FOREIGN DIRECT INVESTMENT: CATALYST OF ECONOMIC GROWTH?

by

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ABSTRACT

This dissertation is an inquiry focused on the causal relationship between foreign direct investment (FDI) and economic growth in both developed and developing countries. Chapter 1 surveys the theoretical foundations and seminal empirical works, and motivates the remainder of the dissertation. This chapter shows that theory mainly points towards a positive FDI to economic growth link, but the empirical findings are highly heterogeneous. Chapter 1 also highlights recent trends in FDI in order for the reader to see FDI's increasing role in the global economy. Chapter 2 considers how the FDI and economic growth connection varies by income levels, using panel cointegration and Granger causality techniques. The two main findings are that in the long run the causal relationship is primarily running from GDP to FDI and short run FDI to GDP causality is restricted to high income countries. Chapter 3 tests for the direction of causation between FDI and GDP in a group of Latin American and East Asian countries attempting to identify differences between the regions. Innovation accounting, in combination with standard Granger causality tests are used to test for the causal relationship between FDI and GDP. FDI to GDP causality is found to be more apparent in East Asia. Chapter 4 considers the case of Mexico. This chapter attempts to indentify how the FDI-growth connection varies by sector in the Mexican economy. In Mexico,

FDI to economic growth causality is restricted to the industrial and agriculture sectors. Much more evidence was found in favor of the GDP to FDI link. The final chapter gives concluding remarks, general policy recommendations, and suggestions for future research. The three general findings of the dissertation are that: (a) FDI to GDP causality is more common in higher income countries where a threshold level of development has been reached; (2) causation is primarily running from economic growth to FDI. It is higher levels of economic growth that are attracting FDI, not FDI spurring economic growth; (3) FDI causes economic growth primarily in the manufacturing sector. This has profound policy implications for developing countries.

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CHAPTER 1

FOUNDATIONS OF THE FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH RELATIONSHIP

Introduction

Foreign direct investment (FDI) is argued by many to be one of the most stable forms of international capital flows. These private capital flows are investments from a parent firm to a location outside the parent firm's country of origin. FDI consists of equity capital, intercompany debt, and reinvested earnings. FDI is composed of a parent enterprise and a foreign affiliate which form the Multinational Enterprise (MNE). In order to qualify as FDI the investment must give the parent enterprise some amount of control over its foreign affiliate. The concept of control, developed by Hymer (1960), is crucial to the distinction between portfolio and direct investment as well as the motivation behind the firm's investment. [1] Control is usually defined as owning 10% or more of the voting shares. The likely impact of FDI has remained a controversial issue since enterprises became multinational.

During the 1960s and 1970s foreign direct investment was highly criticized as being responsible for inequalities between the developed and developing world. Much

[1] See Cohen et al.(1979) for a collection of Hymer's essays.

of this view was wrapped up in dependency theory. Dependency theorists argued that FDI holds negative political, social and economic costs.[2] Moran (1978) highlights three main propositions implicit in dependency analysis in regard to the effect of MNEs and FDI on host countries:

(1) The benefits of foreign investment are poorly distributed between the multinational and the host country. The foreign company siphons off an economic surplus that could have been used to finance internal development.

(2) Multinational corporations create distortions within the local economy by squeezing out local entrepreneurs; employing inappropriate capital-intensive technologies leading to unemployment; worsening the distribution of income; and altering consumer tastes and undermining the local culture.

(3) Foreign investors pervert or subvert host country political processes by co-opting the local elites and/or by using their influence in their home countries, tries to bring pressure to keep host governments in line and/or by structuring the international system to respond to their needs to the detriment of host authorities.

More recently a rosy view of the likely effect of foreign direct investment has prevailed. Much of this view can be seen in the vast amount of "spillover" literature where positive effects from FDI overflow to host countries like water spilling out of a glass.[3] This change represents both theoretical developments in economic growth theory and actual economic events. In Latin America many countries promoted FDI as a means to finance development after the debt crisis. Many countries followed the

[2] See Cardoso and Faletto (*1970)*, Peter Evans (*1979)*, and Gunder Frank (*1969*).
[3] See Gorg and Greenaway (2004) for a review of the "spillover" literature.

Washington Consensus and privatized state run enterprises in hope they would be more efficient. In other circumstances FDI was just seen as an alternative to the debt instruments of the 70s and 80s. Theoretically, new growth models endogenized the technological progress in the older Neoclassical Solow type models (Romer 1986). This provided theoretical justification for FDI as a catalyst for economic growth and development. These new models highlighted the roles of human capital accumulation and technological externalities. Multinationals, who conduct the majority of FDI, were seen as a means of development because they possessed the most sophisticated production and organizational methods, and could transfer these to developing countries. In the older Neo-classical framework the impact of FDI on the growth rate of output was constrained by diminishing returns to capital and could only have a level effect on output per capita (Solow 1956, 1957). In new growth theory, FDI may affect the level of output per capita and also the rate of growth through a permanent knowledge transfer (Romer 1990; Lucas 1988).

It is generally agreed that foreign direct investment has a role in the developmental process of a country but if its effect is positive or negative is highly controversial. The five main areas of research on the impact of foreign direct investment on economic development include growth, trade, employment and skill levels, technological diffusion and knowledge transfer, linkages and spillovers to domestic firms. Is foreign direct investment a catalyst for economic development as many claim? By no means can all of the areas previously mentioned be addressed in one project. The focus of this research will be on the connection foreign direct investment possesses with

economic growth. Much of the existing literature presumes that the direction of causation runs from FDI to economic growth but it is highly plausible that it is economic growth that is attracting the FDI. It is also likely that certain conditions must be present in the host country for FDI to positively impact economic growth. Each empirical section in this dissertation will actually test for the direction of causation between FDI and economic growth using different methodologies. It is the primary objective to see how the FDI and economic growth relationship varies:

(1) By country income levels

(2) Between Latin America and East Asia

(3) By sectors for the case of Mexico

The next section discusses the foundational issues with the FDI-economic growth relationship and reviews the most important literature.

Foreign Direct Investment and Economic Growth

Foreign direct investment is generally seen as a composite bundle of capital stock and technology, and can augment the existing stock of knowledge in the host economy through labor training, skill acquisition and diffusion, and the introduction of new managerial practices and organizational arrangements (De Mello 1997). Foreign direct investment can impact growth directly and indirectly. The impact of FDI can be seen to directly impact growth through capital accumulation, and the incorporation of new inputs and foreign technologies in the production function of the host country. Neoclassical and endogenous growth models have been used to empirically test these theoretical benefits of FDI. In the neoclassical growth models FDI promotes economic

growth by increasing the volume of investment and/or its efficiency but FDI affects growth only in the short run because of diminishing returns to capital in the long run. Long-run growth in the neoclassical models arises from exogenous growth of the labor force and exogenous technological progress. In the endogenous growth models FDI raises growth through technological diffusion from the developed countries to the developing. This permanent knowledge transfer from FDI accounts for the diminishing returns that result in long run growth. The endogenous growth literature has identified country conditions that must be present for FDI to have a positive impact on growth such as the complementarity between domestic and foreign investment, adequate levels of human capital, open trade regimes, and well-developed financial markets. Some of the most important endogenous growth empirical research is discussed next.

Foreign direct investments' interaction with human capital has received considerable attention. Li and Liu (2005) in a panel data analysis for 84 countries over the period 1970-99 found that FDI affects growth directly and also indirectly through its interaction with human capital. They also found a negative coefficient for FDI when it is interacted with the technology gap between the source and host economies. This suggests that greater technological differences between the source and host country hinders the host countries ability to benefit from FDI. In a panel data framework for a sample of 18 Latin American countries for the period 1970-99, Bengoa et al. (2003) found that FDI affects growth positively. In order for a positive effect from FDI to be achieved, the country must have an adequate level of human capital, economic stability, and liberalized capital markets. Borensztein et al. (1998) found similar results in a cross-

country regression framework for 69 LDCs in the period 1970-89, that inward FDI has positive effects on growth through its interaction with human capital. They also found that FDI contributed more to growth than domestic investment and that it also had the effect of increasing domestic investment. It should be mentioned that growth equations have been found to be extremely sensitive to proxies of human capital so these empirical results should be taken with caution.

The seminal work of De Mello (1999) for a sample of OECD and non-OECD countries over the period 1970-90 finds some evidence in favor of a long-run relationship. He finds positive effects of FDI on economic growth in both developing and developed countries. Similar to Borensztein et al. (1998) he concludes that the long-term growth in host countries is determined by the spillovers of technology and knowledge from the investing countries to host countries, and its extent is determined by the complementary and substitution between FDI and domestic investment. In the non-OECD sample, he finds no causation from FDI to growth based on fixed effects regressions and a negative short run impact of FDI on GDP, indicating that growth benefits may be restricted to higher income countries. Along this same theme, Blomstrom et al. (1994) in a cross-country analysis of 78 developing countries found that FDI had positive effect on growth rates for higher income developing countries, but not for lower income ones.

A few researchers have emphasized the way in which the growth effect depends on conditions of the financial markets of the host country. Alfaro et al. (2004) and Durham (2004) found that it is necessary for countries to have well-developed banking

and financial institutions in order to gain from FDI in terms of economic growth. Alfaro et al. (2004) used cross-country data between 1975 and 1995 and found that FDI alone plays an ambiguous role in spurring economic growth. When various measures of financial market development are included positive effects are found. Durham (2004) used data for 80 countries from 1979 to 1998 and found that it is also necessary for a country to have strong institutional development and investor-friendly legal environment for FDI to have a positive effect on growth.

Researchers have also looked at the role that the trade regime plays in the transmission of positive growth effects from FDI. Using annual cross-sectional data for 46 developing countries in a fixed effects model, the seminal work of Balasubramanyam et al. (1996) finds support for the Bhagwati hypothesis: that the growth effect of FDI is positive for export promoting countries and negative for import substituting ones. Using cointegration and error correction techniques, Zhang (2001) finds similar results. Of the 11 countries in the study, in five cases (four of which are in East Asia) FDI enhances economic growth. For the other six countries without cointegration links, unidirectional causal effects are found in five countries. FDI is found to positively impact economic growth in Hong Kong, Indonesia, Singapore, Taiwan, and Mexico.

In an alternative framework, more in line with structuralist/dependency theory arguments, for the years 1940-90, Kentor (1998) finds that countries with a relatively high dependence on foreign capital exhibit slower economic growth than less-dependent countries. Foreign capital dependence is measured first as accumulated foreign stocks and secondly as debits on investment income, which accrues to

foreigners on enterprises controlled by them in the host country, including net profits transferred abroad or reinvested. These results are similar to the earlier findings of Chase-Dunn (1975) and Dixon and Boswell (1996). They argue that foreign investment has an initial positive effect on growth but in the long run the dependence on foreign investment exerts a negative effect on growth. The infrastructure and institutions that develop with foreign investment support further foreign investment; and negative externalities such as unemployment, over-urbanization, and income inequality perpetuate the problem. Kentor (2003) uses a different measure – foreign investment concentration, calculated as the percentage of total foreign direct investment stocks accounted for by the top investing country – and still finds a long term negative effect on growth.

Sakar (2007) and Kentor (1998,2003) ask a similar question of a sample of 51 less developed countries. Sakar (2007) tests if a country with higher FDI relative to its gross domestic capital formation grows at a faster rate. The panel regression shows a positive relation for a group of 11 countries who had high GDP per capita and high trade dependence. The time series analysis of the individual countries shows a positive relation for 10 countries and a negative relation in four. In the majority of cases there is no long-term relation regardless of whether or not the country is rich or poor, or is classified as closed or open. Table 1 summarizes the main findings of the literature reviewed. The studies that are not discussed in this chapter are brought up later in each empirical chapter.

Table 1

Summary of Literature on FDI-economic Growth Relationship

Author	Type of Data	Countries and Time Period	Empirical Approach	Results
Blomstrom et al. (1994)	Cross-section and panel data	78 developing countries 1960-85	OLS Regressions	FDI has positive effect on growth for only higher income developing countries
Balasubramanyam et al. (1996)	Cross-section	46 developing countries 1970-1985	OLS regressions	FDI has positive effect only for export promoting countries
Borensztein et al. (1998)	Cross-section	69 developing countries 1970-1989	Regression estimations using SUR technique	FDI has positive effect but its magnitude depends on human capital in host country
Kentor (1998)	Panel data	79 developed and developing countries 1938-1990	OLS regressions	Countries with high dependence on FDI have slower economic growth
De Mello (1999)	Panel data and time series	32 developed and developing countries 1970-1990	Stationarity tests	Only weak evidence for FDI effects on economic growth
Ericsson and Irandoust (2001)	Time series	Denmark, Finland, Sweden, and Norway 1970-1997	Lag-augmented vector autoregression	Bidirectional causality for Sweden, FDI to growth causality for Norway, and no causal relationship for Finland and Denmark
Nair-Reichert and Weinhold (2001)	Panel data	24 developing countries 1971-1995	Mixed fixed and random coefficient approach	FDI on average has a significant impact on growth but the relationship is heterogeneous across countries
Zhang (2001)	Time series	11 developing countries in East Asia and Latin America, varying time periods between 1957-1997	Analysis of causality between FDI and economic growth using Granger causality tests	Evidence of growth enhancement from FDI in more open countries

Table 1 continued

Author	Type of Data	Countries and Time Period	Empirical Approach	Results
Carkovic and Levine (2002)	Cross-section and panel data	72 developed and developing countries	Regression analysis using OLS as well as GMM	FDI inflows do not exert a robust, independent influence on economic growth
Alfaro (2003)	Cross-section and panel data	47 developing countries 1981-1999	OLS regressions	Negative effect in primary sector, a positive one in manufacturing, and the service sector was found to be ambiguous
Choe (2003)	Panel data and time series	80 developed and developing countries, 1971-1995	Analysis of causality between FDI and economic growth using Granger causality test of Holtz-Eakin	FDI Granger causes economic growth and vice versa but the effects are more common from growth to FDI
Chowdhury and Mavrotas (2003)	Time series	Chile, Malaysia, and Thailand 1969-2000	Lag-augmented vector autoregression	Bidirectional causality in Malaysia and Thailand, no relationship in Chile
Bengoa and Sanchez-Robles (2003)	Panel data and time series	18 Latin American countries 1970-1999	Regression analysis, fixed and random effects	FDI has positive effect on growth but it depends on level of human capital, economic stability, and liberalized capital markets.
Kentor (2003)	Panel data	39 less developed countries 1970-1995	OLS Regressions	Foreign investment concentration has a long-term negative effect on growth
Alfaro (2004)	Time series	71 developed and developing countries 1975-1995	OLS Regressions and IV technique	FDI has positive effect if country has well developed financial markets

Table 1 continued

Author	Type of Data	Countries and Time Period	Empirical Approach	Results
Durham (2004)	Panel data	80 countries 1979-1998	IV estimation with 2SLS	FDI has positive effect only when country has developed financial markets and strong institutional development
Griffiths and Sapsford (2004)	Time series	Mexico 1970-1999	OLS regressions	Two-period lag of FDI was found significant in the period 1980-1999
Li and Lu (2005)	Panel data and time series	21 developed and 63 developing 1970-1999	OLS regressions with random effects and 3SLS	There is a complementary connection between FDI and economic growth. Positive interaction with human capital and negative interaction with technological gap in developing countries
Chakraborty and Nunnenkamp (2006)	Panel data and time series	India 1987-2000	Granger causality tests within a panel cointegration framework	Bidirectional causality in manufacturing, no causal relationship in primary, and temporary FDI to growth effect in the service sector
Vu et al. (2006)	Time series	China and Vietnam 1985-2004	Feasible generalized least squares	FDI had a positive effect directly and indirectly with its interaction with labor on growth in the industrial sector. Other sectors gained very little growth benefit from sector specific FDI

Table 1 continued

Author	Type of Data	Countries and Time Period	Empirical Approach	Results
Ali-Iriani and Al-Shamsi (2007)	Panel data	Bahrain, Kuwait, Oman, Saudi Arabia, and United Arab Emirates 1970-2004	Analysis of causality between FDI and economic growth using Granger causality test of Holtz-Eakin	Bidirectional causality between FDI and economic growth
Khaliq and Noy (2007)	Time series	Indonesia 1998-2006	OLS fixed effects regression	Negative effect on growth in the mining and quarrying sector. The only sector with a significant positive effect was in construction
Sakar (2007)	Panel and time series data	51 lesser developed countries 1970-2002	OLS fixed and random effects regressions. Autoregressive distributive Lag approach	In the majority of cases there is no long term relation between FDI and economic growth

Next is a discussion of recent trends in FDI to give an indication of the importance of FDI in the global economy followed by an outline of the dissertation.

General Figures on FDI

Greenfield and Brownfield Investments

One form of foreign direct investment is greenfield investment where MNEs construct new subsidiaries. In 2006 there were 11,813 greenfield investments in the world economy. Developed countries received 5,197 and developing economies received 5,218 new investments. Greenfield investments in developing countries have been on the rise but the new investments have been highly concentrated in Asia. In 2006 greenfield investments in Asia accounted for nearly 82 percent of all new investments in developing countries. Greenfield investment in the primary sector totaled 492, in manufacturing 6,369, and in the service sector 4,952 (WIR 2007).

Brownfield investments are the second general form of FDI. This type of FDI takes place in already established firms, through mergers and acquisitions, or through the privatization of state-owned enterprises. This form is much more common in developing and transition countries, where MNEs purchase existing companies. Cross border mergers and acquisitions in 2006 totaled over 450 billion dollars, with the majority taking place in the services sector. The largest cross-broader M&A deal was the acquisition of Arcelor S.A., located in Luxemburg by Dutch company Mital Stell Co NV completed in 2006. The transaction totaled 32.2 billion dollars. In developed countries the value of purchases have outweighed sales during the period 2002 to 2004. In

developing countries more firms are being bought or merged with foreign companies (WIR 2007).

Trends by Sector

The estimated world stock of FDI has dramatically increased since 1990. Table 2 displays the stock of FDI for the three broad sectors in the global economy. An important change has been the decrease of FDI flows going to the primary sector. In 1990 the stock of FDI in developed countries was split among the primary, manufacturing, and services sectors by 10, 41, and 49 percent, respectively. For developing economies the corresponding figures were 8, 43, and 47 percent. In both developed and developing economies there has been a decline in manufacturing FDI and an increase in service sector FDI. In 2006 the stock of manufacturing FDI in developed countries fell to 29 percent of the total and service sector FDI stock rose to 62 percent of the total stock. A similar trend took place in developing economies where manufacturing FDI stock fell to 26 percent and service sector stock rose to 64 percent.

Table 2

Foreign Direct Investment Stock (Millions US dollars)

	1990			2006			
Sector	Developed countries	Developing economies	World	Developed countries	Developing economies	South-East Europe and CIS	World
Total	1,582,724	358,528	1,941,252	9,405,550	2,798,869	210,868	12,415,287
Primary	151,816	30,170	181,986	717,803	229,605	41,324	988,732
Manufacturing	641,886	154,572	796,459	2,741,271	718,409	60,891	3,520,571
Services	780,054	168,796	948,850	5,838,666	1,784,601	96,758	7,720,025

Source: World Investment Report (2008)

Trends by Regions

Despite all the focus in the literature on the benefits for developing countries, FDI flows have remained highly concentrated in the developed world and in a few developing countries. Among the developing countries a select few have received the bulk of FDI. These handful of countries primarily include the Asian Tigers (Hong Kong, Singapore, Malaysia, and Indonesia, and China). In Latin America, FDI is concentrated in Brazil, Argentina, Mexico, and Chile. The majority of FDI stock still remains in developed countries. The importance of FDI can be measured by FDI stock as a percentage of GDP and FDI flows as a share of gross fixed capital formation (GFCF). The share of FDI flows as a percentage of GFCF measures the relative weight of the FDI in total investment taking place, both public and private. The share of inward FDI stock as a percentage of GDP provides a measure of the importance of FDI stock in relation to total economic activity taking place. Table 3 displays FDI inflows as a percentage of gross fixed capital formation for the years 2005, 2006, and 2007. In Table 3 FDI stock as a percentage of GDP is shown for 1990, 2000, and 2007.

