries is associated with an increase in China's contemporaneous OFDI stock of 1.58% and 1.40%, respectively. Theses significant effects of previous IFDI are also found in OLS estimations in columns (1) and (2) in Table 4.4, therefore, there is some evidence to support the positive association between China's IFDI and its OFDI in both spilt samples. If the IFDI stock in China does generate a positive externality and spill information about host countries, then the spilled information about high-technology countries and low-technology countries is relevant to China's future investments in them.

The Role of the Host Country's Natural Resources

The Dynamic Adjustment and Host Country's Natural Resources

Host country's natural resources abundance is selected as the second criterion to examine whether the dynamic adjustment of China's OFDI varies with the host country's natural resources abundance.[53] The system GMM estimations for natural resources abundant and less abundant countries are presented in columns (5) and (6) in Table 4.5, respectively; the coefficients of the first main interested variable, China's previous OFDI stock, are both positive and significant at the 1% level, and these significances are consistent across alternative econometric specifications. If other things are equal, on average, a

[53] Natural resources abundance is measured by the total share of fuels and ores and metals exports in merchandise exports. A country is a natural resource abundant country if this value exceeds the median value; otherwise, it is a country that is less abundant in natural resources.

10% rise in China's previous OFDI stock in natural resources abundant and less abundant countries is associated with an increase in China's contemporaneous OFDI stock of 4.7% and 5.24%, respectively. The agglomeration effect is strongly supported in both split samples, and the dynamic adjustment of China's OFDI is very similar in two split samples.

Table 4.5: Estimations for Natural Resources Abundant and Less Abundant Host Countries

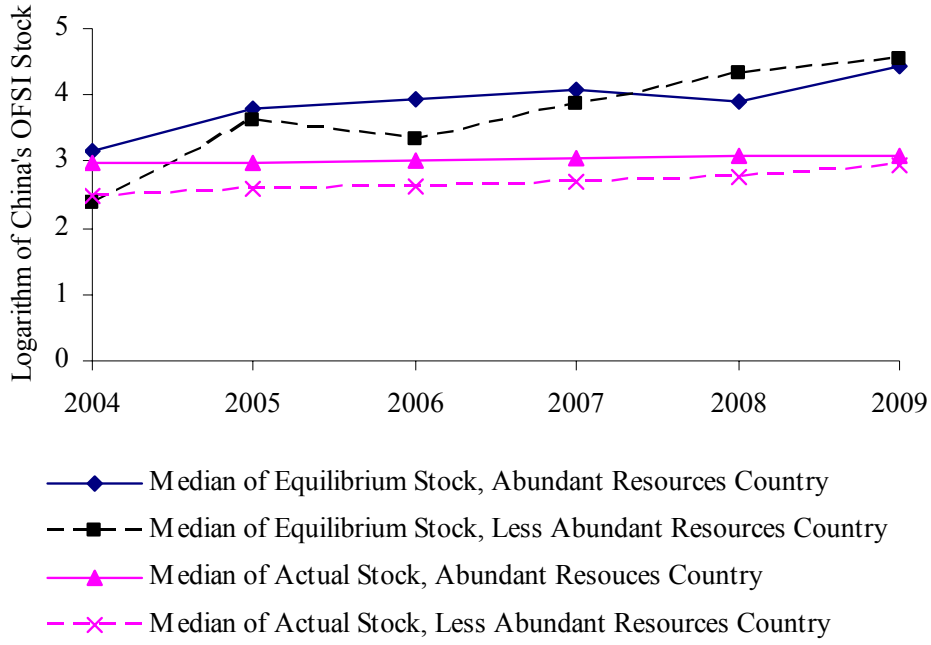
Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
lnCOFDIS	Abundant	Less Abundant	Abundant	Less Abundant	Abundant	Less Abundant
$lnCOFDIS_{t-1}$	0.688***	0.843***	0.202***	0.461***	0.470***	0.524***
	(0.055)	(0.046)	(0.069)	(0.133)	(0.126)	(0.130)
$lnIFDIS_{t-1}$	0.041	0.034	-0.101*	0.097	0.026	0.159
	(0.029)	(0.027)	(0.054)	(0.120)	(0.050)	(0.102)
Country dummy	No	No	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	280	274	280	274	280	274
F statistic	145.20	226.80	18.65	22.88	28.29	27.24
Number of countries					76	68
AR(1) test					0.027	0.015
AR(2) test					0.577	0.624
Hansen J test					0.159	0.218
Difference-in-Hansen					0.224	0.154

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous, levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

The coefficients of China's previous OFDI stock in natural resources abundant and less abundant countries are 0.470 and 0.524 in columns (5) and (6) in Table 4.5, respectively, implying that the speed of adjustment is 1-0.470=0.530 and 1-0.524=0.476. If the steady state of China's OFDI stock holds, the adjustment process implies that it will take about 1/0.530≈2 and 1/0.476≈2

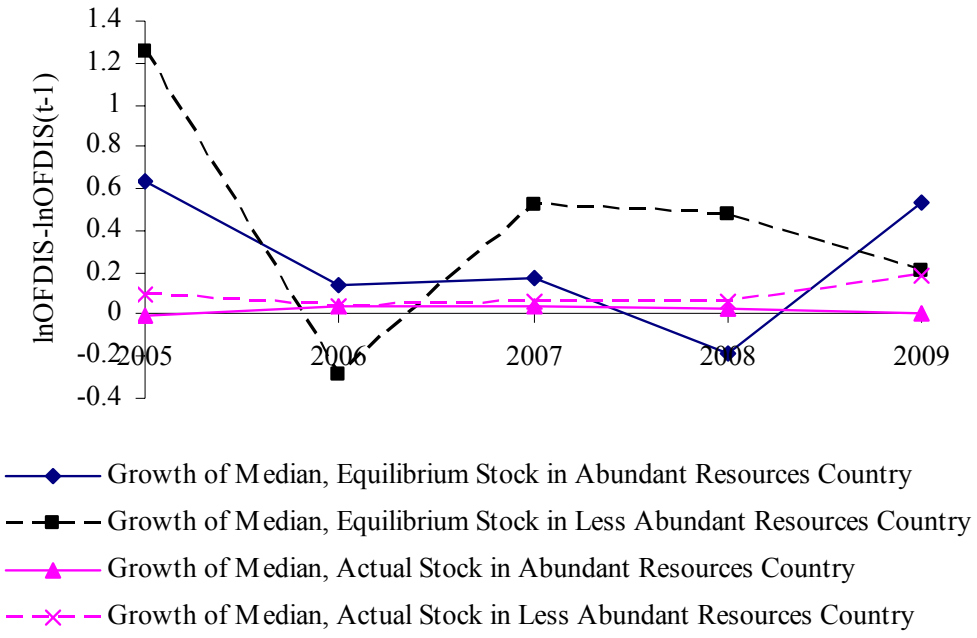
years to close the gap between the equilibrium OFDI stock and the actual OFDI stock in these two split samples, respectively, suggesting similar dynamic adjustment speeds and similar adjustment costs between these two split samples. The equilibrium OFDI stocks in the natural resources abundant and less abundant countries are calculated from Equation (8) by replacing α with 0.530 and 0.476, respectively. Figure 4.5.1 presents the medians of equilibrium OFDI stock and actual OFDI stock, and Figure 4.5.2 presents the annual growth rates of their medians in both split samples, respectively.

Figure 4.5.1: Medians of China's Equilibrium and Actual OFDI Stock in Natural Resources Abundant and Less Abundant Countries



Notes: The median of the equilibrium stock is calculated by myself.
Data Source: MOFCOM (2009)

Figure 4.5.2: Annual Growth Rates of Medians in Natural Resources Abundant and less Abundant Countries

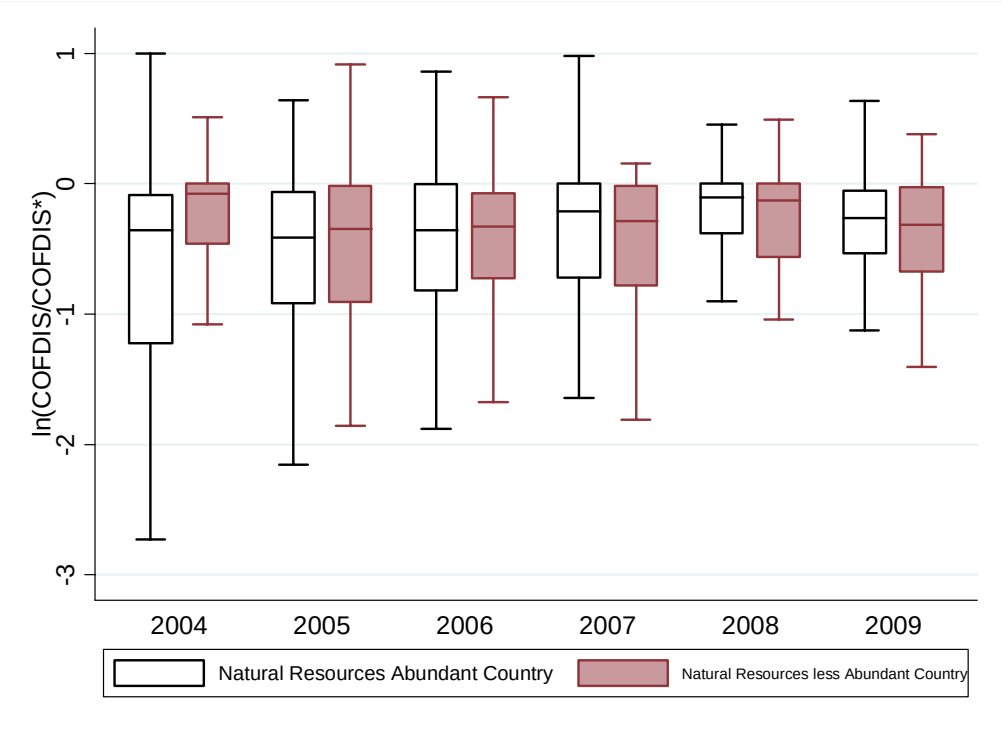


Notes: The annual growth rate of the median is calculated by myself.
Data Source: MOFCOM (2009)

The findings of Figures 4.5.1 and 4.5.2 are consistent with the results in Figures 4.3.1 and 4.3.2. In particular, the equilibrium OFDI stock was more volatile than the actual OFDI stock in both split samples, which coincided with the previous finding that the adjustment cost might exist in general. Interestingly, the difference between the equilibrium OFDI stock and the actual OFDI stock in natural resources abundant countries was similar to the difference in countries that are less abundant in natural resources. This finding is consistent with the similarity between the adjustment speed for natural resources abundant country (0.530) and the adjustment speed for natural resources less abundant countries (0.476), suggesting that the equilibrium OFDI stocks of these two split samples were similarly volatile and the adjustment costs might be similar as well.

Further, the difference between China's actual OFDI stock and its equilibrium OFDI stock in natural resources abundant and less abundant countries in Figure 4.5.1 is alternatively illustrated by the box plots in Figure 4.5.3. This difference, again, is measured by taking the logarithm of the ratio of the actual OFDI stock over the equilibrium OFDI stock.

Figure 4.5.3: Differences between Actual and Equilibrium OFDI Stock in Natural Resources Abundant and less Abundant Countries



Notes: OFDIS is China's actual OFDI stock. OFDIS* is the equilibrium OFDI stock and it is calculated by myself. Outside values are excluded.
Data Source: MOFCOM (2009)

This finding of Figure 4.5.3 is consistent with the result in Figures 4.5.1 and 4.3.3. In particular, firstly, the medians of the logarithmic value for natural resources abundant and less abundant countries were both negative, implying that China's OFDI was underinvestment in these two split samples, as suggested in Figure 4.5.1. Secondly, the over time shrinking dispersion of the difference between China's actual OFDI stock and its equilibrium OFDI stock

is found, as well as a stable median, in both split samples in Figure 4.5.3, as suggested in Figure 4.3.3. These imply that the convergence existed and the host country, on average, exploited its potential to attract China's future investments. Finally and most importantly, the dispersion for natural resources abundant countries was similar to that for countries that are less abundant in natural resources in Figure 4.5.3. A similar dispersion refers, as a whole, to the difference between actual OFDI stock and equilibrium OFDI stock in resources abundant countries being similar to the difference in resources in less abundant countries. An alternative interpretation is that, as a whole, the actual OFDI stock in resources abundant countries adjusted towards the equilibrium OFDI stock at a similar speed to the actual OFDI stock in countries that are less abundant in natural resources, implying that the adjustment costs might be similar between these two split samples. Therefore, the similar dispersion between these two split samples in Figure 4.5.3 was consistent with the similarly volatile equilibrium OFDI stocks in these two split samples in Figures 4.5.1 and 4.5.2 might because of the similar adjustment costs.

The Effect of IFDI and the Host Country's Natural Resources

Alongside examining the variation of dynamic adjustment of China's OFDI with the host country's natural resources abundance, an examination was also made concerning whether the positive effect of China's IFDI on its OFDI varies with the host country's natural resources abundance. The system GMM estimations for natural resources abundant and less abundant countries are presented in columns (5) and (6) in Table 4.5. The coefficients of the second main interested variable, China's previous stock of IFDI, are both insignificant;

therefore, there is no evidence to support the positive association between China's IFDI and its OFDI. This insignificance is expected, given that the information spillovers are largely generated from the manufacturing industry, and the spilled information from the host country's natural resources condition might not be relevant to China's future investments in them.

The Role of the Host Country's Income

The Dynamic Adjustment and the Host Country's Income

Host country's income level is selected as the final criterion to examine whether the dynamic adjustment of China's OFDI varies with the host country's income level.[54] The system GMM estimations for high-income and low-income countries are presented in columns (5) and (6) in Table 4.6, respectively; the coefficients of the first main interested variable, China's previous OFDI stock are both positive and significant at the 1% level, and these significances are consistent across alternative econometric specifications. If other things are equal, on average, a 10% rise in China's previous OFDI stock in high-income and low-income countries is associated with an increase in China's contemporaneous OFDI stock of 6.14% and 6.57%, respectively. The agglomeration effect is strongly supported in both split samples, and the dynamic adjustment of China's OFDI is very similar in two split samples.

[54] The income level is measured by the real GDP per capita. A country is a high-income country if this value exceeds the median value; otherwise, it is a low-income country.

Table 4.6: Estimations for High-Income and Low-Income Host Countries

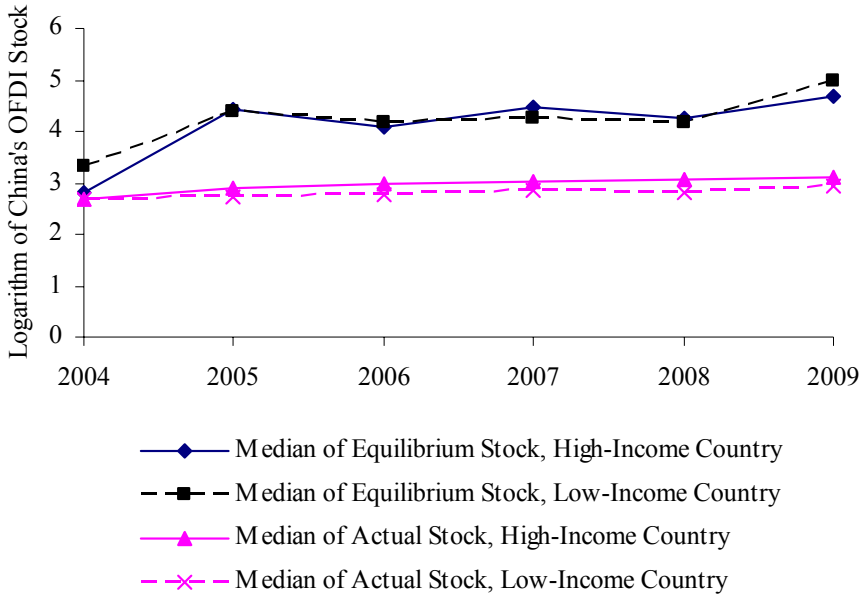
Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
lnCOFDIS	High	Low	High	Low	High	Low
$lnCOFDIS_{t-1}$	0.791***	0.693***	0.352***	0.188**	0.614***	0.657***
	(0.045)	(0.072)	(0.098)	(0.084)	(0.137)	(0.138)
$lnCIFDIS_{t-1}$	0.121***	0.029	-0.098	0.021	0.177***	0.017
	(0.032)	(0.022)	(0.159)	(0.051)	(0.064)	(0.026)
Country dummy	No	No	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	347	207	347	207	347	207
F statistic	211.00	113.10	27.02	17.84	51.25	76.69
AR(1) test					0.005	0.006
AR(2) test					0.666	0.938
Hansen J test					0.545	0.264
Difference-in-Hansen					0.395	0.328

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous, levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

The coefficients of China's previous OFDI stock in high-income and low-income countries are 0.614 and 0.657 in columns (5) and (6) in Table 4.6, respectively, implying that the speed of adjustment is 1-0.614=0.386 and 1-0.657=0.343. If the steady state of China's OFDI stock holds, the adjustment process implies that it will take about $1/0.386 \approx 3$ and $1/0.343 \approx 3$ years to close the gap between the equilibrium OFDI stock and the actual OFDI stock in these two split samples, respectively, suggesting similar dynamic adjustment speeds and similar adjustment costs between these two split samples. The equilibrium OFDI stocks in the high-income and low-income countries are calculated from Equation (8) by replacing α with 0.386 and 0.343, respectively. Figure 4.6.1 presents the medians of the equilibrium OFDI stock and actual

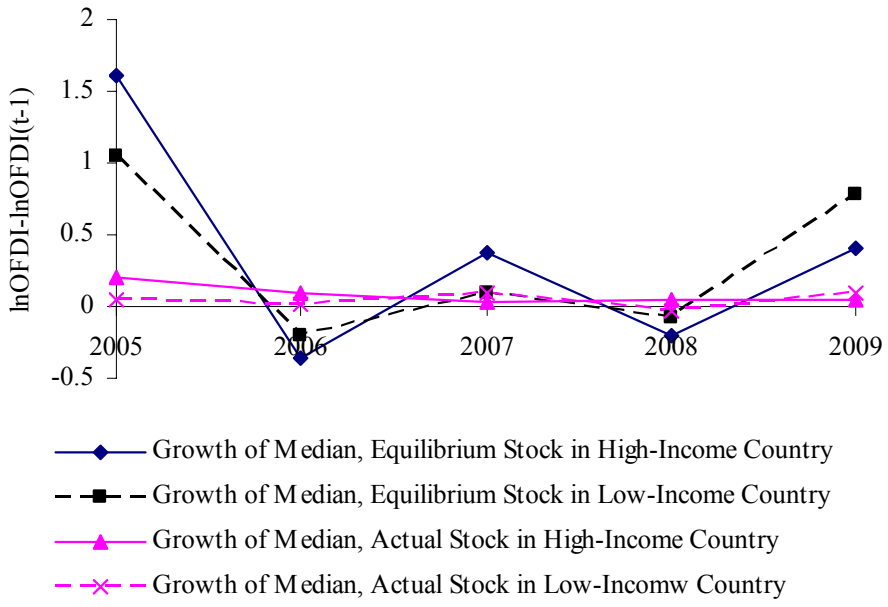
OFDI stock, and Figure 4.6.2 presents the annual growth rates of their medians in both the split samples, respectively.

