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**AN ECONOMETRIC ANALYSIS OF
NEW ZEALAND'S DETERMINANTS OF
ECONOMIC GROWTH
1960-1996**

*A Research Thesis submitted in partial requirement for the degree of Masters of
Applied and International Economics at Massey University*

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ABSTRACT

The key purpose of this study is to analyse whether the generally agreed determinants of economic growth, such as labour force, trade, openness to trade, investment, inflation, research and development, human capital, tourism, government consumption expenditure and government education expenditure, impact significantly on New Zealand's growth. This study applies Auto-Regressive Distributed Lag (ARDL) cointegration regression analysis to time series data on the relevant variables for the period 1960 to 1996. Empirical models are based on neoclassical and endogenous growth theory models, and equations specified will fall under seven differing frameworks. The importance of economic growth and principally the sequence of New Zealand's growth, is the main reason for choosing New Zealand as the case study in this analysis. Such an empirical examination should enhance the knowledge and future development of economic growth and its determinants for New Zealand.

Empirical evidence indicates that the endogenous growth model explains New Zealand's economic growth performance quite satisfactorily. Models incorporating the variables: growth of exports, public sector investment and tourism receipts, are positive and statistically significant to New Zealand's growth performance over this period. Export-led growth is favoured in this analysis.

The need for massive state intervention in the New Zealand economy was officially declared over by the Fourth Labour Government in 1984. Radical and extensive macroeconomic and microeconomic reforms were undertaken, representing a revolutionary break from past policies of heavy regulation and import protection and the accompanying large fiscal deficits and high rates of inflation. Succeeding this period of major restructuring, the New Zealand economy has supported a strong recovery since 1991, outperforming most other OECD countries. The challenge now for policy makers, is to manage sustained economic growth, as growth slows under the influence of a shaky international environment.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
ARDL	Autoregressive Distributed Lag
BOP	Balance of Payments
CER	Closer Economic Relations
CIF	Cost, including Insurance and Freight
CPI	Consumer Price Index
CRI	Crown Research Institute
CTRatio	Collected Tariff Ratio
DF	Dickey Fuller
DSIR	Department of Scientific and Industrial Research (replaced by nine Crown-owned Research Institutes, known as CRIs, in 1992.)
ECA	Employment Contracts Act
EU	European Union
FBT	Fringe Benefit Tax
FDI	Foreign Direct Investment
FOB	Free On Board
GDP	Gross Domestic Product
GST	Goods and Services Tax
GFS	Government Financial Statistics
GNP	Gross National Product
IFS	International Financial Statistics
IMF	International Monetary Fund
LDC	Less Developed Countries
MAF	Ministry of Agriculture and Fisheries
MNC	Multinational Company
OECD	Organisation for Economic Co-operation and Development
PIN	Pacific Island Nations
RA	Regional Authority
R&D	Research and Development
WTTC	World Travel and Tourism Committee

Chapter One

INTRODUCTION

1.1 AIMS AND OBJECTIVES

One of the most important questions in the field of economics is the inquiry into the causes of economic growth. It is difficult to overstate the significance of economic growth. From the words of Elhanan Helpman (1992, p.237) “Fortunes of nations change over time. Leading economic powers of the past have become poorly performing economies of the present, and poor economies of the past have become the new leaders. The determinants of the wealth of nations and its evolution over time continue to mystify economists”. Nevertheless, macroeconomic theories of economic growth, developed over the years, have much to offer.

To date economic growth has been examined using neoclassical or endogenous growth theories, based on cross-country studies, and specific country studies using regression analysis. Recognising the influence and emphasis of economic growth, this study attempts to analyse the economic growth of a specific country using both neoclassical and endogenous models. In particular, this study aims to examine the economic growth of New Zealand for the period 1960-1996. The purpose of the present study is to survey academic literature with an eye to its implications for economic growth in New Zealand. Additionally, Auto-regressive Distributed Lag cointegration regression analysis is applied to time series data on the proposed variables: trade, investment, research and development, human capital, tourism, inflation, openness to trade, government consumption and government education expenditure, in order to analyse the effects of each variable on New Zealand’s growth.

The best single economic indicator of long run economic performance is Gross Domestic Product (GDP). New Zealand’s rate of real GDP growth averaged over 5.5 per cent for the years 1992-1996 (IMF, various editions). This economic growth performance was close to the strongest among the Organisation for Economic Co-

operation and Development (OECD) group of countries over this period, and is respectable by comparison with the previous New Zealand growth experience, from the 1960s to the late 1970s (refer to Figure 3.1, p. 30). However, set against this positive recent outcome is the view that New Zealand's average growth performance has been the worst of any OECD country, both for the overall post war period (1945 to the late 1970s) and for the period since the comprehensive Fourth Labour Government macroeconomic and microeconomic reforms (1984-1990). Per capita income grew at 1.4 per cent from 1950-1985, 1.47 percentage points slower than the average for the OECD, excluding Japan (Smith and Grimes, 1990). Therefore, the recent growth recovery in turn prompts questions with regards to the sources and sustainability of economic growth for New Zealand.

An analysis of New Zealand's determinants of economic growth is meaningful for several reasons. Firstly, and from my point of view, it is important to comprehend the growth experience of New Zealand to determine the economic performance at various times, especially after the reforms of 1984. Second, New Zealand has put into place policy reforms that have drawn interest because of the ramifications for the domestic economy and also the ramifications of these developments on global relations. Third, such an empirical examination should point to several areas requiring additional research efforts aimed at the further development of New Zealand's economic growth.

The objectives of this study are as follows: firstly, to summarise the important features, implications and determinants of both the neoclassical and endogenous growth models. Secondly, to preview the New Zealand economy over the last century, paying particular attention to the Fourth Labour Government reforms of 1984. New Zealand's reform decade, beginning in 1984, is renowned for its economic, social and political impact. A pragmatic culture, an isolated and small population, concentrated political power and pressing economic concerns form the basis of a combination of explanations for New Zealand's notable experience (Silverstone, Bollard and Lattimore, 1996). Thirdly, to analyse whether the generally agreed determinants of growth such as trade, labour force, investment, research and development, human capital, tourism, inflation, openness to trade, government education and government consumption expenditure impact significantly on New Zealand's growth for the period 1960-1996.

This is by no means a new study, however little research in this area has been carried out empirically, using time series data, with regards to New Zealand. I anticipate that the findings from the proposed study will enhance the knowledge and development of economic growth and its determinants for New Zealand.

The section below provides a brief introduction to economic growth. A quick background to some of the more relevant economic growth theories is also provided. Section 1.3 introduces the relevant variables, and definitions of the variables, proposed for this economic growth analysis. A condensed outline of each of the chapters is given in section 1.5.

1.2 ECONOMIC GROWTH: A BRIEF OVERVIEW

The origin of economic growth can be chronicled to the middle 18th century with the works of Hume, Smith, Malthus, Ricardo, Mill and Marx. Broadly speaking, the effort underpinning this stream of economic thought was to “discover and install the natural laws that should govern man in society shifting the heavenly city to earthly foundations” (Rostow, 1990, p.13). The economic growth theory transformation that ensued over the subsequent centuries to the modern world is a complex, many-sided story but can be split into two chronological stages. Firstly the period 1870-1939 saw contributions to the theory from figures such as Marshall, Schumpeter, Robertson, Keynes, Clark, Kuznets and Harrod. In general terms these historians of economic thought underlined the shift from a focus on growth to social reform and welfare; a new emphasis on the refinement of analysis; a heightened concern with the optimum allocation of resources (in terms of marginal analysis), and the emergence of economics as an academic profession. The Post-World War II era saw economic growth as a subject of inquiry, after many years of neglect, revive in leaps and bounds to the forefront of macroeconomic research and teaching with the likes of Harrod, Domer, Solow, Arrow, and Romer. In particular, the early 1950s and 1960s saw a significant revival in both theory and the academic empirical analysis of economic growth. The development of the latter is equally as important as the new wave of theorising, since it provides the opportunity test the theories against reliable data.

The subsequent neoclassical phase of growth modelling was inspired by the relatively steady and unexpected growth of the advanced industrial countries after immediate post-WWII recovery, but none of the growth models actually highlighted the causes of the great boom of the 1950s and 1960s (Rostow, 1990).

The Solow model (1956) provides the most basic neoclassical theory of economic growth and emphasises the accumulation of capital over time. Traditionally, capital is thought to be tangible including an economy's stock of equipment and structures.

More recent theories of economic growth have taken a more radical approach. The goal of contemporary work has been to develop models of persistent growth that avoid the assumption of exogenous advances in growth theory, as in the neoclassical model. Hence the name, endogenous growth theory.

The studies by Romer (1986) and Lucas (1988) prompted this new wave of research on economic growth. Their work depends on Arrow's mechanism of learning by doing, however they have diverted its application to the accumulation of knowledge and human capital rather than the accumulation of plant and equipment. In addition, they have altered the focus of growth theory toward explanations of sustained long-run growth and cross-country variations in growth rates.

1.3 DETERMINANTS OF ECONOMIC GROWTH

It is useful to put economic growth into perspective by introducing some of the more generally agreed determinants used throughout this study and their definitions.

Capital accumulation

Capital accumulation results when some proportion of present income is saved and invested in order to augment future output and income. New factories, machinery, equipment, and materials increase the physical capital stock of a nation (the total net real value of all physically productive capital goods) and make it possible for expanded output levels to be achieved. These directly productive investments are supplemented by investments in what is known as social and economic infrastructure – roads,

electricity, water and sanitation, communications – which facilitates and integrates economic activities.

Similarly, investment in human resources can improve the quality, and therefore the quantity of capital accumulation, and thereby, have the same or even a more powerful effect on production as an increase in human numbers. Formal schooling, vocational and on-the-job training programs, and other types of informal education may all be made more effective in augmenting human skills and resources in combination with direct investments in buildings, equipment, and materials.

Capital accumulation may add new resources but its essential feature is that it involves a trade-off between present and future consumption – giving up a little now so that more can be had later.

Trade

There are two main channels through which trade policies are generally agreed to affect economic growth: 1) outward-oriented trade policies, such as export promotion and 2) trade liberalisation, i.e. the openness of a country to the rest of the world.

Export expansion allows countries to earn foreign exchange, which can promote the importation of advanced capital goods and materials. Exports also often act as an outlet for production in an economy that is too small domestically to support an efficient scale of production. Increasing exports allows economies to specialise in the production of specific products.

In the same token it is also often argued that trade restrictions adversely affect the efficiency of an economy. This is through failure to exploit comparative advantage and the inability to absorb technological advances generated in leading nations, hence aggregate output is reduced. In other words the more open an economy is to trade the faster it experiences economic growth.

Population and Labour Force growth

Population growth and the associated increase in the labour force have traditionally been considered a positive factor in stimulating economic growth. A larger labour force means more productive person-power, while a large overall population increases the potential size of domestic markets.

Innovation

Innovation is a dynamic process requiring the use of past and existing knowledge in order to create new knowledge.

Technological Progress

Technological progress results from new and improved ways of accomplishing traditional tasks such as growing crops, making clothing, or building a house.

Investments that improve the quality of existing physical and human resources, that increase the quantity of these same productive resources, and that raise the productivity of all specific resources through invention, innovation, and technological progress have been and will continue to be primary factors in stimulating economic growth in any society.

1.4 CHAPTER OUTLINES

The structure of this study is as follows. Chapter 2 provides a relevant review of the academic literature. Chapter 3 serves to give an insight into New Zealand's economic development over the last century. The variables of the growth models and data employed are presented in Chapter 4. The empirical results obtained by testing these models for New Zealand (1960-1996) are discussed in Chapter 5. Finally, Chapter 6 provides the conclusion and looks at future possibilities for research.

Chapter Two

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews the theoretical and empirical growth literature that is most relevant to this study of economic growth. It also frames the debate on economic growth within the context of neoclassical and endogenous growth theories as analysed by various eminent economists. The issue of economic growth has increasingly received attention from many economists in recent years who attempt to explain the impact of economic growth in both developed and developing countries. To examine in detail all of the literature on economic growth over the last few decades would prove to be too large and unwieldy a task. Therefore, the ultimate goal of this chapter is to outline the key insights of the neoclassical and endogenous growth theory models and to show what each theory offers concerning worldwide economic growth.

This chapter is structured as follows: section 2.2 and section 2.3 highlight the key factors and implications of the neoclassical and endogenous growth theories respectively. Section 2.2 emphasises briefly the flaws and inadequacies of the neoclassical model while section 2.3 focuses on the different strands of endogenous growth literature. Empirical evidence of the academic literature is discussed in section 2.4. Policy implications of the growth literature for New Zealand are discussed in section 2.5. The final section presents a summary of the literature reviewed in this chapter.

2.2 NEOCLASSICAL GROWTH THEORY

The neoclassical model of economic growth is the most popular framework in which growth analysis is undertaken by contemporary mainstream economists (Rostow, 1990). The timeless article of Ramsey in 1928 (cited in Mankiw, 1995), with his treatment of

household optimisation forms the foundation for modern growth theory. Harrod (1939) and Domar (1946), who attempted to combine Keynesian analysis with elements of economic growth, followed his methodology. The next and more important contributions arose from the seminal papers by Solow (1956) and Swan (1956) which led to the development of the primary neoclassical theory of economic growth (Dowrick, 1993).

Solow provides the most uncomplicated version of the neoclassical theory of growth (Mankiw, 1995). The model focuses on four variables, i.e.: output (Y), capital (K), labour (L), and “knowledge” (A), whereby AL represents the “effectiveness of labour”. The centrepiece of the model is the aggregate production function which can be written as a function of capital and effective labour, analysed by Romer (1996) as follows:

$$Y = F(K, AL)$$

The production function is “combined with a constant-saving-rate rule to generate an extremely simple general-equilibrium model of the economy” (Barro and Sala-i-Martin, p. 10, 1995). ‘Conditional convergence’ is one prediction from these models, which has been exploited as an empirical hypothesis and has considerable explanatory power for economic growth across countries and regions (Barro and Sala-i-Martin, 1995). Conditional convergence defined is where countries consolidate to the same steady state which is in turn dependent on the country’s share of Gross Domestic Product (GDP) (Dornbusch and Fisher, 1994).

The model’s critical assumption, with regard to the production function, is that it has constant or diminishing returns to scale in its two arguments. If the production function is assumed to have constant returns to scale then it can be written as:

$$y = f(k)$$

where $y=Y/AL$, $k=K/AL$ and $f(k)=F(k,1)$. This production function relates output per efficiency unit of labour to the amount of capital per efficiency unit of labour (Mankiw, 1995).

The neoclassical model suggests that significant weight should be attributed to the accumulation of capital in order to produce positive economic growth. The capital stock per efficiency unit, k , develops according to:

$$\dot{k} = sf(k) - (n+g+\delta)k$$

where: s is the rate of saving, n is the rate of population growth, g is the rate of growth of technology, δ is the rate at which capital depreciates. A dot over a variable denotes a derivative with respect to time.

As long as the production function is 'well behaved', the economy approaches a steady state over time. The steady state is defined by Mankiw (1995) as $\dot{k} = 0$. In the steady state, income per efficiency unit is constant, income per person grows at rate g , and total income grows at rate $(n+g)$. Therefore, in the steady state of the neoclassical model, all growth is due to advances in technology but technological progress is taken as exogenous. In other words the long-run per capita growth rate is determined by the rate of technological progress that is determined outside the model (Barro and Sala-i-Martin, 1995). Consequently the model promptly became known as a theory of non-growth in its forecasting for the long run (Dowrick, 1993).

The neoclassical model has again in recent years come under attack for providing an empirically inadequate theory of growth. According to Mankiw (1995) there are three key problems that arise when the neoclassical growth model is used to understand international experience. First, the model predicts less variation in income than is observed across countries. Second, the model predicts a faster rate of convergence to the steady state than most studies estimate. Finally, the model predicts greater variation in rates of return on capital across countries than is empirically plausible.

Of importance is that the capital share plays a key role in each of the three problems and each of the problems of the neoclassical theory of growth disappears if the capital share were much higher than is traditionally understood. One way to raise the capital share above the estimated one-third Solow share is to maintain that there are positive externalities to capital. In other words, some of the benefits to capital accumulation

may accrue not only to the owners of capital, but also to others in society. But, in order for the economy's capital share to be much larger than the share of income received by the owners of capital, the externalities of capital must be about as large as the direct benefit. That is, the owners of capital must be paid only half of the social rate of return from their investments (Mankiw, 1995).

A second argument for a larger capital share proposes that capital is a much broader concept than is been historically suggested. More generally, capital is accumulated whenever consumption is forgone today in order to produce more income tomorrow. In this sense one of the most important forms of capital accumulation is the acquisition of skills. Such human capital includes both schooling and on-the-job training (Mankiw, 1995).

In order to gauge the true capital share, it is necessary to decide how much of labour income should be credited to human capital. Looking at the minimum wage or the return to schooling is one way to do this. According to Mankiw (1995), a large literature in labour economics finds that each year of schooling raises a workers wage by at least 8 per cent, moreover, the average United States citizen has about thirteen years of schooling. He suggests that about two-thirds of the average worker's earnings is from the return to education, and that human capital earns almost one-half of national income. Adding this estimate of the human capital share to the physical capital share of one-third, as estimated by formal neoclassical theorists, implies that income from all forms of capital is about 80 per cent of national income.

