



LUND UNIVERSITY  
School of Economics and Management

Master Program International Economics with a focus on China

## The Dynamic Relationship between Foreign Direct Investments, Domestic Investment: A Multivariate Analysis

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Abstract: China's opening of reform in 1979 started the transition to a social market economy in 1992 and its accession to the WTO in 2001 are seen as pivotal moments in China's recent history when assessing its economic growth and investment climate in the last 30+ years. Some theorists (Kokko 1994; Cave 1974) propose the positive spillover effects of FDI however its merits have been called into questions by other theorists (Bornschier & Chase-Dunn 1985; Aitken & Harrison 1999), suggest FDI is seen to *crowd out* rather than *crowd in* domestic investment. The lack of consensus on the effects of FDI on the host country can be attributed to the different modeling strategies, time period or lack of time dimension as well as the country assessed. Through an assessment of the literature and motivated by the locational advantages of the host country, the IMCD paradigm was created to represent the investment climate, macroeconomic conditions, cost related factors and development strategies to understand the relationship between domestic investment and FDI and how the additional factors interrelate with each other in a multidimensional paradigm. The methodology of the study is based on the Vector Error Correction (VEC) and Vector Autoregressive (VAR) model in order to analyze a long run and short run dynamic relationship.

Key words Foreign direct investments, Domestic investments, Chinese economy

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## **Acronyms**

DI domestic investment

ECM error correction model

FDI foreign direct investment

FIES foreign-invested enterprises

MNEs multinational enterprises

VARm vector autoregressive model

VECM vector error correction model

WTO World Trade Organization

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## **1.0 Objective**

The objective of this paper is to examine the dynamic relationship of foreign direct investment (FDI) and domestic investment (DI) in China to determine the inter-causal relationship and investigate its effects during the period of 1980 -2009.

Time series analysis through the use of Vector Error Correction (VEC), Vector autoregressive Models (VAR) is used to understand the dynamic relationship between FDI and domestic investments in the long run and use time series techniques like cointegration and the Granger causality tests are used to explore this dynamic relationship. These testing procedures will investigate whether:

- FDI has crowded out or crowded in domestic investments
- Determine whether the sector composition of FDI has effected domestic investments
- Explore the causal links between FDI, domestic investment and the locational determinants of FDI

This discussion leads to a larger question of whether foreign investments is crowding out or complementing domestic investment and how has that impacted Chinas economy over the last 30 years.

## **2.0 Aim & Justification**

China's colonial legacy and cultural indifference towards foreigners created a society that was largely insulated from trade and foreign investment. However, in the 1980s Special Economic Zones (furthermore SEZs) were implemented to absorb and contain foreign investment. FDI continued to grow well into the 1980s although it was relatively low because investment was confined to joint ventures with State owned enterprises as the development of private firms and entrepreneurial activity was largely stigmatized during this time.

Since then, China's growth has been a relevant topic within academia and within mainstream media.

The influx of FDI particularly after 1992 denoted by the “Deng Effect” has attracted many scholars in investigating the role of FDI in China’s economic growth. This study adds to the literature by its use of its methodological approach using time series data. Time series studies on China are rare due to data limitations and short time period’s assessed (Tang, 2008) and the studies in the past has been explored through the use either cross-sectional or panel data (Braunstein and Epstein 2002). The increasing time span since opening of reform and more attention towards data collection in China has allowed for the improved use of time series analysis. Studies like (Tang, 2008) focus on bivariate modeling, only looking at domestic investments and FDI, however there are other factors as explored in this paper that are needed to further understand China’s investment environment in the long term. Therefore to exclude these variables may result in an omitted variable bias, which will grossly effect the estimations of the model.

### **3.0 Scope**

- Is FDI and domestic investment in China driven by economic indicators such as market size, trade Openness and exchange rate?
- Is domestic investment complemented by the sectorial composition of FDI?
- How has the Deng Southern tour and Chinas WTO entry effected China’s investment environment?

Although there are many factors that affect the benefits of FDI inflows in China, the ones assessed in this paper are based locational advantages of China i.e. Investment, Macro conditions, Cost factor and Development Strategies (*IMCD paradigm*). The models assess the combined effect and each variable’s separate effect. Sector FDI data is also included within the modeling strategy to determine whether the relationships dynamic changes when accounting for the primary, secondary and tertiary sectors.

#### 4.0 Introduction

Foreign Direct Investment (FDI) is seen as an important source of capital and a contributor to economic growth in China, due to the technology and knowledge spillovers, which creates linkages to the domestic economy. As a result, developing countries like China have increasingly liberalized its policy initiatives in order to attract FDI. China's opening of reform in 1979 started the transition to a social market economy in 1992 and its accession to the WTO in 2001 are seen as pivotal moments in China's recent history when assessing its economic growth and investment climate in the last 30 + years. Some theorists (Kokko 1994; Cave 1974) propose the positive spillover effects of FDI however its merits have been called into question by other theorists (Bornschiefer & Chase-Dunn 1985; Aitken & Harrison 1999) who suggest FDI is seen to *crowd out* rather than *crowd in* domestic investment. The lack of consensus on the effects of FDI on the host country can be attributed to the different modeling strategies, time period or lack of time dimension as well as the country assessed. Through an assessment of the literature and motivated by the locational advantages of the host country, the IMCD paradigm was created to represent the investment climate, macroeconomic conditions, cost related factors and development strategies to understand the relationship between domestic investment and FDI and how the additional factors interrelate with each other in a multidimensional paradigm. The methodology of the study is based on the Vector Error Correction (VEC) and Vector Autoregressive (VAR) model in order to analyze a long run and short run dynamic relationship.

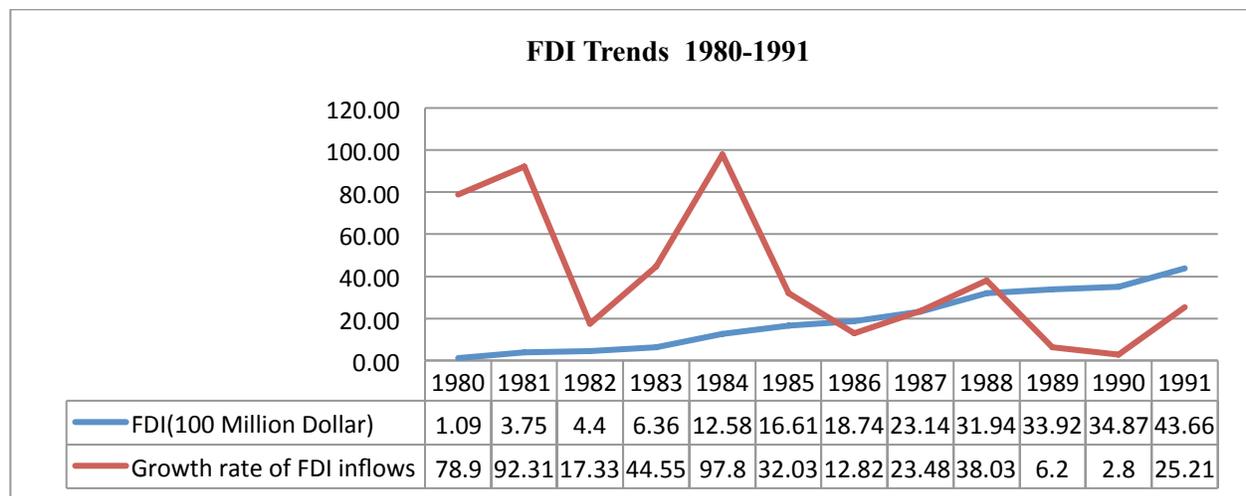
This paper is divided as follows: section 5 discusses the context for FDI inflows in China while section 6 outlines the literature review. Section 7 reports some of the main theories regarding FDI following by the theoretical framework and model specification in section 8. Section 9 discusses the data and description and section 10 outlines the methodology. Sections 11-13 provide a structural analysis of results, followed by a discussion and conclusion with policy implications in sections 14 and 15 respectively.

## 5.0 The China Context: *Historical Periodization*

China's opening of reform in 1979 created a new wave of reform policies and Deng's monumental southern tour in 1992 initiated China's transition to a socialist market economy and encouraged FDI through wholly owned subsidiaries of foreign companies which contributed to China's economic growth. This transition from centrally planned to a market-oriented approach opened international trade and rapidly increased the domestic market and aids as a major component of China's rapid growth. This period of transition is analyzed further in four stages of growth.

### 5.1 Opening reform: 1979 – 1991

Figure 1: FDI Trends 1980-1991



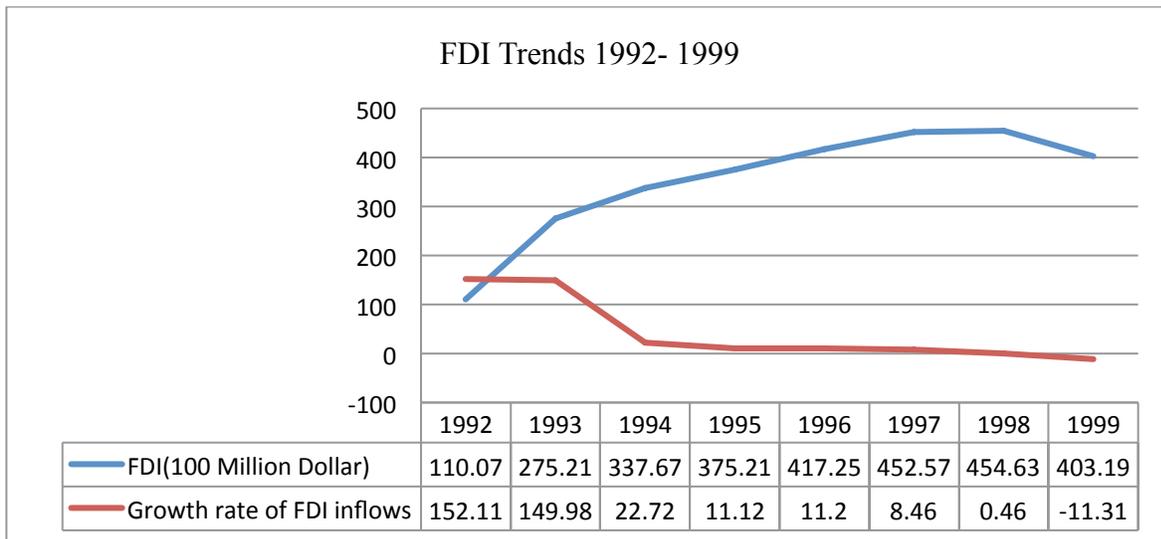
Source: China Statistical Yearbook

On July 1979 the Party Central Committee and State Council established Shenzhen, Zhuhai, Shantou in Guangdong Province and Xiamen in Fujian Province as Special Economic Zones (SEZs). This experimental base formed China's opening policy, the central government, extended its SEZs policies to Hailan Island and an additional fourteen coastal cities. However FDI inflows decreased after 1984 as China's infrastructural developments to sustain was still inadequate. FDI slightly recovered during 1986 and declined again after 1988. Despite the successful changes in China's economic reform, student protests arose because the *trickle down* effects were unforeseen at the local level due rampant corruption and discretionary practices of political officials. These events lead to the Tiananmen Square massacre of 1989 which resulted in the

several hundred deaths of innocent protesters by orders of the central government. The growth rate decreased to 2.8 per cent in 1999, and in order to boost investment the Chinese government expanded the economic zones throughout the Yangtze River Delta, the Pearl River and the coast, as a result FDI growth increased to 25 per cent in 1991.

## 5.2 The Deng Effect: 1992- 1999

Figure 2: FDI Trends 1992-1999



Source: China Statistical Yearbook

In 1992 Deng toured southern China in an effort to revitalize China's movement towards a more open economy after the facing some resistance post-Tiananmen massacre. The tour renewed China's commitment and posed as an ideological shift in thinking towards a market-oriented economic reform and as a result, foreign investors regained confidence in China business environment. Remarkably, FDI inflows in 1992 had a 152% growth rate and in 1993 China became the second largest global recipient of FDI after the United States. The Provisional Regulations upon Guidance for Foreign Investment Orientation and the Guiding Directory on Industries Open to Foreign Investment was promulgated in 1995. These new policies afforded preferential treatment to FIEs and also allowed the central government to control the allocation of FDI inflows. FDI inflows continued to grow and the growth rate remained constant until 1998. According Palmade (2004) to the decline in FDI in 1999 is mostly due to the decrease in FDI following the boom in huge one-time privatization deals in the infrastructure, financial, and

petroleum sectors in the 1990s. However, it can also be attributed to the aftermath of the Asian financial crisis 1998 considering the fact that China’s Asian neighbours are the primary source of FDI inflows.