Figure 4.6.1: Medians of China's Equilibrium and Actual OFDI Stock in High-Income and Low-Income Countries



Notes: The median of the equilibrium stock is calculated by myself.
Data Source: MOFCOM (2009)

Figure 4.6.2: Annual Growth Rates of Medians in High-Income and Low-Income Countries

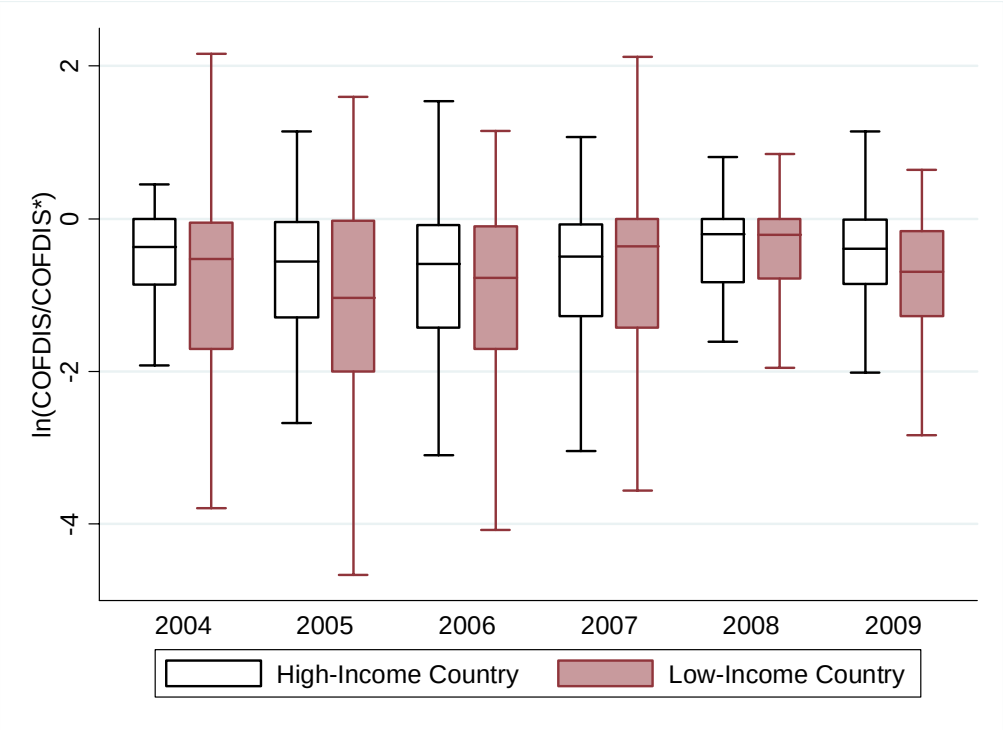


Notes: The annual growth rate of the median is calculated by myself.
Data Source: MOFCOM (2009)

The findings of Figures 4.6.1 and 4.6.2 are consistent with the results in Figures 4.3.1 and 4.3.2. In particular, the equilibrium OFDI stock was more volatile than the actual OFDI stock in both split samples, which coincided with the previous finding that the adjustment cost might exist in general. Interestingly, the difference between the equilibrium stock and the actual stock in high-income countries was similar to the difference in low-income countries. This finding is consistent with the similarity between the adjustment speed for high-income host countries (0.386) and the adjustment speed for low-income host countries (0.343), suggesting that the equilibrium OFDI stocks of these two split samples were similarly volatile and the adjustment costs might be similar as well.

Further, the difference between China's actual OFDI stock and its equilibrium OFDI stock in high-income and low-income countries in Figure 4.6.1 is alternatively illustrated by the box plots in Figure 4.6.3. Again, this difference is measured by taking the logarithm of the ratio of the actual OFDI stock over the equilibrium OFDI stock.

Figure 4.6.3: Differences between Actual and Equilibrium OFDI Stock in High-Income and Low-Income Countries



Notes: OFDIS is China's actual OFDI stock. OFDIS* is the equilibrium OFDI stock and it is calculated by myself. Outside values are excluded.
Data Source: MOFCOM (2009)

This finding of Figure 4.6.3 is consistent with the result in Figures 4.6.1 and 4.3.3. In particular, firstly, the medians of the logarithmic value for high-income and low-income host countries were both negative, implying that China's OFDI was underinvestment in these two split samples, as suggested in Figure 4.6.1. Secondly, the over time shrinking dispersion of the difference between China's actual OFDI stock and its equilibrium OFDI stock is found, as well as a stable median, in both split samples in Figure 4.6.3, as suggested in Figure 4.3.3. These imply that the convergence existed and the host country, on average, exploited its potential to attract China's future investments. Finally and most importantly, the dispersion for high-income countries was similar to that for low-income countries in Figure 4.6.3. A similar dispersion refers, as a whole, to the difference between actual OFDI stock and equilibrium OFDI

stock in high-income countries being similar to the difference in low-income countries. An alternative interpretation is that, as a whole, the actual OFDI stock in high-income countries adjusted towards the equilibrium OFDI stock at a similar speed to the actual OFDI stock in low-income countries, implying that the adjustment costs might be similar between these two split samples. Therefore, the similar dispersion between these two split samples in Figure 4.6.3 was consistent with the similarly volatile equilibrium OFDI stocks in these two split samples in Figures 4.6.1 and 4.6.2 might because of the similar adjustment costs.

The Effect of IFDI and the Host Country's Income

Alongside examining the variation of dynamic adjustment of China's OFDI with host country's income level, an examination was also made regarding whether the positive effect of China's IFDI on its OFDI varies with the host country's income level. The system GMM estimations are presented in columns (5) and (6) in Table 4.6; the coefficient of the second main interested variable, China's previous stock of IFDI, is positive and significant at the 1% level for high-income host countries, while this coefficient is insignificant for low-income host countries. If other things are equal, on average, a 10% rise in China's previous stock of IFDI of high-income countries is associated with an increase in China's contemporaneous OFDI stock of 1.77%. This significant effect of previous IFDI for high-income host countries is also found in OLS estimations in column (1) in Table 4.6, therefore, there is some evidence to support the positive association between China's IFDI and its OFDI in high-income countries, but not in low-income countries. Consumer demand in high-

income countries is more diversified, and the spilled information might include the consumer preference. Chinese companies might learn about the consumer preference of high-income countries through their investments in China, and subsequently promote investments. For example, the US ranks as a top IFDI source country in China.[55] The accumulated investments from the US might provide an opportunity for China to better understand consumer preferences in the American market. The investment of Haier in the US to design and produce a fridge and to quickly become a leading brand is a successful case in point.

4.6 Robustness Check

A range of robustness checks were undertaken in order to examine the sensitivity of the findings to various changes including the change in the instrument matrix, the exclusion of SARs and some outliers of explanatory variables.

4.6.1 Estimations Using Different Instrument Matrices

The levels dated t-2 and earlier are used as instruments for the transformed equation in the above system GMM estimations; however, the usage of large moment conditions is at the expense of the potential risk of introducing weak instruments. Roodman (2006) illustrated that a finite sample might not have enough information to generate a large instrument matrix, and hence too many instruments might weaken the Hansen test. Considering that the current sample is relatively small, various shorter lag lengths were chosen to construct the instrument matrix. The AR(2) test, Hansen test and difference-in-Hansen test

[55] See NBS (2007, 2010) *China Trade and External Economic Statistical Yearbook.*

collectively verify the corresponding estimations. The results do not alter the sign and statistical significance of the main interested variables. The magnitudes of the estimated coefficients are also similar.

4.6.2 Estimations Excluding SARs

The skewness to tax havens and offshore financial centres may affect the actual volume of China's OFDI stock. The British Virgin Islands and Cayman Islands have been excluded from the OFDI host countries; however, SARs, including Hong Kong and Macao, have been retained as destinations. The data on China's OFDI stock in the SARs does not distinguish 'round-tripping' activities. Historically, a large portion of China's OFDI travels to SARs first, and is then invested back into China to enjoy preferential tax treatment as foreign capital. Recent studies have acknowledged that a large part of China's OFDI faces a round-tripping problem (Wong and Chan, 2003; Xiao, 2004). Individual dummies have been included in the previous estimations to absorb all the time-invariant effects of SARs on China's OFDI stock; in this section, Hong Kong and Macao have been alternatively dropped from China's OFDI stock destinations to check the sensitivity of the estimations to SARs. Both the whole sample and the spilt samples were re-estimated; the results do not alter the sign and statistical significance of the main interested variables (the coefficients of the previous stock of IFDI from low-technology countries turns out to be insignificant but it is still positive) and the magnitudes of estimated coefficients are also similar. The detailed results are reported in Appendix G.

4.6.3 Estimations Excluding Outliers

The benefit of the large samples that have been used comes at the expense of including some small countries; however, their economic conditions are unstable in the sense that the governance value exceeds 1. These countries have been excluded for the robustness check, although the corresponding values of China's OFDI in these countries are very small. The following 4 observations have been dropped. The governance of Finland in 2006 and 2007 was 1.012 and 1.016, and the corresponding logarithm of China's OFDI stock was -0.073 and -0.062, respectively. The governance of Iceland in 2006 and 2007 was 1.012 and 1.016, and the corresponding logarithm of China's OFDI stock was -0.073 and -0.062, respectively. The results do not alter the sign and statistical significance of the main interested variables. The magnitudes of the estimated coefficients are also similar.

4.7 Conclusion

This chapter examined the dynamic adjustment of China's OFDI and its relation to China's IFDI, using a panel dataset for China's OFDI stock in 172 host countries from 2003 to 2009. Compared to previous studies which have mainly examined the effects of a host country's characteristics on China's OFDI in a static framework, the analysis in this chapter is the first to use a partial stock adjustment model and to examine the dynamic adjustment of China's OFDI in a dynamic framework. Furthermore, this partial stock adjustment model enables us to restore the unobservable equilibrium OFDI stock value, the examination of the equilibrium OFDI stock, and the comparison between the actual OFDI stock and the equilibrium OFDI stock

sheds light on the potential of China's OFDI from a new dimension. Furthermore, this chapter has revealed the link between China's IFDI and its OFDI as well, which has yet to be examined systematically in existing studies. This chapter further investigated whether and how the dynamic adjustment of China's OFDI and the effect of China's IFDI vary with the host country's characteristics including the technology level, natural resources abundance and income level. The gravity model was introduced by including China's previous OFDI stock and China's previous IFDI stock as the two main interested variables. The system GMM technique was applied to correct the endogeneity problem.

The findings reveal strong evidence for the dynamic adjustment of China's OFDI and the agglomeration effect. The significance of dynamic adjustment reveals the possible existence of a substantial adjustment cost in China's OFDI and implies that China's existing OFDI stock gradually adjusts towards the equilibrium OFDI stock. The results indicate that the restored equilibrium OFDI stock is not only bigger but also more volatile than the actual OFDI stock. The findings also suggest that the host country, on average, exploits its potential to attract China's future investments. There is some evidence for the positive association between China's previous IFDI and China's contemporaneous OFDI. In addition, the dynamic adjustment of China's OFDI and the agglomeration effect are both stronger in high-technology countries than low-technology countries. In contrast, they do not vary with the host country's natural resources abundance and income level. There is some evidence for the positive relation between China's IFDI and its OFDI for high-

income countries, but not low-income countries, and this positive correlation is not conditional on the host country's technology level.

The present study has two implications. Firstly, the possible existence of adjustment cost constrains the potential of China's OFDI, and a further liberalisation of the approval regime might be helpful in reducing the adjustment cost. Secondly, it is helpful for the Chinese government to provide further assistance to Chinese MNEs to better understand the foreign market and to respond faster in future investments. With respect to future research, the use of disaggregate data would enable a break down of the analysis and provide a more comprehensive study on the dynamic adjustment of China's OFDI and the association between China's IFDI and its OFDI. A more detailed investigation on the potential source of adjustment cost and the association between China's IFDI and its OFDI requires further examination.

Appendix F: List of Host Countries

Table F1: List of Host Countries for 2003–2009

1	Afghanistan	42	Czech
2	Albania	43	Denmark
3	Algeria	44	Djibouti
4	Angola	45	Dominica
5	Antigua and Barbuda	46	East Timor
6	Argentina	47	Ecuador
7	Armenia	48	Egypt
8	Australia	49	Equator Guinea
9	Austria	50	Eritrea
10	Azerbaijan	51	Estonia
11	Bahamas	52	Ethiopia
12	Bahrain	53	Fiji
13	Bangladesh	54	Finland
14	Barbados	55	France
15	Belarus	56	Gabon
16	Belgium	57	Gambia
17	Belize	58	Georgia
18	Benin	59	Germany
19	Bermuda	60	Ghana
20	Bolivia	61	Greece
21	Bosnia and Herzegovina	62	Grenada
22	Botswana	63	Guinea
23	Brazil	64	Guyana
24	Brunei	65	Honduras
25	Bulgaria	66	Hong Kong
26	Burundi	67	Hungary
27	Cambodia	68	Iceland
28	Cameroon	69	India
29	Canada	70	Indonesia
30	Cape Verde	71	Iran
31	Central African Republic	72	Iraq
32	Chad	73	Ireland
33	Chile	74	Israel
34	Colombia	75	Italy
35	Comoros	76	Jamaica
36	Congo	77	Japan
37	Congo DR	78	Jordan
38	Côte d'Ivoire	79	Kazakhstan
39	Croatia	80	Kenya
40	Cuba	81	Kuwait
41	Cyprus	82	Kyrgyz

83	Laos	129	Russia
84	Latvia	130	Rwanda
85	Lebanon	131	Saint Vincent & Grenadines
86	Lesotho	132	Samoa
87	Liberia	133	Saudi Arabia
88	Libyan	134	Senegal
89	Liechtenstein	135	Serbia
90	Lithuania	136	Seychelles
91	Luxembourg	137	Sierra Leone
92	Macau	138	Singapore
93	Macedonia	139	Slovakia
94	Madagascar	140	Slovenia
95	Malawi	141	South Africa
96	Malaysia	142	South Korea
97	Mali	143	Spain
98	Malta	144	Sri Lanka
99	Marshall	145	Sudan
100	Mauritania	146	Suriname
101	Mauritius	147	Sweden
102	Mexico	148	Switzerland
103	Micronesia	149	Syrian Arab Rep
104	Moldova	150	Taiwan
105	Mongolia	151	Tajikistan
106	Montenegro	152	Tanzania
107	Morocco	153	Thailand
108	Mozambique	154	Togo
109	Myanmar	155	Tonga
110	Namibia	156	Trinidad and Tobago
111	Nepal	157	Tunisia
112	Netherlands	158	Turkey
113	New Zealand	159	Turkmenistan
114	Niger	160	Uganda
115	Nigeria	161	Ukraine
116	North Korea	162	United Arab Emirates
117	Norway	163	United Kingdom
118	Oman	164	United States
119	Pakistan	165	Uruguay
120	Palau	166	Uzbekistan
121	Panama	167	Vanuatu
122	Papua New Guinea	168	Venezuela
123	Paraguay	169	Vietnam
124	Philippines	170	Yemen
125	Poland	171	Zambia
126	Portugal	172	Zimbabwe
127	Qatar		
128	Romania		