Acknowledging the role of human capital in the neoclassical growth theory can help explain why capital does not flow from rich to poor countries. This is because human capital does not act well as collateral, borrowing to finance human capital investment is often difficult. Including human capital investment into the neoclassical model also increases the proportion of international disparity that the model can explain (Mankiw, 1995).

The studies by Cass (1965) and Koopmans (1965) followed shortly after the work by Solow (1965), bringing "Ramsey's analysis of consumer optimisation back into the neoclassical growth model and thereby accommodated for an endogenous measurement

of the saving rate. This extension allows richer transitional dynamics but is inclined to uphold the hypothesis of conditional convergence” (Barro and Sala-i-Martin, 1995, p.11). The work of Cass (1965) and Koopmans (1965) summarised the basic neoclassical growth model.

Arrow (1962) and Sheshinski (1967) analysed growth models that incorporated ideas as ‘unintended-by-products of production or investment’. These models were named “learning-by-doing” (Barro and Sala-i-Martin, 1995). In this framework, the level of knowledge is itself a productive factor which depends on past levels of investment. Moreover, each firm learns from the investment activity of other firms as well as from its own investment behaviour. The productivity of a given firm is consequently assumed to be an increasing function of cumulative aggregate investment for the industry (Shaw, 1992). More broadly, knowledge acquired by labour is accordingly a function of the total capital stock. Thus capital and labour could continue to receive their marginal products because in a competitive equilibrium no additional compensation would be paid to effective labour. However, the growth of effective labour became endogenous in the sense that an increased savings propensity would affect its time path. The theory suffered from the inadequacy that it assumes that productivity improvements occur as a by-product of capital accumulation while intentional efforts to develop new products and technologies have been outstanding (Helpman, 1992). The Arrow model however is completely fulfilled in the event of a fixed capital/labour ratio and fixed labour requirements (Aghion and Howitt, 1998).

A quote by Sen (as cited by Rostow, 1990, p. 350) uniquely describes, in his opinion, the neoclassical era of growth. “...Interest in growth [after 1945] revived at first slowly and then by leaps and bounds...Growth was everybody’s concern and it is no wonder that in such a milieu growth theory was pampered by the attention of economists. With this immensely practical motivation it would have been natural for growth theory to take a fairly practice-oriented shape. This however has not happened and much of modern growth theory is concerned with rather esoteric issues...It is as if poor man collected money for his food and blew it all on alcohol.”

Subsequent formal growth theory dropped out of fashion in the 1970s and early 1980s. This is most likely because theory became extremely technical and lost touch with

empirical applications (Barro and Sala-i-Martin, 1995). Nonetheless, over the past decade a new view of capital has emerged, reflecting growing awareness among economists that economic growth remains imperfectly understood. This new view alters the interpretation of the neoclassical growth model and by doing so expands its magnitude and suitability. However, the simplicity of the neoclassical model together with its ability to produce seemingly rational predictions has given it a distinguished place in the macroeconomics 'toolbox' (Mankiw, 1995).

2.3 ENDOGENOUS GROWTH THEORY: AN INTRODUCTION

Much of the recent literature on economic growth has taken a more radical approach to theory. The neoclassical model, even with capital interpreted broadly, implies that growth in income per person eventually approaches the exogenous rate of technological progress. Although the model can explain international differences in growth rates as the result of convergence to different steady states, it cannot explain the persistence of economic growth throughout most of the world. The goal of much recent work, therefore, has been to develop models of persistent growth that avoid the assumption of exogenous advances in technology (Mankiw, 1995). This work goes by the name 'endogenous growth theory'. Endogenous growth "is determined by the behaviour of rational optimising agents which affects the rate of accumulation rather than being grafted onto the model as exogenous technological progress" (Dowrick, 1993, p.108).

The goal of endogenous growth theory is not to replace capital accumulation as an explanation of economic growth but to complement it. Innovation is a crucial ingredient to long-run growth in endogenous growth theory, but not the only one; innovation and human capital accumulation are both necessary ingredients for growth to be upheld (Aghion and Howitt, 1998).

In the neoclassical model, saving leads to growth temporarily but eventually the economy approaches a steady state in which growth is independent of the saving rate. By contrast, in the endogenous growth model, saving leads to growth forever. The value of endogenous growth theory is twofold. First, it helps explain the existence of worldwide technological progress, which the neoclassical growth model takes as given.

Second, it offers a more realistic description of research and development (Mankiw, 1995).

Models of endogenous growth exhibit some structural resemblance to their neoclassical contemporaries, but contrast notably in their underlying assumptions and the conclusions drawn therefrom (Todaro, 1994). The most significant theoretical differences stem from three factors: models of endogenous growth discard the neoclassical assumption of diminishing and constant returns to capital investments, permit increasing returns to scale in aggregate production and frequently focus on the role of externalities in determining the rate of return on capital investments.

Different strands of literature use different forces to sustain growth, but all introduce some type of capital whose accumulation overcomes the diminishing/constant returns to physical capital accumulation (Klenow, and Rodriguez-Clare, 1997). The new endogenous growth models contrast fundamentally according to whether they emphasise returns to physical investment (De Long and Summers, 1991), returns to investment in education (Barro 1991; Barro and Lee, 1993; Maynes, Brookes and Davidson, 1996) or returns to the stock of knowledge generated by research and development (Romer, 1996; Grossman and Helpman, 1991; Coe and Helpman, 1993). Additionally, unintentional knowledge accumulation transpires as a side-effect of investment via learning by doing (Lucas 1988), learning by using (Rosenberg, 1982) learning by interacting (Lundvall, 1988), or learning by learning (OECD, 1996). Knowledge is acquired from a person's own experiences with the firm's investment and by examining the investment behaviour of other people.

2.3.1 KNOWLEDGE AS AN INSTRUMENT OF GROWTH

The work of "new growth" economists questions the assumption of diminishing/constant returns to human capital and knowledge and allows for increasing returns from technological investments. This leads to powerful arguments for the pre-eminent role of research, technological innovation and human capital creation in the economy. In new growth economics technological change is at the heart of economic

growth, and knowledge is the basic form of productive capital and is associated with an increasing rather than decreasing marginal product (Romer, 1986, 1990).

Because technical change is irreversible it is also limitless, contradicting the basic neoclassical idea of decreasing returns on the margin. Knowledge can in turn be considered either embodied or disembodied. Obviously the human capital embodied in individuals can be considered rival. It does however stop when people die. Embodied knowledge is also contained within machinery and equipment. However, disembodied knowledge, or accumulations of human capital in groups and in generations can be thought of as cumulative and non-rival. Examples of disembodied knowledge include patents, licenses, research papers and trademarks.

The approach by Romer (1986) is possibly the best expressed of these “knowledge” models. He highlights the importance of non-rivalry in technology as the main source of growth. He concludes that it is possible, nonetheless, that private incentives to invest in knowledge will be suboptimal. Even though patents may permit at least partial property rights to be used over the operation of the design in direct production, other designers can get hold of the initial design by either examination of the patent application or via reverse engineering and as a result they are then able to use it to enhance their new designs. These spillover effects therefore affect future research activities. New knowledge provides a building block for further advances in understanding and the accumulation of additional knowledge, also, because the users of new ideas have at least a temporary period of market power, the research sector is likely to under-supply research activity. As a result, it may be said that government could play an important role in stimulating the supply of research activity.

Grossman and Helpman’s study (1991) is another model that is focused on increasing returns to knowledge via innovation. They hypothesise that innovation may contribute by 1) expanding product variety, whereby new products are aggregated with old products in production and dynamic increases in returns to scale or preference for variety is assumed. Or 2) raising product quality, the new goods are of superior quality and they take the place of the old goods. Their introduction raises productivity or utility. Again, innovators of products can also enjoy the benefits of temporary

technological leads and super-optimal research activity can result because research success for one firm has a negative spillover effect on other producers.

2.3.2 HUMAN CAPITAL MODELS AS INSTRUMENTS OF GROWTH

Human Capital may be defined as the sum of the abilities specific to individuals. It includes such things as intellectual abilities, health, and strength. However, unlike knowledge, human capital is not a public good i.e. it is not rival and excludable. According to Maynes, Brooks and Davidson (1996, p.2), human capital is “expenditure on education and training which increases productivity and presumably future earnings in the labour market that is treated as a human capital investment decision”. They anticipate that the higher the levels of general education, the faster the growth rate in the economy.

Lucas (1988) proposes that the ‘engine’ of growth may lie in the accumulation of human capital, and that many positive externalities may be associated with it. For example, if one person acquires a new skill, others can learn from them by either directly through tutoring, or indirectly through following their example. However, since individuals do not seize the total gains to their private investment in training and education the market equilibrium will be marked by sub-optimal training and growth.

Lucas’ second model focuses on learning by doing (refer also the initial study by Arrow, 1962). The central idea is that as individuals produce goods, they think of methods to better the production process. Thus, the accumulation of knowledge comes to pass, in part, not as a result of intentional efforts, but as a side effect of standard economic activity. The key characteristic is that some activities generate greater learning spillovers than others, so the direction of resources into high technology (high learning) activities can expand overall growth.

2.3.3 PHYSICAL INVESTMENT AND EMBODIED TECHNOLOGICAL CHANGE AS INSTRUMENTS OF GROWTH

These models focus on the feasibility that “new ideas and techniques are generally embodied in machines and equipment with returns to investment made by one firm spilling over to benefit rival firms and firms engaged in related production activities” (Dowrick, 1993, p. 110). The inference is that private incentives on their own could lead to under-investment.

2.4 EMPIRICAL EVIDENCE OF THE DETERMINANTS OF ECONOMIC GROWTH FROM THE LITERATURE

Export-led growth theories have much support. Most recent work has been largely empirical, and has shown without exception, that a positive relationship exists between exports and economic growth. The style of analysis has been predominately that of cross-country regression analysis, however a study by Ram (1987) applies time series analysis to 88 developing countries for the period 1960-1982. He suggests that caution is needed in interpreting the cross section results in terms of inter-country diversity in the parameter estimates. This is because the “imposition of a common structure in the form of cross-section models can be a drastic simplification and important parametric differences could be masked in cross section estimates even when samples chosen look fairly homogeneous with reference to certain criteria” (Ram, 1987, p. 52).

Goncalves and Richtering (1987) also analyse the empirical results on the probable positive correlation between export and output growth rates using inter-country comparisons for 70 countries for the period 1960-1981. They find that, although at the aggregate level there “may exist a positive statistical rank correlation between the growth rates of exports and GDP, this is not so apparent when one takes into account other indicators of export performance” (Goncalves and Richtering, 1987, p. 16).

Ottani and Villanueva (1990) find a positive association between exports and economic growth. Their analysis provides empirical evidence of long-term growth performance in a sample of 55 developing countries grouped by income levels. They suggest that a

steady growth of 10 per cent in the volume of exports, or an increase in the Export/Gross National Product ratio by 2 percentage points would likely raise steady-state per capita output growth by 4 to 5 per cent per year.

The introduction of endogenous growth theory has however seen a growing interest in "other" determinants of long-term economic growth. For example there is evidence of the positive influence of education on growth. Many studies have been hampered by inadequate data, nonetheless, Barro (1991) shows evidence from a very broad cross-section of countries, measured by years of schooling, that human capital formation, is a significant engine to growth. It was found that countries at a given level of development are inclined to experience quicker rates of growth if they start off with a high percentage of teenagers in secondary education. Also, Barro and Lee (1993) have constructed a data set for 129 countries over five year periods from 1960-1985. They find that male education attainment is more important in terms of the direct effects on GDP growth and non-human investment. The result from this study could be a spillover from traditional male preference and privileges in developing countries.

A recent study by Maynes, Brooks and Davidson (1996), finds by measuring educational attainment and labour force status as a proxy for human capital, that human capital is important to the growth process. Their results imply that the growth dividend to the economy of increased educational attainment within the labour force will increase as the economy matures. They argue that the way in which human capital is accumulated and financed has important implications for both economic growth and prosperity.

Research and development (R&D) importance on aggregate growth has to date proved somewhat ambiguous because of the lack of consistent data across time and countries. Nonetheless, data has been found to support the hypothesis that R&D has a positive association on growth.

A study by Adams (1990) looks at United States data on academic scientific output measured by counts on articles, and development capability, measured by the employment of scientists. He finds that growth in the stock of fundamental knowledge adds significantly to productivity growth. However, the lags range from 10 years for

computer science and engineering to about 20 years between discoveries and the peak production effect within a certain industry and a lag of up to 30 years for inter-industry spillovers.

Jones (1995) finds evidence to suggest that growth in the stock of fundamental knowledge does not increase productivity growth. His study demonstrates Post-World War II evidence, for the Organisation for Economic Co-operation and Development (OECD) countries, does not support the prediction of many R&D based models; that a higher scale of R&D input, for example the number of scientists and engineers devoted to R&D increases the growth rate.

Coe and Helpman's study (1995) looks at the extent to which a country's total factor productivity depends not only on domestic R&D capital but also on foreign R&D capital. Their outcomes indicate that there are beneficial effects on domestic productivity of R&D, and that the effects are stronger the more open an economy is to overseas trade. Furthermore, the estimated rates of return on R&D are very high, in terms of both domestic output and international spillovers.

A further re-examination of the effects of research and development spillovers is discussed in Lichtenberg and van Pottelsberghe de la Potterie (1996). This study measures the extent to which technology spills over between industrialised countries through a particular channel of flows. Outward foreign direct investment (FDI) flows and import flows are determined to be two simultaneous channels through which technology spills over and benefits other industrialised countries. Agreement is provided to the idea of technology sourcing, associated with multinational company (MNCs) activities abroad. Furthermore, according to their study, inward FDI flows do not contribute to the improvement of the technological base of the host countries.

Extensive analysis of empirical data from 22 countries (including New Zealand) by Coe & Helpman (1995) has reached some striking conclusions on returns to R&D for the period 1971-1990. Based on data in this paper, Coe & Helpman estimated the average rate of return to R&D in 1990 over the G7 countries as 122.6 per cent and 85.1 per cent in the remaining 15 countries, which include New Zealand. In an earlier study, Birks (1980) suggested that technical progress accounted for between 62 per cent and 73 per

cent of total productivity growth in the New Zealand manufacturing sector. Scobie & Eveleens (1986) despite methodological difficulties, have suggested rates of return much higher than alternative investments. They estimate a 30 per cent annual real rate of return to research investment.

Empirical analysis for physical investment can best be explained using the work of De Long and Summers (1991). In their study using data from the United Nations Comparison Project and the Penn World Tables, 1960 -1985, they find that machinery and equipment investment has a strong statistical relationship with growth. They find evidence that the real rate of return on equipment may be as high as 30 per cent. Because of the role for equipment investment in triggering productivity growth they believe that there is a case for special incentives through government subsidies or taxes which could lead to a higher sustainable growth path, particularly for developing countries. According to Dowrick (1993, p.113) "one plausible interpretation of the De Long and Summers (1991) results is that equipment investment is the principal channel through which advances in technology are diffused both within a country but perhaps more importantly across countries."

There is also indication of the significance of investment in public infrastructure, for example, streets highways, airports, water systems, gas facilities and sewers, on economic growth. A study by Aschauer (1989) provides evidence that public investment in core non-military infrastructure is highly productive. Aschauer suggests that public infrastructure capital compliments private capital in the production and distribution of private goods and services. Thus, the net effect of a rise in public investment expenditure is likely to raise private investment. Consequently the national level of investment is lifted.

In addition, there appears to be contradictory results in the literature on the role of public expenditure. In particular, Barro (1991) points out that government consumption is negatively correlated with growth. His argument is that government has no direct effect on private productivity but lowers saving and growth through the distortionary effects from taxation or government expenditure programmes. However, Dowrick (1993, p.114) argues that it is valuable to "distinguish between the real level of government consumption activities". He discusses that "real government activity does,

on average, contribute to growth, albeit with diminishing marginal returns, whereas taxation per se inhibits investment and growth. The net effect of government consumption is nonlinear: increases in government consumption increase growth only up to a critical level around 12 per cent of GDP, and beyond this the impact is negative” (Dowrick, 1993, p.114).

Public transfers through social security and pensions are generally correlated positively with growth performance. Castles and Dowrick (1990) get a positive relationship for their study of OECD countries, however it is not statistically significant. Sala-i-Martin (1992), using a sample of seventy-five countries finds a positive relationship with growth performance. The explanation provided is that “positive benefits of social cohesion, law-abiding behaviour and goodwill tend to outweigh the disincentive effects of taxation” (as cited in Dowrick, 1993, p.114).

Government policies affect growth as examined by Sala-i-Martin (1994). However his study does not mention whether policies of financial repression, trade distortions or price distortions are causing this correlation. Nonetheless, one fact appears to be certain “publicly induced disarray is not associated with large rates of economic growth” (Sala-i-Martin, 1994, p.746).

Political instability is another important area for consideration. Barro (1991) measures political instability, provided by figures on revelations, coups, and political assassinations, and finds it is inversely related to growth and investment. “These relations could involve the adverse effects of political instability on property rights and the linkage between property rights and private investment. The correlation could, however, also reflect a political response to bad economic outcomes” (Barro, 1991, p.437).

Mauro (1995) also finds evidence in favour of the claim that corruption lowers economic growth. A data set consisting of subjective indices of corruption, the amount of red tape, the efficiency of the judicial system and various categories of political stability for a cross-section of countries is utilised for the period 1980-1983. Mauro suggests that “a considerable portion of the effects of corruption on economic growth works through its effects on the total amount of investment” (Mauro, 1995, p.704).