### 5.3 WTO- Entry 2000-present

The third stage of China’s growth period is marked by its entry into the World Trade Organization (WTO) in 2001. The influences of FDI in infrastructural development, international trade and technology spillovers further accelerated China’s integration into the world economy and in 2002 China became the largest recipient of FDI in the world. China’s entry into the WTO was significant due to China being held to an international standard according to its membership requirements and as a result revised three laws regarding foreign investment, which included the Guiding Directory for Foreign Investors initially, promulgated in 1995. The central government also proposed new country improvements such as equal tax treatments and opening additional sectors to foreign investment. The fourth revision of the Guiding Directory in 2004 decentralized FDI investments into four categories, encouraged, allowed, restricted and prohibited in order encourage technology and export investment (see figure 2)

Figure 2: FDI Project Allocation

Encouraged	Restricted	Prohibited
<ul style="list-style-type: none"> <li>• Infrastructure or under developed agriculture</li> <li>• Advanced Technology for energy efficiency</li> <li>• Export oriented</li> </ul>	<ul style="list-style-type: none"> <li>• Technology has been developed</li> <li>• Production exceed domestic demand</li> <li>• Under experiment or monopolized by the State</li> <li>• In the exploration of rare and mineral resources</li> </ul>	<ul style="list-style-type: none"> <li>• Jepordize national security or public interests;</li> <li>• Damage enviornment, natural resources or human health</li> <li>• Use sizeable ammounts of arable land</li> <li>• Technologies unique to China</li> </ul>

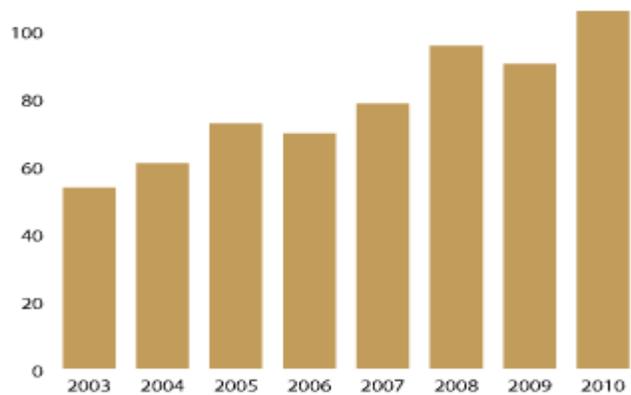
Source: National Development and Reform Commission (NDRC)

Based on these categories, municipal and county-level governments were given authority in order to approve and allocate FDI projects accordingly. Additionally, according to China’s

People Congress (CPC), National Development and Reform Commission (NDRC) and Ministry of Commerce (MOFCOM) FDI in 2004 was encouraged as follows:

- To transform traditional agriculture, develop modern agriculture and promote agricultural industrialization.
- To invest in communications, energy, raw material, infrastructure and other fundamental industries.
- To invest in electronic information, biology engineering, new material, aeronautics and astronautics and other high-tech industries.
- To use advanced technology in helping China transform and upgrade its machinery industry, light industry and textile industry.
- To invest in projects for comprehensive utility of resources, resource recycling, environmental protection and infrastructure construction.
- To invest in China's vast western regions.
- To engage in and promote the exports of those permitted items.

Figure 3: Annual Utilized FDI, US bn, 2003- 2010



Source 1: MOFCOM, China

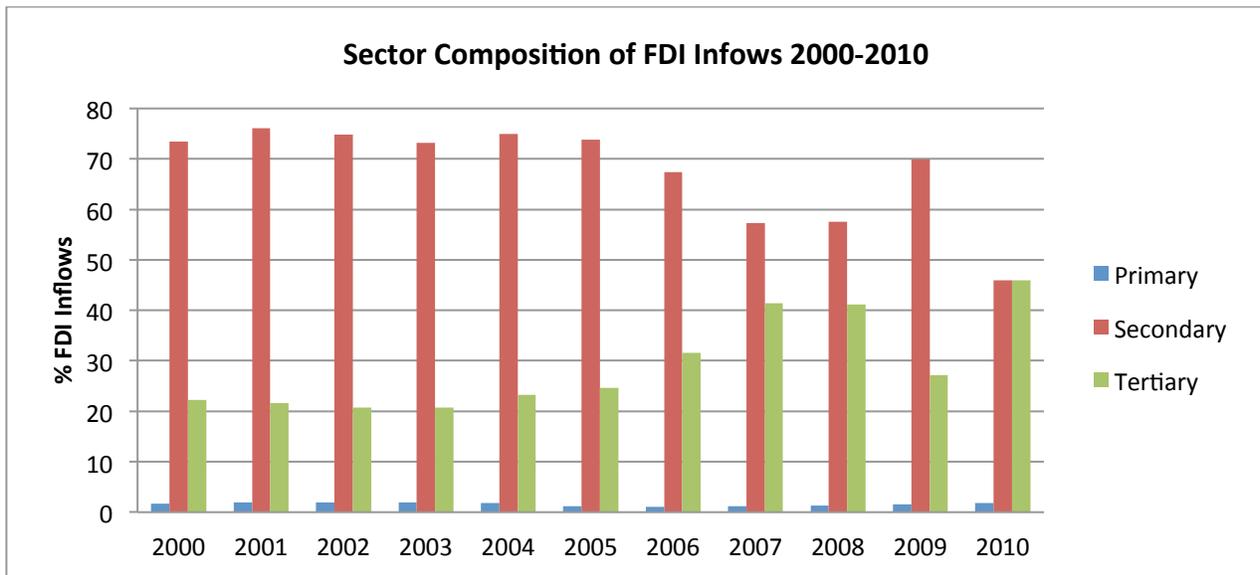
Prior to 2008 domestic firms faced 33 per cent tax rate while FIEs were taxed at 15 to 24 per cent, however in 2008, the CPC announced that both foreign and domestic firms would have a unified tax rate of 25 per cent. This suggests that instead of relying on preferential tax treatments to foreign investors and inadvertently discriminating against domestic firms, the central government is seeking to improve its

business environment through stable and consistent market economy. Although FDI declined slightly after 2008 this was more indicative of the global economic downturn of which China recovered from relatively unscathed.

#### 5.4 Sectorial Composition of FDI

From observing figure 4 it is evident that the sectorial composition of FDI inflows is highly concentrated in China's secondary sector. Unsurprising as China's traditional manufacturing and labour intensive industries are the main areas of FDI inflows from its foreign investors. Interestingly the share of its tertiary sector FDI inflows has steadily increased since 2001 and it is reflective of China's more liberalized policies that have allowed investment in areas within the service sector that were previously restricted pre China's entry into the WTO.

Figure 4 FDI Sector Inflows



Source: MOFCOM, China

In the earlier phases development China's market was a haven for outdated technologies however because of increased market competition more foreign investors have adopted new technology and China's economy benefited greatly. In 1995 the average share of FIE sales in the low tech and high tech industry was 33.2 per cent and 25.1 per cent respectively. However in 2008 the average shares of FIE sales increased to 36 per cent in the high tech industry and declined to 29.1 per cent in the low tech industry (see Table 1; appendix A). This confirms a compositional shift towards higher value added technologies. The changes within FDI flows in the tertiary sector can be attributed to China's commitments to the WTO to increase access to the financial, insurance, telecommunications, accounting sectors that will continue to absorb FDI. Additionally, declines in the manufacturing sector are also as a result of the added pressures of higher labour costs and currency appreciations.

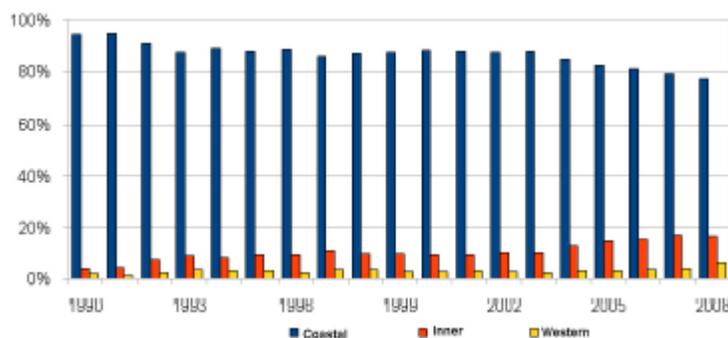


The geographical distribution of FDI in China has been very uneven due to the fact that in the initial stages of development FDI was highly concentrated in the eastern coastal provinces (see figure 5) and large metropolitan cities. FDI inflow in the eastern coastal region accounts for 90 per cent of the total amount of FDI (Tang 2008). Fiscal decentralization played an essential role in the diffusion of FDI because upon opening of reform the central government relinquished some control giving greater autonomy to the sub-national and the local governments. Local jurisdictions operated as independent profit centres and local development became directly connected to local revenues and attracting FDI to promote infrastructural developments. However this was initiated on an uneven playing field where the western regions were largely disadvantaged and faced harder budget constraints compared to the coast.

According to Broadmand and Sun (1997) the uneven distribution of FDI is also explained by the inland regions being underdeveloped with poor infrastructure. Local protectionism rose in the early 1980's as intra-wars over supply of resources increased and many provinces within the north east regions adopted, "local production for use and sale" strategies. Zhang (2001) proposed that many of the overseas Chinese within the Asian developing economies who have a large share of FDI inflows originally came from the coastal areas. Additionally market accessibility is considered to be a determinant in the allocation of FDI therefore foreign investors would more likely invest in the coastal and metropolitan cities due higher economic liberalization relative to the inland regions. To capture the pattern of FDI inflows, the regions are divided into eastern,

inner and western regions<sup>1</sup>

Figure 6: Regional FDI Inflows 1990- 2008



Source: China Statistical Yearbook

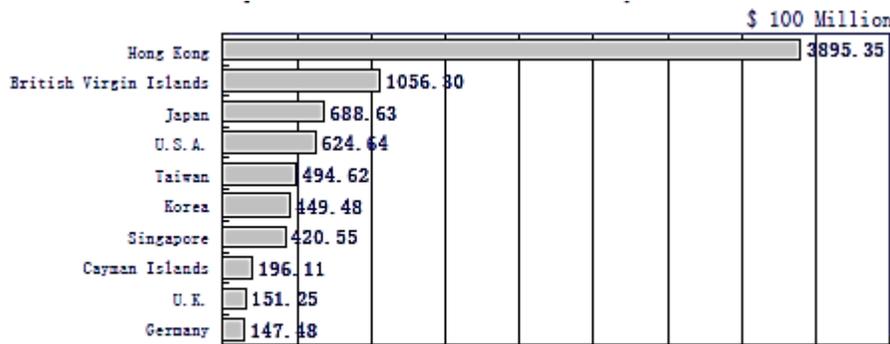
<sup>1</sup> East means the coastal eastern region, covering Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong (Hainan), Guangxi, and Hebei. *Inner* means the central region, covering Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. *West* means the western region, covering Sichuan (Chongqing), Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

In addition to the preferential policies that favour the coastal provinces they also benefit from other comparative advantages such as proximity to the international markets, better transport facilities and skilled labour. However, there is an increasing trend towards increasing FDI inflows in the western and central regions as the coastal regions lose some of its initial advantages of cheap labour.

### 5.6 Source Composition

The source composition of FDI inflows into China has remained generally the same since opening of reform. Due to the proximity of and the shared culture-customs with its neighbouring Chinese affiliates, large amount of FDI inflows are mainly derived from Hong Kong, Taiwan, Japan while Western Europe and the United States play a significant but smaller role (see figure 7).

Figure 7: Top 10 FDI by Source Country 2009



Source: Ministry of Commerce, China 2010

Investment from the major industrial countries in China is mainly motivated by the access to the Chinese market (Zhang, 2000 and 2001). However more recently, Western share of FDI has increased more over the years because of China’s well-endowed labour market, low labour costs increasingly liberalized market and accessible service sectors which are usually favoured by western investors.

The analysis of the sectorial, geographical and source distribution of FDI over time outlines an exploratory assessment to some of the significant characteristics and factors that has contributed to China’s investment climate. The following section summarizes some the empirical studies to assess the magnitude and effects of FDI on the macro-environment.

## 6.0 Literature Review

Academics and policy makers contend that foreign direct investment (FDI) plays a significant role within a country's development process as it is a source of technology and brings know-how, creating linkages to the firms and boosting the economy. As result many developing countries have encouraged foreign direct investments through incentives and through creating more open policies. Earlier works of Cave's (1974) research in Australia reports positive effects of FDI spillovers and Kokko's (1994) research in Mexico yielded similar results. The positive effects of FDI spillovers were unseen in Aitken and Harrison's (1999) study in Venezuela and Haddad & Harrison's (1993) research in Morocco. In a firm level panel dataset of 90,000 Chinese manufacturing firms during 1998-2001, Tang (2008) examined whether there were productivity spillovers from FDI to domestic firms in the same sectors (horizontal spillovers) and sectors supplying intermediate inputs for foreign affiliates (vertical spillovers) in China. His findings confirmed negative horizontal spillovers especially when FDI inflows were in the same sector and region, there were no negative vertical spillover effects. Using provincial level panel data Braunstein and Epstein (2002) found that FDI crowd domestic investment in China and suggests the social benefits of FDI have decreased due to the intense competition for FDI amid the different regions.