Appendix G: Estimations Excluding SARs

Table G1: Estimations of the Whole Sample by Excluding SARs

Dependent:	OLS	FE	SGMM
lnCOFDIS	(1)	(2)	(3)
$lnCOFDIS_{t-1}$	0.779***	0.325***	0.670***
	(0.038)	(0.073)	(0.099)
$lnCIFDIS_{t-1}$	0.073***	-0.024	0.081*
	(0.020)	(0.058)	(0.044)
Country dummy	No	Yes	Yes
Year dummy	Yes	Yes	Yes
Control variables	Yes	Yes	Yes
Number of obs.	545	545	545
F statistic	221.40	33.02	97.82
Number of countries			125
AR(1) test			0.000
AR(2) test			0.510
Hansen J test			0.611
Difference-in-Hansen			0.473

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous, levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

Table G2: Estimations for High-Technology and Low-Technology Host Countries by Excluding SARs

Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
lnCOFDIS	High	Low	High	Low	High	Low
$lnCOFDIS_{t-1}$	0.808***	0.748***	0.381***	0.261***	0.689***	0.456***
	(0.047)	(0.058)	(0.134)	(0.095)	(0.100)	(0.170)
$lnCIFDIS_{t-1}$	0.094***	0.067***	-0.055	-0.002	0.127**	0.096
	(0.035)	(0.022)	(0.114)	(0.076)	(0.061)	(0.061)
Country dummy	No	No	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	297	248	297	248	297	248
F statistic	166.20	71.71	29.16	8.23	73.65	29.96
Number of countries					82	77
AR(1) test					0.009	0.044
AR(2) test					0.764	0.344
Hansen J test					0.474	0.692
Difference-in-Hansen					0.462	0.529

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous, levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

Table G3: Estimations for Natural Resources Abundant and Less Abundant Host Countries by Excluding SARs

Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
		Less		Less		Less
lnCOFDIS	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant
$lnCOFDIS_{t-1}$	0.688***	0.836***	0.202***	0.462***	0.470***	0.547***
	(0.055)	(0.050)	(0.069)	(0.136)	(0.126)	(0.113)
$lnIFDIS_{t-1}$	0.041	0.036	-0.101*	0.096	0.026	0.121
	(0.029)	(0.027)	(0.054)	(0.121)	(0.050)	(0.094)
Country dummy	No	No	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	280	265	280	265	280	265
F statistic	145.20	159.10	18.65	22.11	28.29	29.62
Number of countries					76	66
AR(1) test					0.027	0.007
AR(2) test					0.577	0.671
Hansen J test					0.159	0.245
Difference-in-Hansen					0.224	0.145

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous, levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. The Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

Table G4: Estimations for High-Income and Low-Income Host Countries by Excluding SARs

Dependent:	OLS		FE		SGMM	
	(1)	(2)	(3)	(4)	(5)	(6)
lnCOFDIS	High	Low	High	Low	High	Low
$lnCOFDIS_{t-1}$	0.789***	0.693***	0.352***	0.188**	0.639***	0.657***
	(0.048)	(0.072)	(0.098)	(0.084)	(0.110)	(0.138)
$lnCIFDIS_{t-1}$	0.120***	0.029	-0.099	0.021	0.151***	0.017
	(0.032)	(0.022)	(0.159)	(0.051)	(0.051)	(0.026)
Country dummy	No	No	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	338	207	338	207	338	207
F statistic	172.20	113.10	26.18	17.84	57.97	76.69
Number of countries					75	57
AR(1) test					0.002	0.006
AR(2) test					0.668	0.938
Hansen J test					0.599	0.264
Difference-in-Hansen					0.477	0.328

Notes: Significant at * 10%, ** 5% and *** 1%. Robust standard errors are in parentheses. SGMM is system GMM estimation and two-step robust (the finite-sample bias correction (Windmeijer, 2005)). $lnCOFDIS_{t-1}$ is endogenous, levels dated t-2 and earlier are instruments for the transformed equation and differences dated t-1 are instruments for the level equation. The F statistic examines the joint significance. The Arellano–Bond AR(1) and AR(2) tests examine whether the transformed equation is serially correlated at the first order and second order, respectively. Thr Hansen test examines the over-identification restriction for system GMM estimation. The difference-in-Hansen test examines the validity of the instrument subsets in the level equation. AR(1), AR(2), Hansen and difference-in-Hansen report corresponding p-values.

CHAPTER 5

DOES CHINA DISPLACE THE OECD COUNTRIES' OUTWARD FDI?

5.1 Introduction

In the foregoing two chapters, China's outward FDI (OFDI) was examined by examining the underlying motivations and locational determinants in a static framework, and by investigating the dynamic adjustment of China's OFDI and its relation to China's inward FDI (IFDI) in a dynamic framework. Therefore, previous two chapters have shed some light on the causes of China's OFDI, the question remains as to what are the consequences of China's surge in overseas investments. To quote *The Economist*:

In its drive to secure reliable supplies of raw materials, it is said, China is coddling dictators, despoiling poor countries and undermining Western efforts to spread democracy and prosperity. America and Europe, the shrillest voices say, are "losing" Africa and Latin America. (*The Economist*, 13th March 2008).

The Economist (2010) has reported that China is 'buying up the world'. China Inc. appears to be everywhere, from seeking natural resources to acquiring advanced technology, from the least developed to the most developed countries, from Africa to Europe and North America. Worldwide concern has been triggered by China's fast growing overseas investments.

In terms of FDI recipient countries, on the one hand, China's OFDI provides essential capital to sustain developments. China's overseas investments in the natural resource sector keep afloat the economies of host countries such as Brazil, Australia, South Africa and Zambia. Furthermore, China is an alternative for these resources abundant countries to maximise their benefits. To quote *CNN*:

Tanimu Yakubu, an economic adviser to the Nigerian President, recently told the Financial Times that the Chinese company is "really offering multiples of what the existing producers are pledging [for licenses]." Then he added giddily. "We love this kind of competition." (*CNN*, 8th October 2009)

On the other hand, there are fears that China's OFDI is not entirely driven by economic motivations. Host countries which are abundant in natural resources have implicitly expressed this concern. *The Economist* (2008) clearly presented this angst and illustrated that China was the new colonialist in hunting natural resources. These fears possibly arise because it is difficult to distinguish China's economic motivations from its political objectives, particularly when China's state-owned enterprises (SOEs) are selected as special vehicles to implement its national interests (Yao and Sutherland, 2009).

In terms of FDI source countries, the surge in China's OFDI has triggered fears of increased investment competition, especially for developed countries. China is considered to be a competitor rather than an ally. UNCTAD (2006) stated that OFDI from developing countries is largely led by the government;

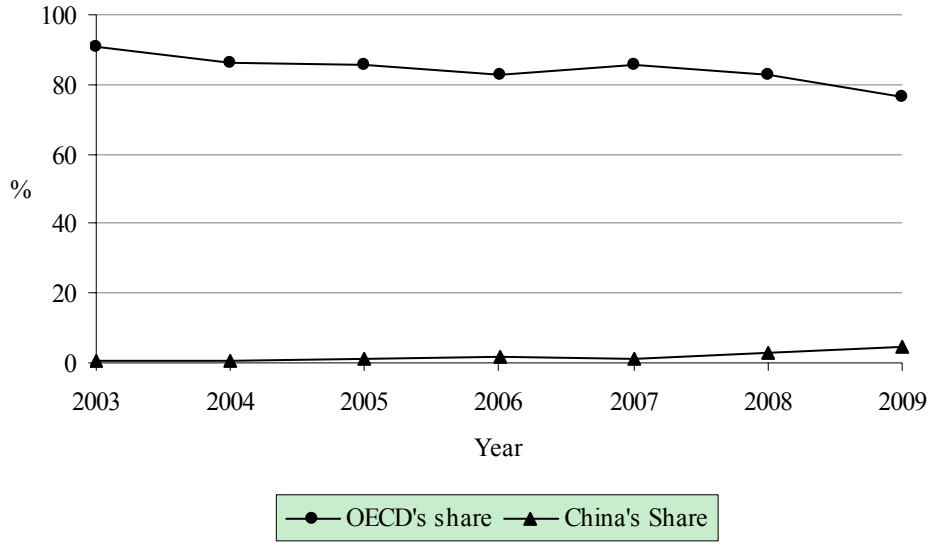
similarly, the majority of China's OFDI is also conducted by SOEs. The dominance of SOEs in Chinese OFDI is not unprecedented. Korea's OFDI used to be directed by state-led companies and Singapore's OFDI also used to be directed by SOEs. However, the high level of government involvement in Chinese OFDI, together with China's huge amount of foreign exchange reserves, cheaper financing costs from state-owned banks and considerable diplomatic support strengthen the competitiveness of Chinese companies. Developed countries worry that their multinational firms will be crowded out by China in the host countries, especially in the natural resources abundant countries and developing countries, such as African and Latin American countries.

Therefore, given China's rapid economic growth and large economy scale, China's integration into the world FDI market has unprecedented and far-reaching consequences. To illustrate the effect of China's OFDI on the world, the OECD countries have been selected for comparison in this chapter for two reasons. Firstly, data availability restricts other sources of bilateral country-level data; however, the OECD has an OFDI database that covers a large range of countries as well as a long time period. Furthermore, China's OFDI data have been consistent with the OECD standards since 2003, which ensures that the data is compatible. Secondly, the OECD countries had an average share of 84% of the global OFDI market during the sample period of 2003–2009.[56] The dominant share of the OECD countries means that the data provides a good representation of the global OFDI market.

[56] Calculated by the author from UNCTAD, *World Investment Reports* (various issues).

Figure 5.1 presents the reaction of the OECD's OFDI on China's surge in overseas investments. The share of the OECD's OFDI decreased alongside the increase of China's OFDI.

Figure 5.1: The OECD's and China's Share in World OFDI



Data Sources: China's data are obtained from MOFCOM (2009). The OECD's data are obtained from UNCTAD, *World Investments Report* (various issues).

The surge in China's overseas investments has raised the currently unresolved question regarding whether China's OFDI displaces other countries' OFDI, and especially those from the OECD countries which are major FDI source countries. However, there have been few systematic investigations into this displacement effect. This chapter fills this gap by investigating whether China's OFDI displaces the OECD countries' investment in a third country, using a panel data set including 33 OECD countries' OFDI flow in 155 host countries for the recent period of 2003-2009. A two-stage least square (TSLS) estimation has been adopted to address the endogeneity issue, the finding reveals that China's OFDI does displace the OECD countries' OFDI in a third

country in general, but the finding depends on the validity of the IV. This negative causal effect implies that a 10% rise in China's OFDI leads a more than 3% decrease in the OECD's OFDI. The whole sample is further split to investigate whether and how the displacement effects vary in terms of the characteristics of the host countries and the characteristics of the home countries. Contrary to the often-heard 'new colonialism' argument, China's OFDI does not displace the OECD's OFDI in oil and metal abundant host countries or African and Latin American host countries. In contrast, there is evidence of the displacement effect in host countries that are less abundant in oil and metal or located in Asia, Europe and North America. Market competition between Chinese and the OECD's OFDI in host countries might results in this significant displacement effect.

This chapter is organised as follows. The second section provides a review of the related literature. The third section introduces the benchmark specifications and endogeneity bias corrected estimation (TSLS). The fourth section describes the data. The fifth section presents the regression results and discusses the findings. The sixth section provides additional regression estimations by using alternative instrument variable (IV). The final section concludes this chapter.

5.2 Previous Research

To the best of the current author's knowledge, only a very limited number of studies exist on the impact of China's OFDI on the OECD's OFDI in a given host country. The research contained in this chapter is the first to shed light on

this subject. This section reviews the related literature on the displacement effect of China's exports on Asian countries' exports.

As an alternative measurement of China's fast growth, several studies have investigated the displacement effect of China's surge in exports on other countries' exports; however, the results of this displacement effect are not conclusive. Greenaway, Mahabir and Milner (2008) and Eichengreen et al. (2007) adopted the IV estimation to examine the displacement effect of China's exports on Asian countries' exports. The displacement effect was found in general. In particular, this displacement effect varied with time period and the host country's and home country's characteristics. In contrast, Ianchovichina and Wamsley (2005) examined the impact of China's accession to the World Trade Organization (WTO) on East Asian countries and found a positive effect of China's exports on other Asian countries' exports in general. However, in particular, newly industrialising economies' exports might face an enhanced competition because China's comparative advantage gradually shifts to the exports of more sophisticated products. Developing countries' exports might slightly suffer as well, because of the increased competition with China's exports in the low-end sector. Similarly, Lall and Albaladejo (2004) pointed out, in general, that the benefits for Asian countries from China's accession to the WTO outweighed the downside of their shrunken market shares. However, in particular, China's exports displaced Asian countries' exports in the low-technology sector, and the market shares of other Asian countries' exports in Japan were displaced the most. In addition, the Hong Kong Monetary Authority (2002) did not find evidence for a displacement effect of China's

exports on other Asian countries' exports, because of differentiated specialisations of goods between China and other Asian countries.

5.3 Methodology

5.3.1 Gravity Model and Augmented Gravity Specification

To examine the impact of China's OFDI on the OECD's OFDI in a given host country, the basic gravity specification has been used by including the OECD's OFDI as the dependent variable and China's OFDI as the main interested variable, controlling a range of a host country's characteristics, a home country's characteristics and host–home country pair characteristics. The benchmark gravity-type specification is given by Equation (1). The interested coefficient is β_1, which represents the impact of China's OFDI on the OECD country's OFDI in a given host country. A negative value of β_1 represents a displacement effect, for example, the OECD's OFDI declines following a rise in China's OFDI in a given host country.

$$\begin{aligned}\ln OECDOFDIF_{jit} &= \beta_0 + \beta_1 \ln COFDIF_{it} + \beta_2 \ln RGDP_{it} + \beta_3 \ln RGDPPC_{it} \\ &+ \beta_4 \mathrm{Re}\, sources_{it} + \beta_5 Techno \log y_{it} + \beta_6 \ln RGDP_{jt} \\ &+ \beta_7 \ln RGDPPC_{jt} + \beta_8 \mathrm{Re}\, sources_{jt} + \beta_9 Techno \log y_{jt} \\ &+ \beta_{10} \ln Exch_{jit} + \beta_{11} \ln Area_{ji} + \beta_{12} Colony_{ji} + \beta_{13} Comcol_{ji} \\ &+ \beta_{14} ComLag_{ji} + \beta_{15} Contig_{ji} + \beta_{16} \ln Dist_{ji} + \beta_{17} Smctry_{ji} + \varepsilon_{jit}\end{aligned} \quad (1)$$

where

j : Home/the OECD country

i : Host country

t : Year

$OECDOFDIF_{jit}$: FDI flow from the OECD country j to a host country i in year t

$COFDIF_{it}$: FDI flow from China to a host country i in year t

$RGDP_{it}$: Real GDP of a host country i in year t

$RGDPPC_{it}$: Real GDP per capita of a host country i in year t

$\mathrm{Re}\, sources_{it}$: Natural resources abundance of a host country i in year t

$Techno \log y_{it}$: Technology level of a host country i in year t

$RGDP_{jt}$: Real GDP of the OECD country j in year t

$RGDPPC_{jt}$: Real GDP per capita of the OECD country j in year t

$\mathrm{Re}\, sources_{jt}$: Natural resources abundance of the OECD country j in year t

$Techno \log y_{jt}$: Technology level of the OECD country j in year t

$Exch_{jit}$: Bilateral real exchange rate between the OECD country j and a host country i in year t

$Area_{ji}$: Product of land areas of the OECD country j and a host country i

$Colony_{ji}$: Binary dummy, which is 1 if there was ever a colonial relation between the OECD country j and a host country i, and 0 otherwise.

$Comcol_{ji}$: Binary dummy, which is 1 if the OECD country j and a host country i were ever colonised by the same coloniser, and 0 otherwise.

$ComLag_{ji}$: Binary dummy, which is 1 if the OECD country j and a host country i share the same language, 0 otherwise.

$Contig_{ji}$: Binary dummy, which is 1 if the OECD country j and a host country i are contiguous, 0 otherwise.

$Dist_{ji}$: Distance between an OECD country j and a host country i.

$Smctry_{ji}$: Binary dummy, which is 1 if the OECD country j and a host country i were ever the same country, 0 otherwise.