Further research has been undertaken into the relationship between inflation and growth. Grier and Tullock (1989), using pooled cross-section and time series data on 113 countries, find no positive association between inflation variability and growth. This is consistent with the work of Kormendi and Meguire (1985) but is contradictory to the Tobin-Mundell hypothesis, which implies a positive effect of inflation growth on economic growth.

De Gregorio (1993) found evidence to support the theory that the level of inflation and its variability, as well as money growth, has negative effects on economic growth. Quantitatively the effects of inflation on growth appear to be important in this study. The findings of this paper suggest that the main channel through which inflation affects growth is through the reduction of the productivity of capital. The paper also focuses on the existence of inefficient taxation as the prime cause for high inflation rates.

With regard to openness to trade, and its relationship to growth, Kormendi and Meguire (1985), found weak evidence that countries that become increasingly more open experience greater economic growth. Grossman and Helpman (1991) have developed several models of international economics. Their results are consistent with Kormendi and Meguire. Romer (1986) and Lucas (1988) have provided further persuasive intellectual support for the proposition that openness affects growth positively. Romer (1992), Barro and Sala-i-Martin (1995), among others, have argued that countries that are more open to the rest of the world have a greater ability to absorb technological advances generated in leading nations. However, in spite of these theoretical advances, the empirical literature has continued to be affected by some serious limitations. In particular researchers have been unable to generate satisfactory indices of trade policy orientation.

Edwards (1997) tries to overcome this problem by using nine alternative indices of trade policy to analyse the robustness of the relationship between openness to trade and productivity growth during 1980-1990. He finds there is a significantly positive relationship between openness to trade and productivity growth in eight of the nine measures used which supports the view that more open countries will tend to experience faster productivity growth than more trade protectionist countries.

Borensztein, De Gregorio and Lee (1998) examine empirically the role of Foreign Direct Investment (FDI) in the process of technological diffusion and economic growth for 69 developing countries over the last two decades. Their results propose that there is a good case for the positive effect of FDI on economic growth. Further, they suggest that there is a good case to presume that FDI is more productive than domestic investment. As Graham and Krugman (1991) argue, domestic firms have better knowledge and access to domestic markets; if a foreign firm decides to enter the market, it must compensate for the advantages enjoyed by domestic firms. It is most likely that a foreign firm that decides to invest in another country enjoys lower costs and higher productive efficiency than its domestic competitors. In the case of developing countries in particular; it is likely that the higher efficiency of FDI would result from a combination of advanced management skills and more modern technology. Borensztein, De Gregorio and Lee (1998) also find that the higher productivity of FDI holds only when the host country has a minimum threshold stock of human capital. In turn, FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy. This study in turn provides persuasive support for the study by De Gregorio (1992) which shows in a panel data of Latin American countries that FDI is about three times more efficient than domestic investment. A further study by Blomstrom, Lipsey and Zejan (1992) finds a strong effect of FDI on economic growth in Less Developed Countries (LDC).

2.5 POLICY IMPLICATIONS OF ENDOGENOUS GROWTH THEORY FOR NEW ZEALAND

A number of principal factors, which have retarded per capita output growth in New Zealand, could recoil in the not too distant future. Population growth has declined relative to the Post-World War II average, inflation is low (Kormendi and Meguire, 1985; Grier and Tullock, 1989; De Gregorio, 1993), product and factor markets are more open particularly to international competition (Romer, 1986, 1996, Lucas, 1988; Barro and Sala-i-Martin, 1995; Edwards, 1997), and New Zealand is relatively poor in comparison to other OECD countries, so that it can copy and has the incentives to copy the best overseas production practices and technologies (Coe and Helpman, 1995).

Lucas (1988) finds that “where investment in education has a spillover effect on the productivity of others, there is a case for the subsidisation of schooling” (as cited from Dowrick, 1993, p.113). However, even though the empirical research suggests that higher levels of education will, all other things held constant, induce higher economic growth, there is little direct help as to exactly how many students New Zealand should aim to have in various facets of further and higher education.

Romer’s (1990) analysis implies that too little human capital is devoted to research and development (R&D) and a clear role for subsidisation is recommended. The patchy data available suggests that reducing public R&D investment leads to reduced industry R&D. Moreover, governmental R&D also stimulates sharing (of information), which in turn stimulates private R&D. Dowrick (1993) discusses whether or not resources in a small economy are better used in: a) subsidising own original research, or b) in learning and developing from scientific and technological innovation in other countries, or c) in encouraging investment from foreign high-tech firms.

The spillover effects of overseas R&D for a small, open economy can be very significant. The higher the imports as a proportion of GDP the more spillover benefits can be realised through those technology-based imports that improve productive processes in New Zealand. Because New Zealand is a small, open economy there is high potential to access overseas R&D spillovers to a greater proportional extent than larger economies such as the United States. However, New Zealand must pay the “entry fee” into such research by itself contributing internationally. For example, New Zealand’s relative strength in dairy research gives it access to very large overseas research results, which can be turned to New Zealand’s advantage. However, by not undertaking the R&D ourselves, by paying someone to do it for us, we are foregoing the “tacit and uncodified” outputs of research, such as upgrading our ability to search for and interpret new technology-based market opportunities. We also forego the human capital creation, which, with knowledge, is a “co-produced” good from the R&D process.

One of the critical issues for small, open economies like New Zealand is the growing recognition that relying on economic efficiency to generate maximum prosperity may mean that ‘someone else gets prosperous’, not us. There is a distinct possibility that not

only do substantial social benefits from improved efficiencies flow to overseas customers but also that large technology gaps from relying on adapting overseas technology to the domestic economy constrain wages and national prosperity levels. If New Zealand manages closing this technology gap then our distance from major markets will become an even more significant issue. Distance is a clear drawback when it comes to being in the forefront of technology, not so much because of added costs, but because the lack of proximity can prevent a business from continuing in the forefront of technology. A high degree of customer education and a highly attuned perception of market needs are required in order to be on the cutting edge. Technological leadership can also call for the development of new distribution channels, which are complicated to undertake at a distance.

Additionally, it could be disputed in the past, that publicly funded research lessened incentives for scientists and their managers to perform, by sheltering them from competitive pressures and from the need to interact with industry and the science-user community. The departmental science structures, Department of Science and Industrial Research (DSIR), Ministry of Agriculture and Fisheries, (MAF) etc., caused problems in monitoring performance, and the strategic direction of science, and core funding cancelled any competitive pressures. However, the science reforms of 1989 have addressed these problems by producing some of the characteristics of a market for scientific research. Research is now carried out in entities that duplicate many of the incentive structures, commercial powers and behavioural traits of firms e.g. Crown Research Institutes (CRIs), Regional Authority's (RA) etc.

The emphasis by the new growth theories on the importance of investment implies that tax policy can exercise a significant role in distorting or encouraging investment in those areas that generate the spillovers of knowledge and technology. Governments should therefore aim to minimise any form of taxation that acts as a disincentive to forego current consumption in favour of future returns. Empirical evidence suggests, however, that public expenditure on education, infrastructural investment and transfers can have benefits that outweigh the distortionary effects of taxation (Dowrick, 1993).

In conclusion, the nature of new economic growth theory provides a means to contribute integrity to a magnitude of ideas that have for a long time held "water" in mainstream

economic thought and also in public debate. Research and development, education and training, trade, inflation, investment in equipment and new machines, FDI and government policies are now recognised as significant components in promoting long-run economic growth. There is also substantial evidence to support many of these theories, and each has important policy implications for New Zealand.

2.6 SUMMARY

This chapter discusses how economists have previously attempted to evaluate the determinants and impacts of economic growth. Despite the numerous theoretical and empirical research undertaken over the last century it is clear that the impacts of economic growth and its determinants are still very much unknown.

Several implications can be drawn from this chapter. The results on economic growth analysis are mixed to date and further empirical assessment is important to draw a firm conclusion on the determinants of economic growth. Moreover, there is a need to use correct econometric techniques when employing time-series data. To date economic growth has been examined based on cross-country studies, and specific country studies using regression analysis. Recognising the influence and emphasis of economic growth this study attempts to analyse economic growth of a specific country. In particular, this study aims to examine economic growth for New Zealand, for the period 1960-1996. Regression analysis is applied to time series data on the generally agreed, relevant variables: trade, openness to trade, effective labour force, investment, research and development, human capital, inflation, government consumption and government education expenditure.

Having provided this introduction to the simple economics of growth, the next chapter looks carefully at the historical experience of New Zealand's growth performance, in order to analyse in detail the nature of the economic factors that are necessary for long-term growth in New Zealand. The methodology applied in this analysis is examined in Chapter 4 and the empirical results are reported in Chapter 5.

Chapter Three

THE NEW ZEALAND ECONOMY: AN OVERVIEW

3.1 INTRODUCTION

New Zealand is located in the southwest Pacific Ocean. It consists of two main, and a number of smaller, islands whose combined area is equal to 270,500 square kilometres, similar in size to Japan and the United Kingdom, with a population of approximately 4 million (New Zealand Official Yearbook, 1998). New Zealand is a mixed economy, classified by the World Bank as a "high income" country with Gross National Product (GNP) per capita of US\$14340 in 1995 (World Bank, 1997). The climate is temperate and suited to farming, horticulture and forestry. Raw and processed pastoral and wood products account for 70.2 per cent of the composition of exports, while machinery, mineral fuels and vehicles account for 14.4 per cent (Evans, Grimes and Wilkinson, 1997). Exports of goods and services were 31 per cent of Gross Domestic Product (GDP) in 1995. As a direct result of the implementation of the comprehensive, radical reforms by the Fourth Labour Government in 1984, New Zealand is now one of the most deregulated, open economies in the world. It is for this New Zealand is most notably recognised and acclaimed among the world's economists and financial analysts. The purpose of this chapter is to provide an overview of the New Zealand economy and to investigate the major changes in the political economy that have taken place during the twentieth century, focusing in particular, on the post-1960 era.

New Zealand's history during the twentieth century can be divided into three distinct epochs. The first period is from 1960-1983. The leading decade is characterised by sustained economic growth fuelled by high levels of profitability and productive investment, full employment, low inflation, rising real wages and the absence of prolonged Balance of Payments (BOP) problems owing to favourable terms of trade. From 1970-1983, the New Zealand economy experienced economic stagnation, high inflation, declining profitability, insufficient and poorly allocated levels of productive investment, low terms of trade, recurrent BOP deficits, increasing public and private

indebtedness, the standstill of real wage growth, and the highest level of unemployment since the 1930s (Rudd & Roper, 1997).

The comprehensive, “big bang” reforms of the Fourth Labour Government were introduced in 1984 and in turn lay the foundations for the focus of the next period, 1984-1990. The reforms were radical, comprehensive, and implemented quickly and form an important development in New Zealand’s economic history. Although the reforms began in 1984 some were not fully implemented until 1991. The liberalisation process between 1986 and 1991 was overlaid by contractionary stabilisation policies.

The third period, from 1991 onwards, reflects a strong sustainable economic recovery. At least some of this is ‘catch up’, while some is related to the reforms themselves. The growth performance over this time is better than most other Organisation for Economic Co-operation and Development (OECD) countries, nonetheless the Asian Economic Crisis of late-1996 has had a significant impact on the New Zealand economy.

A descriptive analysis of the New Zealand economy is provided in this chapter to set the scene before drawing on the important determinants of economic growth for the economy, throughout the 1960-1996 period, which is the main focus of this study. This chapter is set out as follows: section 3.2 reviews New Zealand’s economy briefly, prior to World War II and throughout 1960-1983. The radical macroeconomic and microeconomic reforms of the Fourth Labour Government are discussed in section 3.3. Section 3.4 looks at New Zealand’s post-reform period, i.e. 1991 onwards, paying particular attention to the implications of the reforms and the recovery. A summary of the New Zealand economy is provided in the final section, 3.5.

3.2 BACKGROUND TO THE NEW ZEALAND ECONOMY

New Zealand was one of the first countries in the South Pacific to be colonised in the nineteenth century. The Treaty of Waitangi in 1840, with the indigenous Maori tribes, initiated New Zealand’s status as a semi-independent colony. New Zealand’s European heritage was based largely on lower-middle class British migrants seeking a new life and the country was developed as a “distant farm” for Great Britain using British

capital. The New Zealand economy quickly became very dependent on Britain; its geographical isolation sheltering the economy from foreign competition until well into this century (Rudd and Roper, 1997).

In the mid-1860s, goldfields, wool industry and ancillary activities and services, produced the highest average income of any country of reasonable size in the world (Hawke, 1985). In addition, the introduction of refrigeration in 1890 transformed the production possibilities of New Zealand's agriculture, by enabling exports of frozen meats. New Zealand was also a pioneer of social legislation. Following its first general election based on 'one-man-one vote' in 1890, it extended the franchise to women in 1893. It passed an Old Age Pension Act in 1889, extended benefits to widows in 1911, and passed a Family Allowances Act in 1926, which assisted parents with limited incomes financially. In 1938 a comprehensive system of social security was implemented by the First Labour Government (Evans, 1997).

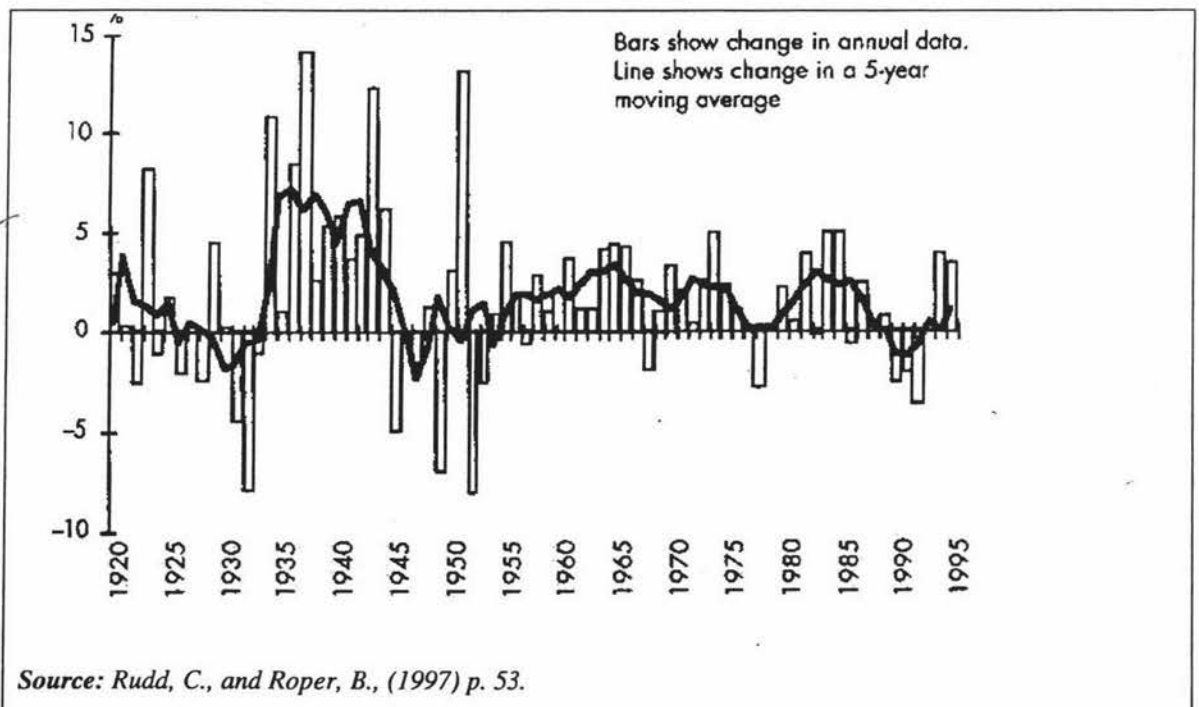
Figure 3.1 presents the annual growth rate of real per capita GDP of New Zealand's economy for the period 1920 to 1995. This term highlights the various impacts experienced in the world economy such as the Great Depression, booms, and the oil shocks of 1973/74 and 1979/80. These events had significant impacts on New Zealand's overall economic growth.

The 1920s revealed problems for Britain, which in turn had a negative impact on the New Zealand economy. For example, Post-World War I inflation in Britain affected the prices of New Zealand exports and imports. The country also faced increasing competition in both its meat and dairy exports. The abandonment of the Gold Standard in 1914 by Britain left New Zealand feeling puzzled as to its implications. As a result, instability was frequently nominated as the chief characteristic of the 1920s.

The Depression in the early 1930s saw significant changes in the development of the New Zealand economy. GDP fell up to 30 per cent, whilst prices dropped up to 20 per cent. At the depth of the depression unemployment grew to 80,000 people, 12 per cent of the labour force. Export receipts also fell dramatically by 37 per cent (Hawke, 1985). Following the election of the First Labour Government in 1935 and the introduction of

import licensing and exchange controls in 1938¹, New Zealand registered annual growth rates of real GDP per capita of over 7 per cent for a decade. These changes or “insulationism” symbolised a broad decision that the course of the New Zealand economy should be determined less by events overseas and more by the choice of local people. These occurrences were followed by an unsteady Post-World War II ride through to the early 1950s. After this period the trends are more consistent, and the Holyoake slogan “steady as she goes” sums up the Post-World War II era (Rudd and Roper, 1997).