It is theorized that FDI may crowd out investment by disrupting backward linkage substitution of imports domestic commodities, allow FIEs to benefit from preferential tax treatments that hurt domestic investors and displace traditional technology with foreign technology (Jansen, 1995; Noorzoy, 1979; Kim and Seo, 2003; Lipsey 2002). Not only does this pose market stealing effects but also it creates inefficient absorptive capacity. Bornschieer and Chase-Dunn (1985), detractors of the positive spillovers effects of FDI also argue the dependence FDI negatively effects growth through monopolistic industrial structures, which Ajayi (2006) refer to as creating an enclave economy and thus isolates the domestic economy. Dunning (1981) proposes that this monopoly can be reinforced through ownership, location and internalization specific advantages also known as the O-L-I paradigm (further explored in section 7).

Regarding whether FDI crowds out domestic investment or poses a threat to domestic firms is a legitimate concern. However, we live in a world that is more integrated than in the past, therefore

appropriate business practices are necessary for the sustainability of these mutually benefiting relationships. As in the case of China, recent trends suggest that China's FDI is expanding into high tech industries and a growing service sectors in the inland (western) regions. New and expanding markets through increased trade openness provide profitable business opportunities at the micro level and at the macro level by way of economic development and in reducing regional inequality.

However the empirical evidence suggests that the positive effects of FDI in host countries are in fact ambiguous and mixed at the micro and macro level. Using a Vector Error Model (VEC) to assess the long run relationship between FDI and domestic investment in China during 1988-2003, Tang (2008) found that domestic investment complemented FDI, and that FDI granger caused domestic investments in the long run and complemented China's economic growth. However the limitation of this study is that it does not account any endogenous or exogenous factors that may contribute to these effects and was restricted to a bivariate model. In a sample of 107 developing countries for the period of 1980-1999 Kumar and Pardhan (2002) found the evidence to be mixed regarding whether FDI crowded domestic investment indicating initial negative effects of FDI on domestic investments and positive effects for some countries. Apergis et al. (2006) found similar findings when analyzing the relationship between the domestic investment and FDI inflow in Egypt, Tunisia, South Africa and Morocco. These results suggest FDI inflows had a positive impact on domestic investment, however when expanding the model as a multivariate approach to control for other factors FDI was seen to crowd out domestic investments. In a continuation of Agosin and Mayer (2000) study, Agosin and Machado (2005) also analyzed the crowding effects of FDI inflows on domestic investment during 1971-2000 for 12 countries in Latin America, Africa and Asia. The results corroborated initial findings and interestingly, indicated that FDI is independent of domestic investments in Africa, crowds out domestic investment in Latin America and showed positive effects on domestic investments in Asia.

The literature regarding effects of FDI and economic indicates a general positive relationship within specific environments. For example, Borensztein et al. (1998) argued that FDI positively effects growth when there is a highly educated workforce in order to make use of FDI

spillovers. Contrastingly, Blomstrom et al. (1994) research indicated that education had no effect on growth once the country is wealthy and Alfaro et al. (2003) highlighted the importance of a developed financial market. Balubramanyam et al. (1996) also indicated the importance of trade openness when assessing the growth effects of FDI.

In a more favorable outlook within the micro literature Lipsey (2002) argues that there are in fact positive effects however he argues that there is no relationship between the size of FDI stock relative to GDP and growth. Therefore optimally determining the relationship between FDI on growth the task lies in accurately gauging important aspects of the economic environment and the different circumstances at play. From an assessment of the literature Blomstrom and Kokko (2003) concluded that FDI spillovers are not automatic, and local conditions influence firms' adoption of foreign technologies and skills. The spillover effects of FDI although present, may also be minuscule when looking at the foreign acquisition of domestic firms. Krugman (2000) argues that foreign investors acquisition of domestic firms may not always be as a result of increased efficiency and but because foreign investors have access to more capital while domestic firms may face harder budget constraints due to lack of access to capital. Razin, Sadka and Yuen (1999) suggests that the foreign investors' asymmetric information advantage might lead to over-investing; an observation also supported by Hausmann and Fernandez-Arias (2000).

A report by the UNCTAD World Investment (2001:138), argues, "in the primary sector, the scope for linkages between foreign affiliates and local suppliers is often limited.... The manufacturing sector has a broad variation of linkage intensive activities. In the tertiary sector the scope for dividing production into discrete stages and subcontracting out large parts to independent domestic firms is also limited." Therefore the key to understanding the effects of FDI inflows may also lie within its sectorial composition and thus its benefit may differ across primary, manufacturing, and services sectors. The theoretical work of Findlay (1978) and Bloomstrom (1996) models the importance of FDI in transferring technology primarily within the manufacturing rather than the primary sector. The differing effects of among sectors are due to the fact that not all sectors have the same potential to absorb the foreign technology (Hirschman 1958: 109).

When examining the *granger* causal relationship between FDI and economic growth in Chile, Malaysia and Thailand, Chowdhury and Mavrotas (2005) found that FDI *granger* causes GDP in Chile, and found a bi-directional causality relationship of FDI and GDP in Malaysia and Thailand. Using the cointegration and error-correction model Chakraborty and Basu (2002) found a one directional relationship from GDP to FDI in India. In a similar study, using time series analysis during the period of 1981-1997 to determine the long-run relationship of economic growth and FDI in China, Liu et al (2002) found a bi- directional causal relationship. In a study of 80 countries between the periods of 1971-1995, Choe (2003) found a more apparent relationship of growth to FDI. Even with the application of different modeling strategies, the results of these studies indicate the relationship between FDI and a country's economic environment is not is not always conclusive. Ndikumana and Verick (2008) suggest that domestic investment is one of the prime channels through which impact is absorbed.

## **7.0 Theories of FDI**

Foreign direct investment theories are mainly based on theoretical hypothesis of imperfect competition and increasing returns to scale (Li 2004). The theoretical framework of FDI inflows may be classified as market-oriented, export-oriented, resource-oriented, efficiency-oriented and production-oriented (Dunning 1981). Some of the early FDI theories which have influenced later studies are those of international product life-cycle theory introduced by Raymond Vernon (1966), complement theory of FDI for trade by K. Kojima (1982), OLI theory (ownership, location and internalizing advantage) of the new investment development path by John Dunning(1981), and so on. These theories feature different assumptions and frameworks for different aspects and determinants of FDI.

### **7.1 Product Life Cycle (PLC) Theory**

Vernon (1966) developed the PLC theory in order to explain the increasing amounts of FDI from US multinational companies (MNCs) and its effects on trade and technology through its comparative advantage of its' factor endowments. The sequence of the PLC is based on four stages of production that includes innovation, growth, maturity and decline. During the first stages of production, MNCs produce new products primarily for domestic consumption with the use of advanced and innovative technology within the home country without the influence of

FDI. However as products and demand increases, firms begin to undertake FDI, enter into joint ventures and expand into foreign markets with similar demand patterns. During the third maturity phase cost reduction problems arise for the producer as there is a shift in FDI from advanced countries to newly industrialized countries (NICs) to take advantage of low labour costs, making the former importers rather than exporters. As the need for cost-minimizing continues to grow into the final stages of production, FDI and production becomes concentrated into countries with the lowest production costs ultimately creating a globalized market. Chen (1983: pp. 28-9) refutes this theory as it oversimplifies the impact FDI and does not account for non-standard products for the overseas market, the rate of change and the time lag between the different stages of production. While it provides a partial explanation FDI inflow from developed countries to developing countries, it also does not explain the process of developing countries investing in developed countries.

## 7.2 New Growth theory

There are two main points of the New Growth theory and they are as follows:

- Technological production is a product of economic activity
- Knowledge and technology are characterized by increasing returns which drive the growth process

Within this endogenous growth model the capital accumulation of FDI promotes growth through new inputs and foreign technologies within the production function (Shan et al (1997). According to the New Growth theory the benefits of the transfer of advanced technology strengthens knowledge through labour training, skill acquisition and organization management practices (De Mellor and Sinclair, 1995). As a result of this increased productivity and economic growth becomes a catalyst for domestic investment and technological advancement. While these macro-economic factors are important to a country's development and performance they do not account for exogenous and other locational advantages in attracting FDI. The O-L-I paradigm created by John Dunning attempts to present a more comprehensive analysis by the inclusion of location endowments.

### 7.3 Eclectic Theory of International Production

In an attempt to integrate different perspectives John Dunning’s Eclectic FDI theory draws on macroeconomics, trade and microeconomic and firm behavior theory, which formulate the O-L-I paradigm. O-L-I paradigm represents the ownership, locational and internalizing advantages of a firm and is also applicable to the ‘home country’ and ‘host FDI country’ (Dunning 1981). FDI is based on a market entry strategy so that a firm utilizes its ownership advantages through internalizing transaction costs in a specific location, which possess locational advantages (Dunning 2001). Table 1 highlights the determinants of FDI in the O-L-I paradigm.

Table 1 Determinants of FDI in the OLI framework

Types of International Productions	Ownership advantages (the “why” of MNE activity)	Location advantages (the “Where” of production)	Internalization advantages (the “how” of involvement)
Natural Resource Seeking	Capital , technology; information; complementary assets; size and bargaining strengths	Possession of natural resources; and related transport and communications infrastructure; tax and other incentives	To ensure stability of suppliers at the right place; to control markets
Market Seeking	Capital, technology, information, management and organization skills, surplus R&D and other capacity; economies of scale; ability to generate brand loyalty	Material and labour cost; market size and characteristics; government policy (e.g. with respect to regulations and to import controls; investment incentives etc.	A desire to reduce transaction or information costs, buyer ignorance or uncertainly, to protect property rights
Efficiency Seeking (a) of products (b) of processes	As above, but also access to markets; economies of scope, geographical diversifications and or clustering and international sourcing of inputs	(a) Economies of product or process specialization and concentration (b) Low Labour cost; incentive to local production by host government; a favourable business environment	(a) As for second category, plus gains from economies of common governance (b) The economies of vertical integration and horizontal diversification
Strategic asset seeking	Any of the first three that opportunities for synergy with estimating assets	Any of the first three that offer technology, organizational and other assets in which firm is deficient	Economies of common governance; improved competitive or strategic advantages; to reduce or spread risk

Source: Dunning 2008 pp. 104

The three conditions in the OLI constitute a comprehensive theoretical framework to gather the main elements that of various explanations of FDI. Dunning proposed that changes in a countries comparative advantage effects its location advantage which affects the firm's ownership advantage. Kiyoshi Kojima, a critic of the Dunning O-L-L paradigm however purports the theory is purely microeconomic in nature does not account affects FDI at the macro level (Kojima 1982). In response to criticisms Dunning extended his model and reconfigured it into five stages, called The Investment Development Path (IDP) to further justify its applicability at the macro level. In order to link the two theories together Dunning argues, "the basic hypothesis of the IDP is that as a country develops, the configuration of the OLI advantages facing foreign-owned firms that might invest in that country, and that of its own firms that might invest overseas, undergoes change, and that it is possible to identify both the conditions making for the change and their effect on the trajectory of the country's development and influences its investment path" (Dunning 2001). During the first phase the host country is in an embryonic stage of development and lacks infrastructure with no FDI. However changes in its resources, and government policies and utilities allow it to become an attractive place for FDI while the industries upgrade and grow in competitiveness. According to Dunning (2001) the final stages of IDP is evident when there is convergence between the development and economic structure of the countries. According to researchers (Madhok & Phene 2001) the validity of Dunning's model is questionable when applied to the current world economy as a result of the increased integration within the global market, although useful in providing a theoretical framework for technological transfer and creation.

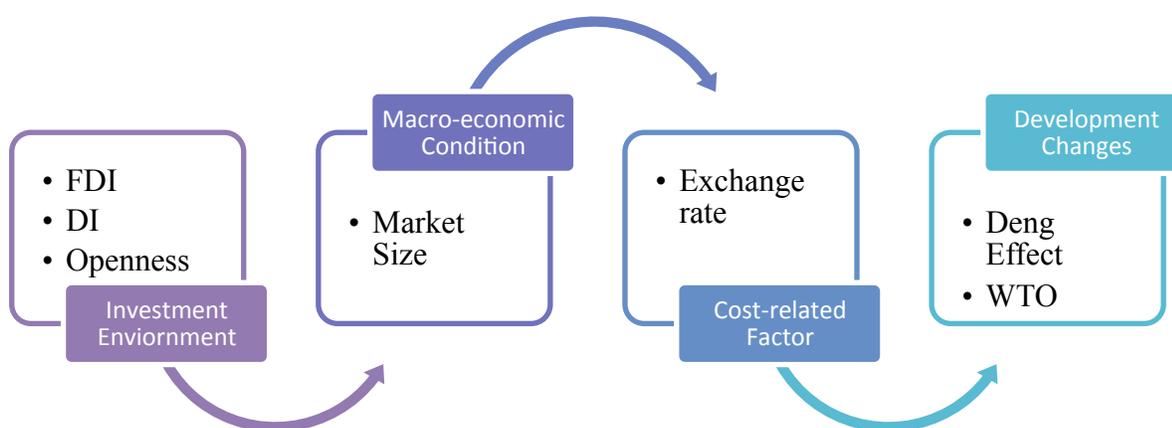
The main conclusion that can be drawn from the literature and theories surrounding FDI is that the effects certainly vary across region, industry may have differing benefits based on the locational determinants used. As proposed by the Dunning OLI paradigm, FDI can be categorized as market- oriented, resource-oriented, efficiency-seeking and production oriented.

