FOREIGN DIRECT INVESTMENT AND ITS IMPACT ON THE NEW ZEALAND ECONOMY: COINTEGRATION AND ERROR CORRECTION MODELLING TECHNIQUES

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Jananee Raguragavan

2004

Massey University
COLLEGE OF BUSINESS

Applied and International Economics
Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 350 5799
Facsimile: 64 6 350 5660

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Candidate's Name: **Ms Jananee Rauragavan**

Signature: Rag

Date: 28.01.04

Supervisor's Name: **Dr James Obben**

Signature: James Obben

Date: 17 Feb. 2004

Massey University
COLLEGE OF BUSINESS

Applied and International Economics
Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 350 5799
• Facsimile: 64 6 350 5660

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Candidate's Name: **Ms Jananee Raguragavan**

Signature 

Date 28.01.04

Massey University
COLLEGE OF BUSINESS

Applied and International Economics
Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 350 5799
Facsimile: 64 6 350 5660

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Signature 

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ABSTRACT

Ongoing globalisation has resulted in more liberalisation, integration, and competition among countries. An upshot of this has been higher levels of cross-border investment. Foreign direct investment (FDI), long considered an engine of growth, has led to widespread probe with its recent rapid spread. Nevertheless, while research on the contribution of FDI to host countries has concentrated heavily on the developed and developing economies, there has been a marked neglect of small, developed economies. This study proposes to focus on New Zealand, a country that falls within the latter category. The study seeks to verify econometrically the impact of FDI on the country through causality links with growth, trade, domestic investment and labour productivity. The analysis is based upon time-series data, the econometric techniques of single, autoregressive distributed lag (*ARDL*), and the multiple equations approach, vector error correction method (*VECM*).

The study found that there have been substantial gains to the New Zealand economy. A positive effect of FDI on the variables mentioned above led to an improvement of the balance of payments through an increase in exports rather than in imports. Economic growth has mainly been achieved through FDI's impact on exports and domestic private investment. The dynamic innovation techniques indicated a bi-directional causality between FDI and the variables. The long-run causality, however, runs mainly from growth and labour productivity to FDI rather than in the opposite direction. Another noticeable feature is that New Zealand's regional agreement with Australia, Closer Economic Relations, has brought the country significant gains in terms of growth and development through FDI.

Both the *ARDL* and *VECM* approaches suggest that for a small, developed country qualitative impacts are greater than quantitative ones. The policy implication is that maintaining sustainable economic growth with a positive domestic investment environment is vital for attracting foreign investors. New Zealand, while continuing to encourage inward FDI, should aim to channel it into 'innovative' tradable sectors. The challenge lies in providing the right kind of policy mix for this purpose.

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LIST OF ACRONYMS

ADF: Augmented Dickey-Fuller Tests
AIC: Akaike Information Criteria
ARDL: Auto Regressive Distributed Lag
APEC: Asia-Pacific Economic Cooperation
BOP: Balance of Payments
CER: Closer Economic Relations Agreement
CV: Cointegrating Vector
DC: Developed Country
DF: Dickey-Fuller
ECT: Error Correction Term
FDI: Foreign Direct Investment
FEV: Forecast Error Variance
GDP: Gross Domestic Product
GLS: Generalised Least square
IMF: International Monetary Fund
IRF: Impulse Response Function
LDC: Less Developed Country
MNE: Multinational Enterprise
M & A: Mergers and Acquisition
NICs: Newly Industrialised Countries
NZ$: New Zealand Dollar
OLS: Ordinary Least Square
OECD: Organisation for Economic Co-operation and Development
OIC: Overseas Investment Commission
R&D: Research and Development
SBC: Schwartz Bayesian Criteria
2SLS: Two-Stage Least Square
3SLS: Three-Stage Least Square
SUR: Seemingly Uncorrelated Regression
TFP: Total Factor Productivity
UK: United Kingdom
UNCTAD: United Nations Conference on Trade and development
US: United States of America
VAR: Vector Autoregression Analysis
VECM: Vector Error Correction Model
WTO: World Trade Organisation

CHAPTER ONE

OVERVIEW OF THE STUDY

1.1 INTRODUCTION

In recent times the world economy has undergone a transformation, and within this transformation two developments need emphasis: (i) the position of states as catalysts and facilitators of economic activities, and (ii) globalisation.[1] The underlying logic of this critical change in the world economy has elevated the importance of competition both nationally and internationally, as Multinational Enterprises (MNEs) increasingly enter the fray with more mobility and knowledge intensiveness. International competitiveness, in particular, lies in a country's ability to create and utilise productive resources effectively. Survival in such an increasingly competitive global environment means that the creation of a 'higher order', subject to competitive advantages based on technology, differentiation, and information or superior management skills, is a prime necessity (Enderwick, 1998). Foreign direct investment (FDI)[2] becomes a major source of this process, providing the impetus for upgrading the international competitiveness of those host countries that could lack the necessary quantity and quality of resources domestically.

Traditionally, FDI has been discussed from the theoretical point of view; however, this discussion gained a new angle in the light of new growth theories. Until the mid-80s, mainstream economic research paid scant attention to the role of technology, and its production, diffusion and effects on an economy's performance. This was due mainly to the treatment of technology as an exogenous factor in the neo-classical framework, which remained a dominant paradigm in economics for a long time. However, with the emergence of new growth theories knowledge-induced growth has become one of the focal points of research in economics. Part of the rationale for interest in new growth theories is that the diminishing returns to capital predicted by Solow models (1956) can no longer be the case with endogenous technological progress resulting from research

[1] Globalisation is defined as increasing levels of interdependence over vast distance (Kearney, 2001).
[2] FDI implies a direct or lasting interest in an enterprise in addition to equity-based ownership.

and development (R&D), technology spillovers and other sources. Within the new growth literature, the importance of FDI as a channel of technology diffusion and faster growth and development has been stressed.

Furthermore, the important role FDI has played in the classic development success stories of newly industrialised countries (NICs), and its vital and continuous contribution in the developed countries[3] means FDI is increasingly being regarded as a major component in growth strategies. The position of MNEs and their FDI activity are, therefore, now commonplace in most countries' development strategies.[4] A host country prefers FDI mainly because it involves commodity trade and leads to a flow of entrepreneurial services including new ideas. Although the primary intention of FDI is to fill in the investment gap and to develop an industrial sector, a package of benefits is usually expected. Such a package would include employment creation, technology transfer, skill development, links with the local economy and access to a wider international environment.

The rapid growth of FDI and its magnitude in many economies has sparked numerous empirical studies dealing with the channels of transmission from FDI to growth and development. However, literature on the benefits of FDI has concentrated mainly on more advanced countries such as the US, European nations, NICs, and only recently has attention turned towards China, Indonesia, Malaysia, and African countries. These studies provide contrasting results not only about the existence of a significant link between FDI and/or growth, trade, domestic capital formation, and productivity, but also about the direction of such a relationship (Bornscheir, 1978; Dutt, 1997; Liu et al., 2001; Calvo, 2002; Bashir, 2002). The presence of diverging results has been attributed

[3] UNCTAD (1999) data on the regional distribution of FDI inflows show developing countries (LDCs) receive a smaller proportion than the developed countries (DCs). DC share increased from 63.4% in 1995 to 71.5% in 1998, while for the LDCs it dropped from 32.3% to 25.8% (World Bank, 1999). In addition to this remarkable increase in global capital movements, daily flows too are now much higher; a fact accomplished by communication and technological advances (Bordo et al., 1999, cited in Plater and Claridge, 2001).

[4] During the period 1991-1999, it is asserted, 94% of policy changes were in the direction of creating more favourable conditions for FDI (UNCTAD, 2000). An increased level of privatisation, deregulation and demonopolisation, and more interaction within DCs and LDCs were clearly visible (Thomsen, 2000).

mainly to econometric issues (sample size, time period, method etc.) and to country-specific characteristics (market size, levels of skilled labour force, available stock of infrastructure, etc.).

The mixed nature of the results cast doubt on the effect of FDI in the case of small, developed countries. While support is echoed in statements like:

> *the economies where foreign-owned enterprises are thought to be [of] greater importance tend to be the small ones, such as New Zealand, the Czech Republic and Denmark (OECD, 2002a. p. 15),*

to the author's knowledge, no attempt has so far been made to investigate empirically the relationship between FDI and the expected package of benefits in small, developed countries. The existing lacunae thus provided the basis for this study.

1.2 STATEMENT OF THE PROBLEM

Considering the mixed nature of the results of various investigations of the effects of FDI and lack of empirical evidence in the case of small, developed countries, there is an urgent need for a better and deeper analysis of FDI's impact on the small, developed economy in order to answer the question:

> *What is the impact of FDI on the growth and development of a small, developed country?*

To answer this question and to overcome the methodological problems identified in the previous studies, this study focuses on New Zealand as a case study. New Zealand's economic growth performance stakes have been the subject of considerable debate over the last two decades. Unfortunately, the performance, in terms of economic growth, over the last few decades has been poor. Over the period 1960-2000, GDP per capita growth has averaged 0.8% per annum, compared with an average of 2.0% per annum for OECD countries. As a result, New Zealand slid from ninth in the OECD rankings in

1970 to 20th in 1999.[5] A contributory factor has been relatively high population growth, especially since 1992.[6] These statistics show that economic growth has proved to be a challenge for New Zealand.

Investment has been said to be crucial to economic growth in a country like New Zealand, which is reliant on trade, and has relatively low savings and domestic capital (Enderwick, 1998; Ball, 2000). Some commentators, such as Enderwick (1998); Ball, (2000) have attributed the worsening economic conditions in New Zealand to the diminishing levels of investment, in particular FDI, and argue for a more concentrated drive by government aimed at attracting more FDI. Inward FDI is, however, not a new phenomenon in the economy. Beginning from the late 1800s, a high reliance on foreign sources of capital has been a common element. In contrast to other resource-rich colonial countries, FDI in New Zealand was channelled mainly to the agricultural sector, providing a comfortable basis for economic survival (Akoorie, 1998a). The motivation behind foreign investment has traditionally been centred on market expansion and/or the avoidance of government-imposed restrictions. When foreign exchange control and quantitative restrictions on imports were introduced, FDI played a substantial part in developing the pastoral base of the economy. FDI was also encouraged by the Government to help diversify the economy and create employment opportunities for the increasing labour force (Akoorie, 1995). FDI, however, has been opposed on grounds such as the diminution of national sovereignty, competition with domestic enterprises, the appreciation of economic rents and concern for the impact on domestic employment, local ownership and national cultural life (Fox and Roy, 1994; Rosenberg, 1998).

[5] In 1990, New Zealand's GDP per capita was roughly on a par with Ireland's and Singapore's, but by 1999 these countries considerably surpass New Zealand (OECD 2001).

[6] OECD (1999b) compares data for various OECD members, and shows that Mexico, Turkey, Luxemburg, Australia, and Canada exceed New Zealand's annual population growth rate of 1.1% in the 10 years since 1986. Although New Zealand enjoyed higher GDP growth rates over the 5 years to 1996 at 3.7%, countries such as Ireland, Korea, and Norway enjoyed higher GDP and lower population growth rates than New Zealand.

The role of FDI as a policy tool was emphasised across the political spectrum in the 2002 elections. David Carter, the National Party Finance Spokesman stated, for example, in a pre-election manifesto, that

> New Zealand is simply off the radar screen of investors ... in order to attract foreign investment New Zealand needs to have a business environment better than anywhere else in the world. This means dealing with regulation, compliance costs and high tax rates *(The New Zealand Herald, 25.05.2002)*.

On the other hand, Michael Cullen, the Finance Minister, stated

> Too much of the foreign investment in New Zealand in recent years has been acquiring existing assets and capacity. The real value to the New Zealand economy comes when investors bring greenfield investment here, creating new jobs and expanding [the] productive base *(The New Zealand Herald, 25.05.2002)*.

While FDI is often cited as a source for growth and development, it is clear there is a shortage of empirical evidence on which to base this supposition. As Enderwick stated:

> Perhaps the clearest distinguishing feature of the debate in New Zealand has been the almost total lack of empirical evidence on which to evaluate contending positions. While there has been some case-type research (Enderwick, 1995; KPMG, 1995), such evidence is more indicative than definitive (Enderwick, 1998, p. 12).

Enderwick bases this conclusion on the results obtained, for example, by Deane (1970), who analysed foreign investment in the manufacturing sector. He found that FDI's contribution had been more marked in large-scale investments, especially with regard to plant, and distribution of R&D. A similar study on the impact of FDI by Scott-Kennel (2001) found that the impact had been significant on local industry upgrading. Whilst these studies provided some useful information, the focus on specific issues (specific sector or selected case studies) limits their usefulness to policy makers in advocating for more FDI. There is therefore a need for a systematic time-series analysis of individual

country experiences in order to broaden the understanding of the benefits of FDI. These factors provide the justifications and rationalisations behind carrying out this study.

1.3 AIMS AND OBJECTIVES OF THE STUDY

FDI has been, in fact, integrated into theories of economic growth in terms of the "gain-from-FDI" approach (Graham and Krugman, 1995), where it is expected to add to the domestic capital. In addition to filling the gap between domestic savings and investment, FDI, could also form links with local firms. This encourages domestic private sector investment and leads to Granger-causality between FDI and the domestic private investment. FDI could also promote exports from host countries, provided investment occurs in the export sectors. It is also expected that in addition to employment creation and technological advantages, MNEs will improve the skills of the local work force and management practices. This results in a spillover effect into domestic firms through forward and backward linkages. The process thus underwrites growth and development, in general, leading to an increase in the competitiveness and business effectiveness of the economy as a whole.

To address the problem statement the following objectives have been formulated:

- To investigate the impact of FDI on economic growth and the causality between the two variables.
- To examine the ways in which FDI contributes towards domestic investment, and to evaluate the causal link between the two.
- To investigate the possible substitution-complementary relationship between FDI and trade.
- To analyse the productivity effects of inward FDI in New Zealand.
- To explore The Closer Economic Relation (CER) Agreement's influence on growth and development, along with FDI.

- To suggest ways to improve further the strategic FDI policy areas of a small developed country.

This study, specifically, expands the previous literature, not only by addressing the methodological issues raised in previous studies, but also by examining the effects of FDI on growth-determining factors like exports, imports, domestic capital formation, trade and/or labour productivity.[7] The study therefore considers the key macroeconomic variables' cointegration and causality in order to capture the dynamic relationships and strength by employing recently developed econometric techniques. It assesses the effects of FDI by considering the first round and second round[8] impacts expected in a host country that lead systematically to growth and development.[9] In addition it explores the influence of the CER agreement within an FDI environment.

The statistical analyses will be conducted to test the following null hypotheses (H_0):

$H1_0$: There is no long-run relation among the variables proposed in this study.

$H2_0$: FDI has negatively influenced the economic growth of New Zealand as a host country.

$H3_0$: Human capital is not a necessary condition for the promotion of growth through FDI.

$H4_0$: FDI does not require improvements in human capital levels to impact on the economy.

$H5_0$: FDI negatively affects domestic capital formation and has a "crowding out" effect.

$H6_0$: FDI and domestic private capital are substitutes for each other.

---

[7] The terms key and/or major macroeconomic variables are interchangeably used to indicate the proposed variables that have been taken in this study.

[8] See Enderwick (1998) for details about first-and-second round effects of FDI.

[9] Data limitations constrain this study to focus on only five main macroeconomic variables: economic growth, exports, imports, domestic private investment, and labour productivity.

$H7_0$: FDI in New Zealand has crowded out public investment due to privatisation.

$H8_0$: FDI has reduced the imports of the host country.

$H9_0$: The stock of FDI has not made any changes in the import composition.

$H10_0$: FDI leads to a substitution away from New Zealand exports, thus reducing New Zealand's exports.

$H11_0$: The existing FDI stock has had a negative impact on exports.

$H12_0$: FDI has had a negative impact on labour productivity in New Zealand by its contagion, demonstration and competition effects.

$H13_0$: CER has a negative impact on influencing growth.

$H14_0$: CER has an adverse impact on trading activities between Australia and New Zealand.

Ultimately, the degree to which an economy benefits from the inflow of FDI and the various interrelationships is central to this thesis. The proposition that FDI can impact on a host country in a positive or negative manner, depending on the host country-specific characteristics, provides an additional underlying basis for the study. The outcome will provide useful insights into the channels of effects of FDI inflow, especially in relation to a small, developed host country and will help more effective policy decisions.

1.4 RESEARCH METHOD AND DATA

An econometric approach has been adopted forming individual equations for each of the macroeconomic variables - growth, exports, imports, domestic capital and labour productivity. An autoregressive distributed lag (*ARDL*) model will be used to analyse the short-run and long-run effects of FDI. Particular attention has been devoted to possible non-stationarity in the data. The approach is informed by the results of

Caporale and Pittis (1999), who survey various time series studies and draw conclusions that would help an applied researcher. According to them, dealing with single equations, problems of weak exogeneity with co-integrating vectors, exogeneity and serial correlation can be effectively overcome through the use of the *ARDL* approach for smaller samples.

Since the proposed macroeconomic variables are inter-related, multivariate Granger causality tests are conducted to examine possible causal relationships among them. The tests are based on the vector error correction model (*VECM*), a variant of the vector autoregression (*VAR*) model. The *VAR* techniques of innovation accounting (impulse response functions and forecast error variance decomposition) are applied to analyse the various interrelationships between FDI and the other key macroeconomic variables.

To investigate the effects of FDI empirically, a time-series analysis of a dataset comprising annual observations for the period 1960-2001 has been employed. Most of the data for the study are derived from the Statistical Yearbooks of New Zealand. Other published and unpublished material from Statistics New Zealand and other institutions are also considered in order to fill the gaps. Additionally, some data series from the World Bank, International Financial Statistics and the OECD have also been used.

1.5 IMPORTANCE OF THE STUDY

This study recognises that FDI may affect the supply and demand sides of an economy. On the supply side, FDI may affect the supply of productive factors, including human and physical capital and technology. On the demand side, it can impact upon income levels, demand for productive factors and product markets by affecting aggregate demand. Thus, it is vital to identify how FDI has made its contribution through supply and demand sides of the economy, to gather an overall picture of its impact on the economy.

While New Zealand's economic performance, in a comprehensive sense, has been a central concern of policy makers, the importance of FDI in this process is still an issue

for debate. It could perhaps be mainly due to lack of a fully comprehensive analysis on the subject. It is true that there are a number of studies dealing with other countries, LDCs in particular. But the conclusions of these studies cannot be generalised to a small, developed economy like New Zealand, because of New Zealand's unique characteristics such as isolation, small domestic market size, and constrained labour supply.

Among prior studies on New Zealand, Deane (1970) has analysed in some depth the FDI movement into the country. More recently, Scott-Kennel's (2001) study emphasised FDI contribution in improving local industry. But neither of these studies tested, or econometrically assessed the major implications of FDI for the New Zealand economy. There is thus an urgent need, not only to update, but also to focus on economic benefits. It is in this respect, that this study could prove useful.

This research aims to test, both theoretically and empirically, the influence of FDI on major macroeconomic variables, within characteristics pertaining to New Zealand. It also attempts to demonstrate in the process how they are integrated among themselves, since only a few studies have investigated the interrelationship of FDI with other variables like economic growth, trade and domestic investment. The ultimate outcome is to show the extent to which New Zealand could adjust itself in the ongoing globalisation whirlpool. It is hoped that the present study would throw some more light on these issues and make a contribution to knowledge in this area.

1.6 OUTLINE OF THE THESIS

The overall objective of this study is to investigate the impact of FDI in the context of a small, developed country, by focusing on the New Zealand economy. Two foremost issues are identified from the problem statement: to investigate the impact of FDI on individual macroeconomic variables, and to identify the co-movements of the proposed variables in a small, developed country. On the basis of these issues, the thesis is presented in eight chapters. After this introductory chapter, Chapter Two identifies and reviews earlier research on the subject while focussing on a brief introduction on the

theories of FDI. Chapter Three provides a descriptive analysis of the New Zealand economy in an historical perspective and rationalises this study's choice of country by concentrating on the importance of FDI and existing literature. Chapter Four explores the econometric techniques employed to resolve issues arising from the investigation of FDI effects. It discusses the problem of analysis based on demand, supply side effects, the data availability, and the single-equation approach, within a co-integration technique. The results from a single equation approach are discussed in Chapter Five.

Chapter Six deals with model building within a multivariate approach, by incorporating the interrelationships among the proposed variables. It focuses on the dynamic relationships between the proposed variables and the time-series properties of the data before the models are specified. Chapter Seven is designed to demonstrate the results that have been estimated with the multivariate methodology developed in Chapter Six. The basic tenet has been two-way causality between FDI and the proposed variables in a small, developed economy. This multivariate approach highlights the interrelations among variables and furnishes additional insights on the role of FDI in a small, developed country like New Zealand. Chapter Eight attempts to review the major findings, and presents some evidence in support of the proposal that FDI is a vital resource in the growth and development process. Based on the empirical evidence, the chapter also discusses some policy implications and the thesis concludes with some recommendations for future research.

CHAPTER TWO

LITERATURE REVIEW: THEORIES AND ISSUES

2.1 INTRODUCTION

Before the 1970s, Foreign Direct Investment (FDI) had not generally been seen as an instrument of economic growth or development. On the contrary, the perception of FDI had been that it was parasitic and retarded the development of domestic industries. Such views engendered hostility towards both FDI and its primary instrument of transfer, Multinational Enterprises (MNEs). In the 1980s[1] technology transfer, development of human capital, and the opening-up of the economy to international forces changed this image (Grossman and Helpman, 1991; Chudnovsky, 1993, cited in Bende and Ford, 1998). While casual empiricism underlined the importance of FDI, a more worthwhile contribution came from the literature on endogenous growth theory: FDI generated returns for production through externalities and productivity spillovers, which, both in the long and short terms, affected growth endogenously. A number of competing and complementary theories and empirical evidence have been put forward explaining the nature, causes and possible socio-economic consequences of FDI.

While the existence of an additional growth impact of FDI is widely accepted, however, its extent is less clear. As pointed out in Chapter One, it has been found to depend on country-specific characteristics such as the investment environment, economic policies, domestic market size, etc. To clarify these factors, this chapter reviews the literature on cross-border investment, which has been copious over the last three decades. Many empirical studies exist on large developed countries (DCs) and also on developing countries, but small, developed countries have largely been omitted. This chapter reviews various theories of FDI and issues in Section 2.2; the focus turns to theoretical and empirical studies based on FDI impact on macroeconomic variables like exports, imports, productivity and technology in Section 2.3. Section 2.4 presents some relevant

[1]The free international flow of financial capital became possible only when the countries transferred from the Bretton Wood system of fixed exchange rate (Bosworth and Collins, 1999).

case studies, and Section 2.5 re-states this study's research problem and discusses its importance as a topic for academic investigation. Section 2.6 concludes by highlighting the main implications of the literature.

2.2 THEORIES OF FOREIGN DIRECT INVESTMENT

An examination of the theories of FDI illustrates the basic motivations of cross-border investment. Available literature suggests that during the last 30-year period FDI became much more ambitious in scope. In the 1960s, export implications of FDI had been the main focus, as evidenced by the Hymer-Kindleberger theory and Vernon's (1966) product cycle theory. In the 1970s, however, the growth of the MNEs based on a theory of transaction cost formed the principal emphasis. By the 1980s, Dunning's eclectic approach had gained prominence. In the 1990s, the host country impact of FDI was subjected to empirical analysis.

2.2.1 The Neo-classical Theory

Until the1960s there was no difference between portfolio investment and FDI, which was considered to be within portfolio investment.[2] But when capital began flowing from one country to another, capital movement came to be viewed differently from portfolio investment. The source-firm had to contend with differences in distance, time, markets, cultures, personnel, currency and governments, which were usually favourable to the local competitors. However, portfolio theory did not address such issues. The theory of FDI had, therefore, to explain why firms go against market elements to conduct business in foreign markets and nations. FDI was originally believed to flow from a country with low interest rates to those yielding higher interest rates. This is however an inadequate explanation because there had also been FDI transactions from higher interest countries to those with lower interest rates.

In 1960 Stephen Hymer caused a major breakthrough in the theory of FDI. He pioneered his analysis from an industrial organisation perspective referred to as *the*

[2] Portfolio investment is that of the parent firm lending (investing) to (in) a subsidiary.

oligopolistic theory. He pointed out that the movement of capital associated with FDI is not a response to higher interest rates but rather for financing international operations. Market structure and competitive conditions are therefore important determinants. Firm-specific advantages[3] and the firm's market position have been used to explain MNEs cross-border investments. These advantages must be sufficient to outweigh the disadvantages faced by the MNEs in competing with local firms. Hymer's work spawned several other contributions in the theory of industrial organization. Notably Kindleberger (1969), Dunning (1977) and Caves (1993).

Location theory explains the costs incurred by MNEs in the choice of locations and motives for international expansion (Buckley, 1985; 1990). It considers the supply (cost factor) and demand (market factor) variables influencing the spatial distribution of the production processes, research and development (R&D) and the administrative functions of a firm. In terms of this explanation the host country must obviously have some location-specific advantages such as lower wages, abundant raw materials, investment incentives, tariff and non-tariff protection, free trade zones, etc.

Another dimension of the theory of FDI, based on the currency area in which a firm operates, has been developed by Aliber (1970; 1971). He rejects arguments based on superior managerial skill because any such superiority should be reflected in costs and the exchange rate. The implication is that some currencies are stronger compared with others, and firms operating in strong currency areas can compensate for the capital deficiency in weak currency areas through their own borrowings. Support for this position is found in the empirical observations that devaluation encourages FDI inflow.

2.2.2 The Internalisation Theory

The origins of this theory are found in Coase (1937), who argued that *transaction costs* on foreign activities make it more conducive for a firm to create an internal market rather than enter foreign markets. The idea has been further expanded by McManus

[3] Firm-specific advantages are patents, superior technology, expertise in organisational and management skills, product differentiation, and access to overseas markets.

(1972), Buckley and Casson (1976; 1991; 1998), Dunning (1980) and Rugman (1979; 1981). The *internalisation theory*, proposed by Buckley and Casson (1976), examines the choice between exporting and establishing a subsidiary in a major export location. Expansion by FDI can be a viable alternative for a MNE when it has a competitive advantage over other firms. This firm-specific advantage needs to be protected by the organisational structure, implying that FDI becomes favourable when the benefits of internalisation outweigh its cost.

The role of MNEs as a vehicle for international diversification has been analysed by Rugman (1979) who extended the internalisation theory and included FDI as a possible instrument. According to him, while internalisation is helpful in creating internal markets bypassing capital markets imperfection, it is also at the core of the MNE concept highly consistent with the transaction cost and eclectic theories.

2.2.3 Product Life Cycle Theory

Vernon's (1966) Product Life Cycle Approach and Dunning's (1977; 1979) Eclectic Approach are two other important theories on FDI. They adopt a trade approach to FDI distinctly different from other theories. Vernon's (1966) study is based on the experience of the post-Second World War period and compares sequences involving domestic versus foreign production. In his model, FDI has been viewed as replacing trade. The product cycle hypothesis states that, based on the comparative advantage arising from the pattern of factor endowments, a product invented in the home country initially enjoys competitive advantage in technology and inventory capabilities, and serves the local market.

At the next stage, a favourable combination of innovation and technological advantages makes the product an exportable commodity to countries where conditions are very similar to the home country. As the product gradually becomes standardised and labour becomes an important input in terms of production costs, a foreign country location may become more attractive. The process could grow to such an extent that the home country could in itself be a recipient.

Vernon (1979) considered his theory and observed that it had less power in elucidating the reasons for FDI. He combined the geographical reach of many firms and focused on the reduction of the gap between the US and other national markets in terms of both size and factor cost. Although current developments could perhaps make various stages of product life cycle less applicable, it cannot be denied that the theory is still valid in explaining the rational process leading to FDI.

The product life cycle theory has undergone certain modifications so that recent changes in the FDI theory could be accommodated. Grosse and Kujawa (1995) argue that product life cycle is a dynamic view exploring the reasons for trade flows in the context of changing technology and multiple markets. They agree with Vernon that the export market, which forms the nucleus for FDI in the third stage of the product's life cycle, is vital. Low-cost advantage is the important consideration at this stage of decision-making.

2.2.4 The Eclectic Approach

Dunning (1977; 1979; 1993; 1997) developed the eclectic theory by synthesising the existing theories of FDI to identify and evaluate the significant factors influencing FDI. FDI location will therefore depend on three sets of factors:

1. Ownership (O): The "O" advantages include marketing skills, and R&D skills or production skills that allow firms to provide goods and services more competitively in their countries and in other countries.
2. Location (L): Major criteria will involve low-cost labour, incentives to production on the part of host governments, natural resources, domestic market potentials, and political stability. These are not easily transferable between countries and could differ from the home country situation.
3. Internalisation (I): The "O" and "L" advantages must be complemented by internalisation to overcome transaction costs such as those pertaining to transport, information, different taxes and tariffs (which differ among countries), and other market imperfections.

The eclectic theory encompasses the complementary features of the industrial organisation approach, internalisation theory and the location theory. It provides a comprehensive explanation of the nature and characteristics of FDI.

2.2.5 Macroeconomic Theory

Kojima's theory (1973; 1984) could be considered a milestone in the theory of FDI. The theories already discussed were predominantly structured for US firms investing abroad, differentiating them from the Japanese FDI. The latter are primarily trade oriented and respond to the dictates of the principle of comparative advantage. In contrast, US activity was mainly within an oligopolistic market structure. There was less emphasis on trade and activity was focused on firm-specific profit orientation. Kojima's approach predicted that export-oriented FDI occurred in countries with a comparative advantage for the host country. Thus, when exports grow FDI is characterised as welfare-improving and trade-creating. Due to Kojima's preference for Japanese style management, his approach could be viewed as biased. Dunning (1988), for example, pointed out that Kojima's neo-classical framework was unable to capture the role of firm-specific advantages in determining FDI flows. He further stated that Kojima's theory failed to explain much modern trade; it could not, for example, provide sufficient rationale for trade flows, which are based less on the distribution of factor endowments and more on the need to exploit the economies of scale, product differentiation and other manifestations of market failure (Dunning, 1993).

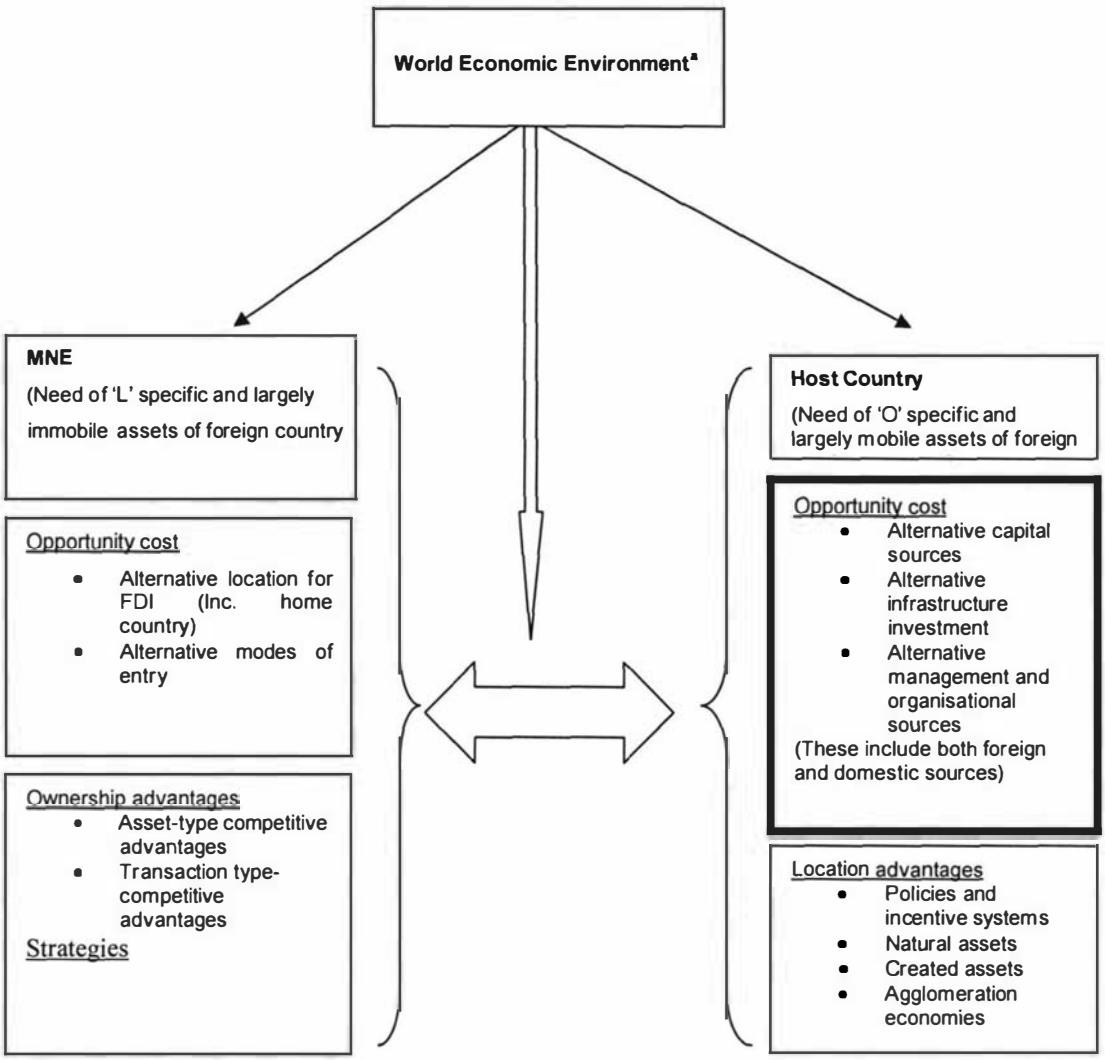
2.3 FOREIGN DIRECT INVESTMENT AND ITS IMPACT ON THE ECONOMY

The leading theories of FDI from Hymers' seminal work to Dunnings' "OLI" paradigm have contributed to the understanding of why MNEs undertake FDI. In Hymers' (1960) view, MNEs face disadvantages in the form of geographic distance, government polices and cultural norms when involved in cross-border investment. To overcome these disadvantages and compete with the host country's local firms, MNEs must possess some kind of ownership advantages. These advantages can be expressed as technology,

cost effectiveness, market access and financial strength. Dunning's "OLI" framework can be viewed as the most ambitious and comprehensive explanation of FDI, especially useful in the context of the present study. The determinants specified by him can be classified as demand and supply side factors. They create an economic relationship between MNE and the host country, as illustrated in Figure 2.1. The relationship is based on the mutual expectation of meeting the demands of either party, which would maximise the welfare for both. It is essentially governed by the concept that the relative bargaining positions of the two parties are based on the opportunity costs of 'O' advantages, as perceived by the MNEs, and those of the 'L' advantages offered by the countries in which they are contemplating an investment; and the host countries' perceptions of their 'L' advantages and that of the 'O' advantages offered by the foreign investors (Narula and Dunning, 2000).

The highlighted section in Figure 2.1 indicates the possible effects FDI could have on a host country. They consist of a bundle of tangible and intangible assets like capital, new technology, management skills and market channels, of both quantity and quality. Recent literature on FDI has expanded and mainly focuses on these, and while this study too cannot escape investigating them, it will confine itself to host country benefits covering the major areas of economic growth, trade, domestic capital formation and labour productivity. These growth-determining factors can be distinct between FDI's first and second round effects, which have been cited as useful ways to approach the question on FDI's impact on the host country (Enderwick, 1998).

Figure 2.1 Economic Relationships between MNEs and Host Countries



Source: Adapted from Narula and Dunning, (2000)

[a] Notes: It is obvious that the relationships between MNEs and host countries go beyond those specified by the above economic and business environment, such as socio-political consideration of both parties (MNEs and host countries). The primary aspects of this relationship are detailed in Lecraw and Morrison (1991). While it is not the primary objective of this study to investigate the relationship between MNEs and host countries, host countries' contemplation of FDI and the negotiation between both parties are based on the above relationship.

2.3.1 Foreign Direct Investment, Economic Growth and Domestic Investment

The literature on growth theories falls into three major categories: post-Keynesian growth models, emphasising the role of savings and investment noticeably for example, Harrod-Domar and its variants; the neo-classical models, embracing technological progress and/or population/labour force growth (Solow models); and the more recent new growth models covering the role of R&D, human capital accumulation and externalities (Romer-Lucas type models). The basic nature of new growth theory is that in contrast to the neoclassical wisdom, growth can be endogenous (Balasubramanyam et al., 1999) The underlying assumption of decreasing marginal productivity of capital ensured convergence towards a steady-state equilibrium (Romer, 1996). In contrast, endogenous growth emphasised the possibility for "real output to grow endogenously, even in the absence of exogenous productivity growth" (Gregario and Guidotti, 1995, p. 435).

The advent of the endogenous growth theory (Barro and Sala-i-Martin, 1995) has encouraged research into channels through which FDI promotes long-run growth. Growth-enhancing new inputs and technologies are incorporated into the production function when growth determinants are viewed as endogenous; FDI becomes part of the capital stock, know-how and technology (Balasubramanyam et al., 1996). It could therefore affect the recipient country both at macro- and micro-economic levels. The macroeconomic contribution in terms of output growth, capital accumulation, trade, technical progress, and productivity spillovers associated with employment creation, is perhaps theoretically less controversial (de Mello, 1997).

When growth empirics are concerned the conventional method of estimation is based on the Solow (1956) approach in combination with Denison's standard growth accounting (de Mello, 1997). FDI is posted as an additional input in an augmented production function. In the usual notation, the production function has been shown as follows (de Mello, 1997):

$$Y = A\Phi(K, L, F, \Omega) \tag{2.1}$$

where Y is output, A is the efficiency of production, K is capital, L is labour, F is FDI, and Ω is the vector of ancillary variables.[4] By assuming a Cobb-Douglas function, taking the time derivatives and the logarithms of equation (2.1) will provide the growth equation as follows:

$$g_y = g_A + \xi g_k + \Psi g_f + \gamma g_w \qquad (2.2)$$

where lower case letters denote the rate of growth of individual variables and parameters ξ, Ψ, Υ are the elasticities of output for domestic capital, foreign capital, and ancillary variables. Note that the explanatory variables are stock variables, therefore, it is incorrect to include the flow variables of domestic and foreign investment. Instead, capital stock is calculated either by using a perpetual inventory method or by substituting the investment ratio of domestic and foreign investment to gross domestic product (GDP) as a proxy (de Mello, 1997).

An empirical study informed by this approach is, for example, Balasubramanyam et al. (1996) who tested the hypothesis advanced by Bhagwati[5] using a regression similar to equation (2.2). They included exports as an ancillary variable in an augmented production function and found that the elasticity of output for FDI was positive when countries were outward oriented.

Oscar and Simon (1994) examined the inflow of FDI into the Spanish economy during the period 1964-1989 and found a long-run relationship between FDI and GDP, inflation, trade barriers and capital stock. Cassiers et al. (1996) argued, on the other hand, that a high level of inward FDI in manufacturing activities was an important factor in the development of small economies like Ireland and Belgium. Similarly

[4] Ancillary variables are exports, imports, economic policy variables including institutional dummies, and political stability.

[5] FDI is more growth enhancing when countries pursue export promotion rather than import substitution. The extent to which growth is determined by export promotion policies establishes the link between trade regimes and long-run growth (Bhagwati, 1978).

Agrawal (2000), and Fan and Dickie (2000) found positive correlation between FDI and economic growth.

These models evaluate the influence of FDI on growth without considering the role of human capital, which new growth theorists argue is more important than physical capital in explaining the rate of development (Barro, 1991; King and Levine, 1994). Excluding human capital is serious mis-specification because the productivity of foreign capital may depend on the capacity of the host countries to absorb the technological know-how. To overcome this limitation, Borensztein et al. (1998) tested the effect of FDI on economic growth in a framework of cross-section regression and found a positive but insignificant impact on growth. They also found a strong complementary effect between FDI and human capital, depending on the level of the latter, and suggest that FDI, by itself, has a positive impact on growth when the host country has a minimum threshold stock of human capital. From a similar perspective, the studies by de Soysa and Oneal (1999), Balasubramanyam et al. (1999), Asafu-Adjaye (2000) found a positive and significant impact when a human capital variable is regressed with FDI.

Based on the endogenous growth theory, Ramirez (2000) analysed FDI in Mexico to test whether FDI enhanced growth and labour productivity. He used a simple endogenous growth model incorporating any positive or negative externalities generated by additions to, rather than flows from, the foreign capital stock. The short- and long-run properties of the variables in the output and productivity equations indicate the growth rates of private and foreign capital stock have positive and significant effects on labour productivity, while impact on the growth rate was negative. Zhang (2001a & b) too claimed that since growth performance is measured by GDP growth it is appropriate to use FDI stock rather than flow. His study of East Asian and Latin American countries, on the other hand, showed both FDI-driven growth and growth-driven FDI linkages.

However, the reasons for a MNE choosing a DC to be a host country are very different. In general, the decision to establish a subsidiary in a DC is, unlike the low-cost advantage in a less developed country (LDC) situation, to access large developed markets. Moudatsou (2001) tested causality between FDI and economic growth in the European Union. FDI-driven growth was found in nine countries; the opposite results were found in four countries; and in one country, no causality was found. Ericsson and Irandoust's (2001) study on the Nordic region, Nair-Reichert and Weinhold's (2001) study on selected developing countries, and Shan's (2002) study on China also supports the two-way causality between FDI and economic growth. The most significant finding from this stream of researchers is that FDI-enhanced growth depends on factors such as host-country trade policies and the absorptive capacity of the labour force. Some implications of these findings are discussed in section 2.5.

The various studies analysed above have been based on the growth equation given as (2.2), and involve regressing economic growth mainly on domestic capital, foreign capital, labour and/or human capital and exports. The results show conflicting evidence in the literature regarding the impact of FDI on economic growth. This suggests that for FDI to affect growth, the host economy must have attained a level of development that allows it to reap the benefits of higher productivity investment fostered by FDI, thus reinforcing the development threshold hypothesis (Borensztein et al., 1995). Otherwise, the impact of FDI on productive capacity would be restricted to a particular industry, mostly specialised export-processing activities, without any growth-generating productivity spillovers to the rest of the domestic firms. The mixed empirical evidence about the impact of FDI on economic growth raises the question of how far the empirical evidence from other countries could be applied to individual countries, in particular, to a small, developed country?

One of the reasons for interest in FDI is that it is a possible source of finance for a country's capital formation. FDI can affect the capital formation of a host country in a number of ways (Jansen, 1995). First it increases the private investment component of domestic investment. Factors that promote FDI usually reflect the healthy investment

climate of the host country and result in an accompanied rise in domestic investment too. When higher investment levels increase aggregate demand, GDP increases subject both to the multiplier and accelerator effects. There are also other ways FDI can contribute to growth: forward and backward linkages; joint ventures financed mostly through local financial markets; rising exports leading to positive effects on savings and investment; and enhanced physical capital in the form of equipment, machinery, instruments, technology, etc.

As domestic investment and FDI can either be complementary or substitutable, output growth is affected by these characteristics too. A simplistic Schumpeterian view of FDI-related innovative investment emphasising the creative destruction through substitution tends to overlook the scope for complementarity. On the other hand, FDI would, given the existing factor endowments in the host country, also be complementary, adding to growth. It could create additional rents accruing to older technologies (Young, 1993).

There are relatively few empirical studies that have examined the effects of FDI. While some complementarity effect was found in Canada (Lubits, 1971; Noorzoy, 1979), a strong substitution effect prevailed in the US (Noorzoy, 1980). The effect of FDI on domestic investment in most LDCs was, according to Areskoug (1976), partial substitution. Nevertheless a study (Lee et al., 1986) on the effects of foreign private investment and foreign aid on economic growth and domestic saving in nine Asian developing countries concluded that foreign private investment had a statistically significant effect on GDP growth and a positive but insignificant effect on domestic savings. Studies by Sun (1998a) and Agrawal (2000) found complementarity between FDI and domestic investment. Focusing solely on Organisation for Economic Co-operation and Development (OECD) countries, de Mello (1999) claimed that FDI is growth-enhancing only when domestic and foreign capital are complementary. Lipsey (2000) however reports that in the case of DCs, there is little evidence of the impact of FDI on domestic capital formation. Blomstrom and Wolff. (1994) also discussed the impact of FDI on growth in relation to other fixed investment variables and found that

when FDI was included in the regression, the significance of the fixed investment ratio decreased.

According to Stevens and Lipsey (1992) it is important to differentiate between the financial and production implications of FDI. The impact of FDI's production implications on trade was found to be direct. The main concern had, however, been the financial interaction and any possible substitution effects on domestic investment. Such effects dominated in US firms and in Dutch data (Fontagne, 1999); and Swedish data (Fontagne, 1999) had the same results.

A distinction can also be made between LDCs (technological followers) and DCs (technological leaders). In LDCs, a complementarity between old and new FDI-related technologies predominates. FDI stimulates factor accumulation and results in a more diversified productive base that ultimately leads to faster growth. But in advanced economies, substitution is the most dominant effect and the qualitative aspect would thus be more appealing to the policy-maker. Growth, coupled with the faster obsolescence of those capital stocks embodying older technologies, would indicate a more efficient production and a more rapid absorption of new FDI-embodied innovations. By increasing the degree of competition in the recipient economy, FDI crowds out inefficient firms and encourages efficiency in the use of physical as well as human capital.

Using panel data analysis of technological leaders and followers, de Mello (1996b, cited in 1997) found a positive impact on both. The absence of country-specific effects suggested there had been dominant complementarity between FDI and domestic investment. This outcome was also present in capital accumulation in the panel of technological leaders. But once the country effects were incorporated the relationship between FDI and capital accumulation became negative. These results lend support to the hypothesis that some degree of substitutability occurs between FDI and domestic investment. In advanced economies, more productive and efficient technologies embodied in FDI generally led to a higher rate of technological obsolescence of the capital stocks embodying older technologies (de Mello, 1995). In contrast,

complementarity prevailed in technological laggards. The latter finding is consistent for Latin America (Mortimore, 1995, cited in de Mello, 1997).

The presence of high FDI elasticity could, perhaps, be due to the effect of the availability of capital inflows, given likely correlation in developing economies between international credit constraints and FDI (de Gregorio, 1992). In Latin America, for example, the 1980s were marked by severe international liquidity, solvency constraints, erratic growth, and unstable domestic investment patterns. In the context of an open economy, it could also be argued (McCombie and Thirlwall, 1994) that when FDI functions as a substitute for domestic saving it is detrimental to growth. FDI inflows through remittances can worsen balance of payment problems.

It could also be argued that when foreign firms compete for scarce domestic financial and physical resources, they discourage indigenous investment, which gives rise to a crowding out effect (Lall and Streeten, 1977). This depends, however, on the nature of local financial markets. If public sector claims to service budget deficits are large or deposits are low due to weak interest rates then the crowding out effect is high. On the other hand, the presence of MNEs could provide an easy means of access to international financial markets, and allow for outside borrowing. The available foreign capital could, in turn, lead to an increased supply of domestic credit. In sum, credit capacity becomes stronger with a firm monetary system in the host country (Jansen, 1995).

The crowding out effect is also possible in the commodity and factor markets, depending on demand made on resources such as skilled labour and import licenses. The ability of foreign firms foreclosing domestic investment opportunities is also an important factor. Thus, the net effects depend on the relative strengths of FDI and domestic investment (Atri and Jhun, 1990; Warwick, 1991) and complementarity or substitutability is purely dependent on host country characteristics.

2.3.2 Foreign Direct Investment, Knowledge Transfer and Productivity Growth

Technological change is an important variable affecting the quality and quantity of goods and services. Many endogenous growth models have emphasised technology transfer from the North to the South as a vehicle for productivity growth in the South (Grossman and Helpman, 1991). Though there are numerous channels of technology transfer, FDI has been identified as one of the major contributors. A significant beneficial effect has been the spillover across domestic firms and sectors. Human capital is one of the key recipients. Productivity could increase through labour training and skill acquisition augmenting an R&D spillover. The determining factor is, nevertheless, the interaction between the absorptive capacity based on the sound policies of the host country and the objectives of the foreign firms.

Findlay (1978) asserted that host countries could benefit from 'contagion effects' associated with advanced technology, management practices and marketing skills. He claimed there was a positive connection between the existing distance in technology and the rate of economic growth. The wider the gap, the larger would be the potential for technological imitation, which spurs economic growth. With an increase in the degree of foreign presence, spillovers increase for a given technology gap, although the study recognises that large gaps themselves constituted an obstacle to spillovers.

In addition to Findlay's assumption that knowledge-based production was a function of FDI, Wang and Blomstrom (1992) suggested that high competition usually forced the transfer of relatively new and sophisticated technologies to retain market share. The technology, so transferred, could also leak to domestic firms and increase competition faced by foreign subsidiaries. Nevertheless, competition facilitates a higher degree of technology transfer with a larger potential for spillovers.

Studies of both DCs and LDCs seem to support the positive spillover hypothesis. Positive spillovers are found in Australia (Caves, 1974), Canada (Globerman, 1979) Ireland (O'Sullivan, 1993) and Mexico (Blomstrom and Persson, 1983; Blomstrom and Wolff, 1994; Kokko, 1994). In Mexico, for example, cross-sectional analysis has shown

productivity spillovers were least likely in industries where there was a wide technological gap with a high concentration of foreign firms. This was analytically equivalent to FDI occurring in enclaves disassociated from domestic production. The outcome was mainly due to the lack of complementarity between domestic human capital FDI and technological transfers (Blomstrom and Persson, 1983). In Brazil and Uruguay FDI was found to have a positive impact on labour productivity and growth (Bielschowsky, 1994, cited in de Mello, 1997; Kokko at el. 1996). The Uruguayan study found domestic labour productivity to be positively correlated with capacity utilisation and capital intensity.

The scope for various types of externalities to impact upon long-run growth, according to Romer (1990), is a common element in endogenous growth theories. Thus, even when individual firms are subject to diminishing returns to capital, externalities place a wedge between social and private rates of returns to investment (de Mello, 1997). FDI causes a productivity increase. Furthermore, greater potential for externality effects in terms of new inputs, knowledge and technology transfer, is created, which ensures growth.

The new growth theory has been used to examine the extent of total factor productivity's (TFP) influence on growth with domestic and foreign R&D. Hejazi and Safarian (1999) have extended TFP's scope by adding FDI stocks to trade as a channel linking TFP levels between countries. They measured the importance of international trade and FDI as channels for diffusing US R&D especially to OECD countries. Results indicated that when FDI was added, total spillovers were 30% higher, whereas the importance of trade was reduced almost by a third. It was thus clear that FDI functions as a channel for technology diffusion leading to significantly greater spillover effects. This conclusion is confirmed by firm-level data in Taiwan (Chaung and Lin, 1999), notwithstanding the fact that labour quality, firm size, market structure and export orientation also affect a firm's productivity. The major policy implication of Chaung and Lin's (1999) study is that governments in host countries should adopt policies to promote FDI for spillover benefits in the short term. Once technological capability is established, R&D could be

stimulated through infrastructure improvement and protection of intellectual property rights, allowing for sustainable economic growth.

More recently, the role played by FDI in the economic transition of the Czech Republic during the period 1993-1998 has come under scrutiny (Jarolim, 2000). The results indicate that firms with foreign participation achieved higher productivity rather than the fully domestically-owned firms. Among firms with foreign participation, "green-field" enterprises performed slightly better in terms of TFP growth than firms created through mergers and acquisitions (M&As). Foreign establishments have comparably higher levels of labour productivity than the domestic firms and domestic establishments therefore benefit from spillovers (Sjoholm, 1999). The positive impact on productivity through FDI has been supported by the studies of Barrell and Holland (2000) and Mei Hsu and Chen (2000).

Human capital stock in the host country is a prerequisite for production relocation across borders. An increase in investment productivity can be achieved only with sufficiently high levels of human capital in the recipient economy. Foreign investors can then use domestic non-reproducible inputs and labour of the quality level needed to set up sustainable operations. There may also be spillover effects from MNEs on local science and technology, education and training and trade promotion, in addition to more general effects on economic policy formulation. The entry of foreign competition forces local firms to become more efficient, providing the necessary spillovers in skills, management techniques and technical knowledge. On the negative side, however, local firms could suffer through major competition or predatory business practices.

In contrast, some studies have found an absence of spillover effects, for example, studies on Morocco (Haddad and Harrison, 1993) and Venezuela (Aitken and Harrison, 1999). The Moroccan study tested for spillovers in the context of a manufacturing sector employing a unique firm-level data set. It was found that the dispersion of productivity is smaller in industries with more foreign firms. The results were also negative in terms of the foreign presence and their accelerated effects on productivity. Lichenberg and de la Potterie (1996) studied international trade and inward/outward

FDI as channels of R&D diffusion, and concluded that outward FDI along with trade are two significant channels through which technology is diffused. The absence of a positive relationship between the inward FDI and technology diffusion suggests spillovers from FDI do not exist. One possible way to avoid the causality problem would be to examine growth rates rather than levels of productivity at a micro-level. Positive spillovers to host countries have been empirically demonstrated both within the sectors of investment and between sectors (Blomstrom, 1991, cited in Fontagne, 1999).

2.3.3 Foreign Direct Investment and Trade

Traditional trade theory does not provide for FDI impact on international trade patterns. It assumes there are given resource endowments (factors of production) in different countries and that these are not internationally mobile. FDI theory, however, involves the international movement and exchange of factors of production. With a few exceptions (for example, Calvet, 1981; Gray, 1982), there is little conceptualisation of the integration between trade theory and FDI. Gray (1982) points out that international trade theory is too unsophisticated to reflect on a number of new forces influencing today's trade patterns. Such new forces are generally associated with the growth of MNEs and FDI and lie outside the international trade theory domain.

Recent research focusing on theories of trade and FDI consistently finds a positive correlation between trade and FDI (Ajami and BarNiv, 1984). It is apparent that much of the recent expansion in international trade has been driven by increases in FDI. Historically, FDI often reduced trade through the establishment of a local, self-contained manufacturing subsidiary in the recipient economy, thus negating exports from the parent country. In recent years, however, as MNEs create and expand foreign subsidiaries that engage in manufacturing, international trade flows in and out of a country have tended to increase. This is most significant when subsidiaries are part of regional or global manufacturing strategies (Bartlett and Ghoshal, 1989; Kogut, 1994; cited in Egelhoff et al., 2000).

To participate in the emerging global marketplace firms often use FDI as the primary entry mode. It is suggested, however, that the dominant motive for investments in DCs or LDCs could be varied and manifest in aggregate impacts on national trade balances. Egelhoff et al. (2000) identified three influences on the trade patterns of foreign subsidiaries. Their study, based on Ireland, showed the nature of industry, especially whether it is global or domestic, the size of the subsidiary, and the nationality of the parent MNE have implications for emerging trade patterns.

Motivations are generally categorized into market-seeking and factor-seeking. Market-seeking investment "is usually a defensive step taken to maintain an existing export market" (Root, 1977, p.12). Yet the increased risks associated with FDI involve the top management of the company in the decision-making process, paving the way for further investment amenities to market penetration (Root, 1994).

There are two common types of factor-seeking investment: raw material-seeking and low-cost seeking. While the former aims to access natural resources lacking in a particular country, the latter aspires to take advantage of low-cost factors as part of global sourcing strategy. Both market- and factor-seeking strategies lead to favourable trade balances either through reduced trade deficits or through building on trade surpluses.

Most efficiency- and strategy-seeking motivations (Dunning, 1993) are driven by MNEs. Efficiency is achieved when firms seek to gain from the common governance of geographically dispersed activities and exploit the benefits of strategic position in international markets while production takes place simultaneously in several countries. Recent findings show a large discrepancy between FDI into the UK and comparative advantages over different periods of time (Nachum et al., 2000). In recent decades foreign activities have tended to be complements rather than substitutes.

Firms' motives for FDI vary in a systematic and predictable way, and manifest themselves in the aggregate patterns of FDI and trade balances, while it also provides an explanation for national trade balances. The findings suggest that the country's status, a

DC or a LDC, moderate the relationship. However, if the dominant motive for the inward FDI is the penetration of foreign markets, there will be, at least in the short term, a negative relationship between FDI flow and trade balance (Brouthers et al., 1996). This empirical study supported the previous findings of Dunning (1993) and Phongpaichit (1990). However, if the objective is efficiency-seeking, then trade surpluses are the likely outcome (Phongpaichit, 1990; Dunning, 1993). LDCs with low levels of FDI are considered to be in the incipient stage of development, which tends to increase negative trade balances (Wert, 1973, cited in Brouthers et al., 1996). LDCs with high levels of inward FDI represent a more mature stage of project development where exports increase and trade balances are positive.