Figure 3.1 Annual Growth Rate of New Zealand’s Real Per Capita GDP, 1920-95 (expenditure basis, March years)



From the above diagram, it is notable that the economic system prevailing after World War II did produce economic growth at least until the 1970s, except for 1979. GDP grew at around 4 per cent per annum, and as the population grew at about 2 per cent per annum, this provided stable growth in income per capita. Inflation throughout the 1950s and 1960s grew at 2 to 3 per cent in most years. During this time, inflation was much the same as its trading partners but was worrying for many. In any case there is no doubt that the Post-World War II economy produced growth at a level that was respectable by comparison with any previous New Zealand experience (Hawke, 1985).

¹ Previously imports required no official permission.

This relative prosperity was due to New Zealand's position of comparative advantage as a primary producer and was a direct result of preferential access to the British market in the terms of trade, particularly in the supply of agriculture-based products.

Full employment was a major aim of government policies throughout the 1950s and 1960s. In fact in 1961, the then Prime Minister, Holyoake, personally determined monetary policy with the unemployment figures as his chief guide. Throughout this period the unemployment rate was less than 1 per cent of the total labour force (Poot, 1992). It wasn't until the oil crisis of 1973 that the unemployment rate exceeded 1 per cent. As achievement of full employment became common place in New Zealand it tended to provoke incredulity overseas. The record generated scepticism of the measurement criteria used or even suggestions that the decimal point was misprinted (Hawke, 1985).

The BOP rode a boom until 1966/67 so restraints on imports of materials and equipment could be relaxed and an endless number of small industrial developments were able to proceed. Industrialists until the late 1960s were confident that high levels of employment and aggregate demand would be maintained so that they could sell their products. There was, therefore, a continuing demand for imports composing a wide range of equipment and materials used to sustain activities spread over the spectrum of industrial categories. The growth of industry was one reason for increased urbanisation of the population after World War II, it was not the only one, services also provided urban employment, and one of the most important services, transport, facilitated the servicing of wider areas from major towns (Hawke, 1985). As a result, industrial unrest was minimal, compared to previous New Zealand experience i.e. the Depression of the 1930's and the Waterfront Strike of 1951, because workers enjoyed rising real wages and businesses recorded high levels of profitability (Roper and Rudd, 1997).

From the late 1960s, the New Zealand economy experienced a sharp reversal in economic development. The long-run growth performance of the New Zealand economy deteriorated as markets were extensively regulated and protected, traditional export markets were lost, productivity growth slowed and unemployment and inflation rose. The old pattern of New Zealand economic growth was considered to have become unsustainable.

The transformation from full employment to large-scale unemployment was a traumatic experience for New Zealanders after the 1970s. Unemployment reached a peak of 131,700 over the period to January 1984, which totalled more than 9 per cent of the workforce (Walker, 1989). Economic growth throughout the period 1970-1984 was one of the lowest among the group of OECD countries, with an average real growth rate of almost nil. The accumulation of overseas reserves during the war years was also soon reversed, and in turn led to the demand for foreign exchange exceeding supply.

New Zealand's inflation rate between 1970-1982 was an almost unbroken upward trend, averaging 12.8 per cent per annum, considerably higher than its main trading partners. One factor that pushed up inflation, higher than the world average, was the behaviour of the Fourth Labour Government whose expenditure (including transfers) rose from 29 per cent of GDP in 1984 to 38 per cent in 1987.

Government deficits were particularly large in the first half of the 1980s. In the five years to March 1985, the government's financial deficit averaged 4.8 per cent of GDP, reaching a peak of 6.5 per cent of GDP in 1984 (Silverstone, Bollard and Lattimore, 1996).

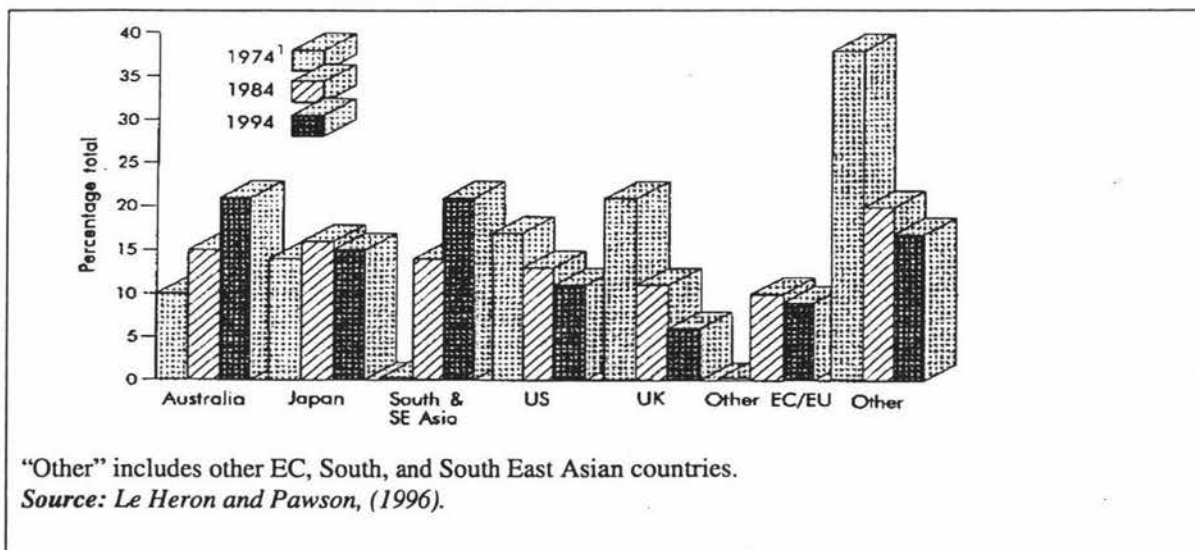
Faced with high inflation, the National Government in June 1982, introduced a comprehensive wage and price freeze. This succeeded in reducing inflation to 3.5 per cent in March 1984, however this resulted in many pricing abnormalities and other displays of inflationary pressures. For example, the concurrent large fiscal deficits, and associated high levels of domestic absorption were reflected in a substantial current account deficit, which averaged 6.9 per cent of GDP over the 1982-85 period (Silverstone, Bollard and Lattimore, 1996).

In turn, these effects were magnified by a New Zealand commodity boom during 1970-1972 and by Britain entering the European Common Market in the mid-1970s. The latter was a major development in New Zealand's history because of the loss of New Zealand's major trading partner, the British market. The Common Market had been set up in 1958 and membership gradually expanded as more and more European countries joined for their own economic benefit. When Britain joined the Common Market it

meant inevitably that New Zealand's economy could no longer have the easy, virtually unlimited access of its goods and services to Britain.

Over the period from 1960-1985, New Zealand suffered a decline in the real value of trade, with exports to Britain dropping from 55 per cent to 10 per cent, and exports to other member countries of the European Economic Community declining from 17 per cent to 9 per cent (Illustrated Encyclopaedia of New Zealand, 1992). These results reflect British entry to the European Union (EU) and the introduction of quotas of New Zealand exports of dairy products and later other meat products. The effect has been the diversification of both New Zealand production and its trading partners. For example, exports have shifted away from the United Kingdom towards the United States and Asia while imports from the United States, Japan and Australia have increased to New Zealand. See Figures 3.2 and 3.3 for New Zealand's major export and import markets for the years 1974, 1984 and 1994.

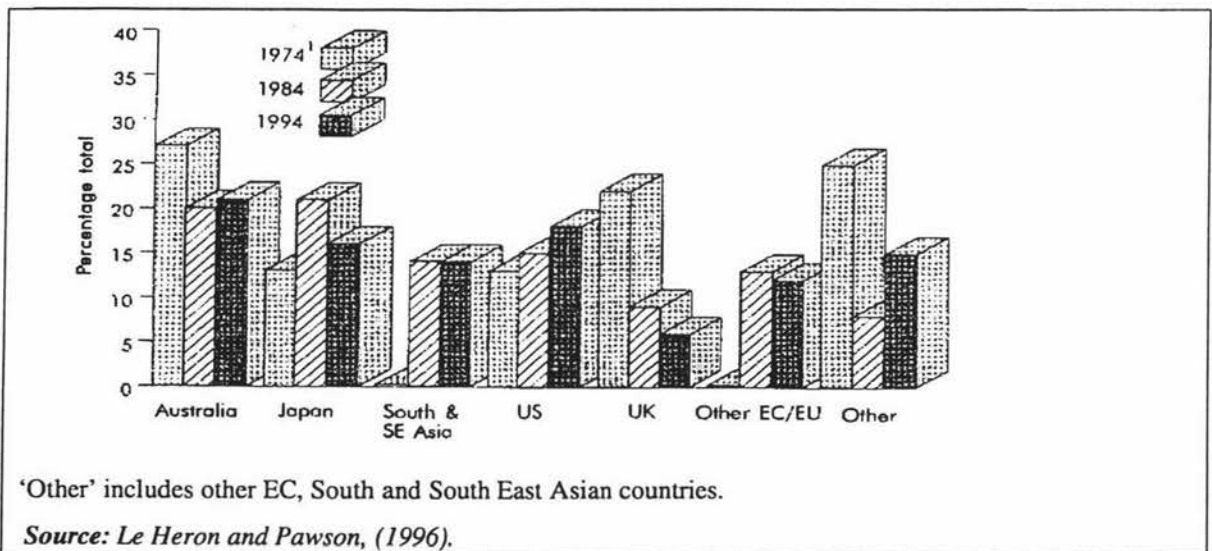
Figure 3.2 New Zealand's Export Markets



During the period 1960 to 1985, New Zealand's economy became extensively regulated and protected against outside market forces, as compared to other OECD countries. Protection was aimed at safeguarding jobs within New Zealand (Illustrated Encyclopaedia of New Zealand, 1992). In the early 1960s, the industrial sector was fostered by subsidies and protected by high tariff barriers and import quotas. This resulted in some sectors receiving effective rates of protection of more than 200 per cent

(Ostry, 1994). Foreign exchange transactions were also tightly controlled; most aspects of domestic trading were regulated; and the wage-fixing system was centralised. Government ownership was also widespread in banking, insurance, health, education, transport, energy and utilities. By 1984 the Treasury announced that government trading enterprises accounted for over 12 per cent of GDP and 20 per cent of gross investment.

Figure 3.3 New Zealand's Import Sources



The oil shocks of 1973/74 and 1979/80 caused further deterioration in terms of trade, but negative real interest rates lessened briefly the need for immediate structural adjustment. Nonetheless, New Zealanders continued to have high expectations about their standard of living. The social legislation as a result of Post-World War II prosperity also reflected a widespread expectation that the state could provide “cradle-to-the-grave” protection against economic uncertainty in the areas of health, education and social services. In the 1970s the country committed to increasing social spending and the role of the state by establishing a Royal Commission on Social Security, a universal Accident Compensation Scheme (ACC) and a universal superannuation scheme funded from general tax revenues (Silverstone, Bollard and Lattimore, 1996).

Government was actively involved in propping up a number of loss-making commercial activities in the early 1980s. The “Think Big” programme, in accordance with the belief of continuing high energy prices, was a series of major industrial developments aimed at developing and fully utilising New Zealand’s energy resources. Projections based on

continuing high prices for oil forecast attractive profits and substantial benefits to the Balance of Payments. It was envisaged that New Zealand's import requirements would be significantly cut back and that exports of by-products such as ammonia-urea and methanol could be developed. However when the oil prices fell again in the 1980s those benefits were void (Scolley, St John and Horsman, 1993). The legacy of the 'Think Big' projects have left New Zealand with a heavy burden of external debt finance, raising the debt to GDP ratio from 10.7 per cent in 1975 to 35.4 per cent in 1984 (Robinson, 1994). Moreover, the extent of this increase was understated by a real exchange rate that was viewed principally to be overvalued. Therefore, without any further external borrowing, the 20 per cent devaluation of 1984 re-scaled the government external debt to GDP ratio up to 45.9 per cent (Walker, 1989). This change arose out of apprehension that there was little or no possibility of an increase in investment income to help service the debt and to encourage exporters by making them more competitive and increasing their profits.

Limited incentives existed for industry to become efficient or to adjust to changing circumstances. Labour market adjustment was similarly constrained by a relatively narrow dispersion of after-tax incomes and, by international standards, a comparatively generous, extensive welfare system. In addition, the prevailing import substitution policy and labour market regulations of the 1970s and early 1980s tended to reduce margins for skill in the significant area of human capital formation. Relatively low wage premiums for skills and the generous welfare benefits provided by the government meant that there was little incentive for people to complete even high school education. As a result New Zealand fell increasingly behind the OECD in human capital formation (Silverstone, Bollard and Lattimore, 1996).

The tax system in New Zealand in the early 1980s was characterised by a complex, sharply stepped up personal income scale. There was a narrow tax base with many exemptions and deductions; evasion and avoidance activity prevailed. The wholesale sales tax system was complicated with a range of different rates. Different forms of income were treated differently, for example capital gains were largely untaxed. Failure to adequately adjust the tax system for inflation led to fiscal drag. Additionally, the share of revenue from business taxation fell due to loopholes, tax concessions of many kinds and poor business portfolios.

An important aspect of the relationship between Australia and New Zealand was developed in 1983 with the introduction of Closer Economic Relations (CER). Border protection was reduced and a trade agreement was established with Australia. Agricultural subsidies and export assistance were also sharply reduced. Under the CER agreement, all merchandise trade across the Tasman Sea has been free of tariffs and quantitative restrictions since 1990. For over almost a decade of CER, total trans-Tasman trade has increased from just over NZ\$2.5 billion to NZ\$6.3 billion, raising at an annual average rate of about 15 per cent. (Le Heron and Pawson, 1996).

McLean (1974) p. 14-15 summarises the New Zealand economy for the period 1938-1984, "as a mixed economy where markets are seldom permitted to operate efficiently, together with a centrally-planned economy, without a central plan. The allocation of resources is to a large extent determined neither by market mechanisms nor government decision, but by historical patterns fossilised in institutional procedures" (as cited in Silverstone, Bollard and Lattimore, 1996, p. 3).

By the early 1980s, New Zealand's inability to adapt to changing circumstances had led to chronic economic decline. Economic growth was consistently lower than our major trading partners, while inflation was higher. Serious internal and external deficits had emerged, unemployment was rising and the economy was no longer able to support the expectations that many people held of the broad welfare state provisions. As a result, New Zealand's relative GDP per head slipped, since the 1950s, to about 80 per cent of the OECD average when the radical economic reforms began in 1984 (Poot, 1992).

3.3 ECONOMIC REFORMS IMPLEMENTED BY NEW ZEALAND

The long run growth performance of the New Zealand economy, from the late 1960s had slowed dramatically, this in turn led the labour government to introduce economic reforms in 1984. It was apparent that existing policies were driving New Zealand into rising overseas debt while not removing the disparity of incomes compared with other countries. When Roger Douglas, finance minister for the Fourth Labour Government, set out on the revolutionary programme of macroeconomic and microeconomic transformation the supreme goal was to reverse the long-run decline in New Zealand's

economic performance². In turn, the wide-ranging policies were intended to promote more efficiency, competition and openness to trade within the New Zealand economy.

Silverstone, Bollard and Lattimore (1996), point out the actual phasing of the twelve areas of reform for the period 1984-1995 in Figure 3.4. The reforms occurred concurrently in the capital and financial sectors, industry regulation and international trade. Monetary policy, tax reform, corporatisation of government departments such as Coalcorp, Electricorp, Landcorp and New Zealand Post Ltd, and the privatisation of state owned enterprises (SOEs) such as Telecom, and the Bank of New Zealand and public expenditure changes followed, to improve the accountability and efficiency of government operations³. The reform process from 1989-1991 involved changes to public expenditure, the labour market, resource use and social services.

Figure 3.4 Actual Phasing of Economic Reforms in New Zealand from 1984

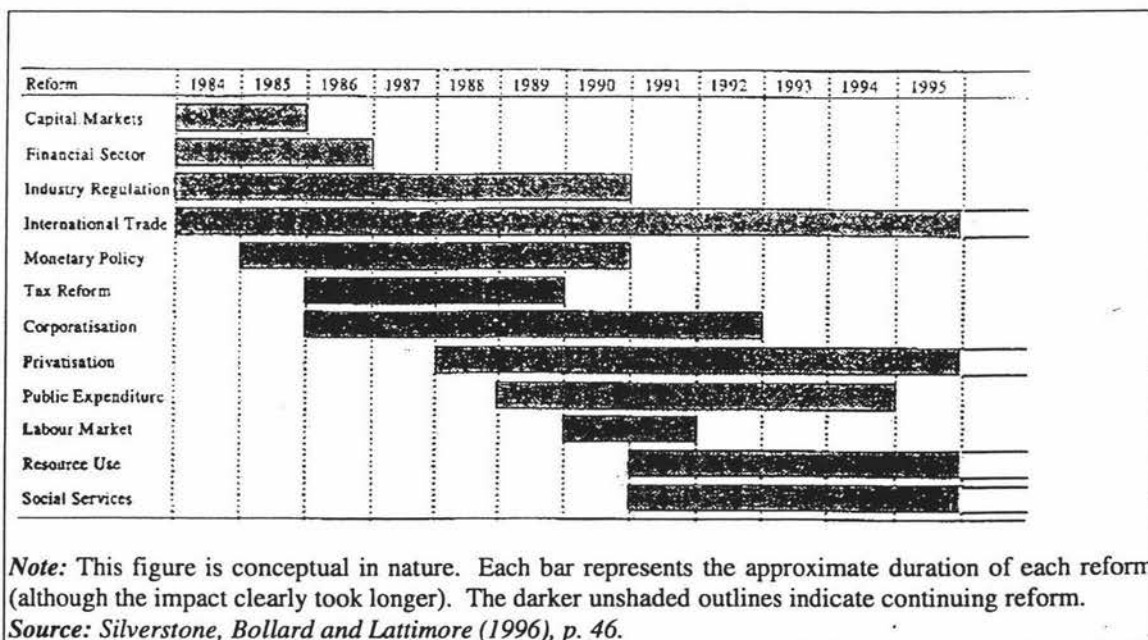


Figure 3.4 also highlights how widespread the reforms were. However, many were implemented quickly with minimal consultation. It was very much a case of ‘Big Bang’ reforms.