## **8.0 Theoretical Framework: "IMCD Paradigm"**

The theoretical framework is closely derived from an assessment of the literature in determining key variables that influence each other and its effects on domestic investment and FDI. This framework is called the IMCD paradigm. The primary focus of the study is the effects of FDI

inflows on domestic investment from locational advantage aspect. Therefore locational advantage aspect FDI is largely influenced by four categories, investment, macro-economic condition, cost related factors and the development strategy of the host country (Benfe-Nabende et al. 2000), which make up the IMCD paradigm. Accordingly, this study builds on this theoretical framework by taking into account these factors over in the short and long run in order to uncover the dynamic relationship of how they interrelate with each other. Therefore the degree to which FDI and China's domestic investments have influenced each other is not independent and based these indicators (see figure 6).

Figure 6: IMCD Paradigm



### 8.1 Investment Environment

Inward FDI has positive implications on domestic investments due to the spillover and agglomeration effects which can be attributed to productivity gains by domestic firms. However domestic investment may also be subject the crowding out effect due to the increase of domestic capital as more productive foreign firms are willing to pay for more capital services. Accessibility to invest in a host country is dependent upon its openness to trade, and according to Dexter, Levi and Nault (2005), openness to trade is an important variable of growth. The degree of openness can be seen as a locational determinate due to the fact that regions also have different policies regarding how FDI is allocated. According to Goldberg and Klein, 1997), FDI fosters exports, import substitution or greater trade in intermediary inputs especially affiliate producers. As a result, trade liberalization increases the amount of accessible markets for exports which in turn promotes FDI. China has created economic linkages to the world as a result of its increasingly liberalized markets through exports and imports. Therefore the level of

liberalization and openness is a determinant in creating an attractive investment environment and more market opportunities.

## 8.2 Macroeconomic conditions

Another locational macro-economic condition is market size, in accordance with economies of scale, the larger the market the more economic diversification and opportunities. The size of the China's market also represents the demand for their output which is a key element in determining the allocation of FDI. Scaperlanda and Mauer (1969) argued that FDI responds positively to the market size 'once it reaches a threshold level that is large enough to allow economies of scale and efficient utilization of resources'. Within this model market size is proxied by GDP per capita. A country's GDP per capita has long been used in the literature to access capital abundance, market potential and economic growth because higher economic developing levels are an indication of strong purchasing power and increased performance.

## 8.3 Cost related factor

According to Mundell (1957) the first common determinant for FDI and trade is the real exchange rate. It is argued that the changes in the real exchange rate make exports more or less profitable and also provide incentives or disincentives for investment. Export firms are more likely invest when the exchange rate is depreciating in order to maximize profits and increase their relative wealth, which ultimately enhances the locational advantage. Froot and Stein (1991) reported that the depreciation of U.S currency increased foreign of U.S firms in the post-1985 time period by linking the real exchange rate and the wealth of the investor with FDI. Klein and Klein (1994), theorize the importance of this relative wealth channel actually exceeds the importance of the relative wage channel in explaining FDI inflows. Wages is typically used when analyzing the market seeking effects of FDI. However Cheng and Wan (2000) and Fung et al. (2002) found wages to have a negative impact on FDI inflows in China, yet this effect was not confirmed by Sun et al. (2002) and Fung et al. (2005). The ambiguity of these effects suggests that low wages may not reduce production cost when labour productivity is low. Therefore Carstensen and Toubal, (2004) propose adjusting labour costs for productivity to assess the "efficiency wage" effect. For the scope of this theoretical framework labour costs are not regarded in the modeling strategy.

#### 8.4 Development Strategies

As previously illustrated the Deng effect and China's entry into the WTO were important moments in China's development phase. Liberalized policies significantly boosted FDI inflows which impacted China's economy. China's entry into the WTO also increased investor confidence due to increased transparency and stability in trade which promoted an improved business environment. Its inclusion provides a deeper narrative in accounting for how the locational advantages discussed, were influenced by these shocks in China's development period.

#### 8.5 Hypothesis

Based on the IMCD theoretical framework, the hypothesis is developed to further examine the relationship between foreign direct investment, domestic investment and the magnitude of these effects with the inclusion of locational advantage factors.

The core hypothesis is estimated as follows:

Ho (1): FDI does not crowd domestic investments

*-In first model hypothesis 1 is based on a bivariate model to assess the crowding in or crowding out effects on each other without the influence of other economic indicators*

Ho (2a): Primary sector of FDI does not crowd domestic investment

Ho (2b): Secondary sector of FDI does not crowd domestic investment

Ho (2c): Tertiary sector of FDI does not crowd domestic investment

- *For Hypothesis 2a- 2c FDI is aggregated by sector in model 2 to determine if the crowding results found in model 1 adjust or differ when accounting for sectorial changes. Additionally the inclusion of the "Deng" dummy to control for its significant shock to FDI in 1992.*

Ho (3): FDI does not crowd domestic investments when accounting for additional locational and development strategies of the host

- Hypothesis 3 connects the IMCD paradigm, which comprises of investment, cost, macro, and development strategies assessed to provide a more comprehensive framework to the analysis.

## 9.0 Data and Description

The period for the time series models ranges from 1980- 2009 based on consistent data availability. The estimations for hypothesis (1) and (3) are based on time series dataset from the World Bank Development Indicators. The FDI sector data for the estimation of hypothesis (2a-2c) was collected from Chinas Statistical Yearbooks. The following is a description of the variables based on the theoretical framework motivated in section 8:

*Foreign Direct Investment (FDI)* is measured as the net inflows of investment as a percentage of GDP. *Domestic Investments (DI)* is the gross capital formation as a percentage of GDP. *Trade openness* variable is based on the authors' calculations of adding imports and exports and dividing it by GDP. Trade openness reflects the degree to which China has allowed trade with other countries, which ultimately, impacts the amount of FDI that can be utilized based on access. Therefore trade openness is expected to have a positive effect on FDI. The impact of trade openness on domestic investment is important when accessing the *crowding out* or *crowding in* effects as a result of trade directly effecting FDI volumes. *Market size* is proxied by GDP per capita and it also a measure of economic performance. A country's size and economic performance is an important locational advantage of FDI inflows and also expected to positively impact domestic investments. *Exchange rate* is measured by real effective exchange rate is the nominal effective exchange rate which is a measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of costs. WTO is discrete dummy variable and introduced to indicate China's entry in the WTO in 2001 in order to reflect the development strategies and new wave of policy changes. The DENG effect is also a discrete dummy variable to account for Deng's 1992 southern tour, which created a significant shock to China's FDI inflows and liberalized China's economy and transformed it into a socialist-market economy. It is expected to positively complement FDI.

See Table 2 for a summary of the main variables and Table A2 in the appendix for the correlation matrix of the main variables. Additionally variables were logged for the analysis of the short-run and long-run Error Correction Models (ECM)<sup>2</sup>. These logarithms are used in conjunction with differencing; the transformed variables address percentage changes, making the interpretations of coefficients straightforward.

Table 2: Summary of Main Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
FDI	29	2.583548	1.845863	.00222	6.246298
DI	29	8.234305	6.955525	-.7085968	30.69745
OPEN	29	4.410104	1.922378	1.81924	7.22133
SIZE	29	938.7163	929.4238	168.246	3738.95
EXRATE	29	141.413	64.74391	82.64667	319.2083
WTO	29	.3	.4660916	0	1
DENG	29	.6	.4982729	0	1

## 10.0 Empirical Strategy

The methodology in this paper is based on the theoretical analysis of FDI in China using initial procedural steps performed:

### ❖ *Stationary*

A time series is deemed stationary when the mean and variance are constant and the covariance between two values depends on the length of time separating the two values and not the actual values at where the variable is observed. The variables are logged and estimated in their first difference in order to avoid a spurious regression; any interpretation of model with autocorrelated errors is invalid due to misspecification. To formally confirm whether the model is stationary the Augmented Dickey-Fuller (ADF) test is used.

The null hypothesis of the Augmented Dickey-Fuller t-test is

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<sup>2</sup> Domestic investment variable was not logged as it contain negative numbers

$H_0 : \theta = 0$  (i.e. the data needs to be differenced to make it stationary)

versus the alternative hypothesis of

$H_1 : \theta < 0$  (i.e. the data is trend stationary and needs to be analyzed by means of using a time trend in the regression model instead of differencing the data)

If the test confirms the time series is stationary after the first difference it is said to be integrated I (1), however, if it is stationary after the second difference it is integrated at I (2) and the series must be integrated at the same level.

#### ❖ *Cointegration*

In order to determine the causality direction of the variables the Johansen procedure is first utilized to determine if there is cointegration. The presence of cointegration is an indication of a long run relationship between the variables. Additionally this implies there is at least one uni-directional relationship. If cointegration is not evident, interpretations based on the short run dynamic are analyzed. The research hypothesis is based on the estimates of this short run and/or long run dynamic using the Vector Autoregressive Model (VARm) and the Vector Error Correction Model (VECM) respectively.

The null hypothesis of the Johansen Cointegration test is

$H_0 : r = 0$  (i.e. **there is no cointegrating relationship**)

versus the alternative hypothesis of

$H_1 : r < 0$  (i.e. **there is at least one cointegrating relationship**)

10.1 Vector Autoregressive Model (VARm)

If a cointegrating relationship cannot be determined a VARm is estimated using the logged first differences from the initial procedure. The number of lags to use in the final model is based on the Akaike’s Information Criterion (AIC). The lag selection is important in the testing procedure because it indicates the short-run relationship along a time period (past and present) and how each variable affects the other. Using the Granger Causality test the VARm is estimated and it should also be noted that the Granger Causality test is not a measure of *causality* in a theoretical sense but its estimation is a prediction of a *change* in X variable followed by a *change* in the Y variable.

10.2 Vector Error Correction Model (VEC)

Upon estimating the Johansen test to retain the amount of cointegrating relationships, the VEC estimates the cointegrating variables in their levels. The VECM, is basically a VAR model with the error correction terms from the cointegrating variables. The VAR does not assume which variable is dependent because all variables interact with each other and itself to determine the long run relationship. The error correction terms enables the interpretation of the short run dynamic in a long run equilibrium accounting for the speed of adjustment. According to Engle & Granger (1987) the error-correction terms indicates the long run impact of one variable on the other, while the changes of the lagged independent variable describes the short run causal impact. The VECM produces a better short run forecast and a short run dynamic to effectively interpret the long run relationship (Granger 1981). Additional model specification tests are estimated and the results are indicated in the following section.

**11.0 Model 1: Bivariate Model**

The hypothesis in the first model specifies that FDI does not crowd out domestic investments. Therefore the dependent variable, FDI will be year on year growth and the independent variables is GDP as a percentage of FDI.

The benchmark model specification for hypothesis (1) is specified follows:

$$FDI_{it} = \alpha + \beta_i DI + \epsilon \dots\dots\dots (1)$$

In order to estimate hypothesis 1 econometrically the testable model is as follows:

$$\ln y_t = \text{constant} + f\{(x)\}_t + \text{error}_t$$

$$\ln(\text{FDI})_t = \alpha_t + f\{(\text{DI})\}_t + \varepsilon_t$$

Where,  $Y$  represents the foreign investment,  $X$  is the domestic investments and  $\alpha$  and  $\beta$  are coefficients,  $t$  denotes time period and  $\varepsilon_t$  is the error term.