FDI stock as a percentage of GDP has grown considerably in most regions since 1980. In most regions in 1990 this figure was close to 10 percent and by 2007 it had climbed to over 30 percent. It was over 40 percent in Europe, the Caribbean, and South-East Asia. FDI stock in the Caribbean is over 100 percent of GDP. At the other extreme is South Asia where FDI stock as a percentage of GDP rose from 1.5 percent to 6.5 percent from 1990 to 2007. This figure is considerably higher in Europe than in North America, 41.2 and 17.1 percent, respectively. In least developed countries FDI stock as a

Table 3

FDI Flows as a Percentage of Gross Fixed Capital Formation and FDI Stock as a Percentage of Gross Domestic Product

	FDI flows as a percentage of gross fixed capital formation			FDI stocks as a percentage of gross domestic product		
Region/economy	2005	2006	2007	1990	2000	2007
World	9.7	12.9	14.8	9.1	18.1	27.9
Developed economies	8.9	12.8	15.6	8.1	16.2	27.2
Europe	17.5	18.9	22.7	10.7	26.0	41.2
European Union	18.2	18.6	22.6	10.6	25.9	40.9
Other developed Europe	5.0	24.2	24.9	13.0	27.6	46.1
North America	4.9	10.4	11.7	8.0	13.9	17.1
Other developed economies	-2.0	3.3	4.3	2.8	4.0	10.3
Developing Economies	11.4	12.5	12.6	13.6	25.2	29.8
Africa	16.3	21.4	21.3	11.5	25.2	31.0
North Africa	16.2	25.1	20.4	12.8	17.8	30.1
Other Africa	16.5	18.6	22.0	10.7	30.7	31.6
West Africa	21.3	52.7	45.2	13.5	31.8	33.1
Central Africa	28.3	21.8	24.0	10.1	20.2	36.3
East Africa	10.8	14.3	19.5	4.4	14.8	20.3
Southern Africa	12.8	2.1	10.4	10.6	36.3	32.5
Latin America and the Caribbean	15.4	15.4	18.0	9.9	24.5	32.4
South America	15.4	12.0	15.4	9.6	23.6	27.7
Central America	13.2	11.6	15.3	9.7	17.7	30.6
Caribbean	34	95.8	78.2	14.3	86.7	111.5
Asia and Oceania	10.0	11.0	10.6	16	25.5	28.6
West Asia	17.5	22.1	20.4	10.1	9.7	21.5
East Asia	9.0	8.7	8.6	25.9	32.1	35.0
South Asia	3.5	6.2	5.7	1.5	4.5	6.5
South-East Asia	18.7	20.2	19.6	18.2	44.9	43.0
Oceania	13.8	33.3	25.7	20.5	26.2	28.1
South-East Europe and CIS	14.3	19.7	20.9	--	15.7	28.0
All developing economies, excluding China	13.3	15.8	16.2	14.6	27.1	35.5
Least developed countries	11.5	16.6	14.7	7.0	21.8	24.1
Major petroleum exporters	14.2	14.7	13.4	9.3	15.5	16.9
Major exporters of manufactures(3)	9.5	10.2	10.4	15.5	25.9	30.7

Source: World Investment Report (2008)

percentage of GDP is over 10 percent lower than all developing economies excluding China. This ratio for major petroleum exporters is even considerably lower at 16.9 percent.

FDI inflows as a percentage of gross fixed capital formation has also increased in most regions. In 2007 the largest figures were 78.2 and 45.2 in the Caribbean and West Africa. South and East Asia inflows as a percentage GFCF have remained small in recent years, under 10 percent. Inflows as a percentage of GFCF in developing economies excluding China were nearly 2 percent higher than the world average in 2007 whereas for the major exporters of petroleum and manufactures they were lower.[4] The least developed countries' average was nearly the same as the world average in 2007.[5]

Objectives of Dissertation

The central benefit of FDI is that it is thought to ultimately translate into higher levels of economic growth and development leading to higher living standards, but from

[4] Major petroleum exporters include Algeria, Angola, Bahrain, Brunei Darussalam, Congo, Gabon, Indonesia, Islamic Republic of Iran, Iraq, Kuwait, Libyan Arab Jamahiriya, Netherlands Antilles, Nigeria, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Trinidad and Tobago, United Arab Emirates, Bolivarian Republic of Venezuela and Yemen. Major exporters of manufactures include: Brazil, China, Hong Kong (China), India, Republic of Korea, Malaysia, Mexico, Philippines, Singapore, Taiwan Province of China, Thailand and Turkey.

[5] Least developed countries are comprised of Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, São Tomé and Principe, Sierra Leone, Solomon Islands, Somalia, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen and Zambia.

the previous review of the most important theoretical and empirical work it can clearly be seen that there is a divide between the theoretical predictions of the consequences of FDI and the actual experiences with it. It is becoming well established that for a country to benefit from FDI certain conditions must be present in the host country and for lasting impacts, linkages must develop between the multinationals and domestic firms (Ocampo 2005). It is also becoming quite apparent that those countries which have had any success with FDI have taken a more hands on approach although international organizations such as the IMF, World Bank and OECD continue to preach the free market mantra and many developing countries continue to adopt such policies.

The Washington Consensus led Latin American governments to believe that FDI was a viable means to promote growth and development. Porzecanski and Gallagher (2007) comprehensively reviewed the literature on FDI in Latin America and showed that few nations in the region actually received significant amounts of FDI and when it did materialize, it often fell short of generating the necessary linkages required to gain development benefits. In contrast, developing Asian countries have received the majority of recent FDI flows, used a more hands on approach towards FDI, and have been able to extract greater benefits from it (Narula, 2002; Chang, 2003).

FDI is a means towards development; it is not an end in itself. FDI is not inherently good or bad, rather it is the environment combined with the FDI strategy that determines the outcome (Crotty et al. 1998). The four general types of FDI, by motive, are: natural resource seeking, market seeking, efficiency seeking, and strategic asset seeking. The environment includes things such as the level of aggregate demand, the

nature of domestic and international, rules of the game, institutions governing investment, and the nature of domestic and international competition, and other conditions in the host country. These differences across countries and regions are not attempted to be identified in this analysis but this does lead to the idea that the same level of FDI can have different effects in different contexts.

The majority of literature assumes that the direction of causality runs from FDI to economic growth and attempts to explain the transmission channel. Another strand of the literature actually tests for the direction of causality. Is it FDI leading to growth or is it more common that it is higher levels of growth that are attracting FDI inflows? This dissertation follows this second strand using new data and advanced econometric techniques. This dissertation is composed of three empirical chapters, each concerned with the issue of the FDI-growth connection, and a final concluding section. Each chapter considers a slightly different question and uses a different estimation technique.

The first essay, using panel cointegration and causality techniques, considers how the FDI growth connection varies by income levels. Data for 128 countries over the period 1980 to 2003 are used. In this section both developed and developing economies are included. The objective of this chapter is to see if the growth benefits from FDI are present in the lowest income countries, or if it takes a certain income level before growth benefits can materialize. Mainstream theory suggests that the lowest income countries are the most prone to benefit because they are essentially the most "backward", using the terminology from Findlay (1978), and have the greatest potential

to benefit. Foreign direct investment with its superior production, management, and market techniques is argued by many to be a force of convergence between the developing and developed world. Empirical results are showing that this is happening for only a few countries and much of the literature neglects the existing level of development. Also, much of the existing literature fails to incorporate the long and short-run dynamics into the models. This essay explores the short run and long run dynamics of the relationship between FDI stock and economic growth. It shows that a long run relationship exists between FDI stock and GDP but the direction of causality is primarily running from GDP to FDI. Only in the high income panel is short run causality found running from FDI to GDP. In the short run, bidirectional causality exists in the high-income panel. Given this, it is more common that it is higher levels of GDP that are attracting FDI, not FDI leading to GDP.

In the second essay the FDI-growth connection is studied on a country by country basis. This essay also does not assume that the direction of causation runs from FDI to economic growth and again actually tests for the direction of causation. Innovation accounting is used in combination with standard Granger causality tests to identify differences between the major recipients of FDI in East Asia and Latin America. Forecast error variance decompositions and Granger causality tests, based on the individual series, are used on 12 countries in East Asia and Latin America. Many authors have made the claim that East Asian countries have been able to benefit more from FDI than Latin American economies on the basis that they adopted more “open” policies compared to the “closed” policies of much of Latin America. In this essay I attempt to

identify regional variations in the FDI-economic growth relationship. Differences are observed within and between these two regions. FDI to GDP causality is found in Brazil, Mexico, Hong Kong, Indonesia, Singapore, Taiwan, and Thailand. This finding may be explained by the larger share of service sector FDI in Latin American which has been found to have less growth impacts compared to manufacturing sector FDI.

The final essay considers the case of Mexico. I use disaggregated FDI data for five sectors over the period 1980 to 2004. Tests for cointegration and causality on single time series are used in contrast to the panel data techniques used in the first essay. This essay attempts to identify sectoral variations in the FDI-growth connection in the Mexican economy. Mexico offers an interesting case study because restrictions on FDI were reduced following the debt crisis of the 1980s and Mexico received a considerable amount of FDI. Reforms beginning in the late 1980s and the signing of the North American Free Trade Agreement (NAFTA) in 1994 placed FDI at center stage with the objective of upgrading the entire economy. Were growth benefits well rounded across sectors or did only a few sectors benefit? Is it just the industrial sector that gains from FDI in terms of economic growth? Is there no effect in the primary and tertiary sectors as other researchers have found? Very few researchers have used sector level FDI data and none of the sector level studies have focused on Mexico, one of the major recipients of FDI in Latin America. I find that in the long-run, causality running from FDI to GDP is present only in the industrial and agriculture sectors. The extractive, commerce, and services sectors are absent of a FDI to GDP long-run link. Much more evidence is found in favor of the GDP to FDI link. Long run GDP to FDI causality is found

in the extractive, commerce and services sectors. A considerable amount of FDI has flowed into the service sector and no FDI to GDP link is found in this analysis. The final chapter gives concluding remarks, general policy recommendations, and suggestions for future research.

CHAPTER 2

FOREIGN DIRECT INVESTMENT AND GROWTH: VARIATIONS BY INCOME LEVELS

Introduction

The FDI-growth empirical work can be classified into two general strands. One tries to explain how FDI affects growth usually assuming the causation runs positively from FDI to growth. This strand has highlighted the roles of human capital, technological gaps, trade openness, institutional quality, well developed financial markets, political stability, and other factors that propagate the positive effect of FDI. The other strand does not assume the direction of causation and tests for the direction. Following the second strand, using panel cointegration and causality estimation techniques, this analysis will contribute to the ongoing debate about the causal relationship between FDI and economic growth. Knowing the direction of causality is extremely important for policy makers when designing policies to stimulate economic growth and development. This analysis attempts to identify patterns in the casual relationship between FDI and economic growth according to country income levels. Solovian growth theory suggests that the lowest income developing countries will benefit the most from FDI but new developments in the field have brought this hypothesis into question. Modern growth theory points out that a certain level of development is necessary in order to benefit

from FDI in terms of growth. Higher income countries are expected to show more evidence in favor of the FDI to growth link than lower income countries. In order for positive effects to materialize a threshold level of development is necessary. The level of development includes but is not limited to factors such as education, well-developed financial markets, and economic stability. Linkages must develop between domestic industry and FDI for lasting impacts.

This section answers two questions using a seemingly unexplored data set for 128 countries for the years 1980-2003:

1. Is there a long-run relationship between the FDI stock in a country and economic growth and what is the direction of causation?
2. Does the causal relationship between FDI stock and economic growth vary by income level?

I will use methodology similar to that of Chakraborty and Nunenkamp (2007). The heterogeneous panel unit root tests of Im, Pesaran and Shin (IPS) (2003), and the panel cointegration test of Pedroni (1997, 1999), which allows for cross-sectional interdependency among different individual effects, are used. In the panels where a cointegrating link is found, a vector error correction model that incorporates both short run and long run dynamics, is estimated to assess causality. In the case where no cointegration is found, the instrumental variable estimator of Anderson and Hsiao (1981) and generalized method of moment's estimator of Arellano and Bond (1991) is used. Panel estimation techniques are used because the commonly used unit root tests like the augmented Dickey-Fuller and the Phillips-Peron test lack power in distinguishing

the unit root null from stationary alternative. The use of panel data unit root tests is one way of increasing the power of unit root tests (Maddala and Wu 1999). The purchasing power parity analysis of Wu (1996) found that standard unit root tests never rejected the null hypothesis but when the panel unit root tests were used the null was rejected. The same issues apply when considering tests of cointegration for a single time series data set (Kremers et al. 1992).

Next is a review of the relevant literature followed by an explanation of the methodology which includes a brief discussion of issues with the presence of unit roots and the concept of cointegration. Then a description of the data is presented followed by trends in FDI by income levels. The last two sections present the results and concluding remarks.

Literature Review

The majority of studies assume the direction of causality runs from FDI to economic growth but it is highly plausible that increased levels of growth may be attracting the FDI. Since the most commonly cited work which tests for the direction of causality is Zhang (2001), this work will be discussed at a bit more length than the others. He tests for causality in the long and short run using an error correction model and conventional granger causality tests based on the single time series of real FDI stock and real GDP. The countries included in the study are Argentina, Brazil, Colombia, Mexico, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan, and Thailand. Data availability varies with each country but roughly covers the period from the late 1950s up until 1997. Zhang (2001) chose these countries based on the subjective evaluation

that they had positive attitudes toward FDI, their relative importance in terms of the share of inward FDI in the developing world, and availability of data for 30 years. He found a long run relationship between the real stock of FDI and real GDP in Colombia, Mexico, Hong Kong, Indonesia, and Taiwan. Unidirectional causality running from FDI to GDP is found in the case of Hong Kong and Taiwan. Unidirectional causality running from GDP to FDI was found in Colombia. Bidirectional causality is found in Mexico and Indonesia. Short run causality running from FDI to GDP was only found in Singapore. Short run causality from GDP to FDI was found in Brazil, Korea, Malaysia and Thailand. No bidirectional short run causality was found for any of the countries. Zhang (2001) primarily focused on the FDI to growth link and explains his findings on the basis that Hong Kong, Taiwan, and Singapore pursued more export oriented policies than the Latin American countries considered in the analysis. The insignificant FDI to GDP link in Malaysia and Thailand are left unexplained.

Using a different estimation technique, Ericsson and Irandoust (2001) used data between 1970 and 1997 for Denmark, Finland, Sweden and Norway. Their empirical analysis is based on the lag-augmented vector autoregression (LA-VAR) approach of Toda and Yamamoto (1995). They found bidirectional causality for Sweden, uni-directional causality from FDI to growth for Norway and no relationship for Finland and Denmark. Chowdhury and Mavrotas (2003) tested for Granger causality using the same LA-VAR method. Using data from 1969 to 2000 they found that FDI does not granger cause GDP in Chile, whereas there is a bidirectional causality in Malaysia and Thailand. Chowdhury and Mavrotas (2003) appear to be trying to fill in the gap left by Zhang

(2001) who found an insignificant FDI to GDP link in Malaysia and Thailand and did not use data for Chile. The results in both these studies are left largely unexplained.

Others have tested for causality using panel data estimation techniques. Nair-Reichert and Weinhold (2001) test causality for cross country panels, using data from 1971 to 1995 for 24 countries.[6] They use the mixed fixed and random (MFR) coefficient approach to test the causal impact of FDI on growth. They find that FDI on average has a significant impact on growth, although the relationship is highly heterogeneous across countries. Choe (2003) uses the panel data causality testing method of Holtz-Eakin et al. (1988) for an analysis of 80 countries. His results suggest bidirectional causality between FDI and growth, although he finds the causal impact of FDI on growth to be rather weak. Much more evidence is found in favor of the GDP to FDI link, i.e., higher levels of growth are attracting FDI flows. Ali-Iriani and Al-Shamsi (2007) use the same methodology for a panel of six countries which make up the Gulf Cooperation Council and find evidence of bidirectional causality between FDI and growth. The countries included are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates.

The findings of these six papers are quite diverse and indicate substantial heterogeneity across countries. They all largely fail to control for the level of development of the countries under analysis. Zhang (2001) uses the most developed countries in Latin America and East Asia that most easily fit into his story about open versus closed economies. Chowdhury and Mavrotas (2003) use data for Chile, Malaysia

[6] The countries are Brazil, Chile, Cote d'Ivoire, CMR, Colombia, Costa Rica, Ecuador, Ghana, Honduras, Indonesia, India, Jamaica, Mexico, Malaysia, NGA, Pakistan, Peru, Philippines, Sierra Leon, El Salvador, Thailand, Tunisia, Turkey, and Venezuela.

and Thailand not really making comparisons across countries. Nair-Reichert and Weinhold (2001) considered a broader group of developing countries but all 24 countries are lumped into one panel. Ericsson and Irandoust (2001) used data for Denmark, Finland, Sweden and Norway. All these are higher income countries and still in the case of Finland and Denmark no relationship between FDI and GDP was found. Choe (2003) uses the largest data set for 80 countries, including both developing and developed samples. When he excludes the high income OECD countries no FDI to GDP causality is found. There is much more evidence in favor of the GDP to FDI link. Ali-Iriani and Al-Shamsi (2007) use data for Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates, all higher level income countries, and found bidirectional causality.

This research contributes to the existing literature by considering data for 128 countries for the period 1980-2003, including both developed and developing economies. The countries are grouped into four panels based on the World Bank's income classifications. It is unique in attempting how to explain the FDI-growth relationship varies by income levels. Next is a description of the methodology.

Methodology

Testing for causality is a three-step process (unit root-cointegration-causality). First the IPS method will be used to test for unit roots, and if unit roots are found then cointegration will tested for using the Pedroni method. For the panels where the variables are cointegrated a vector error correction model (VECM) will be estimated to assess causality, and for those absent of a cointegrating link standard granger causality

tests can be applied. This research will contribute to the existing literature in that no other study has undertaken a similar analysis for this many countries in a panel co-integration framework. With data for this many countries, it is unique in seeking to show how the FDI-growth relationship is different for the various country groups classified by income levels. In the next section the methodological issues surrounding unit roots and cointegration will be briefly discussed.

The Unit Root Problem and Cointegration

It is well documented that the unit root characteristics of time series data results based on least-squares regression analysis are subject to spurious correlation, i.e., the misleading correlation between two variables that is produced through the operation of a third causal variable.[7] Ordinary Least Squares (OLS) estimates with nonstationary series results in inflated R-squared and t-score values. Since the classical regression model assumption that the series be stationary and the errors have a zero mean and finite variance is violated, the results may have little or no economic meaning. If a series is integrated of order one then using the first difference of the series results in a stationary series, removing the spurious correlation, and OLS estimation can be used. However, applying first differences of variables may lead to the failure to detect long run relationships because a model in first differences has no long-run solutions. An alternative to applying first differences and using OLS is cointegration. Cointegration refers to the idea that although two series may exhibit nonstationary behavior, a linear combination between the variables could remove the common trend component and

[7] See Granger and Newbold (1974).

produce a stationary relationship between the variables. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. Murray (1994) provides an illustrative example of cointegration using a story about a drunk woman and her dog. The random paths of the intoxicated woman leaving a bar and her dog are joined together by the calling of the dog's name by the woman and the dog's barking. Each responds to the other's call but watched individually appear to follow a random path.[8] Some economic variables display a similar characteristic.

Test of Panel Unit Root

Recent literature has found that panel unit root tests have higher power than the standard ADF and PP tests based on individual series. The idea is that combining information from the time series dimension with that from the cross-sectional dimension will produce statistically more accurate results. The most common panel unit root tests include Levin, Lin and Chu (2002), Breitung (2000), Im, Pesaran and Shin (2003), and the Fisher-type tests using ADF and PP tests (Maddala and Wu (1999) and Choi (2001) and Hadri (2000)).

Consider the following autoregressive process:

$$y_{it} = \rho_i y_{it-1} + X_{it}\delta_i + \epsilon_{it} \qquad (1)$$

where i is introduced to represent the cross-sectional element. X represents exogenous variables in the model, including any fixed effects or individual trends, the ρ_i's are the

[8] See Granger (1981) and Engle and Granger (1987) for a technical formulation.

autoregressive coefficients, and the ϵ_{it} errors are assumed to be mutually independent idiosyncratic disturbance. If $|\rho_i| < 1, y_i$ is said to be weakly (trend) stationary. On the other hand, if $|\rho_i| = 1,$ then y_i contains a unit root.