² The dramatic economic policies introduced by Roger Douglas were commonly called ‘Rogernomics’.

³ By 1990 the following SOEs had been sold by the Government: New Steel Petroleum Corporation of New Zealand Limited (Petrocorp), Development Finance Corporation (DFC), Health Computing Services, Air New Zealand Limited, New Zealand Post Bank Limited (Postbank), Shipping Corporation of New Zealand Limited (Shipping Corp.) Landcorp, Rural Bank, Government Printing Office (GPO), National Film Unit, State Insurance Office, Tourist Hotel Corporation, Maui/Synfuels (the Crown shareholding in the Synfuels plant and Maui gas contracts), Forestry cutting rights, Telecom, and the Export Guarantee Office (Source: Robinson, 1989).

On the other hand, some of the reforms took longer. Compensation for the losers was minimal and so too concern for the transition period (Silverstone, Bollard and Lattimore, 1996). The reform process ran into severe difficulties in early 1988 when the Prime Minister unilaterally aborted a major economic package announced in December of 1987. The package would have included a flat rate of income tax. Subsequent conflict between the Prime Minister and the Minister of Finance saw them both replaced in those roles by August 1989 (Evans, Grimes and Wilkinson, 1996).

The loss of political momentum and commitment as New Zealand entered a prolonged recession after the global equity shock in October 1987 quickly had an adverse economic effect. The new National Government, which won the general election in 1990, had to deal immediately with a sharply deteriorating fiscal position, rising unemployment, raising debt levels and the likelihood of a double down-grading of New Zealand's sovereign debt rating by Stanford and Poor's Corporation. Government expenditures, including welfare benefits were reduced and the labour market was deregulated. Reducing government expenditure in the midst of a depression was widely and strongly opposed at the time (Evans, Grimes and Wilkinson, 1996).

The significant rise in unemployment between 1984 and 1992 can be explained as a consequence of liberalisation. Through changing relative sectoral prices and profitability, liberalisation and stabilisation induced shocks (such as New Zealand's experience with corporatisation, privatisation, the removal of sectoral subsidies and the scaling down of trade protection and monetary and fiscal policies) created incentives to shift resources from one sector to another. Some parts of the labour market experienced excess demand, while others experienced excess supply. Given sluggish relative wage adjustments, and the time it took labour in declining sectors to be absorbed in expanding sectors, the short-side of the market dominated in both cases, reducing employment and increasing unemployment.

In conjunction with the initial reforms were a host of other structural reforms. These include the floating of the exchange rate in 1985, the removal of controls on the movement of international capital and the restrictions on foreign direct investment (FDI) in 1984/1985. In 1986 a liberal competition policy was adopted. Furthermore, in 1991 the Employment Contracts Act was implemented, making New Zealand's labour market

one of the most liberal among the OECD members. This move emphasised individual employment contracts between employers and employees and has accelerated the trend in reduction of union membership. In turn, wage determination and employment conditions are considerably more flexible, decentralised and competitive now that the remnants of a centralised wage-setting system characterised by the negotiation of national awards and blanket coverage provisions have been abolished (Scollay, St John and Horsman, 1993).

The control of inflation was a high priority for economic policy in the reform period. The dropping of the wage freeze, after the 1984 election, coupled with the exchange rate devaluation of 20 per cent in July 1984 saw inflation rise to 16.6 per cent in June 1985. From this time onwards successive governments have been intent not only on controlling inflation but in doing so through market-oriented policies. The introduction of the Reserve Bank Act in 1989 means that monetary policy is now solely directed at controlling inflation, and fiscal policy focuses on reducing the stock of government debt (Philpott, 1993).

The New Zealand tax system also had several base-broadening exercises from the mid-1980s. These included the introduction of the Fringe Benefits Tax (FBT) in 1985 and the reduction in special tax exemptions for exporters. The FBT was designed to close loopholes by including within the tax base most of the non-cash income provided by way of company cars, low interest loans and other business necessities. On 1st October 1985, the wholesale tax was abolished and replaced by a broad based 10 per cent Goods and Services Tax (GST), this was later raised in 1989 to 12.5 per cent (Walker, 1989). This was accompanied by significant decline in the marginal tax rate schedule and the expansion of targeted tax rebates for those on low incomes.

In 1988 there were further base-broadening measures, mostly deriving from the removal of almost all exemptions or deductions for ordinary taxpayers and for businesses. Other reforms to the tax system include: adoption of full imputation so that company income distributed in the form of dividends is taxed only once at the marginal tax rate of the taxpayer; an accruals regime which better aligns income and expenditure; and a more consistent treatment of foreign sourced income to discourage investment abroad for tax

avoidance reasons (Scollay et al, 1993). The section below discusses the current issues of the post-reform period.

3.4 POST REFORM PERIOD

By the end of the 1980s and early 1990s, i.e. post-Rogernomics, the New Zealand economy was one of the most deregulated economies in the world but still deeply in recession. According to an informal expert poll conducted by *The Economist* (1996), New Zealand was rated as the most liberal economy out of twenty major reforming countries (Silverstone, Bollard, and Lattimore, 1996). Moreover, the New Zealand economy is no longer considered in the ranks among the most prosperous countries. For example, in 1995, New Zealand's national income per head, is only \$US14,340 as against \$US18,000 in the United Kingdom, \$18,500 in Australia, and \$US38,9000 in Japan (Simkin, 1997).

Earlier surges of optimism for New Zealand's economic growth, such as in 1989, were quickly dampened in response to long lags as a result of the extensive reforms and because credibility of the policy changes did not happen instantly, also included are the associated costs of resource shifts. In addition, contracting stabilisation policies overlaid the liberalisation process between 1986-1991. In turn this period was succeeded by a period of strong economic growth. "At least some of this expansion was 'catch-up', while some was related to the reforms themselves" (Silverstone, Bollard and Lattimore, 1996, p.19). New Zealand's economic management and performance from 1991-1996 has improved with a sustainable average growth rate of at least 4 per cent which has been one of the highest among the OECD member countries.

It is useful at this point to provide an overview of the New Zealand economy with key economic indicators. Table 3.3 provides key economic indicators for New Zealand over the period 1960-1996. It can be seen that New Zealand's relative growth rate of GDP declined substantially over the period 1985-1990. Imports exceed exports for the fourth time in a decade in 1996. Population growth is steadily increasing with a figure of 3.57 million in 1996. Consumption as a percentage of GDP compared to investment is high, and prospects look to remain much the same.

The New Zealand economy is now in its seventh year of achieving positive growth. This upswing has been sparked by a surge in export volumes which followed a depreciation of the New Zealand dollar. The economy's steady growth has resulted in a flow of imports resulting in a current account deficit of \$2.5 billion in 1995, i.e. 4.3 per cent of GDP (Statistics New Zealand, 1996).

Table 3.1 Key Economic Indicators for New Zealand for the Period 1960-1996.

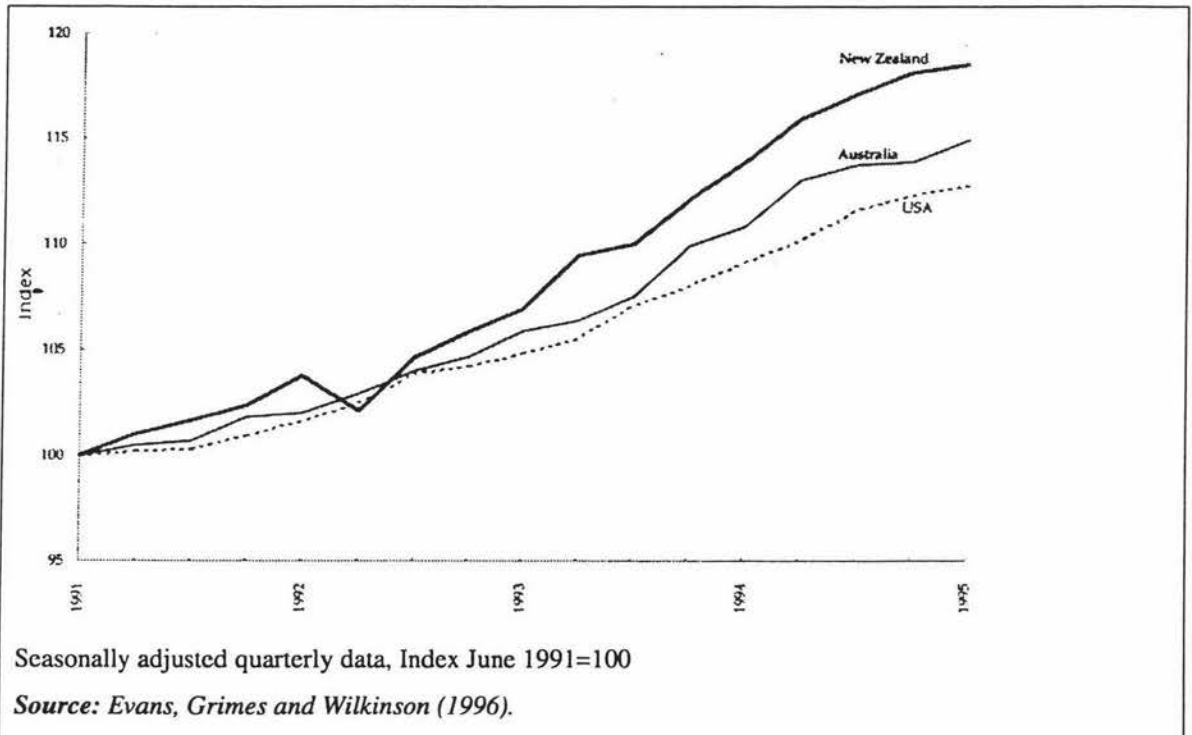
Year	Popn Millions	Exports \$NZm (FOB)	Imports \$NZm (CIF)	Total GDP (constant 1990 prices)	% GDP from previous year Δ	Consumption as a % of GDP	Investment as a % of GDP
1960	2.37	3909	4058	2813	4.2	73.6	24.1
1965	2.63	2582	3744	4012	6.0	75.3	27.4
1970	2.81	3292	3178	5832	3.7	77.4	24.4
1975	3.07	3016	4037	10941	1.7	75.7	31.8
1980	3.11	5255	4713	23089	1.1	75.4	20.8
1985	3.25	11318	12742	45777	-0.2	76.9	26.4
1986	3.31	10572	11467	55024	0.6	76.1	24.1
1987	3.34	12107	11800	62536	1.5	76.1	22.2
1988	3.35	12451	11606	67228	-1.3	76.7	20.3
1989	3.37	14905	12491	71410	-0.9	77.3	22.9
1990	3.35	15163	15770	73126	-2.5	79.5	21.2
1991	3.38	15768	15325	72909	1.9	79.9	17.4
1992	3.41	17840	15483	76111	6.2	77.9	19.5
1993	3.45	18971	17332	80864	7.1	75.4	21.1
1994	3.49	19827	18469	86577	6.0	76.3	22.3
1995	3.54	20924	21263	91739	4.4	77.1	24.1
1996	3.57	20876	21400	95816		76.8	21.5

Source: Statistics New Zealand (various editions), IMF (various editions).

These, however, are problems not of failure but of success compared to the past. Trade liberalisation has also encouraged improvements in non-price competitiveness. Income generated in the export sector, along with low interest rates, has allowed firms and households to increase spending. Rising profitability and record levels of business confidence led to expansion in investment and employment. Although output growth has declined as a result of tighter monetary conditions from the high rates of 6 to 7 per cent in 1993-1994, to 4.4 per cent in 1995, New Zealand's growth has been above the OECD average. (OECD, 1996). Figure 3.5 highlights the point that New Zealand's recent real GDP growth performance has been some what ahead of Australia and well ahead that of the United States. This information takes into account the adjustment for recent business cycle movements.

The trade policy adjustments that formed part of the policy package after 1984 have altered demand and trade incentives significantly.

Figure 3.5 New Zealand's Real GDP from 1991-1995



Prior to 1979 New Zealand followed a strong import substitution policy. Current trade policy is much less biased against exports and efficient resource allocation⁴. The United States and Asia are the fastest growing import markets in New Zealand along with the EU and Latin America since the reforms of 1984. New Zealand had lost market share earlier as a result of EU trade barriers and Latin America had previously been a small market for New Zealand. New Zealand trade developments in the Middle East represent a lesser return now because market growth slowed in the region after the 1986 collapse in oil prices and market instability. Canada and the Pacific Island Nations (PIN) continue to grow slowly. New Zealand exports continue to diversify under the more liberal policy environment in terms of commodity and market coverage (Silverstone, Bollard and Lattimore, 1996).

⁴ Resource allocation can be expected to take some years to occur so that trade data available through to 1996, is only of limited usefulness in assessing the full impacts of the changes that have occurred.

The monetary policy framework initiated in 1989, through the implementation of the Reserve Bank Act which makes price stability the single aim of monetary policy, has to date proved relatively effective at controlling inflation (OECD, 1996). Monetary policy framework has successfully managed to break the chronic inflationary cycle within the economy (refer to Figure 5.1 E, p. 62). From December 1991 to September 1994, the annual rate of inflation remained within the Reserve Bank's target band of 0 to 2 per cent. Conversely in mid-1995 strong demand pressures caused the Reserve Bank's measure of 'underlying inflation' to exceed 2 per cent by a small amount (Silverstone, Bollard and Lattimore, 1996). In turn the Reserve Bank revised its inflationary band to 0 to 3 per cent in late 1996, after the election as part of the coalition agreement (OECD, 1998).

Fiscal control in recent years has aided inflationary pressures throughout the economic upturn. The scale of turnaround in government finances is verified by the fact that the net public debt-to-GDP ratio has fallen from 50 per cent in the early 1990s, to almost 35 per cent in 1996. (New Zealand Official Yearbook, 1997). According to the OECD Survey 1998, many OECD countries have experienced the opposite change. The external debt-to-GDP ratio has however risen to just over 7 per cent, generating continued increases in New Zealand's net foreign liabilities, which at over 80 per cent of GDP, is one of the highest amid the OECD countries (OECD, 1998).

According to the OECD Economic Survey of New Zealand, 1996, New Zealand is planned to remain one of the fastest growing economies in the OECD area. The tax cuts of 1996, 1997 and 1998 have aided in this process. Private consumption is anticipated to increasingly substitute investment as the leading impelling force to economic expansion in the period ahead. International trade policy is now much less biased against exports and has resulted in significant export growth, which is predicted to strengthen but certainly not to the extent of the high rates recorded in the first half of the 1990's (Silverstone, Bollard and Lattimore, 1996). This is because of the adverse effects of exchange rate appreciation on price competitiveness. The current account deficit is expected to remain stable; inflation is expected to pick up as the expansion in activity gathers pace.

Overall labour market reforms, in particular the Employment Contracts Act 1991, appear to have had positive implications for the economy. Most importantly there has been a sustained decrease in unemployment to well below the OECD average. By 1995, New Zealand's unemployment rate had fallen considerably from a peak of over 11 per cent in 1992 to around 6 per cent (Simkin, 1997). However, at the time of writing unemployment has crept up close to 8 per cent. Also, wage relativities now show better responsiveness to specific skill scarcities than was formerly the case under the more inflexible system of industry-wide occupational awards (OECD, 1996).

The reforms have brought about a notable decrease in the range of the government's activities and of its size in connection to the remainder of the economy. According to the OECD (1996), limited empirical evidence suggests that the initiatives have raised incentives and improved efficiency. Measures such as the Local Government Act, which improve the answerability and transparency of local government monetary affairs, would strengthen the underlying progress taking place. In the health sector, hospitals are facing the ongoing formidable task to restructure services in a way suitable for the current competitive environment and to form the essential costing and information systems to govern demand sufficiently and fairly (OECD, 1996).

The recent favourable economic performance, which represents a marked break from past trends, is to an extent a reflection of the beneficial effects of the radical structural and institutional reforms that have been implemented. However, whether the past decline in the relative economic performance can be *fully* reversed will depend in how the New Zealand economy fairs throughout the Asian economic crisis. Notwithstanding positive recent indicators, the events in Asia could be more protracted than widely assumed and constitute a serious threat. One effect of the reforms has been to expose the traded sector to such external shocks directly and the non-traded sector indirectly. In turn slower positive growth is on the cards for New Zealand. However, business confidence is the highest it has been in years as New Zealanders enjoy low interest rates and a competitive currency. Commodity exporters will find it more difficult to cope as they remain the most vulnerable to further international weakness (National Bank Quarterly Economic Forecast, 1998).