Notwithstanding firms' intentions on overseas investment, the interaction between trade and FDI has become one of the main features of globalisation. The theoretical literature on international trade or FDI does not provide a clear indication as to whether foreign production is a substitute or a complement to international trade. Trade models based on Heckscher-Ohlin-Samuelson's (HOS) 2*2*2 framework, with perfectly competitive markets and without transport costs, suggest equalisation of factor prices across countries was possible through either international trade or international factor mobility. The latter, however, is a substitute for trade if production functions are similar (Mundell, 1957).

An alternative approach to horizontal FDI is to integrate vertical FDI into international trade. Helpman and Krugman (1985) constructed models to incorporate vertical FDI into international trade theory to explain the terms of factor proportion asymmetries between countries. Their model demonstrates that given the relative factor endowments of countries, FDI could reverse trade patterns, which could result in complementary trade flows of finished goods from foreign affiliates to parent companies. In the opposite direction, intra-firm transfers of intangible headquarter services from parent companies to foreign affiliates are unavoidable. If production is divided into upstream and downstream, the relationship between trade and FDI can be further developed with the emergence of intra-firm parent-to-affiliate exports of intermediate inputs. The model

anticipates large differences in countries' relative factor endowments. A principal implication is that MNEs become more important depending on the difference between home and the host country.

Fontagne (1999) claims that the relationship between trade and FDI is more complex and cannot be inferred from a theoretical basis. His analysis shows that until the mid-1980s trade was a key factor in determining FDI. But since then, FDI has contributed to trade. When exports are stimulated, leading to overseas investments, there is an inevitable expansion of trade. The trend is reciprocated in the recipient countries resulting in short-run imports and long-run exports. The ultimate outcome in terms of complementary or substitution effects are differentiated by differences between countries.

In subsequent developments three major elements can be highlighted: (1) firm-level activities like R &D, which are joint inputs across plants; (2) the plant-level scale of economies, transport costs, geographical and cultural distance cost; and (3) other kinds of impediments to trade between countries. The models generally postulate a substitution relationship between FDI and trade (Markusen, 1983, 1984, 1995, 1998; Brainard, 1992; and Markusen and Venables, 1995).

Given the fact that countries differ in relative factor endowments, Markusen (1998) and Markusen and Venables (1998) introduce countries' asymmetries to explain the choice between trade and FDI. Firms tend to be national and located in the advantaged countries for convenience, and when the disadvantaged country develops in domestic market size, factor endowments and technological efficiency, more and more firms from the advantaged country will establish subsidiaries in the disadvantaged country; trade and FDI can consequently exist simultaneously. MNEs become more important to trade as countries become similar in size and relative endowments and as world income grows.

Based on the assumption that countries are symmetric in size, factor endowments and technology, Brainard (1992, 1993) developed a model that distinguishes between plant-

and firm-level scale economies and acknowledges the existence of trade barriers such as tariffs, increasing returns to scale and transport costs. Trade barriers generally act in an opposite direction - "proximity-concentration trade-off" -[6] which explains the circumstances under which FDI drives as a substitute for trade (Brainard, 1992).

Trade and FDI have been traditionally characterised as alternative strategies. Firms' export purposes could be met either through home production or through overseas production for relevant markets. This decision is highly influenced by economies of scale and transport costs. FDI becomes feasible when there are important trade links between the foreign investor and the host country (Marchant et al., 2002). Intentions should justify the advantageous production relocation in the light of factor reward differentials, thus FDI and trade are expected to complement each other. The theories suggest implicitly that outward FDI and exports from an investing country would be substitutes and that inward investment and exports from the host country would function as complements.[7]

Apart from such theoretical views, empirical studies on FDI and trade relationships have provided mixed outcomes. Orr (1991) has argued that under specific conditions FDI can contribute to positive long-run trade balances. The conditions cover the use of local import substitutes and/or imports and export promotion. German and Japanese FDI during the period 1989-1992 was found to be positively correlated to export-import trade. For the US, the correlation was much weaker (Agarwal et al., 1994).

International production created or displaced trade, depending on economies, industries, inward or outward investment, and time variability (Pain and Wakelin, 1998). Using an augmented export demand model and panel data set at the economy level for 11 OECD countries for the period 1971-1992, Pain and Wakelin found evidence of heterogeneity

[6] Proximity means that firms have an incentive to overcome various barriers to trade by launching FDI in a foreign market, while concentration refers to increasing returns to scale at the plant level.

[7] A number of studies have found similar outcomes, which suggest that inward FDI in open economies such as Ireland (O'Sullivan, 1993), Portugal (Cabral, 1995), the UK (Blake and Pain, 1994, cited in Barrell and Pain, 1997) and the US Leichenko and Erickson (1997), acts to raise the exports of the host countries. Also see Barry and Bradley, 1997 and Barry 1999 for FDI and trade and industrial structure in small economies. Blomstrom at. el. (1988) find a complementarity effect between FDI and export sales.

in relationships between FDI and exports. In general, however, outward FDI has a negative impact on trade shares, while inward FDI has a positive impact.

Wilamoski and Tinkler (1999) estimated the trade balance effect of FDI with the following models to answer the question "how does US FDI in Mexico affect trade"?

$$X_t = x_1 + x_2 Y_{t,mex} + x_3 R_t + x_4 FDI_t + x_5 \Sigma CFDI_{t-1} + \mu_t \quad (2.3)$$

$$M_t = m_1 + m_2 Y_{t,us} + m_3 R_t + m_4 \Sigma CFDI_{t-1} + \mu_t \quad (2.4)$$

where X_t is US manufactured exports to Mexico; M_t is US manufactured imports from Mexico; $Y_{t,i}$ is gross domestic product (i is country); R_t is real exchange rate; FDI_t is US FDI in Mexico in year t; and $\Sigma CFDI_t$ is cumulative US FDI in Mexico in year t.

Wilamoski and Tinkler's finding suggests FDI will gradually lower US exports to Mexico as Mexican production increases, and thus the trade balance impact is positive. They pointed out that theoretically, FDI and exports can be substitutes or complements and the effect on imports cannot be predicted. They showed several ways in which FDI could affect exports and imports.[8]

Using a panel data set for ten countries for the period 1982 to 1994, Gopinath et al. (1999) regressed a four-equation system with foreign affiliate sales, exports, affiliate employment and FDI as endogenous variables to examine the connection between FDI and trade in the US food industry. Their outcome showed that foreign sales and exports are substitutes in the industry.

Pfaffermayr (1994) tested the direction of causation between outward FDI and exports using a time-series approach that found significant two-way causality to exist between Austrian outward FDI and exports. On the other hand, Liu et al. (2001) found that in China a one-way causality runs from inward FDI to imports and/or exports.

[8] Refer to Table 1 of Wilamoski and Tinker (1999) for details.

2.4 RELEVANT CASE STUDIES

As this study considers the impact of FDI on the New Zealand economy, it is appropriate here to examine the literature on country-specific and group macroeconomic variables that have been analysed, as well as relevant case studies.

Tu (1990) and Schive (1990) examined the effects of FDI on economic growth, private investment, private consumption, total exports and imports in Taiwan. Their results indicated that FDI promotes economic growth by stimulating private fixed investment and increasing exports, without significantly affecting private consumption and imports. Schive and Tu (1991) analysed the direct and indirect effects of FDI on Taiwanese aggregate investment, c onsumption, exports and imports. A four-equation model was constructed to capture the above macroeconomic variables and a three-stage least squares (3SLS) regression method was used to analyse the data for 1958-1987 to ascertain the impact of FDI on those macroeconomic variables. While the results showed FDI flows had a significant and positive influence on total investment, no effect was found on consumption other than an indirect effect through income generation.

Fry (1993) formulated a macroeconomic model to analyse the impact of FDI on 16 LDCs for the period 1966-1988. Domestic investment, national saving, imports, exports and the growth rate of income are tested in his analysis. He constructed five behavioural equations and used a 3SLS regression method of analysis. He not only tested for direct and indirect effects of FDI on important macroeconomic variables but also for the short-run and long run effects of FDI on these variables. Due to the differences in the economic structure and the forms of FDI, Fry (1993) divided the sample countries into two major groups. The first group consisted of Southeast Asian countries (Indonesia, South Korea, Malaysia, Philippines and Thailand); and the second group comprised the following: Argentina, Brazil, Chile, Egypt, India, Mexico, Nigeria, Pakistan, Sri Lanka, Turkey and Venezuela. The results of his study showed the impact of FDI inflows varied significantly between these two groups. FDI seemed to be a more influential factor for the first group, where a direct relationship between FDI and domestic investment was found. In contrast for the second group, FDI appeared to have been used

largely as a substitute for other types of foreign flows and did not increase aggregate domestic investment. For these countries, higher FDI inflow led to falls in domestic investment, national savings, and the rate of economic growth. In conclusion, the study suggested although FDI could be harmful in the short term it provided benefits to the economy in the long term.)

Jansen (1995) examined the macroeconomic effects of FDI in Thailand by using simultaneous equations and the simulation method for the period of 1970 to 1991. He examined the impacts of FDI and foreign portfolio investment flows on the Thai economy, in particular on its balance of payments and rates of investment and growth. He uses ten behavioural equations and 19 identities to explain 29 endogenous variables. The macroeconometric model used by Jansen identified that a sharp increase in FDI flows caused increases in investment, exports, and economic growth, particularly for the sharply increased flow period of 1978-1991. No evidence was found that FDI crowded out local investment since the FDI-induced investments were highly import-intensive and also led to higher investment income payments.

Chen et al. (1995), assessing the role of FDI in China's post-1978 economic development, concluded that FDI had contributed to China's post-1978 economic growth by augmenting resources available for capital formation and promoting exports. However, two apparent weaknesses have been found in the methodology and data set of the study: (1) improper specification of the data for the period 1968-1990 (in fact no FDI was permitted before 1979); and (2) the impact of inflation was not removed. In analysing the macroeconomic impact of FDI on China for 1979-1993, Sun (1996) found FDI contributed positively to Chinese domestic capital formation, industrial growth, and export and employment creation. Due to data limitation, he pooled cross-section and time series data at the provincial level and formulated a regression model to test the hypothesis. Sun applied the Generalised Least Squares (GLS) method and found that FDI had significantly contributed to the economic development of China. The positive impact of FDI was identified primarily as the contribution it had made to domestic capital formation, promotion of industrial production, exports, and the creation of new

employment. Sun (1996) further stated that FDI added to financial and physical capital and encouraged local investment. Sun undertook a similar study (1998b) for China during the period 1979-1996 and found FDI had a positive impact on Chinese economic development.

Hongskul (2000) used the autoregressive distributed lag method and a vector error correction method to investigate the macroeconomic impact of FDI on domestic private investment and trade in Thailand for the period 1965-1997. She developed three single equations to analyse the impact of FDI on trade and domestic investment. Her empirical results showed that FDI had significant effects on imports and domestic private investment but not on exports. Although Hongskul's study considers stationarity and cointegration, it paid attention only to two main macroeconomic variables, without taking into account the growth-determining relationship of FDI.

2.5 DISCUSSION OF THE RESEARCH PROBLEM

The benefits of FDI to host countries can be identified in terms of effects on domestic investment, imports, exports, productivity and technology. FDI could instigate these factors and nurture them to enhance growth. Despite FDI's alleged benefits to the host country, the empirical literature has not succeeded in establishing an unequivocal positive impact on economic growth, trade or productivity improvements. This may be attributed to the differences in data, samples, time periods and models tested and their main focus on single time-series or cross-section data analysis. In addition, as noted by the OECD,

> *"foreign direct investment (FDI) is an integral part of an open and effective international economic system and a major catalyst to development. Yet, the benefits of FDI do not accrue automatically and evenly across countries, sectors and local communities. National policies and the international investment architecture matters for attracting FDI to a larger number of*

developing countries and for reaping the full benefits of FDI for development" (OECD, 2002a, p. 3).)

The significance of FDI in various regressions, thus, is confounded on two issues: the methodology used and the host country context - inflow of FDI, FDI policy, investment environment, location, level of development. The focus of empirical analysis of FDI has been largely cross-section studies, due to the quality and unavailability of data for a long time span. As argued by Nair and Weinhold (2001) the potential weakness among the studies is the assumption of unrealistic homogeneity[9] imposed in the econometric models. The main arguments against cross-section analysis, and in favour of time-series analysis, have been that cross-sectional studies implicitly impose or assume a common economic structure and similar production technology across different economies, which are unlikely. The most recent call for caution about cross-sectional studies points out the need to, "allow for the development... tailored more closely to particular circumstances of particular countries" (Kenny and Williams, 2001, p.12). Despite some developments in panel data analysis, including the use of random coefficients to improve the power of tests based on cross-section data, the significance of the conclusions drawn from these studies are still subject to debate (Nair and Weinhold, 2001,p.16). In addition, the vast differences among countries with respect to the nature and quality of the data[10], makes cross-section comparisons a rather risky business.

On the other hand, the studies that concentrated on time-series analysis also suffer from a number of drawbacks. Initial empirical studies relied on statistical techniques that limited them to estimating only a statistical association or correlation between the variables. They generally used production function approaches, which had a more visible model structure. In these models the growth rate of GDP had been regressed on domestic and foreign capital and labour, often with additional variables such as exports and human capital. This standard approach made *a priori* distinction between

[9] Assuming a common structure like similar production technology, economic structure etc., in all the economies that have been considered in the empirical invetigation.

[10] See Stephan and Pfaffmann (2001) for the general problem associated with the quality of FDI data.

independent and dependent variables with the implicit assumption that causal ordering among the variables was known either from theory or from observation. In this arbitrary ordering, the right-hand-side variable (FDI) was considered independent and was thus identified as the cause of the dependent variable (economic growth). In the FDI-trade nexus, exports and imports were examined by using basic demand and supply functions. Here FDI was again assumed to be an independent variable and expected to affect exports and imports either positively or negatively.

The link between FDI and growth, however, has been subjected to empirical scrutiny since the advent of the new growth theory and the present process of globalisation. Recent empirical studies (Shan et al., 1999; Mondatsu, 2001; Shan, 2002) have found that not only can FDI cause economic growth, but also economic growth can affect the inflow of FDI. In a similar vein, argument can be cited for FDI's connection with trade, as conceptual models of FDI and international trade have traditionally been treated separately (UNCTAD, 1996), and any integration between them is still in its infancy. Conceptually, while the importance of FDI and international trade as individual variables have been widely documented, any links between them are relatively understudied. The normal suggestion is that FDI and trade can be substitutes or complements for each other, that FDI and exports may have a two-way causal relationship. Failure to consider either direction of such causality can lead to an under- and/or over-estimation.

Second, since the influence of FDI can differ depending on country context, the results of one study cannot be generalised and applied to another country.

Third, the statistical studies of spillovers, may reveal the overall impact of FDI on the productivity of local firms, but they are generally not able to say much about how the effects come about. These studies typically estimate production functions and include FDI as an explanatory variable. They then test whether foreign presence has a significant positive impact on productivity without considering possible long run relationship between FDI and productivity.

Fourth, with the exception of a few recent studies (Asafu-Adjaye, 2000; Ramirez, 2000) the majority of empirical studies using time-series data did so without testing for stationarity. The stationarity of the time series has important implications for a proper estimation of a long-run relationship, with or without causality. When one non-stationarity time-series is regressed onto another, the least-squares (OLS) regressions can produce misleading results, the so-called "spurious regression" (Granger and Newbold, 1974), where the OLS estimator is inconsistent and the usual inference properties do not hold.

Fifth, these studies avoid testing the possibility of cointegration among the variables, i.e., whether the variables in question contain a common stochastic trend (Banerjee et. al., 1993). If the variables are cointegrated, the indication is that these variables move together in the long-run; testing for cointegration thus shows the long-run equilibrium relationship between the variables. Cointegration among the variables has important consequences for determining causality.

One possible solution to these problems regarding the analysis of FDI and other key macroeconomic variables discussed in the literature is the use of time-series estimations that pay attention to the issue of cointegration among the variables. The prescription then is to take the first difference of the non-stationary variables and employ them in their transformed form along with other stationary variables. This procedure, while statistically acceptable, has the disadvantage of ignoring long-run relationships. For small samples, the long-run properties are dimly reflected as evidenced by the co-integrating relationship between variables (Banerjee et al., 1993). Thus, when dealing with single equations, according to Caporale and Pittis (1999), problems of weak exogeneity with cointegrating vectors, exogeneity and serial correlations can be effectively overcome through the use of the autoregressive distributed lag (*ARDL*) approach for smaller samples. This allows the researcher to control for country-specific, time-invariant variables and also to include dynamic, lagged dependent variables that can help control for omitted variable bias. The ability to lag explanatory variables may also help control for endogeneity bias. In addition, it is vital to investigate the co-

movements among these variables to draw policy implications. Recent developments in time-series analysis - cointegration tests, the vector error correction mechanism (*VECM*) and causal relationship - provide more effective techniques to study long-run equilibrium relationships among integrated variables.

The highlights of previous studies are summarised in Table 2.7,[11] indicating that the empirical evidence is mixed. This mixed evidence could mainly be due to methodological issues and country-specific characteristics and raises the question which outcome is applicable for a small, developed country? This led to the question "What is the impact of FDI on the growth and development of a small, developed country", which calls for a different focus, not only in terms of FDI's importance in influencing key macroeconomics variables, but also on how they are interrelated among themselves.

This study, therefore, considers the weaknesses in previous approaches and extends previous work through applying new techniques of *ARDL* and *VECM* to fill the existing lacunae, by focussing on a small, developed country. In addition, the persistence of the two-way puzzle is attributable mainly to methodological weaknesses in studies of both the FDI-growth nexus and FDI-trade relationship. The question also gives rise to the ongoing debate whether FDI is a cause or is a response to other factors that determine the inflow of FDI and its benefits to the host countries. To clarify this it is vital to establish the long-run relationship between FDI and key macroeconomic variables by examining stationarity, cointegration and causal relationships. This study therefore extends its investigation further through a multiple-equilibrium method.

2.6 CONCLUSION

The rapid growth and expansion of FDI sparked numerous studies dealing with the channels of transference from FDI to growth and development. Models of "endogenous" growth have recently combined with studies on the impact of FDI in a theoretical attempt to emphasise the major role played by it in the economy (see Lucas,

[11] For convenience the table is presented at the end of the chapter.

1988; Barro, 1989). The analysis of FDI's impact on host countries implicitly distinguishes between direct and indirect effects. Direct effects are those that can influence the host country's macro variables, like capital formation, employment and trade. The direct effects of FDI are more important for certain countries, however, and it is increasingly accepted that a more important FDI impact is likely to occur in the form of indirect effects such as technology transfer, productivity improvements, and spillover effects.

Based on such effects, this chapter has offered some discussion on leading theories of FDI and on the empirical research of its impact on host countries. The conclusions of this chapter can be summarised as follows: First, the literature on the importance of FDI in contributing to economic growth and other macroeconomic variables in host countries has developed progressively. The majority of the studies have concentrated on LDCs and DCs (in particular the technological impact of FDI) as host countries. Second, statistical analysis has not contributed to resolving the theoretical disputes, as the available empirical evidence provided conflicting results, concerning not only the significance of the impact of FDI, but also its direction. However, the methodological issues discussed above influence this existing empirical evidence. Third, it seems clear that host country characteristics also determine the impact of FDI, and differences between countries should therefore be considered. There is strong evidence pointing to the potential for significant benefits from FDI, but there is also ample evidence indicating that these benefits do not occur automatically, for example, technology transfer through FDI to a host country depends on the technological gap between the host and the home country. Fourth, the relationship between FDI and domestic investment also raises domestic capital formation in the host country. However, there are arguments that FDI inflows may crowd out domestic investment in the host country since foreign firms have an initial advantage both in product and financial markets. Fifth, as FDI is associated with trade the host country can benefit from investment-led export growth. FDI may increase the host country's exports; thus it can have positive impacts on savings and investment. The link between the host country's trade regime and FDI is explained by exports paving the way for FDI. Sixth, the scope for human

capital augmentation when FDI takes place reinforces the view that existing factor endowments in the host country are crucial FDI determinants (Sun, 1998a). Seventh, the majority of the earlier analyses assume FDI causes the other factors (growth, exports), and few studies have considered the feedback and the long-run equilibrium relationship between FDI and the other macroeconomic variables proposed in this study.

These problems and solutions are examined in the context of this study, by considering the effect(s) of FDI in the case of New Zealand, a small, developed country. The rationale for the choice of New Zealand is delineated in Chapter Three.

Table 2.1 The Relationship between FDI and Major Macroeconomic Variables: Selected Results

Study	Countries studied	Econometric Technique	Impact of FDI on				
			Economic Growth	Domestic Investment	Labour Productivity	Exports	Imports
Fry (1993)	16 LDCs	3SLS	(+) in one group and (-) in the other	(+) in one group and (-) in the other			
Blomstrom et al. (1994)		OLS		The significance of the variable is reduced			
Jansen (1995)	Thailand	Simultaneous equations	(+) Impact	(+) Impact		(+) impact	
Balasubramanyam et al. (1996)	Various	OLS	Strong (+) impact, when countries are export-oriented				
de Mello (1996b)	OECD and non-OECD	Panel data analysis	(+) in technological leaders and laggards	(+) only in technological laggards			
Sun (1996)	China	GLS	(+) Impact		(+) Impact	(+) impact	
Barrel & Pain (1997)	Europe	CES	(+) impact				
Borensztein et al. (1998)	69 developing countries	SUR	FDI contributed to a larger degree than domestic investment				
Hejazi & Safarian (1999)	OECD plus Israel				Productivity improvement increases when FDI is included in the regression		
Chaung & Lin (1999)	Taiwan	OLS			(+) impact		

Asafu-Adaje (2000)	Indonesia	ECM	(+) impact				
Mei, Hsu & Chen (2000)	Taiwan	Probit & Two-step GLS			Strong in SMEs & in large firms (-)		
de Mello & Fakasaku (2000)	Latin America and Southeast Asia	Causality				Srong (+) impact under export promotion	(+) impact in some countries.
Ramirez (2000)	Mexico	ECM	(-) impact		(+) impact		
Moudatsou (2001)	14 European Union Countries	ECM	FDI-driven growth and growth-driven FDI was found				
Ericsson & Irandoust (2001)	Selected OECD countries	VAR	Two-way causality was found in some cases and no causality as found in one case				
Shan (2002)	China	*VAR*	Two-way causality is found				

Sources: The nominated studies.

CHAPTER THREE

FOREIGN DIRECT INVESTMENT AND THE NEW ZEALAND ECONOMY: AN OVERVIEW

3.1 INTRODUCTION

Chapter One highlighted that the global economy has witnessed huge changes in the past decade. These changes have influenced the behaviour of people and governments; and governments have been called upon to reassess development strategies. Within these critical changes, foreign direct investment (FDI) as a source of growth and development was recognised not only in less developed countries (LDCs) but also in developed countries (DC).[1] The widespread importance of FDI for these economies has led to the development of theories and empirical studies, which have been discussed in Chapter Two.

In the New Zealand economy, the persistent decline in economic performance since about the 1970s, especially in the context of global change, necessitated a revisitation of policy issues. Foreign investment has become a significant source of capital, assets and employment. Although FDI has not been an entirely new phenomenon, since the colonial times it has played a crucial role in contributing to industries such as dairy, meat and banking. UNCTAD (1999) concludes that the New Zealand economy is still one of those most reliant on FDI.

Today, strong international links in trade and investment are emphasised as a key policy objective. Yet it is difficult to pinpoint any active measures that have been introduced to promote FDI. Thus, policies towards FDI remain non-discriminatory, without much

[1] As mentioned by Balls "The UK provides a stunning example of what can be achieved when investment flows really start. It is not just jobs that are created (currently running at 50,000+ a year) but the effects on existing businesses. The productivity of FDI businesses is high because they invest more than local businesses and their superior performance spills over into local economy. Figures from the UK National Institute of Economic and Social Research show US sourced FDI cooperate productivity at between 25% and 33% higher than local (UK) manufacturing firms. A third of the entire UK productivity growth increase between 1972-96 can be directly attributed to FDI" (New Zealand Business, September 2000, p. 48).

specific attention. On the other hand, it cannot be denied that questions such as whether there is too much or too little FDI, or what the impact has been on the economy, have pre-occupied people and governments alike. A major reason for this concern has been the smallness of the New Zealand economy with its limited resources against a background of increased importance of FDI in a globally competitive environment. Nevertheless, there exists a persistent lack of meaningful academic understanding and insights to match this interest. This lacuna, i.e. lack of focus on the effects of FDI in small, developed countries, in particular New Zealand, provides the rationale for this study.

This chapter presents a descriptive analysis of the New Zealand economy and the role of FDI. Section 3.2 gives a brief background of the economy. Section 3.3 discusses policy changes affecting the economy. Section 3.4 explores the historical importance of FDI, focusing on its increased importance during the past decade. Empirical evidence from the academic literature is discussed in Section 3.5. The concluding section discusses the important implications.

3.2 BACKGROUND TO THE NEW ZEALAND ECONOMY

New Zealand is one of several countries colonised by Britain during the nineteenth century. It gained independence, relatively quickly compared with many other countries. For a long time the country's geographical isolation sheltered the economy from foreign competition (Rudd and Roper, 1997). In the 1860s, the goldfields, the wool industry, along with ancillary activities and services were the backbone of the economy. They combined to provide one of the highest average incomes for a country of that size (Hawke, 1985). While refrigeration, introduced in 1890, vastly transformed the production possibilities of the country, the economy encountered difficulties with post-World War I inflation in Britain and the abandoning of the gold standard in 1914. There was increased competition and a reduction in export prices. The economy was threatened with instability. The Great Depression of the 1930s made the situation worse and the New Zealand economy, like many others, experienced an overall fall in GDP,

price levels, employment, and export revenue over this period. Policy makers introduced licensing and exchange controls in 1938 to provide the necessary relief. These 1938 changes indicated that the course of the economy should be determined more by internal considerations than by events overseas (Rudd and Roper, 1997). The economy had an unsteady ride through to the early 1950s. Since then, trends have been more consistent, and the Holyoake slogan "steady as she goes" sums up the post-World War II era.

From its very beginning the New Zealand economy has been internationally linked. Consequently, changes in the world economy have always had an impact on its growth and development. Table 3.1 shows the key indicators and their influences on the economy during the last decades of the previous century. The favourable balance of payments until 1966/67 led to a relaxed trade policy. A large number of small industrial projects were also floated. A continuing growth of aggregate demand and expanded imports were shown in a wide range of areas. In the 1970s, however, the economy experienced a sharp decline after a long period of growth. Domestic markets were regulated and, under protectionist policies, there was a loss of traditional markets.

Economic growth during the 1970-1980 periods was one of the lowest among the OECD countries. The demand for foreign exchange far exceeded supply, resulting in a decline in accumulated reserves. Budget deficits were also uncommonly high during the first half of the 1980s. A major explanatory factor for this situation was Britain's entry into the European Common Market in 1973. New Zealand had lost its major trading partner and virtually lost its unlimited access to the British market. Policy response resulted in the economy being tightly controlled from 1960 to 1984 a period in which New Zealand was the most protected among the OECD countries. Other effects of the controlled regime were the curtailing of foreign exchange transactions, regulated domestic trading, a centralised wage-fixing system and government ownership of the banking, insurance, health, education, transport, energy and utility industries.

The prominent introduction of the 'Think Big' programme initiated by the Government during this period, however, did not bring much benefit to the economy, particularly

when oil prices fell in the 1980s (Scollay et al., 1993). The 'Think Big' projects left New Zealand with a heavy burden of external debt finance, raising the debt to GDP ratio from 10.7% in 1975 to 35.4 % in 1984 (Robinson, 1994). This led to an increase in the real exchange rate and required further borrowing. However, the development of a trading relationship with Australia was a more positive development. Closer Economic Relations (CER), established in 1983, allowed the two countries to reduce rigid policies and promote freer trading partnership.

Table 3.1 Key Economic Indicators 1960-2000

Year	FDI/GDP	Nominal GDP	Growth Rate	Percapita GDP	Capital Formation as a % of GDP	Exports as a % OfGDP	Imports as a % OfGDP
1960	0.02	33413	6.14	13840	1.79	1.97	1.95
1965	0.10	42507	6.09	15880	20.54	14.48	18.07
1970	0.16	48663	3.7	17010	18.09	18.10	17.57
1975	0.30	59080	1.68	18814	24.00	15.77	25.99
1980	0.57	59760	1.07	18846	17.68	21.21	22.44
1985	0.65	70083	-0.22	21308	19.67	23.74	22.35
1986	1.03	72054	2.81	21733	20.46	23.47	22.07
1987	0.55	72965	1.26	21851	19.05	24.24	22.24
1988	0.32	73792	1.13	22047	19.50	25.72	23.90
1989	0.98	73696	-0.13	21846	18.65	25.94	23.74
1990	3.87	73059	-0.86	21373	20.23	25.52	27.27
1991	4.06	72285	-1.06	20922	19.37	27.44	27.46
1992	2.78	72850	0.78	20848	15.84	29.76	26.22
1993	5.29	77388	6.23	21851	15.46	28.73	26.51
1994	5.57	81470	5.27	22678	17.35	29.46	27.19
1995	4.89	83831	2.9	22994	19.76	31.04	30.19
1996	6.23	85978	2.56	23203	21.06	31.06	31.58
1997	3.12	88573	3.02	23586	21.76	31.28	32.77
1998	4.62	87984	-0.66	23225	22.53	32.26	34.58
1999	1.82	97696	0.10	28060	19.45	30.14	32.23
2000	2.93	102221	0.04	29230	20.90	32.43	33.70

Sources: Statistics New Zealand (Various issues) and Infos Database (Statistics New Zealand)

The poor performance of the economy over the preceding decades resulted in comprehensive reforms referred to as "big bang" projects introduced by the fourth

Labour Government, which came to power in 1984. These projects transformed the New Zealand economy from one of the most protected and regulated to one of the most highly liberalised in the mid-1980s and early 1990s. This liberalisation was reflected almost immediately in the performance of the economy: real GDP grew by 0.8% between 1989 and 1990. Towards the end of the century, however, previous trends seem to have been returned, and GDP growth turned negative by 0.03% (Statistics New Zealand, various issues).

3.3 POLICY CHANGES AND THEIR IMPACT

By the late 1970s, therefore, with stagflation and an unsustainable balance of payments, as well as fiscal deficits that had reached serious proportions, manifesting poor economic growth, it was obvious that existing policies were less useful, and radical and structural changes in economic policy were urgently required. The Labour Government of 1984 took up the challenge and introduced economic reforms with broad objectives. The major objectives of its agenda were the provision of more employment opportunities, further growth and development, a favourable standard of living, and improvement of the country's sustainable competitive advantage. Widespread deregulation, aimed at privatisation of state-owned assets and enterprises, together with liberalisation policies, and capital flows through more FDI and trade, were the means through which the objectives were to be attained. In sum, both domestic and international policy initiatives encountered a non-discriminatory environment.

3.3.1 Economic Reforms

The economic reforms[2] involved bringing to an end a number of long-standing policies in international trade and finance. A primary step was the removal of the fixed exchange rate and the introduction of a floating regime. The broader objectives, however, had closely been linked with the adoption of a market-led economic paradigm. For example, the import substitution strategy was replaced by an outward-looking

[2] For a detailed analysis of the actual phasing of the twelve areas of reforms for the period 1984-1995 see Silverstone et al. (1996).

strategy (Akoorie, 1998b). The adoption of a market-led framework had as its major tenet that the government should facilitate rather than participate in economic activities, and should create a stable and supportive environment conducive to macro-economic stability. The reforms opened up the capital and financial sectors, and promoted trade and investment. There were also accompanying changes in the government policy such as monetary policy, tax reforms, and the corporatisation and, in some cases, the privatisation of government departments.

An underlying thrust of the liberalisation approach was the emphasis on the commercial objectives of higher efficiency and productivity rather than on social objectives. There was a clear positive shift from public to private ownership. Some of the most regulated and restricted sectors were now not only open but were also most accessible to foreign investment. Thus, there were also clear suggestions that FDI had an important role to play in the ongoing economic transformation.

An accompanying feature of the financial reforms had been a surge in money supply leading to inflation, and a sharp rise in interest rates. Balancing this was an improvement in the terms of trade, and a fall in the real exchange rate helped towards an increase in exports. Yet the deficit on current account hardly improved, largely due to servicing of the external debt. The 1984 reforms signalled favourable changes in the industrial structure, while many primary industries like fishing, mining, agriculture, forestry recorded marked growth, as did the communication sector, transport, finance, and community and personal services. It was clear that a devalued exchange rate had rendered a greater effect than a costly subsidy scheme. However, textiles, apparels and leather goods fared worst, due particularly to the termination of import licensing. Opportunities were now given to imports from the Asian trading partners. Building and construction also recorded a decline.

Once the new policies were in place, negative outcomes in certain industries were inevitable. Today, about two decades after the 1984 reforms, there is no firm opinion on the overall benefits gained. Several studies have concluded that the reforms were

misconceived (Easton, 1997; Dalziel, 1999).[3] But there are others, which, while accepting the reforms did not achieve their intentions, argue the failure was not due to the reforms per se but was due more to factors unique to New Zealand. Chief among these factors is New Zealand's small population and geographical isolation. This is echoed in the statement made by Treasury (1999):

> *Because New Zealand is relatively isolated geographically, there has been considerable interest within the country on how this may affect economic performance. As the Treasury notes (Treasury, 1999): "Draw a circle with a radius of 2200 kilometres centred on Wellington and you capture within it 3.8 million New Zealanders and rather a lot of seagulls. Draw a similar circle centred on Helsinki and you capture a population of over 300 million from 39 countries." Traditionally, New Zealand has sought to overcome its isolation by maintaining relatively open markets by international standards and creating a regulatory framework that is conducive to foreign investment. In part, there was a belief that it had to do even more than other ... new technology may help to overcome some of these barriers by reducing "distance" (through for example electronic commerce), but to close the gap in living standards with other OECD countries implies that an even more ambitious reform agenda has to be carried out (OECD, 2000).*

In addition to these, the recent globalisation along with the slow progress of adjustment by the New Zealand economy, had implications (Treasury, 1996; OECD, 1998, 1999c). In the light of such an economic and political background, the next sub-section elaborates the nature of FDI.

[3] New Zealand has carried out extensive reforms over the last two decades (1980s and 1990s) that have affected all major sectors. The nature of its problems in the mid-1980s, the rationale of the policies used to deal with them, the policies themselves and the way these were phased and thus their ultimate outcome, have all been extensively analysed both inside and outside the country (refer Chatterjee, 1996 and Evans et al., 1996, for further details). The critics, naturally enough, question not only the appropriateness of some of the policies, but the nature of some of the outcomes.

3.3.2 Foreign Direct Investment Policy in New Zealand

Statistics New Zealand defines FDI as 'investment that is made to acquire a lasting interest in an enterprise; the investor's purpose being to have an effective influence in the management of the enterprise'. For measurement purposes, Statistics New Zealand (1999) also proposes a threshold level. It was originally decreed that 25%-or-more of the voting share capital should be owned by a non-resident.

FDI in New Zealand consists of three principal elements (Enderwick, 1998):

- Equity capital, i.e. purchase of shares and real estate;
- Unremitted earnings, i.e. undistributed earnings including profits and losses; and
- Intra-company lending and borrowing, i.e. lending and borrowing between parent and affiliates or between affiliates.

As discussed, before 1938, with foreign exchange control and quantitative restrictions on imports, FDI played a substantial part in developing the pastoral-based economy. With the experience of the Great Depression, foreign investment was seen as a means of diversifying the economy and providing sufficient employment opportunities to the increased labour force (Akoorie, 1995). Despite the restrictive policies of the 1970s, there had been a substantial momentum in foreign investment. Yet FDI still had to be approved by the Overseas Investment Commission (OIC). Controls over capital flows and foreign exchange were, however, lifted completely in 1984. Table 3.2 provides a summary of the FDI policies during the pre- and post-1984 periods. A noteworthy feature had been the similarity in policies, in the pre- and post-1984, except for the relaxation during the latter period (Akoorie, 1998a). Akoorie's study further underlined how foreign investment policy could be integrated with macro- and micro-economic policies to derive the benefits of foreign investment.

Table 3.2 Pre-and-Post Reform FDI Policies in New Zealand

Pre-1984 Policies: Restricted Non-integrated Policies	Post-1984 Policies: Liberalised Non-integrated Policies
• Highly restricted FDI • No incentives or concessions • Assessed FDI on its fit with import substitution policy objectives • Restricted outward investment policy	• Highly liberalised unselective FDI • No incentives or concessions • No integrated macro-organisational policies • Neutral attitude towards outward FDI-trade support

Source: Akoorie, 1998a

The current policy on inward FDI could be described as more cordial, liberal and non-discriminatory. A minimal level of control over 'significant' investment is still maintained (OIC, July 2000). The OIC policies operate, depending on the policy threshold, through an authorisation system that screens all inward FDI. The current requirement is that an 'overseas person'[4] should obtain OIC consent for any investment proposal. OIC differentiates potential investment into either general business or their belonging to a sensitive sector, (e.g., commercial fishing and rural land). General business investments usually require OIC consent when a minimum of 25% shares is held overseas or the investment expenditure exceeds NZ$ 50 million. The consent requirement is also applicable when applications involve land of five hectares or more and/or their worth is more than NZ$ 10 million. If the said plot is deemed "sensitive land" (rural land), the minimum threshold for which consent is required comes down to 0.4 hectares. Furthermore, any proposal involving land that is a repository of some unique feature, or is of certain size, should be subjected to a net economic benefit assessment (Tradeport, 1999). This assessment would include one or more of the following: increased market competition and efficiency; new technology; new export markets; and employment opportunities.

An observation of the above policies reveals that the policies by themselves do not forbid foreigners forming fully-fledged, New Zealand companies. Nevertheless, the

[4] 'Overseas person' is defined as an individual or company not-ordinarily resident in New Zealand, or a New Zealand company with a minimum of 25% of its share/voting power held by overseas persons.

companies are called upon to meet certain legal requirements, of a restrictive character (OIC, 2000). It is noteworthy that foreign involvement in certain agricultural and horticultural sectors (e.g., kiwifruit) is thus effectively sealed; as producer boards have statutory monopoly. In the fisheries sector, on the other hand, a quota system restricts foreign involvement. The International Institute for Management Development, which studied FDI policies in 46 countries, ranked New Zealand 12th (1998). Its assessment was based on the level of available control that can be acquired in a domestic company. When it comes to incentives to attract FDI to New Zealand, the country, has, however, been ranked 33rd by the same study. This indicates that control over companies is minimal, while incentives have highly been curtailed. Thus, in line with the free-market policy, the New Zealand Government does not offer incentives to specific investors in certain areas of industry or in particular regions. The thinking seems to be that a stable economic and political environment would serve as a sound base for foreign investment growth.

As FDI and trade are always connected it is therefore important to examine the trade policies adopted by New Zealand. With the liberalization of the economy in 1984, the aim of external trade policy was to lower tariffs. Import licensing and restraints on capital movement were removed, leading to the CER agreement with Australia bringing an increase in bilateral trade. With the elimination of subsidies and incentives for exports, the competitive environment for domestic producers was enhanced (Scott-Kennel, 2001), and these changes too had implications for FDI.

Before proceeding to analyse the FDI trend, it is vital to examine the policy orientation that influences the flow of FDI, because overseas investment decisions are usually based on locational benefits as well as on host country policy criteria. Table 3.3 presents the key determinants of FDI in a host country. They indicate the advantages and disadvantages a small, developed country could encounter in attracting FDI. The main disadvantage, due to the present process of globalisation, is the centralised production

activities, which are likely to result in losing FDI mainly because of New Zealand's distance from main markets and the high labour cost.[5]

Table 3.3 Host Country Determinants of Foreign Direct Investment

Host Country Determinants	Types of FDI classified by Motives of Firms	Principal Economic Determinants in a Host Country
Policy framework for FDI	Market-seeking	
+ Economic, political and social stability		- Market size and per capita income
+ Rules regarding entry and operations		- Market growth
+ Standards of treatment of foreign affiliates		+ Access to regional and global markets
- Policies on functioning and structure of markets (especially competitive and policies governing M&A)		+ Country-specific consumer preferences
		? Structure of markets
? International agreements on FDI	Resources/assets-seeking	+ Raw materials
+ Privatisation policy		- Low-cost unskilled labour
- Trade policy (tariff and non-tariff barriers) and coherence of FDI and trade policies		+ Technical, innovative and other created assets (for example, brand names) included as embodied in individuals, firms and clusters
- Tax policy		+ Physical infrastructure (ports, roads, power, telecommunications)
Economic determinants (See table on the right)		
Business facilitation	Efficiency-seeking	
- Investment promotion (including image-building and investment generating and investment facilitation services		- Cost of resources and assets listed above, adjusted for labour productivity
- Investment incentives		- Other input cost such as transport and communication cost to/from and within host economy and other intermediate products
		? Membership of a regional agreement conducive to the establishment of regional corporate networks
+ Social amenities (for example, bilingual schools, quality of life)		
- After investment services		

Sources: UNCTAD, World Investment Report 1998:Trends and Determinants, Table IV.1, p.91.

Notes: '+', indicates the advantages, '−', indicates disadvantages, and '?' indicates uncertainties, which are based on the business environment ranking (See Appendix 3.3).

[5] In terms of labour cost, Appendix 3.1 shows that of the Asia-Pacific rim countries, excluding Japan, New Zealand faces the highest labour cost in the region.

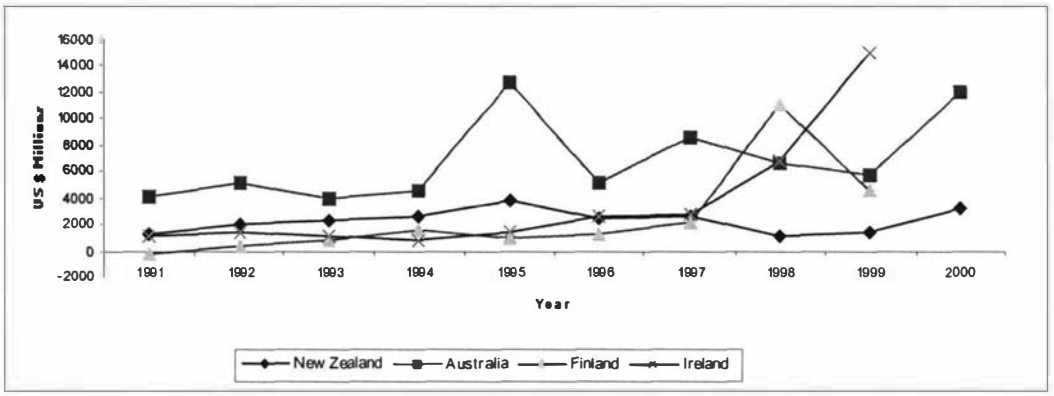
The market for international investment is extremely competitive, and governments around the world recognise the importance of FDI, as more and more countries (Asia, Eastern Europe and Latin American countries) are open to FDI. The risk faced by New Zealand in this respect is that New Zealand's policies are uncompetitive compared with other countries. Waiting for foreign investors to come and invest and offering only a non-discriminatory policy may not be an appropriate approach in the present globalised context.

The implementation of the liberalisation process in 1984 orchestrated an increase in actual flows of FDI, and can be construed as a sign that foreign investors have responded favourably to liberalisation policies. Though, the policies of the free market economy have led to a recent surge in FDI, and New Zealand still suffers from a relatively poor record of FDI compared with Australia, Finland[6] and Ireland[7] (Figure 3.1).

[6] Finland is another small, developed country that has in the recent past achieved significant economic growth through FDI. The small size of the economy was taken as a factor of flexibility i.e. as mentioned by Kathryn (1999) " we are small players in a big world. We have to be quick, flexible and have specialities to compete. We don't have rigid structures to conserve and it is easy to make a quick arrangement. What we can do in a week here would take months in Switzerland and a year in Germany" (p. 3). Using the smallness of the country as an advantage, Finland has attracted a considerable amount of export-driven FDI and foreign-owned companies located in the small southern tip of Finland contribute nearly 28% to GDP and 23% of jobs to the economy.

[7] The Irish economy has grown rapidly and steadily over the last 10 years due to factors of highly educated and trained labour force; larger scale improvement of physical infrastructure. The beneficial consequences of a successful fiscal stabilisation in the mid-1980s, and the move towards consensual wage bargaining enhanced the attractiveness of Ireland as a FDI destination. This shows that for small countries tariff-jumping FDI is less dynamic in technological terms and much smaller in volume than potential export-oriented FDI, and indicates that liberalised trading arrangements are a prerequisite for substantial inflows. The positive impact of FDI indicates that FDI flowed into manufacturing and entails the construction of new factories. This indicates that the building blocks of a country's ability to attract FDI are: R&D, infrastructure, labour skills, educational system, and telecommunications infrastructure (*The Independent, 01.09.1999;* Callino and Carpano, 2000; and Economists Intelligent Unit, 2002). Also see Barry and Bradley, (1997) for host country experience in FDI and trade impact.

Figure 3.1 Inward FDI: Selected Countries 1991-2000



Sources: World Investment Report (various issues).

Existing economic advantages are the main factors that indicate a country's competitiveness to an overseas investing community, where decisions to invest are thus affected. Chief among these advantages are economic, political and social stability, the rules regarding entry and operations, and the standard treatment of foreign affiliates. It is worth mentioning that New Zealand has had macroeconomic stability for more than a decade combined with a fiscal position and monetary policy that deliver consistently low inflation. This stable political environment together with a substantial measure of consensus across political parties on the important aspects of macroeconomic policy, is an advantage in attracting investors.

Recent improvements in the quality of services available in banking, telecommunications, retailing, postal services and health care are other major strengths. In addition, the quality of life[8] compared with other countries (refer to Appendix 3.2), and the recent move towards development of an innovation or knowledge-based economy indicates New Zealand's strengths in the FDI policy arena.

[8] 'Quality of life' was a major factor for Ireland attracting large inward investment; it was considered a great place to live (Boston Consulting Group, 2001).

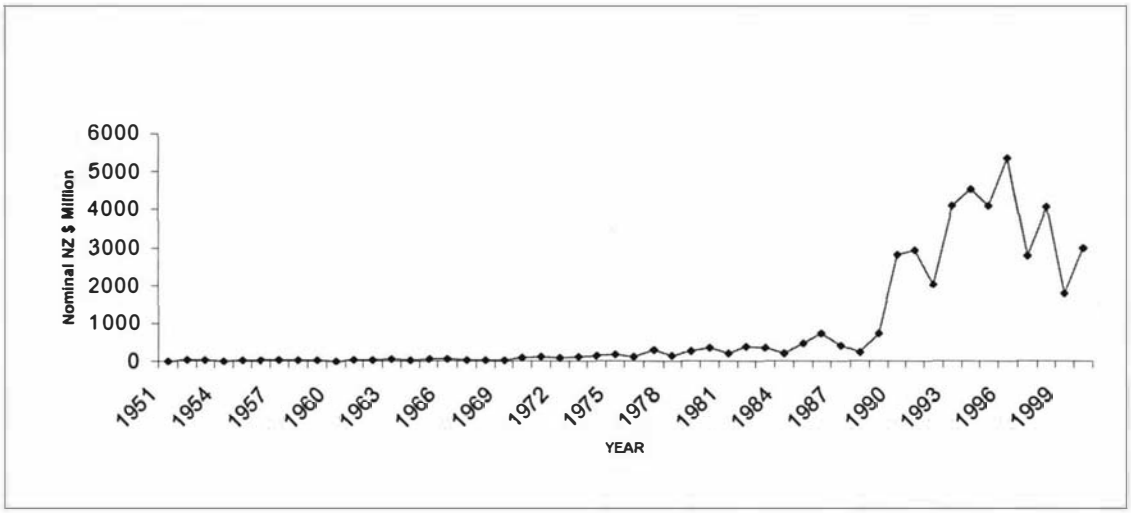
3.4 FOREIGN DIRECT INVESTMENT TRENDS

The objective of this section is to trace briefly New Zealand's reliance on FDI, using official statistics and published data. Overseas funding, as already mentioned, had begun during British colonisation. Before 1900, it was concentrated in local manufacturing endeavours such as sugar and ammunition. As well as this, the meat industry in particular received substantial investment before 1920. Over the period 1938 to 1967, the economy was characterised by an import-substituting, inward-looking policy orientation. Under a controlled regime, investment had, however, been highly regulated. Although the beginnings were in the 1920s, the bulk of the FDI was made in the 1930s. Another spurt was observed between 1955 and 1965. Foreign investment generally concentrated in industries where there was a need for high technology and patent protection (Deane, 1970).

The period 1967-1984 could be described as hybrid in character, involving both outward- and inward-looking investment. A slow but steady progress towards market liberalisation was also taking place. Yet, government intervention, too, was marked. An important feature had been the increase in Australian investment, especially during 1965 to 1975. By 1971, it was equal to the British inflow. Other countries too raised their FDI, making the phenomenon more global than regional or colonial.

Akoorie (1995; 1998a) analysed in detail the historical role of FDI in New Zealand. Her works underlined the significant contribution of overseas capital towards early development, especially in the diary and meat industries. A sizable amount also went into rail transport and banking. It was essential to provide for infrastructural facilities and support the existing agro-based manufactures. Nevertheless, the FDI inflow during the pre-1984 era had, in relative terms, been rather modest (see Figure 3.2). The annual average inflow during 1960 to 1984 amounted in real terms to only NZ$ 656.6 million compared with NZ$ 2801.2 million during 1985 to 2001. Even though a setback was experienced with the stock market crash of 1987, upward trend soon returned to previous levels, and the momentum was sustained.

Figure 3.2 Inflow of FDI 1951-2000 (Nominal NZ $ million)



Sources: Statistics New Zealand, various issues.

From 1989, FDI levels shot up and reached NZ$ 3 billion in 1991, before peaking at NZ$ 5 billion in 1996. From 1994 to today, the trend has been subjected to increased fluctuation. In 1997 alone 49% decline was recorded. Despite an 18% increase in the following year, it fell back by another 45% in 1999.

These fluctuations reflect to a certain extent the economic and political climate both in New Zealand and in global terms. Notwithstanding the volatile nature of investment, overseas capital during 1990 to 1996 had been higher that the entire amount for the previous four decades, i.e. 1950 to1990 (Mc Kinnon, 1994). It was largely an outcome of the privatisation programme (OECD, 1993).

3.4.1 Foreign Direct Investment Flow by Country

New Zealand's traditional sources of FDI have been Australia, the United Kingdom (UK), and the United States (US). The flow into New Zealand from OECD countries on the other hand, has, tended to fluctuate (OECD, 2002). Table 3.4 shows the net flow for the period 1995 to 2001 both regionally and nationally. Regionally, the largest proportion of FDI has been provided by the OECD group, followed by the Asia-Pacific Economic Cooperation (APEC) group. The CER agreement in 1983 substantially

boosted the Australian flows and a majority of these investments went into mergers and acquisition (M&As) of New Zealand firms. In 1991 the US became the largest supplier of FDI due, in part, to the sale of Telecom to Ameritech/Bell Atlantics, a US consortium, for NZ$ 3.70 billion. The one-off event was followed by a modest but steady inflow from the US since 1991.

Table 3.4 Total Inward FDI in New Zealand by Group/Country of Origin

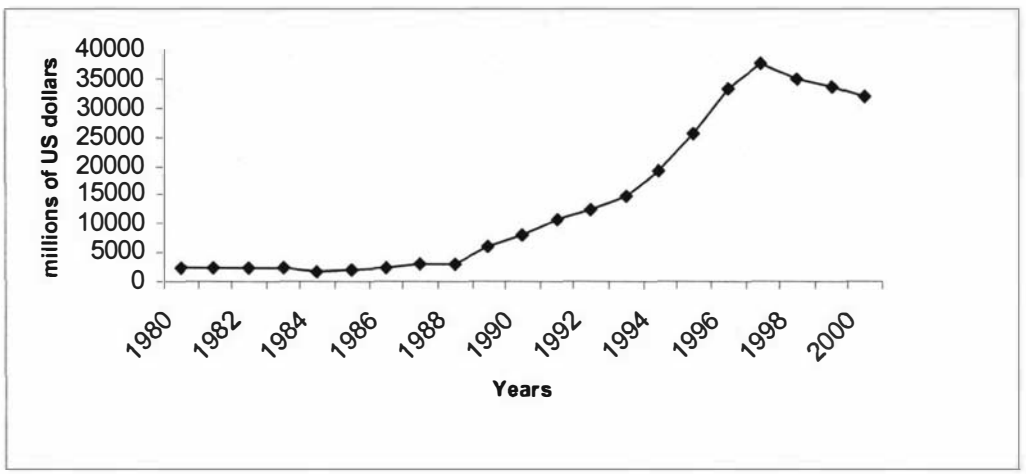
	1985	1987	1989	1991	1993	1995	1997	1999	2001
BY MAJOR ECONOMIC GROUPING									
APEC					3522	3423	976	1276	
ASEAN					260	329	23	-1051	
EU					546	533	1221	831	
OECD					3746	3428	2196	3294	
Australia	190	-40	343	-728	3127	1018	1214	2817	-611
Canada	11	-14	10	03	305	244	-472	-86	-
Germany	-	-	-	-	17	34	-3	18	18
Hong Kong	-	-	-	-	35	375	-63	-73	555
Japan	-51	-23	-31	107	-46	-50	177	1533	-553
Netherlands	-	-	-	-	-65	32	-37	634	-
Singapore	-	-	-	-	256	310	11	-1108	405
Switzerland	-	-	-	-	-20	107	21	76	01
UK	145	96	306	-537	634	450	1122	169	1599
US	144	357	69	3713	-161	1574	16	-1875	217
Total	456	402	725	2932	4069	4100	2766	1871	7715

Source: 1984-1989: Department of Statistics; 1990-2001 Statistics New Zealand.

Figure 3.3 shows that the stock of FDI has progressively increased, more than doubling from US$ 13 billion to US$ 36 billion between 1993 and 1997. While the traditional suppliers have continued to dominate, the Asian investors - Japan, Korea, Hong Kong, Singapore, Malaysia and Taiwan - have emerged as significant new contributors. Flows from the Asian investors, grew from a negligible level, to a total of NZ$ 110 million in 1990 and NZ$ 141 million in 1999 (OECD, 1999a). Asian investment formed approximately 12% of the total stock in 1997 (Statistics New Zealand, 1997). In stock values too, the three traditional sources, Australia, UK, and US, provided the largest amount of stock, accounting for about 71% in March 2000 (*The Independent*, 27 September, 2000). In 1999, while Australia and UK retained their traditional position, the US recorded a negative flow. In the mean time, during the period 1982 to 2000, Japan has increased its share by 30.7% (Ebashi and James, 1993; Statistics New

Zealand, 2000). In addition to a quantitative increase, Asian investment has also expanded, qualitatively into a wide cross-section of activities ranging from fisheries to forestry, and from light manufacturing to services.

Figure 3.3 FDI stock in New Zealand 1980-2000 (In millions of US dollars)



Source: WWW.stats.UNCTAD.org/FDI

3.4.2 Sectoral Distribution of Foreign Direct Investment and Employment

Considering the sectoral distribution of FDI is important to assess how far New Zealand experience, is compatible with the global trends. Under the liberalisation policy FDI flowed into all sectors of the economy. This is reflected in Table 3.5, which shows the number of enterprises in New Zealand by industrial type. The decline seen in the manufacturing sectors since 1990 a reflection of the competitive disadvantage-labour constraint and small domestic market-encountered by New Zealand. Trade liberalisation could have also been a contributory factor (Cremer and Ramasamy, 1996).

According to Cremer and Ramasamy (1996) between 1987 and 1995 foreign-owned enterprises with a minimum of 25% equity increased by nearly 95% from 2251 to 4375, whereas fully New Zealand-owned enterprises increased by 40%. But from 1995 there had been a decline in foreign-owned enterprises. In 1999, even though the aggregate total registered a rise, it was a direct outcome emanating from the property and business

services sector. Wholesale trade along with finance and insurance are the other major contributors towards this increase; however, the manufacturing sector accounted for only 3% of the increase.

Table 3.5 Numbers of Enterprises by Industry[9]

ANZSIC Division	Number of Foreign Owned Enterprises[a]				
	1987	1990	1995	1999	2000
Agriculture, forestry, fishing	17	27	55	89	105
Mining	46	57	97	45	43
Manufacturing	591	610	595	610	600
Electricity, gas, water supply	01	01	06	9	20
Construction	62	59	65	77	72
Wholesale trade				1425	1440
Retail trade	732	960	1536	225	135
Accommodation, cafes restaurants				100	100
Transport, storage	141	181	270	215	220
Communication services				41	51
Finance, insurance	553	814	1572	1035	1105
Property, business services				1560	1520
Government administration, defence	-	-	-	0	3
Education	-	-	-	30	33
Health, community services				23	24
Cultural, recreational services	77	98	179	97	100
Personal, other services				40	41
Total	2251	2821	4884	5600	5700

Source: Statistics New Zealand.