These tests can be broken into two types. The first assuming that the parameters are common across cross-sections so that ρ_i= ρ for all i. The Levin, Lin, and Chu (LLC), Breitung, and Hadri tests all use this assumption. Alternatively the ρ_i's can vary freely across the cross-sections. The Im, Pesaran, and Shin (IPS) and Fisher-ADF and Fisher-PP tests are of this type. From among the different panel unit root tests mentioned above the LLC and IPS are the most widely used. Both of the tests are based on the ADF test. The difference between the two tests is that the LLC test assumes homogeneity in the dynamics of the autoregressive coefficients for all panel members whereas the IPS test allows for heterogeneity in these dynamics. The IPS test is most appropriate for my purpose because there are differences between countries in terms of development and other economic conditions.

The IPS test proceeds as follows. For a sample of N cross sections$(i = 1,2, \dots, N)$ observed over T periods, the individual ADF regressions can be represented by:

$$\Delta y_{it} = \alpha_i y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + X_{it}^{'} \delta_i + \epsilon_{it} \qquad (2)$$

where $\alpha_i = (1 - \rho_i)$ and p_i is the order of the the ADF regression, and the errors ϵ_{it} $(i = 1,2, \dots N; t = 1,2, \dots, T)$ are independently distributed across both i and t, with zero means and finite heterogeneous variances, σ_i^2.

The null hypothesis may be written as,

$$H_0: \alpha_i = 0, for\ all\ i$$

While the alternative hypothesis is given by:

$$H_1: \begin{cases} \alpha_i = 0 & for\ i = 1,2, \dots, N_1 \\ \alpha_i < 0 & for\ i = N_1 + 1, N_1 + 2, \dots, N \end{cases}$$

The null hypothesis is tested with the t-bar statistic, which is constructed from the average ADF t-statistics.[9]

Test of Panel Cointegration: Pedroni Tests

Most macroeconomic time series are trended and are therefore most likely non-stationary, i.e., contain a unit root. As was previously explained the problem with this is that standard OLS estimation with nonstationary data can lead to incorrect conclusions. Therefore other techniques must be used with nonstationary data such as differencing the series or cointegration. The use of cointegration to test for long run relationships among integrated variables is common but short time spans of data result in low statistical power in many of the tests based on individual series. The use of panel cointegration techniques has emerged to solve this problem by pooling the individual time series data. The original techniques for pooling time series involved sacrifice in terms of the heterogeneity of the individual time series (Pedroni 2004). The method developed by Pedroni (1997) allows for as much heterogeneity as possible among the individual members of the panel. The Pedroni tests allow for individual specific short-run dynamics, individual specific fixed effects and deterministic trends, as well as individual specific slope coefficients (Pedroni 2004).

[9] See Im et al. (2003) for details.

As explained above the purpose of the cointegration test is to determine if a group of nonstationary series is cointegrated or not. The previous discussion concerning the superiority of panel unit root tests applies to tests of panel cointegration. Many panel cointegration tests have been developed to exploit the cross section dimension in panel data. The most used panel cointegration tests are the McCoskey and Kao (1998), Larsen et al. (2001), and Pedroni (1999, 2004) tests. In this analysis the methodology of Pedroni (1999, and 2004) is followed, where the panel regression model is:

$$Y_{i,t} = a_i + \delta_i t + \sum_{m=1}^{M} \beta_{mi} X_{mi,t} + e_{i,t} \quad (3)$$

Y and X are assumed to be integrated of order one. The parameters a_i and δ_i are individual and trend effects. Under the null of no cointegration, the residuals $e_{i,t}$ will be $I(1)$. The approach is to obtain the residuals from equation 3 and then to test whether residuals are $I(1)$ by running the auxiliary regression,

$$e_{it} = \rho_i e_{it-1} + u_{it} \quad (4)$$

or

$$e_{it} = \rho_i e_{it-1} + \sum_{j=1}^{p_i} \varphi_{ij} \Delta e_{it-j} + v_{it} \quad (5)$$

for each cross-section. Pedroni describes various methods of constructing statistics for testing for null hypothesis of no cointegration $(\rho_i = 1)$. There are two alternative hypotheses: the homogenous alternative, $(\rho_i = \rho) < 1$ for all i (within dimension or

panel statistic test), and the heterogeneous alternative, $(\rho_i < 1)$ for all i (between dimension or group statistic test).

The Pedroni (1999) statistics are then used to test for a long run relationship. Four different statistics are proposed to capture the "within" (pooling the AR coefficients across different sections of the panel for the unit root test on the residuals) and three capture the "between" dimensions (averaging the AR coefficients for each member of the panel for the unit root test on the residual).[10] When the null is rejected in the panel case then the variables are cointegrated for all the cross sections, whereas in the group panel case the variables are cointegrated for at least one of the sections.

Data Description

Real FDI stock and real GDP data for the empirical analysis are taken from the World Investment Report (WIR) Annex Tables published by the United Nations Conference on Trade and Development (UNCTAD) and the PENN World Tables published by the Center for International Comparisons of Production, Income and Prices. The WIR provides data on FDI flows and stock for over 200 countries. In the WIR Tables flows of FDI consists of capital provided (either directly or through other related enterprises) by a foreign direct investor to an FDI enterprise, or capital received from an FDI enterprise by a foreign direct investor.

FDI in the WIR has three components: equity capital, reinvested earnings and intracompany loans. Equity capital is the foreign direct investor's purchase of shares of an enterprise in a country other than its own. Reinvested earnings comprise the direct

[10] See Pedroni (1999) for the calculations of the statistics.

investor's share of earnings not distributed as dividends by affiliates, or earnings not remitted to the direct investor. Intracompany loans refer to short or long-term borrowing and lending of funds between direct investors (parent enterprises) and affiliate enterprises.

FDI stock in the WIR is the value of the share of their capital and reserves (including retained profits) attributable to the parent enterprise, plus the net indebtedness of affiliates to the parent enterprise. The WIR tables present data on FDI stocks at book value or historical cost, reflecting prices at the time of investment. UNCTAD collects published and unpublished national official FDI stock data from central banks, statistical offices or national authorities on an aggregated and disaggregated basis for its FDI/TNC database. These data are the main source for the reported data on FDI in the WIR. In the WIR these data are supplemented by data from (1) other international organizations such as the IMF; (2) regional organizations such as the ASEAN Secretariat; and (3) UNCTAD's own estimates. In the WIR for countries about which data are not available from national official sources, or were not available for the entire period of 1980-2006 covered in the *WIR07*, data were obtained using the IMF's *Balance of Payments Statistics Online*, June 2007. When data are not available from either of the above sources, the WIR contains estimates made by either adding up FDI flows over a period of time, or adding or subtracting flows to an FDI stock that had been obtained for a particular year from national official sources, or the IMF data series on assets and liabilities of direct investment, or by using the mirror data of FDI stock of

major economies as proxy. FDI stocks in the WIR are in nominal terms so price level data are taken from the PENN tables to derive real FDI stock in 2000 prices.

In the empirical analysis both variables are used in logarithmic form. Real GDP in the PENN tables is available for various countries for the years 1980 to 2003. The sample of countries used is restricted first to the availability of real GDP data in the PENN tables and then to the availability of FDI stock data in the WIR tables for the same period, 1980 to 2003. The countries are then grouped according to the World Bank income classifications. The World Bank classifies all member countries and all others with populations of more than 30,000. Economies are divided among income groups according to 2007 gross national income per capita, calculated using the World Bank Atlas method. The groups are low income, $935 or less; lower middle income, $936-3,705; upper middle income, $3,706-11,455; and high income, $11,456 or more[11].

[11] Low income economies are Afghanistan, Bangladesh, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Cote d'Ivoire, Ethiopia, The Gambia, Ghana, Guinea-Bissau, India, Kenya, Democratic Republic of Korea, Laos, Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda, Senegal, Sierra Leone, Solomon Islands, Sudan, Togo, Uganda, Zambia. Lower-Middle-Income economies are Algeria, Bhutan, Bolivia, Cameroon, China, Colombia, Republic of Congo, Djibouti, Ecuador, Egypt, El Salvador, Fiji, Guatemala, Honduras, Indonesia, Iran, Jamaica, Jordan, Lesotho, Maldives, Morocco, Namibia, Nicaragua, Paraguay, Peru, Philippines, Samoa, Sri Lanka, Swaziland, Syrian Arab Republic, Thailand, Tonga, Tunisia, and Vanuatu. Upper-Middle-Income economies are Argentina, Belize, Botswana, Brazil, Chile, Costa Rica, Dominica, Gabon, Grenada, Malaysia, Mauritius, Mexico, Oman, Panama, South Africa, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Turkey, Uruguay, and Venezuela. High-Income economies are Australia, Austria, the Bahamas, Bahrain, Barbados, Bermuda, Brunei Darussalam, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Republic of Korea. Kuwait, Macao, Malta, Netherlands, Netherlands Antilles, New Zealand, Norway, Portugal, Qatar, Singapore, Spain, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirate, United Kingdom, and the United States.

Trends in FDI and GDP by World Bank Country Groupings

Figures 1-4 display the mean of real FDI stock over the period 1980 to 2003 in the World Bank country groupings used for the empirical analysis. The disparity in average FDI stock between the low income group and high income has greatly increased since 1980. In 1980 it was nearly twenty times higher in the high income group and by 2003 it was over sixty-four times higher.

The low income and lower middle income panels have received a comparatively negligible amount of FDI. High income countries have received the majority of FDI flows. In 2003 the average amount of FDI stock in the high income panel was over four times that of the other three panels combined. Despite the focus of theoretical growth

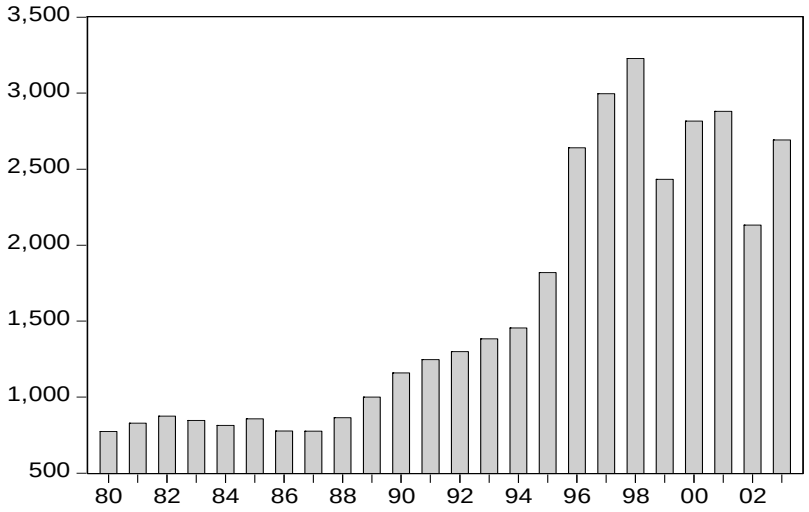

Figure 1
Mean of Real FDI Stock in Low Income Countries 1980-2003 (US Millions)

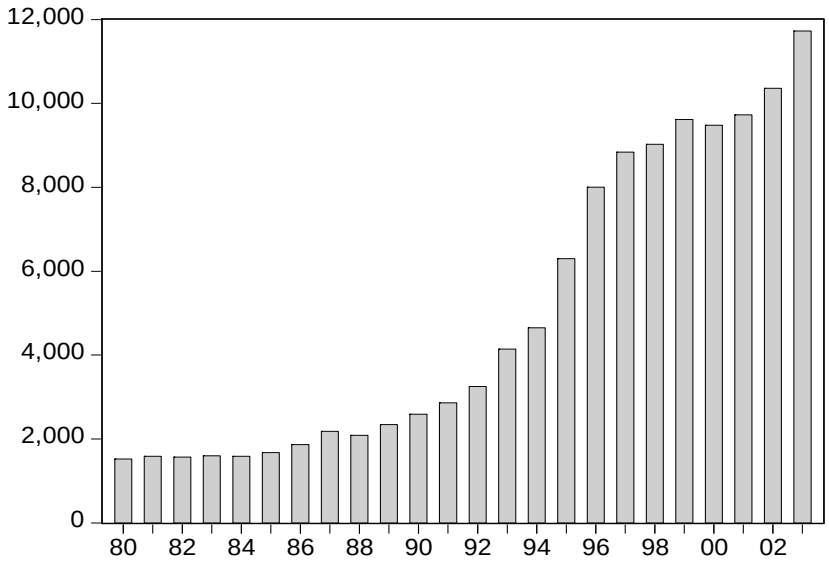

Figure 2
Mean of Real FDI Stock in Lower Middle Income Countries 1980-2003 (US Millions)

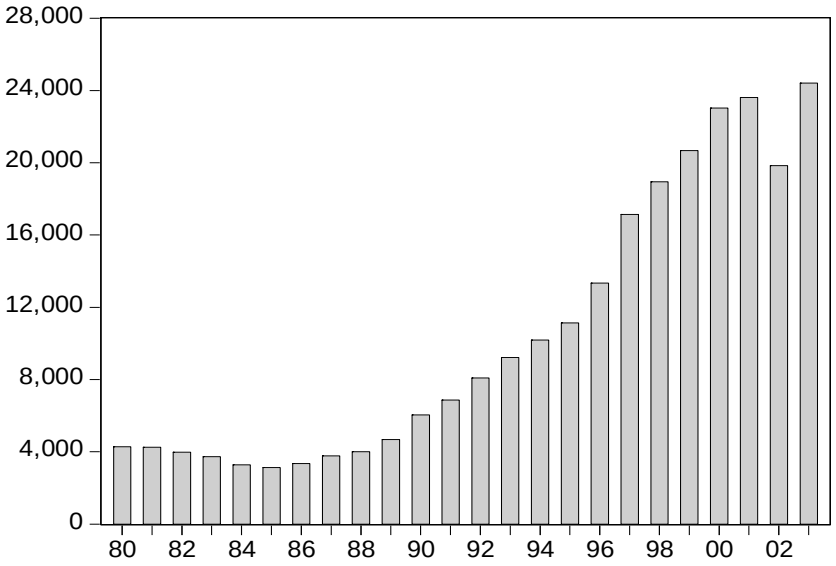

Figure 3
Mean of Real FDI Stock in Upper Middle Income Countries 1980-2003 (US Millions)

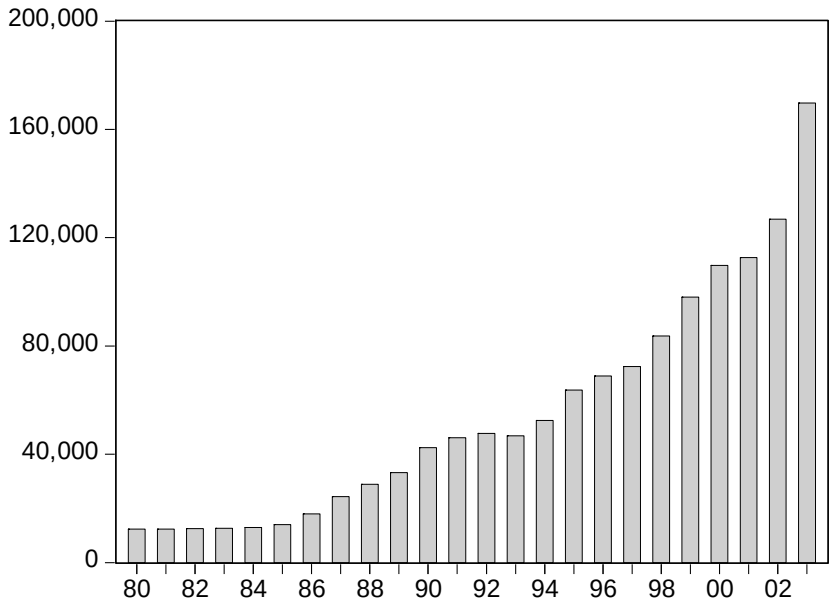

Figure 4
Mean of Real FDI Stock in High Income Countries 1980-2003 (US Millions)

promoting effects FDI offers for developing countries most FDI flows go to developed countries

Large differences in GDP levels also exist across the panels. Figures 5-8 display the average GDP in the four country groups. The average GDP in the high income panel is greater than the other three groups combined. In 1980 the difference between the low income and high income group was eightfold. By 2003 the difference decreased to fivefold. Unless GDP growth rates are significantly increased in lower income countries these large disparities are likely to persist for some time. A country with a growth rate of 1 percent doubles its living standard every seventy years. A country with a growth rate of 3 percent doubles its living standard every twenty-three years. This small difference in growth rates results in a significant disparity for an extended period of time.

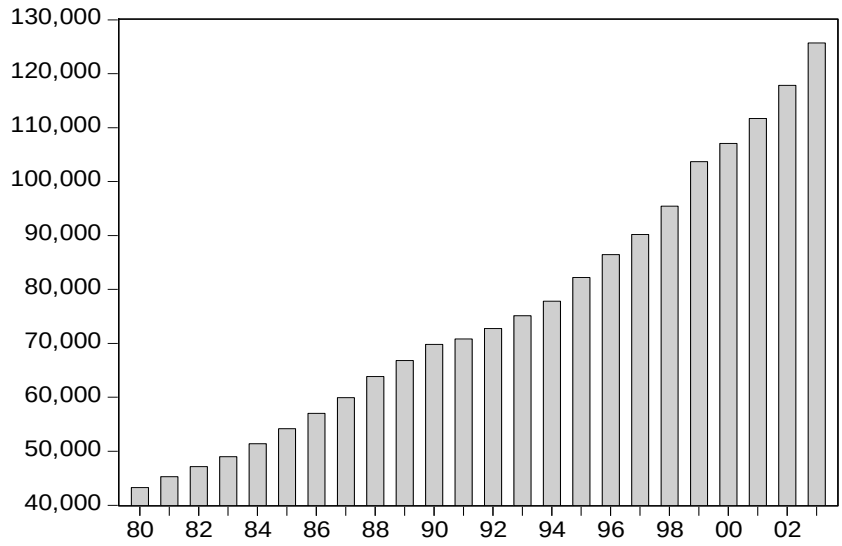

Figure 5
Mean of Real GDP in Low Income Countries 1980-2003 (US Millions)

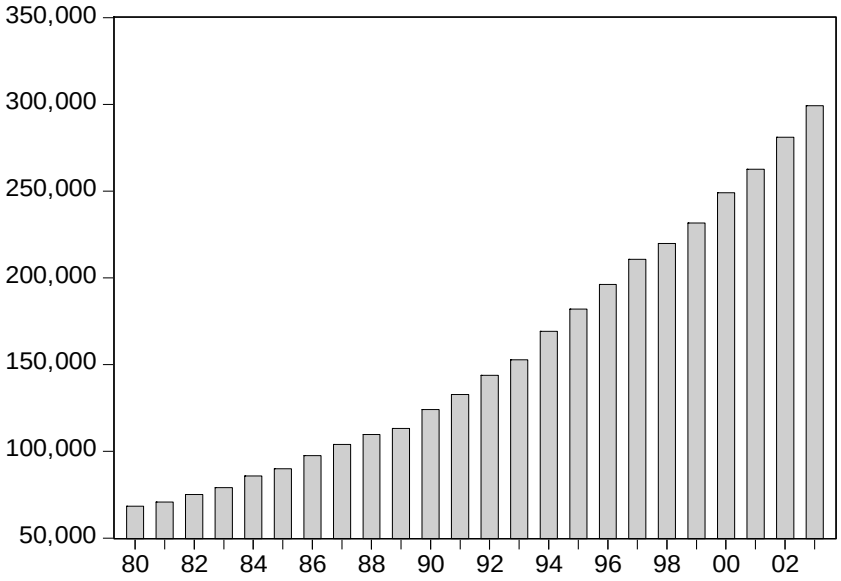

Figure 6
Mean of Real GDP in Lower Middle Income Countries 1980-2003 (US Millions)