3.5 SUMMARY

The last 150 years have seen the transition of New Zealand's economy from colonial dependency, to economic nationalisation, and finally, to economic internationalisation; from reliance on unprocessed primary exports, to the output from protected domestic manufacturing industries, to the export of processed goods and services. Similarly the state's role has changed in the way it has 'managed' capitalism and its 'crises'. State involvement in economic management was minimal until the 1930s when in response to the Depression, the New Zealand government became a major economic producer, consumer and regulator of economic activities, a role it maintained until the 1980s. Increasing state intervention in economic reproduction and in the internationalisation of investment was the order of the day.

Beginning with the Fourth Labour Government, the need for state intervention in the economy was declared over and the internationalisation of economic production was possible only by the negation of state intervention so that market mechanisms could operate unhindered. The state began to reduce public ownership of the means of production, cut back public employment, and remove a host of state regulations on the economy. In the latest stage of globalisation of production, state intervention is being dismantled. The reforms to date have considerably improved New Zealand's economic prospects and represent a radical break from New Zealand's past policies of heavy regulation and import protection and the accompanying, by OECD standards, relatively large fiscal deficits and high rates of inflation.

Succeeding a period of major restructuring the New Zealand economy has supported a strong recovery since 1991, outperforming most other OECD countries. If measured purely in terms of economic growth the mid-1990s recovery is the strongest for New Zealand since 1973. The sustained economic upturn provides some basis for an encouraging conclusion. The challenge now for policy makers is to manage the transition from a cyclical rebound to sustained economic growth. This issue is currently being tested as economic growth slows under the influence of a shaky international environment as a result of the Asian economic crisis combined with a competitive New Zealand dollar. The next chapter incorporates the various issues as discussed in this chapter with the empirical analysis undertaken in Chapter 4.

Chapter Four

GROWTH MODELS: AN EMPIRICAL INVESTIGATION

4.1 INTRODUCTION

The aim of this chapter is to provide both a theoretical and empirical setting for the econometric analysis of New Zealand's economic growth. As mentioned in chapter two, testing for economic growth provides a base for further assessment of the macroeconomic impacts of economic growth. This study focuses on New Zealand's economic growth over the period 1960 to 1996.

The fact that the New Zealand government has promoted a more liberalised trade, industrial and credit environment is beneficial to the economy. However, the important question is whether or not the generally proposed determinants of economic growth, such as human capital, investment, trade, inflation, openness to trade, government education expenditure and government consumption expenditure have had a direct and significant impact on New Zealand's growth over recent years. The importance of economic growth and principally the sequence of New Zealand's growth, is the main reason for choosing New Zealand as the case study in this analysis. Such an empirical examination should enhance the knowledge and future development of economic growth and its determinants for New Zealand.

A country-specific study has been chosen in this economic growth analysis, as compared with a cross-country study, because it takes into account the country-specific factors which vary substantially among developing countries (Ram, 1987). Additionally, time-series information, compared to cross-sectional information, is more advantageous when variables have altered a good deal over time within countries, as in the case of inflation and investment for New Zealand. It is for these key reasons that a country-specific, time-series framework has been favoured in this study of New Zealand.

Since the analysis involves time-series data from 1960-1996 for New Zealand, it is important to pay particular attention to the possible non-stationarity of the data, and hence, the need to avoid spurious correlations in the regression analysis. In this study the finite Autoregressive Distributed Lag (ARDL) method of cointegration is used to analyse New Zealand's growth, and in turn identify any dynamic short and long run relationships between economic growth and the proposed determinants. For a more in-depth discussion of these issues see Pesaran and Shin (1995).

This chapter is structured as follows: in section 4.2 the models estimated in this study are outlined. Section 4.3 focuses on the neoclassical model's specification as estimated in the next chapter. This is accompanied by a brief discussion of the neoclassical model extended to include human capital in section 4.3.1. The endogenous growth model's specification is introduced in section 4.4 and this is in turn extended to include human capital in section 4.4.1. The endogenous growth model extended to include tourism is introduced in section 4.4.2, followed by inflation in section 4.4.3 and then finally openness to trade in section 4.4.4. Section 4.5 looks at the estimation procedures used in this methodology. Section 4.6 presents the data and key implications. The final section, 4.7, summarises the conclusions for this chapter.

4.2 ECONOMIC GROWTH: THE THEORETICAL FRAMEWORK

At the conceptual level, this work follows closely the studies by Khan and Reinhart (1990), Ram (1996), De Gregorio (1993), Brookes, Maynes and Davidson (1996), and Edwards (1997). However, the current analysis for New Zealand differs in several aspects. One, the production function employed includes further variables, such as tourism, and government education expenditure, to overcome any problems of misspecification. Two, this research into the determinants of economic growth for New Zealand, from neoclassical to endogenous growth theory analysis, is maybe the first of its kind. Three, this is a country-specific study focusing on thirty-six years of time series data. Four, the coefficients are estimated to indicate the short run and long run dynamic relationships between the proposed variables on growth. Five, the methodology involved in estimating the models, using time series data, applies recent econometric approaches of co-integration to avoid spurious regression results.

An issue that was given some early attention in this literature was the measure of the dependent variable. In this study models will be estimated using the growth in annual total income or growth in total Gross Domestic Product (GDP), as the dependent variable in the regression analysis. Gross Domestic Product portrays the total market value of goods and services produced in New Zealand after deducting the cost of goods and services utilised in the process of production, but before deducting allowances for the consumption of fixed capital.

Equations specified will fall under seven differing frameworks: the neoclassical growth model, the neoclassical model extended to include human capital, the endogenous growth model, the endogenous model extended to include human capital and the endogenous model extended to include tourism, inflation and openness to trade.

4.3 NEOCLASSICAL MODEL

The first two equations in this analysis are based on the more general specification of the neoclassical framework of the Solow model (1956). However, various other determinants of growth are introduced in addition to capital, labour and productivity growth. For example, proponents of “export-led growth”, such as Ram (1985, 1987), argue that the growth of exports belongs in the specification on the grounds that in a number of developing countries the growth of exports has led to the development of infrastructure, transport and communications and other infrastructure components. This in turn facilitates the production of other goods and services. Work on development theory strongly emphasises the role of education, and thus, human capital has been included in the specification (Barro and Lee, 1993). Total investment has also been split into its respective marginal productivities of private and public sector investment (Khan and Reinhart, 1990) and added to the specification in order to see the independent effects of private and public sector investment on growth. In summary, while there have been a number of variations to the original Solow equation proposed in the literature, the essential nature of the model remains the same.

Following Reinhart and Khan (1990), the Solow framework (1956) using an aggregate production function can be written as a function relating output to factor inputs and a variable usually referred to as total factor productivity:

$$Y = Af(K, L, Z)$$

Where Y is the level of output, K is the stock of physical capital, L is the labour force, and Z is a vector including other factors affecting growth. The variable A measures factor productivity.

For the purposes of this study the above equation has been rewritten in growth terms and expressed using the different variables as proposed. The dot above each variable indicates estimation using annual growth rates. Regression equation (1a) estimates how the annual growth rate in the effective labour force ($GELF$), the total investment/income, or total GDP (TIY) ratio and the annual growth rate of exports (GX) affect economic growth⁵:

$$\dot{GY} = \vartheta_0 + \vartheta_1 \dot{GELF} + \vartheta_2 \dot{TIY} + \vartheta_3 \dot{GX} + \mu_t \quad (1a)$$

Interpretation of the parameters is also important. The constant term, ϑ_0 , in equation (1a) is assumed to capture the growth in productivity. The coefficient ϑ_1 represents the elasticity of output with respect to labour; ϑ_2 is the marginal productivity of capital or investment; ϑ_3 is the elasticity of output with respect to exports. μ_t represents the error term.

The above specification is re-estimated to include the growth of imports (GM):

$$\dot{GY} = \zeta_0 + \zeta_1 \dot{GELF} + \zeta_2 \dot{TIY} + \zeta_3 \dot{GM} + \mu_{2t} \quad (1b)$$

Equations (1a) and (1b) are the standard specifications of the neoclassical economic growth equation, which can be set up in several different ways. The production function

⁵ Refer to Appendix A for a full description of the variables in the estimated models.

Errata Corrige

Page 49, paragraph 1:

“Multicollinearity arises when linear relationships between economic variables do not hold”.

This sentence should be replaced with the following:

“Multicollinearity among economic variables arises when they move together in a systematic way, i.e. they are highly correlated among themselves. For such data it is often impossible to isolate the economic relationships, or parameters, of interest as the data do not convey enough information for doing so.”

can be estimated with either exports or imports. Note that these variables do not enter the equation simultaneously to avoid the problem of multicollinearity. Multicollinearity arises when linear relationships between economic variables do not hold. Large standard errors may occur and in turn information provided by the sample data becomes relatively imprecise.

The next equation introduces the dummy variables for the oil shocks of the 1970s (*DVOIL*) and New Zealand's 1984 reforms (*DV*) to the specification. The dummy variable for the oil shocks has a value of one for the years 1973/74 and 1979/80. This takes into consideration the impact of the changes that occurred within the economy for both these years, all the other values for the period 1960-1996 have values of zero. The dummy variable to take into consideration the economic reforms of 1984 has pre-reform period values of zero (1960-1983), and the post-reform period has values of one (1984-1996).

$$\dot{G}Y = \tau_0 + \tau_1 \dot{GELF} + \tau_2 TIY + \tau_3 \dot{G}X + \tau_4 DVOIL + \tau_5 DV + \mu_{3t} \quad (2a)$$

An important contribution in the analysis of the neoclassical model is Reinhart and Khan's (1990) separation of total investment into public sector investment (*PUIY*) and private sector investment (*PRIY*) as a ratio of total annual income:

$$\dot{G}Y = \vartheta_0 + \vartheta_1 \dot{GELF} + \vartheta_2 PRIY + \vartheta_3 PUIY + \vartheta_4 \dot{G}X + \mu_{4t} \quad (3a)$$

$$\dot{G}Y = \xi_0 + \xi_1 \dot{GELF} + \xi_2 PRIY + \xi_3 PUIY + \xi_4 \dot{G}X + \xi_5 DVOIL + \xi_6 DV + \mu_{5t} \quad (3b)$$

4.3.1 NEOCLASSICAL MODEL EXTENDED TO INCLUDE HUMAN CAPITAL

The human capital component in this analysis closely follows the work by Maynes, Brookes and Davidson (1996). Each specification is split up into secondary (*SECER*), university (*UNIER*), trade/technical (*TRADEER*), and college/polytechnic (*BASVOCER*) attainments. The variable, *GELF*, to measure the growth rate in New

Zealand's effective labour force has been removed from the human capital specifications because of problems associated with mis-specification. The models estimated are as follows:

$$\dot{GY} = \kappa_0 + \kappa_1 SECER + \kappa_2 TIY + \kappa_3 \dot{GX} + \mu_{6t} \quad (4a)$$

$$\dot{GY} = \varphi_0 + \varphi_1 BASVOCER + \varphi_2 TIY + \varphi_3 \dot{GX} + \mu_{7t} \quad (4b)$$

$$\dot{GY} = \partial_0 + \partial_1 UNIER + \partial_2 TIY + \partial_3 \dot{GX} + \mu_{8t} \quad (4c)$$

$$\dot{GY} = \varpi_0 + \varpi_1 TRADEER + \varpi_2 TIY + \varpi_3 \dot{GX} + \mu_{9t} \quad (4d)$$

4.4 ENDOGENOUS GROWTH MODEL

The neoclassical theory of economic growth has been mostly concerned with capital accumulation, where economic growth is seen as a moving balance between diminishing returns to the growing capital resource and the growth of knowledge in technology. Innovations are the result of events outside the economy. In endogenous growth theory however, innovations are a result of economic events. In this way government policies and other forces are central to endogenous growth analysis. The standard endogenous framework is applied in this study as derived from its neoclassical counterpart. The model is extended to incorporate government policies, accumulation of human capital and the diffusion of technology. Various additional determinants of growth are introduced, such as tourism, inflation, openness to trade, government consumption expenditure and government education expenditure, to analyse their impacts on New Zealand's economic growth.

Proponents of the effects of government and economic growth, such as Maynes, Brooks and Davidson (1996), argue that government consumption and government education expenditure should be included in the specification. Government consumption and government education expenditure include both government investment and transfers. These are among the more obvious government activities that may enhance growth and are therefore included in this study. De Gregorio (1993) emphasises the role of inflation to economic growth analysis. His paper takes advantage of developments in the theory

of endogenous growth to “extend mechanisms to environments where growth can be sustained without requiring exogenous technological progress” (De Gregorio, 1993, p.272). He argues that inflation directly affects the “choice of real balances which ultimately affects the rate of growth through its impact on the rate of capital accumulation and the productivity of capital” (De Gregorio, 1993, p.272). Edwards (1997) finds persuasive evidence for the effect of openness on economic growth. He suggests that more open countries experience faster productivity growth and in turn this variable is included in the specification. Human capital and investment variables, as introduced in the neoclassical framework, are again included in the specification (Maynes, Brooks and Davidson, 1996; Khan and Reinhart, 1990).

Regression equation (5a) estimates how the annual growth rate in the labour force (*GELF*), the investment/income ratio (*TIY*), the annual growth rate of exports (*GX*) and the annual growth in government consumption expenditure (*GCGC*) affect economic growth:

$$\dot{G}Y = \forall_0 + \forall_1 \dot{GELF} + \forall_2 \dot{TIY} + \forall_3 \dot{GX} + \forall_4 \dot{GCGC} + \mu_{10t} \quad (5a)$$

$$\dot{G}Y = \chi_0 + \chi_1 \dot{GELF} + \chi_2 \dot{PRIY} + \chi_3 \dot{PUIY} + \chi_4 \dot{GX} + \chi_5 \dot{GCGC} + \mu_{11t} \quad (5b)$$

Equations (5a) and (5b) are the standard specifications of the endogenous economic growth equation, which can be set up in several different ways. From equation (5b), investment is disaggregated into the private investment to income ratio (*PRIY*) and the public investment to income ratio (*PUIY*).

Another alternative for trade growth is to introduce Edward’s (1997) Collected Trade Taxes Ratio (*CTRatio*) to measure openness to trade. This variable is measured as the ratio of total revenue on taxes on international trade (imports plus exports) to total trade. The growth rate of exports variable has been excluded from this particular specification to avoid the problem of multicollinearity.

$$\dot{G}Y = Z_0 + Z_1 \dot{GELF} + Z_2 \dot{TIY} + Z_3 \dot{CTRatio} + Z_4 \dot{GCGC} + \mu_{12t} \quad (6a)$$

Economic Openness, as used by Maynes, Brooks and Davidson (1996) is another variable used to measure trade growth. This variable, identified as *OPEN* for short, is included in a separate specification, without the growth rate of exports, to avoid the problem of multicollinearity, as stated above. It is calculated as exports plus imports divided by GDP:

$$\dot{G}Y = \Pi_0 + \Pi_1 \dot{GELF} + \Pi_2 \dot{TIY} + \Pi_3 \dot{OPEN} + \Pi_4 \dot{GCGC} + \mu_{13t} \quad (6b)$$

Introducing government education (*GE*) expenditure to the specification:

$$\dot{G}Y = \Delta_0 + \Delta_1 \dot{GELF} + \Delta_2 \dot{TIY} + \Delta_3 \dot{GX} + \Delta_4 \dot{GCGC} + \Delta_5 \dot{GE} + \mu_{14t} \quad (7a)$$

$$\dot{G}Y = \Phi_0 + \Phi_1 \dot{GELF} + \Phi_2 \dot{PRIY} + \Phi_3 \dot{PUIY} + \Phi_4 \dot{GX} + \Phi_5 \dot{GCGC} + \Phi_6 \dot{GE} + \mu_{15t} \quad (7b)$$

4.4.1 ENDOGENOUS GROWTH MODEL EXTENDED TO INCLUDE HUMAN CAPITAL

The endogenous growth model analysed in relation to the human capital component in this study follows the work by Maynes, Brookes and Davidson (1996), as introduced in the neoclassical model. Each specification has been modified to include government consumption expenditure. Each specification is split up into secondary (*SECER*), university (*UNIER*), trade/technical (*TRADEER*), and college/polytechnic (*BASVOCER*) attainments. The models estimated are as follows:

$$\dot{G}Y = \eta_0 + \eta_1 \dot{GELF} + \eta_2 \dot{TIY} + \eta_3 \dot{GX} + \eta_4 \dot{GCGC} + \eta_5 \dot{SECER} + \mu_{18t} \quad (8a)$$

$$\dot{G}Y = \ell_0 + \ell_1 \dot{GELF} + \ell_2 \dot{TIY} + \ell_3 \dot{GX} + \ell_4 \dot{GCGC} + \ell_5 \dot{BASVOCER} + \mu_{18t} \quad (8b)$$

$$\dot{G}Y = \delta_0 + \delta_1 \dot{GELF} + \delta_2 \dot{TIY} + \delta_3 \dot{GX} + \delta_4 \dot{GCGC} + \delta_5 \dot{UNIER} + \mu_{18t} \quad (8c)$$

$$\dot{G}Y = \varepsilon_0 + \varepsilon_1 \dot{GELF} + \varepsilon_2 \dot{TIY} + \varepsilon_3 \dot{GX} + \varepsilon_4 \dot{GCGC} + \varepsilon_5 \dot{TRADEER} + \mu_{18t} \quad (8d)$$

4.4.2 ENDOGENOUS GROWTH MODEL EXTENDED TO INCLUDE TOURISM

The effects of government, investment, trade and openness to trade on economic growth have been widely examined. However, this analysis intends to introduce the growth rate of total tourism receipts, identified as GTR , to the specifications for New Zealand's economic growth. The reason for doing this is threefold. According to recent research, undertaken by the World Travel and Tourism Council (WTTC), tourism is the world's largest industry. In New Zealand alone one in nine people work within the tourism industry, and it is presently New Zealand's top foreign exchange earner (World Travel and Tourism Council, 1996, as cited in the New Zealand Official Yearbook 1998, p.296).