Note: The total figure may be different from the actual addition due to rounding and omissions made by SNZ for reasons of confidentiality. [a] = 25% or more equity firms only.

In sum, in the period 1987 to 1999, foreign firms have increased by 59%. The most dramatic change has been recorded in electricity, gas and water supply. Agriculture, forestry and fishing, construction, and communication remain as sectors that have gained modestly in terms of investment. In contrast, mining, education and manufacturing have been subject to a decrease.

According to the OECD (1993), employment through FDI has increased since the post-1984 reforms. Employment in MNEs rose from 10% of the total labour force in 1986 to 12% in 1990, the bulk of which was in the manufacturing sector (18% to 23%).[10]

[9] The enterprises include a legal entities engaged in the provision of goods and/or services earn an income and/or incur expenses (Statistics New Zealand, 1999).

[10] Also see Scott-Kennel (2001) for analytical details of employment in foreign-owned enterprises.

Between 1983 and 1995 the number of overseas companies spiralled from 1.7% of all enterprises to 2.3%, while, the number of workers engaged expanded from 10.5% to 17.8% of the total labour force. The recommitment of labour has in fact grown only in proportion to the number of overseas companies (Rosenberg, 1998). Between 1987 and 1998, for example, when the number of foreign-owned companies swelled from 2251 to 6000, they were able to absorb only 17.95% of the New Zealand workforce.

3.5 EMPIRICAL EVIDENCE ON THE IMPACT OF FOREIGN DIRECT INVESTMENT

FDI has appeared an increasingly attractive form of investment for countries that face declining domestic investment and a high cost of borrowing. In recent times, there has been a dramatic global rise in FDI, with substantial flows both ways, in particular among the DCs and OECD countries. As mentioned in Chapter Two, there are a number of ways in which FDI could add to the international competitiveness of a host country. A more outward and direct benefit has been the receipt of investible financial resources. MNEs distinguish themselves from other sources of capital and invest in long-term projects. They take risks in the process and repatriate profits only when the projects start yielding returns. They will bring in otherwise unavailable modern technologies, and thus raise efficiency of production. Another advantage of FDI is that it provides access to international markets, which leads to a growth of exports, enabling economies of scale and competitive stimulus. FDI also imports management techniques and employment skills enhancing the competitive benefits. Many of these benefits are evident purely at the affiliate level through the internationalisation of O-advantages. However, these alleged benefits are largely dependent on host country characteristics, and the advantages accruing can be classified as economy-wide and industry-specific. Since this study focuses on economy-wide impacts, previous evidence of growth determining factors, in the context of New Zealand, will be investigated in the next subsection. As Table 3.6 (pp. 76-77) provides details of empirical investigations that have been carried out, the purpose of this section is only to discuss main outcomes and overall weaknesses of the studies.

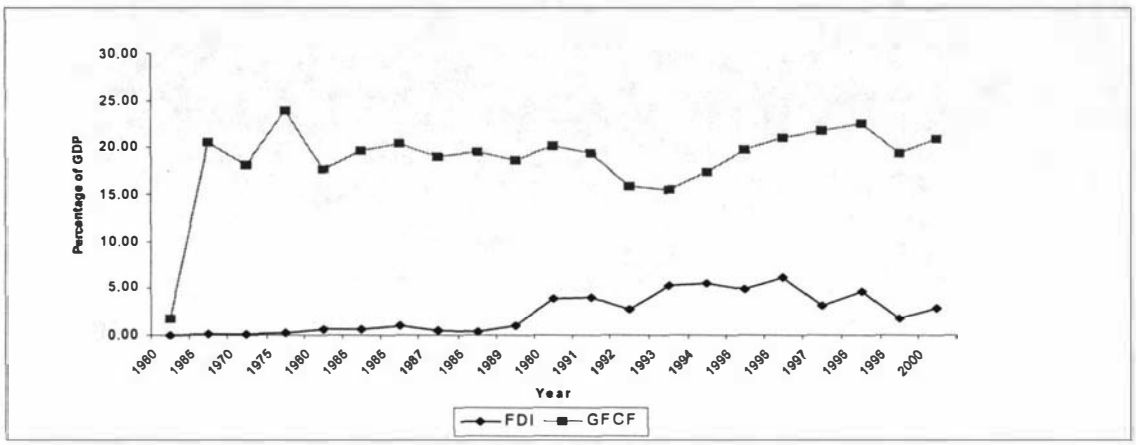
3.5.1 Growth and Capital Formation

The link between FDI and economic growth, along with the determinants of the latter, have for a long time been the subject of considerable intensified research. Nevertheless, in New Zealand little attention has been devoted to this area.

The importance of FDI can be measured by the ratio of its contribution to GDP and domestic capital formation. Even though the GDP ratio is not a measure in itself, it serves as a useful means of comparison with other countries. In 1984, FDI, as a percentage of New Zealand GDP, was 2%, which had doubled by 1991. This ratio was maintained, on an average of 5%, until 1997 but fell to 3% during 1997/1998. In 1999, it fell further to 2%. It is clear that the ratio of FDI to GDP has in recent years been subjected to a decline, in contrast to the global trends. The 3% average for 1995-1999 had, however, been higher than the world average (1.3%), and the average for other developed countries, 1.9%. On the other hand, FDI registered an increase as a percentage of gross fixed capital formation (GFCF). The 'transnationality index' (UNCTAD, 2000) another indicator, showed that New Zealand was holding the top position. This was mainly been due to the small size of the country. A considerable decline in Mergers & Acquisitions activity also furnished further evidence that New Zealand was running counter to the international trend.

Figure 3.4 compares these two variables where FDI as a percentage of GFCF, averaged 14% between 1984 and 2000. The annual average for 1988 to 1993 was 23.3%, much higher than the world average of 4.1%, and the developed country average of 4.0%. Cremer and Ramasamy (1996) claim that available domestic capital would have fallen short of the actual investment requirements, thus making FDI a more useful supplement for New Zealand's investment funds. This conclusion was also endorsed by the findings of Scott-Kennel's (1998a) study, which was based on a case study of six companies.

Figure 3.4 FDI and Total Domestic Investment as a % of GDP 1960-2000



Source: Statistics New Zealand (Various Issues)

In addition to this heavy reliance on FDI, FDI was mainly channelled to the ongoing privatisation programme. Notwithstanding that there has been little comprehensive research undertaken in New Zealand on the phenomenon, it appears that off-shore finance has been largely responsible for the activities of foreign firms (Enderwick, 1995). Many Japanese concerns in the forestry industry, for example, were receiving funding from their parent companies as an ongoing basis for their expansionary activities (Jaray, 1998).

Another significant fact to be considered has been that nearly 90% of the value-added of foreign-owned firms remained in New Zealand (KPMG, 1995). A breakdown of the proportion showed its distribution as follows: employee remuneration 37%; interest 20%; depreciation 15%; tax 9%; retained earnings 7%; and dividends 2%. Only 10% of the value-added has been distributed as overseas dividend, which is equal to an average of 3.7% of the total sales revenue. The dividend payments have, with the exception of telecommunications, been gradually lowering compared with total sales. However, according to Kelsey (1999), this claim is biased on a KPMG survey, the methodology of which is unsound. The survey polled 700 New Zealand registered companies with more then 25% ownership, of which only 19% responded. A further 59 companies were

included in the analysis of some questions, based on public information; hence, there is no indication of how representative the sample is.

A survey by Enderwick (1995) of 11 large American owned companies indicated a high level of integration with local firms. This study too supports the view expressed by the KPMG report, which stated that the majority of these firms reinvested between 85% and 100% of their earnings locally (Enderwick, 1995). Similarly, Scott-Kennel (2001) argues there was evidence that some firms paid no dividend to their foreign shareholders. Evidence gathered from these studies indicated that the earnings were ploughed back into further expansion. A study by Harper (1994) also claims that in the case of Japanese investment, not only did FDI contribute to first round capital but it also helped technology transfer and local employment creation. FDI has thus without doubt been a major source of capital in the development process.

Using a three-sector model Rose (1996) illustrated the possible effects of variations in the net level of FDI. The results showed that GDP and capital formation were highly influenced by FDI. His results further revealed that FDI reduced the need to borrow, and brought overall benefit to the economy. Moreover, the first round impact of FDI studied by Duncan et al. (1997) in terms of investment, capital, employment and technology transfer, based on 20 foreign-owned enterprises, also turned out to show a positive impact on the economy.

It is therefore clear that FDI does not crowd out domestic capital. On the contrary, it serves as a medium for additional capital. The indication has, in fact, been that a complementarity exits between FDI and domestic capital, further suggesting that foreign capital enhances growth and development.

3.5.2 Foreign Direct Investment and Trade in New Zealand

The international dimension of the New Zealand economy has always occupied a key position in policy formulation and decision-making. Products of sheep and cattle have traditionally provided the bulk of the foreign earnings, while the UK served as the largest market. The UK in return, has, also been the principal supplier of manufactured

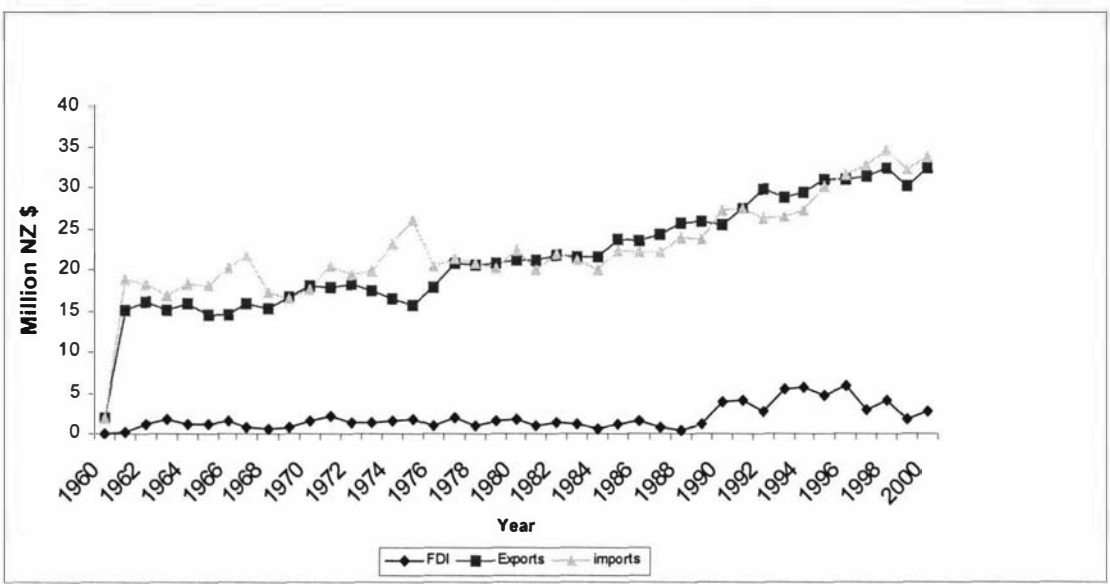
goods. By the late 1960s, however, there was a recorded diversification both in the composition of commodities, and in trading partners. The UK, though still the major trading partner, had declined in importance. The three major primary exports to UK - meat, dairy products and wool - decreased in quantities. Ensuring access has been increasingly difficult in both traditional and new markets. Attempts to diversify the economy were reflected in a significant increase in the share of manufactured exports. There has been a corresponding reduction on the reliance on imports too. The structural change in trade began, in fact, with the import substitution polices of the 1970s. Non-traditional primary items like forestry products and other primary products (from land or sea excluding pastoral) have entered the export market since the 1970s.

The trade pattern during the 1991 to 1995 period shows an increase in exports by 23% and imports by 27%. Obviously, imports were growing faster than exports. The favourable trade balance the country experienced in early 1990s was thus lost after the mid-1990s. In the new century, i.e. in March 2000 for example, exports grew by 6.2%, having benefited from excellent agricultural production, increasing world demand and the depreciation of the New Zealand dollar. Imports, on the other hand, grew by 11%. Another marked change has been the entry of services as a major component of trade figures. Transportation, travel, insurance and other financial services formed the important majority of the service sector.

The influence of FDI on the changes in trading activities is the main concern that needs to be investigated. Figure 3.5 shows the pattern of New Zealand trade and the flow of FDI. There is, however, a lack of definitive evidence on the impact of foreign-owned firms on trade. Forestry seems to be an important export in terms of monetary value (NZ$ 356.1 million), followed by manufacturing and wholesale and retail trade (NZ$ 294.6 million, KPMG, 1995). Mining firms, on the other hand, exported nearly 71% of total sales. Evidence on, the service sector (communications, banking and insurance) is limited. The KPMG survey investigated the import activities of foreign firms and found that almost 50% of these firms made overseas purchases of over 70% of their total purchases.

The general conclusion emerging from this contribution is that FDI made valuable contribution towards accessing international markets and enhancing the country's ability to trade. Access to corporate production, distribution and marketing networks were the most important factors in the success of firms (Enderwick, 1995; Duncan, 1997). The market network enabled an intra-firm flow of products, technology, information and capital. Further evidence in this regard has been furnished by the experience of Japanese forestry firms (Jaray, 1998). Thus integration into a corporate network provided firms with access to intermediate products and services, export markets, corporate expertise, marketing technique and distribution infrastructure (Scott-Kennel et al., 2000). MNEs, in the manufacturing and tertiary sectors, expanded sales and operating efficiency through overseas links (Loh, 1994).

Figure 3.5 Exports, Imports and FDI as a % of GDP



Source: Statistics New Zealand (Various Issues).

3.5.3 Foreign Direct Investment and Labour Productivity and Technology Transfer

FDI is generally seen as one of the major channels of technology transfer to the host country. A favourable link between FDI and the transfer of technology is determined by a number of factors. Host country educational levels and experience are identified as

important criteria. Existing labour training and labour productivity, skill acquisition and diffusion, and management practices could also decide the level of technology absorption. The necessary base, however, needs to be provided by domestic and foreign R&D expenditure and government consumption expenditure.

Total factor productivity (TFP) in New Zealand, a useful measure of labour productivity and technology transfer, has generally been low during the 1960 to 1980 period. Although TFP peaked between 1982 and 1984, since then until 1992 the progress had been consistent. There have, however, been some signs of improvement after 1993. Production estimates used have been relatively sensitive to the specification and source of input data and insensitive to the inclusion or exclusion of land and inventory inputs (Lawrance and Diewert, 1999). Among factors helping TFP, liberalisation showed a positive impact (Orr, 1994; Chapple, 1994). A comparison of domestic and foreign R&D expenditure would likely have indicated that contribution of the foreign R&D expenditure is higher because a majority of New Zealand's trading partners are globally reputable leaders in R&D spending.

Nearly one-third of the New Zealand workforce is directly or indirectly dependent on FDI (Cremer and Ramasamy, 1996) and among these 20% are in the manufacturing sector (Enderwick and Akoorie, 1994). Yet FDI has not resulted in substantial growth in employment, mainly due to acquisitions resulting in downsizing and restructuring of firms (Rosenberg, 1998). Privatisation of state-owned firms is a case in point. The concern has generally been to evaluate productivity improvement rather than the absolute number of jobs created. The lack of rigorous studies in this area, however, makes it difficult to evaluate the contribution made by FDI to productivity improvement. Nevertheless, early studies indicated (Deane, 1970) that out of 145 companies, only 70 employed overseas personnel, and this was on a relatively small scale. Foreign staff was mostly used at the initiation level. The larger firms, in the mean time sent local personnel for training to their parent companies or subsidiaries (KPMG, 1995; Jaray, 1998). Available evidence suggests MNEs tend to operate in industries that are characterised by higher skill, productivity and rewards (Enderwick, 1998).

Evidence regarding the contribution of FDI in enhancing technological progress appears to be mixed. On the one hand it is true that FDI helped to introduce new technology through production techniques or R&D output (KPMG, 1995). Most foreign manufactures were heavily dependent on foreign technology despite some inevitable New Zealand adaptation (Deane, 1970). US affiliates in this regard could be mentioned as suitable examples (Enderwick, 1995). In the services sector, Telecom, TranzRail and banking organizations introduced substantially improved technology, which was not locally available. While the Government considered the cost of such upgrading to be prohibitive, there is no doubt it had spillover effects in to the internal economy (Scott-Kennel, 1998a). On the other hand, there are also arguments that locally-conducted R&D by foreign firms had been minimal and their contribution had been nothing more than local adaptation. There is, controversy, among politicians and academics that FDI had transferred, local R&D activity to offshore destinations.

Scott-Kennel (2001), who examined the forward and backward links between local enterprises, concluded that forward linkages were more evident than the backward ones. Her study further confirmed that because of small domestic market size, market-seeking is more important than resource or efficiency-seeking. The corollary could be that New Zealand has been a gateway for other Asia Pacific markets.

The empirical findings discussed above have supported claims of the positive impacts the economy experienced as a result of FDI. It can also be argued that the New Zealand Government has for many years accepted FDI as a necessary and desirable concomitant to openness in international trade and finance. As Enderwick (1998) noted, the ability of a country to expand its production possibility boundaries through external resources is vital for a geographically isolated country like New Zealand. Although there is widespread acceptance of FDI, controversy surrounds the interpretation of its impact. FDI was opposed on such grounds as the diminution of national sovereignty, competition with domestic enterprises, the appreciation of economic rents, and concern for the impact on domestic employment, local ownership and national cultural life

(Rosenberg, 1998; Cartwright, 1998). The opposing views cast doubts on the finding of the previous studies.

The empirical research on FDI in New Zealand presented in Table 3.6 can be mainly classified into three groups: specific countries or regions (examples are Enderwick's (1995) study on US; Harper (1994) and Jaray's (1998) on Japan; and Cremer (1996) study on Asia); sectors (Chung, 1994; Duncan et al., 1997); current issues surrounding FDI at a particular time (Loh, 1994; KPMG, 1995; and Scott-Kennel, 1998a).

Existing empirical studies, however, fail to answer major criticisms generally raised in public and political debates. Thus, there are several caveats that should be mentioned regarding the evidence of existing research. The first arises with the approaches these studies have taken to investigate the impact of FDI. The majority of the researches have been revealed to be based on a case-study type approach. Convenience samples and case-study approaches do not generate results that can be considered representative of all foreign investors. For example, the studies have been limited to large client firms (KPMG, 1995), specific nationality (Harper, 1994) or specific sectors (Jaray, 1998). Any analysis or interpretation of the outcomes from these studies, therefore, must be tempered by the fact that these firms are possible examples of positive impact that can be gained from a broad range of FDI's impact, rather than from a probable, overall impact to the economy.

Second, along with the first point, the specifications or methodology used to collect that data have raised some critical issues regarding the empirical research. Possible sources of bias arising from methodological considerations should be emphasised, for example, size and nature of the sample, response rate and quality, questionnaire design and administration, and procedures used for fieldwork and data analysis. There are only a few studies, notably Deane (1970), Akoorie (1995), and Scott- Kennel (2001), which do not suffer from these problems.

Third, in most studies the research has relied primarily on the respondents' verbal or written responses to the questions presented by the researcher. Due to confidentiality,

and competitiveness among the firms, the sample size in most of the previous investigations have been low (Tao, 1997). The problem of selection bias is aggravated by this limitation. As a whole, these factors mean the application of these results to the whole economy is problematic.

Fourth, most of these studies are constrained by the period of analysis. As the results were based on case studies, they are possibly applicable only for the time of the analysis and only where there are no specific changes in the economy. However, the economic events mentioned before were not only affected by the national changes but also might be due to the international events like the Asian crisis, changes in other country policies, incentive for inward foreign investment, and so on.

Fifth, research on the impact of FDI suffers from inadequacies in firm-level data, which has prohibited analysis. Confidentiality assurances to participants in official data collection surveys prevent any disaggregation of data to the firm level and often lead to omission of data in published statistics. Thus, FDI data, that are available tend either towards a detailed study of individual firms or aggregate figures of inward FDI. Many studies of other countries, mentioned in Chapter Two, used aggregate data to compile econometric analyses to examine various aspects such as the impact on economic growth, trade, and productivity. Despite the inadequacies of firm-level data, inward flow data could be utilised to examine the overall impact of FDI in New Zealand.

Sixth, the majority of studies fall short of actually assessing definitive and representative evidence, and are merely indicative of the types and extent of backward links for selected foreign firms.

Finally, in terms of explaining the lack of an econometrical approach to the impact of FDI, Cremer and Ramasamy (1996) found that there are no official statistics available on FDI stock for an adequate period of time. This is not a unique problem in the case of New Zealand; many DCs and LDCs face similar problems with the quality of FDI data. To overcome this problem many researchers (e.g., Fry, 1993; Wilamoski and Tinkler, 1999; Ramirez, 2000; and Zhang, 2001) have used either cumulative figures or stock

data calculated by using perpetual inventory methods. Thus, a parallel approach could be appropriate in the case of New Zealand. Such an analysis would be more general and could be applicable to the whole economy.

In sum, the literature suggests case study research has elucidated many key areas of impact relating to FDI in a host country. It is not the contention of this research to state that previous studies are totally invalid or failed to achieve some conclusions. Rather the focus on specific issues is at the expense of a comprehensive analysis. Selection biases, along with a lack of robust statistical information, are important weaknesses and highlight the need for an analysis of the overall impact of FDI on the economy. This approach seems to be more effective in elucidating how FDI contributes to key macro economic variables, and answer the policy perspectives and public concerns about FDI's role in the New Zealand economy.

3.6 CONCLUSION

The global economy has experienced unprecedented changes since the mid-1980s leading to more direct competition among countries based on a free market concept. FDI undoubtedly has been a major source of this transformation process. New Zealand has been a recipient of considerable amount of FDI, giving rise to a public debate over its pros and cons. Yet there is a persistent shortcoming of systematic analysis of its nature and extent. Since the pioneering work of Deane (1970), many changes have occurred both nationally and internationally. Nationally, government policy has shifted from inward-looking to outward-looking orientation, and this has been coupled with extensive liberalisation. Internationally, apart from the globalisation already mentioned, events like the Asian economic crisis and Australia's tax reforms also affect New Zealand, with implications for FDI. The specific changes in countries like Ireland, Chile and Finland have also affected FDI in New Zealand. The emerging conclusion has been that New Zealand had a favourable inflow in FDI from the mid-1980s to the mid-1990s. Since then, however, a tendency to decline has been observed, in conjunction with an unprecedented increase in the global turnover of FDI.

Although most of the empirical evidence reviewed reveals positive impacts, a number of limitations are also evident. Basically, results have mostly been deduced from case studies, and limitations include biases, sample size, country of investment and sectoral specification, and the results from such an approach cannot always be employed to measure the impacts of FDI. The doctoral studies of Akoorie (1995) and Scott-Kennel (2001) could be considered as the most significant contributions in the area. However, both relied on data obtained from surveys, with the attendant shortcomings already discussed. The negative outcomes of FDI on the other hand, are left largely unsubstantiated (Rosenberg, 1998).

To overcome the weaknesses identified in the empirical findings, to allow conclusions to be reached from a New Zealand perspective, and to answer the political and public concern, the current approach employs an econometric analysis that is absent in previous studies. The approach incorporates new developments, such as time series concepts of cointegration and causality testing. The issues and limitations rose in Chapter Two and Three are the main focus of Chapter Four, which formulates methodologies and econometric models to address these critical issues.

Table 3.6 Summary of the FDI Literature in New Zealand

Study	Method	Objective	Results
Deane (1970)	Case study (147 companies)	To investigate foreign investment in the manufacturing sector	Results showed trade policy encouraged much FDI and many industries were dependent on their parent companies for technology and organisational practices.
Callister (1991)	Secondary data analysis	To review the pattern of investment in New Zealand	Highlighted the patterns of FDI in New Zealand over the 1980s, using Statistics New Zealand and OIC figures.
OECD (1993)	Secondary data	To review the position of FDI in the post reform period	Provides details of the amount of flow into the economy and indicates the majority of investment that took place due to the privatization.
Chung (1994)	Case study (Secondary data)	To investigate the extent, motivation and impact of foreign investment	Found the foreign investment stabilised the market at a time of serious decline and added liquidity to the industry when domestic investment has absent. Foreign investment is linked with development, refurbishment extension, subdivision of financial commitment and the input of local firms.
Loh (1994)	Case study (68 companies)	To investigate the motivation of FDI in New Zealand	Results showed that the motive for investment in New Zealand was to access the domestic market. Nearly half the companies had generated more employment and expanded sales after investment.
Harper (1994)	Case study	To survey the Japanese affiliate in new Zealand	Showed that Japanese firms introduce management practices into New Zealand.
Enderwick et al (1995)	Secondary data	To review the current position of FDI in New Zealand	Showed the current trends in FDI
KPMG (1995)	Case study (130 Companies) and Secondary data for another 59 companies	To investigate the reasons for investing in New Zealand	Results implied that the biggest single reason for investing was to increase market share (49% of respondents); another 32% respondents indicated New Zealand is their export base. Some respondents also the political environment as a reason. The results confirm that foreign firms bring in new technology otherwise unavailable in New Zealand.
Enderwick (1995)	Case study (11 companies)	To investigate the contribution of foreign investment to the New Zealand economy	The results showed firms gained market access, management practices and finance from their parent companies, and they had a positive impact on the New Zealand economy.
Cremer and Ramasamy (1996)	Case study (six companies)	To investigate the role of Asian investment in New Zealand	Found Asian investment in New Zealand is small compared with other sources of investment (less that 1/5 including Japanese investment) and contributes positively to the economy.
Akoorie (1996b)	Case study	To apply the investment development path concept to examine the developments of MNCs in New Zealand	Found that outward FDI is followed by developments in inward investment and this leads to upgrading of local firms ownership advantages. Government policy was found to be crucial in this development process.

Duncan et al (1997)	Case study (20 Companies)	To investigate the impact of FDI on capital, dividends, employment, wages, downstream benefits, technology, assistance from global network, exports	Found FDI positively influence these factors.
Akoorie (1998a)	Case study	To investigate the impact of inward and outward FDI stock within the investment development path	Showed the type and impact of FDI by contrasting government policy orientation. Added that impact of FDI changed when the policy changed from IS to EO policy orientation.
Jaray (1998)	Case Study (Five Companies)	To study the impact of Japanese investment into New Zealand forestry sector	Found a positive impact of FDI in the forestry sector by Japanese investment, in particular in the processing operations of forestry sector.
Rosenberg (1998)	Official statistics	Investigating into the current position of FDI by using the data available from the secondary sources	Showed the present trend of FDI.
Scott-Kennel (1998a)	Case Study (six companies)	To investigate the extent and impact of FDI in the privatisation programmes implemented since 1984	Concluded FDI had expanded critical assets such as capital, technology and commercially oriented management practices. Also found the restructuring of state-owned enterprises made a reduction in employment numbers but that financial performance and quality improvement made by these firms supported the evidence that FDI has positively contributed to improving the labour force.
Scott-Kennel (1998b)	Secondary data	To study for FDI policy in Australia and New Zealand	Found even though New Zealand made many changes in its policy arena (deregulation, trade policy and removal of FDI restrictions) Australia seemed to be the most attractive place for FDI due to its hands-on approach to industry and foreign investment targeting.
Scott-Kennel (2001)	Case study (516 companies)	To measure the impact of FDI on New Zealand industry	Found a significant contribution of FDI to local industry upgrading at the first-round level by adding to the competencies of the affiliates, and at the second-round level through competitive pressure, creating demand and supply channels, providing assistance, and transferring firm-specific resources for local firms.
BCG (2001)	Secondary data and case study	To analyse the importance and recommend FDI polices be adopted in New Zealand	Showed FDI is a vital source of investment, mainly Greenfield, and recommended government policy changes to achieve the maximum benefits.

CHAPTER FOUR

THE IMPACT OF FOREIGN DIRECT INVESTMENT: SINGLE-EQUATION ANALYTICAL FRAMEWORKS AND DATA SOURCES

4.1 INTRODUCTION

The review of the empirical literature in Chapter Two discussed the specifications of most of the models analysing the relationship between foreign direct investment (FDI) and key macroeconomic variables. The majority of the empirical findings concur with the positive impact of FDI (Orr, 1991; Fry, 1993; Jansen, 1995; Sun, 1998b; Bashir, 1999; Asafu-Adjaye, 2000; Calvo, 2002). Nevertheless, there are some studies (Haddad and Harrison, 1993; Dutt, 1997; Carkovic and Levine, 2002) that fail to identify a positive link, and thus there is neither universal agreement nor definitive results. That is, the results from empirical analyses are mixed at best and cannot be generalised to the context of every country. As discussed in Chapter Two, this may be attributed to the differences in data, samples, time period and model specification, and especially to differing country characteristics. This emphasises the need to focus on the cases of small, developed countries. On the other hand, the limited empirical evidence from the New Zealand perspective, as discussed in Chapter Three, is plagued by the general problems with case-study analysis. There is, therefore, a need for systematic time-series analysis of the experience of individual countries in order to broaden the understanding of FDI's impact in a small, developed country.

The aim of this chapter is to examine the existence of a relationship between FDI and key macroeconomic variables. It provides a theoretical and empirical setting for an econometric analysis to measure the influence of FDI, mainly focussing on certain specific factors pertaining to New Zealand. Recent contributions show that most macroeconomic time series are non-stationary and therefore the presence of a unit root may be the cause of spurious regression, including misleading conclusions. Many studies (Gounder, 2001; Taylor and Lewis, 2001; Oskooee and Wing Ng, 2002) suggest

that cointegration techniques should be implemented. Therefore, the finite autoregressive distributed lag (*ARDL*)[1] method of cointegration is used firstly to analyse the relationship between FDI and major macroeconomic variables.

The chapter is organised as follows: Section 4.2 sketches the theoretical motivation and the analytical framework for explaining the relationship between FDI and other major macroeconomic variables. Section 4.3 presents the empirical models of FDI that have been used to demonstrate the impact on the New Zealand economy. Section 4.4 explores the estimation procedure that is undertaken to investigate problems. The sources of data and the method of variable construction are discussed in Section 4.5. The final section presents the conclusion.

4.2 THE THEORETICAL MOTIVATIONS: THE IMPACT OF FOREIGN DIRECT INVESTMENT ON RECIPIENT ECONOMIES

As discussed in Chapter Two, based on the supply and demand side of FDI, many theoretical and empirical analyses have been produced in the FDI literature. As far as theory is concerned, the classical and neoclassical economic theories explain the growth and development of a country in terms of its stock of available productive resources – physical capital, human capital, technology, and management skills. The literature of the last few decades, however, has stressed a particular channel whereby the host countries may have access to new technology and therefore grow faster. The models built within this framework provide an interesting background to the study of FDI and growth. In the context of the new growth theory, however, FDI may affect not only the level of output per capita but also its rate of growth.

Furthermore, Multinational Enterprises (MNEs) have been found to be the primary source of production capabilities encouraging exports; FDI could thus play a key role both in the industrial structure and in the commodity composition of trade in host economies. The definition of the relationship between trade and FDI originated in the neoclassical Heckscher-Ohlin-Samuelson assumptions, where international trade is

[1] Pesaran and Shin (1995) have discussed the *ARDL* method in detail.

driven by differences in factor endowments and factor prices for homogeneous products. These differences become smaller when international factors become mobile between countries and international trade flows decrease. Thus, Mundell (1957) concludes that capital movements, driven by FDI, are the perfect substitute for exports. Mundell also states that import tariffs reduce exports and encourage FDI. Alternatively, Schmitz and Helmberger (1970) argued that a shortcoming of Mundells's analysis was that "it referred explicitly to trade in secondary manufacturing... while the large part of international trade and FDI associated with it are in primary commodities and primary manufacturing" (p. 762). Schmitz and Helmberger were among the first to demonstrate through theoretical arguments and modelling that international capital movements and trade in primary products are complements rather than substitutes. Kojima (1978) also described FDI as complementary to trade if FDI outflows create or expand the opportunity to export products. Thus, theoretically, the impact of FDI on trade depends on the motive, sector of investment, and home and host country relationship, and such considerations necessitated the investigations to be carried out from New Zealand perspective, due to the commodity compositions varied from other developed countries.

The literature also claims that FDI presence in the economy helps the incorporation of superior technology and management skills by local firms, makes them gradually compete more efficiently, and leads towards market-oriented policies. The major advantages of this process have been the increase in marginal productivity of existing capital (Wang and Blomstrom, 1992), increased consumer surplus through lower prices (Lahiri and Ono, 1998), a rise in investible resources and capital formation, above all, and a transfer of production technology, skills, innovative capacity, and organisational and managerial practices providing access to international marketing networks. FDI has also generally been considered a major channel towards the access of advanced technologies through Research and development (R&D) investments as well as specialisation (Borensztein et al., 1998).

It should be borne in mind that there is another school of thought that believes FDI is mainly a tool for international exploitation in the hands of the MNEs. This contention is

supported by an array of arguments: FDI financing from the domestic market raises interest rates and crowds out domestic capital; increased competition for factor markets displaces local firms; and greater market access of MNEs leads to foreign domination over local production activities.

It could, however, be argued that the ultimate contribution of FDI to a host economy very much depends on the conditions in the host country. These conditions would include the level of human capital, location and infrastructure, policy regimes adapted by the host country, and the institutional framework. Despite the presence of a large number of studies, only a few have gone beyond qualitative assertions to examine the impact of FDI on different macroeconomic variables. Studies have analysed the FDI effects on a few major macroeconomic variables consisting of economic growth, domestic capital formation, technology transfers, employment and/or trade. This study considers the theoretical arguments and mixed nature of the empirical evidence to formulate models to investigate the impact of FDI on the New Zealand economy. Therefore, the study considered an extended set of growth-determinant variables relative to FDI, as well as incorporating both single and multiple equation models. Rather than limiting analysis to FDI and growth and/or trade, the investigations have been widened to consider FDI's impact on key macroeconomic variables and specific characteristics pertaining to New Zealand.

It is against such a background that the present study expands and develops the analytical schema in Figure 4.1 regarding the impact of FDI on the host country. The essential concept is that FDI can augment competitiveness both quantitatively and qualitatively. Yet the interaction among variables in the different countries can lead to different results, determining whether FDI has a positive or negative impact.

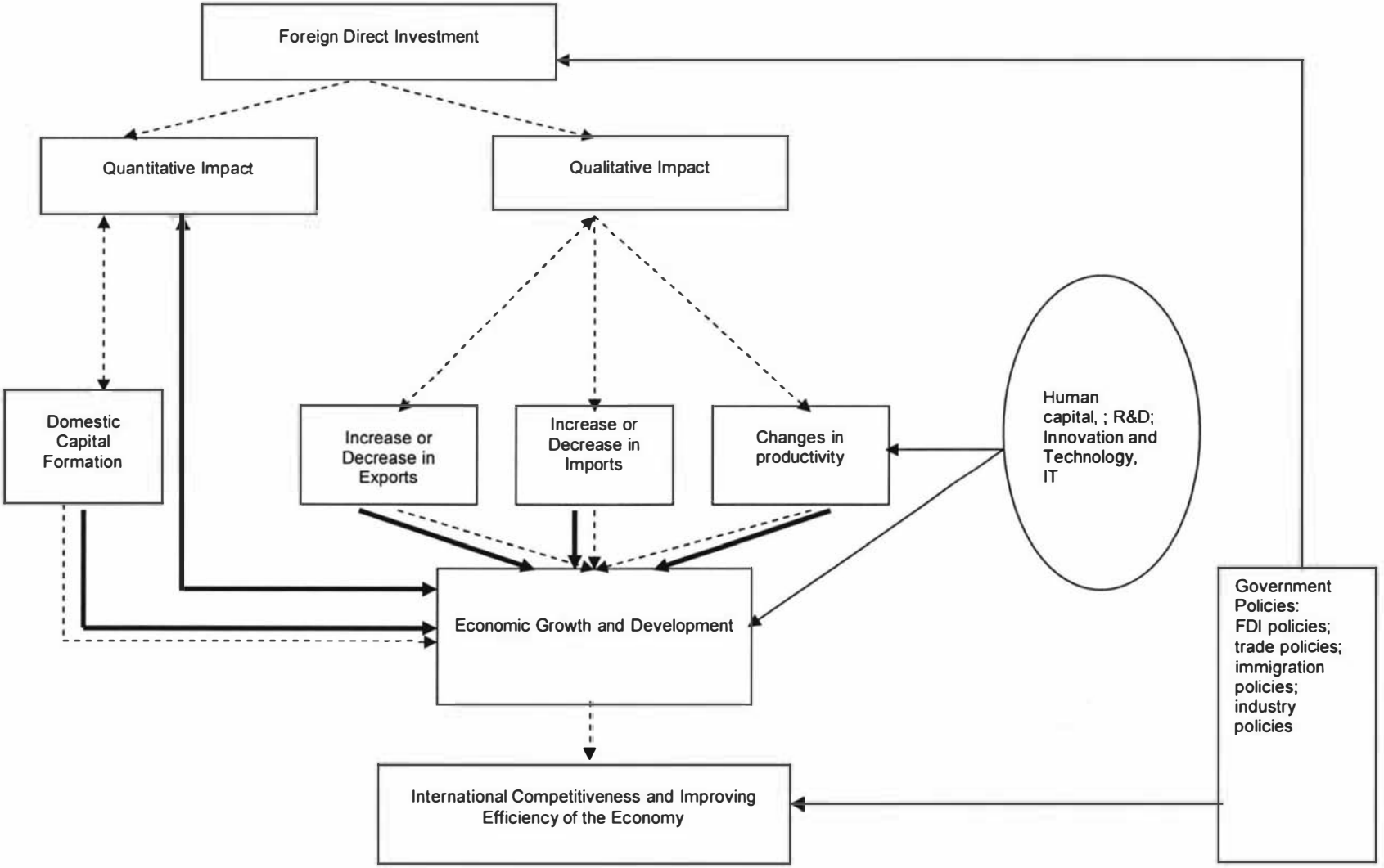
Based on the endogenous growth theory, FDI has been included as an additional input in the production process. The theoretical explanations above indicated that FDI could influence growth-determining factors directly and indirectly. The solid-line arrows in Figure 4.1 indicate the direct contribution, the dashed ones the indirect impact. The arrows show the possibility of causality that will be expected. The oval shows the other

influencing forces, such as human capital, R&D expenditure, innovations, and technological diffusion. It has also been made clear that related government policies could determine the size and the nature of FDI inflow characterising the effects both nationally and internationally. There is already some relevant research that explores the role of FDI in the growth and development process of host countries. However, in the author's view, the empirical evidence available, based on the proposed analytical schema, is still insufficient, especially for small, developed countries, which need to be analysed separately by taking the context of individual countries into consideration.

The long-run equilibrium relationship between FDI and the above macroeconomic variables are studied through five major models: growth models, import models, export models, capital formation models and labour productivity models (Refer to Appendix 4.1 for details). At the conceptual level, while this work has followed the common line taken by previous studies, it differs from the previous studies in a number of ways. First, it focuses on a small, developed host country. Thus country-specific factors like size and level of development, location, policies, and market size have different implications.[2] Second, a time series analysis of 41 years is used to distinguish the long-term impact of FDI. Third, to overcome the shortcomings of previous studies, this study has applied the recently developed time-series procedures of integration and cointegration to avoid spurious correlations in the regression analysis. Finally, this study also considers the two major events that have influenced inflow of FDI in New Zealand: the post-1984 reforms and the Closer Economic Relation (CER) agreement, which have been expected to contribute positively towards growth and development. The models will investigate these changes unique to New Zealand by incorporating dummy variables.

[2] In the case of New Zealand, these country-specific factors, which include country size, location, market size and historical aspects of trade and trading partners, are important in the analysis because of the uniqueness of New Zealand.

Figure 4.1 Schema for Methodological Investigation of the Role of FDI in a Host Country



4.2.1 The Growth Models

The economic performance of a country is generally, measured by its annual growth rate of Gross Domestic Product (GDP). The common explanatory variables that enter the growth model include annual growth rate in labour force and investment share in GDP.[3] In addition, it has been argued in several growth studies that other factors like exports, FDI, human capital, political and institutional factors also influence GDP. The literature on the subject can be divided into two groups. The first group consists of studies where FDI, along with the traditional factors, is introduced as an additional factor of production (e.g., de Mello, 1997; Borensztein et al., 1998). The approach in the second group is built on recent models of MNEs in which FDI flows are primarily linked with the income level and market size of host countries.

The basic limitation of conventional neo-classical growth models, as far as FDI is concerned, is that long-run growth can only be achieved by technical progress, which is considered to be exogenous. FDI would only affect growth in the short-run; in the long-run, under the conventional assumption of diminishing returns to capital input with a given technology, FDI would have no permanent impact on growth. To overcome this shortcoming, within new growth theory, FDI is treated as one of the factor inputs along with labour and domestic capital, and is expected to promote growth in the long-run. Whether or not technological progress is best described as an exogenous factor, the role of FDI in diffusing technology to host countries appears clear. Consequently, a positive relationship between FDI and long-run growth in the host countries should be expected. This study utilises an approach to investigate the relationship between growth and FDI by running regressions for the rate of output growth on the rate of FDI growth. Additional explanatory variables like the growth rate of domestic capital, domestic labour force, export growth, are included in order to control for other influences upon the rate of economic growth. The equation would also allow exploration of whether policies aimed at promoting FDI made a significant contribution to long-run growth.

[3] Due to the formidable problems with capital stock data, many studies have used investment as a ratio to GDP

The models that have been developed in this study are therefore extended to incorporate endogenous growth types to avoid omitted variable problems. As the hypothesis tested is to evaluate the separate contribution of investment, the results give an insight into how domestic and foreign capital components contribute to growth, which is a crucial concern for policy makers in a small, developed country like New Zealand.

Following the lead of Balasubramanyam et al. (1996), de Mello (1997), and Ramirez (2000), the model used here includes FDI as an additional factor in the production function, and the production function can be written in the usual notation as:

$$Y_t = Y(K_{pri,t}, K_{pub,t}, L_t, K_{f,t}, X_t, HC_t, FDI * HC_t), \quad (4.1a)$$

where Y is the gross domestic product in real terms[4], $K_{pri,t}$ is the domestic private capital stock, $K_{pub,t}$ is the domestic public capital, L is the labour input, $K_{f,t}$ is the stock of FDI, and X_t is exports, HC_t is the human capital and $FDI*HC_t$ is an interactive term that captures the effect of FDI on economic growth through growth in human capital. Table 4.1 gives a full description of the variables in the estimated model.

It is common for researchers to use proxies for key variables in econometric analysis, such as population data and/or substitute investment data (as a ratio of GDP) for capital stock. In this study due to problems associated with the measurement of domestic and foreign components of the capital stock, an attempt has been made to borrow from previous studies. Thus capital stock has been measured by perpetual inventory methods (Ramirez, 2000; Zhang, 2001), which can be utilised in this specification. Accordingly, in equation (4.1a), domestic capital and FDI stock have been calculated and their growth rates used to replace the growth rates of domestic and foreign capital.

[4] Y and growth in GDP have been interchangeably used to indicate economic growth.

Table 4 .1 List of Variables Used in the Estimation of the Models

Variables	Description
GDP	Gross Domestic Product
GDPPC	GDP per capita
X	Exports
IM	Imports
TDI	Total Domestic Investment
FDI	Foreign Direct Investment
K_f	Stock of FDI
K_d	Total Domestic Capital
K_{pri}	Domestic Private Capital
K_{pub}	Domestic Public Capital
I_{pub}	Domestic Public Investment
I_{pri}	Domestic Private Investment
REX	Real Exchange Rate
WGY	Real World Income Growth Rate
DC	Domestic Credit
HC	Human Capital
L	Labour Force
LP	Labour Productivity
FDIHC	FDI*HC FDI and Human Capital Interactive Variable
CI	Capital Intensity
FDIY	FDI as a Ratio of GDP
DV	Dummy Variable
OT	Openness to Trade

Following Ramirez (2000), this study estimates a modified counterpart to the production function given in equation (4.1a), as explained in Appendix 4.1.1 and the time indices have been dropped for simplicity. Thus, the generic form is given as follows:

$$\Delta \ln Y = \alpha_1 + \alpha_2 \Delta \ln K_{pri} + \alpha_3 \Delta \ln K_{pub} + \alpha_4 \Delta \ln L + \alpha_5 \Delta \ln K_f + \alpha_6 \Delta \ln X + \alpha_7 \Delta \ln HC + \alpha_8 (\Delta \ln FDI * \Delta \ln HC) + \mu_{1t}, \quad (4.1b)$$

where Δ is the difference operator, ln Y is the natural logarithm of real GDP, ln K_{pri} refers to the natural logarithm of domestic private capital stock, ln K_{pub} refers to the natural logarithm of domestic public capital stock, ln K_f is the natural logarithm of FDI stock, ln L refers to the natural logarithm of labour force, ln X is the natural logarithm of exports, ln HC is the natural logarithm of human capital, and FDI*HC is the interactive variable to capture the affect of FDI with human capital.

The economic rationale for the inclusion of the right hand side variables in equation (4.1b) and their interpretations are discussed below. The coefficients are the elasticities of output with respect to the variables in question.

Any analysis on domestic capital needs to evaluate independently its private and public impact. When the effects of the two are combined it is not possible to ascertain whether an increase in private capital would lead to a corresponding reduction in public capital or whether an enhancement in private capital encourages further public capital (Khan and Reinhart, 1990). Analysing different components of capital will explore the relationship between economic growth and domestic as well as foreign capital. Once the division is made it becomes easier to gauge their respective contributions to growth. The coefficients α_2 *and* α_3 represent the elasticity of output with respect to domestic private and public capital.

In the context of this study, the elasticity coefficient α_5, FDI's effect on growth, is the variable of interest. FDI contributes to growth directly and indirectly through several channels. FDI can affect growth, being a source of capital, thus, it has been included in

the production function so that the learning-by-doing and spillover effects associated with FDI could be investigated. FDI as an input to the production function enhances growth; thus α_5 is expected to be positive.

The general claim that the production capacity of a country is dependent on the availability of labour is the main reason to include the labour force variable in the growth model. The coefficient α_4 represents the elasticity of output with respect to the labour force. The theoretical claim that increases in labour force would negatively affect growth is expected.

Furthermore, this study extends previous empirical models by including exports and a human capital variable to investigate the impact of FDI on economic growth. For a variety of reasons the connection between exports and economic growth is quite close. Most obviously, exports raise the level of GDP. Proponents of "export-led growth" such as Ram (1985; 1987), Balassa (1985), and Bhagwati (1988) argue that exports form one of the main determinants of growth; therefore exports are taken as a fifth determinant. Based on the findings of a large number of empirical studies, that export-led growth is normally positive, the elasticity coefficient α_6 is expected to be positive (Balassa, 1985; Greenaway and Sapsford, 1994).

Studies on development theory strongly emphasise the role of education, which prompted the inclusion of human capital in the model specification (Barro and Lee, 1993). Barro (1991) and Benhabib and Spiegel (1994) have argued that human capital is probably more important than labour in the growth process. Solow (2000), for instance, pointed out that research on the role of human capital in growth "should have high priority" (p. 154). Therefore, secondary school attainment - number of students enrolled - has been proxied to measure human capital. The coefficient α_7 with respect to human capital is expected to be positive.

The effect of FDI on the growth rate of the economy is positively associated with level of human capital, that is the higher the level of human capital in the host county, the higher the effect of FDI on economic growth. Thus, studies on FDI and growth

postulate a positive link between FDI and human capital, since the application of the advanced technology embodied in FDI requires a sufficient level of human capital in host economies (Guntlach, 1995; Borensztein et al., 1998).[5] To incorporate such complementarities between FDI and human capital, this study has been extended by including an interactive variable (FDI*HC). The coefficient α_8 represents the elasticity of output with respect to FDIHC interactive term, which is expected to be positive.

It has been discussed in the literature that effective use of human capital in connection with FDI demands a domestic market for produced goods. In other words, the basic argument is that the existence of an adequate domestic market is an essential pre-requisite for a host country to reap the full benefits of FDI (Balasubramanyam et. al., 1999). The domestic market has a unique character in the case of New Zealand; thus, it needs to be investigated to see how far the small market character has impacted on the benefits of FDI. Following Balasubramanyam et al. (1999), this study adopts the simplest proxy that captures the effects of domestic market by real GDP per capita. Thus, based on these arguments a proxy for domestic market has been included in equation (4.1c).

In addition, the growth equation also takes into consideration the changes that occurred within the economy during the study period. A dummy variable is introduced for the CER agreement with Australia. Therefore, equation (4.1b) is extended by including a dummy variable and given as:

$$\begin{aligned}\Delta \ln Y = {} & \alpha_1 + \alpha_2 \Delta \ln K_{pri} + \alpha_3 \Delta \ln K_{pub} + \alpha_4 \Delta \ln L + \alpha_5 \Delta \ln K_f + \alpha_6 \Delta \ln X \\ & + \alpha_7 \Delta \ln HC + \alpha_8 (\Delta \ln FDI * \Delta \ln HC) + \alpha_9 \ln GDPPC + \alpha_{10} DV + \mu_{2t},\end{aligned} \tag{4.1c}$$

4.2.2 Foreign Direct Investment and Trade

New Zealand relies heavily on international trade. Thus, the external or international sector of the economy has always occupied a key position in economic decision-making. In recent years, the composition and direction of New Zealand's international

[5] It should be noted, however, that Borensztein et al. (1998) study does not address the effects of stock of FDI on growth.

trade has changed remarkably. In addition, aggregate data provide some support for the complementarity thesis, showing that in recent times, with increasing GDP, the level of foreign trade as well as the share of exports in GDP has also increased (Statistics New Zealand, various issues). Can this change in international trade be explained by FDI inflow?

A large body of literature provides the basis for analysing complementarity as well as substitutability between FDI and trade flows. Empirical evidence indicates both patterns of relationships in the economic history of different countries (Chunlai, 1997; Kaminski, 1998; Somwaru and Bolling, 1999). For instance, Somwaru and Bolling (1999) stated that "stages of similarities of economic development of the host countries as macroeconomic factors - such as exchange rate fluctuations and income growth - act differently in developing vs. developed countries, and exporting vs. importing countries" (p. 8). On the other hand, the case study-based evidence from New Zealand also found complementarity as well as substitutability effects between FDI and trade. The author postulates this may be a problem of the methodological issues discussed in Chapter Two, in addition to the country characteristics explained by Somwaru and Bolling (1999). This raises the question of what the relationship would be between FDI and exports and imports in a small, developed country.

This study therefore, improves on the existing literature by taking into account the econometric issues that may have biased the results of the earlier works, to answer the above question. FDI does not only appear as a one-time effect on the host country's capital account, but results in long-term effects on both the current and capital accounts of the host country. The initial investment is often financed with a combination of equity capital and international loans. Further, the operations of the MNE affiliate often generate flows of imports and exports. This study, therefore, goes beyond the existing literature by shedding some light on determinants of exports and imports by testing two types of models: First, FDI flow (value of inflow during a particular time period); and second, FDI stock (value of cumulative FDI flow at the end of a particular time period).

It has also adopted the widely held view that New Zealand represents a small, developed, open, and price-taking country in international trade. In addition, the theoretical argument that private capital is more trade oriented than public capital has been taken into consideration, thus the models have been expanded to incorporate the disaggregated domestic capital components along with foreign capital to examine the impacts on overseas trade.

Based on the theoretical possibility of complementarity between FDI and trade as presented above, the question of factors boosting trade and capital movements simultaneously becomes an interesting policy issue (Eaton and Tamura, 1994). These factors may include regional policy integration or foreign sector liberalisation. Indeed, regional trade partnership agreements may induce not only trade but also bilateral FDI inflow. The liberalisation of the external sector increases the level of competitiveness in the internal market that, in turn, would be beneficial for some investors and importers, and hence increase both trade and FDI. Thus the models of imports and exports also consider the two major events - policy reforms of the mid-80s and the CER agreement - in the specifications.

4.2.2.1 The Import Equation

To analyse the relationship between FDI and imports this study utilises two models: one is the imports equation with FDI flow and the second is with FDI stock. In general, these models take the following form:

$$IM_t = IM(FDI_t, \Omega), \tag{4.2a}$$

where FDI_t is the measure of flow or stock FDI at time t; IM_t is the value of total imports at time t; Ω is the set of variables like per capita GDP, exchange rate etc. that shift the demand for imports in the host country.

Based on equation (4.2a) an equation using the classical regression methodologies employed by Lin (1995) and Wilamoski and Tinkler (1999) is adopted to study the

import function (refer to Appendix 4.1.2 for details). The import equation for the purpose of this study is estimated as:

$$\ln IM_t = \kappa_1 + \kappa_2 \ln GDPPC_t + \kappa_3 \ln FDI_t + \kappa_4 \ln REX_t + \kappa_5 \ln I_{pri,t} + \kappa_5 \ln I_{pub,t} + \mu_{3t}, \quad (4.2b)$$

where *IM* is the value of imports, ln *GDPPC* is logarithm of per capita income, ln *FDI* is the logarithm of FDI flow, ln *REX* is the logarithm of real exchange rate, ln I_{pri} is the logarithm of domestic private investment, and ln I_{pub} is the logarithm of domestic public investment. The error term is denoted by μ and is normally distributed. The import demand equation is based on the traditional theory of demand, where the quantity demanded is expressed as total imports.

Referring to classic macroeconomic theory, this study employs GDP per capita as a proxy for the source of demand. When income increases lead to a rise in imports, particularly of luxury goods, the expected sign of the income variable is positive. Similarly, an increase in income also increases domestic capital formation. Part of this capital may require imports of intermediate and capital goods to continue the production process. The expected sign of this variable is positive.

FDI generally affects imports both directly and indirectly (Fry, 1993; 1996). As a direct effect FDI increases imports of raw materials and capital equipment, which would not otherwise occur. The indirect effect is mainly an outcome of the appreciation of the real exchange rate, which in turn stimulates unrelated imports. Although it is imperative that FDI needs to be included in the import equation, empirical evidence suggests it may have a mixed influence on imports. Thus, the sign for the variable FDI is undetermined.

Domestic consumers are assumed to face a supply curve for imports that is horizontal at the given world price. Imports, which are consequently demand determined, may be taken to depend on the price of imports relative to the price of domestically produced goods, which is approximated by the real exchange rate. The real exchange rate (REX)

is thus included in the import demand equation, which will measure competitiveness, and the expected sign is negative due to the relationship with the level of imports.

The domestic private and public investment variables are included in the import model to capture the demand created by the local production process. In particular, due to unavailability and/or limited resources, local production may demand overseas input, which will affect the import structure by the domestic investment component. Furthermore, the motivation behind the different domestic investment components would differ. As it is explained, domestic private investment could be more profit oriented than public investment. Thus the influence on imports from private investment is expected to be higher than public investment. Therefore, the import equation has been expressed with the disaggregated investment component.

Further, to estimate the impact of policy changes, such as reforms and/or the CER agreement, a dummy variable to capture the CER was included in equation (4.2b), which is re-written as equation (4.2c).

$$\begin{aligned} \ln IM_t = {} & \kappa_1 + \kappa_2 \ln GDPPC_t + \kappa_3 \ln FDI_t + \kappa_4 \ln REX_t \\ & + \kappa_5 \ln I_{pri,t} + \kappa_6 \ln I_{pub,t} + \kappa_7 DV + \mu_{4t}, \end{aligned} \tag{4.2c}$$

The import function then replaces foreign and domestic investment with capital stock to investigate the impact of cumulative investment on imports. Such an approach is necessary to sustain existing capital components and the measures that need to be taken to sustain existing foreign capital stock. New Zealand in the recent past experienced disinvestment, thus this issue must be examined. Estimating the FDI stock's impact on imports provides suitable strategies for a small, developed country in the formulation of FDI policies. That is if FDI stock has a higher propensity of imports than exports, it creates a deficit in the balance of payments and has a negative impact on host country trading activities. By analysing the impact of FDI on the balance of payments a government could encourage production activities and support the firms that use domestic resources efficiently. Therefore, the flow variables in the imports model have

been replaced by stock variables and the version of the imports model employing stock variables takes the following form

$$\ln IM_t = \theta_1 + \theta_2 \ln GDPPC_t + \theta_3 \ln K_{f,t} + \theta_4 \ln REX_t + \theta_5 \ln K_{pri,t} + \theta_6 \ln K_{pub,t} + \mu_{5t}, \quad (4.3a)$$

where the coefficients are elasticities with respect to corresponding variables as explained in equation (4.2b). This model has also been extended to test the policy changes, and represented by (4.3b).

$$\ln IM_t = \theta_1 + \theta_2 \ln GDPPC_t + \theta_3 \ln K_{f,t} + \theta_4 \ln REX_t + \theta_5 \ln K_{pri,t} + \theta_6 \ln K_{pub,t} + \theta_7 DV + \mu_{6t}, \quad (4.3b)$$

4.2.2.2 The Export Equation

Another key issue debated in the FDI literature is whether FDI creates or displaces exports from host countries, i.e. whether FDI and exports are substitutes or complements. Empirical evidence appears mixed and varies across different geographic spaces according to social and economic setting. The unique characteristics and high dependence on international trading activities of New Zealand makes it vital to test empirically the role of FDI on exports. Based on the empirical findings in the literature, the theoretical econometric equation has been setup. The export supply equation, like the import equation, is defined as follows:

$$X_t = X(FDI_t, \Phi), \quad (4.4a)$$

where FDI_t is the measure of inflow or stock of FDI at time t; X_t is the value of total exports at time t; Φ is the set of variables like world income growth, exchange rate etc. that shift the exports from the host country. Based on equation (4.4a), and as explained in Appendix 4.1.3, the model for exports takes the following form:

$$\ln X_t = \beta_1 + \beta_2 \ln I_{pri,t} + \beta_3 \ln I_{pub,t} + \beta_4 \ln FDI_t + \beta_5 WGY_t + \beta_6 \ln REX_t + \beta_7 \ln L_t + \mu_{7t}, \quad (4.4b)$$

where ln $I_{pri,}$ *and* ln I_{pub} are the natural logarithm of domestic private and public investment respectively, ln *REX* is the natural logarithm of real exchange rate, *WGY* is the world income growth, since WGY is expressed in growth rate there is no need to use logarithmic values. ln *FDI* is the logarithm of FDI flow, ln *L* is the logarithm of labour, and the error term is denoted by μ. The β coefficients on explanatory variables reflect the elasticity of exports with respect to domestic private and public investment, FDI, REX, and L.