ε_{jit} : Error term

In terms of the host country's and home country's characteristics, real GDP is a commonly used proxy to measure market size. On the demand side, OFDI closely relates to the market-seeking motivation (Dunning, 1993, 1998) and a larger GDP implies a bigger market and more opportunities. On the supply side, an increase in a home country's GDP implies a bigger capability to conduct OFDI. Following Braconier et al. (2002), a host country's and a home country's real GDP has been included to distinguish between a host country's and a home country's characteristics.

GDP per capita, another commonly used indicator for market size, is introduced to identify the economic development effect on the OFDI decision. In terms of the host country, GDP per capita consists of the market-seeking motivation, and a higher value is acknowledged with a better economic environment and greater market potential. Following Lipsey (1999) and Lane (2000), GDP per capita is used to capture the host country's economic condition. In terms of the home country, Dunning (1981b, 1995) and Dunning et al. (2001) have illustrated a country's investment development path which closely depended on the GDP per capita, therefore, the home country's real GDP per capita has also been included. Together with real GDP, real GDP per capita was selected to control the host country's and the home country's market effects.

Given the importance of natural resources and technology to China's OFDI, as found in previous chapters, they have also been included as control variables for both host counties and home countries into this chapter. Similarly to

previous chapters, the natural resource abundance is measured by the sum of the fuels' and ores' and metals' share in merchandise exports. High-technology level is measured by the share of high-technology exports in manufactured exports.

In terms of the host-home country pair characteristics, the bilateral exchange rates have been acknowledged as an important determinant of the OFDI decision by Froot and Stein (1991); however, there is little consensus about the relationship between the bilateral exchange rate and bilateral FDI. On the one hand, Froot and Stein (1991) argued that internal financing is cheaper than external financing in an imperfect capital market, and the appreciation of the home currency strengthens overseas activities by increasing wealth in the home country and reducing costs in the host country. Goldberg and Klein (1998) have alternatively indicated that the depreciation of the host currency would attract more investment, because the operation cost was lower and the capital return was higher. On the other hand, other researchers argue that the appreciation of the home country's currency may decrease OFDI. Cushman (1985) and Summary and Summary (1995) argued that if the home country's subsidiary needed to import intermediate goods from the home country, the appreciated home country's currency would make the imports more expensive and thus reduce OFDI. Similarly, Goldberg and Klein (1998) also indicated that the depreciation of the home country's currency increased OFDI. The depreciated home country's currency made its exports cheaper and the host country imported more of them. The larger volume of imports raised the risk of

increasing the tariff in the future. Thus, the home country would increase tariff-jumping OFDI based on this expectation.

There is a wide range of variables that are used to measure bilateral economic friction. The analysis in this chapter follows the literature in selecting commonly used measurements such as distance, colonial relation and common language and so on.

5.3.2 Benchmark Estimation Methods

A natural starting point for estimating Equation (1) is pooled ordinary least square (POLS). POLS relies on both the between and within variation. It has a constant intercept; in other words, it does not distinguish country effects from different countries in the same period and does not distinguish time effects from different time periods for the same country. Given the possibility that unobserved effects are correlated with explanatory variables, POLS leaves all unobserved effects into the idiosyncratic error term, and its estimators are biased and inconsistent.

The omission of unobserved heterogeneity is remedied by the fixed effects model (FE), which includes country effects, time effects or both. FE can be implemented by two alternative strategies. Firstly, the first difference model (FDM), which 'differences out' the unobserved heterogeneity by taking the first difference and it relies on the within variation solely. The drawback of the FDM is that it introduces an autocorrelation bias, which is caused by the co-existence of current and lagged error terms. This serially correlated error

violates the classical linear regression assumption. Another downside is that the FDM does not efficiently use time information (e.g. a one period lagged difference can be replaced by a two periods lagged difference). Secondly, a least squares dummy variables (LSDV) estimation generates dummy variables to capture unobserved effects and allows the intercept to vary with country and time. It is used in this chapter because it is easy to interpret with the correct test statistics, and the individual effect is reported.

A follow-up question concerns how to introduce the individual effects. Brainard (1997) controlled host country fixed effects (one-way FE), Feinberg and Keane (2001) controlled affiliate fixed effects and time effects (two-way FE) and Braconier et al. (2002) controlled the time effects, home country fixed effects, home country fixed effects and home country-by-host country pair fixed effects (three-way FE). The subsequent analysis starts from a simple two-way FE (FE1) by controlling three sources of unobserved heterogeneity: time trend *Trend*, host country fixed effects η_i and home country fixed effects η_j. These three heterogeneous components combine to illustrate the unspecified combination of China's OFDI, host country characteristics, home country characteristics, time effects and the pairwise relation between the OECD and host country. Integrating these fixed effects with POLS, FE1 is given by:

$$\begin{aligned}\ln OECDOFDIF_{jit} = {} & \beta_1 \ln COFDIF_{it} + \beta_2 \ln RGDP_{it} + \beta_3 \ln RGDPPC_{it} \\ & + \beta_4 \mathrm{Re}\, sources_{it} + \beta_5 Techno \log y_{it} + \beta_6 \ln RGDP_{jt} \\ & + \beta_7 \ln RGDPPC_{jt} + \beta_8 \mathrm{Re}\, sources_{jt} + \beta_9 Techno \log y_{jt} \\ & + \beta_{10} \ln Exch_{jit} + \beta_{11} \ln Area_{ji} + \beta_{12} Colony_{ji} + \beta_{13} Comcol_{ji} \\ & + \beta_{14} ComLag_{ji} + \beta_{15} Contig_{ji} + \beta_{16} \ln Dist_{ji} + \beta_{17} Smctry_{ji} \\ & + \beta_{18} Trend + \eta_i + \eta_j + \varepsilon_{jit}\end{aligned} \tag{2}$$

The interested coefficient is still β_1, which presents the effect of China's OFDI on the OECD country *j*'s OFDI in a host country *i*. *Trend* is time trend to present time effects. η_i and η_j are dummies to capture host country's fixed effects and home country's fixed effects respectively.

It is reasonable to believe that the pairwise relationship between the host country and home country plays an important role in allocating OFDI; however, this unobserved heterogeneity cannot be completely controlled by the variables used in FE1. Therefore, the country pair dummy η_{ji} is integrated into the Equation (2) and FE2 takes the new expression as:

$$\begin{aligned}\ln OECDOFDIF_{jit} = {} & \beta_1 \ln COFDIF_{it} + \beta_2 \ln RGDP_{it} + \beta_3 \ln RGDPPC_{it} \\ & + \beta_4 \mathrm{Re}\, sources_{it} + \beta_5 Techno \log y_{it} + \beta_6 \ln RGDP_{jt} \\ & + \beta_7 \ln RGDPPC_{jt} + \beta_8 \mathrm{Re}\, sources_{jt} + \beta_9 Techno \log y_{jt} \\ & + \beta_{10} \ln Exch_{jit} + \beta_{11} Trend + \eta_{ji} + \varepsilon_{jit}\end{aligned} \tag{3}$$

The interested coefficient is still β_1, which presents the effect of China's OFDI on the OECD country *j*'s OFDI in a host country *i*. Equation (3) is also a two-

way FE that controls two sources of unobserved heterogeneity: time trend *Trend* and country pair dummy η_{ji}.

5.3.3 IV Estimation

Standard panel estimations rest on the strong assumption of exogeneity and estimations are unbiased only if China's OFDI is an exogenous variable. The question here remains as to whether the OECD's OFDI is truly correlated with China's OFDI, or whether the estimation has resulted in a spurious correlation. The exogenous variable assumption is challenged by the fact that unobserved effects might simultaneously affect the OECD's and China's OFDI. In the current context, unobserved determinants left in the error term may simultaneously affect both the OECD's OFDI and China's OFDI flow to a third country. They may take the form of a common shock or policy change; for instance, a liberalisation of the host country's economic policy may simultaneously stimulate the OECD's and China's investment, while an economic recession may simultaneously reduce the OECD's and China's investments. FE estimations are under the risk of omitted variable bias; the exogenous variable assumption might be violated and the endogeneity bias emerges because of the correlation between China's OFDI and the residuals. The endogeneity bias triggered by the omitted variable, the simultaneity and the measurement error violates the exogeneity assumption and makes FE estimations of exogenous and endogenous regressors inconsistent. To identify the causal effect of China's OFDI on the OECD's OFDI, instrument variable (IV) estimation is used to correct the endogeneity bias, and the causal interpretation can be valid under the TSLS estimation. In the first stage,

exogenous IVs are included to estimate the predicted value of the endogenous variable, namely, China's OFDI in the host country. The standard TSLS technique includes not only the IVs but also all explanatory variables in the first stage. The predicted value of China's OFDI is included in the second stage regression to get consistent estimators.

The IV estimator is less efficient than a conventional FE estimator and the TSLS estimation is redundant if the suspicious independent variable is in fact exogenous; therefore, an endogeneity test should be conducted first. A formal test is carried out with the null hypotheses that the suspicious regressor is in fact exogenous, and the rejection accepts the alternative hypotheses that it is endogenous. This endogeneity test is robust to the violation of the homoskedasticity assumption.

The validity of the IV crucially depends on two conditions, one is the 'instrument relevance' that a high correlation between the excluded IV and the endogenous variable, and the other is the 'instrument exogeneity' that the zero correlation between the excluded IV and residuals. In terms of the first condition, the instrument relevance, the underidentification illustrates that coefficients are not identified when the number of endogenous variables exceeds the number of IVs. In the heteroskedasticity-adjusted estimation context, the Kleibergen-Paap test is introduced to test the underidentification and the rejection implies the excluded IV is relevant. Hall et al. (1996) further indicated that the rejection of underidentification did not necessarily imply a high relevance, and the weak identification arose when the excluded IV was

weak and poorly correlated with the endogenous variable. Stock et al. (2002) pointed out that the weak IV generated a series of problems such as explaining little variation in the endogenous variable, biasing the estimation and dissatisfying the asymptotic approximation. The first-stage F-statistic was facilitated to examine the weakness of IV, with the null hypotheses that the coefficient of excluded IV was zero and the IV was irrelevant; thus, it was safe to conclude the IV was not weak if the F-statistic exceeded 10. In terms of the second condition, the instrument exogeneity, it is only assumed under the exact identification when the number of endogenous variables equals the number of IVs, however, this condition can be tested when the coefficient is over identified and the acceptance of overidentification implies the excluded IVs are exogenous. In the heteroskedasticity-adjusted estimation context, Hansen's J-statistic is used to test the overall exogeneity of all IVs. The null hypotheses assumes IVs are not correlated with residuals, and the acceptance of the null hypotheses confirms that IVs are valid. In addition, Baltagi and Griffin (1997) claimed the TSLS estimation associated with controlling fixed effects was preferable, because the control of unobserved heterogeneity reduced the risk of correlation between fixed effects and other regressors. The TSLS estimation with fixed effects has a further advantage that it consists of the benchmark estimations of FE1 and FE2.

Choice of IVs

The precision of TSLS estimation lies in the appropriateness of IVs. An appropriate IV should not only be econometrically valid but also economically justifiable. The question here remains whether the causal effect of China's

OFDI on the OECD's OFDI, after controlling heterogeneity bias, connects to the relation between China's OFDI and IVs. Following Greenaway, Mahabir and Milner (2008), the logarithm of China's distance to a third country ($lnChinaDist_i$) was chosen as the first IV. The logarithm of China's bilateral real exchange rate with a third country ($lnChinaExch_{it}$) was also chosen as the second IV to instrument China's OFDI. The advantage of selecting $lnChinaExch_{it}$ as an IV is that its value changes with the host country as well as with time, unlike Greenaway, Mahabir and Milner (2008) and Eichengreen et al. (2007), who selected China's GDP, which only changed with time, therefore, the IV selected in this study provides more variations. This section explains the economic rationale behind the satisfaction of instrument relevance and instrument exogeneity for these two IVs.

The gravity model provided the first IV, which was China's distance to a third country (Greenaway, Mahabir and Milner, 2008; Eichengreen et al., 2007), and the relationship between China's OFDI in a host country and its distance from China could be negative or positive. On the one hand, Buckley and Casson (1981) illustrated that OFDI increased with distance. Exports reduced with distance because of the increased trade cost; however, OFDI increased with distance as a substitute to exports. On the other hand, Zhang (2009) and Buckley et al. (2007) found that OFDI decreased with distance because of the increased cost.

Further, a second IV should be included to overidentify the IVs' coefficients, otherwise the exact justification implies the IV's exogeneity is only assumed

and cannot be tested. China's bilateral real exchange rate is defined as the units of a host country's currency per Chinese Yuan. An increase in China's bilateral real exchange rate implies the Yuan's appreciation and a decrease refers to Yuan's depreciation, so the logarithm of China's bilateral real exchange rate was chosen as a second IV. The relation between the bilateral exchange rate and FDI has been well documented from three aspects, including the change in the value of the exchange rate, the volatility of the bilateral exchange rate and the expectation of the exchange rate. The first strand of literature has examined impacts on the home currency's appreciation and the host currency's depreciation on FDI flows, as in Froot and Stein (1991), Klein and Rosengren (1994) and Blonigen (1997). The second strand has investigated the response of FDI to a major change in the exchange rate in the event of a currency crisis as in Lipsey (2001) and Desai et al. (2004). The final strand of literature has studied the responses of OFDI decisions to an expectation of exchange rate, as in Campa (1993) and Goldberg and Kolstad (1995).

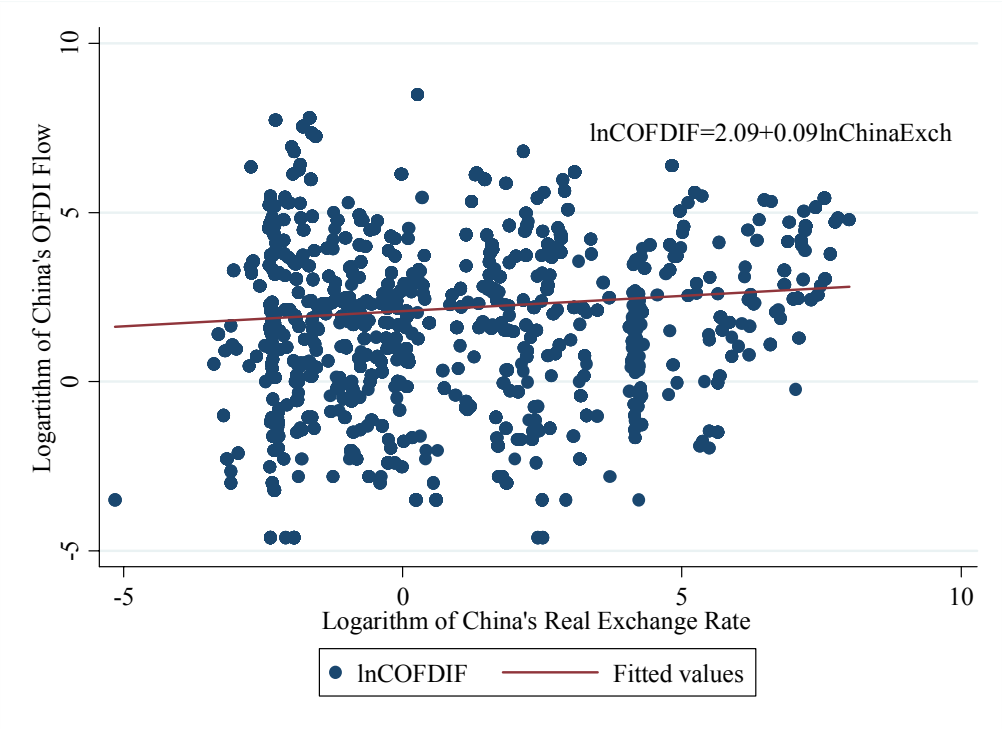
Instrument Relevance and Instrument Exogeneity

The appropriateness of the second IV, China's bilateral real exchange rate, is further justified from two aspects which are the instrument relevance and the instrument exogeneity.

Firstly, to preliminarily inspect the instrument relevance between China's OFDI and China's bilateral real exchange rate, Figure 5.2 provides a scatter plot of China's OFDI and China's bilateral real exchange rate, and a plausible correlation emerged. A rise in China's bilateral real exchange rate implied the

appreciation of Yuan and resulted in an increase in China's OFDI. Of course, the unobserved heterogeneity affects the displacement effect, and hence the home country's fixed effects and time effect have been controlled by adding the home country dummies and time trend.

Figure 5.2: Relation between China's Bilateral Real Exchange Rate and OFDI



Note: China's bilateral real exchange rates with host countries are calculated by myself. Regression results are significant at the 1%.
Data sources: MOFCOM (2009) and World Bank's *World Development Indicators* (various years).