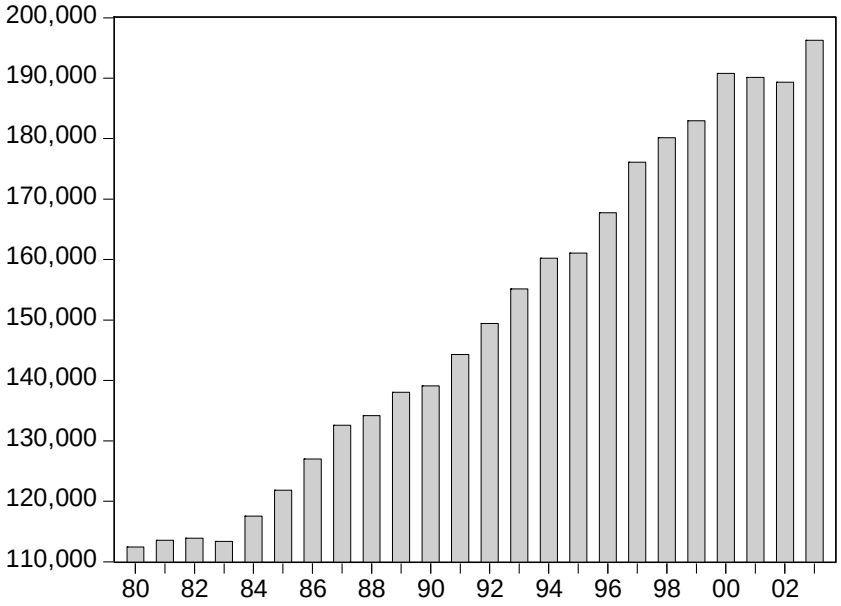

Figure 7
Mean of Real GDP in Upper Middle Income Countries 1980-2003 (US Millions)

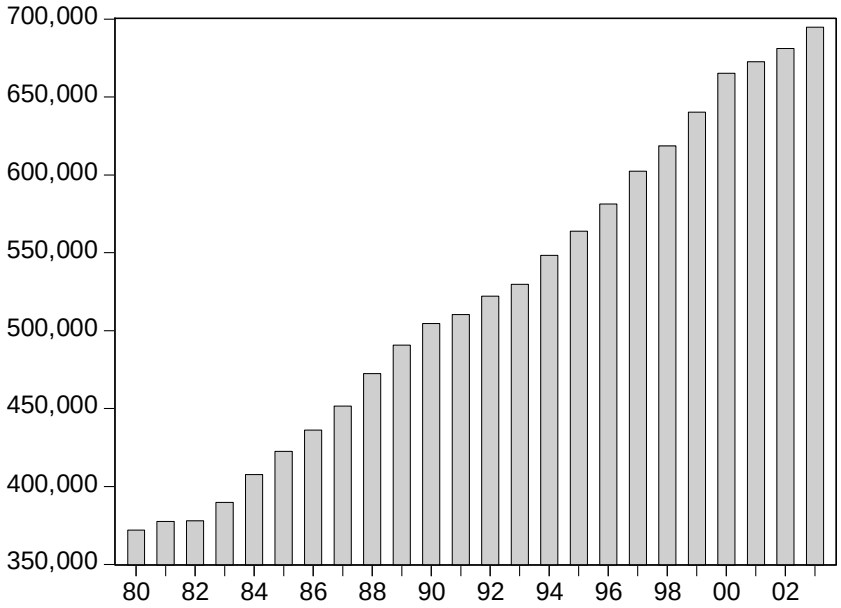

Figure 8
Mean of Real GDP in High Income Countries 1980-2003 (US Millions)

Empirical Results

IPS Test of Unit Roots

The results in Table 4 indicate that in all cases but for high-income countries when individual intercepts and individual trends are included the variables are integrated of order one, meaning that the panels are non-stationary. In the case of the high income panel with individual intercepts and trends, the two variables are found to be integrated of order zero. This means that the variables real FDI stock and real GDP are stationary. With real FDI stock and real GDP found to be nonstaionary with time-dependent means and variances we can proceed to test for cointegration.

Pedroni Test of Cointegration

In order to test for a long run relation between FDI stock and GDP the following panel equation will be estimated for each group of countries:

Table 4

Results of IPS Test of Unit Roots

Country Groups	Individual Intercepts		Individual Intercepts and Individual Linear Trends	
	FDI	GDP	FDI	GDP
Low-Income	I(1)***	I(1)***	I(1)***	I(1)***
Lower-Middle Income	I(1)***	I(1)***	I(1)**	I(1)**
Upper-Middle Income	I(1)***	I(1)***	I(1)***	I(1)***
High-Income	I(1)***	I(1)***	I(0)***	I(0)**

Notes: I(1) and I(0) indicate that series of log(FDI) or log(GDP) to be integrated of order one and zero, respectively. The asterisks of *** (**) represent significance at the 1% (5%) level. Lag length is chosen using the Akaike selection method.

$$GDP_{i,t} = a_i + \delta_i t + \sum_{m=1}^{M} \beta_{mi} FDI_{mi,t} + e_{i,t} \quad (13) \qquad (6)$$

where a_i (i=1,2,….) refers to country specific effects in our case, δ_t refers to time effects, and e_{it} is the estimated residual indicating deviation from the long run steady-state relationship. After 13 is estimated the auxiliary regression 14 is run:

$$e_{it} = \rho_i e_{it-1} + u_{it} \qquad (7)$$

With a null of no cointegration, it is a test of unit roots in the estimated residuals of the panel. If e_{it} is found to be stationary then cointegration exists between FDI stocks and output.

When testing for cointegration one has to choose the dependant variable. In theory as the sample size goes to infinity the results should be the same, regardless of the dependent variable. This is an inherent problem with tests of cointegration. Macroeconomic time series are usually not long enough to provide consistent results, so the researcher must decide which variable to use as the dependent. The papers surveyed for this analysis never report both tests. Here the test is run both ways.

Table 5 presents the results of using FDI as the dependent variable. There are two alternative hypotheses: the homogenous alternative, $(\rho_i = \rho) < 1$ for all i (within dimension or panel statistic test), and the heterogeneous alternative, $(\rho_i < 1)$ for all i (between dimension or group statistic test). The four Pedroni (1999) statistics propose to capture the “within” (pooling the AR coefficients across different sections of

Table 5

Pedroni Test of Cointegration Using FDI as Dependent Variable

FDI on LHS							
	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF
Country Group							
Low-Income	.49	.10	-1.5*	-4.36***	1.84	-2.82***	-4.93***
Lower-Middle Income	1.23	.36	-2.63***	-5.30***	2.25	-1.51*	-4.52***
Upper-Middle Income	.28	2.58	-1.86**	-3.26***	3.72	-.79	-2.78***
High-Income	2.22	7.04	-.99	-3.42***	8.55***	-.15	-5.02***

Notes: Asterisks (***),(**),(*) represent significance at the 1, 5, and 10, percent, respectively.

the panel for the unit root test on the residuals) and three capture the "between" dimensions (averaging the AR coefficients for each member of the panel for the unit root test on the residual). When the null is rejected in the panel case, the variables are cointegrated for all the cross sections, whereas in the group case the variables are cointegrated for at least one of the sections. When results conflict, the panel ADF and group ADF should be used. When FDI is the dependent variable, cointegration between FDI stock and GDP is found in all panels. In the low income and lower middle income panels, four of the seven statistics are significant. In the upper middle income and high income panels three of the seven statistics are significant. The panel ADF and group ADF, which are the most powerful statistics, are significant in all panels.

When GDP is used as the dependent variable evidence is found in favor of cointegration in all four panels (Table 6). In the low income panel three statistics are found to be significant. In the lower middle income panel five of the seven statistics are significant. In the upper middle income panel three of the statistics are significant and in

Table 6

Pedroni Test of Cointegration Using GDP as Dependent Variable

GDP on LHS							
Country Group	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF
Low-Income	.91	1.38	-.79	-1.93***	.97	-3.33***	-5.37***
Lower-Middle Income	11.42***	-.41	-3.57***	-2.99***	.81	-4.52***	-5.39***
Upper-Middle-Income	8.45***	2.88	-1.01	-2.16	3.47	-1.58**	-3.72***
High-Income	5.11***	7.27	-1.26*	-3.05***	8.86	1.83	-4.37***

Notes: Asterisks (***),(**),(*) represent significance at the 1, 5, and 10, percent, respectively.

the high income panel four are found to be significant . With FDI stock and GDP found to be cointegrated in all four panels a VECM can be estimated for each panel.

Tests of Causality

To assess causality a vector error correction model (VECM) will be estimated for each group of countries. The VECM to be estimated is:

$$\Delta FDI_{it} = \alpha_{1i} + \mu_{1i} e_{it-1} + \sum_k \beta_{1ik} \Delta FDI_{i,t-k} + \sum_k \beta_{2ik} \Delta GDP_{i,t-k} + u_{1it} \quad (7)$$

$$\Delta GDP_{it} = \alpha_{2i} + \mu_{2i} e_{it-1} + \sum_k \gamma_{1ik} \Delta GDP_{i,t-k} + \sum_k \gamma_{2ik} \Delta FDI_{i,t-k} + u_{2it} \quad (8)$$

In this model e_{it-1} is the error correction term which is zero in the long run equilibrium. If FDI and GDP deviate from the equilibrium then each variable adjusts to restore the equilibrium. The coefficient μ measures the speed of adjustment towards the equilibrium. They can be interpreted as the long-run effects of FDI stock on GDP and the long-run effects of GDP on FDI stock. When lagged difference terms are included the

coefficients capture the "interim" effects and reflect the adjustment process in response to a shock. They can be interpreted as the short-run effects (Chakraborty and Nunenkamp 2007). To assess the long run causality in the VECM, the significance of the coefficients μ is tested and the short run causality is tested by the joint significance of the lagged difference variables[12]. Table 7 summarizes the causality tests.

A long run relationship between real FDI stock and real GDP is found in all four country groupings but the direction of causality is found to be running from GDP to FDI. This coincides with growth driven FDI theory which highlights the role of growing market size, human capital, and infrastructure in attracting FDI. A countries market size can be approximated by GDP which increases with economic growth and attracts FDI.

Table 7

Long Run and Short Run Causality

FDI LHS	Long Run		Short Run	
Country Group	GDP causes FDI	FDI causes GDP	GDP causes FDI	FDI causes GDP
Low-Income	YES***	NO	NO	NO
Lower-Middle Income	YES***	NO	YES**	NO
Upper-Middle Income	YES***	NO	NO	NO
High-Income	YES**	NO	YES***	YES***

Notes: The asterisks *** (**) represent 1% (5%) significance levels.

[12] The VECMs were run with 1,2, and 3 lags to see if the results were sensitive to changes but nothing qualitative changed.

Economic growth can lead to higher levels of aggregate demand stimulating FDI. Better economic performance, measured by higher growth rates, can potentially provide resources for new infrastructure which could also attractive FDI (Zhang 2001). Contrary to standard FDI led growth theory, no long run FDI to GDP causality is found. Only in the high income panel is FDI to GDP causality found.

Interpretation and Conclusion

The findings of this study cast serious doubt on the growth promoting effect of FDI. Many developing countries believed that FDI would spark growth through knowledge transfer, export growth, or job creation but it was found here that FDI was not the catalyst of economic growth that it was thought to be. It must be remembered that MNEs do not move operations to countries to transfer knowledge; they establish subsidiaries in order to exploit a certain condition present in the host country. It may be cheap labor, abundant natural resources, less environmental regulation, proximity to markets, or lower taxes that inveigle the MNE to move operations. It is in the interest of the MNE to protect their knowledge.

According to the panel data methodologies used, FDI was not the major driving force of economic growth in developing and developed countries. Short run causality was found running from FDI to GDP only in the high income panel. It is possible that other factors such as domestic investment were the major driving force of economic growth. Grenaway et al. (2007), for a sample of 77 developing countries, found that the

major driving forces of growth were domestic investment and exports.[13] Short run FDI to GDP causality was found in the high income panel. This lends support to the idea that a certain level or stage of development is necessary in order for FDI to have a positive effect on economic growth. These findings are at odds with much of the literature where it is argued that the least developed countries have the greatest potential to benefit from FDI.

Similar to the findings of Choe (2003) much more evidence was found in favor of the economic growth to FDI causality link. It was higher levels of GDP that were attracting FDI in the long run. Culem (1998) found positive relationships between a recipient country's growth rate and foreign direct investment inflows in the United States, Germany, France, United Kingdom, the Netherlands and Belgium over the years 1969-1982. Similar results have been found for developing countries. Tsai (1994) found that in 27 developing countries over the period 1965-86 economic growth rates were determinants of FDI inflows. Also in Mottaleb (2007) for a panel of 60 low-income and lower-middle income countries it was found that countries with larger GDP and high GDP growth rates were more successful in attracting FDI. A 1 percent increase in GDP size was found to increase FDI inflow by .87 percent and a 1 percent increase in GDP growth rate will increase FDI inflows by .08 percent.

The policy implications of these are findings are that the countries should place more weight on stimulating growth through other measures than those aimed at

[13] The countries were then divided into open and closed economies according to whether or not their import to GDP ratio exceeds or falls short of the sample mean. It is then found that for the open economies it is foreign and domestic investment that enhance growth whereas for the closed economies it is labor force and export growth that promotes growth.

attracting FDI. Blindly reducing restrictions on FDI will most likely not result in long run growth. Policies directed at stimulating domestic investment in infrastructure, technology and exports may be the better alternative in terms of promoting economic growth. Only after a country has reached a certain level of development will FDI affect growth positively.

CHAPTER 3

FOREIGN DIRECT INVESTMENT AND GROWTH IN EAST ASIA AND LATIN AMERICA

Introduction

Much of the FDI-growth literature has focused on the benefits FDI contains for developing countries. It is believed that the superior organizational and production techniques that MNEs contain can be transferred directly and indirectly to the "host" country. The review of the literature in the introduction chapter revealed that the actual experience with FDI has greatly varied across countries. The benefits of FDI are more complex and limited than previously thought. Positive effects do not simply spill over to the host country. In the previous chapter it was found that FDI was not the major driving force of economic growth using the panel estimation methodology. In the long run more evidence was found in favor of the GDP to FDI causality link. It was higher levels of economic growth that were attracting the FDI. Only in the lower middle income panel was short run FDI to GDP causality found.

This chapter considers a similar question but for a group of developing countries in East Asia and Latin America that have been the major recipients of FDI in the developing world. Data over the years 1980-2003 for Argentina, Brazil, Chile, Colombia, Mexico, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Thailand, and Taiwan are

used in an attempt to identify trends between the two regions. These two regions have received considerable attention in the development literature because these countries have received the majority of FDI flows in recent years, pursued very different economic policies and have diverse economic performance. This analysis is unique by including all these countries in one analysis and uses a different estimation methodology than much of the FDI literature. Following a similar method used by Tang et al. (2008) forecast error variance decompositions and Granger causality tests are conducted on a country by country basis as opposed to the panel data techniques used in Chapter 2. The forecast error variance decomposition shows the proportion of the movements in a sequence due to its own shocks versus shocks to the other variable. Understanding the forecast errors is helpful in exposing the relationship between variables in a VAR system. If the FDI shocks explain none of the forecast error variance of the GDP sequence at all forecast horizons we can say that the GDP sequence is exogenous. If this is the case then GDP evolves independently of FDI shocks and the FDI sequence. Next is a review of the relevant literature, followed by a description of the methodology, a data description, the empirical results, and the final section concludes.

Literature Review

Only two papers have explicitly focused on the interaction between FDI and GDP in these two regions and they are theoretically derived from the Bhagwati hypothesis, that the growth effect of FDI is positive for export promoting countries and negative for import substituting ones (Bhagwati 1973). Zhang (2001) tests for causality in the long and short run using an error correction model and conventional Granger causality tests

based on the single time series of real FDI stock and real GDP. The countries included in the study are Argentina, Brazil, Colombia, Mexico, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan, and Thailand. Data availability varies with each country but roughly covers the period from the late 1950s up until 1997. Zhang (2001) chose these countries based on the subjective evaluation that they had positive attitudes toward FDI, their relative importance in terms of the share of inward FDI in the developing world, and availability of data for 30 years. He found a long run relationship between the real stock of FDI and real GDP in Colombia, Mexico, Hong Kong, Indonesia, and Taiwan. Unidirectional causality running from FDI to GDP is found in the case of Hong Kong and Taiwan. Unidirectional causality running from GDP to FDI was found in Colombia. Bidirectional causality is found in Mexico and Indonesia. Short run causality running from FDI to GDP was only found in Singapore. Short run causality from GDP to FDI was found in Brazil, Korea, Malaysia and Thailand. No bidirectional short run causality was found for any of the countries. Zhang (2001) primarily focused on the FDI to growth link and explains his findings on the basis that Hong Kong, Taiwan, and Singapore pursued more export oriented policies than the Latin American countries considered in the analysis.

The insignificant FDI to GDP link in Malaysia and Thailand is left unexplained but is brought up in Chowdhury and Mavrotas (2003). They tested for Granger causality using the lag-augmented vector autoregression (LA-VAR) approach of Toda and Yamamoto (1995). Using data from 1969 to 2000 they found that FDI does not granger cause GDP in Chile, whereas there is a bidirectional causality in Malaysia and Thailand.

Chowdhury and Mavrotas (2003) appear to be trying to fill in the gap left by Zhang (2001) who found an insignificant FDI to GDP link in Malaysia and Thailand and did not use data for Chile. The results in both these studies are left largely unexplained.

In this Chapter data over the years 1980-2003 for Argentina, Brazil, Chile, Colombia, Mexico, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Thailand, and Taiwan are used in an attempt to identify trends across the two regional. This exercise contributes to the ongoing debate about the FDI-growth relationship by using more recent data for these two regions in one analysis. Next is a description of the methodology used to identify regional trends.

Methodology

The methodology follows a similar procedure to that used by Tang et al. (2008). First for each country the variables FDI and GDP are tested for the presence of unit roots in each series. If unit roots are found then the possibility that the two series are cointegrated is tested. Next a vector auto regression (VAR) is estimated for each individual country which incorporates the long run relationship if the series are found to be cointegrated. After a VAR is estimated the forecast error variance decomposition can be constructed for each country. Then standard Granger causality can be performed testing for causality running from FDI to economic growth and from economic growth to FDI in each VAR. Next each method is discussed in greater detail.

Forecast Error Variance Decomposition

The variance decomposition method (VDC) computes the percentage of the forecast variance of one variable explained by one other variable introduced in the model. Variance decompositions are a useful tool for examining the relationships among economic variables.[14] The VDC procedure will be explained based on a bivariate VAR model.[15] Consider the VAR

$$x_t = A_0 + A_1 x_{t-1} + e_t \qquad (9)$$

where $x_t = [y_t, z_t]$ and e_t is the vector of error terms with zero mean and finite variance.