Adding tourism to the above specification gives:

$$\dot{G}Y = \beta_0 + \beta_1 \dot{GELF} + \beta_2 \dot{TIY} + \beta_3 \dot{GX} + \beta_4 \dot{GCGC} + \beta_5 \dot{GE} + \beta_6 \dot{GTR} + \mu_{16t} \quad (9a)$$

$$\dot{G}Y = \lambda_0 + \lambda_1 \dot{GELF} + \lambda_2 \dot{PRIY} + \lambda_3 \dot{PUIY} + \lambda_4 \dot{GX} + \lambda_5 \dot{GCGC} + \lambda_6 \dot{GE} + \lambda_7 \dot{GTR} + \mu_{17t} \quad (9b)$$

4.4.3 ENDOGENOUS GROWTH MODEL EXTENDED TO INCLUDE INFLATION

An important contribution to this analysis is De Gregorio's (1993) measure of inflation using the growth rate of the Consumer Price Index (GI):

$$\dot{G}Y = \sigma_0 + \sigma_1 \dot{GELF} + \sigma_2 \dot{TIY} + \sigma_3 \dot{GX} + \sigma_4 \dot{GCGC} + \sigma_5 \dot{GE} + \sigma_6 \dot{GTR} + \sigma_7 \dot{GI} + \mu_{22t} \quad (10a)$$

$$\dot{G}Y = \theta_0 + \theta_1 \dot{GELF} + \theta_2 \dot{PRIY} + \theta_3 \dot{PUIY} + \theta_4 \dot{GX} + \theta_5 \dot{GCGC} + \theta_6 \dot{GE} + \theta_7 \dot{GTR} + \theta_8 \dot{GI} + \mu_{23t} \quad (10b)$$

Various recently developed tests and estimation procedures on time-series analysis will be incorporated in this study. It is imperative to discuss the estimation procedures used in this analysis, because econometric estimations of economic growth models can be criticised for the methodology applied. Contemporary econometric literature stresses

the outcomes of spurious regression, which arises from lack of accurate testing for time series analysis. These issues are discussed in the next section.

4.5 ESTIMATION PROCEDURE

The econometric method of cointegration has received a lot of attention in academic literature since the concept was formally introduced by Granger (1981). It concerns the derivation and estimation of long-run equilibrium relationships between sets of variables. In this analysis the finite Autoregressive Distributed Lag (ARDL) method of cointegration is utilised, as recently developed by Pesaran and Shin (1995). Finite ARDL models show how a change in an independent variable effects the dependent variable that is “distributed” over a measurable number of future periods. There are several important advantages in using the ARDL method which necessitate mentioning here. Firstly, the ARDL method avoids the requirements of pre-testing the order of integration, which is necessary in other cointegration methodologies and in turn avoids spurious regression results by using the most recent econometric techniques. In other words, the ARDL technique does not require knowledge of whether the variables under consideration are integrated of order one (I(1)) or integrated of order zero (I(0)). Additionally, this method avoids the problems of serial correlation that arise in the use of residual-based cointegration methods by an appropriate augmentation.

The ARDL modelling procedure is employed to test for short and long-run relationships between economic growth and the proposed determinants. It is important when performing regression analysis to distinguish between “short run” (those holding over a relatively short period) and “long run” relationships between variables. The former relates to links that do not persist. Shocks, such as the oil price hikes in 1973/74 and 1979/80, temporarily disturb the relationship. Even if shocks are constantly occurring over time, so that the economic system is never in equilibrium or where there is no inherent need to change, the concept of long run equilibrium may be useful.

The ARDL procedure comprises two stages. Computing the F-statistic tests the existence of the long run relationship between the variables proposed. The F-statistic is used for testing the significance of the lagged levels of the variables in the error

correction form of the underlying ARDL model. In this study the maximum number of lags is two to avoid autocorrelation problems in the annual data. The hypothesis used for testing the F test is the null of “non-existence” of the long run relationship i.e. $H_0: \delta_1 = \delta_2 = \delta_3 = 0$. However, the (asymptotic) distribution of this F-statistic is non-standard, irrespective of whether the regressors are I(0) or I(1). Pesaran and Pesaran (1997) have tabulated the appropriate critical values. For each equation, the table provides a band covering all the possible classifications of the variables into I(0) and I(1). If the computed F-statistic falls outside this band, a conclusive decision can be made without needing to know whether the underlying variables are I(0) or I(1). If the computed F-statistic is higher (lower) than the upper bound (lower bound) of the critical value, the null hypothesis would be rejected (accepted). On the other hand, if the computed statistic is within the band, information on the order of integration is necessary before making decisions regarding the long run relationship. Unit root tests have additionally been carried out on the variables employed in this study (refer to Appendix B, Table B.1). The second stage of the analysis is to estimate the coefficients of the long run relationships and make inferences about their values.

4.6 DATA AND KEY IMPLICATIONS

It is important to discuss the data employed in this study. Annual data for the period 1960 to 1996 is utilised here. All variables are converted to New Zealand dollars at 1993 constant prices, using price and exchange rate indices obtained from the New Zealand Official Yearbook (Statistics New Zealand, 1998) and International Financial Statistical Yearbooks (IMF, various editions), respectively. Due to the lack of continuity of data sets over time and because of issues associated with data accuracy, various sources and editions have been used to create a complete data set for New Zealand for the period 1960-1996.

Dummy variables are used to take into account the advent of the oil shocks and the 1984 government reforms. These variables are identified in the specifications as DVOIL and DV respectively.

Errata Corringe

Page 56, paragraph 2:

“Government Consumption Expenditure represents the total current expenditure on consumer durables made by government on behalf of households.”

This sentence should be replaced with the following:

“Government Consumption Expenditure represents:

- a) *Resident households*- All outlays on consumer goods and services, including expenditure on consumer durables: included are payments made by government on behalf of households, and the imputed rent of owner-occupied dwellings.
- b) *Producers of general (central and local) government services and private non-profit services to households* – Total current expenditure by these producers less the value of any sales or own account capital formation.” (New Zealand Official Yearbook 1997, p.628)

Data for New Zealand's Labour Force is acquired from the New Zealand Official Yearbook (Statistics New Zealand, various editions). In general terms the "Labour Force" includes people aged 15 to 65 years who are either employed or unemployed.

New Zealand's data for final Government Consumption (GCGC) and Government Education (GE) expenditure is also obtained from New Zealand Official Yearbooks (Statistics New Zealand, various editions). Government Consumption expenditure represents the total current expenditure on consumer durables made by government on behalf of households. Government Education expenditure represents the total public current expenditure for educational institutions at all levels.

Gross Fixed Capital Formation or Total Investment, is recorded annually in New Zealand Official Yearbooks (Statistics New Zealand, various editions) and represents the outlays of producers on durable real assets, such as buildings, motor vehicles, plant and machinery, roading and improvements to land. In measuring the outlays, sales of similar goods are deducted. Land is excluded from gross fixed capital formation. The term 'gross' indicates that consumption of fixed capital has not been deducted from the value of the outlays. Gross Fixed Capital Formation is made up of two components: Gross Public Fixed Capital Formation and Gross Private Fixed Capital Formation. The variables are expressed as a ratio of investment to income or output (Total, Public, and Private Sector Investment to Gross Domestic Product, respectively).

The human capital component of this study is categorised into four segments: secondary (SECER), university (UNIER), trade/technical (TRADEER) and college/polytechnic (BASVOCER) educational attainments. Student educational attainment was used to measure the impact of specific educational levels of human capital on New Zealand's economic growth. Data was obtained from New Zealand Official Yearbooks (Statistics New Zealand, various editions).

International trade taxes as a ratio of total trade is used, identified as CTRatio, to measure the trade growth relationship, as well as the growth in exports. However, only one variable is used in the equation to avoid the problem of multicollinearity. For the period 1960-1972 data for the CTRatio variable, from the International Financial Statistical Yearbook, is unavailable, hence data on customs duty is used as a proxy

during this period as collected from the New Zealand Official Yearbook (Statistics New Zealand, various editions). The Government Financial Statistics Yearbook (IMF, various editions) is employed as the source of CTRatio data for the period 1973-1996.

A further alternative specification to measure trade growth is economic openness. This variable, called OPEN, is calculated as Exports plus Imports divided by GDP.

Tourism receipts (GTR) data depicts the total money received from international travellers in New Zealand. The United Nations Statistical Yearbook (United Nations, various editions) is utilised.

Export (GX), import (GM) and exchange rate data has been obtained from the World Tables (World Bank, various editions). Exports of merchandise are valued free on board (FOB), while imports are valued cost, including insurance and freight (CIF).

Inflation (GI) was measured using the growth rate in the Consumer Price Index (CPI). Data was obtained from the International Financial Statistical Yearbook (IMF, various editions).

A key limitation in this analysis is in selecting GDP as the dependent variable. Firstly GDP measures only monetary exchanges. Therefore, it leaves out of consideration the large amount of work done within families and communities. It equates goods and bads, for example it considers that valuable services such as caring for children or the elderly as having the same significance as the manufacture of weapons or cigarettes. GDP figures also count both addictions and cures. For example addictive drinking is counted twice. Once when it is consumed and again when sums are spent for cures. Environmental degradation, resource depletion is not accounted for and finally GDP places no value on leisure or human freedom. Nonetheless, the use of the growth rate in GDP as the dependent variable in this analysis is the standard specification in most economic growth models and in turn allows comparison between similar studies.

A further key limitation in this study is that insufficient time series data on New Zealand's Research and Development (R&D) expenditure was obtained. Data for only ten years was available for New Zealand's R&D, therefore, this variable has not been included in this empirical analysis.

The complete set of regressions estimated in this analysis, in particular the specifications including the variables OPEN, CTRatio and the growth rate in imports, are not reported as the results with alternative variables give similar results. Overall, however, the inclusion of these variables continues to support the idea that the more open economies experience a faster rate of productivity growth. The empirical results are reported in chapter 5.

4.7 SUMMARY AND CONCLUSION

This chapter presents the theoretical model, data and some implications of the economic growth models that will be analysed for New Zealand and provides the foundation for estimating the proposed equations in Chapter 5.

Since the analysis involves time-series data, an appropriate estimation procedure is important to employ in order to overcome the problems of spurious regression. The estimation of the various economic growth models proposed are based on the finite ARDL cointegration technique. The time series data for the period 1960-1996 is utilised employing neoclassical and endogenous growth theories. Various determinants of growth are thus included in this study to analyse the effects of each specific variable on New Zealand's economic growth.

The neoclassical equations are based on the more general specification of the neoclassical framework of the Solow model (1956). The central determinants employed include labour, investment and exports. Additional determinants of growth are introduced in the endogenous growth model to incorporate government policies, and the accumulation of human capital. The shortcoming of the lack of research and development data for New Zealand excludes the important aspect of technological diffusion as explained in the endogenous growth theory. It is also important to note that this study uses categorisation of educational attainments to measure the contribution of education (human capital) to New Zealand's economic growth. Empirical results for each of the regression equations discussed here will be reported in the following chapter.

Chapter Five

ANALYSIS OF NEW ZEALAND'S ECONOMIC GROWTH: EMPIRICAL RESULTS

5.1 INTRODUCTION

This chapter presents the empirical results of economic growth for this analysis on New Zealand for the period 1960-1996. In the neoclassical model for economic growth, the central determinants employed are labour, investment and exports. The marginal factor productivity for each variable is also analysed. The model further extends to include an import variable, excluding exports to avoid the problem of multicollinearity. In addition, the effective labour force is analysed in terms of the various educational categories. Thus, the effective labour force determines the contribution of each educational attainment to New Zealand's economic growth. Dummy variables are used to take into consideration the oil shocks and the government reforms of 1984. In the next stage of this analysis, endogenous growth theory is employed to try to further explain New Zealand's economic growth. Additional determinants are utilised to examine New Zealand's growth and these include inflation, tourism, government consumption and government education expenditure. Models are also re-estimated to test for human capital in the endogenous model.

As stated in Chapter four, neoclassical and endogenous growth theories have been applied to measure the determinants of New Zealand's economic growth. The models estimated utilise the Autoregressive Distributed Lag (ARDL) approach to cointegration for time series data. Based on this methodology, the results reported are not spurious and the model diagnostics are not subject to the econometric pathologies, such as serial correlation, functional form and so on, that are typically encountered in time series analysis. In broad terms the results reported for the endogenous growth model have a higher explanatory power than those of the neoclassical growth model.

The structure of this chapter is as follows: section 5.2 presents a graphical representation for each determinant of growth. The results of the ARDL procedure to test for short run and long run relationships in the equations estimated are submitted in section 5.3. The F-test in turn is reported for each variable. Section 5.3.1 provides the results of the neoclassical model. Section 5.3.2. submits the findings of the neoclassical model extended to include human capital. The empirical outcomes of the endogenous model are discussed in section 5.4. Section 5.4.1 investigates the endogenous model augmented to include human capital. The results for the endogenous model enlarged to include tourism receipts are considered in section 5.4.2. Section 5.4.3 examines the endogenous model expanded to include inflation. A conclusion completes this chapter in section 5.5.

5.2 ECONOMIC GROWTH: GRAPHICAL REPRESENTATION OF THE DETERMINANTS OF GROWTH AND THE F-TEST

This section presents a graphical representation of the trends of the proposed determinants for New Zealand's economic growth as shown in Figure 5.1 – A to H. A complete list of variables with descriptions, utilised in this study, is presented in Appendix A, Table A.1.

Figure 5.1 Economic Growth and its Proposed Determinants (1960-1996)

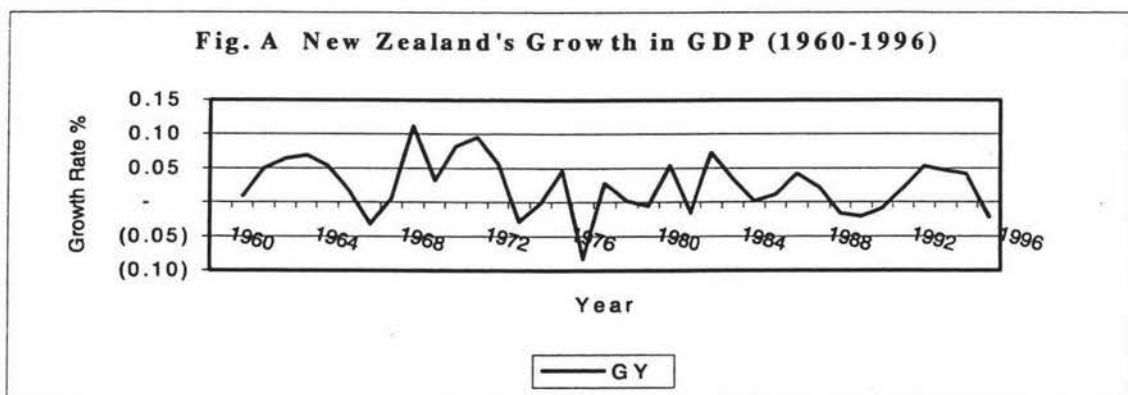


Fig. B New Zealand's Growth in Labour Force (1960-1996)

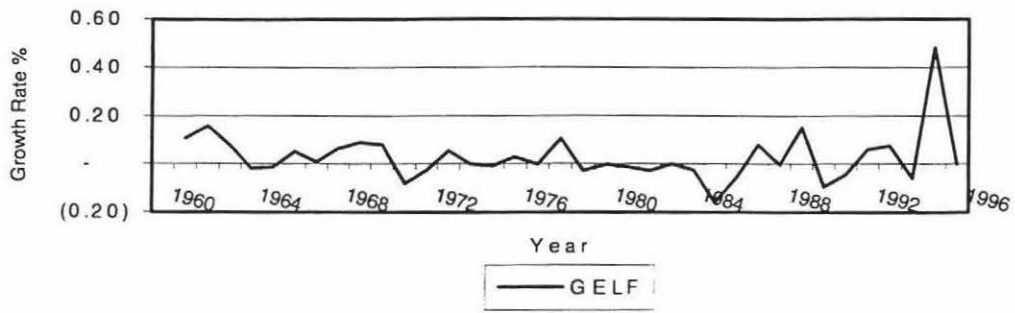


Fig. C New Zealand's Growth in Total Investment, Public & Private Investment to GDP Ratio (1960-1996)

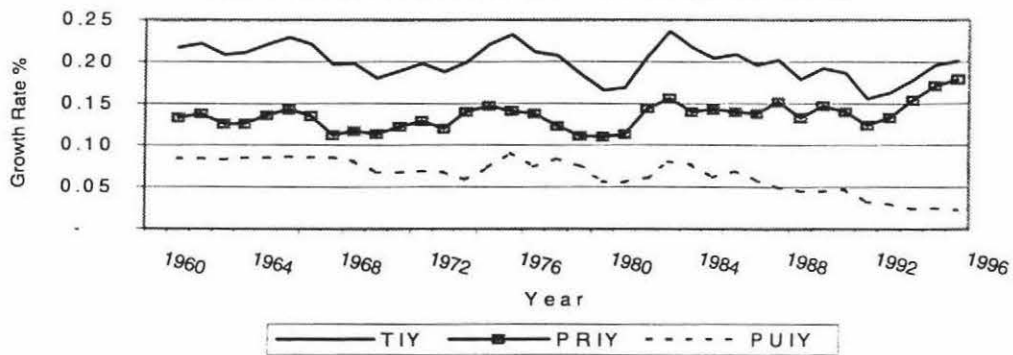


Fig. D New Zealand's Growth in Government Consumption & Government Education Expenditure (1960-1996)