Exports of a country are normally determined by domestic capital availability, prices of export commodities, and transport costs. Production capabilities depend not only on internal capital formation but also on the level of FDI. The value of coefficient β_4 is of particular interest to this study; it reflects the percentage change in exports as a response to the percentage change in FDI. FDI increases the capital available for investment in the country and leads to changes in factor proportions and improvements in the quality of labour, thus the economic growth. Empirical evidence from previous studies (Orr, 1991; Leichenko and Erickson, 1997; Sun, 2001; Liu et al., 2002) indicates that FDI could have a positive or negative effect on exports, thus the expected sign of this variable is undetermined.

On the other hand, domestic investment is also an important factor affecting exports, as it is the major determinant of production capability. Due to New Zealand's small domestic market, its dependence on international trading activities are high and a major proportion of domestic investment is export oriented, thus it is plausible to include this variable in the export function.

In addition to domestic capital, labour is another explanatory variable in terms of domestic capacity that will determine the cost of production; labour force therefore is included as an additional variable. It is assumed that domestic costs are also reflected in the domestic price level, so that export supply is determined by the real exchange rate. In general terms, a depreciation of the exchange rate when other factors remain unchanged tends to encourage exports. There may be a time lag between the depreciation and appreciation of a currency and the time when actual trade effects are

realised. The New Zealand dollar fluctuated widely during the period of this analysis, involving long-term depreciation and a consequent stimulation of exports.

New Zealand is a large exporter of agricultural goods and a relatively small exporter of other types of goods. For the former it is recognised that New Zealand has considerable market power and that exports of such agricultural goods (for example, wool) are in part, demand determined. Theoretically, the demand for exports is determined by the rest of the world's (mainly the trading partners) income growth WGY, and a positive relationship is expected.

The export equation (4.4b) has been expanded with the dummy variable to investigate the impact of policy changes that took place during the study period. Thus the equation is given as:

$$\ln X_t = \beta_1 + \beta_2 \ln I_{pri,t} + \beta_3 \ln I_{pub,t} + \beta_4 \ln FDI_t + \beta_5 WGY_t + \beta_6 \ln REX_t + \beta_7 \ln L_t + \beta_8 DV + \mu_{8t}, \quad (4.4c)$$

To draw any conclusions, it is also important to separate the impact of FDI flow and stock on exports. The rationale for doing so is that FDI flows could fluctuate, depending on the domestic capital environment, investor decisions, and policy changes. Nevertheless, existing capital could remain in the country and influence the export structure. It is thus reasonable that the impact of FDI flow and stock is differentiated in analysing exports. The second version of the export model takes this into consideration and replaces the FDI flows with foreign capital stock. The time period is important mainly because modernisation of new facilities, dissemination of new production technologies, or other changes require time. Thus the model to capture FDI stock impact on exports takes the following form: disaggregated investment variables in equation (4.4b) have been replaced by the corresponding capital stock variables as equation (4.5a),

$$\ln X_t = \lambda_1 + \lambda_2 \ln K_{pri,t} + \lambda_3 \ln K_{pub,t} + \lambda_4 \ln K_{f,t} + \lambda_5 \ln REX + \lambda_6 WGY_t + \lambda_7 \ln L_t + \mu_{9t}, \quad (4.5a)$$

The coefficient of λ_5 is elasticity of exports with respect to real exchange rate, while λ_6 is the coefficient of world income growth as explained in equation (4.4b). In contrast to equation (4.4c), λ_2, λ_3 and λ_4 in equation (4.5a) represent the elasticity of export with respect to domestic and foreign capital stock. FDI promotes the productivity growth of domestic firms, strengthens their competitiveness, and facilitates access to overseas markets through industrial links, technology improvement and competition. As explained before, FDI is a long-term investment and even though the flows fluctuate, existing cumulative investment will contribute to the changes in exports. Similar to the explanations given in the imports equation, the exports equation (4.5a) incorporates the components of private and public capital. Based on the earlier theoretical explanations, the coefficients of private and foreign capital stock variables are expected to be positive. The FDI stock model of exports also has been estimated by including dummy variables to gather the influence of policy changes that are unique to New Zealand. Thus equation (4.5a) has been expanded as (4.5b):

$$\ln X_t = \lambda_1 + \lambda_2 \ln K_{pri,t} + \lambda_3 \ln K_{pub,t} + \lambda_4 \ln K_{f,t} + \lambda_5 \ln REX_t + \lambda_6 \ln L_t + \lambda_7 DV + \mu_{10t}, \quad (4.5b)$$

4.2.3 The Capital Formation Models

In recent theoretical and empirical work, investment has been identified as a key variable determining growth in the new growth models, where the driving force is the introduction of new goods to the economy (Romer, 1993).[6] FDI becomes important as a means of introducing new technologies and investible capital that are lacking in the host countries. When evaluating the effect of FDI on growth and development, the main question that arises is whether FDI crowds in or crowds out domestic investment.

Theoretical as well as empirical evidence suggests that FDI affects domestic capital formation through crowding-in or displacement through a crowding out process. Because the effects of FDI on domestic investment may well vary from country to

[6] This is precisely the spirit of Romer's (1993) paper on the contribution of FDI to development, which emphasises the "idea gap", thus FDI is one major agent for introducing new goods and technological know-how.

country, depending on domestic policy, the kinds of FDI a country receives may impact positively and/or negatively on the domestic capital formation. The strength of the relationship between FDI and domestic enterprises also influences whether FDI is complementarity or substitute for domestic investment. Thus, it is likely to be complementary when investment is in an undeveloped sector of the economy; the opposite is true when FDI takes place in host-country sectors that are already developed. Even if FDI does not displace domestic investment it may not stimulate new downstream or upstream production and therefore may fail to exert crowding-in effects on domestic investment (Agosin and Mayer, 2000). Furthermore, the existence of backward or forward linkages from FDI investors is a key consideration for determining the total impact of FDI on capital formation. However, as noted by Agosin and Mayer (2000), "The assessment of the effects of FDI on domestic and total investment is far from being a trivial matter. Little can be said on an a priori basis" (p. 3).

This study, based on the studies of Sun (1998b), Lipsey (2000), and Agosin and Mayer (2000), formulates models to examine the impact of FDI on New Zealand's domestic investment, which is taken as a function of FDI, income per capita and real exchange rate. Thus for the propose of this study the domestic investment equation is given as follows:

$$TDI_t = TDI(GDPPC_t, FDI_t, REX_t, DC_t), \tag{4.6a}$$

where TDI_t is the total domestic investment, $GDPPC_t$ is GDP per capita, FDI_t is foreign direct investment, REX_t is the real exchange rate and DC_t is the domestic credit. In order to measure directly the impact of the explanatory variables on the dependent variable in terms of percentage changes, equation (4.6a) is expressed in logarithmic form as[7]

$$\begin{aligned} \ln TDI_t &= \varphi_0 + \varphi_1 \ln GDPPC_t + \varphi_2 \ln FDI_t + \varphi_3 \ln REX_t \\ &\quad + \varphi_3 \ln DC_t + \alpha_5 DV + \mu_{11t}, \end{aligned} \tag{4.6b}$$

[7] Refer to Appendix 4.1.4 for theoretical capital formation model.

where ln TDI_t is natural logarithm of total domestic investment, ln $GDPPC_t$ is the natural logarithm of GDP per capita, ln FDI_t is natural logarithm of FDI flow, ln REX_t is the natural logarithm of real exchange rate and ln DC_t is natural logarithm of domestic credit. The coefficients measure the percentage changes in the domestic investment in response to a one percentage change in *GDPPC, FDI,* DC_t and *REX*; μ is the stochastic error term.

GDP per capita has been included in the equation, and is justified on the grounds of the Keynesian 'acceleration principle'. Because GDP per capita measures the average income level, changes in per capita income induce changes in investment but at a faster rate than the increase in GDP per capita. The coefficient reflects the increasing effect of income growth on domestic investment.

Based on the arguments of Fry (1993), the real exchange rate is included as a proxy for the price of non-tradable goods in relation to imports. Because the price of intermediate imports may affect the profitability of investment, changes in the real exchange rate may have an influence over the investment decision.

In general, host countries encourage FDI specifically for export-oriented sectors and as a means of access to international markets. Due to the smallness of New Zealand's domestic market, FDI is primarily encouraged to increase and diversify New Zealand's export structure. FDI into an export-oriented primary or processing industry will tend to crowd in domestic capital (Buffie, 1993). In addition, FDI constitutes a source of investment funding and could promote domestic capital through backward and forward linkages. Consequently, the expected coefficient of FDI is positive.

The effect of the domestic cost of borrowing is difficult to measure due to selective credit policies and institutional interest rates. In other words, the observable interest rates do not always reflect the scarcity of capital. This study considers the quantity rather than the price of credit. The expected sign is undetermined, because a high availability of credit can lead to higher private capital but the cost of borrowing may be prohibitive and decrease private investment. Depreciation of the real exchange rate

could affect private sector profitability and dampen investment arising from the high cost of imported capital goods (Chibber and Shafik, 1992).

FDI is seen as a fundamental ingredient in boosting flows of private capital promoting development. Not all agree, but that FDI is the most reliable vehicle for development has been accepted in many host countries. New Zealand also expected to fill the savings investment gap by allowing foreign participation in many activities. Thus it is plausible to separate FDI's impact on private and public investment. To investigate FDI's impact on domestic private investment, equation (4.6b), the total domestic investment equation, has been replaced with private investment, I_{pri} as

$$\begin{aligned} \ln I_{pri,t} &= \alpha_0 + \alpha_1 \ln GDPPC_t + \alpha_2 \ln FDI_t + \alpha_3 \ln DC_t \\ &\quad + \alpha_4 \ln REX_t + \alpha_5 DV + \mu_{12t}, \end{aligned} \tag{4.7}$$

The set of explanatory variables is similar to that of equation (4.6b). Equation (4.7) has been extended to examine the influence of policy changes on FDI inflow and its impact on private investment.

This study measures the impact of FDI on public investment, based on the arguments of Lipsey (2000), who investigated the impact of FDI not only on private investment but also on public investment. In the case of New Zealand, there are also claims that the majority of FDI flows have been invested in the privatisation of the state-owned enterprises, which needs to be investigated. This justifies the rationale behind the formulation of equation (4.8). Equation (4.8) links FDI and other variables, to public investment as follows:

$$\begin{aligned} \ln I_{pub,t} &= \nu_0 + \nu_1 \ln GDPPC_t + \nu_2 \ln FDI_t + \nu_3 \ln REX_t \\ &\quad + \nu_4 \ln DC_t + \nu_5 DV + \mu_{13t}, \end{aligned} \tag{4.8}$$

4.2.4 The Labour Productivity Models

The role of FDI in international technology spillovers and/or productivity growth has long been of interest to academics and policy makers. Though technology can be

diffused through various channels, it is suggested that the most significant means for dissemination of modern technology are external effects or spillovers from FDI, rather than formal technology transfer agreements (Blomstrom, 1989; 1991). Two types of technology transfer have been identified in the literature: an intra-firm transfer from MNE parent firms to their foreign affiliates, and from overseas affiliates of MNEs to local firms. MNEs account for much of the world's R&D and knowledge transfers. They create spillover effects as an externality for the host country (Urata and Kawai, 2000). Intra-firm technology transfer occurs through the training of local employees overseas and/or purchasing technology from parent firms. Technology spillovers are also possible through local employees working in foreign firms. They acquire knowledge and then move on to local firms or start new complementary/competing businesses. Locals can also mimic production methods used by foreign firms.

There are a number of econometric investigations of technology spillovers through FDI from DCs to LDCs. In contrast, similar studies on technology spillovers from one DC to another DC, in particular small DCs, are relatively limited.[8] The spillover effect is measured through labour productivity improvement. The binding rationale is that the long-term presence of FDI generates spillover efficiency for the domestic workforce through better machinery, equipment and skills. The presence of foreign firms exerts a stimulating effect in the training programmes of the local firms (Ramirez, 2000). It is also argued that trade is another channel for spillover effects with policy implications.

The analysis begins with the introduction of an augmented Caves-type model of uni-directional productivity spillovers from FDI as shown in equation (4.9a). In this model, labour productivity is measured formally by the value of real gross domestic product divided by the number of full-time equivalent employees (Aschauer, 1989). Labour productivity is influenced by the following variables: the physical capital intensity (CI), which is normally measured by a capital labour ratio indicating an average level of physical capital stock per worker; growth of labour force (L); ratio of FDI to GDP

[8] With the exception of a few very recent studies, for example Ali Ugur (2002).

(FDIY); and openness to trade (OT), which is proxied by the ratio of the of sum exports and imports to GDP, i.e. X + IM/GDP.

To investigate the impact of FDI on labour productivity the empirical model takes the following form:

$$Y(t) = L(t)^{\psi_1} K_d(t)^{\psi_2} FDI(t)^{\psi_3} OT(t)^{\psi_4}(t) e^{\psi_0'} \tag{4.9a}$$

where Y is the GDP, K_d is the domestic capital, FDI is foreign direct investment, and OT is openness to trade. As explained in Appendix 4.1.5 the specific functional form is given below:

$$d \ln LP = \zeta_1 + \zeta_2 d \ln L + \zeta_3 d \ln CI + \zeta_4 d \ln FDIY + \zeta_5 d \ln OT + \mu_{14t}, \tag{4.9b}$$

where the coefficients ζ_2, ζ_3, ζ_4, and ζ_5 represent the elasticities of labour productivity associated with the variable in question, and μ is the error term, which reflects the unknown factors. The labour force (L) variable is expected to have a negative relationship with labour productivity, i.e. increases in the labour force dilute labour productivity resulting in the expected sign being negative.

Productivity is an increasing function of capital intensity (CI), which is an indicator of the availability of capital per worker in the production process. Capital accumulation fosters growth and leads to improvements in labour productivity. The expected sign is therefore positive. In addition to domestic capital intensity, the model also includes foreign capital. This enables the spillover effects of FDI to be captured. Many studies analysing the impact of FDI on labour/total factor productivity found a statistically positive relationship (Barrell and Pain, 1997; Sjoholm, 1999; Ramirez, 2000).

In addition to the normal explanation given for exports as a variable in the growth equation, the ratio of the sum of exports and imports to GDP (OT) is included as a proxy for a higher degree of openness to trade, since it has been widely used as a proxy

for openness to trade in the literature.[9] The expected sign is positive because increased trade is often linked with a greater transfer of technology, learning by doing, greater market discipline, and an additional market outlet for domestically produced goods and services.

A higher value of human capital may be seen as evidence of higher learning efforts or a larger effective labour force. Therefore, when measuring productivity it is important to include human capital as a variable because of its direct relationship with improvement of labour. In other words, human capital indicates the level of knowledge or skills of the labour force. In a developed country, the inclusion of human capital results in productivity growth. The human capital coefficient should, then, have a positive sign. An educated workforce is always capable of absorbing the spillover effects of FDI more efficiently, and seizes many market opportunities. Secondary school attainment has been used as a proxy for the capacity of human capital. The productivity model (4.9b) is thus expanded to include human capital, HC (equation 4.9c).

$$d\ln LP = \zeta_1 + \zeta_2 d\ln L + \zeta_3 d\ln CI + \zeta_4 d\ln FDIY + \zeta_5 d\ln OT + \zeta_6 d\ln HC + \mu_{15t}, \quad (4.9c)$$

4.3 THE ESTIMATION PROCEDURE: UNIVARIATE MODELLING

The main focus of this study is to investigate the impact of FDI on economic growth, exports, imports, capital formation and productivity and their causality during the period of study by employing annual time-series data for the period 1960 to 2001.

In general, classical economic theory assumes that observed data come from a stationary process, where means and variance are constant over time.[10] Granger and Newbold (1974) demonstrated that most time series variables share common trends and have the potential to reveal *spurious* results. Therefore, when applying the estimation techniques to time series data, some model builders make stationary assumptions about

[9] There is no unique measure of openness to trade, see Edwards, (1998) for a succinct discussion on various measures of openness.
[10] Refer to Chapter Six for details.

the variables used in the models. However, graphs of economic time series reveal the invalidity of such assumptions, and led to the analysis of unit-root processes and cointegration. In recent times, unit-root processes and cointegration systems have played a prominent role in econometrics and macroeconomics, with applications to such diverse fields as finance, economic history, international trade, and so on. The reasons behind such an expansion are the strong intuitive appeal and highly involved technical complexity.

A non-stationary process arises when one of the above mentioned assumptions for stationarity does not hold. Therefore, cointegration analysis has been extensively applied to test the long-run equilibrium relationships among non-stationary economic variables. The time series of several variables, X_t, are cointegrated if these variables are individually nonstationary but there exists at least one linear combination of them, $Z_t = \beta' X_t$, that is stationary. Such cointegrated variables do not drift far apart and they tend to move together in the long run. Thus, when applying time series data in empirical analysis researchers should pay attention to the stationarity and cointegration properties of data.

To tackle the aforementioned problems, this study, therefore uses the *ARDL* method recently developed by Pesaran and Shin (1995)[11] to investigate the impact of FDI on the individual variables proposed. In addition, the study proposes to utilise the cointegration technique, which has received much attention since Granger formally introduced it in 1981. A simple illustration of the *ARDL* technique using a model with two variables and a maximum of two lags is explained in Appendix 4.2.

Furthermore, the main concern of this study is to investigate FDI's impact on key macroeconomic variables. As FDI does not appear only as a one-time effect on the host country's investment level, but results in long-term effects, some researchers, when modelling FDI influence on other key macroeconomic variables, apply lagged forms of

[11] *ARDL* applications and econometrics theory are analysed in Pesaran and Shin (1995) and Pesaran and Pesaran (1997).

the dependent and independent variables as explanatory variables. These can be seen in the *ARDL* procedure because *ARDL* models are dynamic in nature and explicitly consider the behaviour of a variable over time. The model shows how a change in an explanatory variable affects the dependent variable, which is "distributed" over a measurable number of future time periods. This enables the *ARDL* modelling procedure to test for short- and long-run relationships between sets of variables (Hendry, 1995). Short-run relationships between variables do not persist over long periods, making it possible to detect temporary disturbances to the links between variables, which can be picked up in the regressions. Likewise, the long-run relationship is useful in assessing shocks that occur over time, can be used regardless of the order of integration of the variables, and avoids pre-testing problems associated with other cointegration methodologies. Consequently, the *ARDL* technique minimises the possibility of spurious relation through non-stationary data while retaining valuable long-run information (Hendry, 1995). The system has an augmentation procedure that uses the minimum number of lags on each variable consistent with statistical significance to remove serial correlation from the error terms (Pesaran and Pesaran, 1997), advantages that justify the estimation procedure adopted in this study.

The *ARDL* procedure consists of two stages. In the first stage, the existence of a long-run relationship between variables concerned is examined by computing the F-statistic to test the significance of the lagged levels of variables of the series in the error correction form of the underlying *ARDL* model (Karfakis and Phipps, 2001). The test statistic is a joint test of the null hypothesis that coefficients C_0 and C_1 in the following equation (4.10) equal zero, i.e. testing whether lagged levels of variables X and Z are jointly insignificant. Thus H_0: $C_1 = C_0 = 0$. Rejection of H_0 implies the existence of long-run relationships between the variables. The error correction version of the *ARDL (p,q)* in the variables X_t and Z_t is given by:

$$\Delta X_t = \alpha + \sum_{i=1}^{p} A_i \Delta X_{t-1} + \sum_{j=1}^{q} B_i \Delta Z_{t-j} + C_0 X_{t-1} + C_1 Z_{t-1} + \mu_t \qquad (4.10)$$

The computed F-statistics under H_0: $C_1 = C_0 = 0$ have a non-standard asymptotic distribution regardless of the integration of the variables. Pesaran and Pesaran (1997) provide the tabulated appropriate critical values,[12] which consist of two sets, one assuming all regressors are purely I(1), and the other assuming they are all purely I(0).[13] These bands cover all possible combinations of variables including fractionally integrated ones into I(1) and I(0). The null hypothesis postulating no long-run relationship would be rejected (not rejected), if the computed F-statistic were higher (lower) than the upper (lower) band of the bound of the critical value. If the computed F-statistic falls outside this band, a conclusive decision can be made without any knowledge of whether the underlying variables are I(1) or I(0). On the other hand, if the F-statistic falls within the band, information on the integration is necessary before making a decision regarding the long-run relationship.

In the second stage, if the variables in each equation are found to be cointegrated, the dynamic structure of the equations can be estimated using the *ARDL* procedure.[14] The dynamic structure of the *ARDL (p,q)* model takes the following form:

$$X_t = \alpha + \sum_{i=1}^{p} A_i X_{t-i} + \sum_{j=0}^{q} B_i Z_{t-i} \mu_t \qquad (4.11)$$

where X_t is an endogenous variable, α is an intercept, Z_t is a vector of explanatory variables, p and q are, respectively, the lag lengths of X_t and Z_t, and μ is the random error term. Finally, the goodness of fit criteria and properties of the models are given in the diagnostic tests. They consist of the Durbin-Watson (DW) test for autocorrelation, normality of the residuals based on a test of skewness and kurtosis, autoregressive conditional heteroscedasticity (ARCH), and the Ramsey RESET test for the model specification.

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[12] See Pesaran and Pesaran, 1997 (pp. 477-478).

[13] This method avoids the problem of serial correlation that arises in the residual-based cointegrated methods by an appropriate augmentation (Pesaran et al., 1996).

[14] The orders of the lags in the ARDL model are selected using one of the four choice criteria. They are Theil's (1971) R-Bar Squared criterion proposed by Pesaran and Smith (1994); the Akaike Information Criterion (AIC proposed by Akaike (1973); the Schwarz Bayesian Criterion (SBC) proposed by Schwarz (1978); and the Hannan-Quinn Criterion (HQC) proposed by Hannan and Quinn (1979). Refer to Pesaran and Pesaran (1997, pp. 352-355) for the properties of the last three criteria.

4.4 DATA: SOURCES AND CONSTRUCTION

This study employs 41 annual observations covering the period 1960-2001 to analyse the impact of FDI on the New Zealand economy. Most of the data was obtained from Statistics New Zealand. GDP and GDP per capita data was collected from various official statistics yearbooks. All monetary variables have been converted to 1991/92 (constant) prices.

FDI flow data were obtained directly from Statistics New Zealand and converted into constant prices by using the GDP deflator. Statistics New Zealand collects data for the balance of payment (BOP) statistics.[15] FDI data were sourced from the annual surveys of business organizations having international transactions. The definition of FDI used complies with the guidelines of the International Monetary Fund (IMF, 2000) and OECD. The minimum qualifying threshold is fixed at the acquisition of 25% or more of any class of share or voting power in a company.[16] This statutory definition of an overseas company has been consistent for several decades (Rosenberg, 1998). It should be assumed that the analytical results of this empirical study are based on this definition of FDI.

Total capital or gross capital formation is recorded annually in the New Zealand Official Yearbooks (Statistics, New Zealand). This variable represents the outlays of producers on durable real assets, such as buildings, motor vehicles, plant and machinery, roading and improvement to land. Land is excluded from gross fixed capital formation (GFCF). The term "gross" indicates that consumption of fixed capital (i.e. depreciation) has not been deducted from the value of outlays. This variable comprises two main components - private and public capital. This study uses total, private and public capital formation in estimating the model.

[15] See Statistics New Zealand, 2001 for information on data collection methods and publications relating to FDI and some other macroeconomic variables used in this research.

[16] At present, the distribution of inward FDI by industry is not available but some measures are undertaken by Statistics New Zealand, which has published quarterly data since 2000.

Variable constructions are carried out for FDI, total domestic capital, domestic private capital and domestic public capital. To construct these stock variables the perpetual inventory method at 5% is used. A standard perpetual inventory model of the following form was employed for both the domestic and foreign capital stock data:

$$K_t = K_{t-1} + I_t - \delta K_{t-1}, \tag{4.12}$$

where K_{t-1} is the stock of capital at time t-1, I_t is the flow of domestic and inward foreign capital during period t, and δ is the rate at which both capital stocks depreciate. Initial capital stocks were estimated by aggregating 5 years of gross capital (1956-1960). The depreciation rate was assumed as 5% in this estimation.

Labour force data were acquired from the New Zealand Official Yearbook (Statistics New Zealand). In general the term "Labour Force" includes people aged 15 to 65 years who are either employed or unemployed. The human capital (HC) variable in this study is considered to be equivalent to secondary school attainments. Student attainment was used to measure the impact of the specific educational level of human capital on New Zealand's economic growth and productivity growth. Data on secondary school leavers by attainment were obtained from the web site of the Ministry of Education, and some missing data were obtained directly from the Ministry of Education and Statistics New Zealand.

The exchange rate indices were obtained from the New Zealand Official Yearbook (Various issues, published by Statistics New Zealand) and the International Financial Statistics Yearbook (Various issues, published by the IMF). Due to lack of continuity and accuracy of datasets over time, various other sources (Treasury publications) have been used so that a complete dataset for the reference period could be created.

Exports and imports data were derived from Statistics New Zealand Official Yearbooks. Some disaggregated (export/import destination) data were directly sought from Statistics New Zealand. OECD Economic Outlook and Economic Indicators were also

used to fill the gaps. Exports of merchandise were valued free-on-board (FOB), while imports were valued at cost, including insurance and freight (CIF).

World income growth data were obtained from the World Bank's macroeconomic time series dataset, which calculates the income growth of trading partners.

4.5 CONCLUSION

The primary objective of this chapter was to explain the three main steps used to investigate the impact of FDI on a small, developed, host country. These steps were: the development of the analytical framework; research models and estimation procedure; and the definition of the data used in this investigation. Findings and techniques from previous theoretical and empirical studies of FDI on other DCs and LDCs were used as a guide to develop the analytical framework and models. The analytical outline indicates the direct and indirect impact of FDI on a host country's growth and development and how FDI enhances the country's overall objectives of achieving competitiveness and efficiency. The framework also indicates the interrelationships that could be expected when a country encourages inward FDI.

The conceptual models based on this framework have been formulated to investigate various hypotheses that have been set out in Chapter One. Since the analysis involves time-series data, it is important to employ an appropriate estimation procedure to overcome the problems of spurious regression. The proposed estimation procedure, *ARDL,* is applied to investigate the hypotheses set out in this chapter. Time-series data covering the period 1960-2001 are used. The variables were selected depending on data availability and the models' appropriateness to the New Zealand economic structure. Relevant secondary data for various data constructions were collected from a variety of reliable sources. The outcomes of these models are discussed in Chapter Five.

CHAPTER FIVE

THE IMPACT OF FDI ON THE ECONOMY: A SINGLE EQUATION APPROACH

5.1 INTRODUCTION

The econometric models developed in Chapter Four considered the hypotheses set out in Chapter One. This chapter presents the results, statistical properties and interpretations of those estimated models. The general theoretical models, have now been subjected to more specific modelling and were employed to measure the impact of foreign direct investment (FDI) on economic growth, domestic investment, labour productivity, exports and imports.

As time series data have been used in the empirical work, it is imperative firstly to test the stationarity property of each variable. Engle and Granger (1987) claimed that if time series are non-stationary,[1] then, conventional hypothesis testing is likely to be not only inconsistent, but also the assumption of the usual asymptotic econometric properties will not hold, and the standard statistical tests will be invalid. Attention is given to the possible non-stationarity of the data in order to avoid spurious results in the regression analysis (Gujarati, 1995). Thus the models are estimated using an autoregressive distributed lag (*ARDL*) approach. This approach has several important properties such as derivable long-run solutions and economically interpretable error correction representation of the regressions at the levels and first differences of the variables. MICROFIT 4.0 computer software has been used for the empirical investigations.

The structure of this chapter is designed as follows: Section 5.2 presents the results of the estimation and validation of the econometric models obtained from the *ARDL* approach and the empirical results of the interactive influence between FDI and major

[1] A stochastic process, Y_t is stationary if it has a "constant mean, a constant variance and a covariance that depends only on the time between lagged observations" (Watsham and Parramore, 1997, p.230), non-fulfilment of any of these conditions implies that the data are non-stationary and refer Chapter Six for details.

macroeconomic variables. Section 5.3 considers the overall significance of the results and provides some implications for the New Zealand economy. Section 5.4 concludes the chapter by highlighting the major outcomes using the single equation approach.

5.2 THE ARDL RESULTS

The results from the *ARDL* approach are reported in this section. The dependent variables in the regression are economic growth; imports; exports; total, private and public domestic investment; and labour productivity. As the variables are in logarithmic form, the coefficients indicate the elasticity of the dependent variables in response to a one percent change in the corresponding independent variables. The test statistics and diagnostic tests reported for these results show that the Adjusted R^2 statistics for the *ARDL* parameter estimates exceed 0.75 because the data contains information about dynamic short-run relationships. The Adjusted R^2 statistics for error correction representations range from 0.31 to 0.99. This is because the error correction representations are calculated using differenced data and all information about any long-term relationship is lost when the data are differenced.

Firstly, the F-test was used to test the null hypothesis that there was "no existence of a long-run relationship". After computing the F-statistics to test the significance of the lagged levels of the variables, it is essential to determine the critical values. Pesaran and Pesaran (1997) have tabulated the appropriate critical values for different numbers of regressors. These values have to be used to observe whether the *ARDL* model contains an intercept and/or trend. Results of the F-statistics are reported in Table 5.1.

As the computed F-statistic for each equation exceeds the upper bound of the critical value of F-statistic, a conclusive decision has been made that the variables in each equation are cointegrated. Therefore, the *ARDL* procedure can be applied to estimate the equations without knowledge of whether the underlying variables employed in the models are I(0) or I(1).The optimal lags were determined using the Schwarz Bayesian or Adjusted R^2 criterion.

Table 5.1 Long-run Relationships within the Models: Results

Equations[a]	Computed F-Statistics	Critical values of the F-Statistics[b]	Significance level
(5.1a). $\ln Y = \alpha_1 + \alpha_2 \ln K_{pri} + +\alpha_3 \ln K_{pub} + \alpha_4 \ln L + \alpha_5 \ln K_f + \alpha_6 \ln X + \alpha_7 \ln HC + \alpha_8 \ln FDIHC + \alpha_9 \ln GDPPC + \alpha_{10} CER + \mu_{2t}$	4.35	2.035-3.153	90 percent
(5.1b). $\ln Y = \alpha_1 + \alpha_2 \ln K_{pri} + \alpha_3 \ln K_{pub} + \alpha_4 \ln L + \alpha_5 \ln K_f + \alpha_6 \ln X + \alpha_7 \ln HC + \alpha_8 \ln GDPPC + \alpha_9 CER + \mu_{2t}$	10.32	1.899-3.047	90 percent
(5.2a). $\ln IM_t = \kappa_1 + \kappa_2 \ln GDPPC_t + \kappa_3 \ln FDI_t + \kappa_4 \ln REX_t + \kappa_5 \ln I_{pri,t} + \kappa_6 \ln I_{pub,t} + \kappa_7 CER + \mu_{4t}$	12.09	2.141-3.256	90 percent
(5.2b). $\ln IM_t = \kappa_1 + \kappa_2 \ln GDPPC_t + \kappa_3 \ln FDI_t + \kappa_4 \ln REX_t + \kappa_5 \ln I_{pri,t} + \mu_{8t}$	13.33	2.141-3.256	90 percent
(5.3) $\ln IM_t = \theta_1 + \theta_2 \ln GDPPC_t + \theta_3 \ln K_{f,t} + \theta_4 \ln REX_t + \theta_5 \ln K_{pri,t} + \theta_6 \ln K_{pub,t} + \theta_7 CER + \mu_{6t}$	9.64	2.141-3.256	90 percent
(5.3a) $\ln IM_t = \theta_1 + \theta_2 \ln GDPPC_t + \theta_3 \ln K_{f,t} + \theta_4 \ln REX_t + \theta_5 \ln K_{pri,t} + \mu_{7t}$	11.94	2.141-3.256	90 percent
(5.4a). $\ln X_t = \beta_1 + \beta_2 \ln I_{pri,t} + \beta_3 \ln I_{pub,t} + \beta_4 \ln FDI_t + \beta_5 WGY + \beta_6 \ln REX_t + \beta_7 \ln L + \beta_8 CER + \mu_{8t}$	3.65	2.035-3.153	90 percent
(5.4b) $\ln X_t = \beta_1 + \beta_2 \ln I_{pri,t} + \beta_3 \ln FDI + \beta_4 \ln REX + \beta_5 \ln L_t + \beta_6 CER + \mu_{8t}$	4.54	2.141-3.256	90 percent
(5.5). $\ln X_t = \lambda + \lambda_2 \ln K_{pri,t} + \lambda_3 \ln K_{pub,t} + \lambda_4 \ln K_{f,t} + \lambda_5 \ln REX + \lambda_6 \ln L_t + \lambda_7 CER + \mu_{10t}$	4.15	1.956-3.085	90 percent

(5.6). $\ln TDI_t = \varphi_0 + \varphi_1 \ln GDPPC_t + \varphi_2 \ln FDI_t + \varphi_3 \ln REX_t + \varphi_4 \ln DC + \mu_{11t}$,	4.24	2.262-3.367	90 percent
(5.7). $\ln I_{pri,t} = \alpha_0 + \alpha_1 \ln GDPPC_t + \alpha_2 \ln FDI_t + \alpha_3 \ln DC_t + \alpha_4 \ln REX_t + \mu_{12t}$	3.48	2.262-3.367	90 percent
(5.8). $\ln I_{pub,t} = \upsilon_0 + \upsilon_1 \ln GDPPC_t + \upsilon_2 \ln FDI_t + \upsilon_3 \ln REX + \upsilon_4 \ln DC + \mu_{13t}$	5.24	2.262-3.367	90 percent
(5.9) $\ln LP = \vartheta_1 + \vartheta_2 \ln L + \vartheta_3 \ln CI + \vartheta_4 \ln FDIY + \vartheta_5 \ln OT + \vartheta_6 \ln HC + \mu_{15t}$	19.67	2.035-3.153	90 percent

Legend: GDP = gross domestic product; TDI = total domestic investment; I_{pri} = domestic private investment; I_{pub} = domestic public investment; FDI = foreign direct investment; k_f = FDI stock; k_{pri} = domestic private capital; k_{pub} = domestic public capital; k_d = total domestic capital; X = exports; IM = imports; REX = the real exchange rate; L = Labour force; HC = Human capital; FDIHC = FDI human capital interactive variable; WGY = world income growth; GDPPC = per capita income; lp = labour productivity; CI = capital intensity; OT = Openness to trade; CER = dummy for Closer Economic Relation Agreement; FDIY = foreign capital as a ratio of GDP.

[a] For convenience the equations developed in Chapter Four, to empirically test the impact of FDI on the economy, have been duplicated in the Table 5.1.

[b] Source: Pesaran and Pesaran, 1997.

5.3 Empirical Results: Foreign Direct Investment-Growth Nexus

Table 5.1 shows the established long-run correlation between the variables employed in the models and provides evidence to proceed with the second stage of the analysis. The base equation (4.1a) in terms of the hypothesis stated earlier, includes FDI and human capital as well as the traditional variables - domestic capital, labour force and exports - to evaluate their impact on growth. The equations are further expanded (4.1b) to investigate the impact of the FDI-human capital interactive variable on growth, by creating an interactive variable (FDI*HC). Equation (4.1c) incorporates the effect of public and private capital. The focus on the growth nexus help towards determining whether the magnitudes of foreign, public and private capital change are based on the size of domestic market. Another important effect measured is whether the Closer Economic Relations pact (CER) has a differing impact on growth if capital is obtained from foreign, public and private sources.

Equation (4.1c) has been estimated on the basis of the theoretical arguments advanced initially. The results of this growth equation in terms of the direct and indirect effects of factor inputs are reported as equation (5.1a) in Table 5.2, along with commonly used diagnostic statistics. The equation has relatively good explanatory power in terms of Adjusted R^2, and the F-statistics are significant at the one percent level. The Durbin-Watson (DW) test statistics indicate no positive or negative auto-correlation, which means the equations are methodologically unbiased. As indicated by the estimated value of Adjusted R^2, the initially estimated growth equation (4.1c), explains 75 percent of the variations of New Zealand's economic growth. Although some coefficients have the expected signs and are statistically significant at more than ten percent level, variables like labour force (L), the FDIHC interactive term and human capital (HC) indicated an insignificant impact on growth. This counter-intuitive result could be due to the simultaneous inclusion of labour force, human capital, and the FDI-human capital interactive variable. Thus, in an attempt to improve the individual significance of variables, variables with statistically insignificant t-ratios have been deleted one by one.

It has altered the results significantly and in this specification the equation has been accepted as the appropriate growth equation.

The equation (4.1c) has been re-estimated by dropping the FDI human capital interactive term and the results of this estimated final equation are discussed below. The estimated final equation (reported as 5.1b) in Table 5.2 indicates a relatively good fit to the data, and the model diagnostics indicate no concern. The estimated value of Adjusted R^2, explains 76 percent of the variation of economic growth. The coefficients of FDI stock (K_f), human capital (HC), domestic private capital (K_{pri}), domestic market (GDPPC), and exports are positive and statistically significant in the long-run demonstrating their contribution to growth.

FDI stock's impact on growth is of primary interest. The estimated FDI stock coefficient suggests that a one percent increase in the growth of FDI stock is associated with an increase in the GDP growth rate of almost 0.10 percent. FDI stock variable is positive and significant not only in the long-run but also in the short-run. This indicates that FDI in New Zealand plays a positive role in enhancing economic growth. The results therefore reject the null hypothesis stated in Chapter One. Nevertheless, magnitude of the impact of FDI is low compared to the other explanatory variables, the domestic private investment, in particular.

The growth equation has incorporated, along with FDI the impact of human capital on growth, as the human capital variable is important to the growth. It will thus, investigate the threshold level of endowments[2] as a necessary condition for the promotion of growth through FDI. New growth theory presumes that an increased level of human capital contributes positively to growth: the results support human capital contributes significantly to growth in New Zealand, and its effect is larger than the public capital

[2] The "development threshold hypothesis" is related to the notion of absorptive capacity, i.e. host countries can take advantage of the potential positive externalities associated with FDI, when they have a specific level of educational capabilities, for details refer to Borensztein at al. (1998).

variables.[3] It appears that improvements in human capital are valuable in encouraging the stages of economic growth.

The exports (X) coefficient is positive and statistically significant at the one-percent level of significance in the long-run and the short-run. The long-run relationship indicates that one percent increase in growth of exports leads to a 0.10 percent increase in economic growth. This is analogous to the export-led growth hypothesis in development literature.

Having established the relationship between FDI and growth, and human capital and growth, attention is directed towards the disaggregated impact of public and private capital on growth. Private and public capital contributes positively to growth in the long-run. Yet, only the coefficient of private capital is statistically significant. In addition, private capital's contribution is substantially larger than the FDI stock in the long-run. The estimated private capital coefficient suggests that a one percent increase in the level of private capital is associated with a 0.25 percent increase in GDP growth. Thus, private capital is an important determinant of growth.

A notable feature of the final estimated growth equation is that the domestic public investment variable has been retained despite the statistically insignificant nature of its coefficient. The rationale behind this points to the conclusion that it is domestic public investment in infrastructure projects that is playing a leading role in stages of growth and development. These projects could be in the state sector in raising socially productive capital. For its part, foreign capital and knowledge, conferred through FDI and the productivity of domestic private capital depends on the state owned socially productive capital. This leads one to believe that, to be productive, FDI and domestic private capital call for an adequate level of infrastructure further supported by public capital. It is therefore, plausible to retain the public capital in the estimated final equation.

[3] This result supports the points raised by Barro (1991), Benhabib and Spiegel (1994) and Solow (2000), who have argued that human capital is, perhaps, more important than labour in the growth process.

The above results provide evidence that foreign and domestic private capital have contributed to growth. The model has then been extended to investigate the role of the domestic market with the inclusion of GDP per capita variable as a proxy. The contribution of the domestic-market variable is positive and statistically significant at one percent level of significance, indicating its relative contribution in the long-run. The results suggest that despite New Zealand's small market, a considerable amount of FDI is invested. This may be possibly due to two important aspects. One is the inclusion of the free trade agreement as a dummy variable in the growth equation, which provides the possibility of the extended market access. Second the result may be biased depending on the proxy variables that have been used in the estimation. In essence, however, what the result suggest that the domestic market does have a role to play in the growth and development process on host countries.

What is significant is the change in the contribution by foreign and domestic capital when the CER dummy variable is added. The impact of CER on growth indicates a positive and notable impact. In addition, the link between the FDI-economic growth nexus and the contribution of the bilateral trade agreement are also shown. As expected, the estimated coefficient of CER is positive and statistically significant at the ten percent level, suggesting that the CER has contributed positively towards FDI in New Zealand. The implication is that trade agreement has had a positive effect. These results are closely linked to the FDI trend discussed in Chapter Three. It explains that after the CER agreement had been signed the inflow of Australian capital increased. The inflow has, however, been mainly channelled into the privatization of state owned enterprises.

The coefficient of $ECT_{(-1)}$, referred to as the "speed of adjustment coefficient", measures the short-run deviation of economic growth from the long-run equilibrium level (Asafu-Adjaye, 2000). In the estimated final equation, the coefficient is -0.68, indicating a rapid convergence to the long-run. It indicates that economic growth in the short-term declines by about 0.68 percent in response to a one percent positive deviation from the long-run equilibrium level. The coefficient of $ECT_{(-1)}$ is significant and implies that all the explanatory variables jointly exert short-run effects on output.

TABLE 5.2 FDI-GROWTH MODELS

Equation (5.1a) Long-run Coefficients:

$$\ln Y = \underset{(9.65)^{***}}{3.35} + \underset{(5.19)^{***}}{0.28}\ln K_{pri} + \underset{(1.83)^{*}}{0.06}\ln K_{pub} - \underset{(1.64)}{0.03}\ln L + \underset{(2.78)^{**}}{0.08}\ln K_{f} + \underset{(2.57)^{**}}{0.08}\ln X + \underset{(1.07)}{0.35}\ln HC + \underset{(0.94)}{0.03}\ln FDIHC + \underset{(8.53)^{***}}{0.39}\ln GDPPC + \underset{(2.03)^{*}}{0.16}CER$$

$$\bar{R}^2 = 0.75 \quad F_{11,26} = 9.95^{***} \quad SEE = 0.01 \quad DW = 1.76 \quad LM\chi^2(1) = 1.28$$

$$\text{Re}set\chi^2(1) = 1.04 \quad JNB\chi^2 = 0.09 \quad ARCH\chi^2 = 0.86$$

Short-run Coefficients:

$$\ln Y = \underset{(7.14)^{***}}{5.91} + \underset{(3.49)^{***}}{0.48}\ln Y_{t-1} + \underset{(4.50)^{***}}{0.50}\Delta\ln K_{pri} + \underset{(2.44)^{**}}{0.57}\Delta\ln K_{pub} - \underset{(1.68)}{0.05}\Delta\ln L + \underset{(2.37)^{**}}{0.13}\Delta\ln K_{f} - \underset{(2.66)^{**}}{0.15}\Delta\ln X + \underset{(1.02)}{0.61}\Delta\ln HC - \underset{(0.89)}{0.06}\Delta\ln FDIHC + \underset{(7.46)^{***}}{0.69}\Delta\ln GDPPC + \underset{(1.98)^{*}}{0.03} + CER - \underset{(9.97)^{***}}{0.76}ECT_{t-1}$$

$$\bar{R}^2 = 0.83 \quad F_{8,29} = 18.00^{***} \quad DW = 1.75$$

Equation (5.1b) Long-run Coefficients:

$$\ln Y = \underset{(10.59)^{***}}{3.18} + \underset{(5.50)^{***}}{0.25}\ln K_{pri} + \underset{(1.53)}{0.04}\ln K_{pub} - \underset{(2.01)^{**}}{0.04}\ln L + \underset{(5.56)^{***}}{0.10}\ln K_{f} + \underset{(3.27)^{***}}{0.10}\ln X + \underset{(3.29)^{***}}{0.04}\ln HC + \underset{(8.14)^{***}}{0.38}\ln GDPPC + \underset{(1.97)^{*}}{0.02}CER$$

$$\bar{R}^2 = 0.76 \quad F_{8,29} = 10.79^{***} \quad SEE = 0.01 \quad DW = 1.80 \quad LM\chi^2(1) = 0.71$$

$$\text{Re}set\chi^2(1) = 1.91 \quad JNB\chi^2 = 0.05 \quad ARCH\chi^2 = 0.42$$

Short-run Coefficients:

$$\ln Y = \underset{(10.04)^{***}}{5.34} + \underset{(3.40)^{***}}{0.44}\ln Y_{t-1} + \underset{(5.59)^{***}}{0.42}\Delta\ln K_{pri} + \underset{(2.95)^{**}}{0.64}\Delta\ln K_{pub} - \underset{(2.01)^{*}}{0.06}\Delta\ln L + \underset{(3.18)^{***}}{0.15}\Delta\ln K_{f} - \underset{(3.19)^{***}}{0.17}\Delta\ln X + \underset{(3.26)^{***}}{0.07}\Delta\ln HC + \underset{(8.11)^{***}}{0.65}\Delta\ln GDPPC + \underset{(1.92)^{*}}{0.02}CER - \underset{(11.14)^{***}}{0.68}ECT_{t-1}$$

$$\bar{R}^2 = 0.83 \quad F_{10,27} = 19.88^{***} \quad DW = 1.80$$

Notes: ***, ** and * are significance at the 1, 5, and 10 percent levels respectively. t ratios are given in parentheses. Critical value for $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$. The test statistics are as follows: R^2 coefficient of determination, Adjusted for degree of freedom; F = F-statistic; SEE = standard error of the estimate; LM = Lagrange multiplier test for serial correlation; RESET = Ramsey test for functional form; ARCH = Engle's Autoregressive conditional heteroscedasticity test; and JNB = normality of the residuals.

The empirical results for New Zealand show that FDI stock, exports, domestic market, human capital and private capital have a larger impact on growth than public capital, and consistently contribute to growth in the long run. The results also indicate that public investment has played a complementary role to private capital. In essence, these results indicate that domestic private capital is more potent than FDI in driving New Zealand's growth process. In terms of relative magnitudes of the coefficients, the results show that additions to the stock of domestic private capital were most effective in improving growth performance in New Zealand. It is followed by additions to FDI stock, exports, and human capital.

In small, developed countries the level of domestic private capital and the past growth performance have been the main driving forces behind economic growth. While FDI influences growth as a quantitative factor, it is more through an influence on exports and labour productivity, and through augmenting capital formation. This study has been further extended to investigate the effects of FDI on exports, labour productivity and domestic capital formation. The outcome of this investigation is reported and discussed in the following sub-sections.

5.4 IMPACT ON TRADE

The effects of FDI on the pattern of a country's output depend very much on the country size. In addition, the impact of FDI on trade patterns also needs to be assessed. FDI can lead to changes in the proportion of local factors of production, which on the other hand influence and determine the trade performance of host countries (Grossman and Helpman, 1991). Any evaluation of the impact of FDI on trade needs to consider the effects of changes in the FDI stock and flow. Any deterioration in the current account must be accompanied by an increase in imports, a decrease in exports or some combination of both. An import demand and an export supply function are, therefore, estimated to examine the impact of FDI on trade. The results obtained from the *ARDL* approach are discussed below.

5.4.1 The Import Models

The base equation (4.2c), on the basis of stated hypotheses, includes GDP per capita (GDPPC), FDI, domestic private and public investment and the real exchange rates (REX), which are necessary to evaluate the impact on imports. The models also focus on foreign and domestic private and public capital's influence, by replacing FDI and domestic investment with FDI stock and domestic capital. In addition, it examines whether CER has a different impact on imports depending on whether the capital is sourced from foreign, public or private capital sources.

Table 5.3 reveals several interesting results concerning the effects of FDI on imports. The estimated initial equation (4.2c), which is represented as equation (5.2a) shows the goodness of fit test as indicated by the estimated value of Adjusted R^{2}. It implies that the independent variables explain about 99 percent of the variation in the dependent variable. The F-statistic is statistically significant at the one percent level and confirms the hypothesis that the proposed variables in the model jointly contribute to the import structure during the period 1960-2001 with the exception of domestic investment components. The import equation has, therefore, been re-estimated by dropping the domestic public investment variable.

The estimated final equation, reported as equation (5.2b), shows a higher Adjusted R^2 value. The F-statistic is, as reported in Table 5.3 significant at the one percent level. It can be observed that considering the t-ratio for each variable the current level of FDI's impacts on imports is positive and significant at the one percent level. The explanatory variables GDPPC and REX have their expected signs and are also significant at the one percent level. Although the domestic investment variable is positive it is significant only at the ten percent level of significance. The result indicates that all these variables are likely to have an impact on imports.

The results show the importance of GDPPC in determining the demand side of imports in the long run. It implies that a one percent increase in GDPPC will induce a 1.9 percent increase in imports, whereas a one percent increase in FDI will lead to an increase of 0.1 percent in imports. Furthermore, the results also show the impact of FDI

on imports increases in the long-run from 0.05 percent to 0.15 percent. The results confirm the prior expectation that an increase in FDI, particularly in the long-run, may require additional inputs in the production process. This input need is usually filled by imports unless it is supplied domestically. The evidence thus shows that there is a complementary relationship prevailing between FDI and imports. It confirms the outcomes of previous studies establishing a positive relationship between inward FDI and imports.

Having established the relationship between FDI and imports, attention is, now, directed to combine the impact on imports and domestic private investment. The motivation behind private investment, unlike public investment, is profit-oriented. Imports are encouraged in order to continue production. In the long-run the variable is, as indicated in the estimated final equation, positive and statistically significant. It thus contributes to imports.

The coefficients of FDI, GDPPC and domestic private investment are positive and statistically significant both in the long-run and in the short-run. In the long-run the contribution of FDI and GDPPC to imports increases, however, the contribution from domestic private investment declines. The results support the theoretical assumption that increases in income and FDI inflow encourage imports in the host country. This outcome could be rationalised with the limited domestic resources available in New Zealand and had been indicated by the positive impact on imports through increases in inflow of FDI.

The opening up of the economy and its accompanying policy changes of 1984 has been viewed as major turning points in the New Zealand economy. They have implications not only for trading activities but also for the FDI. Thus a dummy variable has been assigned for the reforms and the import equation has been estimated. But the results from this equation indicate a negative and insignificant impact; consequently the dummy variable for the reforms has been left out from the final equation. However, a dummy variable for the CER agreement with Australia has been included in the estimation to analyse whether free trade agreement has an impact along with FDI. The

results show that the CER variable itself is positive but not significant on imports, therefore the CER dummy variable was also dropped from the final estimation (see equation 5.2b).

It is further necessary to examine the impact on imports from existing capital stock, as changes in imports could also result from cumulative investment, especially in relation to FDI. Turning now to the import model, which considers stocks of FDI and domestic capital, it can be seen from the diagnostic statistics associated with equation (4.3b), given as equation (5.3), that there is no evidence of functional form mis-specification, non-normally distributed errors or heteroscedasticity. In terms of DW test statistics, no positive or negative autocorrelation is identified. It means that the equation is methodologically unbiased.

The results reported in Table 5.3 for equation (5.3) indicate that the elasticity of FDI stock is positive and significant at the one percent level. The equation shows that a one percent increase in FDI stock would induce a 0.17 percent increase in imports. Although the long-run elasticities of FDI stock remain positive, the magnitude has declined from 0.31 to 0.17 from short-run to long-run. This indicates that in the short-run requirements for FDI related production may have been imported, in the long-run, they have been produced locally or purchased from domestic suppliers.

The results indicate that increases in GDPPC significantly contribute to imports. A one percent increase in GDPPC would raise imports by 0.78 percent. The REX variable also has a negative impact on imports and is significant at the one percent level. The contribution of domestic private capital is positive and significant in both the short and the long run. However, the public capital variable is insignificant in the short and the long-run, thus it has been dropped and the equation has been re-estimated.