### 11.1 Empirical Analysis: Bivariate Model

The logged values of the original time series (FDI and DI) is seen in Figure 7

Figure 7: Logged Time Series FDI and DI

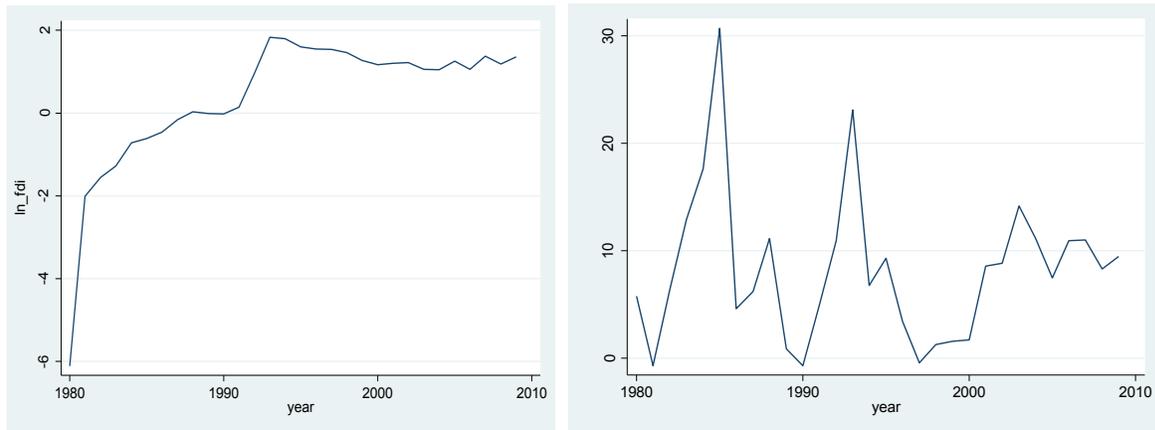
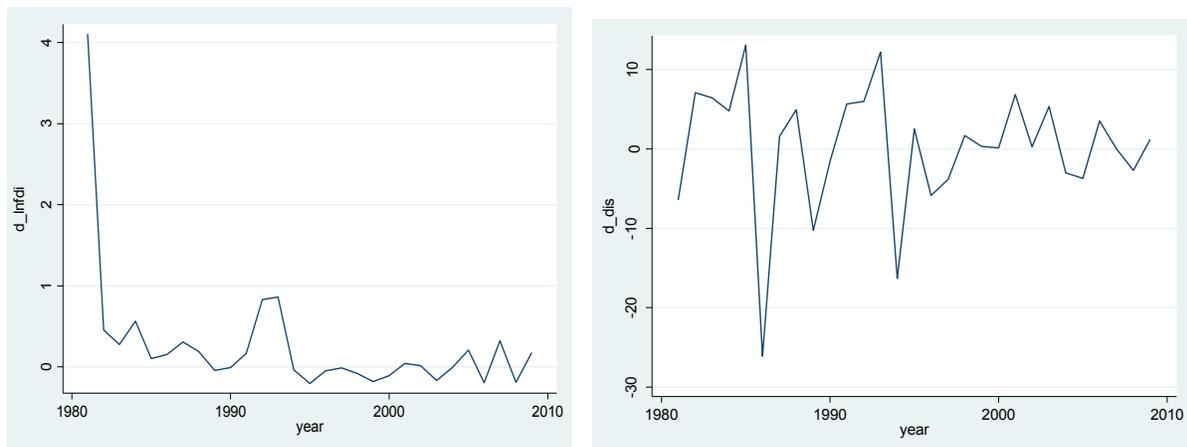


Figure 8: Transformed first differences FDI and DI



An ocular inspection of the logged time series for FDI indicates an upward trend whereas DI seems constant around the mean. The Dickey-Fuller test is used to measure the variables in their levels and differences to confirm stationarity. The Dickey-Fuller (Dickey and Fuller, 1979, 1981) test was developed in 1979, by D.A Dickey and W.A Fuller and tests for a unit root in an autoregressive model. Lags were chosen according to the testing down procedure, the following is an output of the Dickey Fuller Test:

Table 3: Model 1 - Augmented Dickey Fuller Test Results

Variables	Test Statistics (Z test)	5 % Critical Value	Deterministic Regressors	Lags	Obs.	Results
<b>Levels</b>						
ln_fdi	-2.356	-2.992	constant; no trend	1	28	non-stationary
Di	-3.540	-2.997	constant; trend	3	26	stationary
<b>Differences</b>						
D_LNFDI	-3.760	-3.592	constant; trend	1	27	stationary
d_lndi	-4.638	-2.994	constant; no trend	1	27	stationary
Di is stationary I(0) in its levels. However the in order for the series to be integrated of the same order and to avoid autocorrelated and white noise errors the log of FDI and DI was estimated in their differences and are integrated I(1).						

Table A3 (see appendix) is the output for the results of the Johansen test for cointegration. The null hypothesis of the Johansen test is (H0: there is no cointegrating relationship). Therefore the null hypothesis is not rejected at the 5% level ( $11.4955 < 12.25$ ). In other words, this trace test result does not reject the null hypothesis that these two variables are not cointegrated because the trace statistic is not larger than the critical value. Furthermore the results indicate there is no long term relationship between FDI and DI and only an analysis based on the short run dynamic relationship can be modeled.

## 11.2 Short Run VARm Estimation

Using the selection-order criteria, the lag order (1) was determined by SBIC and the VARm was estimated in its differences the output of the results is seen in Table 4.

Table 4: Model 1 Short-run VAR results

<b>Sample: 1982 – 2009</b>	<b>No. of obs. = 28</b>		
<b>Equation</b>	<b>R-sq</b>	<b>Chi2</b>	
D_LNFDI	0.1437	4.702709	

D_DIS		0.1033	3.225315	
		<b>Coef.</b>	<b>Std. Error</b>	<b>Z</b>
D_LNFDI	D_LNFDI	2.41**		
	L1.	(0.352)	.352	1.17
D_DIS	D_LNFDI	1.80**		
	L1.	(1.798)	1.794	1.01

Notes: Table

1. \*\*\*1% significance level, \*\*5% significance level, \* 10% significance level
2. Standard error in parenthesis

It is evident that in the short run FDI is significantly dependent on the increase of FDI in the previous time period. This means that a 1 per cent increase in FDI last year would lead to a 2.2 per cent increase of FDI in the current year at a 5 per cent significance level. Additionally, DI is also dependent on FDI in the short run, because it is estimated that a 1 per cent increase in FDI in the previous year would lead to a 1.8 per cent increase in DI in the current year.

Table 5: Model 1 Granger Causality Test Results

Equation	Excluded	chi2	df	Prob > chi2
D_LNFDI	D_DIS	.95955	1	0.327
D_LNFDI	ALL	.95955	1	0.327
D_DIS	D_LNFDI	1.0148	1	0.314
D_DIS	ALL	1.0148	1	0.314

To further understand the direction of the relationship, the Granger causality test is utilized. As expressed earlier the Granger causality test is not a measure of cause *per se*, but a measure of a change and how the variables react to each other. Although the short run analysis suggests domestic investment is dependent on FDI, the Granger causality test (Table 5) indicates that there is no directional relationship between FDI and domestic investments ( $p > 0.05$ ).

#### *Stability tests and Model Specification*

To ensure proper model specification the Jacque Bera test for Normality is estimated as seen in Table A4 (see appendix) I fail to reject the null hypothesis of normality; therefore the residuals

are normally distributed ( $p > 0.05$ ). At lag order 1, the Lagrange Multiplier test (see Table A6 in appendix) indicates the model does not suffer from autocorrelation ( $\chi^2_{2.37}$ ;  $p > 0.67$ ). Also, there is no autocorrelation at lags order 2-4 because the p values higher 0.05, therefore the residuals should also be homoscedastic, having similar variances over time. Lastly, the Eigenvalue stability test was utilized to determine whether the model was asymptotically stable. According to Table A5 and Figure 1A (see appendix) the moduli of the roots are all less 1 and lie within the Eigenvalue unit circle, therefore the model is in fact stable and well-specified.

## 12.0 Model 2 - Sector Composition of FDI

The second model estimates the effects of China’s domestic investments when controlling for the sector composition of foreign investment. Therefore the dependent variable is DI and the explanatory variables are FDI within the primary, secondary and tertiary sectors.

The benchmark model specification of hypothesis (2a-2c) is specified as follows:

$$DI_{it} = \alpha + \beta_1 FDIP_{it} + \beta_2 FDIS_{it} + \beta_3 FDIT_{it} + \beta_4 DENGd_{it} + \varepsilon \dots\dots\dots (2)$$

The modified equation is expressed as follows:

$$y_t = \text{constant} + f \{ \ln(x_1, x_2, x_3, x_4) \}_t + \text{error}_t$$

In order to estimate hypothesis (2a-2c) econometrically the testable model is as follows:

$$Y(DI)_t = \alpha_t + f \{ \ln(\text{FDI Primary sector}), \ln(\text{FDI Secondary Sector}), \ln(\text{FDI Tertiary sector}) \}_t + \varepsilon_t$$

Where,  $Y$  represents growth in DI,  $X_1$  is growth in Primary sector,  $X_2$  is growth in Secondary sector,  $X_3$  is growth in Services sector,  $X_4$  is a dummy variable representing the Deng effect,  $\alpha$  and  $\beta$  are coefficients ( $\alpha$  is constant,  $\beta$  is elasticity),  $t$  denotes time period,  $\varepsilon$  is the error term.

### 12.1 Empirical Analysis: Sector Composition of FDI

The explanatory variables in the original time series were transformed in their first differences. The results of the Augmented Dickey Fuller test for formally testing stationarity are located in Table 6.

Table 6: Model 1 - Augmented Dickey Fuller Test Results

Variables	Test Statistics (Z test)	5 % Critical Value	Deterministic Regressors	Lags	Obs.	Results
Levels						
DI	-3.540	-2.997	constant; trend	3	26	stationary
LN_FDIp	-3.125	-3.600	constant; trend	2	24	non-stationary
LN_FDIs	-4.290	-3.000	constant; no trend	2	24	stationary
LN_FDI <sub>t</sub>	-4.580	-3.000	constant; no trend	1	25	stationary
Differences						
D_DI	-4.638	-2.994	constant; no trend	1	27	stationary
D_LNFDI <sub>p</sub>	-3.082	-3.005	constant; no trend	4	21	stationary
D_LNFDI <sub>s</sub>	-3.561	-3.000	constant; no trend	2	23	stationary
D_LNFDI <sub>t</sub>	-4.505	-3.000	constant; no trend	3	22	stationary
In order for the series to be integrated of the same order and to avoid autocorrelated and white noise errors all of the variables were estimated in their differences and are integrated I(1).						

See Table A7 in the appendix for the results of the Johansen test for cointegration for model 2. The null hypothesis of the Johansen test is ( $H_0: r = 0$ , there is no cointegrating relationship). Therefore the null hypothesis is not rejected at the 5% level because ( $r=0$ ;  $22.56 < 25.15$ ). In other words, the trace test result does not reject the null hypothesis that these two variables are not cointegrated because the trace statistic is not larger than the critical value. Furthermore the results indicate there is no long term relationship between DI and the sectorial composition of FDI inflows. As a result the subsequent analysis of model 2 is based on the short-run dynamic relationship.

## 12.2 Short Run Analysis

Using the selection-order criteria, the lag order (3) was determined by SBIC and the VAR<sub>m</sub> was estimated in its differences and the output of the results is seen in Table 7. Results from the VAR<sub>m</sub> indicate that a 1 per cent increase in the primary and secondary sectors decreased domestic investment however a 1 per cent increase in the tertiary sector increased domestic investments, although the results were not significant.

1 per cent increase in domestic investment lead to a .02 per cent decrease in the FDI in the primary sector (-0.24;  $p > 0.032$ ). 1 per cent increase in the secondary and tertiary sectors also

decreased primary sector investment by 2.27 and .6 per cent respectively. 1 per cent increase in the primary and secondary sector also decreased tertiary sector FDI inflows by .9 per cent and 1 per cent respectively. Interestingly, domestic investments were significantly negatively affected by the Deng effect (-3.2;  $p > 0.000$ ). The secondary sector FDI was seen to positive impact the Deng effect. The results indicate domestic crowding out FDI in the primary sector and crowding in FDI within the secondary and tertiary sector. An analysis on the direction of this short run dynamic is further explored.

Table 7: Model 2: Short run results

Sample: 1987 – 2009		No. of obs. = 23	
Equation		R-sq	Chi2
			P>chi2
D_DIS		0.8123	4.702709
D_LNFDIp		0.7578	3.225315
D_LNFDIs		0.8902	10.34566
D_LNFDIt		0.8468	15.64566
DENG		0.9243	11.56542
		Coef.	Z
D_DIS	DENG L2.	-3.2*** (.896)	1.34
D_LNFDIp	D_DIS L1.	-.02** (.139)	-0.21
	D_LNFDIs L3.	-2.27** (.964)	-2.36
	D_LNFDIt L2.	-.61** (.316)	-1.94
D_LNFDIs	D_DIS L2.	-.01*** (0.002)	-4.38
D_LNFDIt	D_DIS L2.	.23*** (.007)	3.88

	D_LNFDI <sub>p</sub> L1.	-.97*** (.217)	-4.50
	D_LNFDI <sub>s</sub> L3.	-1.19** (.439)	-2.73
DENG	D_LNFDI <sub>s</sub> L1.	.89** (.382)	2.33

Notes: Notes for Table

1. \*\*\*1% significance level, \*\*5% significance level, \* 10% significance level
2. Standard error in parenthesis

Table 8: Model 2 Granger Causality Test Results

Variables	Results
D_DI	$\Delta D\_DIS \leftrightarrow \Delta DENG$
D_LNFDI <sub>p</sub>	$\Delta D\_LNFDI_p \rightarrow \Delta D\_DI$ $\Delta D\_LNFDI_p \rightarrow \Delta D\_LNFDI_s$ $\Delta D\_LNFDI_p \leftrightarrow \Delta D\_LNFDI_t$
D_LNFDI <sub>s</sub>	$\Delta D\_LNFDI_s \rightarrow \Delta D\_DI$ $\Delta D\_LNFDI_s \leftrightarrow \Delta D\_LNFDI_t$ $\Delta D\_LNFDI_s \leftrightarrow \Delta DENG$

Note

$\Delta$ denotes change

$\rightarrow$ denotes one way direction (uni-directional relationship)

$\leftrightarrow$  denotes two way direction (bi-directional relationship)

According to the Granger causality test, changes in the primary, secondary and tertiary sectors leads to changes in domestic investments. This indicates a one-way causality relationship, where domestic investment *granger* causes sectorial inflows but FDI sectors do not *granger* cause domestic investments. Additionally, the test also indicates a bi-directional relationship between the changes in domestic investment and the Deng effect and a one-directional relationship between the Deng effect and the primary and secondary sector. Therefore primary and secondary inflows are granger caused by the Deng effect.