Suppose A_0 and A_1 are known and we want to forecast values of x_{t+i} conditional on the observed value of x_t. Updating (1) one period and taking the conditional expectation of x_{t+1}:

$$E_t x_{t+1} = A_0 + A_1 x_t$$

The one step ahead forecast error is $x_{t+1} - E_t x_{t+1} = e_{t+1}$. The n-step-ahead forecast is:

$$E_t x_{t+n} = (I + A_1 + A_1^2 + \cdots + A_1^{n-1})A_0 + A_1^n x_t$$

and the forecast error is:

$$e_{t+n} + A_1 e_{t+n-1} + A_1^2 e_{t+n-2} + \ldots + A_1^{n-1} e_{t+1}$$

Using the vector moving average notation

$$x_t = \mu + \sum_{i=0}^{\infty} \phi_i \ \varepsilon_{t-i} \qquad (10)$$

To conditionally forecast x_{t+1}, the one-step ahead forecast error is $\Phi_0 \varepsilon_{t+1}$. In general,

[14] See Enders (2004).
[15] Razafimahefa and Hamori (2007) use a similar method for analysis of trade and growth.

$$x_{t+n} = \mu + \sum_{i=0}^{\infty} \phi_i \ \ \varepsilon_{t+n-i}$$

So that the n-period forecast error $x_{t+n} - E_t x_{t+n}$ is

$$x_{t+n} - E_t x_{t+n} = \sum_{i=0}^{n} \phi_i \ \ \varepsilon_{t+n-i}$$

Considering only the y_t sequence, the n-step-ahead forecast error is

$$y_{t+n} - Ey_{t+n} = +\varphi_{11}(0)\varepsilon_{yt+n} + \varphi_{11}(1)\varepsilon_{yt+n-1} + \cdots + \varphi_{11}(n-1)\varepsilon_{yt+1}$$

$$+\varphi_{12}(0)\varepsilon_{zt+n} + \varphi_{12}(1)\varepsilon_{zt+n-1} + \cdots + \varphi_{12}(n-1)\varepsilon_{zt+1}$$

Denote the n-step-ahead forecast error variance of y_{t+n} as $\sigma_y(n)^2$:

$$\sigma_y(n)^2 = \sigma_y^2[\varphi_{11}(0)^2 + \varphi_{11}(1)^2 + \cdots + \varphi_{11}(n-1)^2]$$

$$+\sigma_z^2[\varphi_{12}(0)^2 + \varphi_{12}(1)^2 + \cdots + \varphi_{12}(n-1)^2]$$

It is possible to decompose the n-step-ahead forecast error variance into the proportions due to each shock. The proportions of $\sigma_y(n)^2$ due to shocks in the ε_{yt} and ε_{zt} sequences are

$$\frac{\sigma_y^2[\varphi_{11}(0)^2 + \varphi_{11}(1)^2 + \cdots + \varphi_{11}(n-1)^2]}{\sigma_y(n)^2}$$

and

$$\frac{\sigma_z^2[\varphi_{12}(0)^2 + \varphi_{12}(1)^2 + \cdots + \varphi_{12}(n-1)^2]}{\sigma_y(n)^2}$$

The forecast error variance decomposition tells us the proportion of the movements in a sequence due to its own shocks versus shocks to the other variable. If the ε_{zt} shocks explain none of the forecast error variance of the y_t sequence at all forecast horizons,

we can say that the y_t sequence is exogenous. If this is the case then the y_t sequence evolves independently of the ε_{zt} shocks and of the $z_t$sequence (Enders 2004).

Granger Causality

Causality in Granger sense refers to the idea that the availability of one variable, say y_t, can help to predict another variable, say x_t. The relationship between the two variables can be captured in the following VAR system:

$$y_t = a_1 + \sum_{i=1}^{n} \beta_i x_{t-i} + \sum_{j=1}^{m} \gamma_i y_{t-j} + e_{1t}$$

$$x_t = a_2 + \sum_{i=1}^{n} \theta_i x_{t-i} + \sum_{j=1}^{m} \delta_i y_{t-j} + e_{2t}$$

Based on the VAR system it is then possible to have:

(1) y_t causes x_t

(2) x_t causes y_t

(3) there is bidirectional causality

(4) the two variables are independent

From Granger (1969) the variable y_t is said to Granger cause x_t, if x_t can be predicted with greater accuracy by using past values of y_t rather than not using them at all.

Trends in FDI and Economic Growth in East Asia and Latin America

The importance of FDI can be measured by FDI stock as a percentage of GDP and FDI flows as a share of gross fixed capital formation (GFCF). The share of FDI flows as a percentage of GFCF measures the relative weight of the FDI in total investment taking

place, both public and private. The share of inward FDI stock as a percentage of GDP provides a measure of the importance of FDI stock in relation to total economic activity taking place. Table 8 displays FDI stock and stock as a share of GDP in the two regions for the years of the analysis. In 1980 the stock as a percentage of GDP was modest in both regions with the exception of Chile, Hong Kong, and Singapore. This figure has grown for every country except for Hong Kong and Indonesia. FDI flows can be seen to accelerate in both regions in the decade of the 1990s. Four countries have consistently received a large share of the FDI flows in the two regions; Hong Kong, Mexico, Singapore, and Brazil. These four countries account for a significant portion of FDI in all developing countries.

Table 8

FDI Stock and the Stock as a Percentage of GDP in East Asia and Latin America

1980-2003

	1980		1985		1990		1995		2003	
Country	FDI Stock	% in GDP	FDI Stock	% in GDP	FDI Stock	% in GDP	FDI Stock	% in GDP	FDI Stock	% in GDP
Argentina	749	1.0	3,185	3.6	7,751	5.5	25,463	9.9	48,262	37.2
Brazil	17,480	7.7	25,664	11.5	37,143	8.5	47,887	6.8	132,818	24.0
Chile	10,847	36.8	11,988	65.8	16,107	48.1	24,437	33.9	54,082	73.1
Colombia	1,061	2.7	2,231	5.4	3,500	7.3	6,407	6.9	20,540	25.9
Mexico	8,105	4.2	8,700	4.4	22,424	8.5	41,130	14.4	178,101	27.9
Hong Kong	177,755	616.8	183,220	515.6	201,653	262.3	227,532	157.8	381,342	420.5
Indonesia	4,559	5.7	5,739	6.0	8,732	6.9	20,626	9.3	10,329	4.3
Korea	1,139	1.8	1,803	1.9	5,186	2.0	9,497	1.8	66,070	10.9
Malaysia	5,169	21.1	7,388	23.7	10,318	23.4	28,731	32.3	41,188	37.4
Singapore	5,351	45.7	10,620	60.0	30,468	82.6	65,644	78.2	147,961	158.8
Taiwan	2,405	5.7	2,930	4.6	9,735	5.9	15,736	5.7	37,262	12.2
Thailand	981	3.0	1,999	5.1	8,242	9.7	17,684	10.5	48,944	34.3

Notes: FDI stock is in millions of US dollars and shares of FDI stock in GDP are in percentages
Source: UNCTAD WIR 2008

Table 9 displays FDI inflows as a share of gross fixed capital formation. In 1980 this figure was low in all of the Latin American countries, under 5 percent. It was also low in the East Asian countries with the exception of Malaysia (12.2 percent) and Singapore (25.9 percent). By 2003 this figure had increased for every country, with larger variations within the regions. In Latin America, Chile had the highest ratio at 28.9 percent and Argentina the lowest at 8.4 percent. In East Asia, Singapore had the largest ratio (52.3 percent) and Taiwan the lowest (.8 percent) Following this ratio over time gives an indication of relative growth of foreign and domestic investment in a country. A larger ratio signals that FDI is growing faster than domestic investment. On average East Asia has had lower ratio.

Table 9

FDI Inflows and Inflows as Percentage of Gross Fixed Capital Formation in East Asia and Latin America 1980-2003

Country	1980		1985		1990		1995		2003	
	FDI Flows	% in GFCF	FDI Flows	% in GFCF	FDI Flows	% in GFCF	FDI Flows	% in GFCF	FDI Flows	% in GFCF
Argentina	678	3.6	919	5.9	1,836	9.3	5,609	12.1	1,652	8.4
Brazil	1,910	3.4	1,418	3.8	989	1.0	4,405	3.0	10,144	12.0
Chile	213	3.7	144	4.4	661	8.0	2,956	16.2	4,308	28.9
Colombia	157	1.9	1,023	11.4	500	5.1	968	4.7	1,720	13.0
Mexico	2,099	4.2	1,984	5.5	2,633	5.6	9,526	20.6	16,594	13.7
Hong Kong	710	7.6	-267	---	3,275	16.3	6,213	14.4	13,624	40.6
Indonesia	180	1.2	308	1.5	1,092	3.4	4,419	7.7	-507	---
Korea	17	0.1	218	0.8	759	0.8	1,270	0.7	4,384	2.4
Malaysia	934	12.2	695	7.5	2,611	17.9	5,815	15.0	2,473	10.0
Singapore	1,236	25.9	1,047	14.0	5,575	46.8	11,535	41.1	11,664	52.3
Taiwan	166	1.3	342	2.9	1,330	3.6	1,559	2.3	453	0.8
Thailand	189	2.1	160	1.5	2,575	7.5	2,070	3.0	5,235	15.2

Notes: FDI inflows are in millions of US dollars and inflows as a share of GFCF are in percentages.
Source: UNCTAD WIR 2007

Table 10 shows FDI stock in the two regions broken down by sector for 1988 and 1997. In 1988 a similar structure of FDI existed in the two regions. The primary sector accounting for 8 percent, the manufacturing sector for 62-67 percent, and the services sector for 29-23 percent of the total FDI stock. By 1997 in East Asia the structure was nearly the same with manufacturing FDI still accounting for 62 percent, the primary sector declined to 3.4 percent, and the service sector slightly increased to 32.8 percent. In Latin America primary sector FDI also declined to 5.7 percent. An interesting difference between the two regions is the decline in the share of manufacturing sector FDI to 38.8 percent and the increase in the share of service sector FDI to 55.5 percent in Latin America.

Table 11 presents GDP per capita growth for the countries in 1980 and 2003, and also the annual average growth rate throughout the period of analysis. The two regions have experienced very different economic performance since 1980. The average annual

Table 10

FDI Stock in East Asia and Latin America by Sector, 1988 and 1997

	1988				1997			
	East Asia		Latin America		East Asia		Latin America	
Sector	Value	Share	Value	Share	Value	Share	Value	Share
All industries	68,329	100	39,379	100	903,473	100	83,995	100
Primary	5,730	8.4	3,480	8.8	30,958	3.4	4,817	5.7
Manufacturing	42,192	61.7	26,518	67.3	555,587	61.5	32,549	38.8
Services	19,983	29.2	9,362	23.8	296,280	32.8	46,607	55.5
Unspecified	424	0.7	19	0.1	20,648	2.3	22	0

Notes: Millions US dollars. East Asia includes South, East, and Southeast Asia. Latin America includes the Caribbean.

Source: World Investment Report 1999 (UNCTAD 1999)

Table 11

GDP Per Capita Growth in Latin America and East Asia, 1980-2003

Country	1980	2003	1980-2003 Average Annual Growth Rate (%)
Argentina	10,920	10,170	-0.08
Brazil	6,775	7,204	0.58
Chile	6,675	12,140	2.96
Colombia	4,828	6,094	1.13
Mexico	7,271	7,938	0.71
Hong Kong	13,410	27,657	3.64
Indonesia	2,083	4,122	3.13
Korea	4,496	17,596	5.94
Malaysia	4,950	12,133	4.25
Singapore	13,032	26,999	3.72
Taiwan	5,962	19,885	5.63
Thailand	2,708	7,274	4.64

Note: Data in 2000 US dollars.

Source: Penn World Tables

growth rate of GDP per capita in the Latin American countries is substantially lower than in East Asia. Chile is the only country with significant GDP per capita growth, nearly 3 percent average annual growth. Argentina had an actual decline in GDP per capita and Mexico had a meager .71 percent average annual growth despite the large increase in FDI flows. The East Asia countries have had a superior growth performance, with average annual growth rates all above 3 percent. Korea and Taiwan had average annual growth rates at nearly 6 percent. By 2003 all the East Asian countries had at least doubled the GDP per capita levels that were present in 1980. These differences within and between regions, in amounts of FDI and economic growth indicate that each

country has had a unique experience with FDI. Next are the empirical results testing for the direction of causation between FDI and economic growth.

Empirical Results

Data Description

The data for the empirical tests are the same as used in the first essay. Real FDI stock is taken from the WIR and real GDP is from the PENN World Tables. Both variables are used in logarithmic form. Between the two data sources FDI and GDP are available for the years 1980-2003. For a more detailed description of the data see the previous chapter.

ADF Test of Unit Roots

As a preliminary analysis the Augmented Dickey-Fuller (ADF) test is carried out to test for the presence of unit roots in the FDI and GDP series for each country. The ADF tests are conducted on the level and first differences of the variables by estimating the following models:

- Model (1): Constant and no trend model:

$$\Delta y_t = \propto_0 + \gamma y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t$$

- Model (2): Constant and trend model:

$$\Delta y_t = \propto_0 + \alpha_2 t + \gamma y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t$$

where $\Delta y_t = y_t - y_{t-1}$ is the first difference; $\propto, \gamma$ and β_i are the parameters to be estimated and ε_t is a stochastic disturbance term. Lag length selection is chosen by using the Akaike Info Criterion (AIC). Table 12 displays the results of the ADF test of unit roots.

In model (1) the ADF test rejects the null nonstationarity in first differences for Argentina, Brazil, Mexico, Hong Kong, Korea, Malaysia, and Singapore for both the FDI and GDP series suggesting that both FDI and GDP are integrated of order one, I(1). For Chile, Colombia, and Taiwan the ADF test rejects the null of nonstationarity in second differences suggesting that both series are integrated of order two, I(2). In Indonesia the FDI series is found to be stationary in levels and the GDP series is found to be integrated of order. Therefore the VAR for Indonesia is estimated in first differences. For the case of Thailand the FDI series is found to be I(1) and the GDP series is found to be I(2). This poses problems for tests of cointegration because the variables must be integrated of the same order. Due to the low power of the ADF test explained in Chapter 2 the cointegration tests are still carried out for Thailand but the results should be interpreted with caution.

In model (2) the null of nonstationarity in first differences for the FDI and GDP series can be rejected for Argentina, Brazil, and Mexico. For these three countries the FDI and GDP series are integrated of order one. The null of nonstationarity in second differences for the FDI and GDP series can be rejected for Chile, Colombia, Hong Kong, Korea, Malaysia, and Taiwan meaning that the series are integrated of order two. In Indonesia the FDI series is found to be stationary in levels and the GDP series is found to

Table 12

Results of ADF Test of Unit Roots

Region		Variable	Model (1) Constant & No Trend	Model (2) Constant & Trend
Latin America				
	Argentina	FDI	I(1)***	I(1)***
		GDP	I(1)***	I(1)**
	Brazil	FDI	I(1)***	I(1)**
		GDP	I(1)***	I(1)**
	Chile	GDP	I(2)***	I(2)***
		FDI	I(2)***	I(2)***
	Colombia	FDI	I(2)***	I(2)***
		GDP	I(2)***	I(2)***
	Mexico	FDI	I(1)***	I(1)**
		GDP	I(1)***	I(1)***
East Asia				
	Hong Kong	FDI	I(1)***	I(2)***
		GDP	I(1)***	I(2)***
	Indonesia	FDI	I(0)**	I(0)**
		GDP	I(1)**	I(1)**
	Korea	FDI	I(1)**	I(2)***
		GDP	I(1)***	I(2)***
	Malaysia	FDI	I(1)**	I(2)***
		GDP	I(1)***	I(2)***
	Singapore	FDI	I(1)**	I(2)***
		GDP	I(1)***	I(1)**
	Thailand	FDI	I(1)***	I(1)***
		GDP	I(2)***	I(2)***
	Taiwan	FDI	I(2)***	I(2)***
		GDP	I(2)***	I(2)***

Notes: The asterisks ***(**) represent significance at the 1(5) percent level.

be stationary in first differences. For this reason the VAR for Indonesia is estimated in first differences. For the case of Thailand again, the FDI series is found to be I(1) and the GDP series is found to be I(2). After testing for unit roots we can proceed to test for cointegration.

Johansen Test of Cointegration

The Johansen full information maximum likelihood method tests for an equilibrium relationship between FDI and GDP in the 12 countries. Table 13 displays the results of the Johansen test. The test generates two test statistics: the trace statistic and the maximum eigenvalue statistic.[16] In Argentina, Brazil, Korea, and Singapore, both statistics fail to reject the null of no cointegration. For the other eight countries at least one of the statistics rejects the null of no cointegration indicating a unique cointegrating equation connecting FDI and GDP in the long run. With the existence/nonexistence of cointegration confirmed, VARs (in the case of no cointegration) and VECMs (in the case of cointegration) can be estimated for each country.

The VAR Model and Forecast Error Variance Decomposition

In order to analyze the casual relationship between the growth of FDI stock and GDP in the following VAR system is used which includes the error correction term if the

[16] See Johansen (1991,1995) for details.

Table 13

Results of Johansen Test of Cointegration

	Null Hypothesis	*Alternative Hypothesis*	*Test Statistic*
Argentina			*Trace Test*
	r=0	r≥1	13.51
	r≤1	r≥2	4.25
			Maximum Eigenvalue Test
	r=0	r≥1	9.26
	r≤1	r≥2	4.25
Brazil			*Trace Test*
	r=0	r≥1	23.75
	r≤1	r≥2	6.99
			Maximum Eigenvalue Test
	r=0	r≥1	16.75
	r≤1	r≥2	6.99
Chile			*Trace Test*
	r=0	r≥1	29.20**
	r≤1	r≥2	10.1
			Maximum Eigenvalue Test
	r=0	r≥1	19.09**
	r≤1	r≥2	10.1
Colombia			*Trace Test*
	r=0	r≥1	46.07***
	r≤1	r≥2	11.63
			Maximum Eigenvalue Test
	r=0	r≥1	34.44***
	r≤1	r≥2	11.64
Mexico			*Trace Test*
	r=0	r≥1	31.31***
	r≤1	r≥2	12.52
			Maximum Eigenvalue Test
	r=0	r≥1	22.52**
	r≤1	r≥2	12.52
Hong Kong			*Trace Test*
	r=0	r≥1	20.41***
	r≤1	r≥2	5.91**
			Maximum Eigenvalue Test

Table 13 continued

	Null Hypothesis	*Alternative Hypothesis*	*Test Statistic*
	r=0	r≥1	14.26**
	r≤1	r≥2	3.84**
Korea			*Trace Test*
	r=0	r≥1	11.38
	r≤1	r≥2	3.37
			Maximum Eigenvalue Test
	r=0	r≥1	8
	r≤1	r≥2	3.37
Malaysia			*Trace Test*
	r=0	r≥1	32.43***
	r≤1	r≥2	2.43
			Maximum Eigenvalue Test
	r=0	r≥1	29.99***
	r≤1	r≥2	2.43
Singapore			*Trace Test*
	r=0	r≥1	10.2
	r≤1	r≥2	1.3
			Maximum Eigenvalue Test
	r=0	r≥1	14.26
	r≤1	r≥2	3.84
Taiwan			*Trace Test*
	r=0	r≥1	20.58***
	r≤1	r≥2	5.03**
			Maximum Eigenvalue Test
	r=0	r≥1	15.55**
	r≤1	r≥2	5.20**
Thailand			*Trace Test*
	r=0	r≥1	21.4***
	r≤1	r≥2	2.8
			Maximum Eigenvalue Test
	r=0	r≥1	18.58***
	r≤1	r≥2	2.84

two series were found to be cointegrated[17]:

$$FDI_t = \propto_1 + \propto_{fdi} \hat{e}_{t-1} + \sum_{i=1}^{k} \propto_{11} FDI_{t-i} + \sum_{i=1}^{k} \propto_{12} GDP_{t-i} + \varepsilon_{it}$$

$$GDP_t = \propto_2 + \propto_{gdp} \hat{e}_{t-1} + \sum_{i=1}^{k} \propto_{21} GDP_{t-i} + \sum_{i=1}^{k} \propto_{22} FDI_{t-i} + \varepsilon_{it}$$

where

$$FDI_t = real\ FDI\ stock\ in\ year\ t;$$
$$GDP_t = GDP\ in\ year\ t;$$
$$\hat{e}_{t-1} = the\ error\ correction\ term$$
$$\propto_{ij} = the\ estimated\ parameters;$$
$$\varepsilon_{it} = white\ noise\ disturbance\ terms$$

The VAR treats every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. The disturbance terms may be contemporaneously correlated but are uncorrelated with their lagged values and uncorrelated with all of the right hand side variables. Only lagged values of the endogenous variables are on the right hand side so simultaneity is not an issue and OLS yields consistent results. The VAR system is first estimated then the forecast error variance decomposition can be constructed for each country.

The forecast error variance decomposition of the errors provides the percentage of the variance of the error made in forecasting a variable at a given horizon due to a specific shock. The forecast error variance decomposition is like a R-squared for the

[17] Lag length selection is chosen using the Akaike Information Criterion (AIC). For most countries a three period lag seems appropriate.

forecast error. If the GDP shocks explain none of the forecast error variance of FDI at all forecast horizons, then the FDI sequence can be said to be exogenous. If this was the case then the FDI sequence evolves independently of the GDP shocks and the GDP sequence. Table 14 displays the results for the forecast error variance decomposition for FDI and GDP per at the tenth forecast horizon.[18]

The FDI itself explains the forecast error variance decomposition of FDI in Chile (90 percent). In Colombia FDI explains a more moderate amount (55 percent), as it does in Mexico (51 percent) and Argentina (31 percent). FDI explains just 7 percent in Brazil. The forecast error variance decomposition of GDP also varies across Latin American countries. GDP explains moderate amounts in Argentina (40 percent), Brazil (30 percent), and Mexico (53 percent). Colombia and Chile are the extremes with 95 percent explained by GDP in Colombia and .5 percent in Chile.