Secondly, the instrument exogeneity implies zero correlation between the change in Yuan and the OECD's OFDI; however, this exclusion restriction might be violated if the IV (China's bilateral real exchange rate) correlates with other unobservable factors which also affect OECD's OFDI. For example, the US dollar depreciates against Chinese Yuan and it also depreciates against the host country's currency at the same time. Therefore, the IV is only valid when

the exclusion restriction assumption holds and the result obtained crucially depends on the assumption of the validity of the IV. To account for this possibility, the analysis also explicitly control for the logarithm of the OECD's real exchange rate with a third country.[57] In addition, China's foreign exchange reforms in 2005 function as an exogenous shock which improves the instrument exogeneity, because the change in China's exchange rate policy should have little impact on the OECD's exchange rate with the host country.

Overall, the distance from China to a third country as well as the real exchange rate between Chinese Yuan and a third country's currency are potentially valid IVs. The validity of these two instruments can be examined by the value of first-stage F-statistic (e.g. bigger than 10), the rejection of the Kleibergen-Paap underidentification test and the failure of rejecting Hansen J-statistic overidentification test. The results of these tests will be shown in Section 5.5.

5.4 Data and Summary Statistics

5.4.1 Data

Data Source

The OECD's bilateral country-level OFDI flow data are obtained from the OECD *International Direct Investment Statistics* and are reported in millions of US dollars. China's bilateral country-level OFDI data are obtained from the Ministry of Commerce (MOFCOM) (2009) *Statistical Bulletin of China's Outward Foreign Direct Investment*. Real GDP and real GDP per capita for both home and host countries are obtained from the World Bank's *World*

[57] The inclusion of the OECD's real exchange rate further ensures the comparability between the TSLS estimation and the benchmark estimations FE1 and FE2.

Development Indicators, but are deflated to constant 2000 US dollar prices. The natural resources abundance and technology level are calculated by the author based on the World Bank's *World Development Indicators.* The bilateral real exchange rate between the OECD countries and the host countries are also calculated from World Bank's *World Development Indicators,* as well as the bilateral real exchange rate between China and host countries.[58] Data on distance, land area, landlocked, colony, common colony, common language, same country and contiguity are collected from the CEPII *Distances Database* (CEPII, 2010).

Data Construction and Cleaning

Based on the above sources, a panel dataset of OFDI flow between 155 host countries and 33 OECD home countries during the period 2003–2009 was constructed. Country lists of the host and home countries are reported in Table H1 and Table H2 in Appendix H respectively. Mexico was dropped from the home country list because of missing OFDI data from the OECD *International Direct Investment Statistics*.

The dataset was cleaned by the following three steps. Firstly, observations with negative or missing OFDI flow values are dropped. Secondly, the data of the Cayman Islands, British Virgin Islands, Hong Kong and Macao are dropped

[58] Subject to the data availability, there is no direct quotation for the bilateral real exchange rates for this dataset. Alternatively, the bilateral real exchange rates are calculated from following two steps. Firstly, a country's nominal exchange rate is measured by how many local currency units (LCU) per US$, and it is obtained from the World Bank's *World Development Indicators*. Then, the real exchange rate is calculated by deflating the nominal exchange rate with the consumer price index (CPI), which is also obtained from the World Bank's *World Development Indicators*. And secondly, the bilateral real exchange rate between an OECD country and a host country is calculated from the ratio of the OECD country's real exchange rate over the host country's real exchange rate. A similar calculation is also applied to calculate the bilateral real exchange rate between China and the host country.

because they are acknowledged as tax havens and suffer from the 'round tripping' FDI problem. Finally, the dependent variable, the OECD's OFDI, was winsorised at the 1% in two tails of the distribution. Winsorisation is a systematic approach to remove outliers and so any observation beyond the computed critical value was deleted. The cleaned dataset includes 9283 observations and accounts for 76.34% of the OECD's initial total OFDI flow value.

5.4.2 Summary Statistics

Table 5.1 gives the summary statistics of all variables used in FE1, FE2 and TSLS. They include the OECD's OFDI, China's OFDI, the host country's characteristics, the home country's characteristics, the bilateral characteristics and IVs.

Table 5.1: Summary Statistics (33 OECD countries, 155 host countries, 2003–2009)

Variable	Obs.	Mean	S.D.	Minimum	Maximum
lnOECDOFDIF	9283	3.47	2.902	-3.817	9.744
lnCOFDIF	7111	2.052	2.468	-4.605	8.478
Host country's characteristics					
lnRGDP	8958	11.329	2.03	4.776	16.3
lnRGDPPC	8958	8.587	1.508	4.419	11.326
Resources	8026	0.232	0.259	0	0.997
Technology	8115	0.13	0.13	0	0.997
Home country's characteristics					
lnRGDP	9235	12.867	1.703	8.865	16.258
lnRGDPPC	9235	9.96	0.617	8.307	10.944
Resources	8841	0.093	0.091	0.006	0.751
Technology	9032	0.168	0.089	0.015	0.571
Bilateral Characteristics					
lnExch	7776	1.039	3.462	-8.295	17.781
lnArea	9218	24.254	2.896	11.828	32.719
Colony	9218	0.067	0.249	0	1
Comcol	9198	0.005	0.068	0	1
Comlang	9218	0.099	0.298	0	1
Contig	9218	0.049	0.216	0	1
lnDist	9218	8.202	1.045	4.088	9.885
Smctry	9218	0.014	0.118	0	1
Instruments					
lnChinaDist	9283	8.931	0.553	6.733	9.857
lnChinaExch	8226	0.048	2.612	-5.148	15.071

Notes: Obs. = number of observations. S.D. = standard deviation. Values are measured in current prices in million US dollar (OECDOFDIF, COFDIF); in 2000 price US dollar (RGDP, RGDPPC); in percentage (Resources, Technology); in units of local currency per the OECD's and China's currency (Exch, ChinaExch); in KM (ChinaDist, Dist); in KM^2 (Area); in binary value (Colony, Comcol, Comlang, Contig, Smctry).
Data sources: the OECD *International Direct Investment Statistics*, MOFCOM (2009), World Bank's *World Development Indicators* (various years), and CEPII (2010).

5.5 Results and Discussions

5.5.1 Baseline Results

An estimation was firstly made of the benchmark models FE1 and FE2 for the whole sample. These results are presented in columns (1) and (3) in Table 5.2a respectively.

Table 5.2a: Results of FE and TSLS for the Whole Sample

Dependent:	FE1		FE2		TSLS	
	(1)	(2)	(3)	(4)	(5)	(6)
lnOECDOFDIF	Coefficient	S.E.[1]	Coefficient	S.E.[1]	Coefficient	S.E.[1]
lnCOFDIF	0.022	(0.021)	0.011	(0.017)	-0.344***	(0.080)
Host Country Characteristics						
lnRGDP	-1.177	(1.511)	-0.848	(1.222)	0.697***	(0.055)
lnRGDPPC	1.691	(1.552)	2.758**	(1.272)	0.191***	(0.039)
Resources	0.902	(0.879)	1.136	(0.725)	0.524**	(0.216)
Technology	0.772	(0.842)	0.640	(0.681)	2.617***	(0.324)
Home Country Characteristics						
lnRGDP	-1.144	(2.953)	-1.158	(2.707)	0.194	(3.317)
lnRGDPPC	6.965**	(2.918)	5.839**	(2.688)	4.735	(3.277)
Resources	-2.921*	(1.619)	-0.0487	(1.332)	-3.089	(1.909)
Technology	1.594*	(0.855)	0.867	(0.696)	1.458	(0.948)
Bilateral Characteristics						
lnExch	-0.182	(0.186)	-0.229	(0.154)	-0.048***	(0.016)
lnArea	1.329	(1.490)			0.059**	(0.026)
Colony	0.696***	(0.113)			0.675***	(0.130)
Comcol	2.293***	(0.602)			2.996***	(0.450)
Comlang	0.301***	(0.097)			0.543***	(0.117)
Contig	0.238*	(0.141)			0.394***	(0.148)
lnDist	-1.048***	(0.048)			-0.680***	(0.051)
Smctry	-0.095	(0.267)			0.325	(0.319)
Host country dummy	Yes		No		No	
Home country dummy	Yes		No		Yes	
Time trend	Yes		Yes		Yes	
Host–home dummy	No		Yes		No	
Number of obs.	5091		5105		5091	
Adj. R2	0.673		0.833		0.512	
Endogeneity test					46.331	
p-value					0.000	
First stage F-Stat					89.390	
Kleibergen-Paap rk					141.033	
p-value					0.000	
Hansen J-Stat					0.002	
p-value					0.968	

Notes: [1] Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 5.2b: First Stage Estimation of TSLS for the Whole Sample

Dependent:	TSLS	
	(1)	(2)
lnCOFDIF	Coefficient	S.E.[1]
Host Country Characteristics		
lnRGDP	0.427***	(0.032)
lnRGDPPC	0.005	(0.039)
Resources	1.995***	(0.127)
Technology	1.173***	(0.277)
Home Country Characteristics		
lnRGDP	1.128	(3.039)
lnRGDPPC	-1.778	(3.081)
Resources	-0.429	(1.900)
Technology	-0.683	(0.801)
Bilateral Characteristics		
lnExch	-0.159	(0.483)
lnArea	0.146***	(0.027)
Colony	0.370**	(0.127)
Comcol	0.574	(0.471)
Comlang	0.482***	(0.119)
Contig	0.323**	(0.146)
lnDist	0.455***	(0.035)
Smctry	-0.178	(0.341)
Excluded Instrument Variables		
lnChinaDist	-0.788***	(0.059)
lnChinaExch	0.172	(0.483)
Host country dummy	No	
Home country dummy	Yes	
Time trend	Yes	
Host–home dummy	No	
F test of excluded instruments	89.390	
p-value	0.000	

Notes: [1] Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

FE1's estimation in column (1) in Table 5.2a has a relatively high explanation power with an adjusted R-square of 0.673. The main interested variable, China's OFDI, presents an insignificant correlation with the OECD's OFDI, which suggests that the change in China's OFDI does not affect the OECD's OFDI. None of the host countries' characteristics is significant but the interpretation of this insignificance needs to be treated with caution, because FE estimations may be biased because of potential endogeneity. In terms of the home countries' characteristics, the OECD countries' real GDP is insignificant; however, the real GDP per capita, an alternative measure of market effect, is positive and significant at the 5% level. This significance consists of Dunning's investment development path approach, which states that the strength of OFDI is represented by GDP per capita and bigger GDP per capita refers to a greater capability to conduct OFDI. The home country's natural resources abundance negatively correlates with its OFDI and is merely significant at the 10% level, suggesting the natural resources self-sufficiency of the home country depresses the willingness to conduct OFDI in order to seek external natural resources. The home country's technology level promotes its OFDI; it is positive and significant at the 10% level. This finding is consistent with the technology-exploiting motivation; the higher technology level enhances the home country's firm-specific advantage and improves its competitiveness in a host country. The OECD's real exchange rate is insignificant and coincides with Blonigen (2005), who stated that the benefit of a change in a home country's currency offsets the cost of a lower return in the home country's currency and left the total rate of return unchanged. In terms of bilateral characteristics, the approximation measurement includes the colonial link, the same coloniser,

common language and the contiguity, which all positively correlate with the OECD's OFDI and are significant at or below the 10% level. This positive significance addresses the fact that the OECD's OFDI positively correlates with economic approximations. Bilateral distance negatively correlates with the OECD's OFDI and is significant at the 1%. FE2's estimation in column (3) in Table 5.2a, compared with FE1, improves the adjusted R-square to 0.833. As an alternative model to control unobserved heterogeneity, it also yields an insignificant correlation between China's OFDI and the OECD's OFDI in a given host country. The host country's real GDP per capita turns out to be positive and significant at the 5% level. This significance confirms the market-seeking motivation of the OECD's OFDI, and the change from insignificance in FE1 to significance in FE2 implies the estimation is sensitive to the control of host-home country pair characteristics. The home country's real GDP per capita maintains positive and significant at the 5% level.

The estimation result of TSLS is presented in column (5) in Table 5.2a. The negative and significant coefficient of the main interested variable, China's OFDI, might indicates the failure of the exogeneity assumption and implies that the estimations of FE1 and FE2 might be biased. This result is supported by the rejection of the endogeneity test. Further, a sufficiently large first-stage F-statistic (bigger than 10) indicates that the IVs are strong and the instrument relevance is high. The Kleibergen-Paap rk test provides an additional check for the underidentification, a strong rejection implies that the IVs are relevant. Finally, the failure to reject the Hansen overidentification test ensures that the IVs are uncorrelated with residuals, and the instrument exogeneity is confirmed.

Overall, the estimation passes all tests and the TSLS estimation has a valid causal interpretation. The main interested variable, China's OFDI, is negative and significant at the 1% level. The causal effect suggests that a 10% rise in China's OFDI causes a 3.44% decrease in the OECD's OFDI. The correction of endogeneity bias improves the significance of the estimation. The host country's market effect measurements, real GDP and real GDP per capita, are both positive and significant at the 1% level. Their significance confirms that the OECD's OFDI is largely driven by the market-seeking motivation as demonstrated by Dunning (1993, 1998). The host country's natural resources abundance is positive and significant at the 5% level, this significance implies that the natural resources-seeking motivation also drives the OECD's OFDI. The host country's high-technology level is positive and significant at the 1% level. This finding supports the technology-seeking motivation illustrated by Driffield and Love (2003), Fosfuri and Moptta (1999) and Kogut and Chang (1991). The OECD's OFDI is driven to technologically superior economies, and 'reverse spillovers' ensure that the OECD's subsidiary and the parent company benefit from the foreign technology (Driffield and Love, 2003). The OECD's real exchange rate is negative and significant, and consists of the literature's findings. Table 5.2b presents the result of the first stage regression of TSLS for China's OFDI. Although the first IV, China's distance to a third country (*lnChinaDist*), is negative and significant at the 1% level, the second IV, China's bilateral real exchange rate (*lnChinaExch*), is positive but insignificant. The insignificance of IV might imply that the finding of the displacement effect in column (5) in Table 5.2a depends on the validity of IV.

Overall, there is no evidence of the displacement effect of China's OFDI on the OECD's OFDI in FE estimations because of the endogeneity bias. There is evidence of the displacement effect in the TSLS estimation after correcting for the endogeneity bias, but the finding depends on the validity of IV. To further investigate this displacement effect and coincide with the interests in previous chapters, in the following sections, the whole sample is split by using different criteria including natural resources abundance, income level and continental location of host countries, home countries and host-home country pairs respectively.

5.5.2 The Effect of the Host Country's Characteristics

The Effect of the Host Country's Natural Resources Abundance

Given the findings of Chapter 3 that Chinese OFDI is largely driven by the host country's natural resources abundance including oil and metal, a follow-up question is whether the displacement effect of China's OFDI on the OECD's OFDI in a host country is conditional on the oil/metal abundance. The whole sample has been split into oil/metal abundant countries and countries that are less abundant in oil/metal.[59]

The variation of the displacement effect with the oil abundance of the host country is first presented in Table 5.3.

[59] Oil abundance is defined by the share of oil's production in GDP, as it was in Chapter 3. A host country is oil abundant if this share exceeds its median value; otherwise, it is less oil abundant. Metal abundance is defined by the share of ores and metal exports in merchandise exports, as it is in the World Bank *World Development Indicators* (various years) and Chapter 3. A host country is metal abundant if this share exceeds its median value; otherwise, it is less metal abundant.

Table 5.3: Estimations for Oil Abundant and less Oil Abundant Host Countries

Dependent:	FE1		FE2		TSLS	
	(1)	(2)	(3)	(4)	(5)	(6)
		Less		Less		Less
lnOECDOFDIF	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant
lnCOFDIF	0.049*	-0.019	0.045**	-0.030	-0.051	-0.653**
	(0.028)	(0.031)	(0.021)	(0.028)	(0.059)	(0.266)
Host country dummy	Yes		No		No	
Home country dummy	Yes		No		Yes	
Time trend	Yes		Yes		Yes	
Host–home dummy	No		Yes		No	
Control variables	Yes		Yes		Yes	
Number of obs.	2790	2301	2803	2302	2790	2301
Adj. R^2	0.659	0.707	0.815	0.850	0.610	0.446
Endogeneity test					5.584	14.500
p-value					0.018	0.000
First stage F-Stat					135.100	11.410
Kleibergen-Paap rk					220.300	19.450
p-value					0.000	0.000
Hansen J-Stat					0.602	1.575
p-value					0.438	0.209

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

For oil abundant countries (columns (1), (3) and (5)) in Table 5.3, interestingly, there is no evidence of the displacement effect. Although the coefficient of the main interested variable, China's OFDI, is positive and significant for the FE1 and FE2 estimations (columns (1) and (3)), this positive significance could be biased because of the endogeneity. These biased FE estimations are confirmed in the TSLS estimation results (column (5)), where the endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly yield a valid causal interpretation in the TSLS estimations. The causal effect implies that a rise in China's OFDI will not cause a significant decline in the OECD's OFDI in oil abundant countries for two reasons. Firstly, Chen (2008) argued that China's presence was resisted by the West in these oil abundant economies. China's oil companies were unable to penetrate the most easily extractable countries because the West had a long held dominance. For instance, Saudi Arabia has a very long and close relationship with the West and oil plays a

significant role in this bilateral relationship. The US recognised Saudi Arabia's government in 1931, and two years later, a US oil company, Standard Oil, conducted its first investment in Saudi Arabia. World War II revealed the importance of oil and the vulnerability of oil production facilities; thus, the US established permanent military cooperation with Saudi Arabia in 1951 to protect its oil interests. This strategic relationship between the US and Saudi Arabia grew closer during the Cold War in order to protect their mutual interests from the Soviet Union. The oil crisis in the 1970s and the Gulf War in the 1990s further developed this strategic relationship. The biggest ever sale of weapons to Saudi Arabia in American history in 2010 is symbolic of these further improvements in their relationship. By contrast, the short history of the Chinese-Saudi relationship has served to limit China's OFDI in the kingdom, especially in the oil industry. Bilateral diplomatic relations between the two countries were only established in June 1990, more than half a century later than that of the US. The relationship between China and Saudi Arabia has only grown close relatively recently, following the first visit of the king of Saudi Arabia to China in 2006. Secondly, China's OFDI in other oil-rich countries that have been placed under punitive sanction regimes by the West has little impact on the OECD's OFDI in these countries. For instance, Iran has had a poor economic and diplomatic relationship with the US since 1979. The Iranian Revolution and the Iranian hostage crisis led to mutually enmity in the American–Iranian relationship in all areas. Since 1995, economic sanctions have prohibited all business connections between American companies and Iran. Additionally, the Iran and Libya Sanctions Act has imposed millions of dollars in sanctions on non-American oil and natural gas companies since 1996.