TABLE 5.3 FDI-IMPORT MODELS

Equation (5.2a) Long-run Coefficients:

$$\ln IM = \underset{(4.51)^{***}}{6.56} + \underset{(6.66)^{***}}{2.01}\ln GDPPC + \underset{(5.33)^{***}}{0.14}\ln FDI - \underset{(3.91)^{**}}{0.81}\ln REX + \underset{(1.18)}{0.19}\ln I_{pri} - \underset{(0.18)}{0.06}\ln I_{pub} - \underset{(0.84)}{0.03}CER$$

$\bar{R}^2 = 0.99 \quad F_{11,26} = 413.03^{***} \quad SEE = 0.03 \quad DW = 2.4 \quad LM\chi^2(1) = 3.86$

$\text{Re}set\chi^2(1) = 0.09 \quad JNB\chi^2 = 0.44 \quad ARCH\chi^2 = 0.23$

Short-run Coefficients:

$$\ln IM = \underset{(3.86)^{***}}{4.38} + \underset{(2.27)^{**}}{0.49}\Delta\ln GDPPC + \underset{(3.19)^{***}}{0.05}\Delta\ln FDI + \underset{(2.55)^{*}}{0.30}\Delta\ln REX + \underset{(3.63)^{***}}{0.32}\Delta\ln I_{pri} - \underset{(1.81)^{*}}{0.08}\Delta\ln I_{pub} - \underset{(0.85)}{0.02}CER - \underset{(7.50)^{***}}{0.66}ECT_{t-1}$$

$\bar{R}^2 = 0.82 \quad F_{8,30} = 27.40^{***} \quad DW = 2.4$

Equation (5.2b) Long-run Coefficients:

$$\ln IM = \underset{(8.00)^{***}}{1.73}\ln GDPPC + \underset{(6.80)^{***}}{0.13}\ln FDI - \underset{(3.17)^{***}}{0.48}\ln REX + \underset{(2.77)^{**}}{0.28}\ln I_{pri}$$

$\bar{R}^2 = 0.99 \quad F_{11,27} = 547.14^{***} \quad SEE = 0.04 \quad DW = 2.3 \quad LM\chi^2(1) = 1.84$

$\text{Re}set\chi^2(1) = 0.47 \quad JNB\chi^2 = 1.29 \quad ARCH\chi^2 = 0.84$

Short-run Coefficients:

$$\ln IM = \underset{(2.69)^{**}}{0.62}\Delta\ln GDPPC + \underset{(3.79)^{***}}{0.06}\Delta\ln FDI + \underset{(2.81)^{***}}{0.21}\Delta\ln I_{pri} - \underset{(3.17)}{0.37}\Delta\ln REX - \underset{(8.99)^{***}}{0.76}ECT_{t-1}$$

$\bar{R}^2 = 0.74 \quad F_{8,29} = 23.13^{***} \quad DW = 2.32$

CONT. TABLE 5.3 FDI-IMPORT MODELS

Equation (5.3) Long-run Coefficients:

$$\ln IM = \underset{(1.61)}{2.26} + \underset{(3.80)^{***}}{0.78}\ln GDPPC + \underset{(3.50)^{***}}{0.17}\ln K_f - \underset{(4.88)^{***}}{0.04}\ln REX + \underset{(4.00)^{***}}{0.54}\ln K_{pri} + \underset{(0.76)}{0.13}\ln K_{pub} + \underset{(1.90)^{*}}{0.03}CER$$

$\bar{R}^2 = 0.99 \quad F_{11,26} = 626.10^{***} \quad SEE = 0.03 \quad DW = 2.2 \quad LM\chi^2(1) = 2.55$

$\text{Re}set\chi^2(1) = 0.29 \quad JNB\chi^2 = 1.75 \quad ARCH\chi^2 = 0.76$

Short-run Coefficients:

$$\ln IM = \underset{(1.59)}{2.29} + \underset{(2.16)^{**}}{0.38}\Delta\ln GDPPC + \underset{(2.71)^{**}}{0.31}\Delta\ln K_f + \underset{(2.84)^{**}}{0.37}\Delta\ln K_{f,t-1} + \underset{(0.55)}{0.55}\Delta\ln REX - \underset{(1.84)^{*}}{0.05}\Delta\ln REX_{t-1} + \underset{(4.88)^{***}}{4.44}\Delta\ln K_{pri} + \underset{(1.11)}{1.14}\Delta\ln K_{pri,t-1} - \underset{(1.27)}{0.10}\Delta\ln K_{pub} + \underset{(1.85)^{*}}{0.05}CER - \underset{(7.85)^{***}}{0.94}ECT_{t-1}$$

$\bar{R}^2 = 0.88 \quad F_{11,24} = 34.42^{***} \quad DW = 2.2$

Equation (5.3a) Long-run Coefficients:

$$\ln IM = \underset{(0.45)}{0.56} + \underset{(3.16)^{***}}{0.68}\ln GDPPC + \underset{(4.66)^{***}}{0.21}\ln K_f - \underset{(5.13)^{***}}{0.44}\ln REX + \underset{(4.13)^{***}}{0.52}\ln K_{pri}$$

$\bar{R}^2 = 0.99 \quad F_{11,26} = 853.05^{***} \quad SEE = 0.03 \quad DW = 2.0 \quad LM\chi^2(1) = 0.34$

$\text{Re}set\chi^2(1) = 0.04 \quad JNB\chi^2 = 0.19 \quad ARCH\chi^2 = 0.53$

Short-run Coefficients:

$$\ln IM = \underset{(0.45)}{0.69} + \underset{(1.69)^{**}}{0.28}\Delta\ln GDPPC + \underset{(3.17)^{**}}{0.33}\Delta\ln K_f + \underset{(2.54)}{0.31}\Delta\ln K_{f,t-1} - \underset{(0.89)^{*}}{0.08}\Delta\ln REX + \underset{(5.33)^{***}}{4.55}\Delta\ln K_{pri} - \underset{(13.72)^{***}}{0.95}ECT_{t-1}$$

$\bar{R}^2 = 0.89 \quad F_{11,24} = 49.51^{***} \quad DW = 2.0$

The results for this final equation for the import models with capital stocks are reported in Table 5.3 as equation (5.3a). The $ECT_{(-1)}$ coefficient has the expected sign and is statistically significant at the one percent level. The high absolute value of $ECT_{(-1)}$ (0.95) implies that the speed of convergence to the long-run equilibrium is much faster

when it deviates from the short-run. In essence, these results indicate that GDPPC, FDI stock, private capital and REX are potent driving forces in affecting the import structure of the economy. Nevertheless, the CER trade agreement with Australia shows a positive but insignificant impact on imports, when the imports are regressed without the domestic public capital; therefore it has been dropped from the final estimation. In sum, the results demonstrate that both FDI stock and flows have a positive and significant impact on imports. The other main explanatory variable other than FDI is GDPPC, which indicated the general pattern of New Zealand's imports. In the case of small, developed countries it should be noted the changes in domestic private capital could also lead to changes in the import structure. The finding is supported by New Zealand's major proportion of imports, which consists of luxury and consumable items (Statistics New Zealand, 1999).

5.4.2 The Export Models

A number of regression analyses have been undertaken to examine the impact of FDI and other variables on exports using the models discussed in Chapter Four. The primary model as specified by equation (4.4c) tests the impact of FDI, in terms of domestic private and public investment, labour force, the real exchange rate, and growth in world income on exports. The robustness of the impact of FDI on exports has been tested employing a number of alterations to the primary model. These include: the replacement of FDI and domestic investment by foreign and disaggregated domestic capital and the inclusion of a dummy CER variable to examine the impact of the trade agreement combined with FDI. The results from this estimation procedure are set out in Table 5.4.

The estimated coefficients presented in Table 5.4 are elasticity coefficients of exports in response to a one percent change in the explanatory variables. The results for the initially estimated equation have been reported as equation (5.4a). The impact of FDI on exports, during the study period, was positive and statistically significant. A one percent increase in FDI leads to a 0.08 percent increase in the level of exports, indicating that it had been an important driving force behind export growth and a primary determinant of

the exports structure of the economy. The labour force has a significant and positive impact on exports. The impact of foreign exchange rates on exports is also positive and significant. It confirms that the devaluation of the New Zealand dollar has positively contributed to New Zealand's export expansion over the study period. However, the domestic public investment variable and world income growth variable have insignificant impacts on New Zealand exports. Since New Zealand is a major exporter of primary products, the increase in world income may not lead to a large-scale change in export demand. It has, thus, been left out from the final estimation. Consequently, taking the non-profit motivation behind public investment, it has also been deleted from the estimated final equation.

The estimated final equation, which is represented as equation (5.4b), considers the impact of private domestic investment with FDI, labour force, real exchange rate, and the CER dummy variable. The theoretical expectation that domestic private investment is profit oriented is also examined. The result of the estimated final equation in Table 5.4 indicates a relatively good fit to the data, and model diagnostics indicate no serious econometric problems. The coefficient of the real exchange rate variable is positive and significant at the one percent significance level. That for the labour force variable is however, negative and significant at the one percent level whereas the estimated coefficient for FDI is positive and statistically significant at the one percent level. Besides the positive impact of FDI, the impact on exports of private investment is also positive. Yet, it is not significant in the long-run. With the exception of the real exchange rate, none of the variables are positive and significant in the short-run. It confirms, thus, the theoretical expectation that there is a time lag between changes in investment and changes in exports.

FDI, domestic investment, and the rate of foreign exchange affect exports only with a time lag. It is therefore vital to model the impact of stock variables on exports. The estimated final equation has been re-examined by replacing the domestic and foreign investment variables by capital stock variables. The results are reported in Table 5.4, as equation (5.5). The diagnostic tests of the equation indicate no econometric pathologies,

such as serial correlation, heteroscedasticity, non-functional form and non-normality of the residuals. The R^2 for this equation is reasonable in explaining the variables affecting the export function during the period of study.

While both FDI stock and domestic private capital have positive impacts on the long-run estimates, their magnitudes differ considerably. The magnitude of the contribution of private capital is larger in both the short and the long run. The estimated FDI stock coefficient suggests that a one percent increase is associated with an increase in exports of almost 0.26 percent. On the other hand, a one percent increase in private capital leads to nearly 0.31 percent increase in exports. A notable result in terms of this equation is that when stock variables are entered into the equation, the size of both the long-run labour force contribution and the exchange rate coefficients declines. They decreased from 1.4 and 1.2 percent in FDI flow equation (5.4b) to 0.42 percent and 0.39 percent in FDI stock equation (5.5) respectively. For a small, developed country like New Zealand when stock variables enter the equations they are the more crucial determinants of exports than the labour force and the exchange rate. The results also show that while labour may be an important factor of input in the short-run, however, the production capacity, incorporating both domestic private and foreign capital, is more important in the long-run. The FDI in New Zealand have served to achieve the basic motivations for encouraging inward FDI; that is, to gain access to international markets.

The estimated short-run relationship for equation (5.5) is reported in Table 5.4. It shows that the FDI stock variable has the correct, expected sign and is significant at the one percent level. In this short-run specification, a one percent increase in the FDI stock variable results in a nearly 0.18 percent increase in the level of exports. Similarly, a one percent increases in the domestic private capital variable results in a nearly 0.22 percent change in exports in the short-run. It should also be noted that even though the labour force and domestic public capital variables are insignificant in the long-run they have, in the final estimation, been retained because they are crucial components that explain the impact on exports. The coefficient of $ECT_{(1)}$ has the expected sign and is significant at the five percent level. This implies that the FDI stock, labour force, and the CER

agreement impart a short-run effect on exports. The coefficient of $ECT_{(-1)}$ indicates that the exports decline by about 0.70 percent in the short-run in response to a one percent positive deviation in the long-run equilibrium. This implies that any deviation from the long-run equilibrium will converge at a higher rate.

The export equation has been expanded to investigate the combined impact of FDI and the CER agreement on exports. The CER dummy variable, both in the short and long runs, also indicates a positive and statistically significant contribution towards exports. The results support the view expressed in the World Trade Organisation (WTO) Report (1996), which states that, "Market size is an important consideration for an MNC contemplating a particular FDI. By removing internal barriers to trade, a free trade area or customs union gives firms the opportunity to serve an integrated market from one or a few production sites, and thereby to reap the benefits of scale economies. ...." (p. 12).

A comparison of the effects of the measures of FDI stock and flow with other determinants of exports in equation (5.4b) to (5.5), leads to the following deduction: New Zealand's export function is jointly determined by the level of domestic private capital, FDI, and the exchange rate. In terms of FDI not only its flow but the stocks also contribute positively to exports. The positive and statistically significant effect of FDI on exports implies that FDI and exports have a complementary relationship. Nevertheless, the contribution made by the foreign capital component is less when compared to the level of domestic private capital. While FDI remains one of the main driving forces towards the expansion of New Zealand exports since about the 1960s, there remain opportunities for FDI to contribute towards export expansion. The complementary relationship between FDI and exports is largely consistent with the predictions of Helpman (1984) and Helpman and Krugman (1985).

TABLE 5.4 FDI-EXPORT MODELS

Equation (5.4a) Long-run Coefficients:

$$\ln X = \underset{(7.30)^{***}}{12.80} + \underset{(0.91)}{0.27}\ln I_{pri} - \underset{(0.80)}{0.08}\ln I_{pub} + \underset{(1.94)^{*}}{0.08}\ln FDI - \underset{(0.37)}{0.05}WGY + \underset{(2.37)^{**}}{1.32}\ln REX + \underset{(2.37)^{**}}{1.43}\ln L + \underset{(2.43)^{**}}{0.17}CER$$

$\bar{R}^2 = 0.99 \quad F_{11,26} = 488.21^{***} \quad SEE = 0.03 \quad DW = 2.8 \quad LM\chi^2(1) = 9.01$

$\text{Re}set\chi^2(1) = 1.99 \quad JNB\chi^2 = 0.05 \quad ARCH\chi^2 = 1.14$

Short-run Coefficients:

$$\ln X = \underset{(2.90)^{**}}{4.62} + \underset{(1.22)}{0.08}\Delta\ln I_{pri} - \underset{(2.55)^{**}}{0.17}\ln I_{pri_{t-1}} - \underset{(0.93)}{0.03}\Delta\ln I_{pub} + \underset{(0.82)}{0.02}\Delta\ln FDI + \underset{(0.37)}{0.002}WGY + \underset{(2.09)^{**}}{0.21}\Delta\ln REX + \underset{(0.28)}{0.08}\ln L + \underset{(2.03)^{*}}{0.06}CER - \underset{(2.64)^{**}}{0.36}ECT_{t-1}$$

$\bar{R}^2 = 0.43 \quad F_{5,34} = 4.02^{***} \quad DW = 2.8$

Equation (5.4b) Long-run Coefficients:

$$\ln X = \underset{(8.91)^{***}}{12.53} + \underset{(1.04)}{0.18}\ln I_{pri} + \underset{(4.45)^{***}}{0.12}\ln FDI + \underset{(3.72)^{***}}{1.27}\ln REX + \underset{(3.84)^{***}}{1.43}\ln L + \underset{(3.46)^{***}}{0.19}CER$$

$\bar{R}^2 = 0.99 \quad F_{9,30} = 805.88^{***} \quad SEE = 0.03 \quad DW = 1.7 \quad LM\chi^2(1) = 6.01$

$\text{Re}set\chi^2(1) = 0.01 \quad JNB\chi^2 = 0.19 \quad ARCH\chi^2 = 0.69$

Short-run Coefficients:

$$\ln X = \underset{(3.66)^{***}}{4.82} + \underset{(1.38)}{0.07}\Delta\ln I_{pri} - \underset{(2.73)^{*}}{0.16}\ln I_{pri_{t-1}} - \underset{(0.12)}{0.001}\Delta\ln FDI - \underset{(1.99)^{*}}{0.18}\Delta\ln REX - \underset{(1.29)}{0.07}\Delta\ln L - \underset{(2.84)^{**}}{0.69}\ln L_{t-1} - \underset{(3.13)^{***}}{0.07}CER - \underset{(3.49)^{***}}{0.38}ECT_{t-1}$$

$\bar{R}^2 = 0.49 \quad F_{6,33} = 6.07^{***} \quad DW = 1.7$

Equation (5.5) Long-run Coefficients:

$$\ln X = \underset{(4.56)^{***}}{6.70} + \underset{(1.72)^{*}}{0.31}\ln K_{pri} - \underset{(0.60)}{0.13}\ln K_{pub} + \underset{(2.25)^{**}}{0.26}\ln K_{f} + \underset{(2.12)^{**}}{0.39}\ln REX - \underset{(1.29)}{0.42}\ln L + \underset{(4.56)^{***}}{0.18}CER$$

$\bar{R}^2 = 0.99 \quad F_{10,29} = 602.72^{**} \quad SEE = 0.04 \quad DW = 2.0 \quad LM\chi^2(1) = 0.19$

$\text{Re}set\chi^2(1) = 3.07 \quad JNB\chi^2 = 1.18 \quad ARCH\chi^2 = 5.69$

Short-run Coefficients:

$$\ln X = \underset{(3.90)^{***}}{4.71} + \underset{(0.93)}{0.22}\Delta\ln K_{pri_{t-1}} - \underset{(2.19)^{**}}{1.23}\Delta\ln K_{pub} + \underset{(2.11)^{*}}{0.18}\Delta\ln K_{f} + \underset{(0.38)}{0.05}\Delta\ln REX - \underset{(1.36)}{0.12}\Delta\ln L + \underset{(4.15)^{***}}{0.13}CER - \underset{(9.92)^{***}}{0.70}ECT_{t-1}$$

$\bar{R}^2 = 0.89 \quad F_{7,32} = 21.26^{***} \quad DW = 2.0$

5.5 IMPACT ON DOMESTIC CAPITAL FORMATION

This section presents the results obtained from equation (4.6b) concerning the impact of FDI on domestic investment. The impact of FDI on total domestic investment was examined, followed by the models with domestic private (4.7) and public investment (4.8). The results of the initially estimated equation have been shown in Appendix 5.1. However, notable features of these equations are the insignificant impact of the dummy variable CER. Thus, it has been left out from the final estimation. The final estimated results are discussed below.

The results of the estimated final equation for total domestic investment are shown in Table 5.4 as equation (5.6). The F-statistic is significant at the one percent level and confirms the hypothesis that all the explanatory variables are important in explaining capital formation. It is seen that all the variables have the expected sign: higher GDP per capita and additional credit availability are associated with increased investment. As expected, the impact of the foreign exchange rate is negative and significant in the short and in the long-run. The crucial variable, FDI inflows, has a strongly positive effect, with a coefficient of 0.08 in the short-run, increasing to 0.23 percent in the long-run. This implies a one percent increase in FDI is associated with a 0.23 percent increase in domestically owned investment in the long-run. Complementarity between FDI and domestic investment is shown through various backward and forward linkages.

The hypothesis that FDI has a positive influence on domestic private investment has been tested by replacing total domestic investment with domestic private investment. The results are shown in Table 5.4 as equation (5.7) and results corroborate the hypothesis of complementarity between FDI and domestic private investment and support the earlier empirical outcomes.

This positive and significant impact of FDI on domestic private investment confirms that increases in the FDI flow will have forward and backward linkages with domestic capital formation. As this assessment is consistent with FDI in New Zealand complementing domestic private capital on a one-to-one basis, FDI, does not therefore,

crowd out or substitute domestic private capital formation. This implies that FDI could serve as a close substitute for other forms of foreign investment, a conclusion arrived by Rana and Dowling (1990) and Fry (1996). Private investment will, in addition, to fulfilling the needs of the supply requirement of the FDI, also increase the local production activities.

It should be noted that the impact of GDPPC is larger than the impact of FDI (coefficient of GDPPC is 3.16 and coefficient of FDI is 0.22). The equation also indicates that the availability of domestic credit (DC) has a positive impact on private investment. However, the real exchange rate (REX) is negative and significant at the five percent level. This reveals that the price of intermediate inputs could have been affected by an increase in the exchange rate, decreasing private investment. The coefficient of $ECT_{(-1)}$ is significant in equation (5.7), implying that GDP per capita, the REX, and the flow of FDI jointly give rise to short-run effects on private capital formation.

The private investment equation was also extended to investigate the impact of the CER agreement along with the FDI (see Appendix 5.1). The results indicate that with the inclusion of the CER dummy variable the contribution made by FDI to domestic private capital formation has been increased.

The private investment equation shows that the majority of the changes in total domestic investment are through effects on private investment. However, there is public concern about the impact of FDI on public investment, because FDI could crowd out domestic public investment, or has been solely used to fund the privatisation of the state owned enterprises. Thus, the capital formation models have been extended to test this dispute.

In overall terms, the diagnostic statistics associated with equation (5.8) do not indicate any serious econometric problems. The combined impact of GDPPC and domestic credit availability are, in fact, positive and highly significant. This shows the importance of such variables in determining the level of public investment. A one

percent increase in the level of GDPPC results in an increase in domestic public investment by 4.93 percent. In turn, a one percent increase in credit availability will raise domestic public investment by 0.9 percent. The REX shows a negative and statistically significant effect on domestic public investment in the long-run. While the estimated coefficient for FDI is positive, it is not significant in the short or long-run. The encouragement of domestic investment through foreign investment has been identified; in the present case FDI impact is greater on private investment rather than public investment.

The coefficient of $ECT_{(-1)}$ has the expected sign and is significant at the one percent level. This implies that FDI, REX and GDPPC jointly exert short-run effects on domestic private capital. The high absolute value of $ECT_{(1)}$, 0.51, indicates a moderate speed of convergence towards long-run equilibrium from a short-run deviation.

5.6 THE IMPACT ON LABOUR PRODUCTIVITY

The following sections discuss the impact of FDI on labour productivity. The results are given in Table 5.6 as equation (5.9). The model performs satisfactorily in terms of the conventional tests, i.e. the Adjusted R^2 and F-statistics. The Adjusted R^2 implies that the independent variables explain about 99 percent of the variation in the dependent variable, while the F-statistic is also significant at the one percent level of significance, thus implying that selected variables of the equation jointly contributed to labour productivity improvement in New Zealand during the period of study. In addition, the equation's diagnostics are not subject to econometric pathologies, such as serial correlation, heteroscedasticity, non-functional form and non-normality of the residuals.

TABLE 5.5 FDI-CAPITAL FORMATION MODELS

Equation (5.6) Long-run Coefficients:

$$\ln TDI = \underset{(10.16)^{***}}{15.87} + \underset{(6.00)^{***}}{3.27}\ln GDPPC + \underset{(2.93)^{**}}{0.23}\ln FDI + \underset{(3.59)^{***}}{0.01}\ln REX + \underset{(3.11)^{***}}{0.38}\ln DC$$

$$\bar{R}^2 = 0.94 \quad F_{11,26} = 79.60^{***} \quad SEE = 0.06 \quad DW = 1.8 \quad LM\chi^2(1) = 0.35$$

$$\text{Re}set\chi^2(1) = 1.48 \quad JNB\chi^2 = 2.76 \quad ARCH\chi^2 = 0.48$$

Short-run Coefficients:

$$\ln TDI = \underset{(5.80)^{***}}{8.41} + \underset{(1.57)}{0.53}\Delta\ln GDPPC + \underset{(2.67)^{**}}{0.08}\Delta\ln FDI + \underset{(2.09)^{**}}{0.01}\Delta\ln REX + \underset{(4.34)^{***}}{0.20}\Delta\ln DC - \underset{(4.62)^{***}}{0.52}\, ecm_{t-1}$$

$$\bar{R}^2 = 0.54 \quad F_{5,32} = 10.62^{***} \quad DW = 1.8$$

Equation (5.7) Long-run Coefficients:

$$\ln I_{pri} = \underset{(7.35)^{***}}{14.28} + \underset{(4.75)^{***}}{3.16}\ln GDPPC + \underset{(2.54)^{**}}{0.22}\ln FDI + \underset{(2.88)^{**}}{0.01}\ln REX + \underset{(1.83)^{**}}{0.26}\ln DC$$

$$\bar{R}^2 = 0.95 \quad F_{6,32} = 109.74^{**} \quad SEE = 0.08 \quad DW = 1.84 \quad LM\chi^2(1) = 0.35$$

$$\text{Re}set\chi^2(1) = 337 \quad JNB\chi^2 = 0.63 \quad ARCH\chi^2 = 0.88$$

Short-run Coefficients:

$$\ln I_{pri} = \underset{(5.21)^{***}}{7.25} + \underset{(1.95)^{**}}{0.83}\Delta\ln GDPPC + \underset{(3.41)^{**}}{0.11}\Delta\ln FDI + \underset{(2.78)^{**}}{0.01}\Delta\ln REX + \underset{(2.34)^{**}}{0.13}\Delta\ln DC - \underset{(4.25)^{***}}{0.51}\, ECT_{t-1}$$

$$\bar{R}^2 = 0.45 \quad F_{8,29} = 7.23^{***} \quad DW = 1.8$$

Equation (5.8) Long-run Coefficients:

$$\ln I_{pub} = \underset{(2.78)^{**}}{13.21} + \underset{(2.91)^{**}}{4.93}\ln GDPPC + \underset{(1.00)}{0.20}\ln FDI - \underset{(1.86)^{*}}{2.49}\ln REX + \underset{(2.57)^{**}}{0.96}\ln DC$$

$$\bar{R}^2 = 0.76 \quad F_{7,31} = 18.21^{***} \quad SEE = 0.12 \quad DW = 2.2 \quad LM\chi^2(1) = 0.84$$

$$\text{Re}set\chi^2(1) = 0.01 \quad JNB\chi^2 = 0.63 \quad ARCH\chi^2 = 1.71$$

Short-run Coefficients:

$$\ln I_{pub} = \underset{(2.07)^{**}}{4.14} - \underset{(0.07)}{0.05}\Delta\ln GDPPC + \underset{(1.23)}{0.06}\Delta\ln FDI + \underset{(0.59)}{0.20}\Delta\ln REX - \underset{(3.86)^{***}}{0.30}\Delta\ln DC - \underset{(3.03)^{***}}{0.31}\, ECT_{t-1}$$

$$\bar{R}^2 = 0.31 \quad F_{5,33} = 4.73^{***} \quad DW = 2.2$$

The coefficients for all independent variables are positive and statistically significant in the long run with the exception of the labour force. The results of the equation suggest that the immediate impact of an increase in domestic capital intensity is positive and highly significant. This indicates that capital intensity is a very important determinant of labour productivity. At first glance this may not appear to be a surprising result, because in a small, developed country like New Zealand, the productivity may be highly influenced by domestically available capital. On the other hand, an increase in the labour force has, as expected, a negative impact on labour productivity. The coefficient of negative 0.02 implies that a one percent increase in labour force results in a 0.02 percent decrease in labour productivity.

The FDI variable has a positive as well as significant impact on labour productivity. These results are not altogether surprising because the positive externalities generated in the form of a greater transfer of technology and managerial know-how are likely to favourably affect labour productivity in a host country. An increase in the level of FDI results in a positive and significant impact on labour productivity in the long-run (i.e. a one percent increase in FDI stock will improve labour productivity by 0.16 percent). Linkages between FDI and labour productivity are, as noted by Rodriguez-Clare (1996) more pronounced, when the size of the host market is larger. Thus, in relative terms, the lower contribution from FDI, compared to domestic capital intensity, could be due to the small domestic market in New Zealand.

Moreover, the labour productivity model has been extended to include a human capital factor (proxied by secondary school attainments) for examining the impact of human capital along with FDI on labour productivity growth. The human capital variable has the correct sign and is statistically significant at the one percent level. This suggests that the human capital component is an important variable contributing towards productivity improvement along with FDI. It is important to note that, when interpreting the results, it could be biased due to the human capital variable used. As explained before, the proxy variable used was determined by the limitations of the published statistics.

The short-run specification of the equation indicates a good relative fit, and the significance of the error correction term of the equation (5.9) is quite good and, as the theory predicts, the $ECT_{(-1)}$ is negative and statistically significant, suggesting a deviation from the long-run labour productivity growth during this period. The deviation is corrected by 0.92 percent in the next year. In terms of the short-run relationship, the coefficient of FDI is again positive and significant at the 10 percent level, and domestic capital intensity has a positive correlation with productivity in the short-run.

TABLE 5.6 FDI-PRODUCTIVITY MODELS

Equation (5.9) Long-run Coefficients:

$$\ln LP = \underset{}{-4.36} \underset{(2.37)^{**}}{} - \underset{(0.25)}{0.02} \ln L + \underset{(4.49)^{***}}{2.22} \ln CI + \underset{(2.00)^{**}}{0.16} \ln FDIY + \underset{(2.76)^{***}}{4.71} \ln OT + \underset{(3.32)^{***}}{0.94} \ln HC$$

$$\bar{R}^2 = 0.99 \quad F_{9,30} = 558.47^{***} \quad SEE = 0.002 \quad DW = 1.7 \quad LM\chi^2(1) = 0.49$$

$$\text{Reset}\chi^2(1) = 0.04 \quad JNB\chi^2 = 0.007 \quad ARCH\chi^2 = 1.05$$

Short-run Coefficients:

$$\ln LP = \underset{}{-0.33} \underset{(1.62)}{} - \underset{(0.25)}{0.01} \Delta \ln L + \underset{(6.06)^{***}}{0.91} \Delta \ln CI + \underset{(2.52)^{**}}{0.12} \Delta \ln FDIY + \underset{(4.20)^{***}}{0.57} \Delta \ln OT$$

$$+ \underset{(7.80)^{***}}{0.98} \Delta \ln HC - \underset{(4.34)^{***}}{0.07} ECT_{t-1}$$

$$\bar{R}^2 = 0.99 \quad F_{6,33} = 409.88^{***} \quad DW = 1.8$$

Collectively, the results indicate that the level of the FDI makes a positive contribution towards improving the labour productivity of a small, developed host country. The estimated results indicate that all explanatory variables have the expected sign. Although FDI has a statistically positive impact on labour productivity, in terms of the relative magnitude of the impact on labour productivity, the openness to trade variable has been the most important determinant followed by domestic capital intensity and, then, the FDI. The results also show the importance of having a sound educational background in increasing labour productivity, which is also vital for absorbing the new technologies introduced by investors. Productivity improvements will have a long-term

impact on the economy, and productivity spillovers gained by local firms can be an added advantage for the host country.

5.7 SIGNIFICANCE OF THE RESULTS

Many countries, including developed and developing economies, compete against one another in attracting foreign investors. They offer attractive packages and justify their action by the growth and development gains accruing from knowledge externalities generated by FDI. Although the issue is important to public policy, there is relatively little conclusive evidence to support the claim, especially for small, developed countries.

This study is an effort to further understand these issues and examines whether there exists a correlation between FDI and other proposed variables in a small, developed host country. The study seeks to improve the existing literature by focusing on FDI flow and stock. This is done in two ways: firstly, it concentrates on issues of FDI, like the time lag effect and free trade agreements, which are understudied, especially in the case of small, developed countries. Secondly, it goes beyond the existing studies and sheds light on factors driving FDI and growth, exports, imports, domestic capital, and labour productivity in an interrelated way. Further, this study also addresses several econometric problems, which could have contributed towards a bias of the results of the earlier research. The implications of the results are discussed in the following paragraphs.

The empirical literature on growth, in its efforts to understand the growth process, has determined the causes of growth. There have been several studies over the past two decades. A majority of them have explained economic growth as a dependent process relying on a combination of factors such as per capita income, domestic capital formation, the effectiveness of the labour force, the extent of liberalisation (particularly with the LDCs), and the flow of FDI (Caves, 1996; Balasubramanyam et al., 1996; Borensztein et al., 1998; Calvo, 2002; Buckley et al., 2002). Yet, the treatment of the relationship between FDI and growth has rather been mixed as well as inconclusive.

Some studies (Sun, 1998a; Asafu-Adjaye, 2000; Soto, 2000; and Chou and Wong, 2001) indicated that FDI had a strong positive effect on growth. Whereas, others (Balasubramanyam et al., 1996; Borensztein et al., 1998; Carkovic and Levine, 2002), suggested that the effect of FDI had been negative and/or insignificant consequent to the mitigating influence of country-specific factors.

The developmental level of the country as mentioned before, determines MNE investment in a host country. MNEs may decide to establish a subsidiary in a developed country with the aim of gaining entry into a more developed market. But at the same time, establishment in a LDC depend either on taking advantage of low-cost production or of getting access to real resources. The success in the East Asian economies in utilising FDI to enhance growth is closely related to the economic policies and investment climate created by the host governments. Links between FDI and economic growth cannot, therefore, be generalised. They differ between countries depending on their stages of development.

This study has, compared to previous studies, taken a new approach in that it explicitly considers country-specific factors, in particular specific-characteristics of a small, developed country. Capital stock, whether domestic or foreign, has had a beneficial effect on the economic growth of New Zealand during the period 1960-2001. The coefficient of domestic investment disaggregated into public and private investment shows that the variation in economic growth is due to domestic private capital and FDI stock. These two variables are both positive and statistically significant, indicating that both forms of capital stock have determined the economic growth. Nevertheless, domestic private capital has been more pre dominant.

The magnitude of the FDI contribution has been increasing with improvements in human capital. The signing of the CER trade agreement also has had a positive effect. Results indicate that a one percent increase in FDI stock leads to nearly 0.10 percent increase in economic growth. There is no evidence to show that inward FDI through privatisation, (which occurred after 1984) replaced public investment. Private capital, exports, and human capital are the major contributors towards economic growth. This

gave rise to a public concern that FDI in New Zealand is not making a useful contribution. The results are not altogether pessimistic. The indirect effects have to be taken into account before making a definite conclusion. The long-term growth could, in fact, be very favourable.

There are many channels through which FDI can quantitatively affect growth. Inward FDI may increase the host country's capital formation, productivity, and exports and they affect growth indirectly. There is sufficient evidence to show that foreign-owned firms trade more than locally owned ones and they are also more technologically advanced. This study has examined the influence of FDI on growth, giving due considerations to the above views. The results have been indicative and provide some insights into ways that FDI can affect a small, developed country.

While FDI and exports have been expected to be substitutes (Mundell, 1957) or complements (Markusen, 1983), FDI's effect on imports has not been predicted *a priori*. The arguments for FDI shows an initial increase in imports. The positive effect in certain instances continues without a time constraint (Blomstrom et al., 1988; Orr, 1991; Wilamoski and Tinkler, 1999). Literature on the role of FDI on trade is sparse and lopsided. It is hazardous to generalise the impact on exports and imports. It can vary depending on typological characteristics of the host nations.

The regression results obtained from the import models suggest that New Zealand imports increased in response to increased FDI levels. The results of the current study are in accordance with the studies of Orr (1991) and Wilamoski and Tinkler (1999) but it contrasts with the findings of Sharma (2000), which is in agreement with the view expressed the by WTO in the following terms:

> *" Turning to the linkages between FDI and host countries' imports ... inward FDI tend to increase the host country's imports. One reason is that MNCs often have a high propensity to import intermediate inputs, capital goods and services that are not readily available in the host countries. These include imports from the parent company of intermediate goods and services that are highly specific*

to the firm. Concerns about the quality or reliability of local suppliers of inputs can also be a factor" (WTO, 1996, p. 16).

The regression results obtained revealed that New Zealand exports expanded in statistically significant terms in response to a rise in FDI. This is in addition to favourable changes that typically affect trade patterns like real exchange rate improvements and income growth. The lagged nature of the effect represents the time it takes for an increase in FDI to work through competitive channels. The results found a complementary effect between FDI and both exports and imports. The outcomes are compatible with the findings of Tao (1997), who analysed the role of Asian investments in New Zealand. He found a positive relationship between Asian FDI and the export behaviour of firms in a sample he surveyed. Empirical findings of the present study supports this view and establishes the fact that FDI would continue to provide New Zealand with access to international networks vital to any dynamic internationally competitive economy. This is crucial in overcoming the constraints of a small domestic market.

This study also investigates the impact of FDI on domestic variables in the form of capital formation and investment, new investment opportunities, and stimulation through industrial linkages. Existing literature has found that FDI could have either a "crowding out" or "crowding in" effect. The present findings suggest that FDI complements total domestic investment. The observation is similar to a few other studies (Lee et al., 1986; Tu, 1990; Sun, 1996; McMillan, 1999). FDI has helped to increase forward and backward linkages and has channelled domestic investment into more productive investment areas. The competitive environment created by foreign companies has served as an inducement for local investment and motivated New Zealand industry.

One of the frequent benefits cited has been FDI's ability to transfer advanced technology to host countries (Saggi, 2000). Blomstrom (1989) states that FDI leads to increased efficiency and competitiveness among domestic firms. FDI can raise economic activity in a host country through productivity spillovers, local use of

available infrastructure, competitive efficiency, dissemination of management skills, and R&D activities. There are however, some studies, which served as exceptions (Saltz, 1992, cited in Campos and Kinoshita, 2002; Chen and Shimomuro, 1998; Hsu, 2000) and concluded that FDI had a negative effect on the productivity of host countries.

In the case of New Zealand, the empirical findings were supportive more of the conventional wisdom, viz an improved effect on labour productivity. Foreign companies usually expressed strong commitment to ongoing training, and took advantage of opportunities provided by the MNE's parent network to expand existing facilities. Foreign ownership could, depending on the state of the technology, have reduced the number of jobs. Nevertheless, the quality of many retained jobs would have been improved. This ensures a more highly skilled employment at management level. This is further elevated by healthy management practices enhancing performance (Enderwick et al., 1995).

5.8 CONCLUSION

This chapter has investigated the impact of FDI in New Zealand for the period from 1960 to 2001 in terms of economic growth, exports, imports, domestic capital formation, and productivity. *ARDL* regression analysis has been used to analyse the influence of these macroeconomic variables on the economy. The empirical results from each estimated final equations in all models indicated a relative goodness of fit of the data as measured by Adjusted R^2 and F-statistics. Ramsey's RESET test provides no evidence of mis-specification of functional form. Similarly, the Bera and Jarque test provides no evidence of non-normal residuals. Likewise, the Lagrange multiplier test for heteroscedasticity provides no evidence to suggest a departure from the assumption of homoscedastic disturbances. Consequently, the models are also econometrically reliable.

The empirical analysis supports the contribution of FDI and its positive economic interaction with other variables. The FDI flow and stock variables are not only

statistically significant but are also positively related to economic growth, exports, imports, domestic investment and labour productivity. FDI serves, thus, as an important promoter of growth and development with increased efficiency and effective use of resources.

The empirical results provide some important implications for the New Zealand economy. The liberalisation and internationalisation of the economy are inextricably linked to ongoing globalisation and deeper international economic integration. The competitive environment created by globalisation necessitated developing a sustainable form of competitive advantage. In this context, inward FDI has influenced the economy in a number of ways. It has contributed to innovations, product differentiation, and international market access to the local economy. The international exchange of competitive assets has generated a multifaceted network among the host and home countries. In sum, the results are remarkable. The most robust finding of this analysis is the economy's dependence o n FDI. However, FDI's efficiency revel depends on the combination of several factors.

CHAPTER SIX

THE IMPACT OF FDI ON THE ECONOMY: A MULTIVARIATE COINTEGRATED MODEL

6.1 INTRODUCTION

The results reported in Chapter Five were based on an ad hoc technique (Autoregressive distributed lag, *ARDL*) adopted to tackle the problems with existing literature, i.e. lags, exogeneity and serial correlation. They indicated the importance of foreign direct investment (FDI) as a qualitative as well as a quantitative factor in enhancing growth and development. However, recent studies[1] go beyond this simple positive/negative significance to seek evidence of Granger-causality[2] between FDI and growth, and FDI and exports or imports. Arguments, such as the occurrence of economic growth is multifaceted; the lines of causation frequently go both ways between the supposed causes and growth; the factors that are used to explain growth are interrelated; FDI is attracted to countries experiencing rapid growth since growth signifies greater opportunities for profits, emphasise the importance of this interrelationship.

Furthermore, globalisation has caused large increases in international movement of goods and capital. Growth of trade and FDI has been strong, although since the mid-1980s FDI has surpassed world trade.[3] The link between FDI and trade has not however, been satisfactorily examined. The interrelationship FDI has with economic growth, exports or imports, labour productivity improvements, and/or domestic investment can run either way (de Soysa and Oneal, 1999; Shan, 2002; Liu et al., 2002). Given this bi-directional causation there would seem to be no compelling reason to choose any of the variables as a dependent one. New developments in econometric

[1] See for example, Khan and Leng (1997); Zhang (2001); Moudatsou (2001); Ericsson and Irandoust (2001); Basu et al. (2001); Chakraborty and Basu (2002); Shan (2002).

[2] Basically, the notion of causality is a statistical one and it does not imply any cause-and-effect relationship in a philosophical sense. It refers strictly to the concept of predictability (Granger, 1981) see sub-section 6.5.1 for details.

[3] The value of global production by MNC affiliates now exceeds the value of total world trade, suggesting that FDI production is the dominant means by which foreign markets are served (Globerman, 2002). Also see Fortanier and Maher (2002).

theory, such as the time-series concepts of cointegration and causality testing, offer investigative ways to handle bi-directional causality issues.

In contrast to previous studies, this study further expands the analytical aspects so that causal relationship issues are considered not only with growth or exports, but also with domestic investment, imports and labour productivity. These too are variables which have a causal relationship with FDI. It provides for the probing of the effects of FDI shocks on key macroeconomic variables and vice versa. This chapter builds, therefore, on several hypotheses already suggested and makes use of the vector autoregression (*VAR*) approach.

The above mentioned interrelationships are vital for government policy formulation in terms of growth and development. Section 6.2 discusses the dynamic nature of FDI and other related variables. It considers how FDI could serve as a channel for economic growth, exports and domestic investment. It also simultaneously explores whether these macroeconomic variables promotes FDI. Section 6.3 analyses the test of stationarity utilised in this study. Section 6.4 briefly reviews the cointegration methodology. Section 6.5 explains the model specification and procedure applied in the empirical estimation and then the focus leading to the concluding Section 6.6.

6.2 THEORETICAL MOTIVATION: DYNAMIC RELATIONSHIPS AMONG THE VARIABLES

The FDI literature has extensively been reviewed in Chapter Two. This chapter, therefore, only intends to clarify certain aspects necessary for the investigation of causal relationships. The idea of a development threshold, country specific characteristics, stages of development (developed or underdeveloped), and the methodologies employed suggest that FDI could have a positive or negative impact on the economy. Yet, there is no consensus on the relationship between FDI and key macroeconomic variables. In recent years, there has been a growing view that not only does FDI Granger-cause key macroeconomic variables but key macroeconomic variables also affect FDI.

Theoretically, the interrelationship between FDI and other macroeconomic variables has been strengthened by recent developments in growth and trade theories. An explanation for FDI-driven growth and trade was already presented in Chapter Two. It is possible to view FDI-driven growth rather optimistically, mainly due to wide range of complementarities MNEs can have through local firms. It could stimulate development in host countries. FDI could promote economic growth in two ways: first is through capital accumulation in the host countries. FDI encourages new inputs and superior foreign technologies, which enhances growth (Blomstrom et al., 1996; Borensztein et al., 1998; Lim, 2001). Secondly, there could be a transfer of knowledge, in the form of labour training and skill acquisition (de Mello, 1997, 1999).

There are strong arguments, on the other hand, that causality runs from growth to FDI. When rapid growth occurs foreign investment is a concomitant development. Fast growth and characteristics like macroeconomic stability, economic liberalisation, improvement in infrastructure and reformed institutional factors also encourage FDI. If these characteristics are found to be determinants of FDI, then economic growth may be created in order to attract FDI.

Higher levels of aggregate demand are another factor, which stimulates demand for overall investment, including FDI. FDI on its own can add to growth of the market (Zhang, 2 000). The larger the market, the greater will be the opportunities to realise economies of scale. Furthermore, the direction of causation also depends on existing factor endowments. Larger economies are always more attractive to FDI than smaller ones. Economies of scale, geographical location, and the availability of infrastructure are vital components in the decision-making process of MNEs. It is therefore clear that the direction of causality depends to a considerable extent on the scale effects and the existence of other conditions impacting upon growth.

Studies by Dowling and Hiemenz (1982) and Lee and Rana (1986) showed that rapid growth could induce an inflow of FDI. In certain instances a two-way causality between FDI and growth is possible. Caves (1996), showed that a strong connection between FDI growth and growth could be an outcome of either growth-driven FDI or FDI-driven

growth. It is, however, equally plausible for both variables to move in tandem. Further, whether FDI is complementary or a substitute for domestic investment emphasises the importance of the causal relationship between FDI and domestic investment.

In a similar vein, the trade-FDI nexus shows that

> *"as countries develop and approach industrialised-nation status, inward FDI contributes to their further integration into the global economy by engendering and boosting foreign trade flows. Apparently, several factors are at play. They include the development and strengthening of international networks of related enterprises and an increasing importance of foreign subsidiaries in MNEs' strategies for distribution, sales and marketing. In both cases, this leads to an important policy conclusion, namely that a developing country's ability to attract FDI is influenced significantly by the entrant's subsequent access to engage in importing and exporting activities" (OECD, 2002b, p. 11).*

FDI increases in the host country may lead to changes in the trading pattern. FDI not only affects a country's export structure, but causes imports to change from consumer to intermediate and capital goods. FDI can also have a negative impact on the economy through increased imports. The crux of the argument is that FDI tends to have a higher propensity of importable inputs, which leads to a balance of payments deficit (Lipsey, 1991; Graham and Krugman, 1995). It is therefore necessary, in addition to investigating the FDI-export relationships, to study the import side. The causal relationship between FDI and trade is generally complicated and depends largely on the nature of FDI and trade (Liu et al., 2001).

The interrelation between FDI and trade theories is, as noted in Chapter Two, relatively understudied[4] although the importance of FDI and international trade, as individual variables in economic growth, has been commonly documented. Most studies have

[4] The connection between outward FDI and exports appears to be widely treated empirically. See, for example, Lipsey and Weiss (1981); Yamawaki (1991); Pfaffermayr (1994); Alguacil and Orts (2001). Yet, only a few studies are related to inward FDI and exports or imports. See, for instance, de Mello and Fukasaku (2000); Liu et al. (2001); Alguacil and Orts (2001); Liu et al. (2002).

considered mainly the substitution-complementarity impacts between FDI and trade whereas studies that have explicitly tested for causal links between FDI and trade are extremely rare.

It is clear that host country characteristics determine the impact of FDI. The empirical findings reported in Chapter Five of this study indicated how FDI has been a significant factor in the growth and development of a small, developed country. There is evidence to show that there is potential for significant benefits from FDI towards improvements in labour productivity. Yet, they do not occur automatically. Benefits depend on the ability and innovation of local firms to engage in investment and learning so as to absorb foreign technology and skill. Competition and education are major requirements to achieve benefits. FDI flows create potential benefits for spillovers to the local labour force. However, the host country's human capital level determines the amount of FDI it can attract. This association between FDI and spillover can form the necessary foundation for policy and strategic development.

Within a cointegrated single equation approach, the significance of FDI's influence on these variables has been investigated. Yet, the relative importance of their interdependence and the feedback effects were not identified. As shown in the analytical schema (see Figure 4.1), the interrelationship between FDI and other macroeconomic variables needs to be investigated to obtain a complete understanding of the role played by FDI on a host economy. These connections are vital for policy implications in a small, developed country like New Zealand. The outcomes would show whether FDI could be deemed as a catalyst for economic growth, capital formation and trade, and could lead to an explanation of the pre-conditions required to encourage larger FDI inflows.

This study, therefore, forms further expansion on the previous empirical findings. It uses the cointegrated *VAR* approach. Multivariate techniques have been developed to investigate counterparts of the econometric models developed in Chapter Four. Based on the results from the single equation approach the most robust equation from each of

the models has been examined in this multivariate approach. These models will examine possible causal relationships among major variables (such as economic growth, exports, domestic investment, FDI, and labour productivity). They will at the same time also consider the other factors influencing the major macroeconomic variables such as GDP per capita, human capital, the exchange rate, and so on. In addition, this study also investigates the impact of the flow and stock concept of FDI on trade.

6.3 STATIONARITY

Intensive use of time-series data analysis in the field of empirical research has become more prominent in the recent past. The implicit assumption here is that the data series are stationary. However, one important property for this study is the order of integration. As defined by Johnston and DiNardo (1997) "the order of integration is the minimum number of times that needs to be differenced to yield a stationary series" (p.220). If the data are non-stationary, then the conventional hypothesis testing based on the t-ratio, F-statistics, and chi-square distribution become unrealiable. A stochastic process, Y_t, is stationary when it has a "constant mean, a constant variance and a covariance that depends only on the time between lagged observations" (Watsham and Parramore, 1997, p. 30); it is non-stationary when any one of these conditions is not fulfilled.

Granger and Newbold (1974) used Monte Carlo experimentation to show that an ordinary least squares (OLS) regression with non-stationary variables may produce spurious results, a point later explained by Phillips (1987). This implies that the statistics computed for a regression model that uses means, variance and covariance of non-stationary variables are time dependent and unlikely to converge to their true value as the sample size increases. Conventional statistics such as the t-test, R square and Durbin-Watson statistics become inaccurate and even ambiguous once their distributions cease to follow the correct asymptotic sampling distribution. Ignoring non-stationarity can consequently induce a bias towards rejecting the null hypothesis of no

relationship between variables (Escudero, 2000). When, in fact, it should not be rejected.

A non-stationary series has a unit root. Several tests, such as the Phillips and Perron (1988) non-parametric test, and the Dickey-Fuller (1979) approach, have been developed to test for stationarity by determining whether or not variables have unit roots. The Augmented Dickey-Fuller (ADF) test (1979) is viewed as one of the most efficient tests for integration level (Jackson et al., 1999). This study therefore uses the ADF test.

The ADF unit root test requires the estimation of the following regression equation:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{\rho} \lambda_i \Delta Y_{t-i} + \varepsilon_t, \quad \text{for i=1...,p} \tag{6.1}$$

where Δ is the difference operator; Y_t is the relevant time-series; ε_t represents a sequence of uncorrelated stationary error terms with zero mean and constant variance. The number of lags introduced into the unit root test is important: too few may cause the null hypothesis to be rejected too often, while too many may reduce the power of the test due to losses in degrees of freedom. There is no clear indication in the literature as to how many lags should be included. However, based on Gujarati's (1995) suggestions, enough of the lagged difference terms are added to ensure that the error term ε_t is serially independent.

After determining the appropriate lag length, the null hypothesis H_0: $\gamma = 0$ (i.e. the series has a unit root or is nonstationary) will be tested against the alternative hypothesis H_1: $\gamma < 0$ (i.e. the series is stationary). The t-ratio of the parameter γ is compared to critical τ values as compiled by Fuller (1976) or Dickey and Fuller (1979). If the levels are stationary then the variable is integrated of order zero I(0). If the series becomes stationary after the first differencing then the variables are intergraded of order one-(I(1), and so forth. Thus, rejection of H_0 implies that the series is stationary i.e. is I(0) while acceptance implies that it is integrated of order (d).

ADF tests for unit roots with and without trend will be performed on all variables. The null hypothesis is that the variable under investigation has a unit root, against the alternative that it does not, will be tested in each case of the ADF test, with 4 lags initially; then the model will be reduced until the highest significant lag has been reached. The lag length will be chosen according to the Akaike Information Criteria (AIC). The null hypothesis of a unit root can be rejected if the absolute value of the ADF statistic is greater than the 95 percent critical value. The data series in such a case is said to be stationary.

6.4 COINTEGRATION AND VECTOR ERROR CORRECTION MODELS: A BRIEF REVIEW

Once a unit root has been confirmed for a data series, the question arises as to whether there exists some long-run equilibrium relationship among the variables. This is referred to as cointegration. The concept is based on the idea that, even though economic time-series reveal non-stationary behaviour, an appropriate linear combination between variables could remove the common trend component. The resulting linear combination of the time-series variables will thus be stationary, which means the relevant time-series variables are cointegrated. Park and Phillips (1988) and Sims et al. (1990) argued traditional *VAR* is inappropriate when variables are cointegrated, because estimating a multivariate time-series model using differences of the time-series alone could result in serious misspecification, since important level terms will have been omitted (Engle and Granger, 1987).

To overcome this misspecification, analysis could be carried out by the cointegration technique. That is, once the variables included in the *VAR* model have been found to be cointegrated, the next step is to use an error correction model (*VECM*).[5] The theoretical justification for cointegration can be found in Engle and Granger (1987). They show that a *VAR* with cointegrated variables need to incorporate an error correction term

[5] The cointegrating model of VAR is a restricted version of traditional VAR and, as with bivariate cointegration, an error correction component is required in a VAR containing cointegrated variables.

(ECT) and thus can be written as a *VECM*.[6] This allows the estimated model to reflect long-run equilibrium constraints and permits flexibility in the short-run dynamics.

The research on cointegration tests has been developed in two main directions. Firstly, tests based on the residuals from a cointegration regression suggested by Engle and Granger (1987).[7] Secondly, the Engle and Granger single equation approach of cointegration is subject to a shortcoming; which is overcome by the Johansen (1988, 1992), Johansen and Juselius (1990) tests based on the system of equations utilising *VAR* models. This approach provides a multivariate framework and allows for more than one cointegration vector in the estimated model and thereby prevents any loss of efficiency. It is thus, considered superior to the Engle and Granger approach.

The Johansen (1988, 1992) and Johansen and Juselius (1990) approach commonly uses two tests to determine the number of cointegration vectors: the 'trace' test and the 'maximum-eigenvalue' test. In the trace test, the null hypothesis is that the number of cointegrating vectors is less than or equal to r, where r = 0, 1, 2, 3.....n., and in each case, the null hypothesis is tested against the relevant alternative. In the maximum eigenvalue test, the alternative for r=0 is that r=1; r=1 is tested against the alternative of r=2 and so on. If there is any divergence of results between these two tests, reliance should be placed on the evidence produced by the maximum eigenvalue test, since the results of this test are more reliable in small samples (Banerjee et al., 1986). In addition, a recent attempt by Haug (1997) using the Monte Carlo Method for ten alternative tests for cointegration has also found that the Johansen and Juselius (1990) maximum eigenvalue test has the overall least size distortions compared with the trace test.

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[6] See Zivot (2000) for econometric explanation of VARs transferred into *VECM*.

[7] The Engle and Granger based cointegarion tests have been used widely in the literature. It has, however several shortcomings such as: if there are more than two variables in the model, there can be more than one coinetgrating vectors. That is, the variables in a model may feature as a part of several equilibrium relationships governing the joint evaluation of the variables. It is possible for up to (n-1) linearly independent conintegration vectors to exist in a system with n variables. Assuming only one cointegrating vector, when there is more than one, leads to inefficiency in the sense that only a complex linear combination of all possible vectors can be obtained. When estimating a single-equation model, even if there is only one cointegrating vector, estimating a single equation is potentially inefficient because of the loss of information that results from inability of the model to treat all variables as potentially endogenous. Given that the number of cointegration vectors in a model is unknown, and given the need to allow all variables to be potentially endogenous, the Engle and Granger single equation approach to testing cointegration can give rise to misleading results.

If the maximum eigenvalue tests indicate the existence of more than one cointegrating vector, then discrimination among these multiple long-run relationships gives rise to the issue of identification of cointegrating relationships. Imposing restrictions on the cointegrating vectors motivated by economic theory does help in identifying the cointegrating vectors. A likelihood ratio test can then be performed to check the validity of these identifying restrictions.

Once cointegaring relationships between relevant variables are identified, the next concern is how these variables adjust in response to a random shock. The short-run disequilibrium dynamics are an issue. The short-run dynamics of the model are studied by analysing how each variable in a cointegrated system responds or corrects itself to the residual or error from the cointegraing vector. This justifies the use of the ECT which picks up the speed of the adjustment of each variable in response to a deviation from the steady state equilibrium. A variable with a zero speed of adjustment is Granger non-causal in determining the short-run dynamics of the other variables. The precise direction of Granger-causality can thus be detected by undertaking a likelihood ratio test to determine how significantly the ECT for each variable differs from zero.

6.5 MODEL SPECIFICATION AND ESTIMATION PROCEDURE

The theoretical arguments discussed in Section 6.2 indicated the variables that have been tested to identify the impact of FDI on the economy are interrelated, thus suggesting the models need to be analysed within a systems approach, in addition to the established single equation approach. In time-series modelling, as an alternative to single equation modelling, *VAR* models have now become an integral part of econometrics. The *VAR* methodology developed by Sims (1980) helps meet the need for a multivariate model that could estimate relationships among jointly endogenous variables without placing *a priori* restrictions on them. In this *VAR* methodology each variable will be regressed on its own lagged values as well as those of other explanatory variables in the equation. Pesaran and Pesaran (1997) provide a detailed econometric explanation of the *VAR* methodology that has been used in this study.

After the identification of the stationarity properties of the variables that have been included in the models, this study defines the vector of potentially endogenous variables to be Z_t, as an unrestricted *VAR* in the following manner:

$$Z_t = \alpha_0 + \sum_{i=1}^{p} \phi_i Z_{t-i} + \psi w_t + \mu_t \qquad (6.2)$$

where, Z_t is a (m x 1) vector of jointly determined dependent variables (i.e., all the variables that have been included in the equations); α_0 is a (m x 1) column vector; ϕ_i is a (m x m) matrix of coefficients to be estimated; w_t is a (q x 1) vector of deterministic or exogenous variables; and μ_t is a (m x 1) vector of unobsevered disturbances assumed to satisfy the following assumptions:

- *Zero mean assumption*: The (m x 1) vector of disturbances, μ_t, has zero mean: $E(\mu_t) = 0$ for $t = 1, 2, \ldots, n$

- *Homoskedasticity assumption*: The (m x 1) vector of disturbances, μ_t, has a time invariant conditional variance matrix;

- *Non-autocorrelated error assumption:* The (m x 1) vector of disturbances, μ_t, is serially uncorrelated;

- *Orthogonality assumption*: The (m x 1) vector of disturbances, μ_t, and the regressors *w* are uncorrelated;

- *Stability assumption*: The augmented *VAR* (p) is stable, i.e. all the roots of the following determinantal equation fall outside the unit circle;

- *Normality assumption:* The (m x 1) vector of disturbances, μ_t, has a multivariate normal distribution.

The single equation models developed in Chapter Four have been employed to test the significance of the variables and the impact of FDI on suggested key macroeconomic variables. The results are reported and discussed in Chapter Five. Based on those results

(i.e. the finally estimated equations are selected as the superlative models to test the hypothesis set out in Chapter One) the parsimonious models have been selected as the robust equation for the *VAR* system to be built up in this Chapter. As shown below, in the *VAR* system all variables[8] are considered endogenously.

The growth model, based on the finally estimated growth equation (5.1b), is given as (6.3) in the *VAR* model as follows:

$$\begin{bmatrix} GDP_t \\ K_{f,t} \\ K_{pri,t} \\ K_{pub,t} \\ X_t \\ L_t \\ GDPPC_t \\ HC_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} GDP_{t-1} \\ K_{f,t-1} \\ K_{pri,t-1} \\ K_{pub,t-1} \\ X_{t-1} \\ L_{t-1} \\ GDPPC_{t-1} \\ HC_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} GDP_{t-n} \\ K_{f,t-n} \\ K_{pri,t-n} \\ K_{pub,t-n} \\ X_{t-n} \\ L_{t-n} \\ GDPPC_{t-n} \\ HC_{t-n} \end{bmatrix} + \psi CER_t + \mu_t \qquad (6.3)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 8 x 8 matrices of coefficients; A_0 = 8 x 1vector of intercepts; CER_t = 8 x 1 vector of elements representing the Close Economic Relations (CER) dummy variable; and ψ = 8 x 8 matrix of coefficients of the CER dummy variable.