In East Asia FDI itself explains significantly more of the variance decomposition. In Hong Kong, Indonesia, Singapore, and Thailand FDI explains over 70 percent. FDI explains moderate amounts in Korea (44 percent) and Taiwan (28 percent). Malaysia stands out with only 3 percent explained by FDI. More variation exists in the variance decomposition of GDP within East Asia. At the extremes, for the amount explained by FDI, there is Thailand (92 percent), Hong Kong (87 percent), Indonesia (5 percent), and Malaysia (1.5 percent). The results of the forecast error variance decomposition can identify no clear trends. Large variations exist within each region. Next, Granger causality tests attempt to reveal similarities and differences between the two regions.

[18] Lag length selection in the VARs was based on the AIC criterion.

Table 14

Forecast Error Variance Decomposition

at the Tenth Period Forecast Horizon

	Variance Decomposition of	Percentage Explained by FDI	Percentage Explained by GDP
Latin America			
Argentina	FDI	30.9	69.1
	GDP	59.6	40.4
Colombia	FDI	50.5	49.5
	GDP	5.4	94.6
Brazil	FDI	6.8	93.2
	GDP	69.7	30.3
Chile	FDI	89.5	10.5
	GDP	99.5	0.5
Mexico	FDI	55	45
	GDP	47	53
East Asia			
Hong Kong	FDI	99	1
	GDP	86.8	13.2
Indonesia	FDI	73.9	26.1
	GDP	4.7	95.3
Korea	FDI	43.5	56.5
	GDP	16.9	83.1
Malaysia	FDI	2.7	97.3
	GDP	1.5	98.5
Singapore	FDI	87.1	12.9
	GDP	41.4	58.6
Thailand	FDI	92.4	7.6
	GDP	91.7	8.3
Taiwan	FDI	27.6	72.4
	GDP	15.8	84.2

Granger Causality

Table 15 presents the results of the Granger causality tests. The first two columns display short run causality; the third and fourth columns display long run causality. In Latin America two countries have evidence of FDI to GDP causality. Brazil has significant short run FDI to GDP causality, and Mexico has both significant short and long run FDI to GDP causality. These two countries are the major recipients of FDI in Latin America. Three countries have long run GDP to FDI causality: Colombia, Chile, and Mexico. Argentina has no significant causality between FDI and GDP.

East Asia has more evidence in favor of a FDI to GDP causality. In five cases significant short run causality running from FDI to GDP is present; Hong Kong, Indonesia, Taiwan, and Thailand. Long run FDI to GDP causality is found in Singapore, Taiwan, and Thailand. For GDP to FDI causality there are two cases of significant short run causality (Korea and Malaysia) and two cases of significant long run causality (Hong Kong and Malaysia). It is interesting that Korea and Malaysia do not have FDI to GDP causality given that the FDI stock is significantly higher compared to Indonesia where significant FDI to GDP causality was found.

Interpretation and Conclusion

The forecast error variance decomposition shows the proportion of the movements in a sequence due to its own shocks versus shocks to the other variable. If the FDI shocks explain none of the forecast error variance of the GDP sequence at all forecast horizons we can say that the GDP sequence is exogenous. If this is the case then

GDP evolves independently of FDI shocks and the FDI sequence. In Latin America, Colombia is the only country where the FDI shocks explain a small enough percentage of the forecast error variance that we can say that GDP evolves fairly independently of the FDI shocks and the FDI sequence. Colombia has received the smallest amount of FDI in the Latin American countries considered. The only two countries in Latin America where FDI to GDP causality was found are Brazil (short run) and Mexico (short and long run).

In East Asia, Indonesia and Malaysia have a small amount of the GDP forecast error variance explained by FDI, 4.7 and 1.5 percent, respectively. No FDI to GDP causality was found in Malaysia but short run FDI to GDP causality was found in

Table 15

Results of Granger Causality Tests

	Short-Run Causality		Long-Run Causality	
	FDI to GDP	GDP to FDI	FDI to GDP	GDP to FDI
Latin America				
Argentina	NO	NO	NO	NO
Brazil	YES**	NO	NO	NO
Colombia	NO	NO	NO	YES**
Chile	NO	NO	NO	YES***
Mexico	YES***	NO	YES***	YES**
East Asia				
Hong Kong	YES**	NO	NO	YES***
Indonesia	YES***	NO	NO	NO
Korea	NO	YES***	NO	NO
Malaysia	NO	YES***	NO	YES***
Singapore	NO	NO	YES**	NO
Taiwan	YES***	NO	YES***	NO
Thailand	YES**	NO	YES**	NO

Note: The asterisks ***(**) indicate significance at the 1 (5) percent level.

Indonesia. Considering the two tests together then Malaysia is the only East Asian country where we can say that GDP evolves fairly independently of the FDI shocks and the FDI sequence. This finding is interesting given that FDI stock as a percentage of GDP in Malaysia is much higher (38 percent) compared to Indonesia with the lowest percentage (4.3 percent). In East Asia the only other country with no FDI to GDP causality was Korea. The results of variance decomposition do not necessarily conflict with the Granger test of causality because only 17 percent was found to be explained by FDI. But an interesting comparison is the case of Taiwan where the variance decomposition revealed that 16 percent of the forecast error was explained by FDI but both short and long run causality was found. In 2003 Taiwan and Korea had similar levels of FDI stock as a percentage of GDP, 12.2 and 10.9 percent, respectively, and have had similar levels of FDI inflows as a percentage of GFCF.

In terms of economic growth rates East Asia has outperformed Latin America for the period of analysis. The average annual growth rate of GDP per capita for the period 1980-2003 was much higher in East Asian countries. The stock of FDI is heavily concentrated in East Asia. In 2003, for the countries considered in this analysis, 63 percent of the stock of FDI was located in East Asia. The Granger causality tests revealed that only two Latin American countries, Mexico and Brazil, had FDI to GDP causality. In East Asia, five countries displayed FDI to GDP causality; Hong Kong, Indonesia, Singapore, Taiwan, and Thailand. GDP to FDI causality was present in three Latin American countries (Colombia, Chile, and Mexico) and in three East Asian countries

(Hong Kong, Korea, Malaysia). How is one to interpret these differences across and within Latin America and East Asia?

One potential explanation could be the larger share of service sector FDI in Latin America compared to East Asia. This coincides with the findings in the next chapter and other sector level studies that have found that manufacturing FDI causes economic growth whereas service sector FDI has no causal relationship with economic growth. It may be that service FDI does not provide the advanced technologies, access to export markets or linkages to local enterprises that manufacturing FDI does. Some services are more monopolistic than manufacturing and are more prone to exploitation of the market power by MNEs which could result in higher prices and depressed aggregate demand in the domestic market. It has also been found that financial service FDI can undermine the capability of domestic regulators to control international capital flows and increase foreign exchange volatility and the possibility of contagion effects from other countries markets (WIR, 2004). An interesting point to highlight is that Hong Kong has the second largest stock of service sector FDI, following the United States, and short run FDI to GDP causality was present. So the different types of service FDI-tourism, banking, media, telecommunications, transportation or retailing-probably impact economic growth differently. Another difference between the two regions worth mentioning is the lower share of FDI inflows as a percentage of gross fixed capital formation in East Asia. On average this figure has been lower in East Asia.

CHAPTER 4

FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH IN MEXICO 1980-2003

Introduction

Foreign direct investment (FDI), mostly undertaken by multinational enterprises, has played a controversial role in the economic development of Mexico. In theory FDI is thought to have a positive impact on economic growth. FDI is considered as the main channel for technology transfer for developing countries. It is thought to induce higher levels of competition which in turn boost growth through productivity effects. Also, foreign firms are assumed to invest in the training of the domestic workforce thereby increasing the qualifications of the country. Theory mainly points towards positive effects but the empirical results of research are widely varied and inconsistent. The effect of FDI on economic growth has been found to be conditional upon a set of host country conditions. Some of these include adequate levels of education, well developed financial markets, political/economic stability, and an already existing level of economic development.

A fairly unexplored area of research is the role that the sectoral composition of FDI plays in the impact of FDI on overall economic growth. It is believed that the type of FDI and its structural composition matter at least as much for economic growth and

development as does the overall volume.[19] Furthermore, if the FDI is not linked to domestic production then it is highly unlikely that this type of growth will last permanently. It has been shown that the linkages between FDI and domestic industry in Mexico are rather weak (Pacheco-Lopez and Thirwall 2004). It is most likely that for a country to gain development benefits from FDI, the proper industrial policies must be put in place which link MNC objectives with development goals and thus individual countries need the policy space to customize their interventions to their specific circumstances. These will only be known by analyzing the individual sectors within a country and their corresponding industrial policies

Foreign enterprise's early presence, the period of "Mexicanization," the debt crisis of the 1980s, neo-liberal reforms, and the inception of the North American Free Trade Agreement (NAFTA) in 1994 all contribute to a unique country case study on the effects of foreign corporations on economic growth. Beginning in the 1980s restrictions on FDI were progressively relaxed culminating in the signing of the NAFTA in 1994, which opened up many new areas to foreign investment. The NAFTA solidified the major shift in Mexican development strategy that had started in the 1980s. It was a turn away from the import substitution and state led industrialization period, towards the

[19] See Kentor (2003) where it is argued that after the late 1980s the structure of foreign investment, represented by foreign investment concentration, calculated as the percentage of total foreign direct investment stocks accounted for by the top investing country has a greater impact on economic development than does the overall level of foreign investment. This is explained on the basis that high concentrations of foreign investment allow investors to gain control over economic and political processes. This prevents the host country from using policies that are in its own long term interest. This coincides with a new wave of globalization and neoliberal policies that began in the late 1980s.

Washington Consensus strategy of trade liberalization and reduction in state involvement.

Foreign direct investment inflows dramatically increased following the signing of the NAFTA but the expected benefits still have not materialized. Economic growth in Mexico has not returned to the levels of the state led industrialization phase. A negative trade balance still exists, poverty and inequality have not improved, few high-skill jobs were created, and much FDI has now fled to other countries. The FDI-led growth strategy did not materialize; rather an enclave economy has been created where small domestic firms supply the local market and the large MNE export with little contact with domestic industry (Matter et al. 2002, Zarsky and Gallagher 2007).

It is the objective here to examine the impact of FDI on economic growth in five broad sectors over the period 1980 to 2004. Did FDI lead to growth in all five sectors or are growth benefits more isolated and possibly restricted to the industrial sector? Is it more common that economic growth is attracting FDI? In line with previous empirical work which uses sector level FDI data, it is expected to find causality running from FDI to economic growth in the industrial sector but not in the service sector. This could be partly due to an absence of sector level policies in the service sector and also because much of the FDI in this sector is in the form of mergers and acquisitions which theoretically and empirically have been found to have less of an impact on growth than greenfield investments (Prufer 2008). Also, the capacity for linkages between domestic and foreign firms has been found to be greater in the industrial sector (UNCTAD, 2001). FDI in the agriculture and extractive sectors is expected to have less of a growth impact

due to the low-skill/value added nature of work and the more limited capacity of linkages that have been found in the primary sector (Alfaro and Rodriguez-Clare 2003). Some have actually found negative growth impacts from FDI in the primary sector. Causality running from economic growth to FDI is expected to be more common because FDI will most likely flow to sectors where growth is increasing.

In order to test the direction of causality in the five sectors, cointegration and Granger causality techniques based on single time series are used. The Augmented Dickey-Fuller test is used to test for the presence of unit roots. If unit roots are found then the Johansen test of cointegration is used to test for the presence of a long run relationship between FDI and economic growth. For sectors where cointegration is found, causality is assessed using the estimation of a vector error correction model. For sectors absent a cointegrating link causality is tested for using a vector auto regression. Next is a review of the empirical FDI literature that uses sector specific FDI data and then that which is focused on Mexico, followed by a discussion of the historical context, and trends in FDI. The empirical section is then presented and final section concludes.

Literature Review

In this section a review of the relevant literature is discussed. First, four papers that use sector specific FDI data, then more general FDI literature that is focused solely on Mexico, and then a few papers highlighting issues with the NAFTA, are discussed. Only four working papers have attempted to analyze the role that the sectoral composition has played in the FDI-growth connection. Data limitations and changes in methods of FDI collection at the sector level have restricted this type of research but

disaggregated FDI data are becoming increasingly available. Each paper, using different estimation techniques has come to the main finding that the growth effects of FDI are restricted to the manufacturing sector. This is interesting for policy makers because the service sector has witnessed large increases in FDI flows in recent years.

Sector Level FDI Literature

Alfaro (2003) is the earliest research to consider the sectoral impact of FDI on economic growth. Data for 47 countries were used to examine the different impact of FDI in the primary, secondary, and services sectors for the years 1981-1999 in a cross country regression. A negative effect was found in the primary sector, a positive one in manufacturing, and the service sector was found to be ambiguous. Similarly, Vu et al. (2006) used FDI flow data for China and Vietnam and found that FDI had a positive effect directly and indirectly with its interaction with labor on growth in the industrial sector. Other sectors gained very little growth benefit from sector specific FDI. They used an augmented production function and feasible generalized least squares methodology. The Vietnam dataset contained data for five sectors for 1990-2003, and the China counterpart for five sectors for 1985-2004. Khaliq and Noy (2007) looked at the growth impact of FDI using annual data for 12 sectors from 1998 to 2006 in Indonesia. Similar to Alfaro (2003) and Vu et al. (2006) they looked at the direct effect of FDI flows in different sectors but used a fixed effect estimation methodology. They used an augmented production function with FDI incorporated as one of the factor inputs. Once they controlled for differences across sectors, the correlation of FDI with growth lost its significance which was found at the aggregate level. They found a negative

statistically significant effect on growth in the mining and quarrying sector. The only sector with a significant positive effect was in construction. They did not have FDI data for the manufacturing sector as did the other studies.

Chakraborty and Nunnenkamp (2006) assessed the growth implications of FDI in India by subjecting industry-specific FDI and output data to Granger causality tests within a panel cointegration framework for 15 industries in the primary, secondary, and tertiary sectors for 1987-2000. They found that the growth effects of FDI vary widely across sectors. FDI stocks and output were mutually reinforcing in the manufacturing sector. In sharp contrast, any causal relationship was absent in the primary sector. They found only temporary effects of FDI on output in the services sector, which attracted the bulk of FDI in the post-reform era.

Literature on FDI in Mexico

No sector level FDI studies have been done on Mexico. The two early studies focused on FDI and productivity spillovers in Mexico which are commonly cited are Blomstrom (1986) and Blomstrom and Wolf (1994). Both use economic census industry level data from 1970 and 1975 in a standard cross-sectional OLS regression and find some evidence of spillovers. Lopez-Cordova (2003) and Rodriquez-Clare and Alfaro (2004) used plant level data from the annual industrial survey. This methodology allowed them to distinguish between forward (industries that supply intermediate goods to) and backward linkages (industries that purchase intermediate goods from a plant's own industry). FDI in industries with which a plant has backward or forward linkages had positive effects on both the level and growth rate of productivity. A one

standard deviation rise in FDI in backward-linked industries results in a 29 percent increase in TFP and a 15 percent rise in its growth rate. Respectively, forward-linked industries show a 15 percent and 10 percent increase. But the work of Rodriquez-Clare and Alfaro (2004) found that domestic and foreign firms have a similar linkage potential in Mexico. A linkage coefficient, measured as the value of domestic inputs to total workers per year, is constructed for each firm and estimations imply a lower linkage coefficient for foreign firms. This is explained on the basis that most of the foreign firms in Mexico are based in the United States making it attractive for them to import most of their inputs. The average share of inputs sourced domestically for foreign and domestic firms in Mexico was 54 percent and 84 percent, respectively.

Griffiths and Sapsford (2004) use time series data from 1970 to 1999 to assess the impact of FDI on growth. Only the growth rate of domestic capital stock was found statistically significant in an augmented production function OLS estimation methodology. They break the data into an import substitution (IS) period (1970-1985) and export promoting (EP) period (1980-1999) and the results did not change. This is at odds with the findings of Balasubramanyam et al. (1996) who found support for the Bhagwati hypothesis that FDI will be more beneficial in an export promoting trade regime. All lagged variables of domestic capital performed poorly but a two-period lag of FDI was found significant in the EP period. The output elasticity was found to be 3.45 for the period since liberalization, an extremely high value. So once lagged values of FDI were included there is evidence of FDI contributing to output growth. These strong

findings could be driven by the problems associated with nonstationary time series data, which they do not test for.[20]

NAFTA and FDI Literature

There have been a few studies on the impact of NAFTA and its association with FDI. Moreno-Brid et al. (2005) argue that NAFTA was successful in terms of producing an export boom in the manufacturing sector and an inflow of FDI accompanied by technology transfer in Mexico but the constraints on long term growth have not be alleviated. In spite of the NAFTA there has been little economic growth and job generation was not what it was expected to be. What it did accomplish was to spark a process of integration that promoted the interests of large MNCs and financial institutions. The impact of exports on domestic output was limited by the rupture of backward linkages brought about by the inflow of imported inputs by the MNEs, many of them required for export. Trade and investment liberalization are not enough to propel economic development by themselves.

Tornell and Westermenn (2004) argue that the lack in growth is not due to NAFTA but is due to the lack in judicial and structural reform after 1995. There was deterioration in contract enforceability and an increase in nonperforming loans, which led to a bad credit crunch. Enforceability problems make it difficult for a creditor to take over the assets of defaulting debtors. The problems include long delays in the

[20] As was explained in Chapter 2 the use of OLS is dependent on the series being stationary. When the series is nonstationary, the use of OLS can produce spurious regression results, i.e., high R^2 values and t-ratios yielding results with no economic meaning. See Granger and Newbold (1974).

adjudication of commercial disputes, very low salaries for judges, biased judgments, and poor enforcement of judicial decisions. In 2000 new bankruptcy and guarantee laws were introduced. Structural reforms in key sectors, such as energy, have not been implemented and have implied higher costs for other sectors in the Mexican economy. As far as FDI goes they point out that hardly any FDI went to the nontradable sector and resulted in bottlenecks in the tradable sectors because the tradable sector requires inputs from nontradable. The credit crunch impacted the tradable sector less severe because the large MNEs have easier access to international financial markets After 2001 more FDI has gone to the nontradable sector but economic growth in Mexico has still remained stagnant.

Zarsky and Gallagher (2004) conducted a comprehensive case study on the impact of NAFTA and FDI on Mexico and failed to find evidence of widespread growth. Overall they found that the FDI led integration strategy sparked a process of economic polarization and segmentation between the externally and internally oriented parts of the economy. A small number of MNCs and globally integrated Mexican firms with access to foreign capital have expanded production while firms reliant on the domestic banking system and serving the domestic market have been starved for capital and for customers. In a more recent case study Zarsky and Gallagher (2007) examined the information technology (IT) sector in detail and argued that the FDI plan in this sector failed for two main reasons. First, a passive policy was adopted. Second, the dynamics of global restructuring and competition in the IT industry, contributed to its failure (i.e., collapse of high-tech stock market bubble in 2000 and China's accession to the WTO).

These authors argue that FDI inflows created an enclave economy where foreign firms used imported inputs to manufacture and assemble IT products for export to the US. When the situation did not suit the IT firms they simply moved to China. Mexican authorities did not seek partnerships with foreign firms to encourage knowledge transfer or local supply linkages. A deal with IBM generated the only start up firm. The authors contrasted Mexico with other countries that took more of an active approach and observed that they were able to gain more development benefits from FDI.