The 'Axis of Evil' speech and the Iranian nuclear programme further prohibit investment between the OECD and Iran. It is therefore obviously the case that China's investment in these countries has had, and will continue to have, little impact on the OECD's investments in these countries, which are prohibited. Given the limited scale of China's OFDI stock in oil abundant countries, the rapid expansion of China's OFDI is still not large enough to displace the OECD's OFDI in these countries.

The estimations of FE1, FE2 and TSLS for countries that are less abundant in oil are presented in columns (2), (4) and (6) in Table 5.3 respectively. There is evidence of a displacement effect in the TSLS estimation (column (6)) and it is significant at the 5% level. The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm a valid causal interpretation in TSLS estimations. China's OFDI has a causal effect on the OECD's OFDI in less oil abundant countries; a 10% rise in China's OFDI will cause the OECD's OFDI to decrease by 6.53%. This displacement effect can be explained as the result of market competition. The market-seeking motivation drives not only China's OFDI but also the OECD's OFDI, and this enhanced competition results in this displacement effect.

Further, the variation of the displacement effect with the metal abundance of the host country is examined, estimations in Table 5.4 yield similar results.[60]

[60] The interpretation of the insignificant displacement in metal abundant countries needs to be treated with caution because of the failure to reject the endogeneity test.

Table 5.4: Estimations for Metal Abundant and less Metal Abundant Host Countries

Dependent:	FE1		FE2		TSLS	
	(1)	(2)	(3)	(4)	(5)	(6)
lnOECDOFDIF	Abundant	Less Abundant	Abundant	Less Abundant	Abundant	Less Abundant
lnCOFDIF	0.006	0.017	0.008	0.007	0.151	-1.099***
	(0.034)	(0.029)	(0.027)	(0.023)	(0.118)	(0.192)
Host country dummy	Yes		No		No	
Home country dummy	Yes		No		Yes	
Time trend	Yes		Yes		Yes	
Host–home dummy	No		Yes		No	
Control variables	Yes		Yes		Yes	
Number of obs.	2486	2623	2478	2627	2468	2623
Adj. R^2	0.661	0.700	0.833	0.844	0.624	0.201
Endogeneity test					0.000	88.391
p-value					0.985	0.000
First stage F-Stat					30.050	31.190
Kleibergen-Paap rk					55.740	54.600
p-value					0.000	0.000
Hansen J-Stat					0.860	0.647
p-value					0.354	0.421

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

There is no evidence of the displacement effect (columns (1)–(5)) except the TSLS estimation in countries that are less abundant in metal (column (6)) in Table 5.4. China's OFDI in countries that are less abundant in metal is negative and significant at the 1% level. The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm a valid causal interpretation. This result shows that China's OFDI has a causal effect on the OECD's OFDI in countries that are less abundant in metal; a 1% rise in China's OFDI will cause the OECD's OFDI to decrease by 1.1%. This significant displacement effect coincides with the above arguments that the rise in China's OFDI causes the OECD's OFDI to decrease in less oil abundant countries. The market-seeking motivation and market competition might jointly yield this significant displacement effect.

Overall, the estimations of TSLS indicate that China's OFDI displaces the OECD's OFDI in countries that are less abundant in natural resources rather than in natural resource abundant countries, and this displacement effect is consistent across oil and metal. This finding might initially be surprising, especially after addressing the importance of the natural resources-seeking motivation of China's OFDI in previous chapters and bearing in mind the oft-heard 'new colonialism' argument on China's overseas investments, but the above explanation indicates that the long held dominance of the West serves to restrict China's OFDI in natural resource abundant countries. Of course, China's OFDI might displace the OECD's OFDI in certain countries;[61] however, there is no systematic evidence of a displacement effect. The displacement effect in countries that are less abundant in natural resources is driven by the market-seeking motivation.

To examine this argument in detail, the whole sample is alternatively split according to the host country's income level and its continent in the following discussion to further investigate whether the displacement effect varies with other characteristics.

The Effects of Host Country's Other Characteristics

The host countries have been further split according to income level and continental location. The estimations based on these two criteria are expected to yield consistent results because these two classifications are closely related.

[61] Congressional Research Service (CRS) (2008) arguably illustrated an increase in China's OFDI but a decline in American OFDI in the Democratic Republic of Congo and Sudan.

High-income countries are generally located in Europe and North America and low-income countries largely exist in Africa and Latin America.

The whole sample was firstly split into high-income and low-income countries to examine whether the displacement effect varies with the income level of the host countries in Table 5.5.[62]

Table 5.5: Estimations for High-Income and Low-Income Host Countries

Dependent:	FE1		FE2		TSLS	
	(1)	(2)	(3)	(4)	(5)	(6)
lnOECDOFDIF	High	Low	High	Low	High	Low
lnCOFDIF	0.048*	-0.027	0.038*	-0.031	-0.532***	-0.014
	(0.027)	(0.030)	(0.022)	(0.026)	(0.165)	(0.064)
Host country dummy	Yes		No		No	
Home country dummy	Yes		No		Yes	
Time trend	Yes		Yes		Yes	
Host–home dummy	No		Yes		No	
Control variables	Yes		Yes		Yes	
Number of obs.	2528	2563	2541	2564	2528	2563
Adj. R^2	0.691	0.629	0.832	0.800	0.432	0.550
Endogeneity test					26.985	5.683
p-value					0.000	0.017
First stage F-Stat					20.170	132.800
Kleibergen-Paap rk					39.530	206.200
p-value					0.000	0.000
Hansen J-Stat					0.132	0.450
p-value					0.717	0.502

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 5.5 shows the estimation results for high-income host countries (columns (1), (3) and (5)). There is evidence of displacement in the TSLS estimation (column (5)). Although the coefficient of the main interested variable, China's OFDI, is positive for the FE1 and FE2 estimations (columns (1) and (3)), it is very marginal and merely significant at the 10% level. In addition, this marginally positive coefficient could be biased because of the endogeneity.

[62] The income level is measured by real GDP per capita. A host country is a high-income country if this value exceeds the median value; otherwise, it is a low-income country.

This is confirmed in the TSLS estimation result (column (5)), where the endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation has a valid causal interpretation. China's OFDI is negative and significant at the 1% level. The causal effect implies a 10% rise in China's OFDI will cause a 5.32% decline in the OECD's OFDI in high-income host countries. This displacement can be explained by the market competition between the OECD's OFDI and China's OFDI. As an important measure of the market effect, the host country's high income level would attract FDI in order to explore a big market. And China's market-seeking motivation is indirectly reflected in an empirical study that claimed that China's exports displace other Asian exporters' exports to high-income countries (Greenaway, Mahabir and Milner, 2008). In addition, the importance of the market-seeking motivation is jointly witnessed by China's export-oriented economy and a close relationship between China's OFDI and its exports.[63] Therefore, market competition results in a displacement effect of China's OFDI on the OECD's OFDI in high-income host countries.

Table 5.5 also shows the estimation results for low-income host countries (columns (2), (4) and (6)); there is no evidence of the displacement effect. The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation (column (6)) has a valid causal interpretation. The insignificant displacement effect implies that a rise in China's OFDI does not cause the OECD's OFDI to reduce in low-income host countries. Low-income host countries associated with small markets are not

[63] In 2009, the rent and business service industry, the wholesale and retail industry and the transportation industry occupied 36.2%, 10.8% and 3.7% of China's OFDI respectively. Overall, 50.7% of China's OFDI was directed to exports-related industries (MOFCOM, 2009).

preferable destinations for Chinese companies, and less competition between China's OFDI and the OECD's OFDI makes the displacement effect insignificant.

The displacement effect was found to be conditional on the income level of the host country, an examination was also made as to whether the host country's continent alters this displacement effect in Table 5.6.

Table 5.6: Estimations for the Host Country's Continental Location

Panel A	FE1			FE2		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent: lnOECDOFDIF	Asia	Africa+ O.+L.A.[1]	Europe +N. A.[2]	Asia	Africa+ O.+L.A.[1]	Europe +N. A.[2]
lnCOFDIF	-0.028	0.017	0.036	-0.010	0.014	0.017
	(0.039)	(0.033)	(0.031)	(0.034)	(0.031)	(0.024)
Host country dummy		Yes			No	
Home country dummy		Yes			No	
Time trend		Yes			Yes	
Host–home dummy		No			Yes	
Control variables		Yes			Yes	
Number of obs.	1285	1505	2301	1285	1509	2311
Adj. R^2	0.671	0.684	0.655	0.809	0.825	0.819

Panel B	TSLS		
	(7)	(8)	(9)
Dependent: lnOECDOFDIF	Asia	Africa+ O.+L.A.[1]	Europe +N. A.[2]
lnCOFDIF	-0.385**	-0.058	-0.355***
	(0.188)	(0.076)	(0.111)
Host country dummy		No	
Home country dummy		Yes	
Time trend		Yes	
Host–home dummy		No	
Control variables		Yes	
Number of obs.	1285	1505	2301
R^2	0.465	0.628	0.506
Endogeneity test	11.177	8.002	24.384
p-value	0.001	0.005	0.000
First stage F-Stat	26.590	75.470	35.280
Kleibergen-Paap rk	44.720	157.800	58.940
p-value	0.000	0.000	0.000
Hansen J-Stat	0.007	1.733	0.186
p-value	0.932	0.188	0.666

Notes: [1]Africa+Oceania+Latin America. [2]Europe+North America. Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 5.6 shows estimation results for Asia (columns (1), (4) and (7)). There is no evidence of the displacement effect in the FE1 and FE2 estimations (columns (1) and (4)). The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation (column (7)) has a valid causal interpretation. This displacement effect is significant at the 5% level, and a causal effect implies a 10% rise in China's OFDI will cause a 3.85% decrease in the OECD's OFDI in Asian host countries. Estimations for Europe and North America (columns (3), (6) and (9)) yield a similar result. There is no evidence of the displacement effect in the FE1 and FE2 estimations (columns (3) and (6)). The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation (column (9)) has a valid causal interpretation. This displacement effect is significant at the 1% level and a causal effect implies that a 10% rise in China's OFDI will cause a 3.55% decrease in the OECD's OFDI in European and North American host countries. These significant effects coincide with the above-mentioned argument, whereby the market-seeking motivation drives both Chinese and the OECD's OFDI to flow into big markets including Asia, Europe and North America.

By contrast, estimations for Africa, Latin America and Oceania (columns (2), (5) and (8) in Table 5.6) do not present a displacement effect. The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation (column (8)) has a valid causal interpretation. A causal effect implies that a rise in China's OFDI does not cause the OECD's OFDI to reduce in African, Latin American and Oceanian host countries. This

insignificant displacement effect can be explained by the joint effect of the natural resources-seeking and market-seeking motivations illustrated in Tables 5.3-5.5. The host countries located in these continents, especially Africa, are generally acknowledged as income low and natural resources abundant; thus, the market-seeking motivation is relatively weak, but the natural resources-seeking motivation is relatively strong for China's OFDI in Africa. Besada et al. (2008) have claimed that China's OFDI in Africa was primarily led to natural resources-rich countries. Cheung et al. (2011) have argued that energy abundance attracted more of China's overseas investments to Africa, a continent where Western countries have conventionally invested relatively small amounts in order to avoid risk. In contrast, the motivations of the OECD's overseas investments might be more diversified in these countries. Therefore, this differentiated motivation between China's OFDI and the OECD's OFDI result in an insignificant displacement effect.

Overall, this displacement effect is conditional on the host country's income level and continental location. The market-seeking motivation drives China's OFDI flow into high-income, Asian, European and North American host countries. There is no evidence of the displacement effect of China's OFDI on the OECD's OFDI in low-income, African, Latin American and Oceanian host countries.

5.5.3 The Effect of the Home Country's Characteristics

The displacement effect was found to vary with the host country's characteristics in the last section, a follow-up question is whether this displacement effect varies with the home country's characteristics. Similar to

the classifications of the host countries in the previous section, the home countries have also been split according to income level and continental location.[64]

The Effect of the Home Country's Income Level

The whole sample was firstly split into high-income and low-income home countries to examine whether this displacement effect varies with the income level of the home country in Table 5.7.[65]

Table 5.7: Estimations for High-Income and Low-Income Home Countries

Dependent:	FE1		FE2		TSLS	
	(1)	(2)	(3)	(4)	(5)	(6)
lnOECDOFDIF	High	Low	High	Low	High	Low
lnCOFDIF	0.014	0.022	0.001	0.018	-0.457***	-0.309***
	(0.025)	(0.034)	(0.021)	(0.031)	(0.118)	(0.118)
Host country dummy	Yes		No		No	
Home country dummy	Yes		No		Yes	
Time trend	Yes		Yes		Yes	
Host–home dummy	No		Yes		No	
Control variables	Yes		Yes		Yes	
Number of obs.	2735	2356	2749	2356	2735	2356
Adj. R^2	0.678	0.658	0.822	0.817	0.407	0.511
Endogeneity test					38.280	15.845
p-value					0.000	0.000
First stage F-Stat					43.260	41.420
Kleibergen-Paap rk					70.550	65.180
p-value					0.000	0.000
Hansen J-Stat					0.0001	0.105
p-value					0.990	0.745

Notes: Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 5.7 shows the estimation results for high-income home countries (columns (1), (3) and (5)). Just as Greenaway, Mahabir and Milner (2008) found that China's exports displaced the high-income exporter's exports, there is also evidence of the displacement effect in the TSLS estimation for high-

[64] The home countries are not split according to their natural resources abundance because this classification is relatively less important to investigate the displacement effect.
[65] Income level is measured by real GDP per capita. A home country is a high-income country if this value exceeds the median value; otherwise, it is a low-income country.

income home countries (column (5)). The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation has a valid causal interpretation. China's OFDI is negative and significant at the 1% level. The causal effect implies that a 10% rise in China's OFDI will cause a 4.57% decline in the high-income OECD countries' OFDI. Table 5.7 also shows the estimation results for the low-income OECD countries (columns (2), (4) and (6)). The TSLS estimation (column (6)) yields a different result from that of Greenaway, Mahabir and Milner (2008), who stated that China's exports did not displace the low-income exporter's exports. In contrast, there is still a significant displacement effect for the low-income OECD countries. The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation (column (6)) has a valid causal interpretation. The significant displacement effect implies that a 10% rise in China's OFDI causes a reduction in the low-income OECD countries' OFDI by 3.09%. These two significant displacement effects could also be the result of market competition between China's OFDI and the OECD's OFDI, as was illustrated in the previous section. Therefore, these findings suggest that this significant displacement effect is not conditional on the OECD's income level. To look into whether and how this displacement effect varies with income level in detail, the whole sample was further split according to both the host country's income level and the home country's income level in the following Section 5.5.4.

The Effect of the Home Country's Continent

Next, the whole sample was split according to the home country's continent to examine whether this displacement effect varies with the continent of the home country in Table 5.8.