### Stability tests and Model Specification

The Jacque Bera test for Normality (table A8 see appendix) as seen in indicates the model is normally distributed because all p value are larger than ( $p > 0.05$ ). Therefore, I fail to reject the null hypothesis of normality. LaGrange Multiplier test indicates there is no autocorrelation in the model therefore is properly specified (table A10; appendix). Furthermore, all eigenvalues lie within the unit circle of the Eigenvalue stability test therefore the VAR model satisfies the stability condition. (see figure A2 & Table A9; appendix)

### 13.0 Model 3: Multivariate Model

The third model estimates the effects of FDI inflows in China when controlling for the investment climate, macro-economic indicators, cost-related factor and the effect of China's WTO accession. Therefore the dependent variable is FDI and the explanatory variables are domestic investment, market size, trade openness, exchange rate and the WTO effect.

The benchmark model specification of hypothesis (3) is specified as follows:

$$FDI_{it} = \alpha + \beta_1 DI_{it} + \beta_2 SIZE_{it} + \beta_3 OPEN_{it} + \beta_4 EXRATE_{it} + \beta_5 WTO_{it} + \epsilon \dots\dots\dots (3)$$

The modified log linear equation is expressed as follows :

$$y_t = \text{constant} + f \{ \ln(x_1, x_2, x_3, x_4, x_5) \} t + \text{error}_t$$

In order to estimate hypothesis (3) econometrically the testable model is as follows:

$$\ln Y(FDI)_t = \alpha t + f \{ (di), \ln(\text{size}), \ln(\text{open}), \ln(\text{exrate}), (wto) \} t + \epsilon t$$

Where,  $Y$  represents growth in FDI,  $X_1$  is domestic investment,  $X_2$  is size,  $X_3$  is open,  $X_4$  is exchange rate,  $X_5$  is a *dummy* for the wto effect,  $\alpha$  and  $\beta$  are coefficients ( $\alpha$  is constant,  $\beta$  is elasticity),  $t$  denotes time period,  $\epsilon t$  is the error term.

#### 13.1 Empirical Analysis: Multivariate Analysis

The following is logged-linear representation of the original time series and the transformed first differences of the results output of the Augmented Dickey Fuller test for formally testing stationarity:

Table 9: Model 3 Augmented Dickey Fuller Test Results

Variables	Test Statistics (Z test)	5 % Critical Value	Deterministic Regressors	Lags	Obs.	Results
<b>Levels</b>						
LN_FDI	-2.356	-2.992	constant; no trend	1	28	non-stationary
DI	-3.540	-2.997	constant; trend	3	26	stationary
LN_SIZE	2.790	-2.994	constant; no trend	2	27	non-stationary
LN_OPEN	-2.322	-3.392	constant; trend	2	27	non-stationary
LN_EXRATE	-2.474	-2.992	constant; no trend	1	28	non-stationary
<b>Differences</b>						
D_LNFDI	-3.760	-3.592	constant; trend	1	27	stationary
D_LNDI	-4.638	-2.994	constant; no trend	1	27	stationary
D_LNSIZE	-5.647	-3.592	constant; trend	1	27	stationary
D_LNOPEN	-3.218	-3.000	constant; no trend	3	25	stationary
D_LNEXRATE	-4.749	-3.592	constant; trend	1	27	stationary
DI is stationary I(0) in its levels. However in order for the series to be integrated of the same order and to avoid autocorrelated and white noise errors all variables were transformed in their differences and are integrated I(1).						

Table A11 (see appendix) is the output for the results of the Johansen test for cointegration for model 3. The null hypothesis of the Johansen test is ( $H_0: r = 0$ , there is no cointegrating relationship). Therefore the null hypothesis is rejected at the 5% level because ( $r=3$ ;  $11.9259.56 < 15.41$ ) which confirms multiple cointegrating relationships. This also validates the presence of a long run dynamic relationship within the multivariate model; as a result, a VEC model is utilized. Further assessments on the short run dynamic of the relationships will also be discussed because a long run relationship cannot exist without the presence of a short run dynamic.

### 13.2 Long Run Analysis

The VEC is estimated in its levels using the SBIC selection criteria with 3 lags, and 3 ranks as indicated by the Johansen test.

#### *Normalizing and Interpretation of the Beta coefficients*

Table 10: Model 3 Beta Coefficients – Cointegrating equation 1

Normalizing cointegrating equation coefficients			
LNFDI	DI	LNOPEN	WTO
1	-1.06	-3.80	-1.76

	(.492)	(.237)	(.348)
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Notes: Notes for Table

1. Standard error in parenthesis

$$\text{LNFDI}_t = -1.06 (\text{di}) - 3.80 \ln(\text{open}_t) - 1.76 (\text{WTO}_t)$$

Normalized coefficients:

$$\text{Infdit} = 1.06 (\text{di}) + 3.80 \ln(\text{open}) + 1.76 (\text{WTO}_t)$$

FDI inflows are significantly correlated with domestic investments, trade openness and China's entry into the WTO. A 1 per cent increase in DI increases FDI by 1.06 per cent. A 1 per cent increase in trade openness increased FDI inflows by 3.8 per cent and China's entry into the WTO increased FDI inflows by 1.76 per cent.

Table 11: Model 3 Beta Coefficients – Cointegrating equation 2

Normalizing cointegrating equation coefficients			
DI	LNSIZE	LNOPEN	WTO
2	-2.33 (.342)	-2.52 (.129)	-2.12 (.245)

Notes: Notes for Table

1. Standard error in parenthesis

$$\text{DI}_t = -2.33 \ln(\text{size}) - 2.52 \ln(\text{open}_t) - 2.12 (\text{WTO}_t)$$

Normalized coefficients:

$$\text{DI}_t = +2.33 \ln(\text{size}_t) + 2.52 \ln(\text{open}_t) + 2.12 (\text{WTO}_t)$$

Domestic investments are significantly correlated with market size, openness and WTO. A 1 per cent increase in market increases domestic investment 2.33 per cent. A 1 per cent increase in trade openness increases domestic investment 2.52 per cent. Lastly, a 1 per cent increase in the exchange rate increases domestic investment 1.47 per cent.

Table 12: Model 3 Beta Coefficients – Cointegrating equation 3

Normalizing cointegrating equation coefficients			
LNSIZE	LNFDI	DI	WTO
3	-3.55 (.486)	-3.47 (.284)	-2.12 (.831)

Notes: Notes for Table

1. Standard error in parenthesis

$$\ln size_{it} = -3.55 \ln(fdi_{it}) - 3.47 (di_{it}) - 2.12 (WTO)$$

Normalized coefficients:

$$\ln size_{it} = 3.55 \ln(fdi_{it}) + 3.47 (di_{it}) + 2.12 (WTO)$$

A 1 per cent increase in FDI increase China's market size 3.55 per cent. Its market size is also increased by 3.47 per cent when there is a 1 per cent increase in domestic investments. China's entry into the WTO has also affected its market size. Since GDP per capita is also a proxy for economic development, this indicates that China's entry into the WTO has also positively impacted its economic growth and performance.

#### *Interpretation of the alpha coefficients*

The alpha coefficient of the cointegrating equations in the VECM explains the deviations from the previous cointegrating value. In the first cointegrating equation the alpha coefficients of FDI ( $ce1 = .86$ ) is significant at the 10 per cent level ( $p > 0.054$ ) therefore the yearly positive adjustment of the FDI will be approximately .86 per cent deviation of  $fdit-1$  from its cointegrating values. The trade openness variable indicates a positive adjustment. The error correction of trade openness variable ( $ce1 = .48$ ) is significant at the 5 per cent significance level ( $p > 0.001$ ). The WTO effect also has a positive adjustment ( $ce1 = .18$ ;  $p > 0.030$ ). If the long run relationship is broken, FDI, trade openness and the effects of China's WTO entry is adjusting in the long-run to become integrated while, the other variables like market size, GDP and domestic investment is not reacting because they are driving factors.

Based on the second cointegrating equation, the alpha coefficients for DI ( $ce2 = 2.55$ ) is significant at the 5 per cent level ( $p > 0.003$ ). The yearly positive adjustment of DI has a 2.55 per

cent deviation from the cointegrating values. The trade openness coefficient has a positive adjustment ( $ce2 = .01$ ;  $p > 0.002$ ). The exchange rate coefficient also has a positive adjustment ( $ce2 = .01$ ;  $.022$ ). Therefore, domestic investments, trade openness and the exchange rates are adjusting to form a long run equilibrium while the other insignificant variables are not adjusting.

In the third cointegrating equation size has a positive adjustment ( $ce3 = .09$ ;  $p > 0.037$ ) with a .09 per cent deviation from the cointegrating error. The error correction for FDI has a positive adjustment ( $ce3.15$ ;  $0.001$ ). The error correction coefficient of trade openness ( $ce3 = -0.4$ ;  $p > 0.02$ ) also indicates a positive adjustment as well as the WTO effect variable ( $0.8$ ;  $0.028$ ). Similar to the previous equations the size of the market, openness to trade and the effects of the WTO are all adjusting in the long run.

When looking at each cointegrating equations the result of the long run equilibrium model implicates each variable as a driver and adjusting therefore the relationships between the cointegrating variables are mutual/conjoint.

### 13.3 Short run Relationship

The VECM results output also includes the short run relationship and the interaction on each variable.

Table 13: FDI as dependent variable

	Coef.	Z
D_LNFDI	.412** (.352)	1.17
D_DI	.01* (.007)	1.78
D_LNSIZE	1.21** (.575)	2.11
D_LNEXRATE	-1.81** (.761)	-2.38
D_LNOPEN	2.39*** (.689)	-3.47

Notes: Notes for Table

1. \*\*\*1% significance level, \*\*5% significance level, \* 10% significance level
2. Standard error in parenthesis

From an assessment of the VECM output in table (13) the effects of FDI is dependent on itself, DI, market size, the exchange rate and openness to trade. The results are as follows:

- ❖ 1 per cent increase in FDI the previous period increases FDI 0.4 per cent in the current period.
- ❖ 1 per cent increase in DI in the previous period increases FDI 0.1 per cent in the current period.
- ❖ 1 per cent increase in market size in the previous period increases FDI 1.21 per cent in the current period
- ❖ 1 per cent increase in exchange rate in the previous period decreases FDI 1.81 per cent in the current period.
- ❖ 1 per cent increase in trade openness in the previous period increases FDI 2.39 per cent in the current period.

Table 14: Domestic Investments as the dependent variable

	Coef.	Z
FDI	19.69** (.352)	1.17
ERATE	1.31** (.433)	1.08
OPEN	1.21** (.575)	1.11

Notes: Notes for Table

1. \*\*\*1% significance level, \*\*5% significance level, \* 10% significance level
2. Standard error in parenthesis

- ❖ 1 per cent increase of FDI in the previous period increases domestic investments 19 per cent in the current period.
- ❖ 1 per cent increase in exchange rate in the previous period increases domestic investments 1.31 per cent in the current period.
- ❖ 1 per cent increase in trade openness in the period increases domestic investments 1.21 per cent in the current period.

Table 15: Model 3- Openness to trade as a dependent of variable

	Coef.	Z
DI	.013*** (0.003)	3.28
EXRATE	.578** (.258)	2.24
OPEN	.48** (.182)	-2.68
WTO	.312** (.115)	2.70

Notes: Notes for Table

1. \*\*\*1% significance level, \*\*5% significance level, \* 10% significance level
2. Standard error in parenthesis

- ❖ 1 per cent increase in the domestic investment in the previous period increases openness to trade .01 per cent in the current period.
- ❖ 1 per cent increase in the exchange rate in the previous period increases trade openness by .05 per cent in the current period.
- ❖ The effect of China's entry into the WTO increased trade openness

The results of the short run relationship indicate, FDI and DI have complementary effects, where the changes in FDI are dependent on DI and the changes in DI are dependent on FDI. However increased domestic investments have smaller effect on FDI inflows and domestic investments benefit significantly.

#### *Stability tests and Model Specification*

Model 3 satisfies the model specification and stability tests as discussed within the previous models. The Jacque Bera tests for normality indicate that residuals are normally distributed (see appendix A12). The moduli within the Eigenvalue test are not larger than one nor do they lie outside the unit circle as seen in figure A3 in the appendix, therefore the model is stable. According to the LaGrange Multiplier test, the model also does not suffer from autocorrelation issues, p values a lag order 1 -4 are larger than 0.05.

A summary of the results further confirms a non-standardized effect of FDI and domestic investments (see table 16). When isolated to a bivariate model the results indicate that DI is

dependent on FDI however a directional relationship was not found. The sector model specifies FDI's dependency on domestic investment in the primary, secondary and tertiary sectors. It also highlights the negative effects of primary sector FDI inflows on domestic investment. While a directional relationship was not present in model 1, the breakdown of FDI inflows by sector indicated one-directional relationship running to FDI, therefore, changes in all three sectors were said to be caused by domestic investments. Unlike model 1 and 3 however, domestic investment negatively impacted FDI except in the tertiary sector. Additionally, the bivariate and sector models were unable to capture a long run relationship however the extended multivariate model which accounted for additional locational factors, did reveal multiple cointegrating relationships. Compared to the singular dependent relationship previously modeled, in model 3 domestic investments and FDI was seen to be mutually dependent and adjusting to each other in the long run. In model 1 and 3 the contributing effects of FDI largely favoured domestic investments however when the benefits of domestic investment were reciprocated, the impact is minuscule in comparison. The following section further discusses these effects and interactions.