The empirical findings on the FDI-growth relationship in Mexico have been mixed. Spillovers and externalities have been found by some researchers but the findings seem to be sensitive to estimation techniques and the period of analysis. The work of Zarsky and Gallagher (2004; 2007), based on extensive interviews and field work, found that the FDI led growth strategy did not materialize. Rather an enclave economy has been created in Mexico. This dualistic structure, an export sector linked to foreign capital and smaller domestic firms supplying the local market, has resulted in productivity improvements in very small enclaves with few linkages with the rest of the system. The findings of Zarsky and Gallagher (2004; 2007) suggest that a sector level analysis will be beneficial to policy makers and academics. In order to place the empirical analysis in a historical perspective the next section discusses Mexican development policy highlighting changes in the regulation of FDI.

Historical Context and the Foreign Investment Law

After the end of WWII Mexico followed a path of development that promoted industrial self-sufficiency and growth in domestic markets through import substitution

industrialization (ISI) policies. For three decades ISI performed well in Mexico but by 1980 the system was breaking down and Mexico started to swing the other way, towards openness (Gallagher and Zarsky 2004). By the turn of the century Mexico had drastically reversed its method of development and had joined General Agreement on Tariffs and Trade, the NAFTA and the Organization of Economic Cooperation and Development.

The excessive borrowing of the 1970s finally came to a crash in 1982 when world oil prices dropped at a time of high interest rates. Having accumulated large amount of debt denominated in dollars, Mexico suffered from the Volcker interest rate hikes in the United States. In 1982 Mexico announced the inability to pay the interest on debt and a devaluation followed which sent the Mexican economy into crisis. Mexico received 3.7 billion dollars from the US Treasury and another 2 billion dollars from the Paris Club. The administration of Miguel de la Madrid (1982-88), a Harvard graduate, initiated the Program of Immediate Economic Reorganization. Financial stability was thought to be restored through a peso devaluation and cuts in the government deficit generated from the recycled petro dollars. Tariffs were increased to 100 percent of the value of all imports, licenses were required for importing all goods, and foreigners were restricted to 49 percent ownership of firms. It was predicted that these policies would reduce inflation and create a trade surplus. By 1985 in Mexico a balance of payment crisis had emerged, fiscal spending had increased, IMF funding had ended, an earthquake struck Mexico City, and oil prices had dropped again (Moreno-Brid et al. 2005).

These events set the stage for de la Madrid administration to begin the neoliberal reform. Imports subject to license were decreased to 35 percent, the tariff rate was lowered to 45 percent, and Mexico signed the General Agreement on Tariffs and Trade (GATT) in 1986, locking in further restrictions. Initially the Foreign Investment Law (FIL) remained basically the same but the de la Madrid administration changed the way the FIL was interpreted and applied. In 1984 new regulations were issued in the "Guidelines for Foreign Investment and Objectives for its Promotion" by the National Commission for Foreign Investment (NCFI). FDI was encouraged into industries such as heavy machinery, electronic equipment, high technology products and tourism (UNCTC 1999).

In order to attract FDI the Foreign Investment Law of 1973 (FIL) had to be modified. The FIL restricted FDI in product groups that were reserved exclusively for the state, which included petroleum and other hydrocarbons, basic petrochemicals, radioactive and strategic minerals, nuclear energy, electricity, railroads, telegraphic and radio communications and banking. FDI was also restricted in product groups reserved for the state and Mexican private investment which included radio and television, agricultural activities, road, air and maritime transportation, forestry, gas distribution and financial intermediation. There were products groups in which FDI was allowed only a specific proportion of the firm's capital: mining (49 percent), secondary petrochemicals (40 percent) and fabrication of automobile components (40 per cent) (UNCTC, 1992).

In cases in which the FIL or other regulations had not established a specific limit, foreign equity participation was not permitted to exceed 49 percent of total capital. Exceptions to this were allowed on a case by case review. Criteria used for approving majority foreign ownership were: if it complemented national investments; if it did not displace national companies; if it had a positive balance of payments effect by expanding exports; if it increased local employment; and if it utilized local inputs and components in final products or contributed to the technological modernization of Mexico. Firms with foreign capital up to 49 percent outside the restricted groups could operate without approval (UNCTC, 1992).

Up until the debt crisis the FIL was applied in a restrictive way, where the aim was to limit FDI to certain industries and only allow majority ownership in exceptional cases. After the 1982 debts crisis the FIL was modified to create more favorable conditions for FDI. The administration of Carlos Salinas de Gortari (1988-1994), another Harvard trained economist, adopted full blown neoliberal reform. The Salinas plan was presented in the National Development Plan for 1989 to 1994. The main goals of the plan were (1) macroeconomic stability, (2) increase investment, and (3) modernize the economy. The heart of the strategy was in the manufacturing sector fueled by foreign investment, mainly FDI from the United States (Gallagher and Zarsky, 2004).

In 1989 the FIL was modified by allowing 100 percent ownership in many sectors and requirements tied to exports and local content quotas were reduced under two decrees; the *Decreto para el Fomento del Sector Auntomotriz* and the *Decreto para el Fomento y Modernización de la Industria Manufacturera de Vehiculos de*

Autotransporte. According to the new regulation automatic authorization for up to 100 percent foreign ownership was given in the product groups if the FDI met the following conditions:

1) A maximum of $100 million dollars is invested in fixed assets.
2) Direct funding is obtained from abroad.
3) Investment in industrial establishments is located outside the three largest metropolitan areas.
4) The accumulated foreign net exchange flows are positive over the first three years. (UNCTC 1992)

The intention was to limit the case by case approvals by the NCFI and speed up the process. The new criteria said nothing about the displacement of domestic investment and the content level of Mexican input in final products and no authorization was needed for investment in the maquiladoras. Glass, cement, iron, steel, and cellulose were open to foreign majority ownership. Several products that were considered basic petrochemicals were reclassified as secondary petrochemicals opening them up to foreign investment. Foreign investment could participate with a majority ownership in activities reserved for Mexicans, national air, and maritime transportation, mining, secondary petro chemicals and automotive parts, if the investment was done through trusts or, *Fideicomisos* (UNCTC 1992).

In 1993 the reforms were solidified in a new FIL which reduced the number of restricted or forbidden activities. The adjustments made to the FIL in 1993 were necessary to make it compatible with the NAFTA. In 1999 another extensive amendment

was made to the FIL where the majority of financial services were liberalized. One-hundred percent foreign participation was allowed in banks, railroad services and gas distribution. The Mexican government has since signed numerous investment treaties with other countries but the main source of FDI is still the US.[21] The restrictions on foreign investment in the FIL were divided into four categories and are currently defined as:

(i) activities that are reserved for the Mexican State and in which neither foreign nor Mexican private investment may participate (i.e., petroleum, petrochemicals, electricity, nuclear energy, radioactive minerals, telegraph, radiotelegraphy, postal service, issuing of bank notes, minting of coins, control, supervision and surveillance of ports, airports and heliports and others as expressly provided by applicable legal provisions);

(ii) activities that are reserved exclusively for Mexican nationals and Mexican companies that exclude foreigners (i.e., domestic land transportation for passengers, tourism and freight, not including messenger or courier services, gasoline retail sales and distribution of liquefied petroleum gas, radio broadcasting services and other radio and television services other than cable television, credit unions, development banking institutions, under the terms of the law governing the matter; and rendering of professional and technical services set forth expressly by applicable legal provisions);

(iii) activities in which foreign investment may participate up to a prescribed percentage:

a. Ten percent (cooperative companies for production);

[21] Argentina (1996), Austria (1998), Belgium (1998), Denmark (2000) Finland (1999), France (1998), Germany (1998), Greece (2000), India (2007), Iceland (2005), Italy (1999), Korea (2000), Netherlands (1998), Panama (2005), Portugal (1999), Spain (2006), Sweden (2008), Switzerland (1995), Trinidad and Tobago (2006), United Kingdom (2006), and Uruguay (1999). (SICE)

b. Twenty-five percent (domestic air transportation, air taxi transportation; and specialized air transportation)

c. Forty-nine percent (insurance companies, bonding companies, currency exchange houses, bonded warehouses, retirement funds management companies, manufacture and commercialization of explosives, firearms, cartridges, ammunitions and fireworks, not including acquisition and use of explosives for industrial and extraction activities nor the preparation of explosive compounds for use in said activities, printing and publication of newspapers for circulation solely throughout Mexico, series "T" shares in companies owning agricultural, ranching, and forestry lands, fresh water, coastal, and exclusive economic zone fishing not including fisheries, integral port administration, port pilot services for inland navigation under the terms of the law governing the matter, shipping companies engaged in commercial exploitation of ships for inland and coastal navigation, excluding tourism cruises and exploitation of marine dredges and devices for port construction, conservation and operation, supply of fuel and lubricants for ships, airplanes, and railway equipment; and telecommunications concessionaire companies as provided by articles 11 and 12 of the Federal Telecommunications Law, depending on the activity); and

(iv) activities in which foreign participation may exceed 49 percent with prior approval from the Mexican Foreign Investment Commission (i.e., port services in order to allow ships to conduct inland navigation operation, such as towing, mooring and barging, shipping companies engaged in the exploitation of ships solely for high-seas traffic, concessionaire or permissionaire companies of air fields for public service, private education services of preschool, elementary, middle school, high school, college or any combination, legal services, credit information companies, securities rating institutions, insurance agents, cellular telephony, construction of pipelines

> for the transportation of petroleum and products derived there from, drilling of petroleum and gas wells; and construction, operation and exploitation of general railways, and public services of railway transportation.

Investment in any activity which does not fall within the above categories is not restricted (Ley de Inversión Extranjera, 1993).

Trends in FDI in Mexico

Overall Trends

FDI flows in Latin America were modest and had been concentrated in infrastructure (railroads) and natural resources (mining) during the first part of the 20th century. In the 1970s much of that investment was nationalized. In between the Great Depression and the debt crisis of the 1980s most of the FDI was sought to gain market access under the ISI regimes. Much of this FDI was from the US and was concentrated in the chemical, machinery and transportation equipment sectors. FDI flows remained fairly modest up until the 1990s. In the 1990s, following changes in the economic environment, MNCs looked for four principal benefits: increased access to natural resources, greater access to markets for manufactures, new access to markets for services, and improved efficiency of their international systems of integrated production (Mortimore 2000). In Mexico, the predominate forms were those seeking market access in the services sector, which had previously been closed off to foreign investment, and FDI seeking to improve efficiency, i.e., lower labor costs, in the manufacturing sector. This was the case of the automobile, electronics, and apparel industries in Mexico, where MNCs converted their operations into an export platform.

Figures 9 and 10 illustrate the increasing role of FDI in the Mexican economy. In Figure 9 the large increase of FDI inflows can be seen starting in the early 1990s. After the signing of the NAFTA in 1994 there is a jump followed by a decrease corresponding to the pesos crisis. A large spike is seen in 2001 that is mostly attributed to the acquisition of Banamex by Citigroup and inflows dropped thereafter with the Mexican recession. In Figure 10 FDI inflows as a percentage of gross fixed capital formation (GFCF) and FDI stock as a percentage of GDP show the increasing importance of FDI in the Mexican economy. The share of FDI flows as a percentage of GFCF measures the relative weight of the FDI in total investment taking place, both public and private. The share of inward FDI stock as a percentage of GDP provides a measure of the importance of FDI stock in relation to total economic activity taking place.

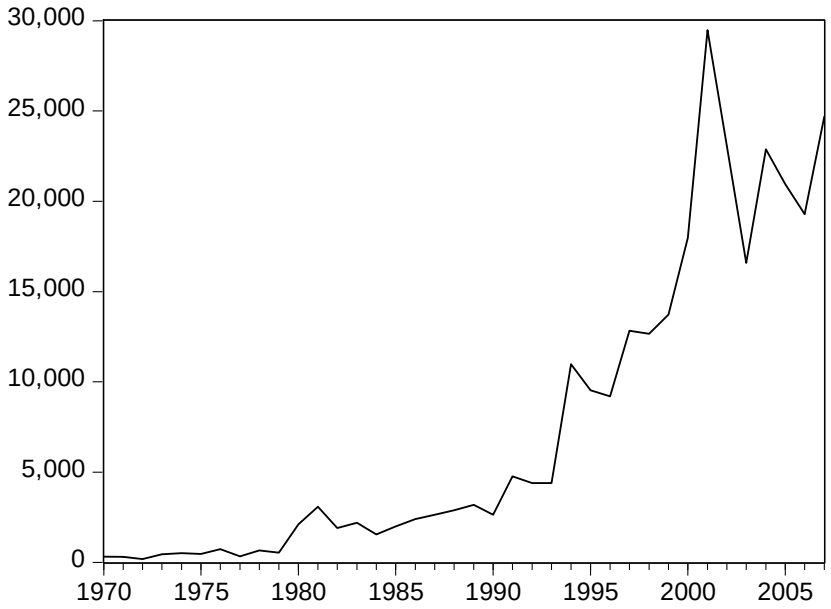

Figure 9
FDI Flows in Mexico 1970-2005 (US Millions)

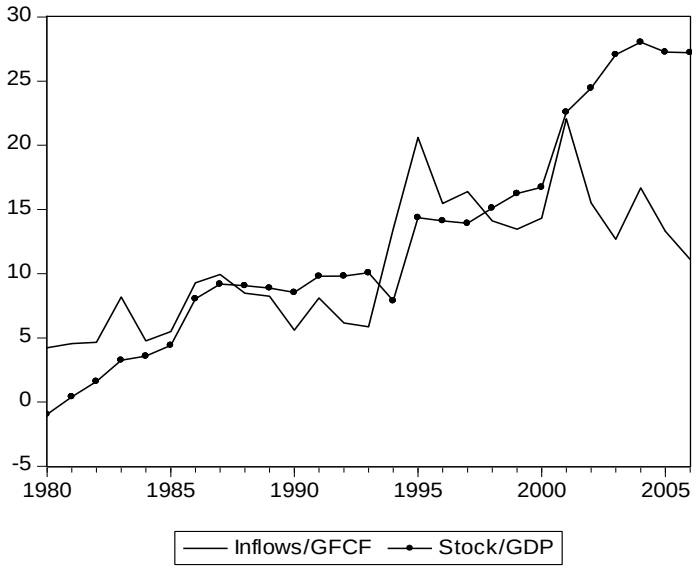

Figure 10
Foreign Direct Investment as Percentage of Gross Domestic Product
And Gross Fixed Capital Formation

FDI inflows as a percentage of GFCF were more or less stable throughout the 1970s, decreased following the crisis of 1982, and throughout the 1990s increased much more rapidly. Following the signing of NAFTA in 1994 FDI inflows as a percentage of GDP surged to nearly 4.5 percent of GDP by 2002 (WDI 2006). The larger figures of the 1990s were partly due to the change in definition of FDI by Mexico described in section 4.6.

Trends in Five Broad Sectors

Figure 11 shows FDI inflows for the five broad sectors in the Mexican economy. FDI inflows can be seen to be fairly modest in all sectors up until the mid 1990's. After the signing of NAFTA in 1994, FDI inflows into the industrial sector surged.

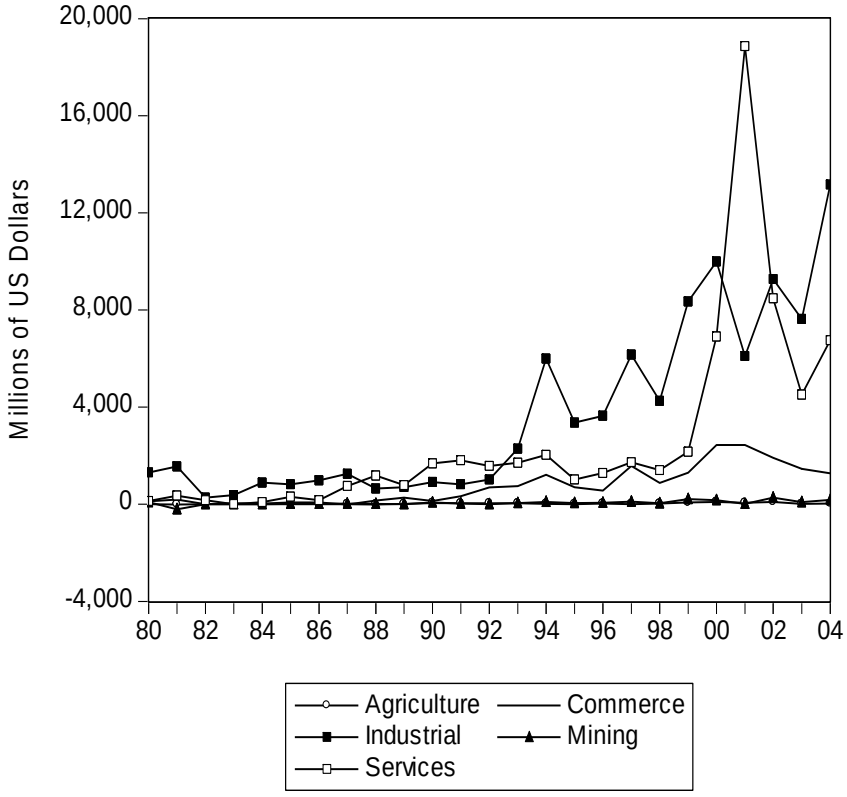

Figure 11

Foreign Direct Investment Inflows 1980-2004

The majority of this went into the production of automobiles and parts. FDI in Mexico is heavily concentrated in this subsector. Inflows into the service sector remained modest until the 1999 amendment to the FIL which opened up most financial services to foreigners. As previously mentioned, the large spike in 2001 is the acquisition of Banamex by Citigroup. Agriculture and mining have accounted for a small portion of total inflows throughout the entire period. FDI inflows into the commerce sector have remained fairly modest since 1980.

Methodology

Testing for causality is a three-step process (unit root-cointegration-causality) and proceeds as follows. First, the order of integration of the variables is tested using the Augmented Dickey Fuller (ADF) test. If the variables are found to be integrated of order one then the Johansen test of cointegration will be used to test for the existence of a long run relationship between FDI and economic growth. If FDI and GDP are found to be cointegrated then to assess causality a vector error correction model (VECM) is estimated that incorporates the long run dynamics. If no cointegration is found then standard Granger causality tests can be applied to an estimated vector auto regression (VAR).

In the case of cointegration the VECM to be estimated is:

$$\Delta FDI_{it} = \alpha_{1i} + \mu_{1i} e_{it-1} + \sum_k \beta_{1ik} \Delta FDI_{i,t-k} + \sum_k \beta_{2ik} \Delta GDP_{i,t-k} + u_{1it}$$

$$\Delta GDP_{it} = \alpha_{2i} + \mu_{2i} e_{it-1} + \sum_k \gamma_{1ik} \Delta GDP_{i,t-k} + \sum_k \gamma_{2ik} \Delta FDI_{i,t-k} + u_{2it}$$

In this model e_{it-1} is the error correction term which is zero in the long run equilibrium. If FDI and GDP deviate from the long run equilibrium then each variable adjusts to restore the equilibrium. The coefficient μ measures the speed of adjustment towards the equilibrium. They can be interpreted as displaying the long-run effects of FDI stock on output and the long-run effects of output on FDI stock. When lagged difference terms are included the coefficients capture the “interim” effects and reflect the adjustment process in response to a shock. They can be interpreted as the short-run

effects (Chakraborty and Nunenkamp 2007). To assess the long run causality in the VECM, the significance of the coefficients μ are tested and the short run causality is tested by the joint significance of the coefficients of lagged difference variables. If no cointegration is found then causality is tested by dropping the e_{it-1} term and testing the joint significance of the lagged difference terms.

Data Description

Data for the empirical analysis are taken from Instituto Nacional de Estadistica Geografica e Informatica (INEGI) and the Economic Commission of Latin America and the Caribbean (ECLAC). Real FDI stock is available for five broad sectors: agriculture, mining, commerce, industrial, and services from INEGI. After 1994 FDI data are available at a more disaggregated level but to form a long enough time series for the econometric analysis the five broad sectors must be used. In 1994 the Mexican government changed the definition of FDI data to make it more consistent with that of the IMF and OECD. Before 1994, FDI included notified and authorized FDI to the National Foreign Investment Registry Office, which did not match up with the realized investment (i.e., firms could ask for authorization but not actually undertake the investment). Since 1994, FDI refers to realized new investment which includes: 1) amounts reported to the National Foreign Investment Registry Office; 2) provision of capital for new companies; 3) foreign investor trust funds; 4) transfers of stocks from nationals to foreigners, 5) imports of capital assets by maquilla firms, 6) reinvestment of earnings by FDI firms; and, 7) the amounts involved in accounts between companies (debts and loans between parent companies). Prior to 1994, FDI data were only available for the first three

categories. Because of the change in data collection making comparisons of the data before and after 1994 should be taken with caution. This change is accounted for by including a dummy variable for the two periods in the estimated VECM or VAR. The dummy variable takes the value one before 1994 and zero for the years after.[22] Real GDP at the sector level are taken from ECLAC statistical yearbook to match up with the same sectors for the FDI data from INEGI. Both variables are used in logarithmic form.