Based on the empirical evidence found in Chapter Five the Imports Model with FDI flow, i.e. equation (5.2b) is represented by (6.4) as follows:

$$\begin{bmatrix} IM_t \\ FDI_t \\ I_{pri,t} \\ REX_t \\ GDPPC_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} IM_{t-1} \\ FDI_{t-1} \\ I_{pri,t-1} \\ REX_{t-1} \\ GDPPC_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} IM_{t-n} \\ FDI_{t-n} \\ I_{pri,t-n} \\ REX_{t-n} \\ GDPPC_{t-n} \end{bmatrix} + \mu_t \qquad (6.4)$$

[8] All variables are expressed in logs and full description of the variables is given in Table 4.1

μ = error terms for the variables included; $A_1 - A_n$ = are 5 x 5 matrices of coefficients; A_0 = 5 x 1 vector of intercepts.

FDI stock equation (5.3a) is shown as (6.5):

$$\begin{bmatrix} IM_t \\ K_{f,t} \\ K_{pri,t} \\ REX_t \\ GDPPC_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} IM_{t-1} \\ K_{f,t-1} \\ K_{pri,t-1} \\ REX_{t-1} \\ GDPPC_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} IM_{t-n} \\ K_{f,t-n} \\ K_{pri,t-n} \\ REX_{t-n} \\ GDPPC_{t-n} \end{bmatrix} + \mu_t \qquad (6.5)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 5 x 5 matrices of coefficients; A_0 = 5 x 1 vector of intercepts.

In a similar vein, basing the finally estimated single equation for Exports Model the *VAR* equations for FDI flow and stock are given as equation (6.6) and (6.7) below:

FDI Flow equation (5.4b) is represented as (6.6):

$$\begin{bmatrix} X_t \\ FDI_t \\ I_{pri,t} \\ REX_t \\ L_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} X_{t-1} \\ FDI_{t-1} \\ I_{pri,t-1} \\ REX_{t-1} \\ L_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} X_{t-n} \\ FDI_{t-n} \\ I_{pri,t-n} \\ REX_{t-n} \\ L_{t-n} \end{bmatrix} + \psi CER_t + \mu_t \qquad (6.6)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 5 x 5 matrices of coefficients; A_0 =; 5 x 1 vector of intercepts; CER_t = 5 x 1 vector of elements representing the Close Economic Relations (CER) dummy variable; and ψ = 5 x 5 matrix of coefficients of CER dummy variable.

The corresponding FDI stock equation (5.5) is represented as (6.7):

$$\begin{bmatrix} X_t \\ K_{f,t} \\ K_{pri,t} \\ K_{pub,t} \\ REX_t \\ L_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} X_{t-1} \\ K_{f,t-1} \\ K_{pri,t-1} \\ K_{pub,t-1} \\ REX_{t-1} \\ L_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} X_{t-n} \\ K_{f,t-n} \\ K_{pri,t-n} \\ K_{pub,t-n} \\ REX_{t-n} \\ L_{t-n} \end{bmatrix} + \psi CER_t + \mu_t \qquad (6.7)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 6 x 6 matrices of coefficients; A_0 = 6 x 1 vector of intercepts; CER_t = 6 x 1 vector of elements representing the Closer Economic Relations (CER) dummy variable; and ψ = 6 x 6 matrix of coefficients of CER dummy variable.

Based on the final estimation models of single equation the capital formation models are specified in the following manner.

Total domestic investment equation (5.6) is specified as (6.8):

$$\begin{bmatrix} TDI_t \\ FDI_t \\ DC_t \\ REX_t \\ GDPPC_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} TDI_{t-1} \\ FDI_{t-1} \\ DC_{t-1} \\ REX_{t-1} \\ GDPPC_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} TDI_{t-n} \\ FDI_{t-n} \\ DC_{t-n} \\ REX_{t-n} \\ GDPPC_{t-n} \end{bmatrix} + \mu_t \qquad (6.8)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 5 x 5 matrices of coefficients; A_0 = 5 x 1 vector of intercepts.

Domestic private investment equation is (5.7) given as (6.9):

$$\begin{bmatrix} I_{pri,t} \\ FDI_t \\ DC_t \\ REX_t \\ GDPPC_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} I_{pri,t-1} \\ FDI_{t-1} \\ DC_{t-1} \\ REX_{t-1} \\ GDPPC_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} I_{pri,t-n} \\ FDI_{t-n} \\ DC_{t-n} \\ REX_{t-n} \\ GDPPC_{t-n} \end{bmatrix} + \mu_t \qquad (6.9)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 5 x 5 matrices of coefficients; A_0 = 5 x 1 vector of intercepts.

Domestic public investment equation (5.8) expressed as (6.10):

$$\begin{bmatrix} I_{pub,t} \\ FDI_t \\ DC_t \\ REX_t \\ GDPPC_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} I_{pub,t-1} \\ FDI_{t-1} \\ DC_{t-1} \\ REX_{t-1} \\ GDPPC_{t-1} \end{bmatrix} + ... + A_n \begin{bmatrix} I_{pub,t-n} \\ FDI_{t-n} \\ DC_{t-n} \\ REX_{t-n} \\ GDPPC_{t-n} \end{bmatrix} + \mu_t \qquad (6.10)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 5 x 5 matrices of coefficients; A_0 = 5 x 1 vector of intercepts.

Since none of these equations in the capital formation model includes dummy variables the exogenous component of the *VAR* system has been deleted.

Labour productivity equation (5.9) is specified as (6.11):

$$\begin{bmatrix} LP_t \\ FDIY_t \\ HC_t \\ CI_t \\ L_t \\ OT_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} LP_{t-1} \\ FDIY_{t-1} \\ HC_{t-1} \\ CI_{t-1} \\ L_{t-1} \\ OT_t \end{bmatrix} + ... + A_n \begin{bmatrix} LP_{t-n} \\ FDIY_{t-n} \\ HC_{t-n} \\ CI_{t-n} \\ L_{t-n} \\ OT_{t-n} \end{bmatrix} + \mu_t \qquad (6.11)$$

μ = error terms for the variables included; $A_1 - A_n$ = are 6 x 6 matrices of coefficients; A_0 = 6 x 1 vector of intercepts.

In this approach, the selection of lag length is an important issue as it significantly influences the test results.[9] It is better to use certain information criteria for selecting the appropriate lag length to avoid the risk of arbitrariness. The popular criteria suggested in the literature are the Akaike information criteria (AIC), and Schwartz Bayesian Criteria (SBC). This study employs both to obtain reliable lag structures for the proposed models. In addition, the choice of the lag length is tested on a host of diagnostic tests related to the properties of the residuals.

After selecting the appropriate lag length, the approach suggested in Johansen (1988, 1992) and Johansen and Juselius (1990) will be employed to determine the number of cointegaration vectors. As mentioned before, Johansen (1988) and Johansen and Juselius (1990) proposed the use of both the maximum eigenvalue and the trace statistics to test the number of cointergarting vectors. Consequently the null hypothesis is:

H_r: Rank (Π) = r (6.12)

Against

H_{r+1}: Rank (Π) = r + 1; r = 1, 2, …., M – 1, in equation (6.12)

The log-likelihood ratio statistics for the maximum eigenvalue is given as:

$LR(H_r/H_{r+1}) = -n \log (1 - \lambda_{r+1})$

where λ_r is the r^{th} largest eigenvalue.

Alternatively, in the trace test the null hypothesis H(r) defined by (6.12) against the trend-stationarity is given by:

[9] Jung and Marshall (1985) pointed out that the determination of appropriate lag length is problematic, especially when there are many variables to be examined and when few observations are taken.

$$LR(H_r/H_m) = -n\Sigma \log (1- \lambda_{r+1}) \quad (6.13)$$

where, for r = 1, 2....., m−1 and λ_{r+1}, . λ_{r+1}, ... λ_m are the largest eigenvalues.

If the variables are non-stationary, say I(1), it may be helpful to take the first difference of the variables to make them I(0) and then use the differenced variables in the *VAR* system. However, if the I(1) variables are cointegrated, differencing the variables will lead to the loss of important and useful information about the long-run relationships. That is, omitting the cointegrating combination is a specification error in a *VAR* system and such *VAR* models provide no information about the long-run which is of considerable interest to economists (Patterson, 2000).

Therefore, based on the procedures enunciated by Johansen (1988) and Johansen and Juselius (1990) the *VAR* equations ((6.3), (6.4), (6.5), (6.6), (6.7), (6.8), (6.9), (6.10) and (6.11)) of the respective models developed in this Chapter will be tested, and if cointegration exists then the *VECM* will be applied to investigate the interrelationships. This cointegrating model of *VAR* is a restricted version of the traditional *VAR*[10] and, as with bi-variate cointegration, an error correction component is required in a *VAR* containing cointegrated variables.

Thus, Equation (6.2) can now be transformed into a *VECM* form as follows:

$$\Delta Z_t = \alpha_0 + \alpha_1 t + \Pi\ Z_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Z_{t-i} + \psi\ w_t + \mu_t \quad (6.14)$$

where

- Z_t = is an (m x 1) vector of jointly determined endogenous I(1) variables;
- w_t is a (q x 1) vector of exogenous/deterministic I(0) variables excluding the intercepts and/or trends;
- μ_t is the error terms.

[10] See Maddala (2001) Chapter 14 for details.

The Π matrix conveys information about the long-run relationship between Y_t variables (key macroeconomic variables proposed in this study). The rank of Π is the number of linearly independent and stationary linear combinations of the macroeconomic variables. Therefore, testing cointegration involves testing the rank r matrix of Π by examining whether the eigenvalues of Π are significantly different from zero. Three possible conditions exist: (i) The Π matrix has full column rank, implying that the Z_t was stationary in levels to begin with; (ii) The Π matrix has zero rank, which implies the system is an unrestricted *VAR*; and finally, (iii) The Π matrix has rank r such as $0 < r > n$, indicating that there exist r linear combinations of Y_t that are cointegrated. If condition (iii) prevails, then Π can be decomposed into α and β, such that $\Pi = \alpha\beta'$. The vectors of β represent the r linear cointegrating relationships, and by testing the significance of the β coefficients it can be known whether the variables enter the cointegrating relationship significantly. The loading matrix α represents the error correction parameters, which can be interpreted as speed of adjustment parameters. As Johansen (1992) demonstrated, the significance of the α coefficients provides information about weak exogeneity of the variables in the system. An insignificant coefficient of α_g suggests the variable g is weakly exogenous - it drives the co-movements of the variables in the cointegrated system, while a significant α indicates the variable endogenously reacts to the past errors and adjusts to restore the long-run relationship.

Given the results of the Johansen (1988) and Johansen and Juselius (1990) procedure and following the Granger Representation Theorem[11] each equation in the aforementioned *VAR* system will be transformed into *VECM* equations by adding an error correction term (ECT).[12] It would be, therefore, possible to separate the long-run relationship between economic variables from their shot-run responses, and to determine the direction of Granger causality.

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[11] According to the Granger Representation Theorem, with cointegrated I(1) series, an ECT has to be included in the first differenced model in order to capture the equilibrium relationships among the cointegrated variables in their dynamic behaviour.

[12] As the results are discussed in Chapter Seven, the corresponding *VECM* models of the VAR equations, (6.3) to (6.11), are given in Appendix 7.3.

6.5.1 Causality Test

This empirical work then extended to the issue of Granger-causality between FDI and major key macroeconomic variables, where very little attention has been given in the empirical literature.[13] Granger (1986, 1988) and Engle and Granger (1987) provide a test of causality that takes into account the information provided by the cointegrated properties of variables. Following Granger (1969), an economic time-series Y_t is said to be 'Granger-caused' by another series X_t if the information in the past and present values of X_t helps to improve the forecasts of the Y_t variable. Granger-causality tests in a strictly bi-variate framework is computationally easier, but the omission of other relevant variables could result in spurious causality (Granger, 1969). Caporale et al. (1998) showed that the omission of an important variable results in invalid inferences about the causality structure of the system unless causality is in the direction of the omitted variable(s), but not vice versa. The procedure for testing Granger-causality becomes more complex when the variables X_t and Y_t have unit roots. In such cases it is useful to re-parameterise the model in an equivalent *VECM* (see Engle and Granger, 1987; Johansen, 1988).

This study tries to find the causality between FDI and the suggested key macroeconomic variables, it, therefore, assumed that there are only two variables included in the models in a *VECM* procedure. This requires a re-parameterisation of the models to test the causality between FDI and major macroeconomic variables.

[13] For example Kasibhatla and Sawhney (1996), cited in Axarlaglou et al. (2002), tested the causality between FDI and GDP growth for US data for the period 1970-1990, and found growth Granger-cause FDI not the reverse. Chakraborty and Basu (2002) found similar evidence in the study of India. Nevertheless, Zhang (1999) found FDI to enhance economic growth in the short-run and the long-run. in the case of some selected East Asian and Latin American countries. Conflicting evidence in terms of causality could be found in the studies of Khan and Leng (1997), while studies on the FDI trade nexus consider mainly outward FDI and exports (see, Alguacil and Orts (2002), with the exception of the study of Liu et al. (2001). As Kumar (1996) concluded the conflicting results of the studies are perhaps evidence of the difficulty of disentangling FDI's effect on growth from the effects on growth of FDI determinants. Further, the conflicting and limited evidence from growth-FDI nexus and FDI-trade nexus needs to be shown empirically and unequivocally to prove with individual country experiences. Thus, based on these arguments the current study extends the previous literature in that direction.

The re-parameterising of the equation can be shown in the following form[14]:

$$\Delta Y_t = \eta + \sum_{i=1}^{p-1} \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{p-1} \beta_j \Delta X_{t-i} + \theta ECT_{t-1} + \mu_t \quad (6.15)$$

$$\Delta X_t = \eta + \sum_{i=1}^{p-1} \gamma_i \Delta Y_{t-i} + \sum_{j=1}^{p-1} \delta_j \Delta X_{t-i} + \Phi ECT_{t-1} + \mu_t \quad (6.16)$$

where the lagged ECT are the lagged residuals from the cointegrating relation between Y and X. However, there are now two sources of the causation of Y_t by X_t, either through the lagged dynamic term ΔX_{t-1}, if all the β_i are not equal to zero, or through the lagged ECT, if θ is nonzero. Similarly, X_t is Granger-caused by Y_t either through the lagged dynamic terms ΔY_{t-1}, if all the γ_i are not equal to zero, or through the lagged ECT, if Φ is nonzero. Based on this concept, this study uses Granger-causality tests to examine possible causal relationships between FDI and GDP growth, exports and domestic investment. Granger (1988) suggests that if a cointegrating vector exists among the variables, there is causality among these variables in at least one direction. The Granger-causality tests can thus be used to investigate the nature of the relationship. The variables are I(1) and cointegrated: employing the equation (6.15) and (6.16) as a base, Granger-causality will be tested for the *VAR* models specified in section 6.5. Granger-causality tests are examined by the Wald test and/or the t-test of the of the ECT.

6.5.2 Impulse Response and Variance Decomposition

Since the estimated coefficients of *VAR* are difficult to interpret, it is necessary to look at the impulse response functions (IRF) and forecast error variance decompositions (FEV) of a system to draw conclusions about a *VAR*. These two functions together are called innovation accounting, which is used in this study to analyse the impact of unanticipated shocks and to examine the relationships between economic variables. According to Pesaran and Pesaran (1997), "IRF measures the time profile of the effect

[14] See Oxley and Greasley (1998); Mills (1998); Chang et al. (2001).

of shocks on the future states of a dynamical system" (p. 423). That is, it is possible to determine the reaction of the variables in the *VAR* to a one standard deviation shock in a given variable. Two types of IRFs have been developed, one by Sims (1980) orthogonalised IRFs, and the other by Koop, Pesaran and Potter (1996),[15] which is the generalised IRF.

These two can be distinguished by the relative importance they place on the ordering of the variables in the *VAR*. It should be noted that the orthogonalised approach is problematic when the researcher has limited knowledge of the order of the variables. However, generalised IRFs are independent of the order of the variables in the VAR. The impulse responses will be similar for the first variable in the *VAR* or in situations where the system covariance matrix of error is a diagonal matrix.

Lutkepohl and Reimers (1992) have developed IRF analysis of the cointegrated *VAR*. They drew on the full information maximum likelihood-based procedure developed by Johansen and Juselius (1990). This *VAR* model is very powerful and flexible because it can accommodate stationary, difference operators, and cointegrated *VAR* systems. Lutkepohl and Reimers (1992) stated that it might be deceptive to interpret the coefficient from the cointegrating relationships as the long-run elasticities or semi-elasticities of the corresponding variables. They suggested IRF analysis of the cointegrated system with multiple cointegrating roots to be more appropriate. The IRFs of cointegrating *VAR* can be computed in the same way as in the case of stationary *VAR* models. Pesaran and Pesaran (1997) noted that the main difference is the "matrices A_i, in the moving average representation of the z_t process tend to zero when the underlying *VAR* model is trend-stationary and the tend to non-zero rank deficient matrix C(1), when the underlying *VAR* model is first-difference stationary" (p. 444).

When carrying out the IRFs of cointegrating *VAR*, the rank of the long-run multiplier matrix, Π, should be taken into account so that shocks on individual variables in the model will persist and their effects will not generally die out. To provide economic interpretations from the shock, Pesaran and Pesaran (1997) suggested considering the

[15] See Pesaran and Shin,(1996a) for more information.

variable's specific shock on the cointegrating relations, $\beta' z_t$, rather than the individual variables in the model. The analyses of IRFs in this study are based on cointegrating relations rather than individual variables in the *VECM* models. The cointegrating relations among the models are explained below.

From equation (6.14), the rank of the long-run multiplier matrix, Π, could at most be equal to m_y, while the rank deficiency of Π can be given as:

Π_y is rank deficient when $y_t \sim I(1)$, $\Delta y_t \sim I(0)$, and $\beta' z_t \sim I(0)$.

The (r x 1) trend-stationary relations and $\beta' z_t$ are referred to as the cointegrating relations, which characterise the long-run equilibrium states of the *VECM* (Pesaran and Pesaran, 1997).

FEV will be used to provide an indication of the proportion of the movements in a variable's reaction sequence as a result of its own shocks compared with shocks from another variable (Enders, 1995). If a shock to one variable, x, explains none of the FEV of variable y, then the series x is said to be exogenous. On the other hand, if it explains all of the FEV, it is said to be endogenous. FEV allows inferences to be drawn about the proportion of a variable's movement in a time-series due to its own shocks or shocks to other variables within the system (Enders, 1995). This breaks down the variance of the forecast error for each variable into components that can be attributed to each endogenous variable. When there is no set way of ordering the variables (Enders and Lee, 1990), the sequence of ordering may be based on the variable that enters first having relatively more predictive impact than those that enter afterwards (Obben, 1995). Therefore, if an important variable enters the models subsequently it will have less predictive power, which is unrealistic.

The major criticism of the orthogonalised impulse response functions is: that they are not unique and depend on the way the shocks in the underlying *VAR* model are orthogonalised. Furthermore, some of the results are also significantly influenced by the order of the entry of the variables or equations in the *VAR* model, which in itself is a further reflection of the non-uniqueness problem (Pesaran and Shin, 1996).

Alternatively, Pesaran and Pesaran (1997) proposed the Generalised FEVs as a way of analysing the reaction of variables to a shock. Pesaran and Pesaran (1997) give a detailed econometric explanation of both orthogonalised and generalised FEV decompositions. Since this study uses many variables, it is problematic to find a correct order of the models; therefore, to tackle this issue this study employs the generalised forecast error variance decompositions.

6.6 CONCLUSION

The main focus of this chapter has been to describe a way of investigating the interrelationship between FDI and economic growth, exports, imports, labour productivity, domestic investment, and the causal direction during a specific period. Recent contributions in econometrics show that most macroeconomic series are non-stationary. One solution to overcome this anomaly is to employ a cointegration analysis. The econometric method of cointegration has received much attention in academic literature since the concept was formally introduced by Granger (1981). This study investigates, therefore, the co-movements of the variables simultaneously by taking a time-series approach.

Based on the dynamic relationships viewed in Section 6.2, the FDI-growth nexus, and FDI-Trade nexus will be tested within a systems approach. In time-series modelling, as an alternative to single and simultaneous equation modelling, *VAR* models have now become an integral part of econometrics. This prominence arose as a result of inherent problems associated with model specification, and this approach allows data to speak for themselves rather than the researcher specifying the dynamic structure of the model (Gujarati, 1995). This study thus considers the *VECM*, a variant of the *VAR* approach, to test research problems highlighted in Chapter One.

The major advantage of *VAR* is its simplicity in specification and estimation. In addition, it is useful in analysing all the variables symmetrically. In spite of the *VAR* methodology's simplicity, it does have some limitations, such as, the choice of lag length; the model being *a-theoretic* (uses no *a priori* information); and the difficulty of

ensuring stationarity of all the variables employed. The researchers consider, therefore, the innovation accounting tool in analysis. This study employs a similar methodology to investigate the interrelationships among proposed variables. It will examine the direction and the speed of interrelationships among the variables. The empirical findings emanating from these recent econometric methodologies will be discussed in Chapter Seven.

CHAPTER SEVEN

DYNAMIC RELATIONSHIPS AND EMPIRICAL MODELS OF VAR

7.1 INTRODUCTION

Chapter Six emphasised that it was necessary to examine the interrelationships between proposed macroeconomic variables to obtain a complete picture of the impact of foreign direct investment (FDI) on host countries. In a deeper sense, the relationship between these macroeconomic variables might be closer and more inclusive than suggested by the single equation approach. The role of FDI in this more complex context would imply not only that the FDI and major macroeconomic variables "Granger-cause" each other, but also that the interactions are amplified through a number of other variables, like domestic investment, human capital, domestic market size, etc. Failure to consider these issues can lead to insufficient estimation of the model.

In this chapter the models have been extended using a multivariate cointegrated technique to investigate the long-run effects of FDI. It helps to overcome the problem of interdependence, and the complicated cross-equation feedback of the proposed variables. It is also confirms the robustness of the results provided in Chapter Five. The results obtained in this chapter attempt to throw some light on the dynamic relationships between the proposed variables. They are based on the models developed in Chapter Six.

This chapter is organised into seven sections as follows: Section 7.2 presents results on the unit roots test, whilst Section 7.3 discusses the cointegration among the variables based on the Johansen procedure. The Granger-causality test results are reported and discussed in Section 7.4. The results of the vector error correction (*VECM*) procedure, which tests the forecast error variance decomposition (FEV) and impulse response function (IRF), are submitted in Section 7.5. Then Section 7.6 discusses the significance of the analytical results obtained from the vector autoregression (*VAR*) system. Section 7.7 concludes the chapter.

7.2 TEST RESULTS FOR UNIT ROOTS

It is necessary to verify, before identifying possible long-run relationships, the order of integration of the variables. Thus, knowing the order is important for optimal inference (Phillips and Perron, 1988). The results reported in Table 7.1, are based on the Augmented Dickey-Fuller (ADF) test. They indicate that the null hypothesis - the variables in their levels contain unit roots, with intercept but without trend - cannot be rejected. The test results for stationarity with a deterministic linear trend also did not reject the null hypothesis at the 5% critical value.[1] However, after differencing the data once, the test statistics rejected the null hypothesis for all variables. Since the variables appear to be stationary in the first differences, no further tests are performed. Hence, the results of Table 7.1 are consistent with the null hypothesis that the variables are integrated of order one (I(1)), so that the Johansen-Juselius procedure of multivariate cointegration technique has been legitimately invoked to determine the existence of a long-run relationship between proposed variables.

[1] Except the world income growth variable.

Table 7.1 Test Results for Unit Roots

Variables	Test-Statistic		Variables	Test-Statistics	
	With intercept but without trend	With intercept and trend		With intercept but without trend	With intercept and trend
GDP	-0.19796	-0.24111	ΔGDP	-3.5474	-4.6228
GDPPC	-0.23968	-3.2617	ΔGDPPC	-5.2511	-5.1994
TDI	-1.3074	-3.1874	ΔTDI	-4.0246	-3.9761
FDI	-0.56766	-2.1892	ΔFDI	-6.3599	-6.3179
I_{pri}	-0.96992	-2.8165	ΔI_{pri}	-4.1829	-4.1702
I_{pub}	-2.1256	-2.2869	ΔI_{pub}	-4.0411	-3.9835
FDIHC	-1.9011	-1.2193	ΔFDIHC	-3.2619	-3.4716
X	-0.76956	-3.1270	ΔX	-4.1669	-4.2465
IM	-0.18786	-2.4044	ΔIM	-5.0984	-5.1151
REX	-1.7395	-1.6709	ΔREX	-4.1171	-4.2649
WYG	-4.2410	-4.6615	ΔWYG	-	-
LF	-0.26763	-2.2098	ΔLF	-4.3563	-4.7858
DC	0.31367	-2.6570	ΔDC	-3.9400	-3.9293
HC	-2.3291	-2.3536	ΔHC	-5.2411	-4.9849
K_f	-0.46927	-2.2784	ΔK_f	-3.4265	-3.7179
K_d	-1.3912	-2.1167	ΔK_d	-3.2070	-3.8970
K_{pri}	-1.0585	-2.4470	ΔK_{pri}	-3.5281	-3.9643
K_{pub}	-2.0955	-1.2374	ΔK_{pub}	-3.9949	-3.9441
CI	-2.650	-3.2769	ΔCI	-4.1507	-4.1064
FDIY	-1.0323	-3.0579	ΔFDIY	-6.3489	-6.2975
OT	-0.5488	-3.3117	ΔOT	-5.4744	-5.4190
LP	-0.24731	-1.8973	ΔLP	-3.5474	-4.6238
5%critical values	-2.9400	-3.5313	5%critical values	-2.9446	-3.5386

Notes: A ll the level variables are e xpressed in natural logs, and Δ indicates the first difference of the variables. Test regressions were run both with intercept and trend and with intercept but no trend.
Legend: GDP = Gross domestic product; GDPPC = GDP per capita; FDI = foreign direct investment; K_f = FDI stock; TDI = total domestic investment; K_d = total domestic capital; I_{pri} = domestic private investment; K_{pri} = private capital; I_{pub} = public investment; K_{pub} = public capital; LF = labour force; OT = openness to trade; DC = domestic credit; HC = human capital; WGY = world income growth; REX = the real exchange rate; FDIY = FDI to GDP; X = exports; IM = imports; LP = labour productivity; CI = Capital intensity.

7.3 TEST RESULTS FOR COINTEGRATION

It is necessary to determine the lag length (k) of the *VAR* before applying the Johansen procedure of multivariate cointegration technique. In selecting the lag length to be included in the model, two opposing issues have been considered. On the one hand, it is known that a lag length, which is too short could produce serially correlated errors. On the other, a highly over-parameterised model could induce insignificant and inefficient parameters (Canova, 1995). To overcome these constraints, several unrestricted *VAR*s with different lag lengths have been estimated. It should be noted that employing the Johansen procedure is sensitive to the choice of lag length. However, simulations reported in Phillips (1998) show that using information criteria to select the order of

VAR is an accurate method of model determination. Both the Schwartz Bayesian Criteria (SBC) and the Akaike Information Criteria (AIC) (Judge et al., 1988) tests had, therefore, been carried out for various lags (1-4) so that the appropriate lags for each model is selected. The results are reported in Table 7.2. The results show that in most cases, the application of SBC and AIC criteria selects different lag length for each equation. Thus, diagnostic tests were undertaken to investigate further the choice of lag (See Appendix 7.1). The lag lengths, which left the residuals approximately independent and normally distributed in identical terms, are selected.

Table 7.2 Tests for the Order of *VAR*

Order / Equations	Selection Criteria	4	3	2	1	0
Equation (6.3)	AIC		698.86*	620.11	581.84	328.35
	SBC		501.33	504.12	517.40*	315.46
Equation (6.4)	AIC	211.06	211.23*	198.08	205.27	106.05
	SBC	99.02	119.41	135.25	171.44*	101.21
Equation (6.5)	AIC	490.43	498.12	498.33*	477.33	217.91
	SBC	400.78	401.55	426.68	438.67*	208.25
Equation (6.6)	AIC		470.52	477.33	494.33*	217.91
	SBC		401.55	426.68	438.67*	208.25
Equation (6.7)	AIC	452.08	454.55*	453.12	426.41	198.93
	SBC	339.43	357.90	367.46	387.48*	180.26
Equation (6.8)	AIC	138.93	136.13	134.18	140.27*	61.74
	SBC	54.98	71.26	88.39	114.01*	54.11
Equation (6.9)	AIC	129.05	129.14*	121.10	128.17	59.15
	SBC	46.10	64.27	75.31	101.46*	51.52
Equation (6.10)	AIC	110.86	122.86*	118.84	118.51	35.97
	SBC	38.91	53.97	72.72	91.77*	28.34
Equation (6.11)	AIC	510.56	506.66*	496.38	489.36	245.17
	SBC	432.84	418.74	443.82	462.55*	240.33

Notes: Lag length is based on the Akaike Information Criteria and Schwartz Bayesian Criterion, and * denotes the maximum value.

The multivariate cointegration technique developed by Johansen and Juselius (1990) was then applied to detect the number of cointegrating vectors (CVs), r, which bind the variables together. This approach is especially appealing since it provides a unified framework for estimating and testing cointegrating relationships in the context of a *VECM* model. Thus, by treating all the variables as endogenous, this approach avoids the arbitrary choice of the dependent variable in the cointegrating equations. The results for testing the number of CVs are reported in Tables 7.3 to 7.7 for each equation in the

various models that have been tested to investigate the impact of FDI on the key macroeconomic variables. Tables 7.3 to 7.7 present the maximum eigenvalue (λ_{max}), the trace statistic at the 10% critical value, as well as the corresponding λ values. This test is performed using an unrestricted intercept term in each *VAR* model, which assumes the existence of a deterministic time trend in the data. Both the λ_{max} and the trace tests suggest the existence of CVs, which can be selected for each equation in the corresponding models.

Results in Tables 7.3 to 7.7 suggest that both the maximum and trace eigenvalue statistics reject the null hypothesis for r = 0 in each equation. For instance, in the case of the growth model, the hypothesis r=0 is rejected as the computed value of the test statistic (61.35) is greater than the critical value (37.65). Similarly, the null hypothese r=1 and r=2 are also rejected. In the next step, however, the null hypothesis of at most three cointegrating vectors (r=3) cannot be rejected at the 10 percent level of significance. Thus, there is evidence of three cointegrating vectors in the system. In addition, the maximum eigenvalue test provides more conclusive evidence on the exact number of cointegrating vectors in the system. The results again confirm that there are three cointegrating vectors. Based on the results, it could be adduced that there are three common factors driving the entire system of the growth model.

In a similar vein, the hypothesis that there was at least one or more CVs among the variables is not rejected for each of the models. For the majority of the equations, both the maximum and trace statistics suggest a similar number of CVs. For some equations, however, the trace and maximum eigenvalue suggest a different number of CVs. As noted in Chapter Six, the number of CVs for these equations is selected on the basis of maximum eigenvalue. They are based on the arguments of Banerjee et al. (1986) and Haug (1996).

The results for the trace statistic and the maximum eigenvalue test suggest that, as noted above, there are three CVs in the equation for the growth model. The existence of multiple long-run relationships gives rise to the issue of identification of the structural relationships among the variables. At this point one needs to invoke economic theory to

hypothesise some possible cointegrating relationships. In the present study Section 6.2 analysed, in terms of growth models, the possible relationship that can be expected among the growth-determining factors. In addition, the single equation approach employed gives some indication of the CVs among variables in the growth models. Based on these results, this study presumes that the first CV captures the long-run relationship between growth, FDI stock, domestic private capital, exports, human capital, and market size. The second CV may possibly relate FDI stock, domestic private and public capital, labour force, and exports, while the third is presumed to be FDI and its interaction with human capital and labour productivity. Based on these assumptions, general restrictions are imposed on the CVs of the growth models. Appendix 7.2 presents the χ^2.test statistics obtained for the restricted CVs. The results confirm that the CVs as assumed by this study are, in fact, correct. Nevertheless, the results for imports, exports, domestic capital formation and labour productivity models suggest a single CV.

Given these cointegration results, the next stage in the model building process requires the construction of multivariate *VECM* for all the *VAR* models developed in Chapter Six. Employing the general *VECM* equations (6.14, 6.15 and 6.16) the *VECM* equations for all the models have been built and given in Appendix 7.3, with the corresponding ECT's. The ECT represents the error correction term, which is the lagged residual of the cointegrating vector. It measures the deviations of the series from the long-run equilibrium relation.

Table 7.3 Johnasen's Test for Multiple Cointegration: Growth Model

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	189.20	49.04	r = 0	r = 1	403.40	160.30
r <= 1	r = 2	64.44	43.44	r <= 1	r = 2	214.20	127.24
r <= 2	r = 3	52.55	37.65	r <= 2	r = 3	149.76	97.87
r <= 3*	r = 4	30.50	31.73	r <= 3	r = 4	77.21	71.81
r <= 4	r = 5	24.33	25.80	r <= 4*	r = 5	46.70	49.95
r <= 5	r = 6	14.49	19.86	r <= 5	r = 6	31.37	31.93
r <= 6	r = 7	12.49	13.81	r <= 6	r = 7	16.87	17.88
r <= 7	r = 8	4.37	7.53	r <= 7	r = 8	4.37	7.53

Table 7.4 Johnasen's Test for Multiple Cointegration: Imports Model

(a) Imports Model with FDI Flow

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	47.44	37.65	r = 0	r = 1	147.10	97.87
r <= 1*	r = 2	28.75	31.73	r <= 1	r = 2	79.66	71.81
r <= 2	r = 3	24.91	25.80	r <= 2*	r = 3	43.90	49.95
r <= 3	r = 4	20.06	19.86	r <= 3	r = 4	25.98	31.93
r <= 4	r = 5	8.18	13.81	r <= 4	r = 5	12.92	17.88

(b) Imports Model with FDI Stock

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	54.50	37.65	r = 0	r = 1	145.23	97.87
r <= 1*	r = 2	29.25	31.73	r <= 1	r = 2	90.72	71.81
r <= 2	r = 3	22.39	25.80	r <= 2*	r = 3	43.46	49.95
r <= 3	r = 4	18.20	19.86	r =< 3	r = 4	29.06	31.93
r = <4	r = 5	10.35	13.81	r = <4	r = 5	10.85	17.88

Table 7.5 Johnasen's Test for Multiple Cointegration: Exports Model

(a) Exports Model with FDI Flow

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	36.56	37.65	r = 0	r = 1	119.08	97.87
r <= 1*	r = 2	22.11	31.73	r <= 1*	r = 2	55.52	71.81
r <= 2	r = 3	14.41	25.80	r <= 2	r = 3	33.40	49.95
r <= 3	r = 4	8.32	19.86	r <= 3	r = 4	18.99	31.93
r <= 4	r = 5	6.05	13.81	r <= 4	r = 5	10.66	17.88

(b) Exports Model with FDI Flow

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	62.85	37.65	r = 0	r = 1	167.74	97.87
r <= 1*	r = 2	31.05	31.73	r <= 1	r = 2	94.89	71.81
r <= 2	r = 3	24.94	25.80	r <= 2*	r = 3	46.87	49.95
r <= 3	r = 4	20.99	19.86	r <= 3	r = 4	27.92	31.93
r <= 4	r = 5	13.89	13.81	r <= 4	r = 5	16.93	17.88
r <= 5	r = 6	3.03	7.53	r <= 5	r = 6	3.03	7.53

Table 7.6 Johnasen's Test for Multiple Cointegration: Capital Formation Models

(a) Capital Formation Model with Total Domestic Investment

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	38.42	31.73	r = 0	r = 1	87.33	71.81
r <= 1*	r = 2	22.44	25.80	r <= 1*	r = 2	48.90	49.95
r <= 2	r = 3	16.02	19.86	r <= 2	r = 3	26.46	31.93
r <= 3	r = 4	6.30	13.81	r <= 3	r = 4	10.44	17.88
r <= 4	r = 5	4.13	7.53	r <= 4	r = 5	4.13	7.53

(b) Capital Formation Model with Domestic Private Investment

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	31.14	31.73	r = 0	r = 1	78.09	71.81
r <= 1*	r = 2	22.30	25.80	r <= 1*	r = 2	46.94	49.95
r <= 2	r = 3	15.08	19.86	r <= 2	r = 3	24.63	31.93
r <= 3	r = 4	5.97	13.81	r <= 3	r = 4	9.55	17.88
r <= 4	r = 5	3.58	7.53	r <= 4	r = 5	3.58	7.53

(c) Capital Formation Model with Domestic Public Investment

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	37.38	31.73	r = 0	r = 1	88.30	71.81
r <= 1*	r = 2	19.14	25.80	r <= 1	r = 2	50.91	49.95
r <= 2	r = 3	16.38	19.86	r <= 2*	r = 3	31.76	31.93
r <= 3	r = 4	10.92	13.81	r <= 3	r = 4	15.38	17.88
r <= 4	r = 5	4.46	7.53	r <= 4	r = 5	4.46	7.53

Table 7.7 Johnasen's Test for Multiple Cointegration: Labour Productivity Model

Labour Productivity Model

Results of the Maximum Eigenvalue Tests				Results of Trace Tests			
H_0	H_1	Test Stat.	90%	H_0	H_1	Test Stat.	90%
r = 0	r = 1	45.09	37.65	r = 0	r = 1	139.51	97.87
r <= 1*	r = 2	31.59	31.73	r <= 1	r = 2	94.42	71.81
r <= 2	r = 3	24.48	25.80	r <= 2*	r = 3	45.83	49.95
r <= 3	r = 4	17.36	19.86	r <= 3	r = 4	31.34	31.93
r <= 4	r = 5	7.18	13.81	r <= 4	r = 5	13.98	17.88
r <= 5	r = 6	6.79	7.53	r <= 5	r = 6	6.79	7.53

Notes: * denotes the number of CVs that are identified from the Johansen procedure for each VAR model

7.4 CAUSALITY BETWEEN FOREIGN DIRECT INVESTMENT AND OTHER MACROECONOMIC VARIABLES

After confirming that the models are correctly specified, the focus turns on Granger non-causality testing. Since the variables are non-stationary, causality inferences in the multivariate framework are made by estimating the parameters of the equations reported in Appendix 7.3 with an ECT. The inclusion of an error-correction term in a *VAR* model allows the estimated model to reflect long-run equilibrium constraints. At the same time, it is also permits flexibility in the short-run dynamics captured by the *VAR* (Wilamoski and Tinkler, 1999). Furthermore, according to Tano (1993), the use of cointegration error correction modelling in the Granger-Causality models is important because of the possibility of the spurious co-movement among variables. The cointegration analysis attempts to identify conditions under which relationships are not spurious. Unlike the standard Granger-Causality, which may not detect any causal relationship between variables under consideration, with the ECT, cointegration ensures that Granger-Causality exists, at least in one direction. Granger non-causality will imply an existence of neither short- nor long-run relationship between variables (Engel and Granger, 1987). Causality can, based on this view, be decided through the significance of the lagged ECT.

The results of the Granger-causality tests are shown in Table 7.8. Since the concern here is solely with the interrelationship between FDI and economic growth, exports, imports, domestic investment, and labour productivity, only the results for these relationships are reported. As these results are sensitive to departures from standard assumptions, some diagnostic tests on the residuals are also performed. The serial correlation in the residuals, the Jarque and Bera (1980) normality test, which is asymptotically distributed χ^2, RESET, the test for functional form, and Engle's autoregressive conditional heteroscedasticity test indicate that all the equations pass the tests at the 10% significance level and the results are reported in Appendix 7.4. This implies, therefore, that there is no significant departure from the standard assumptions. Inferences of causality have been drawn from the lagged ECT and are applicable at either the 10% or 5% levels of significance.

Table 7.8 Multivariate Granger-Causality Tests Based on *VECM*

MODELS	Equation No	Test for causality of	By	ECT
Growth Model	(7.1a)	ΔK_f	ΔGDP	3.5669***
	(7.1b)	ΔGDP	ΔK_f	2.4155***
Imports Model	(7.2a)	ΔIM	ΔFDI	4.4792***
	(7.2c)	ΔFDI	ΔIM	0.42711
	(7.3a)	ΔIM	ΔK_f	6.8503***
	(7.3c)	ΔK_f	ΔIM	0.52203
Exports Model	(7.4a)	ΔX	ΔFDI	6.1901***
	(7.4b)	ΔFDI	ΔX	8.0452***
	(7.5a)	ΔX	ΔK_f	2.8409**
	(7.5b)	ΔK_f	ΔX	2.2475*
Capital Formation Models	(7.6a)	ΔTDI	ΔFDI	4.6157***
	(7.6c)	ΔFDI	ΔTDI	1.7928*
	(7.7a)	ΔI_{pub}	ΔFDI	2.3910**
	(7.7c)	ΔFDI	ΔI_{pun}	1.4879
	(7.8a)	ΔI_{pri}	ΔFDI	3.2182***
	(7.8c)	ΔFDI	ΔI_{pri}	2.8005**
Labour Productivity Models	(7.9a)	ΔLP	ΔFDI	2.8951**
	(7.9b)	ΔFDI	ΔLP	2.9817**

Notes: ***, ** and * are the significance levels at 1%, 5% and 10% respectively. P-values are given in parentheses.
Legend: GDP = Gross domestic product; TDI = total domestic investment; K_d=total domestic capital; FDI = foreign direct investment; K_f = FDI stock; K_{pri} = domestic private capital; I_{pri} = private investment; K_{pub} = public capital; I_{pub} = public investment; X = exports; IM = imports; LP = labour productivity.

Table 7.8 contains the Granger-causality results. The results for the growth model (See Appendix 7.3 equation 7.1a and 7.1b) indicate bi-directional causality, i.e. the significance of the ECT term in growth and FDI equations shows Granger-causality from FDI to economic growth and economic growth to FDI. The ECT measures the speed of adjustment to past shocks in equilibrium and emerges as an important channel of influence for the growth model. This implies that the variables in the growth model have a strong tendency to adjust to their past disequilibrium by moving towards the trend values of their counterparts.

The hypothesis that FDI does not 'Granger-cause' the growth of imports is rejected at the 5% level of significance and shows there is causal relationship between FDI and imports (Based on the estimated results of equations 7.2c and 7.3c). Nevertheless, the reverse hypothesis, i.e. imports do not Granger-cause FDI, cannot be rejected because of the insignificance of the ECT (Based on the estimation of equations (7.2a) and

(7.3a)). The results reported for export models show the presence of a causal relationship from FDI to exports. Similarly, with respect to the FDI equation, the causal relationship can be found from exports to FDI, which appear to be significant at 5% level of significance. The ECT's statistical significance in both equations confirms the two-way causality between FDI and exports. The result indicates, not only FDI affects exports positively but also that increases in exports (indicator of openness to trade) determine the level of FDI. The interrelationships between FDI flow, imports, and exports are investigated to find out how the fluctuations in FDI flow affect New Zealand's international trading activities. The results reported for equations (7.2c), (7.3c) and (7.4b) and (7.5b) show that FDI stock affects the export and import structure of the economy. Moreover, the flow also positively impacts upon both exports and imports.

Estimated equations (7.6a and 7.6c), (7.7a and 7.7c) and (7.8a and 7.8c) indicate that increases in FDI lead to increases in domestic investment. A rise in domestic investment in turn is correlated to increases in FDI. In other words, there exists a feedback between FDI and domestic investment, and in particular, FDI and domestic private investment. This implies that FDI reacts positively to changes in domestic investment, and it can be concluded that FDI has a complementary effect with New Zealand's domestic investment.

The causal relationship between FDI and labour productivity also indicates that a possible feedback relationship can be established between these two variables. The results reported in Table 7.8 for estimated equation (7.9a and 7.9b), imply that FDI and labour productivity are complementary. Any increase in the level of labour productivity leads to increases in FDI, and vice versa. It is theoretically plausible for FDI growth to cause labour productivity growth, especially if innovations and technical progress in an economy help to improve labour performance. Improvement in labour productivity can also increase the inflow of FDI.

7.5 FORECAST ERROR VARIANCE DECOMPOSITION RESULTS

Cointegration analysis can provide an important framework, within which a closer link between theory and econometric applications can be fostered. It is therefore important to analyse the speed at which an economy or market returns to equilibrium after a shock (Pesaran and Shin, 1996). The FEV has been used to investigate the quantitative impact of FDI on economic growth, imports, exports, domestic investment and labour productivity. The FEVs from each equation can be used to quantify the strength of the Granger-causal relationships among the variables in the *VAR* models (Obben, 1995). As the equations deal with a number of variables, it is impractical to examine in this study all the possible orderings to arrive at a good solution to the present problem. Generalised FEV analysis is, therefore, carried out to show the relative proportion of each variable's forecast variance due to each endogenous variable. Variance decompositions for every equation are listed in Tables 7.9 to 7.13 with various time horizons up to 15 years.

7.5.1 Growth-Model Variables

Decompositions for the growth-model variables are listed in Table 7.9. More than 60% of the change in each variable is as anticipated explained by its own innovations in the first year. Innovations in economic growth are mainly explained by its own past values (between 60% and 90% in year one). Nevertheless, the contribution of past values decreases with increasing time horizons. Innovations in economic growth explain more than 19% of the change in FDI stock in year one but decline to 10% in year 15. Another notable feature of the growth model is the contributions made by domestic capital, in particular domestic private investment, human capital and FDI human capital interactive variables. Human capital explains for example, more than 9% of the changes in growth.

On the other hand, innovations in FDI stock are also explained mainly by its own past values (40-70%). FDI is responsible for about 5% to 9% of output changes. In addition, Table 7.9 indicates that FDI contributes positively to domestic private investment.

Considerable changes in FDI are also explained by innovations in the level of human capital (10-20%). This reveals that if FDI is to be effective it is important that the domestic economic structure remains in a satisfactory state.

It can be inferred from these results that the lagged values of economic growth and FDI stock are important in predicting current and future values of those variables. The lagged values of GDP seem to be more important in explaining the change in FDI stock in year 1 than in year 15. Similarly, FDI also explains the considerable changes in economic growth. The results indicate a two-way causality running between FDI and economic growth. However, the causality from economic growth to FDI appears to be stronger. Economic growth is a prerequisite for attracting FDI into small, developed countries like New Zealand. Furthermore, the results also show the importance of the host country's domestic investment climate, educational levels, and export orientation. All of these features contribute towards drawing FDI and further enhances economic growth.

Table 7.9 Variance Decompositions of Growth Model

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in								
	k	GDP	K_f	K_{pri}	K_{pub}	X	LF	HC	GDPPC
ΔGDP	1	74.14	8.29	26.69	4.56	4.38	0.59	11.24	14.93
	3	64.65	6.92	22.45	3.42	11.70	2.44	16.39	19.72
	9	60.05	6.66	17.81	5.94	11.74	4.50	10.53	13.36
	15	58.79	5.96	17.10	6.46	13.01	4.52	9.66	12.35
ΔK_f	1	19.20	68.96	11.95	4.24	0.48	1.68	3.07	11.52
	3	13.61	53.89	12.32	9.68	0.26	1.64	1.83	16.00
	9	12.69	42.71	16.71	8.92	0.45	1.86	1.24	22.23
	15	10.55	40.87	22.37	7.71	0.53	1.82	1.11	22.82

Legend: k = time horizon; GDP = gross domestic product; K_f =foreign direct investment stock; K_d = total domestic capital; K_{pri} = domestic private capital; K_{pub} = domestic public capital; X = exports; HC = human capital; GDPPC = GDP per capita; L = labour force.

7.5.2 Import-Model Variables

The results in Table 7.10 show the presence of a relatively rapid adjustment of imports to unexpected changes in the system. After a nine-year period, 40% of their FEV is due to shocks in own innovations. The rest of the variation is a consequence of innovations in FDI, GDP per capita, domestic investment, and real exchange rate (REX). When FDI

flow is shocked, as reported in Table 7.10a (refer to imports model with FDI flow), about 3-4% of the variations in imports are explained. Nevertheless, the main explanatory variables, which induce changes in imports, are innovations to GDP per capita and FDI flow. More than 60% of the changes in imports are explained by GDP per capita in year 15. The results also indicate that at year one, 20% of the variations in imports are explained by innovations in REX. They decrease with the increasing time horizon. Only a marginal change in imports is explained by the domestic investment component. The domestic private investment, in particular, explains only about 1-4% of the variation in imports.

Innovations in imports explain less than 50% of the changes due to imports own shock in year 1 and decline to less than 34% in year 15. The changes in imports are mainly explained by innovations in FDI stock and GDP per capita (See Table 7.10b). More than 50% of the changes are for example, due to GDP per capita. Another noteworthy factor is the change in the influence of exchange rates over imports. Overall, the results indicate that in year one more than 10% of the variations in imports is explained by exchange rates, and these decrease to less than 5% in year 15. When the foreign and domestic capital variables are considered, the results suggest that innovations in FDI stock are preponderantly due to FDI's own past values. Innovations in FDI stock explain 20-30% of the changes in imports. It is also noticeable that FDI stock's contribution towards imports declines with the increasing time horizon (See Table 7.10b imports model with FDI stock).

7.5.3 Export-Model Variables

Table 7.11a & b illustrate the main channels of influences on exports. The variable FDI explains more than 90% of variance, accounted for by its own innovations. The results show the presence of a relatively rapid adjustment from FDI to exports, in particular with FDI stock (See Table7.11b). Long-run innovations to exports explain only 2% of the changes in FDI flow, while 12% of the FEVs of exports are due to changes in the FDI. As time increases, innovations in FDI explain a greater proportion of the changes in exports.

Table 7.10 Variance Decompositions of Imports Model

(a) Imports Model with FDI Flow

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in					
	k	IM	FDI	I_{pri}	GDPPC	REX
ΔIM	1	50.02	3.56	1.30	31.18	20.18
	3	39.69	3.22	4.18	60.17	9.69
	9	41.34	3.47	2.40	60.58	7.11
	15	39.62	3.81	1.86	61.60	5.11
ΔFDI	1	2.15	93.06	4.18	7.56	4.88
	3	3.20	72.77	8.53	16.87	3.22
	9	1.54	71.53	10.99	12.86	4.31
	15	1.13	69.50	10.97	17.54	3.92

(b) Imports Model with FDI Stock

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in					
	k	IM	K_f	K_{pri}	GDPPC	REX
ΔIM	1	41.35	33.45	22.14	19.37	11.88
	3	34.19	22.43	18.19	26.20	5.16
	9	34.48	22.33	19.71	50.11	3.32
	15	34.69	22.15	21.01	51.24	2.69
ΔK_f	1	8.31	98.54	9.96	1.12	1.04
	3	8.30	97.17	11.10	0.88	2.74
	9	3.42	93.93	17.32	0.50	2.88
	15	7.42	89.89	22.06	1.61	2.60

Legend: k = time horizon; FDI = Foreign direct investment; K_f =FDI stock; K_d = total domestic capital; K_{pri} = domestic private capital; Im = Imports; REX = real exchange rate; GDPPC = GDP per capita; I_{pri} = domestic private investment.

The FEV in FDI stock one period ahead is completely explained by the movements in FDI stock, with more than 65% of the change in FDI stock in year one explained by its own innovation. On the other hand, innovations in FDI stock explain 25-30% of the changes in the level of exports, while exports explain about 20% of the variations in FDI stock in year one. Table 7.11b also shows the markedly increasing influence of FDI stock when the Closer Economic Relation (CER) dummy variable is added. In the export models it is obvious that the labour force explains a considerable proportion of the variations in FDI stock when the CER variable is included.

The results confirm the two-way causality between FDI and exports, consistent with theoretical outcomes. It indicates that the FDI in a host country may have a positive and complementary relationship to exports. The strength of causality between FDI stock and exports confirms that in a small, host country like New Zealand, FDI is an influential factor in determining the export structure.

Table 7.11 Variance Decompositions of Exports Model

(a) Exports Model with FDI Flow

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in					
	k	X	FDI	I_{pri}	REX	LF
ΔX	1	60.33	0.50	20.72	17.12	0.02
	3	59.79	4.97	12.61	19.20	1.93
	9	49.91	8.77	5.06	12.63	15.50
	15	24.96	12.59	1.23	4.35	38.47
ΔFDI	1	2.06	94.23	0.02	0.68	2.76
	3	1.07	73.79	6.75	0.62	15.29
	9	1.31	75.18	8.46	2.12	7.30
	15	2.07	69.12	5.31	1.63	13.42

(b) Exports Model with FDI Stock

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in						
	k	X	K_f	K_{pri}	K_{pub}	REX	LF
ΔX	1	40.20	26.26	14.98	0.79	14.91	5.07
	3	53.39	27.14	17.85	1.04	6.86	7.81
	9	61.24	29.10	16.92	1.14	2.10	8.21
	15	62.81	29.45	16.75	1.16	2.21	8.37
ΔK_f	1	21.49	66.27	2.08	0.60	5.36	7.96
	3	12.68	66.25	2.05	0.73	3.16	7.43
	9	9.15	70.03	4.36	0.84	2.36	7.18
	15	8.90	71.82	6.33	0.85	2.21	7.10

Legend: k = time horizon; EX = exports; FDI = Foreign direct investment; I_{pri} = private investment; REX = real exchange rate; LF = Labour force; K_f = FDI stock; K_{pri}= domestic private capital; K_{pub}= domestic public capital.

7.5.4 Capital Formation Models

The FEVs for the capital formation models are presented in Table 7.12. More than 50% of the variation in a variable is explained by the innovation of that variable. As anticipated, the results show more than 80% of the changes in FDI is accounted for by its own past values. The remaining changes are explained by innovations in domestic investment. Decomposing total domestic investment into private and public components clearly shows how this major contribution to FDI is accounted for by the private investment. The proportion of changes in FDI due to the innovation in private investment seems to be consistent between year one and 15.

On the other hand, innovations in FDI also explain a considerable amount of the changes in total investment, especially in private investment. This variation is slightly higher than the contribution from private investment to FDI. For example, innovations

in FDI to private investment range between 1% and 16% (Table 7.12b), while FEVs from private investment to FDI arrays range between 9% and 10%. Innovations in domestic public investment explain about 1% of the FEVs in FDI at the end of the 15-year (refer to Table 7.12c). Nevertheless, innovations in FDI account for only 3% of the variance in domestic public investment.

Table 7.12 Variance Decompositions of Domestic Capital Formation Models

(a) Capital Formation Model with Total Domestic Investment

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in					
	k	I_d	FDI	GDPPC	REX	DC
ΔI_d	1	84.01	6.63	5.96	1.58	1.84
	3	66.06	14.07	12.85	4.01	3.92
	9	54.53	18.85	16.86	4.49	5.25
	15	52.22	19.81	17.98	4.72	5.52
ΔFDI	1	13.48	86.21	0.12	0.14	0.08
	3	13.20	85.85	0.39	0.43	0.14
	9	12.92	85.30	0.72	0.79	0.22
	15	12.83	85.18	0.83	0.93	0.21

(b) Capital Formation Model with Domestic Private Investment

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in					
	k	I_{pri}	FDI	GDPPC	REX	DC
ΔI_{pri}	1	91.93	0.61	2.99	4.40	0.44
	3	72.26	2.13	10.31	3.77	1.53
	9	49.85	13.99	19.39	15.90	2.87
	15	41.40	14.49	21.78	19.09	3.22
ΔFDI	1	9.61	90.38	0.02	0.01	0.01
	3	9.59	90.40	0.03	0.05	0.05
	9	9.55	90.41	0.01	0.01	0.01
	15	9.53	90.42	0.01	0.01	0.00

(c)Capital Formation Model with Domestic Public Investment

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in					
	k	I_{pub}	FDI	GDPPC	REX	DC
ΔI_{pub}	1	96.60	0.60	2.50	0.59	0.49
	3	88.80	1.69	7.08	1.69	1.53
	9	81.29	2.83	11.84	2.83	2.34
	15	79.51	3.12	13.46	3.12	2.57
ΔFDI	1	3.27	95.11	0.17	1.20	0.24
	3	2.17	91.84	0.63	4.46	0.88
	9	1.11	85.96	1.39	9.64	1.91
	15	0.84	83.95	1.61	11.37	2.25

Legend: I_d = total domestic investment; I_{pub} = public investment; I_{pri} = private investment; FDI = foreign direct investment; GDPPC = GDP per capita; DC = domestic credit; REX = real exchange rate.

The results indicate a positive relationship between FDI and domestic private investment, in which co-movements are caused by bi-directional causality across the two variables. However, the strength of causality is unbalanced: the impact of FDI on domestic private investment is stronger than the effect of domestic private investment on FDI. This result is particularly useful in showing a two-way causality between FDI and domestic private investment, i.e. while FDI has both forward and backward relationships with domestic private investment, the domestic private investment environment also determines the foreign investment flow. The most striking feature of this phenomenon is that while private investment is initially dependent on its past values alone, during the latter periods, innovations in FDI and GDP per capita account for the majority of the changes in private investment.

7.5.5 Labour Productivity Model

The results for the labour productivity model reported in Table 7.13 confirm the existence of a positive relationship between FDI to GDP (FDIY) and labour productivity (LP). Thus a two-way causality exists between the variables. The results suggest that up to 90% of the FEVs of FDIY is accounted for by the own innovations from year one to year 15. As anticipated, the majority of the FDIY and labour productivity variations are due to their own past values. Similarly, nearly 80% of the changes in labour productivity are explained by its own innovations in the entire time horizon.