Table 16: FDI and DI results Summary Table

	Model 1- Bivariate	Model 2 – Sectors	Model 3 - Multivariate
Short run	DI dependent on FDI  No directional relationship	Sector FDI dependent on DI  DI negatively impacts the primary sector  DI positively impacts the secondary and tertiary sectors $\Delta DI \rightarrow \Delta \text{Primary FDI}$ $\Delta DI \rightarrow \Delta \text{Secondary FDI}$ $\Delta DI \rightarrow \Delta \text{Tertiary FDI}$	FDI and DI mutually dependent  $\Delta FDI \leftrightarrow \Delta DI$
Long run	No long run relationship found	No long run relationship found	FDI and DI adjust to each other in the long run

Notes: Notes for Table

1.  $\Delta$  denotes change
2.  $\rightarrow$  denotes one way direction (uni-directional relationship)
3.  $\leftrightarrow$  denotes two way direction (bi-directional relationship)

## 14.0 Discussion

Generally speaking foreign investors usually receive preferential treatment compared to domestic investment. Based on the literature, investment is an essential variable in determining economic growth of a country, therefore when the impact of FDI inflows increases, as in the case of China the question arises: Does the addition of FDI inflows crowd in or crowds out domestic investment? If FDI crowds out domestic investment, it calls into question the benefits of FDI to the host country. FDI brings in goods and services that are new to the economy which usually have favorable effects on technology and enhance capital accumulation.

The bivariate VARm used in model 1 indicates no directional relationships in the short run between DI and FDI, although DI was seen to be dependent on FDI inflows. This dependent relationship between FDI and DI is connected through linkages where FDI increases improved quality, productivity and product diversity which supports the crowding in hypothesis. The impact of FDI on domestic investment is stronger than the reverse relationship therefore the role of domestic investment in attracting FDI is not as significant as that of FDI in determining domestic investment. However a limitation of this model is the exclusion of other factors that also contribute to the effects of FDI.

Sector level data further provides a useful analysis in understanding how FDI effects domestic investments, also through the use of a VAR modeling strategy. The motivation for FDI in different sector may also influence how it influences domestic investments. When looking at the sectorial allocation of FDI in model 2 and its effects on domestic investments, the results differ and provide a mixed analysis in the short run. Domestic investment crowds out primary FDI inflows, therefore increases in domestic investment have a negative impact on the primary sector FDI allocation in the short run. These findings are unsurprising given China's agricultural dynamic within the primary sector. While agriculture was one of the first industries open to FDI it did not receive as much traction as the other sectors due to the fact that it was small scale and did not have the appropriate technologies for large scale production. Additionally, the central government largely controlled the production, pricing and essentially all aspects of agricultural development which hindered foreign access to the industry. Although insignificant, the model also indicated a reverse crowding out effect of which primary sector FDI inflows crowded out

domestic investments which calls into the question the ability of FDI in the primary sector in creating linkages to the domestic market.

Kokko (1994) argues that spillovers should not be expected in all industries because foreign companies sometimes operate in “enclaves” that offer little scope for the local economy to benefit. Hirschman (1958:109) emphasized the potential to absorb technology or to create linkages with the rest of the economy is not apparent in all sectors, specifically in the primary sector. He also noted, “linkages are weak in agriculture and mining”. While the negative effect of domestic investment on FDI in the primary sector is attributed to the inability to create linkages to domestic and foreign firms, the forward and backward linkages becomes less important with the primary sector because it requires less inputs and materials from local suppliers. Contrastingly, domestic investment crowds in FDI and has a positive effect on the secondary and tertiary sectors. According to the literature the main productivity effect of FDI is the technology factor. Within the secondary sector, specifically, the manufacturing industry, the positive effect of domestic investment mirrors the effects of FDI inflows through technological spillovers and human capital accumulation. While the tertiary sector benefits from technological and knowledge spillovers through the demonstration effect, Aizan et. al (2005) theorize that the effect of FDI is likely to be positive in services because of the sector’s non-tradable nature and FDI’s predominantly market-seeking motivation in this sector. The findings supported evidence that FDI does not crowd out domestic investment in the secondary and tertiary and crowd in the primary sector, however the results were insignificant, therefore hypothesis 2a-2c were inconclusive. China’s development strategies implemented as a result of the Deng southern tour also significantly influenced domestic investments and FDI in the primary and secondary sectors. The Deng effect dummy variable indicated a bi-directional relationship with domestic investments, unsurprisingly as FDI inflows in China surged after 1992 and domestic investments declined slightly. The effects of the Deng variable was also evident in the primary and secondary sectors, as the Deng effect was seen to *granger* cause changes in these sectors which can also be attributed to China’s more open market and liberalizing policies. However, the effect of the Deng variable was unforeseen in the tertiary sector since it is an area that was still relatively closed off to FDI until the early 2000’s marked by China’s entry into the WTO.

The extended model is comprised of the IMCD paradigm and the variables selected are based on the locational advantages of the host country, China. As outlined in the theoretical framework, these locational advantages includes; the investment climate, macro-economic conditions, cost-related factors and developmental strategies of the host country. Therefore understanding the effects of FDI and domestic investment is dependent on the inclusion of these additional locational mechanisms. In addition to the FDI and DI variables used in the previous model, variables representing trade openness, market size, exchange rate and China's entry into the WTO were included to provide a more comprehensive narrative of FDI and DI investment in China. While models 1 and 2 assessment was based on the VARm. However, model 3 results were determined by utilizing a VECM which as earlier discussed allows for the interpretation of a long run and short dynamic. Based on the cointegrating equations FDI was positively correlated with domestic investments, openness to trade and the WTO. For reasons discussed earlier the connection between FDI and DI is largely as a result of the linkages that are created as a result of spillover effects/value added technology. While the results of the first two models suggest a mixed effect of FDI and DI, the multivariate model implicates a mutually and dependent relationship. Therefore the extent of FDI's influence on domestic investments and vice versa is somewhat altered by these additional interactions.

The significance and the magnitude of the coefficients in the long and short run for FDI and trade openness oppose the standard neoclassical growth perspective which excludes exogenous factors like trade. The trade openness variable account for exports and imports as a percentage of GDP, therefore it supports the export-led growth hypothesis through the exploitation of economies of scale and removing restrictions to allow inflows of capital formation and goods. This promotes enhanced efficiency through the diffusion of knowledge. The positive effect of China's entry into the WTO reaffirms the importance of trade openness in Chinas investment environment as a result of increased liberalization in adherence to WTO regulations. It also provides opportunities for investment in previously restricted sectors, specifically the service and high tech-sectors which are largely dominated by state-owned enterprises (SOEs). Bhagwati (1988) refers to the openness to trade influence as a "virtuous cycle". The finding also support that of Sjöholm (1999) who found that trade and investments increase a nation's technology

standard through increased competitive pressure, embodiment in imports, and knowledge transfer through commercial contacts.

The extended multivariate model also emphasizes the significance of market size and exchange rates in relation to openness, FDI and domestic investments in the long and short run. This confirms the commonly held view that a country's development level has significant bearing on its investment environment. In addition to increased development, a larger the market also has more potential for expansion to access the domestic market which can boast profits. The significance of the market size also supports the horizontal integration of FDI in China. Unlike the vertical integration or export platform hypothesis the locational advantage of FDI in China is to serve the local market and/or neighbouring countries. The exchange rate is also used as important cost factor in determining the locational advantage of FDI inflows. China's currency has long been held to be undervalued, when the value of a currency declines relative to the value of another it reduces wage and production costs relative to its foreign counterparts and therefore the country with real currency depreciation becomes a locational advantage destination for receiving investments. This supports short run dynamic relationship in model 3, where an increase in exchange rate negatively affects FDI. Trade openness is also positively influenced by real exchange rate. These results support the finding of Calvo and Drazen (1998), who propose that trade liberalization of uncertain duration, could lead to an upward jump in consumption and hence a real appreciation will occur in the short run. It is argued that the real exchange rate will only depreciate if trade liberalization is permanent while transitory reform causes a real appreciation in the short run. Li (2004) theorize that credible trade liberalization leads to real exchange rate depreciation but non-credible ones could lead to a short-run real exchange rate appreciation.

The results of these of these findings support those of other researchers (Borensztein et al. 1998; Balaubramanyam et al. (1996) who propose that the relationship between FDI and domestic investments is a multi-dimensional interaction. The effects can be attributed to the locational and development strategies of the host country as modeled in this paper based on the IMCD paradigm. While the locational advantages and their interacting effect on the China's development allows for an understanding of future investment at the firm level and the paper

shows that it also provides a mechanism for the government to gauge foreign capital inflows in a way that is complementary to its domestic economy and long term development initiative. The Central government is already developing e-government services, promoting long-distance healthcare education, e-commerce, all of which require increased development of the service sector. The Chinese five-year plan also seeks to increase the service sector as a percentage of GDP by 4 per cent, additional opportunities that will result in this change is estimated at over \$US 1 trillion. Therefore, the service sector will be vital in China's continued growth efforts as the government continue to liberalize those markets.

There are a host of other factors at the national level that determine the FDI and domestic investment relationship and this suggests there are some limitations to this study. For example the exclusion of institutional factors to control for the quality of the regulatory environment may have impacted the magnitude of the effects FDI and domestic investments and resulted in an overestimation of the market size coefficient when accounting for quality. This study is largely based on macro-level evidence and it cannot justify the microeconomic dimension that may affect these positive and negative effects, while it is relevant to the FDI and domestic investment narrative, its inclusion is beyond the scope of this study. Additionally, the Granger causality tests, albeit useful as a diagnostic measure of change, is not a real measure of causality.

## **15.0 Conclusion and Policy Implications**

Based on the IMCD paradigm, this paper supports the role of foreign capital inflows in stimulating domestic investment *vis a vis* in China through the use of the VAR and VEC modeling strategies. Annual time series during the period of 1980-2009 were estimated in their logs and differences, and transformed to a stationary time series to avoid problems of a spurious regression. Three models were used to capture different effects of how FDI and domestic investment interact with each other. The first bivariate model indicates that there were no directional relationships between FDI and DI, although DI was seen to be dependent on FDI inflows, supporting hypothesis 1, that FDI does not crowd out domestic investments. In the second model, the Granger causality test showed that changes in FDI in all primary, secondary and tertiary sectors were caused by domestic investments in the short run. However domestic investment was seen to crowd out primary sector and crowd in the secondary and tertiary sector. The inability to form linkages between domestic investments and the primary sector FDI lies in

the initial deficient technological capabilities for large scale production but continues as a result of the Central governments restrictive measures within the agriculture sector and perhaps indicative of the local protectionism practices that crowd out foreign capital inflows. The positive effects on the secondary and tertiary sector confirm the need for continued openness to trade especially in the service sectors. Although model 2 indicated FDI crowding domestic investments in the primary and secondary sector, the results were not significant and therefore inconclusive regarding hypothesis 2. The third extended multivariate model captured a mutually dependent relationship when accounting for the additional investment, macro-economic, cost-related factors and development strategies of the host country. The mutually dependent relationship between DI and FDI confirms the influence of technological transfers through linkages to the domestic and foreign markets, which supports the crowding in hypothesis 3. The implications are clear, the short run effects of the investment, macro-economic, cost-related factors and development strategies are nested in China's long run equilibrium. Therefore complementary policy and strategic measures to support these changes are essential to future developments and in maintaining its appeal as an attractive destination for FDI inflows.

Since FDI was seen to complement domestic investments, China should continue to encourage and promote FDI inflows with appropriate FDI policies and regulations. However rather than just encouraging FDI inflows the central government should impose regulations of MNEs to take on export obligations or encourage FDI in resource industries and high risk areas where domestic investment might be limited. Quality FDI should be encouraged in the primary, secondary and tertiary industries. In order to increase and generate sustainable local linkages China can impose more regulations on MNEs to promote vertical inter-firm linkages for technological diffusion. Additionally, an equal investment environment for domestic investment and foreign investment would be more suitable to long term development as changing regulations for FDI or favouring FIEs over domestic firms can create adverse FDI externalities on China's continued growth and domestic investments. The 2008 global financial crisis proved the need for vigilance and alertness in midst of FDI plateaus which could create capital shortages in the areas or industries in which FDI complemented domestic investments and as demand for exports were reduced. Therefore it is essential for domestic investment to have a significant contribution to China's future investment strategies and policies, especially as China enters its maturing stage. For this,

it is imperative to understand the extant and emerging growth pattern in China, the new structure and spread of demand engendered by it and the backward and forward linkages spreading growth across regions and sectors. Additionally, as China shifts from manufacturing FDI to service FDI more time dimension research to examine the impact of industry flows within their sectors and their spillovers to other sectors will be vital for future FDI research on China.