Table 5.8: Estimations for the Home Country's Continental Location

Dependent:	FE1		FE2		TSLS	
	(1)	(2)	(3)	(4)	(5)	(6)
	Asia+	Europe+	Asia+	Europe+	Asia+	Europe+
lnOECDOFDIF	Oceania	N.A.[1]	Oceania	N.A[1]	Oceania	N.A[1]
lnCOFDIF	0.023	0.017	0.012	0.012	-0.370*	-0.376***
	(0.054)	(0.022)	(0.050)	(0.018)	(0.205)	(0.093)
Host country dummy	Yes		No		No	
Home country dummy	Yes		No		Yes	
Time trend	Yes		Yes		Yes	
Host–home dummy	No		Yes		No	
Control variables	Yes		Yes		Yes	
Number of obs.	692	4399	692	4413	692	4399
Adj. R^2	0.709	0.687	0.854	0.831	0.323	0.526
Endogeneity test					9.935	37.805
p-value					0.002	0.000
First stage F-Stat					14.720	68.410
Kleibergen-Paap rk					23.950	110.700
p-value					0.000	0.000
Hansen J-Stat					0.181	0.014
p-value					0.671	0.904

Notes: [1]Europe + North America. Robust standard errors are in parentheses. Significant at * 10%, ** 5% and *** 1%.

Table 5.8 shows the estimation results for Asian and Oceanian home countries (columns (1), (3) and (5)). There is evidence of displacement in the TSLS estimation (column (5)). The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation has a valid causal interpretation. China's OFDI is negative and significant at the 10% level. The causal effect implies a 10% rise in China's OFDI will cause a 3.70% decline in the Asian and Oceanian OECD countries' OFDI. Table 5.8 also shows the estimation results for the European and North American OECD countries (columns (2), (4) and (6)). There is also a

significant displacement effect in the TSLS estimation (column (6)). The endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic jointly confirm that the TSLS estimation (column (6)) has a valid causal interpretation. The significant displacement effect implies that a 10% rise in China's OFDI causes European and North American OECD countries' OFDI to reduce by 3.76%. It is not surprising to find consistent estimation results between Table 5.7 and Table 5.8, because the OECD countries in Europe and North America generally have higher incomes than countries in Asia and Oceania.

5.5.4 The Effect of the Host–Home Country Pair Characteristics

The findings reveal that the above-mentioned displacement effect varied with the host country's characteristics but did not vary with the home country's characteristics in previous two sections. The significant role played by the host country's natural resources abundance in Tables 5.3 and 5.4, the host country's income level in Table 5.5 and the home country's income level in Table 5.7 imply that these characteristics could be crossed to investigate whether the displacement effect of China's OFDI on the OECD's OFDI varies with these host-home country pair's joint effects. Therefore, the whole sample was further split by using two standards to measure the host–home country pair's characteristics. Firstly, income level is used as the single standard to examine whether the displacement effect varies with a combination of the host country's and the home country's income levels. Secondly, the host country's natural resources abundance together with the home country's income level are selected as the double standard to examine whether the displacement effect

varies with a combination of the host country's natural resources abundance and the home country's income level.

The Effect of the Host Country's and the Home Country's Income Levels

The displacement effect was firstly examined by using the single standard in Table 5.9; therefore, the whole sample is decomposed into four sub-samples reflecting the four possible combinations of high-income host country and high-income home country, high-income host country and low-income home country, low-income host country and high-income home country, and low-income host country and low-income home country.

Table 5.9: Estimations for the Host Country's and Home Country's Income Levels

Single Standard: Host Country's Income level + Home Country's Income Level			
Host Country + Home Country	FE1 (1)	FE2 (2)	TSLS (3)
(1) High Income + High Income	0.047	0.034	-0.423**
Number of obs.	*1338*	*1351*	*1338*
Endogeneity test p-value			*0.000*
First stage F-stat			*13.440*
Hansen J-Stat p-value			*0.284*
(2) High Income + Low Income	0.041	0.040	-0.678**
Number of obs.	*1190*	*1190*	*1190*
Endogeneity test p-value			*0.001*
First stage F-stat			*6.801*
Hansen J-Stat p-value			*0.548*
(3) Low Income + High Income	-0.036	-0.035	-0.041
Number of obs.	*1397*	*1398*	*1397*
Endogeneity test p-value			.
First stage F-stat			*72.090*
Hansen J-Stat p-value			.
(4) Low Income + Low Income	-0.013	-0.018	-0.0002
Number of obs.	*1166*	*1166*	*1166*
Endogeneity test p-value			*0.561*
First stage F-stat			*47.910*
Hansen J-Stat p-value			*0.497*

Notes: . is missing value because the TSLS estimation is possibly hindered by a singleton dummy variable. Significant at * 10%, ** 5% and *** 1%.

Table 5.9 presents the estimations of these four sub-samples (rows (1)–(4)) under FE1, FE2 and the TSLS estimation (columns (1)–(3) respectively). The joint examination of the endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic indicates that only the first sub-sample has a valid causal interpretation under the TSLS estimation (row (1) with column (3)). This displacement effect is significant at the 5% level. The causal effect implies that a 10% rise in China's OFDI will cause the high-income OECD's OFDI to reduce by 4.23% in high-income host countries. In a related study, Greenaway, Mahabir and Milner (2008) found that China's exports displaced high-income exporter's exports, and China's exports displaced other exporters' exports in high-income markets. The findings of this current analysis confirm their results with a more detailed specification. This significant displacement effect may imply head-to-head market competition between China's OFDI and the high-income OECD countries' OFDI in the high-income host country market. Although the displacement effect of China's OFDI on the low-income OECD countries' OFDI in the high-income host counties is also significant (row (2) with column (3)), the associated value of the first-stage F-statistic, which is 6.801 and smaller than 10, is too small to approve the existence of strong IV. This small value of the first-stage F-statistic indicates that this significant result might suffer from a weak IV estimation, therefore, this finding is not convincing.

The Effect of the Host Country's Natural Resources Abundance and the Home Country's Income Level

Now, an examination is made regarding the joint effect of the host country's natural resources abundance and the home country's income level by using the double standard in Table 5.10. As the host country's natural resources abundance is presented either by oil abundance or metal abundance, the whole sample could be split into eight sub-samples reflecting the eight possible combinations of oil abundant host country and high-income home country, less oil abundant host country and high-income home country, oil abundant host country and low-income home country, less oil abundant host country and low-income home country, metal abundant host country and high-income home country, less metal abundant host country and high-income home country, metal abundant host country and low-income home country, and less metal abundant host country and low- income home country.

Table 5.10 Panel A presents the estimations of the first four sub-samples with the combination of the host country's oil abundance and the home country's income level (rows (1)–(4)) under FE1, FE2 and the TSLS estimation (columns (1)–(3) respectively). The joint examination of the endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic indicates that there is no valid causal interpretation among these four sub-samples. Table 5.10 Panel B presents the estimations of the last four sub-samples (rows (5)–(8)) under FE1, FE2 and the TSLS estimation (columns (1)–(3) respectively). The joint examination of the endogeneity test, first-stage F-statistic, Kleibergen-Paap rk test and Hansen J-statistic indicates only two sub-samples have valid causal interpretations including the combination of a less metal abundant host country and high-income home country (row (6) with column (3)), and the combination

of a less metal abundant host country and low-income home country (row (8) with column (3)) under TSLS estimations. These findings are consistent with the finding in Table 5.4, which stated that China's OFDI displaced the OECD's OFDI in less metal abundant host countries in general. The advantage of this examination is that it extends the previous finding by pointing out that this market-seeking motivation driven displacement effect in less metal abundant host countries is not conditional on the OECD's income level.

Table 5.10: Estimations for the Host Country's Natural Resource Abundance and the Home Country's Income Level

Panel A. Double Standard: Host Country's Oil Abundance + Home Country's Income Level			
	FE1	FE2	TSLS
Host / Home	(1)	(2)	(3)
(1) Oil abundant + High Income	0.043	0.030	0.006
Number of obs.	*1520*	*1533*	*1520*
Endogeneity test p-value			*0.000*
First stage F-stat			*85.480*
Hansen J-Stat p-value			*0.000*
(2) Oil less abundant + High Income	-0.025	-0.020	-1.381**
Number of obs.	*1215*	*1216*	*1215*
Endogeneity test p-value			*0.000*
First stage F-stat			*3.839*
Hansen J-Stat p-value			*0.234*
(3) Oil abundant + Low Income	0.046	0.064*	-0.156
Number of obs.	*1270*	*1270*	*1270*
Endogeneity test p-value			*0.358*
First stage F-stat			*43.200*
Hansen J-Stat p-value			*0.000*
(4) Oil less abundant + Low Income	-0.023	-0.045	-0.132
Number of obs.	*1086*	*1086*	*1086*
Endogeneity test p-value			*0.250*
First stage F-stat			*7.928*
Hansen J-Stat p-value			*0.066*

Panel B. Double Standard: Host Country's Metal Abundance + Home Country's Income Level			
(5) Metal abundant + High Income	-0.013	-0.005	0.337*
Number of obs.	*1334*	*1344*	*1334*
Endogeneity test p-value			*0.310*
First stage F-stat			*12.570*
Hansen J-Stat p-value			*0.132*
(6) Metal less abundant + High Income	0.020	-0.006	-1.039***
Number of obs.	*1401*	*1405*	*1401*
Endogeneity test p-value			*0.000*
First stage F-stat			*21.580*
Hansen J-Stat p-value			*0.263*
(7) Metal abundant + Low Income	0.003	0.017	-0.163
Number of obs.	*1134*	*1134*	*1134*
Endogeneity test p-value			*0.110*
First stage F-stat			*11.650*
Hansen J-Stat p-value			*0.826*
(8) Metal less abundant + Low Income	0.026	0.030	-1.113***
Number of obs.	*1222*	*1222*	*1222*
Endogeneity test p-value			*0.000*
First stage F-stat			*11.290*
Hansen J-Stat p-value			*0.707*

Notes: Significant at * 10%, ** 5% and *** 1%.

5.5.5 Summary of the Displacement Effects of the TSLS Estimation

FE1 and FE2 do not provide evidence of displacement effect neither in the whole sample nor in the split samples. This insignificant displacement effect does not provide evidence of the correlation between China's and the OECD's OFDI; however, the evidence of the TSLS estimation casts doubt on this result. The TSLS estimations shed light on the displacement effect in the whole sample and in the sub-samples, but the findings depend on the validity of IV. The causal effect of China's OFDI on the OECD's OFDI is significant and the rise in China's OFDI causes the OECD's OFDI to decrease. This displacement effect responds differently to the host country's characteristics, the home country's characteristics or both if other things are equal. Overall, the estimations demonstrate that the FE estimations incorrectly state the displacement effect but TSLS provides a valid causal interpretation which depends on the validity of IV. Table 5.11 summarises the displacement effects

from above TSLS estimations. Panel A summarises how the displacement effect varies with the host country's and home country's natural resources abundance and income levels respectively. Panel B summarises how the displacement effect varies with the host country's and home country's continental locations respectively. Panel C summarises how the displacement effect varies with the host–home country pair characteristics.[66]

Table 5.11: Summary of Displacement Effects of the TSLS Estimations

	(1) Yes	(2) No
Overall	-0.344***	
Panel A. Host country's and Home country's Characteristics		
Host country's natural resources abundance		
Oil abundant or not	-0.051	-0.653**
Metal abundant or not	0.151	-1.099***
Host country's income level is high or not	-0.532***	-0.014
Home country's income level is high or not	-0.457***	-0.309***

Panel B. Country's Continent	(1)	(2)	(3)
Panel B.1	Asia	Africa+Latin America +Oceania	Europe+North America
Host country's continent	-0.385**	-0.058	-0.355***
Panel B.2	Asia+Oceania		Europe+North America
Home country's continent	-0.370*		-0.376***

Panel C. Host–home Country Pair Characteristics	(1)
Panel C.1	
High-income host country + High-income home country	-0.423**
High-income host country + Low-income home country[1]	-0.678***
Panel C.2	
Metal less abundant host country + High-income home country	-1.039***
Metal less abundant host country + Low-income home country	-1.113***

Notes: [1] weak evidence, the associated value of the first-stage F-statistic is smaller than 10. Significant at * 10%, ** 5% and *** 1%.

[66] For simplicity, only those estimation results with valid causal interpretations have been included.

5.6 Alternative IV Estimations

The TSLS estimation crucially depends on the selection of IVs, therefore, the TSLS was re-estimated by using alternative IV sets for the regression sensitivity analysis. Anderson and Marcouiller (2002) illustrated the importance of institutional quality in examining the international trade, because the institutional quality represented a hidden transaction cost. Following Greenaway, Mahabir and Milner (2008) and Eichengreen et al. (2007) who used China's corruption as an IV in the TSLS estimations, China's control of corruption has also been used as an alternative IV in this section. Intuitively, a higher control of corruption reduces hidden transaction costs and stimulates OFDI (Anderson and Marcouiller, 2002). The instrument exogeneity implies zero correlation between China's control of corruption and the OECD's OFDI; however, this exclusion restriction may be violated by the correlation between China's control of corruption and the OECD's control of corruption. To account for this possibility, the OECD's control of corruption has been included as well. In addition, the host country's control of corruption has also been included. [67]

China's control of corruption as an alternative IV is firstly included to replace China's bilateral real exchange rate, in addition, China's distance to a third market is also included to compose the first set of IVs. Next, China's control of corruption as an additional IV together with China's distance to a third market and China's bilateral real exchange rate are included to compose the second set

[67] Data on control of corruption are obtained from *Worldwide Governance Indicator* by World Bank (2010b). The initial value ranges from -2.5 to +2.5. The value has been normalised to allocate between 0 and 1. A higher value implies a lower degree of corruption.

of IVs. The validity of these two sets of IVs can also be examined by the first-stage F-statistic, the Kleibergen-Paap underidentification test and the Hansen J-statistic overidentification test.

Table 5.12 presents estimation results for both sets of IVs. Similar to Table 5.11, Panel A presents how the displacement effect varies with the host country's and home country's natural resources abundance and income level respectively. Panel B presents how the displacement effect varies with the host country's and home country's continental locations respectively. Panel C presents how the displacement effect varies with the host–home country pair characteristics.[68] In short, the estimations from two sets of IVs coincide with the previous estimations and indicate that the previous findings are robust. Two major changes appear. Firstly, the displacement effect in metal abundant host countries in Panel A turns out to be positive and significant. Secondly, the displacement effect in African, Latin American and Oceanian host countries in Panel B.1 turns out to be negative and significant. However, the interpretation of these changes should be treated with caution because they fail in the endogeneity test and Hansen overidentification test respectively. In terms of estimating the host–home country pair characteristics in Panel C, the displacement effect of China's OFDI on the high-income OECD's OFDI in the high-income host countries turns out to be insignificant.

[68] For simplicity, only estimation results with valid causal interpretations have been included in both sets of IVs.

Table 5.12: The Displacement Effect of China's OFDI on the OECD Countries' OFDI by Using Alternative IVs

	(1)	(2)	(3)	(4)
Instruments	China's corruption China's distance		China's corruption China's distance China's real exchange rate	
Additional Control Variables	Host country's corruption Home country's corruption		Host country's corruption Home country's corruption	
	Yes	No	Yes	No
Overall	-0.326***		-0.322***	
Number of obs.	*5091*		*5091*	
Endogeneity test p-value	*0.000*		*0.000*	
First stage F-stat	*91.380*		*61.280*	
Hansen J-Stat p-value	*0.109*		*0.246*	
Panel A. Country's Characteristics				
Host country's natural resources abundance				
Oil abundant or not	-0.081	-0.511**	-0.083	-0.441**
Number of obs.	*2790*	*2301*	*2790*	*2301*
Endogeneity test p-value	*0.009*	*0.001*	*0.008*	*0.003*
First stage F-stat	*121.600*	*12.190*	*81.460*	*8.279*
Hansen J-Stat p-value	*0.498*	*0.543*	*0.680*	*0.302*
Metal abundant or not	0.229**	-0.892***	0.222**	-0.881***
Number of obs.	*2468*	*2623*	*2468*	*2623*
Endogeneity test p-value	*0.449*	*0.000*	*0.480*	*0.000*
First stage F-stat	*41.470*	*43.060*	*27.680*	*28.920*
Hansen J-Stat p-value	*0.309*	*0.407*	*0.476*	*0.355*
Host country's income is high or not	-0.395***	-0.010	-0.388***	-0.010
Number of obs.	*2528*	*2563*	*2528*	*2563*
Endogeneity test p-value	*0.000*	*0.011*	*0.000*	*0.011*
First stage F-stat	*25.860*	*143.100*	*17.730*	*95.570*
Hansen J-Stat p-value	*0.007*	*0.059*	*0.024*	*0.168*
Home country's income is high or not	-0.447***	-0.267**	-0.445***	-0.261**
Number of obs.	*2735*	*2356*	*2735*	*2356*
Endogeneity test p-value	*0.000*	*0.000*	*0.000*	*0.000*
First stage F-stat	*43.840*	*43.170*	*29.230*	*28.810*
Hansen J-Stat p-value	*0.209*	*0.106*	*0.437*	*0.142*

Panel B. Country's Continent	(1)	(2)	(3)	(4)	(5)	(6)
Instruments	China's corruption China's distance			China's corruption China's distance China's real exchange rate		
Additional Control Variables	Host country's corruption Home country's corruption			Host country's corruption Home country's corruption		
Panel B.1	Asia	Africa+ L.A.+O.[1]	Europe+ N. A.[2]	Asia	Africa+ L.A.+O.[1]	Europe+ N.A.[2]
Host country's continent	-0.235	-0.306**	-0.297***	-0.235	-0.316**	-0.292***
Number of obs.	*1285*	*1505*	*2301*	*1285*	*1505*	*2301*
Endogeneity test p-value	*0.005*	*0.002*	*0.000*	*0.005*	*0.001*	*0.000*
First stage F-stat	*39.530*	*32.200*	*38.510*	*26.340*	*21.480*	*26.150*
Hansen J-Stat p-value	*0.783*	*0.039*	*0.066*	*0.962*	*0.039*	*0.181*
Panel B.2	Asia+O.[3]		Europe+ N.A.[2]	Asia+O.[3]		Europe+ N.A.[2]
Home country's continent	-0.400*		-0.358***	-0.373*		-0.360***
Number of obs.	692		4399	692		4399
Endogeneity test p-value	*0.001*		*0.000*	*0.001*		*0.000*
First stage F-stat	*15.280*		*69.130*	*10.880*		*46.150*
Hansen J-Stat p-value	*0.875*		*0.061*	*0.880*		*0.143*

Panel C. Host–home Country Pair Characteristics	(1)	(2)
Instruments	China's distance China's Corruption	China's distance China's Corruption China's real exchange rate
Additional Control Variables	Host country's corruption Home country's corruption	Host country's corruption Home country's corruption
Panel C.1		
Metal less abundant host country + High-income home country	-0.895***	-0.889***
Number of obs.	*1401*	*1401*
Endogeneity test p-value	*0.000*	*0.000*
First stage F-stat	*27.460*	*18.320*
Hansen J-Stat p-value	*0.554*	*0.388*
Metal less abundant host country + Low-income home country	-0.860***	-0.847***
Number of obs.	*1222*	*1222*
Endogeneity test p-value	*0.000*	*0.000*
First stage F-stat	*16.790*	*11.290*
Hansen J-Stat p-value	*0.534*	*0.630*

Notes: [1]Africa + Latin America + Oceania. [2]Europe + North America. [3]Asia + Oceania. Significant at * 10%, ** 5% and *** 1%.