A reverse pattern can be seen when FDIY is shocked. For example, 2-5% of the variances in labour productivity is due to innovations in FDIY. This implies that in the long-run, the importance of FDIY is highly influenced by improvements in labour quality. While the results indicate causality between labour productivity and FDI, the relationship is stronger in the direction of labour productivity to FDI than in the opposite. This confirms the theoretical speculation that FDI is attracted into the less developed countries (LDCs) by cheap labour. In New Zealand, however, labour quality has been a main driving force attracting FDI.

Table 7.13 Variance Decompositions of Labour Productivity Model

Labour Productivity Model

Percent of Forecast Error Variance in	Percentage of forecast error variance explained by innovations in						
	k	LP	FDIY	CI	OT	LF	HC
ΔLP	1	89.48	3.49	5.46	0.17	1.35	0.03
	3	87.36	4.16	7.13	0.23	1.01	0.08
	9	83.66	4.89	10.89	0.12	1.12	0.07
	15	81.65	3.56	13.28	0.05	1.20	0.21
ΔFDI	1	2.58	94.93	0.53	0.06	0.79	1.08
	3	10.75	85.10	4.07	0.02	2.81	1.98
	9	31.39	46.35	15.47	0.01	4.48	2.28
	15	45.20	25.42	21.91	0.03	4.42	3.64

Legend: k = time horizon; LP = labour productivity; FDIY = foreign direct investment as a ratio to GDP; CI = capital intensity; OT = openness to trade; HC = Human capital; LF = labour force.

7.6 IMPULSE RESPONSE FUNCTION RESULTS

The IRF traces the response of an endogenous variable to a shock in that variable over time or to a shock in another variable in the *VAR* system. The method now extensively used is the orthogonolised IRF, originally proposed by Sims (1980). Before IRFs are computed the underlying shocks to the *VAR* models are orthogonalised using the Choleskey decomposition technique. The orthogonolised IRF should be interpreted with caution, because of the effect of the order in which the variables are introduced in the *VAR* system. The variable entering the system first acts as the most exogenous. It implies that imposing a pre-order among the variables will lead to a semi-structural interpretation of the model, i.e. a partial explanation.[2] Koop et al. (1996) propose an approach to IRF, without this weakness, and it is referred to as the generalised IRF. Under this approach the ordering of variables is immaterial (Pesaran and Shin, 1996a). Thus, as discussed in Chapter Six, the problem of the ordering variables in this study has been overcome by the application of the generalised IRF to measure the time profile of the effect of shocks on the future state of the dynamic system.

[2] As stated by Bergman, (2002) "The standard approach in the literature is to orthogonalise..... One drawback within this approach is that estimated impulse response functions are not uniquely determined and depended on the way shocks are othogonolised.".

For a more complete study of the causal relationship in a multivariate framework, it is useful to investigate the post-sample effects of shocks to the CVs in the system.[3] A graphic illustration of IRFs can provide an insight into the existing dynamic relationships, because it will show the response of a variable or cointegration relation to an unexpected shock in another variable over a certain time horizon. It is also possible to check whether the identified shocks behave in a way consistent with the stipulations of the theory and previous empirical outcomes discussed in Chapter Two. As the effects of shocks on cointegrating relations die out and their time profiles contain useful information on the speed of convergence (Pesaran and Pesaran, 1997), this study applies this technical tool to analyse the dynamic properties of the models. The IRFs gave the response paths of each CV to a shock in one variable, taking into account the short-run adjustment to the long-run equilibrium.

IRFs are presented in Figures 7.1 to 7.10. Here, an IRF shows the dynamic responses of the cointegrated vectors to a one standard deviation innovation in a variable over a 20-year horizon. Shocks are positive unless otherwise stated.

7.6.1 Growth Model

The response of the identified CV1 (the cointegrated relations among the main growth determining factors), due to a shock in FDI, is presented in Figure 7.1. The IRF for CV1 indicates that due to a positive change in FDI stock, a positive effect continues for 4 years before tailing off. As a consequence of a shock in FDI stock, economic growth decreases after 5 years, reaching the long-run equilibrium after 19 years with minimal fluctuations. The most striking feature of the FDI shock is that the response of CV1 is very dramatic in the first couple of years and, then, fluctuates closer to zero level before it slowly converges to its long-run value of zero.

[3] Due to the problems associated with the effects of shocks on individual variables, Pesaran and Pesaran (1997) suggest an alternative approach to consider the effects of system-wide shocks or variable-specific shocks on cointegration relations. They give a detailed econometric explanation (Chapter 19) of the underlying methodology described in this section. Also see Bergman (2002).

The response of CV1 to a positive shock in GDP is presented in Figure 7.2. During the initial stages due to the positive shock in the GDP, FDI increases with a high-speed return toward the zero level and remains for more than 20 years slightly below the zero level before reaching its long-run equilibrium. Overall, the equations show that CV1 regains its long-run steady state after 20 years have passed. These results indicate that the speed of convergence is relatively faster for FDI than for GDP stock. Figure 7.2 shows the response path of FDI stock to an unexpected positive shock in the GDP variable, which has a nearly 35% initial leap. This indicates that the CV1 falls rapidly and stays below zero level during the entire period before it reaches the long-run steady state. The CV1 moderately converges towards its long-run position, confirming that after the growth variable is shocked, original levels are regained at a moderate speed.

Figure 7.1 Generalized Impulse Responses to one S.E. Shock in the Equation for K_f

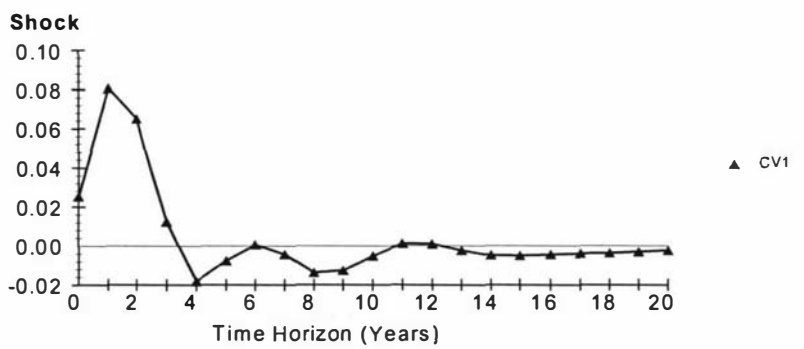
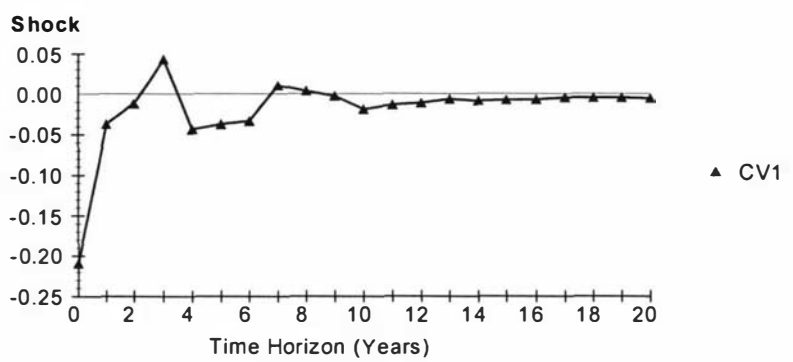


Figure 7.2 Generalized Impulse Responses to one S.E. Shock in the Equation for GDP



The results of the FDI stock shock and the economic growth shock indicate shocks in economic growth seem to have greater effects on FDI stock than vice-versa. The results confirm earlier findings that the causality running from output to FDI is stronger and thus economic growth is a far more important determinant of FDI than FDI is for economic growth. The speed of convergence towards the long-run steady state is quicker when the economy experiences an FDI shock than a GDP shock. The effect of GDP on FDI is moderate and, more importantly, the response of GDP to a shock in FDI quickly reverts to its original level within a shorter time period.

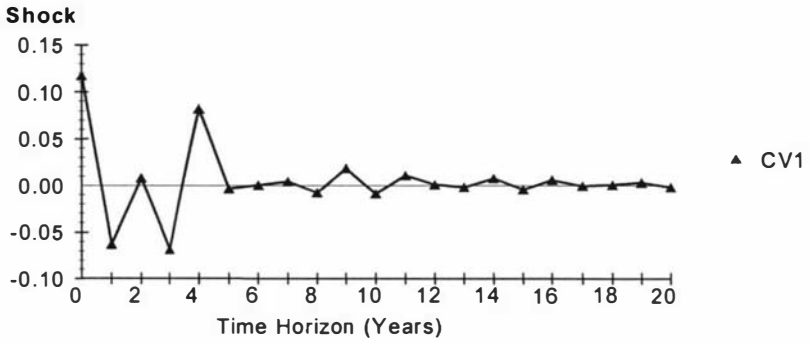
7.6.2 Imports Model

Figure 7.3a shows the response path of the CV1 to a positive shock in the FDI variable. The response path of CV1 indicates that from a positive position it suddenly falls in the next couple of years (1-3) and, then, increases in year 4. Afterwards, it gradually fluctuates around zero to reach its pre-shock level. The response paths of the CV1 due to a shock in FDI stock are presented in Figure 7.3b. The plots indicate a positive effect of an exogenous increase in FDI stock over CV1.

The response of the CV1, as a result of a shock in imports (Figure 7.4b), seems to be very steady during the initial period, with a sharp decrease. The decrease is, then, followed by a steady increase before the original position is again regained. The results imply that when FDI is shocked by imports, the disturbance to the long-run equilibrium will persist for a period of nearly 10 to 15 years. IRFs of CV1, as a result of import shocks are also displayed in Figure 7.4b. The response of CV1 to import shock peaks during the first 2 years, and then, declines. The results provide important implications: there is a two-way causality between these two variables but the speed of convergence to the long-run seems to be quicker when the system is shocked by imports than when the system is shocked by FDI stock.

Figure 7.3 Generalized Impulse Responses to one S.E. Shock in the Equation for FDI

(a) Imports Model with FDI Flow



(b) Imports Model with FDI Stock

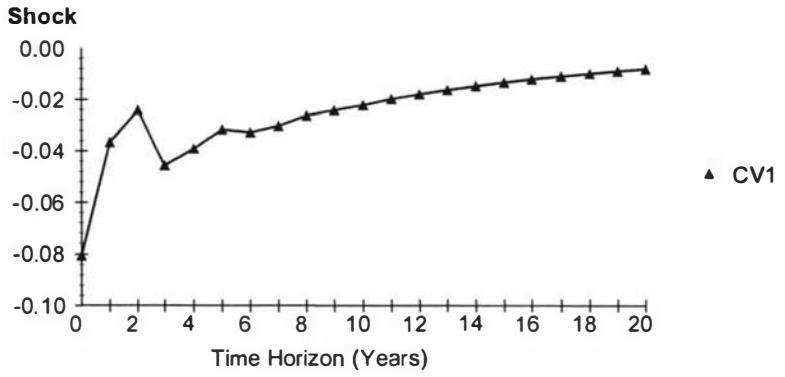
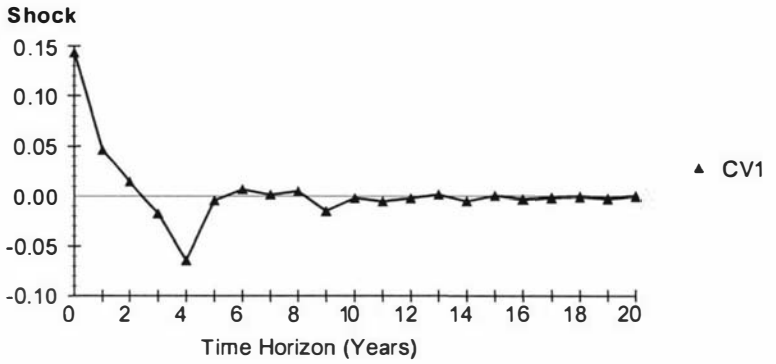
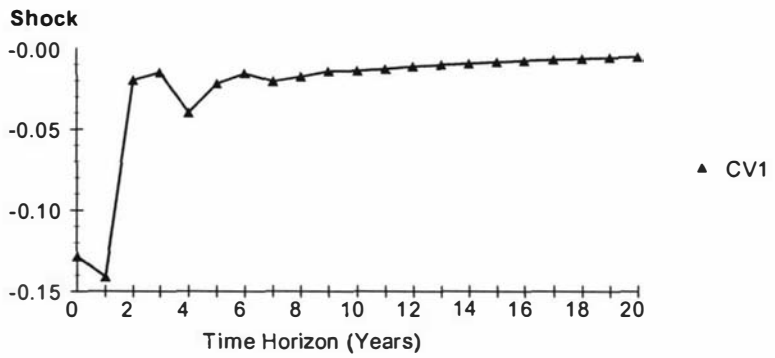


Figure 7.4 Generalized Impulse Responses to one S.E. Shock in the Equation for Imports

(a) Imports Model with FDI Flow



(b) Imports Model with FDI Stock



7.6.3 Exports model

The analysis seeks to examine the IRFs on CV1, so that the effect of exports on FDI shock could be assessed. The responses of CV1 to a shock in FDI are traced in Figure 7.5a. A positive standard deviation shock in FDI has an initial negative response on CV1, followed by a rapid decrease towards its long-run steady state. Nevertheless, a positive change in FDI will lead to a negative change in CV1 reaching the steady state very quickly with about 90% of the adjustment completed within 2 years. A similar pattern can be depicted when exports are shocked, with and without the CER variable. There is, however, a marked difference when FDI is shocked, as the initial increase in CV1 is greater than what is presented when export is shocked. The results confirm the finding from the single equation approach, i.e. FDI flows influence exports, only after a time lag.

It is important to analyse the relationship between exports and FDI stock, as well as the relationship between FDI flow and exports, so that the export-FDI nexus could be investigated. Figure 7.5b illustrates the IRF of CVs of exports when the FDI stock variable is shocked. The results indicate a negative effect followed by a steady increase before falling to reach closer to the zero level in year 9. Approximately 75% of adjustments to the long-run steady state take place within 14 years.

Figure 7.6b illustrates the IRF of CV1, which considers shocks in exports. The response path of the CV1 indicates that it fluctuates between 1% and 15%, and the effect dies out

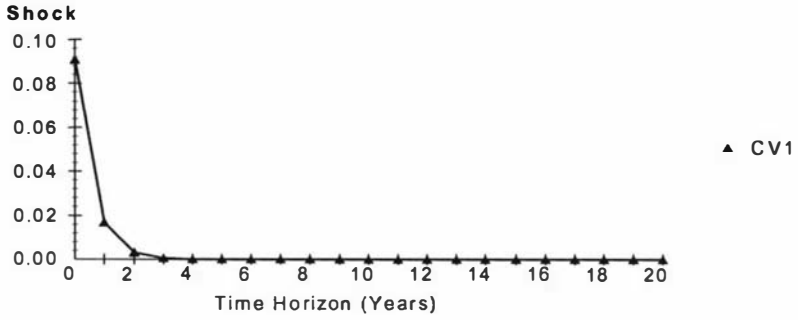
within a 14-year period. One standard positive shock in exports will encourage future increases in FDI, and 90% of its adjustments occur within 12 years before it regains its pre-shock level. FDI stock and export have a positive relationship with each other, where positive changes in FDI stock encourage exports from a host country.

7.6.4 Capital Formation Models

This section considers shocks to the FDI variable and the reactions of total domestic investment, private and public investment. The IRF for the effect of positive change in FDI on CV1 is presented in Figure 7.7a, b & c. It indicates a positive effect, which continues for 4 years before tailing off in entire capital formation equations. The only exception is the model with domestic public investment (See Figure 7.13c). As a consequence of a shock in FDI, the total domestic investment, public and private increases immediately, and reaches the long-run equilibrium after 6 to 7 years. However, the response depicted for the capital formation model with public investment indicates that it takes nearly 9 years to tail off. The most striking feature of the FDI shock is that the response of CV1 is very dramatic, with a leap of over 90% at the beginning, before it slowly converges to its long-run value of zero in year 7. The pattern seems to be more or less similar when the system is shocked by investment components (see Figure 7.8a, b & c). The outcome of the disaggregated investment component further supports the interrelationship between FDI and domestic private investment and shows that FDI is more connected to changes in domestic private investment than to changes in public investment. In particular, when FDI is shocked it takes nearly 12 years to converge. This confirms a two-way causality between FDI and private investment. Yet, the strength of causality seems to be stronger from FDI to domestic private investment than in the opposite direction.

Figure 7.5 Generalized Impulse Responses to one S.E. Shock in the Equation for FDI

(a) Exports Model with FDI Flow



(b) Exports Model with FDI Stock

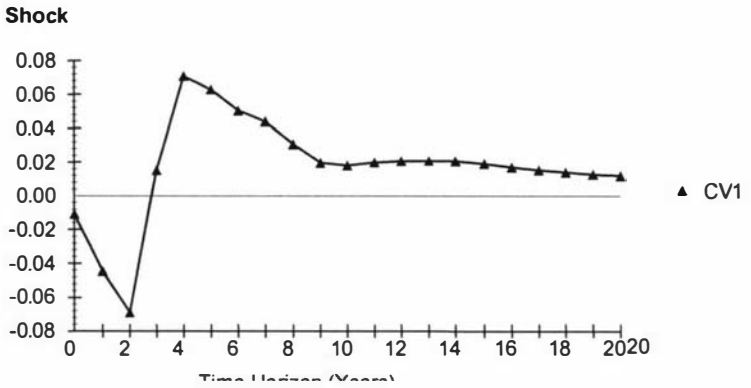
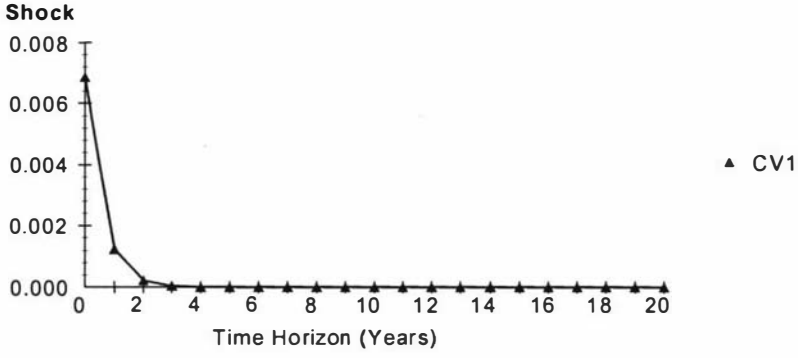


Figure 7.6 Generalized Impulse Responses to one S.E. Shock in the Equation for Exports

(a) Exports Model with FDI Flow



(b) Exports Model with FDI Stock

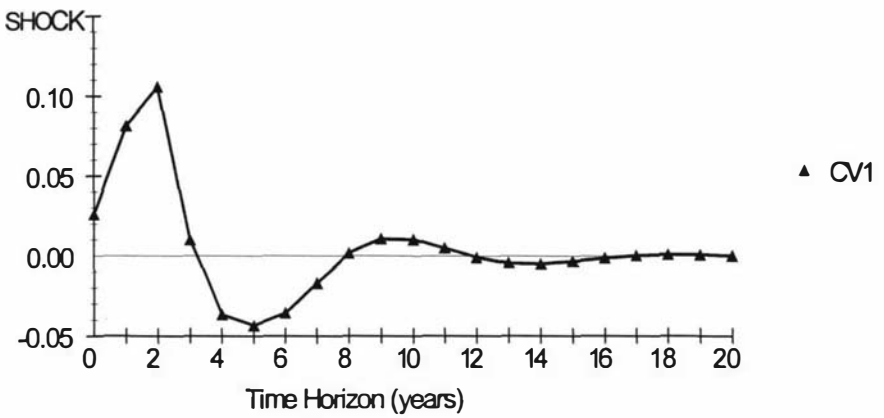
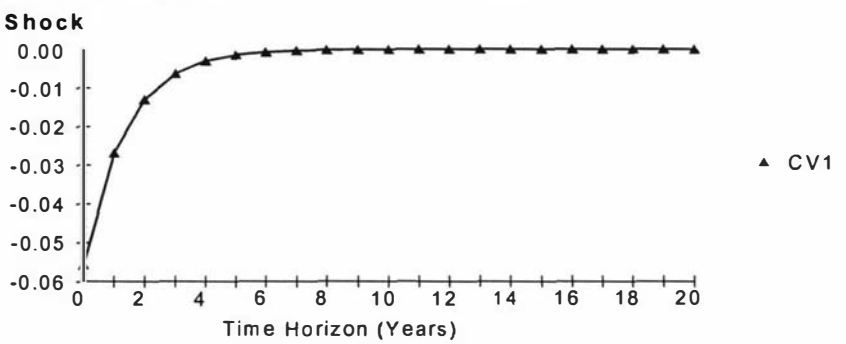
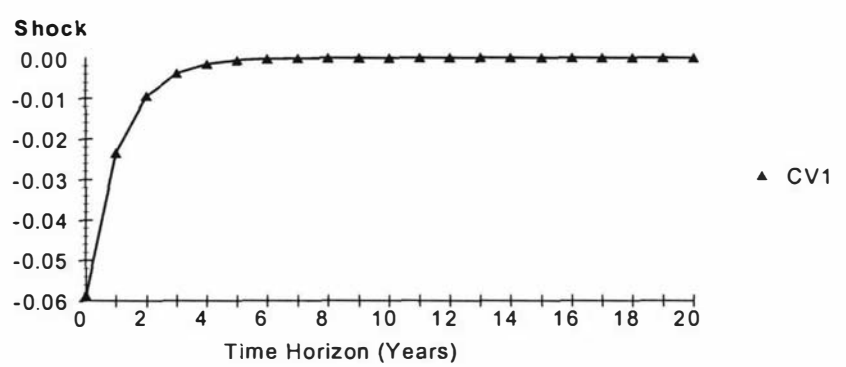


Figure 7.7 - Generalized Impulse Responses to one S.E. Shock in the Equation for FDI

(a) Capital Formation Model with Total Domestic Investment



(b) Capital Formation Model with Domestic Private Investment



(c) Capital Formation Model with I Domestic Public Investment

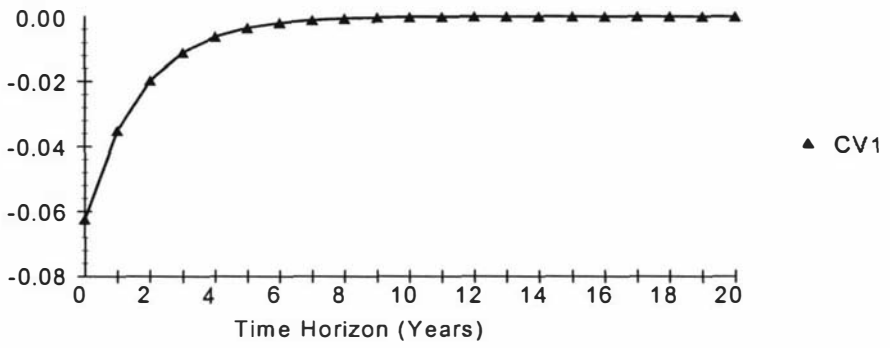
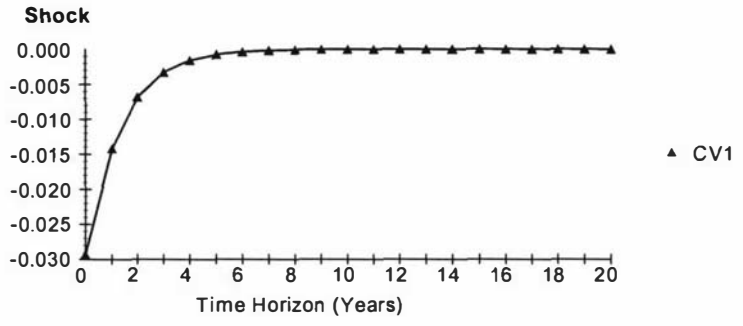
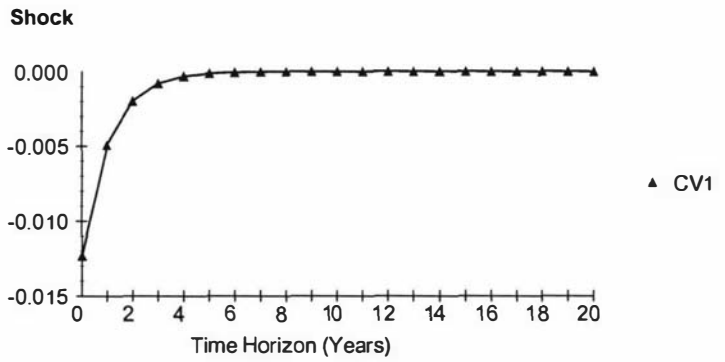


Figure 7.8 Generalized Impulse Responses to one S.E. Shock in the Equation for Domestic Investment

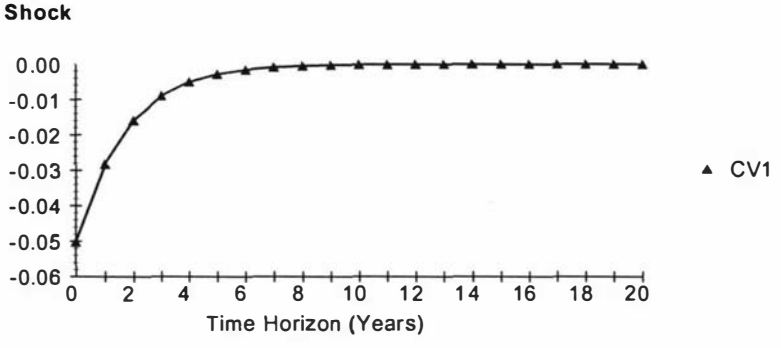
(a) Capital Formation Model with Total Domestic Investment



(b) Capital Formation Model with Domestic Private Investment



(c) Capital Formation Model with Domestic Public Investment



7.6.5 Labour productivity model

Figure 7.9 shows the CV1 responses due to a positive shock in FDI. It decreases initially and, then, after 5 years gradually increases. It remains below the zero level before ultimately reaching its long-run equilibrium. The CV1 takes relatively a longer time to regain its long-run steady state. This confirms the earlier finding that the level of human capital is an important factor influencing FDI over labour productivity. On the other hand, a positive shock to labour productivity immediately leads to a rapid increase in CV1. It remains above the zero level for 6 years. It does not converge on its equilibrium position even after 20 years.

Figure 7.9 Generalized Impulse Responses to one S.E. Shock in the Equation for FDIY

Labour Productivity Model

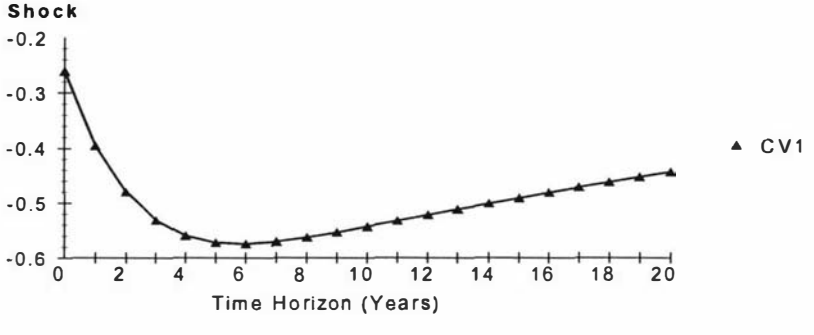
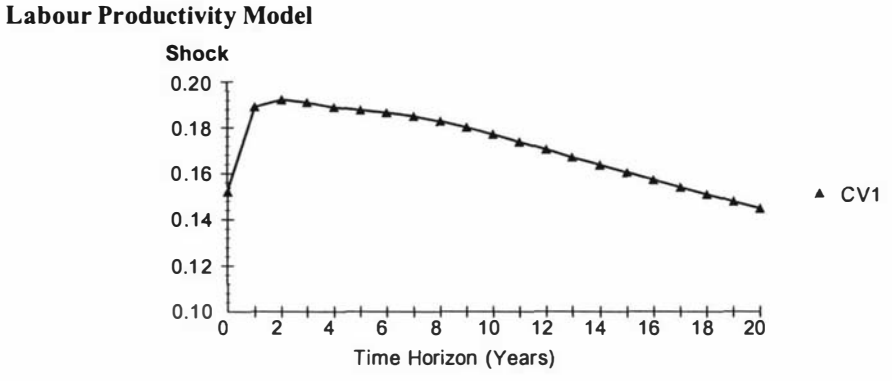


Figure 7.10 Generalized Impulse Responses to one S.E. Shock in the Equation for LP



These results imply that in New Zealand, changes in the level of labour productivity affect the level of FDI. The results also indicate that the speed of convergence is relatively faster for FDI than for labour productivity. While the causality between FDI and labour productivity runs either way the causality running from labour productivity to FDI is, nevertheless, stronger.

7.7 SIGNIFICANCE OF THE RESULTS

The *VAR* technique of innovation accounting (FEVs and IRF) has been used to investigate the various interrelationships between FDI and other macroeconomic variables. The results provide, on their own, an insight into the impact of FDI on a small, developed economy. The innovation accounting approach of *VAR* modelling firstly tests the impact of FDI on economic growth. Between FDI and economic growth there exists a two-way causality. Yet, the strength of causality from economic growth to FDI is higher. The IRF and FEV results explain that an innovation in economic growth accounts for a majority of changes in the FDI. It supports the findings of Shan et al. (1997; 1999), Erricsson and Irandaust (2001), Zhang (2001), and Shan (2001).

FDI has a significant effect on economic growth supporting the endogenous growth theory. A permanent shock to the investment rate results in a permanently higher growth rate of GDP. The positive impact of FDI depends, as explained in the single

equation approach, for New Zealand, not only on the quantity of inflow but also on other factors such as domestic investment, productivity and the rate of exports in economic growth. The results confirm that the co-movements of the variables in the system are important in determining the growth of both GDP and FDI.

The analysis then moves on to the impact of FDI on imports and exports. Increasing cross-border economic integration and interdependence have made a positive contribution in recent times, to the economic performance of nations. FDI is expected to improve the trade balance of host countries by changing their trade pattern. Production in host country affiliates of MNEs could potentially displace imports from either parent companies or other foreign suppliers. The 'supply-side' effect of FDI, such as the transfer of technology or other competitive advantages to host country firms, could expand the level of exports from the host country. The estimation had to prejudge the direction of causality. This study, therefore, has extended the single equation approach to consider the interrelationship between FDI and exports.

There is a lack of systematic investigation of causal links between FDI and trade.[4] The empirical tests in this study provide some interesting outcomes in relation to FDI and trade. The findings support the existence of an investment-trade nexus on the basis of IRFs of FDI, imports and exports. The dynamic nature of the relationship between FDI stock and trade has been revealed in this study. It has been made possible by a system of different equations with a change in one of the variables having ramifications for other CVs over time. It was found that while changes in FDI stock and FDI flow affect imports during initial periods, the IRF suggests only a short-run relationship between FDI flow and imports. The findings between both FDI stock and flow and exports indicate that these variables affect each other through a two-way causality. The strength of causality is, however, imbalanced: the impact of FDI stock on exports is greater and more significant than the effect in the opposite.

[4] One exception is Pfaffermayr (1994), who adopted a time-series approach and Granger's concept to investigate the relationship between outward FDI and exports using Austrian data.

The results support the view noted by UNCTAD World Investment Report (1996). The report focuses on ".... how FDI and trade are interlinked, and whether and how these interlinkages influence the economic growth and welfare of countries" (UNCTAD, 1996, p.i). The report identifies a number of interlinks between investment and trade and concludes:

> *... What seems to be clear is that, first, trade eventually leads to FDI; and, second, on balance FDI leads to trade. The result, therefore, is an intensification of international economic transactions (UNCTAD, 1996, p. 12).*

The finding of a bi-directional causality between exports and FDI is consistent with the previous empirical analyses of Lipsey and Weiss (1981), Markusen (1984) and de Mello and Fukasaku (2000). The positive impact of FDI stock is, as anticipated, stronger on exports than on imports, and the impact of FDI flow positively affects exports and imports. Both the IRF analysis and FEVs support this outcome. Furthermore, the results indicate that links between the FDI levels and trading patterns of New Zealand, i.e. increases in FDI stock during the current period will have a positive impact on trading activities in the future.

The comparison of the results of both the approaches allows the following conclusions to be drawn: the impact of FDI on imports, using either of the approaches, is positive. Both approaches show that increases in the inflow as well as the stock of FDI have a positive impact on imports in New Zealand. The bi-directional causality resulting from the multivariate approach shows that not only does FDI affect exports but exports also affect the level of FDI. As is well known, the reliability of the causality test will depend on the correct specification of the model and, in particular, on the inclusion of variables for common determinants. The presence of a possible long-run relationship among these variables serves as an additional criterion. The results from the multivariate approach are, according to this view, more consistent with the trade-investment nexus.

This study extended the domestic private capital components to further investigate whether increases in FDI attract, displace or have no effect on domestic private investment. In other words, does domestic private investment encourage or discourage FDI? A two-way causality between FDI and domestic private investment was tested, and the results indicate that increases in FDI raise domestic private investment. It establishes that foreign and domestic private investment are complementary. The IRF and the FEV show that an unexpected shock in FDI has a significant and positive impact on capital formation. These results are consistent with Borensztein et al. (1998), Sun (1998a), and de Soysa and Oneal (1999). This strong relationship between private investment and FDI provides evidence that the economy relies on FDI to supplement capital, which is domestically unavailable. These results are consistent with the analysis of Scott-Kennel (2001), confirming a significant linkage between FDI and domestic firms in New Zealand.

7.8 CONCLUSION

This chapter has been investigating the impact of FDI on the economy, considering the co-movements and causality among proposed major macroeconomic variables. The strategy has been to set up *VAR* models and use the techniques of innovation accounting to examine the various impacts between FDI and other macroeconomic variables. As stationarity properties of the variables are necessary before the variables can be included in the *VAR* system, stationarity of each of the variables was first examined by testing for unit roots with the ADF. The lag length of the system was determined by the AIC and SBC analysis before applying Johansen's procedure to estimate the long-run relationships. The diagnostic tests for normality and serial correlation in the residuals for each of the equations in the *VAR* indicate that there was no concern about econometric pathologies inherent in the equations. Johansen's procedure establishes the CVs that can be identified in each of the *VAR* Models.

The main findings are: in the short-run, both economic growth and FDI stock strongly affect each other. The short-run relationships implied by the IRF are supported by

variance decomposition. In the long-run, any shock to FDI stock or to economic growth affects each other; however, the shock to GDP is a major source of the influence over FDI (i.e. changes in economic growth explain more FEV than changes in FDI, and the response of FDI to a shock in economic growth is far more dynamic than the response of economic growth to a shock in FDI). This confirms that economic growth is the most important factor in attracting FDI to a country like New Zealand.

The link between FDI and imports has been established in this analysis: a positive change in FDI stock and/or flow leads to a positive change in imports. The FEV results indicate that positive changes in FDI stock on imports are much stronger during later periods than during initial periods. There exists a two-way complementary causal link running between FDI and exports, but the causality running from FDI to exports is stronger. The empirical evidence further shows a two-way causality relationship between domestic private investment and FDI, with the stronger causality running from FDI to domestic investment. The results also indicate the importance of economic growth levels in determining domestic investment. While productivity models also indicate a two-way causality relationship, labour productivity to FDI seems to be stronger than vice versa.

Overall, the conclusion is a positive one. The evidence of the above empirical analysis indicates net benefits to the economy from FDI. FDI has helped New Zealand's trading and domestic investment activities to achieve both the main goals of competitiveness and the efficient use of resources.[5] These findings from the current research have important policy implications. These are taken up in the concluding Chapter.

[5] See Figure 8.1 in Chapter Eight for details.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

8.1 INTRODUCTION

The current process of globalisation combines all countries in a global village, leading to a high level of interdependency. Foreign direct investment (FDI) has served as an important instrument of this ongoing change, with recent decades witnessing a rapid expansion of FDI across the globe. Along with it there has been a growing belief that FDI contributes to development in host countries. The sources of benefits have been identified as capital formation, export stimulation, provision of new technologies, and growth augmentation. It could be safely assumed that there would be continual change, based on knowledge and the ability to create, distribute, and exploit information. National economies will continue to face more competition, further augmented by growth in information and communication technologies, and an increase in transportation facilities. FDI may well become the most dynamic factor that supports the transition of economies in the present global context.

A large number of empirical studies have provided useful insights into developed countries (DCs) and less developed countries (LDCs). But empirical research on small, developed countries has, largely, been limited. This thesis sought, therefore, to investigate the latter case using New Zealand as a case study. New Zealand has long depended on FDI. Its marked contribution to capital formation has been duly recognized by the UNCTAD (1999). The economy has seen a transformation particularly in the ownership of industry, with substantial influence from liberalisation and privatisation through FDI, especially since the mid-1980s. Studies, which are limited to specific investments and/or industries or to first-round effects, tend to serve little purpose. It undermines the importance of FDI either through an under or over estimation. This empirical and econometric lacuna, along with the established causal relationship between FDI and other proposed variables, provide the required rationale for this study. This study econometrically tests the first- and second-round effects of FDI on the New

Zealand economy. It has used the autoregressive distributed lag (*ARDL*) and cointegrated vector autoregression (*VECM*) techniques to quantify the impact. Given the fact that previous works of this nature have not used New Zealand data, the study makes a useful contribution to knowledge.

This chapter proposes to synthesise the important outcomes emerging from the entire study discussed in the previous seven chapters. The outline of this chapter is as follows: Section 8.2 reviews the key points from earlier chapters. Policy implications are delineated in Section 8.3. The contribution made by this study is outlined in Section 8.4. Section 8.5 indicates unexplored areas, which provide new areas of further research.

8.2 OVERVIEW OF THE RESEARCH

Chapter One examined the importance of FDI in the current global context. The objectives were based especially on theoretical and empirical evidence. The objectives are by and large related to first- and second-round effects of FDI from a host country perspective. The first round impact had manifested through increased capital formation promoting growth, whereas the second round effects resulted in enhanced trade as well as productivity improvements. This chapter also explained the interrelationships between those proposed variables specific to New Zealand.

Chapter Two focused on a review of the theoretical and empirical literature on FDI and its repercussions on host countries. The literature can generally be divided into four distinct periods: (i) 1960s and 70s: *why* FDI?; (ii) 1970s and 1980s: *where* FDI (determining factors from the host country point of view)?; (iii) 1980s and 1990s: *what* impact has FDI had on a host country?; and (iv) the current phase: empirical evidence on the impact and direction of causality when other relevant variables are included. The in-depth analysis of the chapter led to several conclusions, described in the next paragraph.

First, the FDI-growth nexus is econometrically sensitive to country-specific factors such as trade, economic policies, existing factor endowment, and those sectors receiving

FDI. It is made clear that various externalities and spillovers influence the impact on growth. Second, the degree of complementarity or substitutability between FDI and domestic capital formation depends mainly on the developmental stage of the host country. If the country is capable of absorbing the incoming technological know-how, and if this know-how spills over into domestic firms, then domestic investment will be encouraged through backward and forward linkages. Third, the FDI impact on trade is more inconclusive; it could either be positive or negative depending on the nature of the relationship between variables. Fourth, the majority of studies are conducted on a cross-country basis and/or a single equation approach. Fifth, none of the previous studies considered the combined movement of the variables examined in this study as a method for analysing FDI's impact using time-series data.

In sum, the empirical review did not reveal consensus on the positive impact of FDI on growth, capital formation, trade or labour productivity. Neither the existence nor a direction of the causal relationships between FDI and economic growth, exports or domestic investment had been agreed to or examined. Possible reasons could be differences in data, method of analysis, time period and selection of countries. In cross-country studies little attention has been paid to the heterogeneous nature of the countries.

Chapter Three presented an overview of the New Zealand economy and the role of FDI in its growth and development. With the ongoing globalisation coupled with the transformation of the world economy, competitiveness becomes an inherent issue. The New Zealand economy had to, therefore, acquire the necessary efficiency and ability to compete. The economy, whilst pursuing a non-discriminatory policy towards FDI, did not in any way provide special incentives to increase the flow of FDI into the country. The exception has, perhaps, been of a radical policy towards liberalisation and/or privatisation. Data show that during the latter part of the 1990s FDI had increased annually on an average of around 2% to 5% as a ratio of GDP. Another development has been that in New Zealand, while the country was still heavily dependent on its

traditional sources for the flow of FDI, an increased proportion has now been sourced from the Asian economies.

Chapter Three also makes references to studies undertaken on New Zealand and exposes their limitations. An obvious feature of a majority of the existing studies has been their descriptive nature. They are also mostly subject to limitations such as selection bias, restricted data, and small samples. Another shortcoming has been that most of these studies were primarily confined to first-round effects alone. Moreover, the investigative approach adopted has been devoid of any econometric analysis, which has been the hallmark of this study.

Chapter Four considered the relevant econometric models in order to investigate the problems raised. The models and the analytical framework were derived from previous theoretical and empirical analyses of FDI developed for other countries. Consequently, this study adopted the cointegration techniques of *ARDL* and *VECM*, so that the simultaneity bias inherent in the literature could be overcome. These two techniques form the backbone of this thesis, making a useful contribution to the existing literature.

To test the macroeconomic variables five different models have been used. Equations (4.1a) to (4.1c) have been employed to analyse the impact of FDI on economic growth. Equations (4.2a) to (4.5b) were formulated to examine the impact of FDI flow and stock on imports and exports. Equations (4.6a) to (4.8) considered the factors that determine domestic capital formation and showed how the FDI inflow can increase the levels of domestic capital. Finally, the impact of FDI on labour productivity has been framed in equations (4.9a) to (4.9c). The models also incorporated a dummy variable, and examined the impact of bilateral trade agreements on the New Zealand economy when combined with FDI.

The dynamic models set out in Chapter Four have subsequently been used in the empirical investigation in accordance with the objectives, and the results were discussed in Chapter Five. The empirical findings furnish several insights pertaining to a small, developed country:

- The empirical results of the growth equations show that FDI contributes significantly to economic growth. However, the magnitude of FDI seems to increase when the closer economic relations (CER) dummy variable, the human capital variable and the market size variable are added to the models. This implies that an important role is played by these variables in augmenting FDI's contribution towards growth. Perhaps the strongest result to emerge from this study concerns the apparently significant impact on the growth process of FDI along with the trade agreement.

- While investigating the impact of the level of FDI stock and flow on imports, this study found that FDI in New Zealand is generally trade-creating, and is an important factor contributing to the increase of imports in the long-run. The theoretical claim that imports precede FDI is supported by this analysis. Complementarity between FDI and imports occurs with either FDI stock or flow. These outcomes indicate that in a small, developed country, even though a part of the multinational enterprise (MNE) needs are fulfilled from local contacts, there are substantial imports from parent companies. In the long-run, however, FDI is likely to reduce imports, whereas requirements of capital and intermediate products are fueled by local sources.

- FDI flow and stock are export-creating and contribute to rapid growth in exports. FDI stock plays a stronger and more significant role in promoting exports from a small, developed country. The results further confirm that FDI stock affects exports in both the short- and long-run in a positive and significant manner. However, the flow variable is positive but insignificant, implying that to establish a positive long-run relationship between investment and exports a longer time span is required. The results support the view that MNEs can serve as a vehicle for access to international markets and create international competitiveness. Complementarity between FDI and imports and/or exports suggests that close links exist through the procurement and sales activities of MNEs.

- Results indicate that FDI flow has a positive impact in encouraging domestic capital formation. Both short- and long-run impacts of FDI have been positive and statistically significant in domestic capital formation. This relationship confirms the

complementarity between FDI and domestic investment, in particular private investment.

- The estimates of both domestic and foreign capital stock variables, as well as the openness to trade variables, indicate a positive and statistically significant effect on labour productivity. The level of human capital seems to be a crucial factor in supporting the benefits from FDI spillovers.

The methodological approach is then extended in Chapter Six to consider the co-movements and interrelationships among the variables. Without the assumption of economic growth, domestic investment, labour productivity, exports and imports as dependent variables, their correlations were taken and a cointegrated vector autoregression (*VECM)* approach was applied. Generalised innovation accounting techniques were employed to seek the direction and the strength of causality among the variables. The use of this technique to resolve the methodological weaknesses inherent in FDI studies adds, in fact, a new dimension. It throws new light on how FDI impacts on other variables.

The results of this multivariate technique were discussed in Chapter Seven and led to the following main conclusions:

- The overall econometric evidence suggested that the variables included in the models have a cointegrating relationship. The impulse response analysis (IRFs) and the forecast error variance decomposition functions (FEVs) indicate a long-run relationship in the tested models. A two-way causality was found between FDI and economic growth, exports or domestic private investment. The strength of the causality was stronger from growth to FDI than in the opposite direction.

- *VECM* models suggest that FDI plays a positive role in impacting on economic growth. Yet the hypothesis of GDP-driven FDI is also strongly supported. This implies that a country's growth level influences the investment decisions of MNEs. This is borne out by both the IRFs and FEVs. In addition, the growth level has been

found to be sensitive to shocks in its own past values. FDI always creates a larger impact whenever its share in New Zealand's GDP rises by factors like market size and human capital. The possible reason could perhaps be that the nature of FDI dynamics is different under differing circumstances.

- A bi-directional causality has also been found in the relationship between FDI and exports, providing further support for the claim that FDI and exports are complementary. The innovation accounting techniques of export *VECM* models point to the fact that while there is a bi-directional relationship between FDI and exports, the latter is highly sensitive to the former. The implication is that increases in FDI stock would encourage exports, and supports the view that FDI would provide greater opportunities in terms of access to international markets.

- The import-FDI nexus reveals that a positive relationship exists between FDI and imports. While increases in FDI encourage more imports in the short-run, in the long-run FDI is also linked with the domestic supply sources for their requirements. Initially, changes in import levels are more likely to be an outcome of imports own innovations. At the latter stages, however, there is a more gradual decline in imports importance, and the dependence on the level of FDI stock increases. The results support the view that FDI is complementary to imports, especially in small, developed countries, like New Zealand.

- An investigation into capital formation reveals the nature of the relationship between FDI and domestic investment. A bi-directional relationship has once again been found between the two variables. The results indicate that any increase in FDI will have a positive effect on domestic private investment. The findings show that foreign-owned firms enhance competition in many industries. It is therefore clear that domestic private investment also influences FDI. The ultimate implication is that local firms are in a position to benefit from FDI both through backward and forward linkages. Local firms generally offer complementary resources in the form of indigenous experiences and domestic marketing channels.

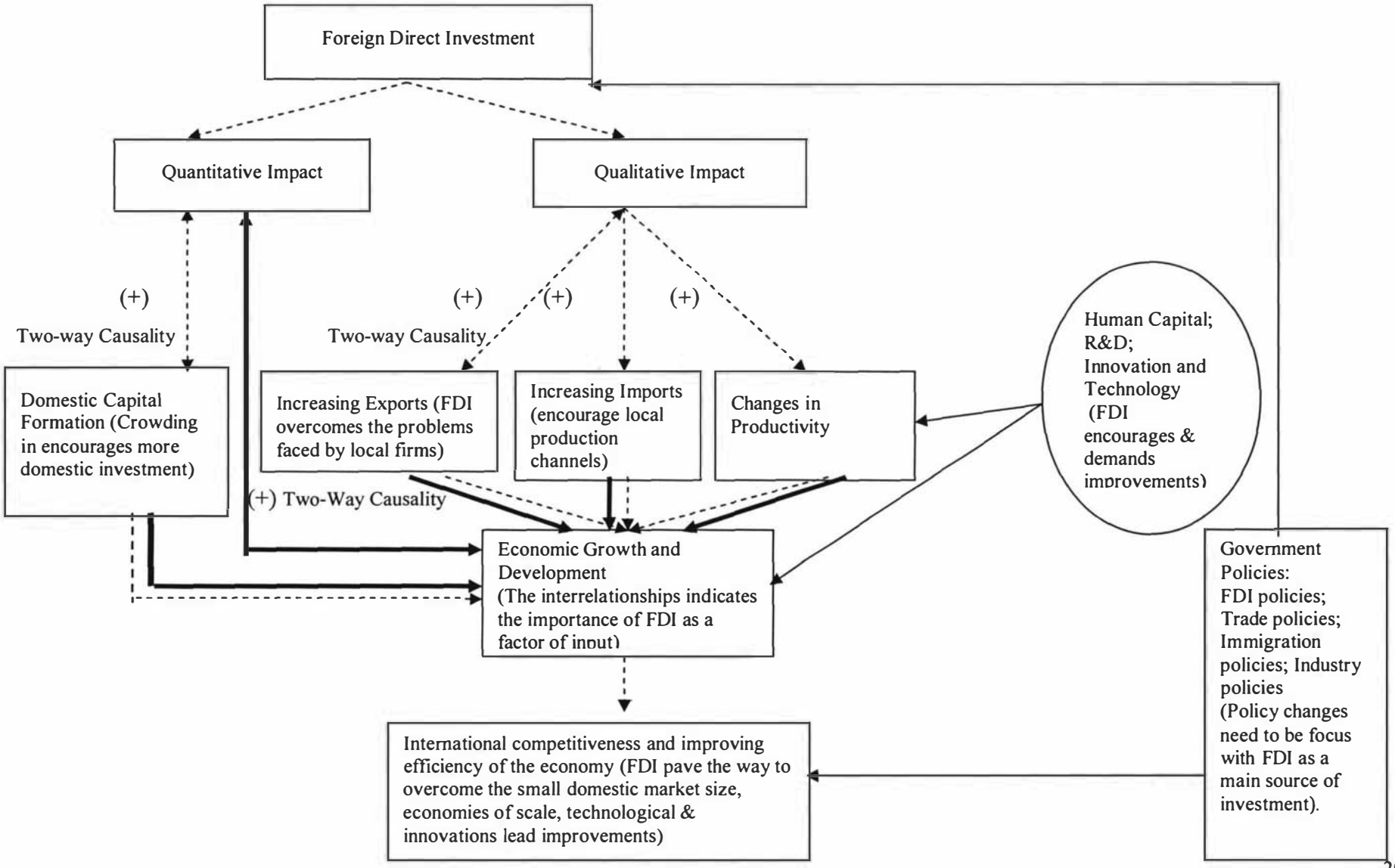
- The outlined results indicate that F DI and labour productivity are integrated, while human capital seems to be the key factor in explaining the impact of FDI on labour productivity.

8.3 POLICY IMPLICATIONS

The relevance of these results to New Zealand, and their main policy implications are discussed in this section (refer to Figure 8.1). In a small, developed host country like New Zealand, which aims to increase international competitiveness through a more effective use of resources, FDI could serve as one of the means. But the results indicated that FDI is in itself a function of a set of government policies based on investment, profit, and taxes. The prevailing export orientation, investment climate, and level of economic growth could further prejudge it.

FDI has a positive relationship with New Zealand's trading activities. The resuls suggest export-oriented policies are an easy means to attract more foreign investments. But in the context of a small, developed economy, FDI policies of larger DCs and LDCs could prove detrimental. For New Zealand, its isolation also adds to its disadvantages in attracting FDI. The policy formulation, therefore, should consider this fact. New foreign firms need more machinery and raw material, which leads to an increase in imports. It is always possible for local firms to step in and supply a part of the input requirements. There is thus more acceleration of local economic activities. As the results confirm the integration of the macroeconomic variables, government policies, therefore, play a major role in propagating competitiveness and the efficient use of resources.

Figure 8.1 Schema for Methodological Investigation of the Role of FDI in a Host Country.



Considering FDI's effects on existing labour productivity and the relatively high labour cost in New Zealand, it may be appropriate to develop capital-intensive industries with high-value added, such as the electronics industry, through a more selective policy towards FDI. It is also imperative to shift the local capital industry towards more effective and productive sectors in order to achieve economic growth. Conversely, such an efficient local industrial structure can attract more FDI in quantity as well as quality. Liberalisation policies have allowed, since 1984, New Zealand to attract a considerable amount of FDI, especially the rapid increase in the 1990s could be an example. However, the nature and mode of the investment flow have meant that, unlike Ireland and Finland, New Zealand has not experienced rapid economic growth. The evidence of *VECM* indicates the interrelationship among the variables investigated, thus suggesting there is a need for a carefully crafted liberalisation strategy integrated with policies to upgrade the skills of the technology base and New Zealand's trade orientation, which can be used to attract new foreign investors.

In the absence of a directive policy, the extent of investment depends on the strength of domestic advantages like an educated workforce, political stability and improvements in the infrastructure. In particular, in the current context of globalisation, targeting FDI to high-tech activities, New Zealand needs to offer a skilled workforce with new technical skills, supported by infrastructure, low business transaction costs, inputs at world market prices, national treatment for foreign investors and stable, transparent policies. Some of these factors (like national treatment of investors, improvement in infrastructure development and educational levels) have improved in the recent past. However, to attract quality FDI, further development of the local infrastructure and good use of the local resources base are important in order to benefit from FDI.

In the long-run, FDI is more productive than domestic investment. However, causality tests showed the two sources of investment are complementary and indicated their comovements. To continue such integration, domestic investment must be mainly targeted to areas where it could supply the requirements for FDI production, while leaving FDI to be targeted more on export-oriented activities. Increased exports will

generate foreign exchange earnings that are likely to offset, at least in part, FDI-induced increases in imports and to factor payments abroad. Through backward linkages in the host country, export-oriented FDI may encourage investment, capital deepening and technological upgrading.

As highlighted in Chapter Three, there is concern among the New Zealand community about FDI activities. Media, political speeches and other fora could be used to highlight the importance of FDI in the global economy, discuss the vital role it has played in restructuring the economy in the past and debate how it could support future development. Publications could give details of employment that has been created, new industries developed, the increase of access to export markets, and extra tax revenue gained from FDI projects.

Greenfield investments may improve the country's competitiveness, and the formation of joint ventures may be effective ways for local firms to develop in a host country. As a joint venture integrates foreign and domestic investment, it can promote capital deepening, technology and management, and also stimulate market-oriented production, which is vital for a country like New Zealand.

Finally, FDI in conjunction with other domestic ingredients like investment environment, human capital and export-orientation, has had a favourable effect on the economy. The potential for further expansion is exceedingly high. In this context government policy becomes a crucial factor. The government should always aim to offer a comprehensive policy package, not only to increase the inflow of FDI but also to derive maximum benefits from FDI.

8.4 CONTRIBUTIONS OF THE STUDY

The present study differs from previous studies in many ways. The growth model employed in this study included country specific variables like human capital, interactive variables, bilateral trade agreements, and market size, and hence eliminated the misspecifications of models used in some previous studies. There has also been a

disaggregation of domestic investment into public and private components. This helps to discover domestic investment components' correlation with FDI. Earlier econometric studies were generally based on the assumption of a one-way causality running from FDI to other macroeconomic variables like GDP, exports and/or domestic capital. These studies ignored the possibility of a two-way causality. Taking two approaches, *ARDL* and *VECM*, and providing for comparison, this study has overcome such methodological weaknesses. A further strength of the present approach has been the incorporation of new developments in econometric theory, such as the time series concepts of cointegration and causality analysis. The proposed models in the study also consider varying effects among variables. The study helps provide for an altogether different perspective in analysing the impact of FDI, in particularly from a small, developed host country.

The academic strength of the current study is drawn mainly from two sources. The empirical evidence from New Zealand is a first attempt to carry out an in-depth econometric analysis of the effects of FDI. The findings derived are by and large compatible with results obtained from earlier case-study type analyses. But this study also provides for more conclusive evidence on the positive impact of FDI on proposed macroeconomic variables. It thus fills a gap in the existing literature not only from the particular standpoint of New Zealand, but also from a general standpoint of small, developed countries.

The other aspect has been the cointegration techniques employed to test the objective set out in Chapter One. As noted before, the recent renewed interest among econometricians in the univariate properties of macroeconomic time-series has increased concern for investigating their long-run equilibrium behaviour. Despite several empirical studies investigating the effect of FDI and other macroeconomic variables, there is no serious effort to understand the two-way link between these variables. This study has considered and applied these new methodologies to tackle the inherent econometric problems in the pervious studies. The methodology has thus, resulted in new insights, ARDL and VECM, on the impact of FDI from a host country

perspective. It has enabled a clear understanding of the first- and second-round effects and their interrelationships. The importance of having a good investment environment with an export-orientation policy has been underlined, leading the way to a two-way causality between variables.

The consideration of cointegration among variables has further enhanced knowledge of the influence of FDI on a host country. It is now possible to have a precise methodological approach when analysing the effect of FDI. Single equation techniques have indicated that even when FDI bring about changes in other variables, if cointegration among them can be established, the simultaneity bias can be overcome by applying *ARDL*.