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## 17.0 Appendix

Table A1: FIE Sales Share in Low Tech and High Tech Industry 1995 & 1998

Manufacturing industry		Share of FIE sales of all sales		Share of FIE exports of FIE sales		Share of FIE export of all export	
		1995	2008	1995	2008	1995	2008
Low tech	Food processing	21.2	13.8	24.5	3.7	57.5	51.4
	Food manufacturing	30.5	11.7	16.6	4.3	38.7	49.1
	Beverage manufacturing	26.2	4.7	4.5	1.1	37.8	56.1
	Tobacco processing	0.6	1.5	17.3	0.0	2.5	0.3
	Textile industry	17.9	40.4	48.6	9.2	28.6	47.2
	Garments and footwear	50.8	52.7	71.7	22.2	60.5	61.7
	Leathers and related products	54.1	53.5	73.6	25.5	73.2	68.8
	Timber processing and related products	57.7	35.5	31.5	5.4	58.7	26.1
	Furniture manufacturing	75.1	61.7	45.8	24.6	75.1	66.6
	Papermaking and paper products	53.4	17.5	20.8	5.9	53.4	83.5
	Printing and recorded pressing	79.4	28.3	19.8	8.0	79.4	79.9
	Culture, educational and sports articles	69	72.4	81.3	41.1	69	72.5
	Petroleum processing and product	1.4	7.5	21.8	1.0	8.5	59.9
	Chemical fibers	12.7	10.4	26.3	3.2	41.5	37.1
	Rubber products	25	38.6	39.7	15.1	53.3	65.0
	Plastic products	33.1	42.3	42.6	21.7	77.2	76.5
	Nonmetal mineral products	11.4	21.6	21.4	3.7	38.9	51.7
	Smelting and pressing of ferrous metals	6.2	8.7	9.3	1.2	6.3	18.0
	Smelting and pressing of nonferrous metals	12.5	16.0	18	2.5	24.4	44.2
	Metal proeucts	26.6	43.9	47.2	13.6	61.1	64.6
Average	33.2	29.1	34.1	10.6	47.3	54.0	
High tech	Chemical materials and products	12.6	15.6	22.7	4.2	31.6	55.5
	Medical and pharmaceutical products	18.3	13.8	16.9	3.7	21.9	37.0
	Ordinary machinery manufacturing	14.5	30.6	21.9	7.8	30.6	54.4
	Special purpose equipment	9.0	28.8	27.9	7.8	35.5	57.9
	Transportation equipment	25.2	17.4	7.6	7.8	30.4	50.6
	Electric equipment and machinery	21.8	44.8	34.3	15.8	58.3	68.3
	Electronic and telecommunications	60.8	76.7	59.1	62.5	94.5	91.9
	Instruments	38.8	65.6	51.2	37.7	71.8	87.3
	Average	25.1	36.7	30.2	18.4	46.8	62.9

Source: Third Industrial Census (1997) and China Industrial Economic Statistics Yearbook, 2009

Table A2: Correlation Matrix Main Variables

	FDI	DIS	OPEN	SIZE	ERATE
FDI	1.0000				
DIS	0.0096	1.0000			
OPEN	0.7758	-0.0319	1.0000		
SIZE	0.3936	0.0568	0.7796	1.0000	
EXRATE	-0.7298	0.0747	-0.6611	-0.3847	1.0000

Table A3: Model 1: Johansen Test for Cointegration results

Trend: rtrend	Number of obs= 29				
Sample: 1981-2009	Lags = 1				
Maximum rank	Parms	LL	eigenvalue	Trace statistic	5 % critical value

0	2	134.877	0.29626	11.4955*	12.25
1	6	114.3203	0.18165	2.6367	9.75
2	8	108.57253	0.134347		

Table A4. Model 1 Jarque Bera Normality Test results

Jarque-Bera test				
Equation		chi2	Df	Prob > chi2
D LNFDI		6.983	2	0.56577
D DIS		10.029	2	0.99664
ALL		17.012	4	0.48192
Skewness test				
Equation	Skewness	chi2	Df	Prob > chi2
D LNFDI	1.1614	6.295	1	0.91211
D DIS	1.0204	4.859	1	0.12751
ALL	11.153		2	0.78378
Kurtosis test				
Equation	Kurtosis	chi2	Df	Prob > chi2
D LNFDI	3.7678	0.688	1	0.40690
D DIS	5.1053	5.171	1	0.92297
ALL	5.859		2	0.65343

Table A5 : Model 1 Eigenvalue Stability Test results

Eigenvalue stability condition

Eigenvalue	Modulus
-.2842073	.284207
.1482027	.148203

All the eigenvalues lie inside the unit circle  
VAR satisfies stability condition.

Figure A1: Model 1 Eigenvalue Stability Output

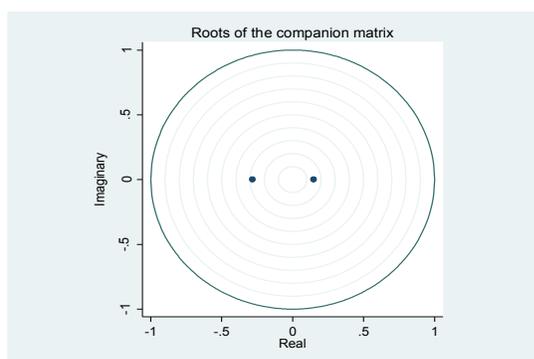


Table A6: Model 1: Lagrange-multiplier test results

Lag	Chi2	df	Prob>ch2
1	2.3783	4	0.66655
2	4.1572	4	0.38515
3	3.0280	4	0.55316

4	0.8351	4	0.93368
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Note: Note Table

1. Ho: no autocorrelation at lag order

Table A7: Model 2: Johansen Test for Cointegration results

Trend: trend	Number of obs= 23				
Sample: 1987-2009	Lags = 4				
Maximum rank	Parms	LL	eigenvalue	Trace statistic	5 % critical value
0	2	107.22067	0.90283	22.5366*	25.32
1	6	114.90076	0.48718	7.1764	12.25

Table A8: Model 2: Jarque Bera Normality test results

Jarque-Bera test				
Equation		chi2	df	Prob > chi2
D DI		0.039	2	0.98053
D LNFDIP		4.547	2	0.10296
D LNFDIS		0.587	2	0.74561
D LNFDIT		2.304	2	0.31608
DENG		5.129	2	0.07695
ALL		12.606	10	0.24653
Skewness test				
Equation	Skewness	chi2	df	Prob > chi2
D DI	.09425	0.034	1	0.85359
D LNFDIP	-1.0265	4.039	1	0.05445
D LNFDIS	-.31327	0.376	1	0.53964
D LNFDIT	-.27316	0.286	1	0.59278
DENG	-.98518	3.721	1	0.05375
ALL		8.456	5	0.13282
Kurtosis test				
Equation	Kurtosis	chi2	df	Prob > chi2
D DI	2.9258	0.005	1	0.94210
D LNFDIP	3.7277	0.507	1	0.47622
D LNFDIS	2.5309	0.211	1	0.64605
D LNFDIT	4.4509	2.017	1	0.15550
DENG	4.2124	1.409	1	0.23526
ALL		4.150	5	0.52804

Table A9: Model 2 Eigenvalue Stability test results

Eigenvalue stability condition

Eigenvalue	Modulus
-.8002238 + .3560318 <i>i</i>	.875852
-.8002238 - .3560318 <i>i</i>	.875852
-.00860469 + .8544881 <i>i</i>	.854531
-.00860469 - .8544881 <i>i</i>	.854531
-.5632315 + .6264708 <i>i</i>	.842434
-.5632315 - .6264708 <i>i</i>	.842434
.6332129 + .5516563 <i>i</i>	.839811
.6332129 - .5516563 <i>i</i>	.839811
.3859579 + .7452177 <i>i</i>	.839234
.3859579 - .7452177 <i>i</i>	.839234
.8279004	.8279
-.1345641 + .6686468 <i>i</i>	.682053
-.1345641 - .6686468 <i>i</i>	.682053
.5545467	.554547
-.2159802	.21598

All the eigenvalues lie inside the unit circle.  
VAR satisfies stability condition.

Figure A2. Model 2 Eigenvalue Stability output

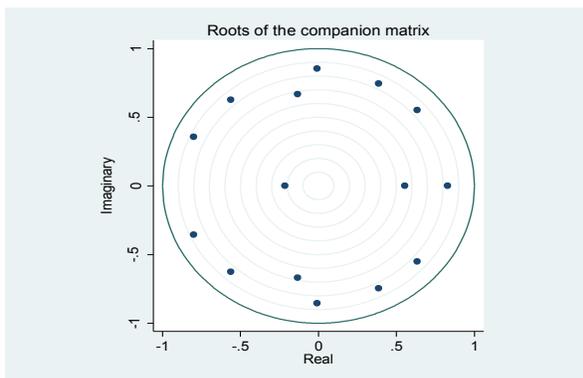


Table A10: Model 2: Lagrange-multiplier test results

Lag	Chi2	df	Prob>ch2
1	16.2373	16	0.89750
2	12.4878	16	0.43857
3	19.4894	16	0.57894
4	15.9383	16	0.99889

Note: Note Table

1. Ho: no autocorrelation at lag order

Table A11: Model 3 Johansen Test for Cointegration results

Trend: constant	Number of obs= 27				
Sample: 1981-2009	Lags = 3				
Maximum rank	Parms	LL	eigenvalue	Trace statistic	5 % critical value
0	78	54.363909	.	124.1103	68.52
1	89	116.70024	.99012	67.2862	47.21
2	98	145.11229	.87811	33.0489	29.68
3	105	172.79244	0.54266	11.9259*	15.41

Table A12: Model 3: Jarque Bera Normality Test results

Jarque-Bera test				
Equation		chi2	df	Prob > chi2
D LNFDI		1.677	2	0.43240
D DI		1.469	2	0.47985
D LNGDP		6.789	2	0.05355
D LNEXRATE		0.281	2	0.86877
D LNOPEN		3.955	2	0.13843
WTO		2.552	2	0.27921
ALL		16.722	12	0.16003
Skewness test				
Equation	Skewness	chi2	df	Prob > chi2
D LNFDI	-.60057	1.623	1	0.54560
D DI	.39758	0.711	1	0.45354
D LNGDP	.7679	0.653	1	0.09565
D LNEXRATE	.24823	0.277	1	0.78660
D LNOPEN	.6661	1.997	1	0.76786
WTO	-.61041	1.677	1	0.46982
ALL		8.938	6	0.25760
Kurtosis test				
Equation	Kurtosis	chi2	df	Prob > chi2
D LNFDI	4.9890	0.054	1	0.94210
D DI	4.6567	0.757	1	0.47622
D LNGDP	2.9890	4.136	1	0.64605
D LNEXRATE	4.3547	0.004	1	0.15550
D LNOPEN	3.8798	1.955	1	0.67876
WTO	4.1249	0.875	1	0.87893
ALL		4.150	6	0.23787

Table A13: Model 3 Eigenvalue Stability Condition results

Eigenvalue stability condition

Eigenvalue	Modulus
1	1
.9543837	.954384
.73356 + .4053194 i	.83809
.73356 - .4053194 i	.83809
.1543798 + .8236892 i	.838032
.1543798 - .8236892 i	.838032
.5260506 + .6421743 i	.830131
.5260506 - .6421743 i	.830131
-.8271386	.827139
.737597	.737597
-.5373883 + .4900691 i	.727292
-.5373883 - .4900691 i	.727292
.1579385 + .6680261 i	.686443
.1579385 - .6680261 i	.686443
-.3882294 + .5017026 i	.634372
-.3882294 - .5017026 i	.634372
-.2891187 + .05243482 i	.293835
-.2891187 - .05243482 i	.293835

The VECM specification imposes a unit modulus.

Figure A3: Model 3 Eigenvalue output

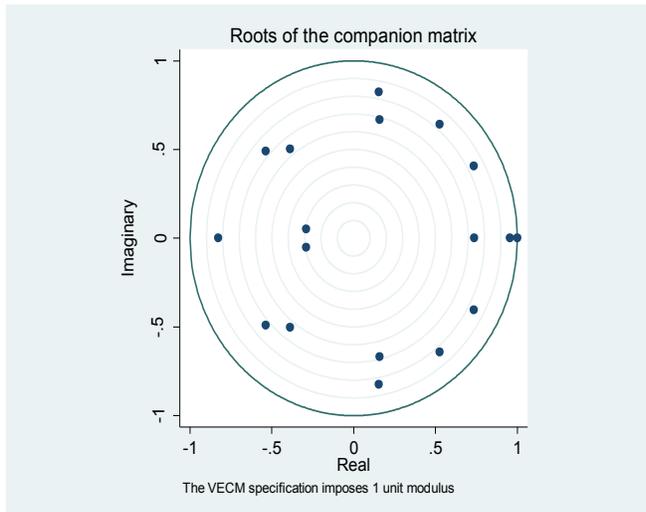


Table A14: Model 3: Lagrange-multiplier test results

Lag	Chi2	df	Prob>ch2
1	19.2478	18	0.55345
2	12.4584	18	0.09089
3	22.4553	18	0.45795
4	9.39685	18	0.45389

Note: Note Table

1. Ho: no autocorrelation at lag order