Empirical Results

ADF Test of Unit Roots

It is well documented that the unit root characteristics of time series data results based on least-squares regression analysis are subject to spurious correlation, i.e., the misleading correlation between two variables that is produced through the operation of a third causal variable.[23] Ordinary Least Squares (OLS) estimates with nonstationary series results in inflated R-squared and t-score values. The classical regression model assumption that the series be stationary and the errors have a zero mean and finite variance is violated and so the results may have little or no economic meaning. In this analysis the Augmented Dickey Fuller (ADF) test is used to determine the order of integration of the variables.

Table 16 reports the ADF test for the levels of the variables in logarithmic form and first differences under the assumption of a constant and under the assumption of a constant and deterministic time trend. If the statistic is significant then the null

[22] Pacheco-Lopez (2005) uses same methodology for analysis of FDI and trade in Mexico.

[23] See Granger and Newbold (1974).

Table 16

Results of ADF Test for Unit Roots

Sector	Variable	With Constant Only		With Constant and Time Trend	
		Level	Differences	Level	Differences
Agriculture	FDI	-1.65	-3.53**	-2.99	-4.29***
	GDP	3.16	-7.74***	-2.09	-4.826***
Extractive	FDI	-1.46	-4.08***	-5.19***	----
	GDP	1.48	-5.67***	-3.48	-6.50***
Industrial	FDI	-.75	-3.29**	-2.10	-7.45***
	GDP	-.12	-4.32***	-2.23	-4.36**
Commerce	FDI	-1.89	-9.22***	-4.64***	----
	GDP	-.11	-4.90***	-1.93	-5.18***
Services	FDI	-1.37	-3.01**	-4.01**	----
	GDP	-.10	-3.88***	-4.15**	----

Notes: Asterisks (**,***) represent significance levels at (5,1) percent respectively.

hypothesis of a unit root can be rejected. The ADF test of unit roots for the case with a constant only indicates that all the variables in level form are nonstationary, i.e., they follow a random walk with drift. In the case of first differences, the null hypothesis of nonstationarity is rejected for all variables at least at the 5 percent level indicating that the variables are integrated of order one, i.e., I(1).

When the ADF test is run on the variables in logarithmic form including a constant and deterministic time trend the null hypothesis of nonstationarity cannot be rejected for most sectors. This suggests that FDI and GDP do not exhibit a deterministic time trend. Therefore detrending the data by a single trend line will not render the data stationary because the trend may shift over time. After these variables are first differenced they become stationary at the 5 percent level of significance. Based on the results of the ADF test, the variables FDI and GDP follow primarily a stochastic trend as

opposed to a deterministic one. Having shown that the variables FDI and GDP are integrated of order one with a constant only, the Johansen full information maximum likelihood method tests for the presence of a cointegrating equation in each sector.

Johansen Test of Cointegration

With the FDI and GDP series found to be nonstationary two options exist for testing for causality. We could transform the series into first differences and perform standard Granger causality tests but the long run dynamics may be lost in the process. An alternative to transforming the series into first differences and using OLS is cointegration. The concept of cointegration refers to the idea that although time series data may exhibit nonstationary behavior, a linear combination between the trending variables could remove the common trend component and produce a stationary relationship between the variables. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables. On the basis of the ADF test of unit roots the Johansen full information maximum likelihood method is used to test for the presence of a cointegrating vector in each sector. Table 17 shows the results of the Johansen cointegration test for three, two, and one period lags. When three period lags are used the null of no cointegration (r=0) is rejected by the trace test and maximum eigenvalue test in all five sectors at least at the 5 percent level. The three period lag model fails to reject the null that there is less than or equal to one cointegrating equation, indicating

Table 17

Results of Johansen Test of Cointegration

	Null Hypothesis	*Alternative Hypothesis*	*Statistic*		
			VAR=3	VAR=2	VAR=1
Agriculture			*Trace Test*		
	r=0	r≥1	48.51***	14.13	11.00
	r≤1	r≥2	16.31**	4.87	3.34
			Maximum Eigenvalue Test		
	r=0	r≥1	32.19***	9.25	7.66
	r≤1	r≥2	16.31**	4.87	3.34
Extractive			*Trace Test*		
	r=0	r≥1	23.75***	15.44**	14.98**
	r≤1	r≥2	0.17	1.07	0.93
			Maximum Eigenvalue Test		
	r=0	r≥1	23.58***	14.36**	14.04**
	r≤1	r≥2	0.17	1.07	0.93
Industrial			*Trace Test*		
	r=0	r≥1	27.45**	21.42	14.45
	r≤1	r≥2	3.31	5.57	0.00
			Maximum Eigenvalue Test		
	r=0	r≥1	24.14***	15.84	14.45**
	r≤1	r≥2	3.31	5.57	0.00
Commerce			*Trace Test*		
	r=0	r≥1	25.87***	29.99***	5.07
	r≤1	r≥2	0.55	0.93	0.04
			Maximum Eigenvalue Test		
	r=0	r≥1	25.32***	29.06***	5.02
	r≤1	r≥2	0.55	3.84	0.04
Services			*Trace Test*		
	r=0	r≥1	25.52***	8.29	12.59
	r≤1	r≥2	0.49	0.14	0.01
			Maximum Eigenvalue Test		
	r=0	r≥1	25.02***	8.15	12.57
	r≤1	r≥2	0.49	0.14	3.84

Notes: The asterisks ***(**) indicate significance at the 1 (5) percent level.

that there is a unique linear combination of FDI and GDP that links them in a stable long-run equilibrium in every sector. The findings are more mixed when two and one period lags are used in the test of cointegration so the vector error correction models are estimated with three period lags.

Tests of Causality

Finally after testing for unit roots and cointegration can causality in the five sectors be tested. Based on the previous tests of unit roots and cointegration, a VECM is estimated for each sector that incorporates the short run and long run dynamics of the FDI-GDP relationship since the series were found to be nonstationary and cointegrated in all five sectors.[24]

The results of the causality tests are displayed in Table 18. Long run FDI to GDP was found in the agriculture and industrial sectors. Long run GDP to FDI causality is present in the other three sectors. Short run FDI to GDP causality was found in the industrial sector. GDP to FDI causality was found in the short run for the commerce sector.

Interpretation and Conclusion

Foreign direct investment was placed at center stage of Mexican development strategy following the debt crisis of the 1980s. It was thought that FDI would upgrade

[24] A shift dummy (taking the value 1 before 1994, and 0 after) was included in the estimated VECMs to account for the change in the definition of FDI in 1994 explained in the description of the data. The causality tests were run with 1,2, and 3 lags and nothing qualitatively changed.

Table 18

Results of Short-Run and Long-Run Causality Tests

	Short-Run Causality		Long-Run Causality	
	FDI to GDP	GDP to FDI	FDI to GDP	GDP to FDI
Sector				
Agriculture	NO	NO	YES**	NO
Extractive	NO	NO	NO	YES***
Industrial	YES***	NO	YES***	NO
Commerce	NO	YES**	NO	YES***
Services	NO	NO	NO	YES***

Notes: The asterisks ***(**) indicate significance at the 1(5) percent level.

Mexican manufacturing generating overall employment and economic growth. The signing of the NAFTA in 1994 solidified the shift of development strategy that had started with the de la Madrid administration (1982-1988) and accelerated under Salinas (1988-1994). It was a turn away from the state-led industrialization towards neoliberal policies. FDI inflows surged first into the industrial sector and later into the services sectors, but empirical work is demonstrating that benefits from FDI are not as well rounded as previous thought. In this chapter data for five broad sectors over the period 1980-2004 were used to test for the direction of causation between real FDI stock and real GDP in the Mexican economy. In the long-run, causality running from FDI to GDP was found in the industrial and agriculture sectors. The extractive, commerce, and services sectors were absent a FDI to GDP long-run link. These findings are in line with the previous literature where growth benefits from FDI have been found to be restricted

to the industrial sector. Alfaro (2003), Vu et al. (2006), and Chakraborty and Nunnenkamp (2006) all found growth benefits restricted to the manufacturing sector.

Despite the recent surge of FDI into the service sector, no FDI to GDP causal link was found in Mexico. This could be because in this sector much of the FDI was in the form of mergers and acquisitions that are of less benefit for the domestic economy. An example is the 2001 acquisition of Banamex which accounted for over 50 percent of the FDI inflows that year. It may be that service FDI does not provide the advanced technologies, access to export markets or linkages to local enterprises that manufacturing FDI does. Some services are more monopolistic than manufacturing and are more prone to exploitation of the market power by MNEs which could result in higher prices and depressed aggregate demand in the domestic market. It has also been found that financial service FDI can undermine the capability of domestic regulators to control international capital flows and increase foreign exchange volatility and the possibility of contagion effects from other countries markets (WIR, 2004). Durand (2007) found that FDI in the Mexican retail sector played a role in modernizing this sector but at the cost of local retailers and lower retail wages. Walmart accounts for the majority of FDI in the retail sector.

Much more evidence was found in favor of the GDP to FDI causal link. Long run GDP to FDI causality was found in the extractive, commerce and services sectors. This coincides with the findings in Chapter 2 and growth driven FDI theory which highlights the role of growing market size, human capital, and infrastructure in attracting FDI. A countries market size can be approximated by GDP which increases with economic

growth and attracts FDI. Economic growth can lead to higher levels of aggregate demand stimulating FDI. Better economic performance, measured by higher growth rates, can potentially provide resources for new infrastructure which could also attract FDI (Zhang 2001).

Although a long run FDI to GDP link was found in the industrial sector, the growth performance of this sector in particular and of the Mexican economy as a whole has been significantly worse than in the earlier state-led industrialization period. Real GDP per capita from 1950-81 grew 3.5 percent, from 1982-1994 real GDP per capita decreased by negative .35 percent. In the post NAFTA period, from 1995-2004, per capita growth averaged 1.15 percent (WDI, 2008). Despite the finding of a FDI to economic growth link in this analysis, it does not necessarily support the argument that FDI contributes strongly to overall economic growth. The only other sector displaying a FDI to economic growth link was the agriculture sector. The structure of the system under the state-led industrialization period had its limitations but the reforms leading up to the signing of the NAFTA, have at this point demonstrated their weaknesses also. Moreno-Brid (2005) found that the impact of FDI and exports on economic growth was limited because of the rupture of backward linkages brought about by inflow of imported inputs, many of them actually required for export. Along these same lines Zarsky and Gallagher (2004,2007) found that the FDI led growth strategy did not materialize, rather an enclave economy has been created in Mexico. This dualistic structure, an export sector linked to foreign capital and smaller domestic firms supplying the local market, has resulted in productivity improvements in very small enclaves with

few linkages with the rest of the system and has polarized the Mexican economy. (Peters, 2000) FDI and trade liberalization by itself is not enough to promote economic development and growth. The main lesson here is that there is a potential middle ground between the inward focused policies of the IS period and full blown neoliberal reform.

CHAPTER 5

CONCLUDING REMARKS

Economic growth and income per capita drastically differ across countries and actually the disparity between rich and poor countries has accelerated over the last 100 years. In Maddison (2001) it is shown that in the year 1000 levels of real GDP per capita in Africa and Asia were higher than in Western Europe. In 1998 GDP per capita in Western Europe was about thirteen times higher than in Africa and about six times higher than in Asia. GDP per capita in the United States was 20 times higher than in Africa and more than eight times higher than in Asia. The disparity in income between now developing and developed countries has greatly worsened over time. FDI with its superior production and organizational methods is seen by many to be a force of convergence between countries but the findings here cast serious doubt on the FDI-growth connection.

Foreign direct investment is generally seen as a composite bundle of capital stock and technology, and can augment the existing stock of knowledge in the host economy through labor training, skill acquisition and diffusion, and the introduction of new managerial practices and organizational arrangements. New endogenous growth models allow FDI to impact economic growth in the long run through knowledge transfers from the MNE to the host country. The findings here suggest that the impact of FDI on economic growth is not as obvious as previously thought. FDI may potentially

impact economic growth positively but is dependent on many factors such as host country characteristics, FDI policy, and the type of FDI. The 3 empirical Chapters, using different econometric techniques, each considered the relationship between foreign direct investment and economic growth. All three found limited evidence in favor of the FDI-growth connection.

Chapter 2 used panel cointegration and Granger causality techniques for a group of 128 developed and developing countries for the period 1980-2003. According to the panel data methodologies used, FDI was not the major driving force of economic growth in developing and developed countries. Short run causality was found running from FDI to GDP only in the high income panel. It is possible that other factors such as domestic investment were the major driving force of economic growth. Grenaway et al. (2007), for a sample of 77 developing countries, found that the major driving forces of growth were domestic investment and exports. This lends support to the idea that a certain level, or stage of development is necessary in order for FDI to have a positive effect on economic growth. Adequate levels of human capital and infrastructure, well developed financial institutions, and economic stability appear to need to be present in order for FDI to impact economic growth positively. The findings in this chapter are at odds with much of the literature where it is argued that the least developed countries have the greatest potential to benefit from FDI. Similar to the findings of Choe (2003) much more evidence was found in favor of the economic growth to FDI causality link and the growth driven FDI theory which highlights the role of growing market size, human capital, and infrastructure in attracting FDI. A country's market size can be approximated by GDP

which increases with economic growth and attracts FDI. Economic growth can lead to higher levels of aggregate demand stimulating FDI. Better economic performance, measured by higher growth rates, can potentially provide resources for new infrastructure which could also attract FDI (Zhang 2001). It was higher levels of GDP that were attracting FDI in the long run. It is most likely that a certain level of development (institutions, political/economic stability) must be achieved before MNEs even start to move operations to the foreign country.

Chapter 3 considered a similar question but for a group of developing countries in East Asia and Latin America that have been the major recipients of FDI in the developing world. Data over the years 1980-2003 for Argentina, Brazil, Chile, Colombia, Mexico, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Thailand, and Taiwan were used in an attempt to identify similarities and differences across the two regional. These two regions have received considerable attention in the development literature because these countries have received the majority of FDI flows in recent years, pursued very different economic policies and have had diverse economic performance. Forecast error variance decompositions and Granger causality tests were conducted on a country by country basis as opposed to the panel data techniques used in Chapter 2. The forecast error variance decomposition revealed much heterogeneity within each region. No obvious similarities or differences were identified on the basis of the forecast error variance decomposition. The Granger causality tests revealed that only two Latin American countries, Mexico and Brazil, had FDI to GDP causality. In East Asia, five countries displayed FDI to GDP causality: Hong Kong, Indonesia, Singapore, Taiwan, and

Thailand. GDP to FDI causality was present in three Latin American countries (Colombia, Chile, and Mexico) and in three East Asian countries (Hong Kong, Korea, Malaysia). More evidence was found in East Asia in favor of the FDI driven growth theory. How is one to interpret these differences across and within Latin America and East Asia? One potential explanation could be the larger share of service sector FDI in Latin America compared to East Asia.

This coincides with the findings in the Chapter 4 that found manufacturing FDI to cause economic growth whereas service sector FDI had no causal relationship with economic growth. It may be that service FDI does not provide the advanced technologies, access to export markets or linkages to local enterprises that manufacturing FDI does. Some services are more monopolistic than manufacturing and are more prone to exploitation of the market power by MNEs which could result in higher prices and depressed aggregate demand in the domestic market. It has also been found that financial service FDI can undermine the capability of domestic regulators to control international capital flows, increase foreign exchange volatility and the possibility of contagion effects from other countries markets (WIR, 2004). A interesting point to highlight is that Hong Kong has the second largest stock of service sector FDI, following the United States, and has a much better growth performance than the Latin American countries. So the different types of service FDI, tourism, banking, media, telecommunications, transportation or retailing probably impact economic growth to varying degrees.

The analysis in Chapter 4 used data for five manufacturing subsectors in Mexico for the period 1980 to 2004 attempting to see how the FDI-growth connection varies by sector. Reforms beginning in the mid-1980s and the signing of the NAFTA in 1994 greatly reduced the barriers to FDI but the large increase in FDI flows has yet to materialize into overall economic growth. This chapter used similar techniques to those that were used in Chapter 3. In the long-run, causality running from FDI to GDP was found only in the industrial and agriculture sectors. The extractive, commerce, and services sectors were absent a FDI to GDP long-run link. These findings are in line with the previous literature where growth benefits from FDI have been found to be restricted to the industrial sector. Despite the recent surge of FDI into the service sector, no FDI to GDP causal link was found in Mexico. This could be because in this sector much of the FDI was in the form of mergers and acquisitions that are of less benefit for the domestic economy. An example is the 2001 acquisition of Banamex which accounted for over 50 percent of the FDI inflows that year.

In Chapter 4 much more evidence was found in favor of the GDP to FDI causal link. Long run GDP to FDI causality was found in the extractive, commerce and services sectors. Short run causality running from GDP to FDI was present in the commerce sector. This coincides with the findings in Chapter 2 and growth driven FDI theory which highlights the role of growing market size, human capital, and infrastructure in attracting FDI. A countries market size can be approximated by GDP which increases with economic growth and attracts FDI. Economic growth can lead to higher levels of aggregate demand stimulating FDI. Better economic performance, measured by higher

growth rates, can potentially provide resources for new infrastructure which could also attractive FDI (Zhang, 2001).

A limitation of this analysis is that it is not a structural analysis. The relationships are detected from time series properties of the variables and only analyze the behavior of FDI and GDP series. The analysis does not directly test for the mechanisms through which FDI leads to economic growth and economic growth leads to FDI. A more complete analysis would seek to explain the channels through which FDI impacts growth. The UNCTAD FDI/TNC database is the most comprehensive source of FDI statistics available to researchers covering nearly 200 countries for various years (1970-2007), but the data do have limitations. The general problem is that the method of data collection in each country varies. For example countries may have differences in definitions (i.e., the 10 percent rule), timing of recording, definition of the FDI relationships (i.e., the Fully Consolidated System), application of the directional principle, the coverage of FDI components (such as reinvested earnings), among other things. For example countries can report FDI at market value, book value, or the perpetual inventory method (accumulation of flows), which can deliver very different results. For example the stock of FDI in the United States in 2004 is valued at 1,920 billion using the accumulation of flows, 2,064 billion at book value, and 3,287 billion at market value. Also mergers and acquisitions pose the problem of correctly determining the part of the transaction related to FDI. These are just a few of the problems with FDI statistics. Details of each countries method of collection can be found in the methodological notes of each years World Investment Report.

The policy implications of these are findings are that the lowest income developing countries should place more weight on stimulating growth through other measures than those aimed at attracting FDI. Blindly reducing restrictions on FDI will most likely not result in long run growth. Policies directed at stimulating domestic investment in infrastructure, technology and exports may be the better alternative in terms of promoting economic growth. Encouraging linkages across sectors and between MNEs and domestic industry will help developing countries achieve growth objectives. As was found in chapter 2 only after a country has reached a certain level of development will FDI effect growth positively.

As more disaggregated FDI data become available future research should be conducted at the sector level on a country by country basis. The existing empirical work has discovered much heterogeneity across countries with the experience with FDI. Heterogeneity is also expected to be found across sectors, as was found in Chapter 4. In many countries growth benefits from FDI have been found to be restricted to the industrial sector. Subsector level data would enable research to ascertain if the growth enhancing effect is even further restricted to a few industrial sub-sectors. FDI is usually concentrated in few subsectors in any given country. For example, in Mexico the auto industry accounts for over 50 percent of the FDI stock in the entire manufacturing sector. This type of analysis would offer crucial insight into the effectiveness of industrial policy. Given that the recent trend in FDI flows has been directed towards the service sector in most countries, more research into the growth impact in this particular sector is needed.

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