8.5 FUTURE RESEARCH

This study has convincingly shown that FDI positively impacts various macroeconomic variables. Empirical evidence shows that FDI is a vital source of investment influencing various other economic activities of a small, developed host country. The statistically significant influence of FDI and the existence of causal relationships between FDI and other growth indicators explicitly point to the importance of incorporating a clear policy agenda within the FDI strategy. Nevertheless, the variables used in this study are in an aggregate form. It would be more interesting if the impact of FDI could be studied using disaggregated data, thus showing the precise channels through which FDI could intervene within the economy.

This study emphasized the ongoing process of globalisation and the need for sectoral development and export opportunities for a country like New Zealand. It examined the impact of the bilateral trade pacts' association with FDI, and its impact on the economy. Yet, the analysis carried out in the study did not elaborate on how other multilateral agreements could affect the flow of FDI and influence the economy. These are complex issues in the current global context, and need a deeper examination.

The lack of adequate data has also made it difficult to consider the impact of FDI on other important variables like employment, or tax revenue. Future improvement in the data series would perhaps enhance investigations into these areas and provide a fuller picture of FDI effects. Recent changes by Statistics New Zealand's published data on quarterly FDI flow and stock level, and on country of origin and sector of investment, could serve as a possible starting point.

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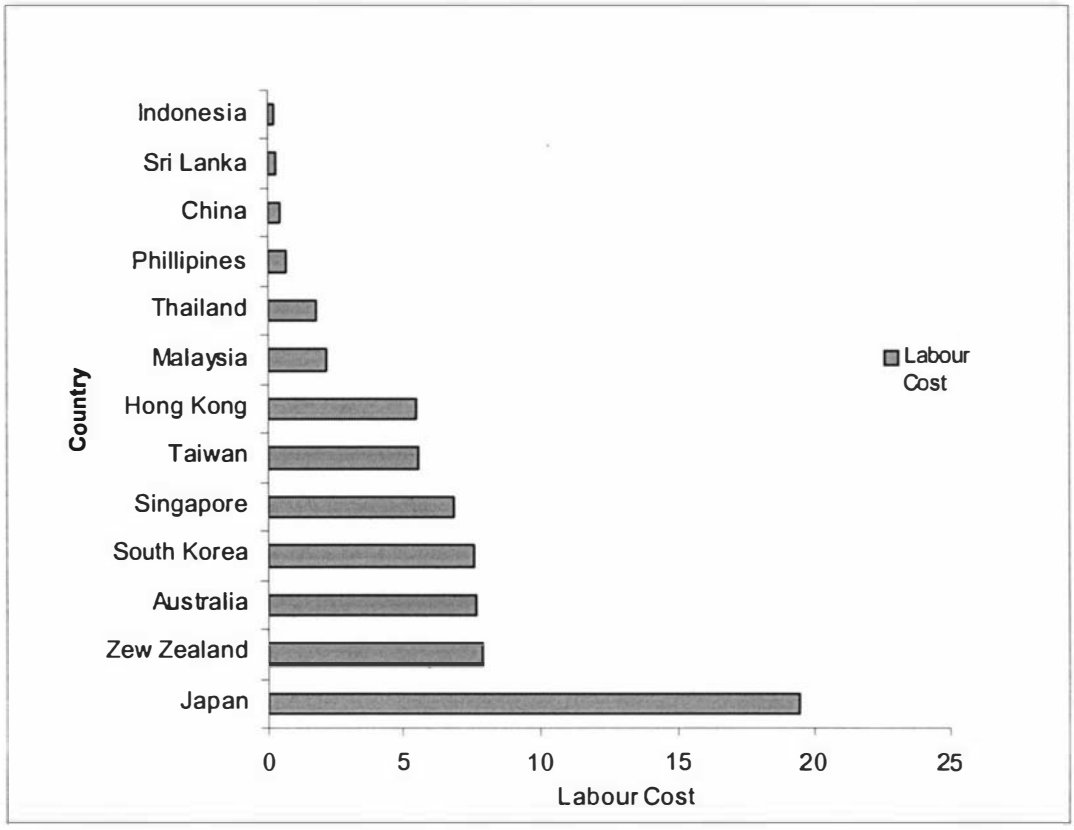
APPENDICES

APPENDIX 3.1

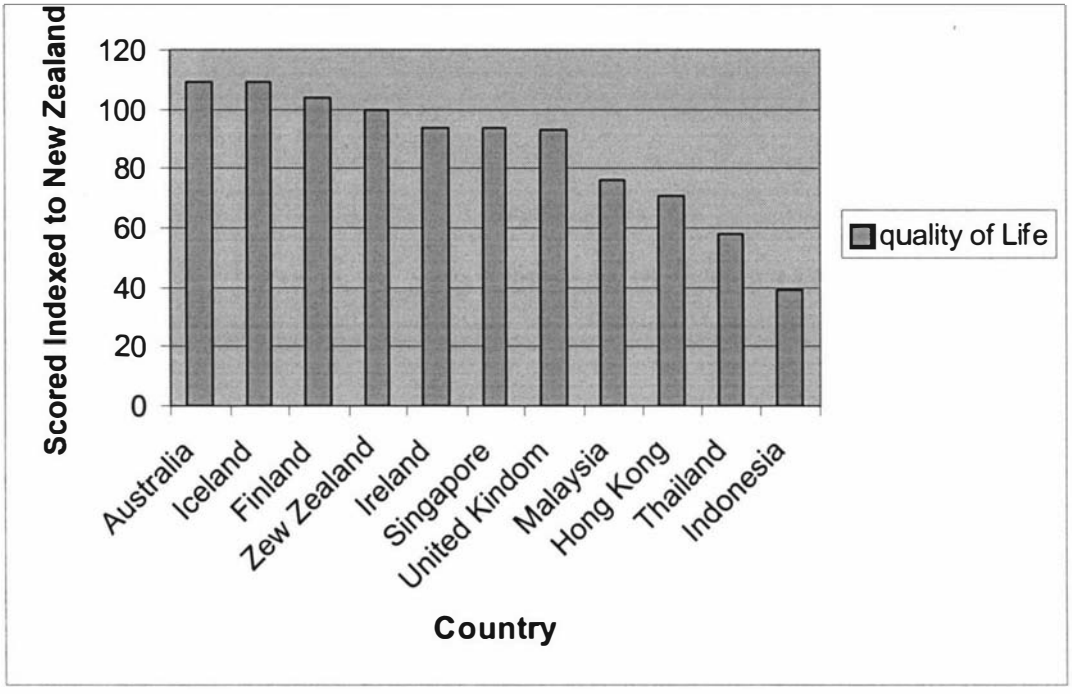
LABOUR COST PER HOUR, 2001 US $



Source: Economic Intelligent Unit, 2001

APPENDIX 3.2

NEW ZEALAND'S POSITION: QUALITY OF LIFE



Source: World Competitiveness Yearbook, 2001.

APPENDIX 3.3

BUSINESS ENVIRONMENT RANKINGS: NEW ZEALAND POSITION VS. GLOBAL AND REGIONAL COMPETITORS[a]

Factors Influencing FDI	New Zealand	Australia	Finland	Ireland	Iceland	Malaysia	Singapore	Hong Kong
Overall position	100	67	14	33	62	138	10	29
Political system	100	24	12	20	32	96	4	92
Government economic policies	100	20	10	8	30	25	3	53
Transparency	100	43	14	50	57	150	7	264
Macroeconomic environment	100	82	97	18	124	38	9	12
Extend of government policies towards com	100	29	12	18	53	153	6	24
GDP per capita	100	80	48	36	28	148	56	40
Market size	100	59	93	102	111	55	98	84
Globalisation	100	74	3	26	19	135	13	23
Investment								
Domestic Investment	100	32	75	82	109	77	64	50
FDI Inflow	100	60	67	31	112	86	52	29
FDI stock	100	44	156	84	192	80	56	40
FDI Policies								
Investment Incentives	100	52	27	2	69	42	4	63
Equal treatment (local vs. foreign)	100	180	7	87	247	313	120	53
Access to local capital markets	100	144	31	44	175	288	200	75
Investment Protection	100	42	13	15	85	81	2	54
International Trade								
Exports	100	57	71	50	117	43	36	24
Imports	100	429	229	400	14	414	486	586
Trade to GDP ratio	100	150	96	21	79	11	4	7
Labour market								
Skilled labour	100	17	55	114	7	103	14	79
Productivity	100	72	44	40	60	168	92	80
Infrastructure								
Basic	100	6	35	124	41	176	24	118
Technical	100	29	18	71	24	218	53	124
Scientific	100	80	24	72	52	136	40	96
Expenditure on R&D	100	47	56	91	138	131	81	119

Source: World Competitiveness yearbook (2001)

a: Notes Score indexed to New Zealand = 100; except for imports the lower value is better because the competitive yearbook ranks a country with highest value first while the one with lowest is last. Transparency indicates the government's communicates its policy intentions clearly; overall position indicates economic performance, government efficiency, business efficiency and infrastructure and globalisation indicates threatening towards the domestic economy.

APPENDIX 4.1

THE THEORETICAL MODELS

4.1.1 THE THEORETICAL GROWTH MODEL WITH FDI

The full expression of the growth model is given below:

$$Y_t = Y(K_{pri,t}, K_{pub,t}, L_t, K_{f,t}, X_t, HC_t, FDI * HC_t), \tag{4.1.1a}$$

$$\Delta Y_t = \frac{\Delta Y_t}{\Delta K_{pri,t}}\Delta K_{pri,t} + \frac{\Delta Y_t}{\Delta K_{pub,t}}\Delta K_{pub,t} + \frac{\Delta Y_t}{\Delta L_t}\Delta L_t + \frac{\Delta Y_t}{\Delta K_{f,t}}\Delta K_{f,t} + \frac{\Delta Y_t}{\Delta X_t}\Delta X_t + \frac{\Delta Y_t}{\Delta HC_t}\Delta HC_t + \frac{\Delta Y_t}{\Delta FDI * HC_t}\Delta FDI * HC_t \tag{4.1.1b}$$

$$\frac{\Delta Y_t}{Y_{t-1}} = \left[\frac{\Delta Y_t}{\Delta K_{pri,t}}\frac{K_{pri,t-1}}{Y_{t-1}}\right]\frac{\Delta K_{pri,t}}{K_{pri,t-1}} + \left[\frac{\Delta Y_t}{\Delta K_{pub,t}}\frac{K_{pub,t-1}}{Y_{t-1}}\right]\frac{\Delta K_{pub,t}}{K_{pub,t-1}} + \left[\frac{\Delta Y_t}{\Delta L_t}\frac{L_{t-1}}{Y_{t-1}}\right]\frac{\Delta L_t}{L_{t-1}} + \left[\frac{\Delta Y_t}{\Delta K_{f,t}}\frac{K_{f,t-1}}{Y_{t-1}}\right]\frac{\Delta K_{f,t}}{K_{f,t-1}} + \left[\frac{\Delta Y_t}{\Delta X_t}\frac{X_{t-1}}{Y_{t-1}}\right]\frac{\Delta X_t}{X_{t-1}} + \left[\frac{\Delta Y_t}{\Delta HC_t}\frac{HC_{t-1}}{Y_{t-1}}\right]\frac{\Delta HC_t}{HC_{t-1}} + \left[\frac{\Delta Y_t}{\Delta FDI * HC_t}\frac{FDI * HC_{t-1}}{Y_{t-1}}\right]\frac{\Delta FDI * HC_t}{FDI * HC_{t-1}} \tag{4.1.1c}$$

Which can be written as follows:

$$g_y = \alpha_2 g_{k_{pri,t}} + \alpha_2 g_{k_{pub,t}} + \alpha_3 g_l + \alpha_4 g_f + \alpha_5 g_x + \alpha_6 g_{hc} + \alpha_7 g_{fdi*hc} \tag{4.1.1d}$$

where:

$$\alpha_2 = \left[\frac{\Delta Y_t}{\Delta K_{pri,t}}\frac{K_{pri,t-1}}{Y_{t-1}}\right]$$

$$\alpha_3 = \left[\frac{\Delta Y_t}{\Delta K_{pub,t}}\frac{K_{pub,t-1}}{Y_{t-1}}\right]$$

$$\alpha_4 = \left[\frac{\Delta Y_t}{\Delta L_t}\frac{L_{t-1}}{Y_{t-1}}\right]$$

$$\alpha_5 = \left[\frac{\Delta Y_t}{\Delta K_{f,t}}\frac{K_{f,t-1}}{Y_{t-1}}\right]$$

$$\alpha_6 = \left[\frac{\Delta Y_t}{\Delta X_t} \frac{X_{t-1}}{Y_{t-1}} \right]$$

$$\alpha_7 = \left[\frac{\Delta Y_t}{\Delta HC_t} \frac{HC_{t-1}}{Y_{t-1}} \right]$$

$$\alpha_8 = \left[\frac{\Delta Y_t}{\Delta FDI * HC_t} \frac{FDI * HC_{t-1}}{Y_{t-1}} \right]$$

where g_i is the growth rate of i = Y, L, K_{pri}, K_{pub}, K_f, X, HC, and FDI*HC similar to the equation (4.1a) in the main text. Following Rameriz (2000) a modified counterpart to the production function for equation (4.1.1d) is taken as equation (4.1b) in the main text by taking the following:

$g_i = ln\ i_t - ln\ i_{t-1}$

$= \Delta\ ln\ i$

4.1.2 THE THEORETICAL IMPORT MODEL WITH FDI

$$IM_t = IM(FDI_t, \Omega), \tag{4.1.2a}$$

$$IM_t = IM(GDPPC_t, REX_t, TDI_t, FDI_t) \tag{4.1.2b}$$

Expressing equation (41.2b) in logs will lead to:

$$\ln IM_t = \kappa_1 \ln TDI_t + \kappa_2 \ln GDPPC_t + \kappa_3 \ln FDI_t + \kappa_5 \ln REX_t, \tag{4.1.2c}$$

4.1.3 The Theoretical Export Model with FDI

$$X_t = X(FDI_t, \Phi), \tag{4.1.3a}$$

$$X_t = X(FDI_t, REX_t, I_{pri,t}, I_{pub,t}, WGY, L) \tag{4.1.3b}$$

Expressing equation (4.4a-2) in logs will lead to:

$$\ln X_t = \beta_1 \ln I_{pri,t} + \beta_2 \ln I_{pub,t} + \beta_3 \ln FDI_t + \beta_4 WGY_t + \beta_5 \ln REX_t + \beta_6 \ln L_t, \tag{4.1.3c}$$

Adding the constant and error terms to equations (4.1.2c) and (4.1.3c) will lead to equations (4.2b) and (4.4b) in the main text.

4.1.4 THEORETICAL MODEL OF CAPITAL FORMATION

Taking the lead of Lipsey (2000) and Agosin and Mayar (2000) capital formation equation with FDI have been developed as follows:

$I_t \equiv I_{d,t} + I_{f,t}$ (4.1.4a)

$I_{f.t} = FDI$ (4.1.4b)

As noted by Agosin and Mayar (2000) investment is a stock adjustment variable responding to the difference between the expected/desired capital stock ($K^*_{d,t}$) and the actual capital stock ($K_{d,t}$). Thus the basic models is given as

$$I_{d,t} = \lambda(K^*_{d,t} - K_{d,t}), \quad (4.1.4c)$$

where λ is the coefficient of adjustment. In the model the desired capital stock depends on GDPPC, REX and DC.

$$K^*_{d,t} = \phi_0 + \phi_1 GDPPC + \phi_2 REX + \phi_3 DC \quad (4.1.4d)$$

Consider the law of motion of the actual capital stock

$$K_{d,t} = (1-d)K_{d,t-1} + I_{d,t-1} \quad (4.1.4e)$$

where d is the annual depreciation rate. By substituting (4.1.4d) and (4.1.4e) in (4.1.4c) will give the following:

$$I_{d,t} = \lambda(\phi_0 + \phi_1 GDPPC + \phi_2 REX + \phi_3 DC - (1-d)K_{d,t-1} + I_{d,t-1}) \quad (4.1.4f)$$

$$I_{d,t} = \lambda\phi_0 + \lambda\phi_1 GDPPC + \lambda\phi_2 REX + \lambda\phi_3 DC - \lambda(1-d)K_{d,t-1} + I_{d,t-1}, \quad (4.1.4g)$$

$$I_{d,t} = \phi_0 + \phi_1 GDPPC + \phi_2 REX + \phi_3 DC + I_{d,t-1}, \quad (4.1.4h)$$

where $\phi_0 = \lambda(1-d)K_{d,t-1}$,

$\phi_1 = \lambda\phi_1$,

$\phi_2 + \lambda\phi_2$,

$\phi_3 = \lambda\phi_3$

By substituting (4.1.4h) and (4.1.4b) in (4.14a) and taking logs will give equation (4.6b) in the main text. It should be noted the lagged form of the investment is not included as the estimation procedure adopted is this study is *ARDL*.

4.1.5 THEORETICAL MODEL OF LABOUR PRODUCTIVITY

Based on the study of Gera et al. (1999) the labour productivity model has been derived as follows:

$$Y(t) = L(t)^{\psi_1} K_d(t)^{\psi_2} FDI(t)^{\psi_3} OT(t)^{\psi_4} (t) e^{\psi_0^t} \tag{4.1.5a}$$

Taking logarithms on both sides of the equation gives:

$$\log Y = \psi_1 \log L + \psi_2 \log K + \psi_3 \log FDI + \psi_4 \log OT + \psi_0 t \tag{4.1.5b}$$

Taking derivatives of (4.1.b) with respect to t gives:

$$\frac{1}{Y}\frac{\partial Y}{\partial t} = \psi_1 \frac{1}{L}\frac{\partial L}{\partial t} + \psi_2 \frac{1}{K}\frac{\partial K}{\partial t} + \psi_3 \frac{1}{FDI}\frac{\partial FDI}{\partial t} + \psi_4 \frac{1}{OT}\frac{\partial OT}{\partial t} + \psi_0 t \tag{4.1.5c}$$

leads to standard the growth equation:

$$\frac{\dot{Y}}{Y} = \psi_1 \frac{\dot{L}}{L} + \psi_2 \frac{\dot{K}}{K} + \psi_3 \frac{\dot{FDI}}{FDI} + \psi_4 \frac{\dot{OT}}{OT} + \psi_0 \tag{4.1.5d}$$

where dots denote the first derivatives with respect to time and the ψ's are output elasticities. Using the definitions for the output elasticities, for example, ψ_2, the output elasticity with respect to domestic capital, equal $\left[\frac{\partial Y}{\partial K}\frac{K}{Y}\right]$, therefore equation (4.1.5d) can be rewritten as

$$\frac{\dot{Y}}{Y} = \psi_1 \frac{\dot{L}}{L} + \left[\frac{\partial Y}{\partial K}\frac{K}{Y}\right]\frac{\dot{K}}{K} + \left[\frac{\partial Y}{\partial FDI}\frac{FDI}{Y}\right]\frac{\dot{FDI}}{FDI} + \left[\frac{\partial Y}{\partial OT}\frac{OT}{Y}\right]\frac{\dot{OT}}{OT} + \psi_0 \tag{4.1.5e}$$

$$\frac{\dot{Y}}{Y} = \psi_1 \frac{\dot{L}}{L} + \left[\frac{\partial Y}{\partial K}\right]\frac{\dot{K}}{Y} + \left[\frac{\partial Y}{\partial FDI}\right]\frac{\dot{FDI}}{Y} + \left[\frac{\partial Y}{\partial OT}\right]\frac{\dot{OT}}{Y} + \psi_0 \tag{4.1.5f}$$

Subtracting the growth rate of labour input from both sides of equation (4.1.5f) will lead to the following equation:

$$\frac{\dot{Y}}{Y} - \frac{\dot{L}}{L} = \psi_1 \frac{\dot{L}}{L} + \left[\frac{\partial Y}{\partial K}\right]\frac{\dot{K}}{Y} + \left[\frac{\partial Y}{\partial FDI}\right]\frac{\dot{FDI}}{Y} + \left[\frac{\partial Y}{\partial OT}\right]\frac{\dot{OT}}{Y} - \frac{\dot{L}}{L} + \psi_0 \tag{4.1.5g}$$

$$\frac{\dot{Y}}{Y} - \frac{\dot{L}}{L} = -(1-\psi_1)\frac{\dot{L}}{L} + \left[\frac{\partial Y}{\partial K}\right]\frac{\dot{K}}{Y} + \left[\frac{\partial Y}{\partial FDI}\right]\frac{\dot{FDI}}{Y} + \left[\frac{\partial Y}{\partial OT}\right]\frac{\dot{OT}}{Y} + \psi_0 \tag{4.1.5h}$$

$$\frac{\dot{y}}{y} = \zeta_1 \frac{\dot{L}}{L} + \zeta_2 \frac{\dot{K}}{Y} + \zeta_3 \frac{\dot{FDI}}{Y} + \zeta_4 \frac{\dot{OT}}{Y} + \zeta_0 \qquad (4.1.5i)$$

where $\zeta_1 = -(1-\zeta)$; $\zeta_2 = \left[\frac{\partial Y}{\partial K}\right]$; $\zeta_3 = \left[\frac{\partial Y}{\partial FDI}\right]$; $\zeta_4 = \left[\frac{\partial Y}{\partial OT}\right]$; $\frac{\dot{y}}{y}$ is labour productivity; $\frac{\dot{L}}{L}$ is growth rate of labour force; $\frac{\dot{K}}{Y}$ is capital intensity; $\frac{\dot{FDI}}{Y}$ is FDI to GDP; $\frac{\dot{OT}}{Y}$ is the sum of exports and imports to GDP. Adding an error term, renaming and expressing the equation (4.1.5i) in logs will lead to equation (4.9b) in the main text.

APPENDIX 4.2

SIMPLE DESCRIPTION OF ARDL MODEL

A simple description of the *ARDL* estimation technique using a model with two variables and a maximum of two lags are explained below:

Suppose the long-run relationship is given as:

$$y_t^* = \alpha + \beta x_t \tag{i}$$

and the associated error correction model can be written as:

$$\Delta y_t = \gamma \Delta y_{t-1} + \delta \Delta x_t - \lambda (y_{t-1} - \alpha - \beta x_{t-1}) + \mu_t \tag{ii}$$

Equation (ii) can be written in level form as:

$$y_t = (1 + \gamma - \lambda) y_{t-1} - \gamma y_{t-2} + \delta x_t - (\delta - \gamma\beta) x_{t-1} + \lambda\alpha + \mu_t \tag{iii}$$

or

$$y_t = a_1 y_{t-1} + a_2 y_{t-2} + b_0 x_t + b_1 x_{t-1} + c + \mu_t \tag{iv}$$

where

$a_1 = 1 + \gamma - \lambda,$
$a_2 = -\gamma,$
$b_0 = \delta,$
$b_1 = \lambda\beta - \delta and$
$c = \lambda\alpha$

Equation (iv) can be estimated using OLS and the coefficients of the long- and short-run relationships may be received in the following manner.

In the long-run

$$\hat{\beta} = \frac{\hat{b}_0 + \hat{b}_1}{1 - \hat{a}_1 - \hat{a}_2} \quad and \quad \hat{\alpha} = \frac{\hat{c}}{1 - \hat{a}_1 - \hat{a}_2}$$

where $\hat{a}_1 - \hat{a}_2$ $\hat{b}_0$ *and* $\hat{b}_1$ are the OLS estimates of $a_1 - a_2$ b_0 *and* b_1

MICROFIT 4.0 calculates asymptotic standard errors for $\hat{\beta}$ and $\hat{\alpha}$ using Bewley's regression approach.

The short-run relationship (in EC form) can be shown as follows:

$\hat{\lambda} = 1 - \hat{a}_1 - \hat{a}_2$ *and* $\hat{\gamma}$ *and* $\hat{\delta}$ are given by $-\hat{a}_2$ *and* $\hat{b}_0$ respectively.

APPENDIX 5.1

CAPITAL FORMATION MODELS

Total Investment

Long-run Coefficients:

$$\ln TDI = \underset{(3.96)^{***}}{10.66} + \underset{(3.49)^{***}}{3.07}\ln GDPPC + \underset{(1.91)^{*}}{0.23}\ln FDI + \underset{(2.41)^{**}}{0.01}\ln REX + \underset{(1.87)^{*}}{0.40}\ln DC + \underset{(0.31)}{0.04}CER$$

$$\bar{R}^2 = 0.93 \quad F_{11,26} = 66.90^{***} \quad SEE = 0.06 \quad DW = 2.1 \quad LM\,\chi^2(1) = 0.82$$

$$\text{Re}set\,\chi^2(1) = 0.99 \quad JNB\,\chi^2 = 1.41 \quad ARCH\,\chi^2 = 0.13$$

Short-run Coefficients:

$$\ln TDI = \underset{(2.22)^{**}}{3.66} + \underset{(1.59)}{0.55}\Delta\ln GDPPC + \underset{(1.66)}{0.70}\Delta\ln GDPPC_{t-1} + \underset{(3.15)^{***}}{0.08}\Delta\ln FDI + \underset{(2.96)^{**}}{0.45}\Delta\ln REX + \underset{(2.72)^{**}}{0.13}\Delta\ln DC + \underset{(0.32)}{0.05}\Delta CER - \underset{(2.78)^{**}}{0.34}\,ecm_{t-1}$$

$$\bar{R}^2 = 0.53 \quad F_{5,32} = 7.06^{***} \quad DW = 2.1$$

Private Investment

Long-run Coefficients:

$$\ln I_{pri} = \underset{(2.84)^{***}}{7.91} + \underset{(2.87)^{**}}{2.41}\ln GDPPC + \underset{(2.12)^{**}}{0.22}\ln FDI + \underset{(2.55)^{**}}{0.01}\ln REX + \underset{(1.23)}{0.21}\ln DC + \underset{(0.77)}{0.10}CER$$

$$\bar{R}^2 = 0.94 \quad F_{6,32} = 80.20^{*^{**}} \quad SEE = 0.08 \quad DW = 2.25 \quad LM\,\chi^2(1) = 2.06$$

$$\text{Re}set\,\chi^2(1) = 0.31 \quad JNB\,\chi^2 = 0.95 \quad ARCH\,\chi^2 = 0.09$$

Short-run Coefficients:

$$\ln I_{pri} = \underset{(2.06)^{**}}{3.22} + \underset{(1.29)}{0.56}\Delta\ln GDPPC + \underset{(2.25)^{**}}{1.09}\Delta\ln GDPPC_{t-1} + \underset{(2.80)^{**}}{0.09}\Delta\ln FDI + \underset{(2.50)^{**}}{0.50}\Delta\ln REX + \underset{(1.44)}{0.08}\Delta\ln DC - \underset{(3.28)^{***}}{0.40}\,ECT_{t-1} + \underset{(0.82)}{0.04}CER$$

$$\bar{R}^2 = 0.43 \quad F_{8,29} = 6.04^{***} \quad DW = 2.2$$

Public Investment

Long-run Coefficients:

$$\ln I_{pub} = \underset{(3.99)^{***}}{16.08} + \underset{(2.90)^{**}}{4.61}\ln GDPPC + \underset{(0.41)}{0.06}\ln FDI - \underset{(1.48)}{1.53}\ln REX + \underset{(2.50)^{**}}{0.77}\ln DC - \underset{(0.67)}{0.12}CER$$

$$\bar{R}^2 = 0.74 \quad F_{7,31} = 10.38^{***} \quad SEE = 0.12 \quad DW = 1.8 \quad LM\chi^2(1) = 0.39$$

$$\mathrm{Re}set\chi^2(1) = 0.09 \quad JNB\chi^2 = 1.6 \quad ARCH\chi^2 = 0.66$$

Short-run Coefficients:

$$\ln I_{pub} = \underset{(2.40)^{**}}{7.20} + \underset{(0.27)}{0.18}\Delta\ln GDPPC - \underset{(1.06)}{0.90}\Delta\ln GDPPC_{t-1} + \underset{(0.44)}{0.02}\Delta\ln FDI + \underset{(0.09)}{0.03}\Delta\ln REX - \underset{(1.62)}{0.39}\Delta\ln DC - \underset{(3.00)^{***}}{0.44}ECT_{t-1} - \underset{(0.64)}{0.05}CER$$

$$\bar{R}^2 = 0.30 \quad F_{5,33} = 3.30^{***} \quad DW = 2.1$$

APPENDIX 7.1

DIAGNOSTIC TESTS ON THE SINGLE EQUATION

GROWTH MODEL

Equation (6.3)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$	Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Lag order 3					**Lag order 1**				
GDP	0.07031	3.4711	0.55516	0.00167	GDP	0.14551	0.86131	2.1817	0.00677
K_f	5.1233	5.0538	2.0483	5.4622	K_f	1.8668	0.4818	1.9754	1.1186
K_{pri}	4.9319	0.77033	0.76871	0.6361	K_{pri}	1.4410	0.55378	0.04408	0.01202
K_{pub}	6.1222	1.3861	1.4802	0.97317	K_{pub}	2.3018	2.0513	0.18004	1.7204
X	0.03914	0.93033	1.2980	4.5556	X	0.08720	2.3778	0.53048	2.4786
HC	0.5623	1.6822	1.2935	0.10545	HC	0.07031	0.092298	2.04080	0.01105
L	1.1255	1.3156	7.91469	0.19149	L	1.5453	1.6105	1.7374	0.09336
GDPPC	0.3534	2.1045	3.8486	0.05391	LGDPPC	0.96021	1.7721	1.0925	4..3010

IMPORTS MODEL

Equation (6.4)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$	Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Lag order 3					**Lag order 1**				
IM	2.3852	4.6491	8.7878	0.38669	IM	2.4157	1.1153	1.0700	0.54419
GDPPC	0.09409	0.00514	1.7750	3.3227	GDPPC	1.1470	1.6731	2.1142	2.2424
FDI	0.08565	2.0661	0.64222	0.04645	FDI	.025613	5.2789	0.89917	1.5620
I_{pri}	5.2246	0.00798	1.6276	0.47370	I_{pri}	2.6141	2.4096	0.57211	2.4982
REX	0.82593	5.8561	3.4980	0.09179	REX	1.8760	1.1169	4.2500	0.56544

Equation (6.5)

Lag order 2					**Lag order 1**				
IM	4.7546	0.10368	1.6305	0.54620	IM	0.68826	0.94194	1.0994	1.7860
GDPPC	0.76114	4.3747	3.6408	3.6580	GDPPC	1.2855	1.9138	1.8079	2.3010
K_f	0.5511	0.55759	1.6954	1.2744	K_f	2.0767	1.6536	1.0444	0.33369
K_{pri}	4.0314	3.8425	0.8129	9.1283	K_{pri}	2.3163	1.7391	2.5994	7.1295
REX	4.3103	4.0753	7.9229	0.5405	REX	2.3720	1.2989	0.06771	0.10775

EXPORTS MODEL

Equation (6.6)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Equation (4.9) Lag order 1				
X	0.16779	0.12721	2.4892	1.6232
FDI	0.15535	0.33334	0.38655	0.02039
I_{pri}	0.0288	0.0098	0.97692	1.9773
L	0.01801	3.28093	2.44128	3.26065
REX	6.5661	0.15079	0.72709	0.06426

Equation (6.7)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$	Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Lag order 3					**Lag order 1**				
X	4.8644	3.1420	1.4625	0.83015	X	2.1358	2.0380	0.48993	0.67882
K_f	0.31881	0.00120	1.1054	0.66243	K_f	3.37628	0.74294	1.1278	1.5422
K_{pri}	5.3928	6.324	1.13312	0.84173	K_{pri}	1.9703	6.6252	1.2008	0.62587
K_{pub}	0.71845	0.31149	0.91080	1.6667	K_{pub}	2.5736	1.3306	4.1034	2.2005
REX	6.1595	0.49627	0.75558	0.16850	REX	2.2616	5.28323	0.45108	3.35309
L	1.3039	2.5620	6.6424	0.00186	L	1.5027	2.9542	2.2233	0.01978

CAPITAL FORMATION MODELS

Equation (6.8)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Lag Order 1				
TDI	0.81549	1.6423	1.6239	0.1661
FDI	0.38987	2.1870	1.2905	0.49560
GDPPC	1.0880	1.8466	1.7454	2.2842
DC	0.00403	0.29194	1.0141	0.15012
REX	1.9302	0.05843	0.32648	0.44415

Equation (6.9)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$	Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Lag order 3					**Lag order 1**				
I_{pri}	2.06919	5.4626	3.4480	0.04945	I_{pub}	1.6041	0.02038	0.49226	0.61545
FDI	1.1365	2.9781	1.7693	0.0911	FDI	2.4695	0.15751	1.0148	0.10802
GDPPC	1.2060	1.9660	7.1669	2.3886	GDPPC	0.253850	1.15166	2.4955	2.2968
DC	0.00270	0.43541	0.95411	0.14563	DC	0.017139	0.14595	1.1167	0.18369
REX	6.1556	0.21937	0.29594	0.55386	REX	2.2524	0.38481	0.42571	0.02246

Equation (6.10)

Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$	Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
Lag order 3					**Lag order 1**				
I_{pub}	0.3879	0.3956	0.9505	0.3142	I_{pub}	1.2773	0.2993	0.2753	0.0948
FDI	0.0118	0.6746	4.1995	0.5613	FDI	2.1085	0.8433	0.2496	1.4663
DC	0.0751	0.3455	1.73232	1.9292	DC	0.0432	0.0076	0.0085	0.6995
GDDPC	0.5163	0.6565	0.2751	37.1883	GDDPC	0.1125	0.8433	2.1286	2.1510
REX	0.2469	12.0792	3.3658	0.6480	REX	0.3679	0.7712	0.7662	1.4052

LABOUR PRODUCTIVITY MODELS

Equation (6.11)

Variables	$LM_{\chi}^{2}(1)$	$Reset_{\chi}^{2}(1)$	$ARCH_{\chi}^{2}(1)$	$JNB_{\chi}^{2}(2)$	Variables	$LM_{\chi}^{2}(1)$	$Reset_{\chi}^{2}(1)$	$ARCH_{\chi}^{2}(1)$	$JNB_{\chi}^{2}(2)$
Lag Order 3					**Lag Order 1**				
LP	6.4210	2.0211	5.2361	1.1663	LP	1.2075	1.7709	1.5898	1.0726
FDIY	6.6167	0.24792	0.51193	2.6975	FDISY	0.45178	2.2003	0.22179	1.4176
CI	2.4977	2.1201	0.34067	1.8678	CI	1.7678	0.09958	0.88967	1.9032
OT	0.05757	4.7241	0.64861	5.4708	OT	2.5291	2.7518	0.54267	1.3907
L	4.7274	1.6316	6.9033	1.8604	L	0.70166	2.4992	1.9555	0.0614
HC	1.3039	1.5620	6.6424	1.1186	HC	0.33100	1.3039	1.5347	0.3494

Notes: Critical value for $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$. The test statistics are as follows: LM = Lagrange multiplier test for serial correlation, Reset = Ramsey test for functional form, ARCH = Engle's Autoregressive conditional heteroscedasticity test and JNB = normality of the residuals.

Legend: GDP = Gross domestic product; GDPPC = GDP per capita; FDI = foreign direct investment; K_f = FDI stock; TDI = total domestic investment; K_d = total domestic capital; I_{pri} = domestic private investment; K_{pri} = private capital; I_{pub} = public investment; I_{pub} = public capital; LF = labour force; OT = openness to trade; DC = domestic credit; HC = human capital; REX = real exchange rate; FDIY = FDI to GDP; X = exports; IM = imports; LP = labour productivity; CI = Capital intensity.

APPENDIX 7.2

TESTING SOME GENERAL RESTRICTIONS ON COINTEGRATING VECTORS

H	GDP	K_f	K_{pri}	K_{pub}	E	LF	HC	GDPPC	χ^2
H_1	1	*	*	0	*	0	*	*	$\chi^2(1)= 7.21(0.02)$
	0	1	*	*	*	*	*	0	
	*	1	0	0	*	*	*	*	
H_2	1	*	*	0	*	0	*	*	$\chi^2(1)= 20.38(0.00)$
	*	0	*	*	1	*	*	0	
	*	1	0	0	*	*	*	*	
H_3	1	*	*	0	*	0	*	*	$\chi^2(1)= 3.34(0.06)$
	0	1	*	*	*	*	*	0	
	*	0	*	0	*	*	1	*	
H_4	1	*	*	0	*	0	*	*	$\chi^2(1)= 9.28(0.01)$
	0	1	*	*	*	*	*	0	
	0	1	0	0	*	*	*	0	
H_5	1	*	*	0	*	0	*	*	$\chi^2(1)= 22.99(0.00)$
	0	1	*	*	*	*	*	0	
	0	0	0	0	*	*	1	0	

Note: The χ^2 statistics test zero restrictions in the cointegrating vectors. Last colmn shows the probability of accepting the null hypothesis. Figures in the parentheses are the degree of freedom. The first vector is always normalized in economic growth variable. While in the other two vectors foreign capital or the exports or human capital variable have been normalized.

Legend: GDP = gross domestic product; k_f = FDI stock; k_{pri} = domestic private capital; k_{pub} = domestic public capital; X = exports; L = Labour force; HC = Human capital; GDPPC = per capita income.

APPENDIX 7.3

VECTOR ERROR-CORRECTION MODELS

Growth Model[1]

$$\Delta GDP_t = \alpha_{10} + \alpha_{11}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{12}\Delta GDP_{t-s} + + \sum_{i=1}^{p-1}\alpha_{14}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{13}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{15}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{16}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{17}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{18}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{19}\Delta GDPPC_{t-s} + \psi CER + \mu_{1t} \quad (7.1a)$$

$$\Delta K_{f,t} = \alpha_{30} + \alpha_{31}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{32}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{34}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{33}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{35}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{36}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{37}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{38}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{39}\Delta GDPPC_{t-s} + \psi CER + \mu_{3t} \quad (7.1b)$$

$$\Delta K_{pri,t} = \alpha_{20} + \alpha_{21}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{22}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{24}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{23}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{25}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{26}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{27}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{28}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{29}\Delta GDPPC_{t-s} + \psi CER + \mu_{2t} \quad (7.1c)$$

$$\Delta L_t = \alpha_{40} + \alpha_{41}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{42}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{44}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{43}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{45}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{46}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{47}\Delta HC_{t-s} + \sum_{t=1}^{p-1}\alpha_{48}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{49}\Delta GDPPC_{t-s} + \psi CER + \mu_{4t} \quad (7.1d)$$

[1] Consequently, according to the Granger Representation Theorem, three error correction mechanism (ECM) are added in growth equation, while only a single ECM is added in the other equations based on the cointegration test results.

$$\Delta X_t = \alpha_{50} + \alpha_{51}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{52}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{54}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{53}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{55}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{56}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{57}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{58}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{59}\Delta GDPPC_{t-s} + \psi CER + \mu_{5t} \quad (7.1e)$$

$$\Delta HC_t = \alpha_{60} + \alpha_{61}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{62}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{64}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{63}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{65}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{66}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{67}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{68}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{69}\Delta GDPPC_{t-s} + \psi CER + \mu_{6t} \quad (7.1f)$$

$$\Delta K_{pub,t} = \alpha_{70} + \alpha_{71}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{72}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{74}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{73}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{75}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{76}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{77}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{78}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{79}\Delta GDPPC_{t-s} + \psi CER + \mu_{7t} \quad (7.1g)$$

$$\Delta GDPPC_t = \alpha_{80} + \alpha_{81}t + ECT_{1,t-1} + ECT_{2,t-1} + ECT_{3,t-1} + \sum_{i=1}^{p-1}\alpha_{82}\Delta GDP_{t-s} + \sum_{i=1}^{p-1}\alpha_{84}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\alpha_{83}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\alpha_{85}\Delta L_{t-s} + \sum_{i=1}^{p-1}\alpha_{86}\Delta X_{t-s} + \sum_{i=1}^{p-1}\alpha_{87}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\alpha_{88}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\alpha_{89}\Delta GDPPC_{t-s} + \psi CER + \mu_{8t} \quad (7.1h)$$

Imports Model with FDI flow

$$\Delta IM_t = \kappa_{10} + \kappa_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{12}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\kappa_{13}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\kappa_{14}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\kappa_{14}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\kappa_{16}\Delta REX_{t-s} + \mu_{9t} \quad (7.2a)$$

$$\Delta GDPPC_t = \kappa_{20} + \kappa_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{22}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\kappa_{23}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\kappa_{24}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\kappa_{25}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\kappa_{26}\Delta REX_{t-s} + \mu_{10t} \quad (7.2b)$$

$$\Delta FDI_t = \kappa_{30} + \kappa_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{32}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\kappa_{33}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\kappa_{34}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\kappa_{35}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\kappa_{36}\Delta REX_{t-s} + \mu_{11t} \quad (7.2c)$$

$$\Delta I_{pri,t} = \kappa_{40} + \kappa_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{42}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\kappa_{43}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\kappa_{44}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\kappa_{45}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\kappa_{46}\Delta REX_{t-s} + \mu_{12t} \quad (7.2d)$$

$$\Delta REX_t = \kappa_{50} + \kappa_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{52}\Delta \mathrm{Im}_{t-s} + \sum_{i=1}^{p-1}\kappa_{53}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\kappa_{54}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\kappa_{55}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\kappa_{56}\Delta REX_{t-s} + \mu_{13t} \quad (7.2e)$$

Imports model with FDI Stock

$$\Delta \mathrm{I}M_t = \theta_{10} + \theta_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{12}\Delta \mathrm{I}M_{t-s} + \sum_{i=1}^{p-1}\theta_{13}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\theta_{14}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\theta_{15}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\theta_{17}\Delta REX_{t-s}\mu_{14t} \quad (7.3a)$$

$$\Delta GDPPC_t = \theta_{20} + \theta_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{22}\Delta \mathrm{I}M_{t-s} + \sum_{i=1}^{p-1}\theta_{23}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\theta_{24}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\theta_{25}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\theta_{27}\Delta REX_{t-s} + \mu_{15t} \quad (7.3b)$$

$$\Delta K_{f,t} = \theta_{30} + \theta_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{32}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\theta_{33}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\theta_{34}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\kappa_{35}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\theta_{37}\Delta REX_{t-s} + \mu_{16t} \quad (7.3c)$$

$$\Delta K_{pri,t} = \kappa_{40} + \kappa_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{42}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\kappa_{43}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\kappa_{44}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\kappa_{47}\Delta REX_{t-s} + \mu_{17t} \quad (7.3d)$$

$$\Delta REX_t = \theta_{60} + \theta_{61}t + ECT_{t-1} + \sum_{i=1}^{p-1}\kappa_{62}\Delta IM_{t-s} + \sum_{i=1}^{p-1}\theta_{63}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\theta_{64}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\theta_{65}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\theta_{67}\Delta REX_{t-s} + \mu_{19t} \quad (7.3e)$$

Exports Model with FDI Flow

$$\Delta X_t = \xi_{10} + \xi_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\xi_{12}\Delta X_{t-s} + \sum_{i=1}^{p-1}\xi_{13}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\xi_{14}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\xi_{15}\Delta L_{t-s} + \sum_{i=1}^{p-1}\xi_{16}\Delta REX_{t-s} + \psi CER + \mu_{20t} \quad (7.4a)$$

$$\Delta FDI_t = \xi_{20} + \xi_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\xi_{22}\Delta X_{t-s} + \sum_{i=1}^{p-1}\xi_{23}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\xi_{24}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\xi_{25}\Delta L_{t-s} + \sum_{i=1}^{p-1}\xi_{26}\Delta REX_{t-s} + \psi CER + \mu_{21t} \quad (7.4b)$$

$$\Delta I_{pri,t} = \xi_{30} + \xi_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\xi_{32}\Delta X_{t-s} + \sum_{i=1}^{p-1}\xi_{33}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\xi_{34}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\xi_{35}\Delta L_{t-s} + \sum_{i=1}^{p-1}\xi_{36}\Delta REX_{t-s} + \psi CER + \mu_{22t} \quad (7.4c)$$

$$\Delta L_t = \xi_{40} + \xi_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\xi_{42}\Delta X_{t-s} + \sum_{i=1}^{p-1}\xi_{43}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\xi_{44}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\xi_{45}\Delta L_{t-s} + \sum_{i=1}^{p-1}\xi_{46}\Delta REX_{t-s} + \psi CER + \mu_{23t} \quad (7.4d)$$

$$\Delta REX_t = \xi_{50} + \xi_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\xi_{52}\Delta X_{t-s} + \sum_{i=1}^{p-1}\xi_{53}\Delta FDI_{t-s} + \sum_{i=1}^{p-1}\xi_{54}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\xi_{55}\Delta L_{t-s} + \sum_{i=1}^{p-1}\xi_{56}\Delta REX_{t-s} + \psi CER + \mu_{24t} \quad (7.4e)$$

Exports model with FDI Stock

$$\Delta X_t = \lambda_{10} + \lambda_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\lambda_{12}\Delta X_{t-s} + \sum_{i=1}^{p-1}\lambda_{13}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\lambda_{14}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\lambda_{15}\Delta L_{t-s} + \sum_{i=1}^{p-1}\lambda_{16}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\lambda_{17}\Delta REX_{t-s} + \psi CER + \mu_{25t} \quad (7.5a)$$

$$\Delta K_{f,t} = \lambda_{20} + \lambda_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\lambda_{22}\Delta X_{t-s} + \sum_{i=1}^{p-1}\lambda_{23}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\lambda_{24}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\lambda_{25}\Delta L_{t-s} + \sum_{i=1}^{p-1}\lambda_{26}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\lambda_{27}\Delta REX_{t-s} + \psi CER + \mu_{26t} \quad (7.5b)$$

$$\Delta K_{pri,t} = \lambda_{30} + \lambda_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\lambda_{32}\Delta X_{t-s} + \sum_{i=1}^{p-1}\lambda_{33}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\lambda_{34}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\lambda_{35}\Delta L_{t-s} + \sum_{i=1}^{p-1}\lambda_{36}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\lambda_{37}\Delta REX_{t-s} + \psi CER + \mu_{27t} \quad (7.5c)$$

$$\Delta L_t = \lambda_{40} + \lambda_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\lambda_{42}\Delta X_{t-s} + \sum_{i=1}^{p-1}\lambda_{43}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\lambda_{44}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\lambda_{45}\Delta L_{t-s} + \sum_{i=1}^{p-1}\lambda_{46}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\lambda_{47}\Delta REX_{t-s} + \psi CER + \mu_{28t} \quad (7.5d)$$

$$\Delta K_{pub,t} = \lambda_{50} + \lambda_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\lambda_{52}\Delta X_{t-s} + \sum_{i=1}^{p-1}\lambda_{53}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\lambda_{54}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\lambda_{55}\Delta L_{t-s} + \sum_{i=1}^{p-1}\lambda_{56}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\lambda_{57}\Delta REX_{t-s} + \psi CER + \mu_{29t} \quad (7.5e)$$

$$\Delta REX_t = \lambda_{60} + \lambda_{61}t + ECT_{t-1} + \sum_{i=1}^{p-1}\lambda_{62}\Delta X_{t-s} + \sum_{i=1}^{p-1}\lambda_{63}\Delta K_{f,t-s} + \sum_{i=1}^{p-1}\lambda_{64}\Delta K_{pri,t-s} + \sum_{i=1}^{p-1}\lambda_{65}\Delta L_{t-s} + \sum_{i=1}^{p-1}\lambda_{66}\Delta K_{pub,t-s} + \sum_{i=1}^{p-1}\lambda_{67}\Delta REX_{t-s} + \psi CER + \mu_{30t} \quad (7.5f)$$

Capital Formation Models

Total Domestic Investment

$$\Delta TDI_t = \phi_{10} + \phi_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{12}\Delta TDI_{t-s} + \sum_{i=1}^{p-1}\phi_{13}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{14}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{15}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{16}\Delta DC_{t-s} + \mu_{31t} \quad (7.6a)$$

$$\Delta GDPPC_t = \phi_{20} + \phi_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{22}\Delta TDI_{t-s} + \sum_{i=1}^{p-1}\phi_{23}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{24}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{25}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{26}\Delta DC_{t-s} + \mu_{32t} \quad (7.6b)$$

$$\Delta FDI_t = \phi_{30} + \phi_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{32}\Delta TDI_{t-s} + \sum_{i=1}^{p-1}\phi_{33}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{34}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{35}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{36}\Delta DC_{t-s} + \mu_{33t} \quad (7.6c)$$

$$\Delta REX_t = \phi_{40} + \phi_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{42}\Delta TDI_{t-s} + \sum_{i=1}^{p-1}\phi_{43}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{44}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{45}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{46}\Delta DC_{t-s} + \mu_{34t}$$

(7.6d)

$$\Delta DC_t = \phi_{50} + \phi_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{52}\Delta TDI_{t-s} + \sum_{i=1}^{p-1}\phi_{53}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{54}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{55}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{56}\Delta DC_{t-s} + \mu_{35t} \quad (7.6e)$$

Domestic Private Investment

$$\Delta I_{pri,t} = \phi_{10} + \phi_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{12}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\phi_{13}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{14}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{15}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{16}\Delta DC_{t-s} + \mu_{37t} \quad (7.7a)$$

$$\Delta GDPPC_t = \phi_{20} + \phi_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{22}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\phi_{23}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{24}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{25}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{26}\Delta DC_{t-s} + \mu_{38t} \quad (7.7b)$$

$$\Delta FDI_t = \phi_{30} + \phi_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{32}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\phi_{33}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{34}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{35}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{36}\Delta DC_{t-s} + \mu_{39t} \quad (7.7c)$$

$$\Delta REX_t = \phi_{40} + \phi_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{42}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\phi_{43}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{44}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{45}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{46}\Delta DC_{t-s} + \mu_{40t} \quad (7.7d)$$

$$\Delta DC_t = \phi_{50} + \phi_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{52}\Delta I_{pri,t-s} + \sum_{i=1}^{p-1}\phi_{53}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{54}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{55}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{56}\Delta DC_{t-s} + \mu_{41t} \quad (7.7e)$$

Domestic Public Investment

$$\Delta I_{pub,t} = \phi_{10} + \phi_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{12}\Delta I_{pub,t-s} + \sum_{i=1}^{p-1}\phi_{13}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{14}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{15}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{16}\Delta DC_{t-s} + \mu_{42t} \quad (7.8a)$$

$$\Delta GDPPC_t = \phi_{20} + \phi_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{22}\Delta I_{pub,t-s} + \sum_{i=1}^{p-1}\phi_{23}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{24}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{25}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{26}\Delta DC_{t-s} + \mu_{43t} \quad (7.8b)$$

$$\Delta FDI_t = \phi_{20} + \phi_{21}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{22}\Delta I_{pub,t-s} + \sum_{i=1}^{p-1}\phi_{23}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{24}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{25}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{26}\Delta DC_{t-s} + \mu_{44t} \quad (7.8c)$$

$$\Delta REX_t = \phi_{40} + \phi_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{42}\Delta I_{pub,t-s} + \sum_{i=1}^{p-1}\phi_{43}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{44}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{45}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{46}\Delta DC_{t-s} + \mu_{45t} \quad (7.8d)$$

$$\Delta DC_t = \phi_{50} + \phi_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{52}\Delta I_{pub,t-s} + \sum_{i=1}^{p-1}\phi_{53}\Delta GDPPC_{t-s} + \sum_{i=1}^{p-1}\phi_{54}FDI_{t-s} + \sum_{i=1}^{p-1}\phi_{55}\Delta REX_{t-s} + \sum_{i=1}^{p-1}\phi_{56}\Delta DC_{t-s} + \mu_{46t} \quad (7.8e)$$

Labour Productivity Model

$$\Delta LP_t = \phi_{10} + \phi_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{12}\Delta LP_{t-s} + \sum_{i=1}^{p-1}\phi_{13}\Delta FDIY_{t-s} + \sum_{i=1}^{p-1}\phi_{14}CI_{t-s} + \sum_{i=1}^{p-1}\phi_{15}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\phi_{16}\Delta OT_{t-s} + + \sum_{i=1}^{p-1}\phi_{17}\Delta L_{t-s}\mu_{47t} \quad (7.9a)$$

$$\Delta FDIY_t = \phi_{10} + \phi_{11}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{12}\Delta LP_{t-s} + \sum_{i=1}^{p-1}\phi_{13}\Delta FDIY_{t-s} + \sum_{i=1}^{p-1}\phi_{14}CI_{t-s} + \sum_{i=1}^{p-1}\phi_{15}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\phi_{16}\Delta OT_{t-s} + \sum_{i=1}^{p-1}\phi_{17}\Delta L_{t-s} + \mu_{48t} \quad (7.9b)$$

$$\Delta CI_t = \phi_{30} + \phi_{31}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{32}\Delta LP_{t-s} + \sum_{i=1}^{p-1}\phi_{33}\Delta FDIY_{t-s} + \sum_{i=1}^{p-1}\phi_{34}CI_{t-s} + \sum_{i=1}^{p-1}\phi_{35}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\phi_{36}\Delta OT_{t-s} + \sum_{i=1}^{p-1}\phi_{17}\Delta L_{t-s} + \mu_{49t} \quad (7.9c)$$

$$\Delta HC_t = \phi_{40} + \phi_{41}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{42}\Delta LP_{t-s} + \sum_{i=1}^{p-1}\phi_{43}\Delta FDIY_{t-s} + \sum_{i=1}^{p-1}\phi_{44}CI_{t-s} + \sum_{i=1}^{p-1}\phi_{45}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\phi_{46}\Delta OT_{t-s} + \sum_{i=1}^{p-1}\phi_{17}\Delta L_{t-s} + \mu_{50t} \quad (7.9d)$$

$$\Delta OT_t = \phi_{50} + \phi_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{52}\Delta LP_{t-s} + \sum_{i=1}^{p-1}\phi_{53}\Delta FDIY_{t-s} + \sum_{i=1}^{p-1}\phi_{54}CI_{t-s} + \sum_{i=1}^{p-1}\phi_{55}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\phi_{56}\Delta OT_{t-s} + \sum_{i=1}^{p-1}\phi_{17}\Delta L_{t-s} + \mu_{51t} \quad (7.9e)$$

$$\Delta L_t = \phi_{50} + \phi_{51}t + ECT_{t-1} + \sum_{i=1}^{p-1}\phi_{52}\Delta LP_{t-s} + \sum_{i=1}^{p-1}\phi_{53}\Delta FDIY_{t-s} + \sum_{i=1}^{p-1}\phi_{54}CI_{t-s} + \sum_{i=1}^{p-1}\phi_{55}\Delta HC_{t-s} + \sum_{i=1}^{p-1}\phi_{56}\Delta OT_{t-s} + \sum_{i=1}^{p-1}\phi_{17}\Delta L_{t-s} + \mu_{51t} \quad (7.9f)$$

APPENDIX 7.4

DIAGNOSTIC TESTS ON GRANGER-CAUSALITY

Equation	Variables	$LM_\chi^2(1)$	$Reset_\chi^2(1)$	$ARCH_\chi^2(1)$	$JNB_\chi^2(2)$
GROWTH MODEL					
7.1a	GDP	0.0076	3.8094	0.6745	100770
7.1b	K_f	5.6034	4.2098	0.1199	1.6968
IMPORTS MODEL					
7.2a	IM	0.7815	0.0166	0.2255	3.1455
7.2c	FDI	1.1882	0.0713	0.4740	0.7972
7.3a	IM	0.0036	3.6993	1.1732	3.9664
7.3c	K_f	5.7937	1.0482	0.4193	2.7208
EXPORTS MODEL					
7.4a	X	0.3571	6.1230	0.2534	2.9081
7.4b	FDI	1.1701	2.2820	0.1055	1.4930
7.5a	X	0.0578	2.2964	0.4358	0.3962
7.5b	K_f	6.2935	0.0092	0.3852	1.3501
CAPITAL FORMATION MODELS					
7.6a	TDI	0.0298	0.2810	2.4769	0.0747
7.6c	FDI	1.4880	1.3585	0.3459	0.7812
7.7a	I_{pri}	0.0459	0.6032	0.7587	0.7925
7.7c	FDI	1.4780	1.3423	0.0787	0.9942
7.8a	I_{pub}	0.3263	0.0477	1.6567	0.7256
7.8c	FDI	1.3805	0.9383	0.0014	0.7018
LABOUR PRODUCTIVITY MODEL					
7.9a	LP	4.6566	2.1516	0.0192	0.1201
7.9b	FDIY	1.6795	0.1862	0.7974	0.3789

Notes: Critical value for $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$. The test statistics are as follows: LM = Lagrange multiplier test for serial correlation, Reset = Ramsey test for functional form, ARCH = Engle's Autoregressive conditional heteroscedasticity test and JNB = normality of the residuals.
Legend: GDP = Gross domestic product; FDI = foreign direct investment; K_f = FDI stock; TDI = total domestic investment; I_{pri} = domestic private investment; I_{pub} = public investment; FDIY = FDI to GDP; X = exports; IM = imports; LP = labour productivity.