5.7 Conclusion

This chapter examined whether and how the surge of China's OFDI displaces the OECD countries' OFDI in a third host country. A panel dataset was constructed that included the OFDI flow from 33 OECD countries to 155 host countries for the period of 2003–2009. This chapter further investigated whether and how this displacement effect varies across the host country's characteristics, the home country's characteristics and the host–home country pair characteristics, such as the natural resources abundance, the income level and the continental location. To solve the potential endogeneity problem, the TSLS method was used to instrument China's OFDI with the bilateral distance and the bilateral real exchange rate between China and the host country.

The findings suggest that China's OFDI displaces the OECD's OFDI in general, but the findings depend on the validity of IV; a 10% increase in China's OFDI reduces the OECD's OFDI by 3.4% in a third host country. However, this displacement effect responds differently to the host country's characteristics, home country's characteristics and host–home country pair characteristics. In particular, there are significant displacement effects in the host countries with less natural resources abundance, higher income level and which are located in Asia, Europe and North America, but *not* in natural resources abundant countries, low-income countries and countries located in Africa or Latin America. The latter findings of these insignificant displacement effects contrast with the often heard argument that China's investments in these countries are driven by a 'new colonialism', where China aims to crowd out Western investors.

An important implication of this study for understating China's overseas investments is that China displaces the OECD's investments in general. However, China's overseas investments do not undermine the OECD's investments in natural resources abundant, low income, African or Latin American host countries. Therefore, a more transparent OFDI policy and more government level cooperation would be helpful in clarifying the anxiety surrounding Chinese OFDI and in removing the perception that Chinese OFDI is a threat to the existing interests of other countries or that it will disorder the world economy. In reality, China's OFDI is driven by common motivations and Chinese capital provides an opportunity to sustain global economic growth and to achieve mutual benefits.

Appendix H: Host Countries and Home Countries List

Table H1: List of Host Countries

1	Afghanistan	45	Eritrea
2	Albania	46	Ethiopia
3	Algeria	47	Federal St. Micronesia
4	Angola	48	Fiji
5	Argentina	49	Finland
6	Australia	50	France
7	Austria	51	Gabon
8	Azerbaijan	52	Gambia
9	Bahamas	53	Georgia
10	Bahrain	54	Germany
11	Bangladesh	55	Ghana
12	Barbados	56	Greece
13	Belarus	57	Grenada
14	Belgium	58	Guinea
15	Belize	59	Guyana
16	Benin	60	Honduras
17	Bermuda	61	Hungary
18	Bolivia	62	India
19	Bosnia and Herzegovina	63	Indonesia
20	Botswana	64	Iran
21	Brazil	65	Iraq
22	Brunei	66	Ireland
23	Bulgaria	67	Israel
24	Burundi	68	Italy
25	Cambodia	69	Jamaica
26	Cameroon	70	Japan
27	Canada	71	Jordan
28	Cape Verde	72	Kazakhstan
29	Chad	73	Kenya
30	Chile	74	Kuwait
31	Colombia	75	Kyrgyzstan
32	Congo	76	Laos
33	Congo DR	77	Latvia
34	Cote d'lvoire	78	Lebanon
35	Croatia	79	Lesotho
36	Cuba	80	Liberia
37	Cyprus	81	Libyan
38	Czech Republic	82	Liechtenstein
39	Denmark	83	Luxembourg
40	Djibouti	84	Madagascar
41	Dominican Republic	85	Malawi
42	Ecuador	86	Malaysia
43	Egypt	87	Mali
44	Equator Guinea	88	Malta

89	Marshall	123	Singapore
90	Mauritania	124	Slovakia
91	Mauritius	125	South Africa
92	Mexico	126	South Korea
93	Mongolia	127	Spain
94	Morocco	128	Sri Lanka
95	Mozambique	129	St. Vincent & Grenadines
96	Myanmar	130	Sudan
97	Namibia	131	Suriname
98	Nepal	132	Sweden
99	Netherlands	133	Switzerland
100	New Zealand	134	Syrian Arab Rep
101	Niger	135	Taiwan Province
102	Nigeria	136	Tajikistan
103	North Korea	137	Tanzania
104	Norway	138	Thailand
105	Oman	139	Timor-Leste
106	Pakistan	140	Togo
107	Palau	141	Tunisia
108	Panama	142	Turkey
109	Papua New Guinea	143	Turkmenistan
110	Paraguay	144	Uganda
111	Peru	145	Ukraine
112	Philippines	146	United Arab Emirates
113	Poland	147	United Kingdom
114	Qatar	148	United States
115	Romania	149	Uruguay
116	Russia	150	Uzbekistan
117	Rwanda	151	Venezuela
118	Samoa	152	Vietnam
119	Saudi Arabia	153	Yemen
120	Senegal	154	Zambia
121	Seychelles	155	Zimbabwe
122	Sierra Leone		

Table H2: List of Home Countries

1	Australia
2	Austria
3	Belgium
4	Canada
5	Chile
6	Czech Republic
7	Denmark
8	Estonia
9	Finland
10	France
11	Germany
12	Greece
13	Hungary
14	Iceland
15	Ireland
16	Israel
17	Italy
18	Japan
19	Luxembourg
20	Netherlands
21	New Zealand
22	Norway
23	Poland
24	Portugal
25	Slovakia
26	Slovenia
27	South Korea
28	Spain
29	Sweden
30	Switzerland
31	Turkey
32	United Kingdom
33	United States

CHAPTER 6

CONCLUSIONS

6.1 Summary of Findings

This thesis carefully discussed a series of important issues about China's outward FDI (OFDI) in three quantitative studies. It examined the underlying motivations and locational determinants of Chinese OFDI by focusing on the host country's natural resources and technology in a static framework, the dynamic adjustment of China's OFDI and its relation to China's inward FDI (IFDI) under a partial stock adjustment model in a dynamic framework, and the displacement effect of China's OFDI on other source countries' OFDI.

In the first empirical study (Chapter 3), this thesis examined the determinants of China's OFDI, with a focus on the role of natural resources and technology. Two datasets were constructed, one encompassing 157 host countries for the recent period of 2003-2009 and the other encompassing 171 host countries for the early period of 1991-2003. The chapter firstly examined the natural resources-seeking motivation and the technology-seeking motivation by investigating whether China's OFDI is driven by the host country's overall resources abundance and technology level respectively. The chapter further examined the role of governance and mineral prices in China's resource-seeking OFDI. In addition to the technology-seeking motivation, the technology-exploiting motivation was also examined. The two main variables of interest, the host country's natural resources and technology, were examined under an augmented gravity model. A Tobit model was adopted as the

benchmark model to account for the data censoring. The FE model was also introduced to account for the unobserved country heterogeneity and the Heckman model was further introduced to correct the selection bias.

The findings indicate that the host country's natural resources abundance is a crucial determinant of China's OFDI. There is strong evidence that in 2003-2009, the host country's overall resources abundance, oil abundance and metal abundance had a positive effect on China's OFDI. In particular, China's OFDI is driven to resources abundant countries with poor governance. Oil abundant countries with poor governance are particularly attractive to China's OFDI and the high growth rate of the oil price index stimulates China's oil-seeking motivation. Given that China's OFDI is driven to oil abundant countries in general, this suggests that China's OFDI is not only driven to secure long-term oil supplies, but that it is also driven by the oil price variability. There is strong evidence for the technology-exploiting motivation, as the findings indicate that China's OFDI is driven to low-income countries with inferior technology. There is weak evidence for the technology-seeking motivation, which implies that China's OFDI is driven by the goal of accessing a host country's high technology.

In Chapter 4, this thesis examined the dynamic adjustment of China's OFDI and its relation to China's IFDI in a dynamic framework, using a panel dataset for China's OFDI stock in 172 host countries from 2003 to 2009. Compared to previous studies that mainly examined the effects of a host country's characteristics on China's OFDI in a static framework, the analysis in this

chapter is the first to use a partial stock adjustment model and to examine the dynamic adjustment of China's OFDI in a dynamic framework. Furthermore, this partial stock adjustment model enables us to restore the unobservable equilibrium OFDI stock value, the examination of the equilibrium OFDI stock, and the comparison between the actual OFDI stock and the equilibrium OFDI stock sheds light on the potential of China's OFDI from a new perspective. Furthermore, Chapter 4 also revealed the link between China's IFDI and its OFDI, which has yet to be systematically examined in existing studies. The chapter further investigated whether and how the dynamic adjustment of China's OFDI and the effect of China's IFDI vary with the host country's characteristics, including the technology level, natural resources abundance and income level. The gravity model was introduced by including China's previous OFDI stock and China's previous IFDI stock as the two main interested variables. The system GMM technique was applied to correct the endogeneity problem.

The findings provide strong evidence for the dynamic adjustment of China's OFDI and the agglomeration effect. The significance of dynamic adjustment reveals the possible existence of a substantial adjustment cost in China's OFDI and implies that China's existing OFDI stock gradually adjusts towards the equilibrium stock. The findings demonstrate that the restored equilibrium is not only bigger but also more volatile than the actual stock. The finding also revealed that the host country, on average, exploits its potential to attract China's future investments. There is some evidence for the positive association between China's previous IFDI and China's contemporaneous OFDI. In

addition, the dynamic adjustment of China's OFDI and the agglomeration effect are both stronger in high-technology countries than low-technology countries. In contrast, these do not vary with the host country's natural resources abundance and income level. There is some evidence for the positive relation between China's IFDI and its OFDI for high-income countries, but not low-income countries, and this positive correlation is not conditional on the host country's technology level.

The third empirical study (Chapter 5) examined whether and how the surge of China's OFDI displaces the OECD countries' OFDI in a third host country. A panel dataset was constructed that included the OFDI flow from 33 OECD countries to 155 host countries for the period of 2003–2009. The chapter further investigated whether and how the displacement effect varies across the host country's characteristics, the home country's characteristics and the host–home country pair characteristics, such as natural resources abundance, the income level and the continental location. To solve the potential endogeneity problem, the TSLS method was used to instrument China's OFDI with the bilateral distance and the bilateral real exchange rate between China and the host country.

The findings suggest that China's OFDI displaces the OECD's OFDI in general; a 10% increase in China's OFDI reduces the OECD's OFDI by 3.4% in a third host country. However, this displacement effect responds differently to the host country's characteristics, home country's characteristics and host–home country pair characteristics. In particular, the findings demonstrate that

there are significant displacement effects in the host countries with less natural resources abundance, higher income levels and which are located in Asia, Europe and North America, but *not* in natural resources abundant countries, low-income countries, and countries located in Africa or Latin America. The latter findings of these insignificant displacement effects again contrast with the argument that China's investments in these countries are driven by the 'new colonialism' or by the goal of crowding out Western investors.

6.2 Limitations and Future Research

Although this thesis has shed some light on the issues surrounding China's OFDI that have not been empirically examined in the existing literature, there are also some limitations regarding the data and foregoing research. These limitations are set out below.

Firstly, the main limitation of the data is that it is at an aggregate level, which prevented the OFDI data being broken down into industries, provinces or even firms. Greenaway and Kneller (2007) provided a survey concerning the relationship between firm heterogeneity and overseas investments, and they also addressed the importance of firm-level characteristics in terms of FDI research. China's OFDI might be affected not only by the host country's characteristics but also by industrial characteristics, and the omission of this industry heterogeneity might affect the findings contained in this thesis. Furthermore, China has a large economy with high economic disparity across regions. The east coast provinces are much more developed than the western provinces, and the aggregate country data cannot distinguish the difference in

motivations between them. Therefore, the importance of differentiated motivations could not be clearly revealed by the aggregate data, which does not account for province heterogeneity. The provincial breakdown data would be helpful in more precisely discovering China's motivations in terms of OFDI.

Secondly, China's official data does not identify the investments driven by the 'capital flight' motivation, although it is very difficult to identify this in practice. The inclusion of these investments might affect the true patterns of China's OFDI. Some small economies, tax havens and official financial centres receive a disproportionally large amount of China's investments, and a large part of this capital will flow back to China as foreign capital to benefit from preferential treatment. Some obvious suspects have been dropped from destinations in this thesis, and future studies based on higher quality data might be able to provide a stronger identification of 'capital flight' investments.

Finally, up to now, the majority of China's overseas investments have been undertaken by SOEs, and thus the conclusions contained in this research are also largely drawn from the investment decisions made by state companies. The rise of overseas investments from small and median size, private companies might play an increasingly important future role in contributing to China's OFDI. Future studies distinguishing between different types of companies in terms of ownership may be able to provide a more comprehensive picture of the driving factors in China's overseas investments.

6.3 Policy Implications

Alongside the promising potential of China's OFDI in terms of global economic growth, the fast growth in Chinese OFDI also creates many challenges. The Chinese government should carefully evaluate and implement overseas investments based on the following considerations.

Firstly, the biggest challenge faced by policy makers is that the world tends to misinterpret the surge in Chinese overseas investments. The findings of this thesis suggest that natural resources and technology play very important roles in China's overseas investments, and in fact, some large investments in natural resources-related and technology-related overseas projects have been conducted by SOEs with government support in terms of financing. However, lack of transparency in Chinese policy and the political background to Chinese OFDI have resulted in a widespread debate about China's overseas investments. The world misinterprets China as being a threat rather than an opportunity, whereby China's overseas investments are driven by the often-heard 'new colonialism' argument. This debate concerns, for example, whether China's large-scale buyouts in natural resources are for economic development or unclear, political purposes; whether China's investments in advanced technology are aimed toward increasing its productivity or simply at stealing foreign technology; and whether China's generous investments in developing countries serve economic or political purposes. Therefore, a more transparent policy and more government level cooperation would be helpful in alleviating current anxiety and delivering the message that China's overseas investments are motivated by similar incentives to those of other states. More government level communication would also be helpful in allaying fears that China's

overseas investments is a threat to the existing interests of other states or that it will create disorder in the world economy. In fact, China's overseas investments provide an opportunity to sustain economic growth and to achieve mutual benefits.

Secondly, the findings of thesis suggest the possible existence of adjustment cost in China's overseas investments, and there are several actions that China could take to reduce this. For example, a further liberalisation of the approval regime would be helpful in improving efficiency and shortening the approval time for OFDI. A decline in bureaucratic costs might contribute to reduce the effect of the adjustment cost when conducting new investments. The government should provide more information about host countries, including the investable industries, the legal system, business environment and so on. This valuable information would save time for Chinese MNEs in understanding foreign markets and it would enable them to respond faster in future investments. The findings of the thesis also suggest that the host country, on average, exploits its potential in attracting China's further investments. Therefore, the host country's government should also provide more assistance to attract China's investments and achieve a 'win-win' result.

Last but not least, the implementation of China's overseas investments strategy does not take place in isolation; China should treat it as a good opportunity to utilise and diversify its huge foreign exchange reserves, update its industrial structure, promote the growth of small and median size companies, and strengthen its economic presence in the world economy.

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