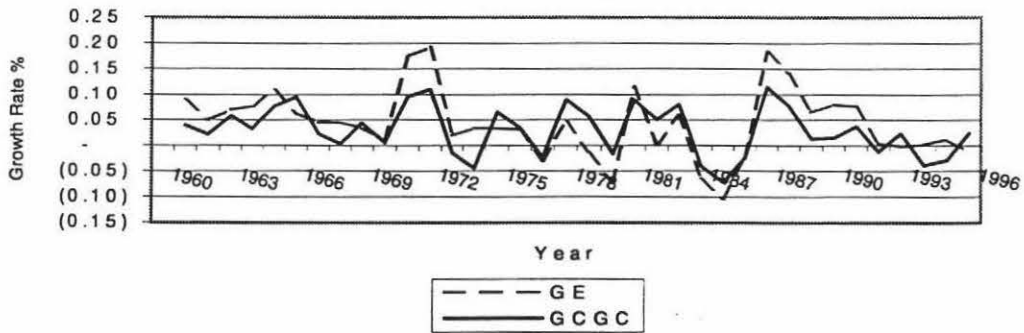
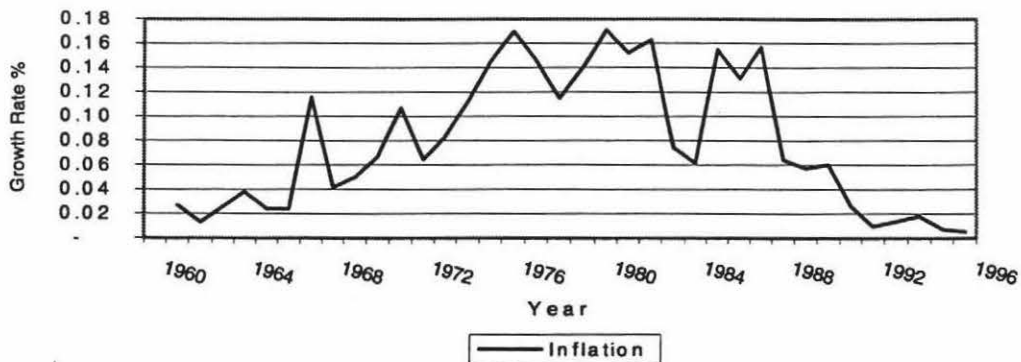
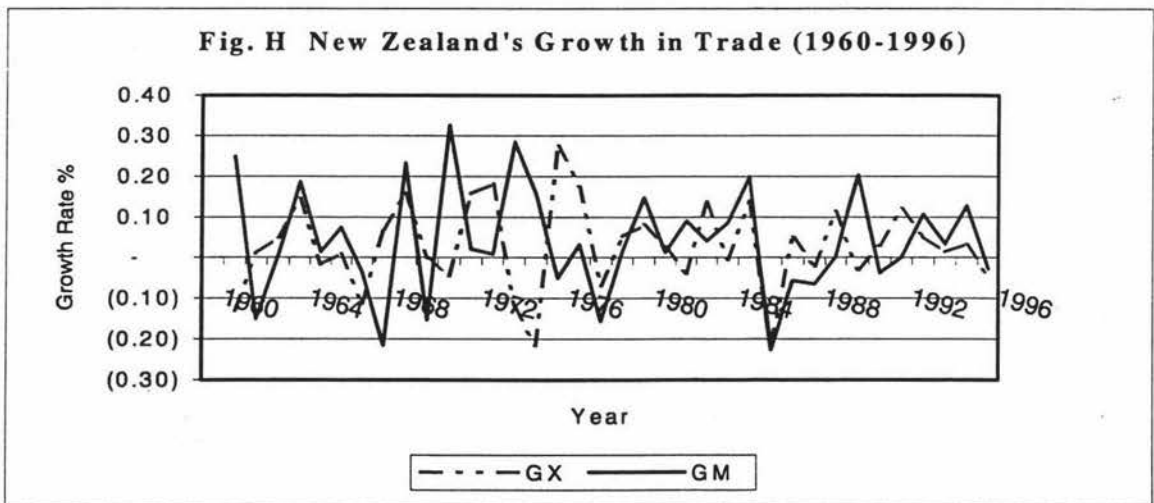
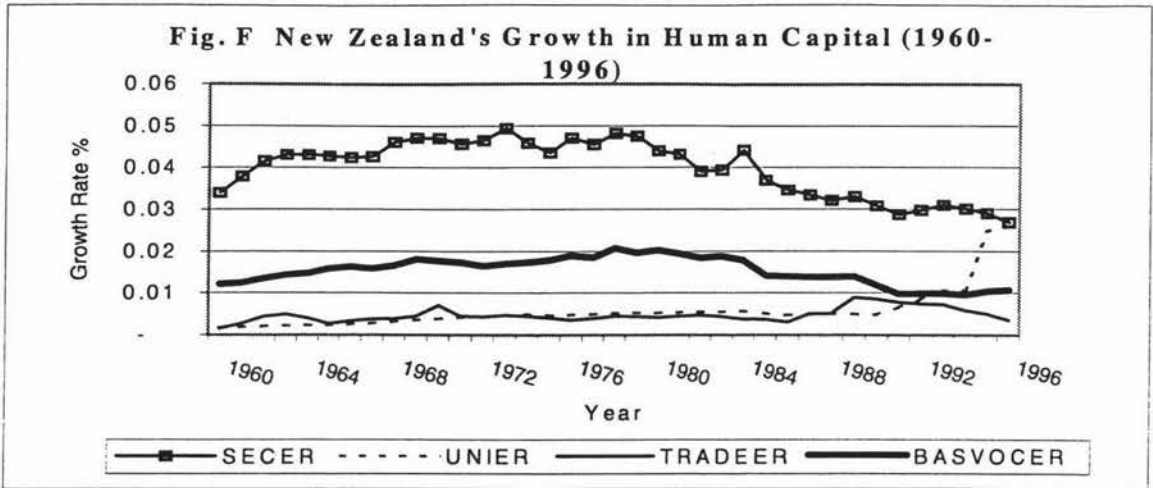


Fig. E New Zealand's Growth in Inflation (1960-1996)





From the figures displayed above the economic system prevailing after World War II did produce economic growth at least until the late 1970s. Gross Domestic Product (GDP) grew at around 4 per cent per annum (see Fig. A), and as the population grew at about 2 per cent per annum, this provided stable growth in income per capita. Figs. B-H looks at the proposed determinants of growth. Equitable levels of profitability and

productive investment, increasing tourism receipts, low inflation, rising employment and the presence of favourable terms of trade, have fuelled New Zealand's economy in latter years. In the 1970s, New Zealand experienced only a modest annual growth rate in GDP. This can be attributed mainly to the oil shocks of the mid to late 1970s. In turn, high inflation, declining profitability, insufficient and poorly allocated levels of productive investment, low terms of trade, recurrent BOP deficits, increasing public and private indebtedness, the standstill of real wage growth, and high unemployment were key factors in New Zealand's economic decline. The period from 1991 onwards, reflects a sustainable economic recovery, although this success has been affected significantly by the Asian Economic Crisis from late 1996. The New Zealand economy faces serious implications with regard to government policies, drops in investment earnings, loss of jobs from business closure, a decline in tourism receipts and unfavourable terms of trade.

5.3 EMPIRICAL RESULTS

The econometric package employed in this study is Microfit Version 4 (Pesaran and Pesaran, 1997). Having computed the F-statistics for testing 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 and whether the ARDL model contains an intercept and/or trend. They give two sets of critical values. One set assuming that all the variables in the ARDL model are integrated of order one ($I(1)$), and another assuming all the variables are integrated of order zero ($I(0)$). For each application, this provides a band covering all the possible classifications of the variables into $I(1)$ and $I(0)$, or even fractionally integrated ones. If the computed F-statistic falls outside this band, a conclusive decision can be made without needing to know whether the underlying variables are $I(0)$ or $I(1)$. If the computed F-statistic is higher (lower) than the upper bound (lower bound) of the critical value, the null hypothesis would be rejected (accepted). On the other hand, if the computed statistic is within the band, information on the order of integration is necessary before making decisions regarding the long-run relationship. Unit root tests have additionally been carried out on the variables (refer Appendix B, Table B.1). The

second stage of this analysis is to estimate the coefficients of the short and long run relations and make inferences about their values.

From the results reported in Table 5.1, the majority of the equations estimated fall outside the critical value band, and therefore a conclusive decision can be made without needing to know whether the underlying variables are I(0) or I(1). The test to include all the proposed variables (equation (9a)) passes at the 95 per cent level of significance. All the proposed variables have critical values that exceed the upper bound of the critical value band. Therefore, the null of no long run relationship between the proposed variables can be rejected, irrespective of the order of their integration for each equation tested in this study. Now that the long run relationship between the variables employed has been established, the second stage of the analysis is to estimate the coefficients of the short and long run relationships and provide explanations about their values using the ARDL cointegration technique.

The table below presents the results for the computed F-statistics.

Table 5.1 ARDL Procedure: The F-Test

Equation	k	Critical Value Band Intercept and No Trend ^a		F-statistic	Pass/Fail
		I(0)	I(1)		
Equation 1a	5	3.52	4.78	7.92	Pass
Equation 2a	4	3.82	5.12	11.00	Pass
Equation 3a	4	3.82	5.62	15.17	Pass
Equation 3b	4	3.82	5.12	12.16	Pass
Equation 3c	4	3.82	5.12	12.11	Pass
Equation 3d	4	3.82	5.12	15.40	Pass
Equation 4a	5	3.52	4.78	10.56	Pass
Equation 5a	6	3.27	4.54	6.97	Pass
Equation 6a	5	3.82	5.12	10.48	Pass
Equation 6b	5	3.52	4.78	11.40	Pass
Equation 6c	5	3.82	5.12	9.15	Pass
Equation 6d	5	3.82	5.12	10.33	Pass
Equation 7a	6	3.27	4.54	7.31	Pass
Equation 8a	6	3.27	4.54	5.94	Pass
Equation 9a	8	2.85	4.13	3.62	Fail

Note: k represents the degrees of freedom
^a represents the 99 per cent level of significance.

The estimated neoclassical and endogenous growth models are for the period 1960 to 1996. All equations perform satisfactorily in terms of the conventional tests, i.e. adjusted R^2 and F-statistics. In addition, the model diagnostics are not subject to the econometric pathologies, such as serial correlation, heteroskedasticity, functional form and normality of the residuals. Comments on each of the estimated equations and the statistical significance, or lack of, for each variable is explained below, with reference to both models. First, the neoclassical model, as specified, is discussed, followed by the endogenous growth model for New Zealand's determinants of economic growth.

5.3.1 EMPIRICAL RESULTS: THE NEOCLASSICAL MODEL

Consider the results of the first equation (*1a*) of the neoclassical growth model whereby the adjusted R^2 is 0.15. The model performs well in terms of the diagnostics. Total factor productivity is positive and significant at the 5 per cent level. The short run coefficient of total investment in this production function equation has the correct (positive) sign, however it is not statistically significant. The growth rate of the effective labour force does not appear to exert a significant effect on the growth of output in this specification. The coefficient for the growth rate in exports on the other hand, is positive and significantly different from zero at the 5 per cent level. The dummy variable for the government reforms of 1984 (*DV*) is negative and significant in the short run at the 10 per cent level. Thus, it can be said that growth declined in the post-reform period. The short run dummy variable coefficient for the oil shocks of the 1970's (*DVOIL*) is also negative, although it is not significant.

In the long run, the growth rate of exports coefficient is the only variable that is positive and significant at the 5 per cent level. A one per cent increase in exports leads to a 0.12 per cent increase in economic growth. The coefficient for the growth in the effective labour force is positive but not significant. The coefficient for total investment is negative although not significant. The dummy variable for the government reforms of 1984 is negative and significant and the 10 per cent level. This result indicates that the long run relationship between economic growth and the government reforms of 1984 has seen a decline in growth. To be precise, the *DV* coefficient indicates that the

reforms led to a 0.03 per cent decline in economic growth in New Zealand. The dummy variable for the oil shocks of the 1970s (*DVOIL*) is negative but not significant.

The second equation (2a), extended to include the marginal productivities of disaggregated investment into public and private sector investment, has an adjusted R^2 value of 0.46. Disaggregating total investment produces very different results. Total factor productivity is positive and statistically significant at the 1 per cent level. The short run coefficient for private investment in this production function equation is negative, however it is not significant. The short run, public sector investment coefficient, on the other hand, is positive and statistically significant at the 1 per cent level. The growth rate of the effective labour force and exports do not appear to exert a significant effect on the growth of output in this specification. However, the coefficient values for these variables are positive.

In the long run specification, the effective labour force measure is the only variable that is positive however it is not significant. The remaining variables have negative coefficients, but they do not appear to be exerting any influence on New Zealand's economic growth, in this specification, over the period 1960-1996. This result in itself is important.

The final equation (2b) in the neoclassical model introduces the dummy variables to the specification. Please note the adjusted R^2 value has increased to 0.49. Total factor productivity is positive and significant at the 1 per cent level. The short run private sector investment coefficient estimated is negative but not significant, while public sector investment on the other hand, is positive and significant at the 1 per cent level. The effective labour force measure is positive but not significant. The growth rate of exports coefficient is positive and significant at the 1 per cent level. The *DV* variable is positive but not significant. The coefficient for *DVOIL* has the expected negative sign and is significant at the 10 per cent level.

Both the long run public and private investment coefficients are negative, however not significant. Private sector investment is significant at the 1 per cent level with a coefficient of 3.84. From this result it can be said that, the long run private sector investment and economic growth relationship has declined in New Zealand. Public

sector investment is not significant. The variables utilised to measure effective labour force and the growth in exports have the correct positive signs for the long run coefficients, but neither is significant and therefore it can be said that these determinants of growth have not contributed to growth in New Zealand. The *DV* coefficient is positive and not significant while *DVOIL* is negative and significant at the 10 per cent level. Thus, the oil shocks have adversely affected the economy.

The equations including private and public sector investment, show a sizeable increase in the productivity coefficient, represented by the respective constants. The inclusion of the dummy variables leads to further increases in total factor productivity. In turn, the F-statistic and the explanatory power of the equations has improved.

The equations estimated with the growth of imports have not been included in the discussion of results due to low explanatory power and similar outcomes related to the determinants of growth variables as explained in the equation with exports. The fit of the equations is reduced once imports are substituted for exports. Thus, the results of the specifications including the growth of exports are reported instead.

Table 5.2 Empirical Results for New Zealand's Economic Growth (1960-1996): The Neoclassical Model

Equation (1a): Neoclassical Production Function with Dummy Variables

$$\dot{GY} = 0.17 + 0.29 TIY_t - 0.99 TIY_{t-1} + 0.06 \dot{GELF}_t + 0.12 \dot{GX}_t - 0.03 DV_t - 0.03 DVOIL_t$$

(1.85)** (0.57) (-2.15)*** (0.92) (1.90)** (-1.69)* (-1.46)

Long Run Co - efficient :

$$\dot{GY} = -0.70 TIY + 0.06 \dot{GELF} + 0.12 \dot{GX} - 0.03 DV - 0.03 DVOIL$$

(-1.57) (0.92) (1.90)** (-1.69)* (-1.46)

Adjusted R²=0.15, F_(6,27)=2.01, DW=1.67, SE=0.04, SCχ²(1)=0.74, FFχ²(1)=1.52, Nχ²(2)=7.65, Hχ²(1)=0.25

Equation (2a): Neoclassical Production Function With Private and Public Sector Investment

$$\dot{GY} = 0.25 + 0.60 \dot{GY}_{t-1} + 0.09 \dot{GELF}_t - 0.86 \dot{PRIY}_t - 2.02 \dot{PRIY}_{t-1} + 1.42 \dot{PRIY}_{t-2} + 2.86 \dot{PUIY}_t - 3.52 \dot{PUIY}_{t-1} + 0.02 \dot{GX}_t - 0.1 \dot{GX}_{t-1}$$

(3.13)*** (2.96)*** (1.53) (-1.36) (-2.7)*** (1.83)** (4.16)*** (-4.06)*** (0.43) (-1.76)*

Long run Co - efficient :

$$\dot{GY} = 0.22 \dot{GELF} - 3.67 \dot{PRIY} - 1.65 \dot{PUIY} - 0.19 \dot{GX}$$

(1.18) (-1.64) (-1.05) (-0.64)

Adjusted R²=0.46, F_(9,24)=4.07, DW=2.06, SE=0.03, SCχ²(1)=0.21, FFχ²(1)=0.82, Nχ²(2)=0.90, Hχ²(1)=0.22

Equation (2b): Neoclassical Production Function With Private and Public Sector Investment and Dummy Variables

$$\dot{GY} = \begin{matrix} 0.33 \\ (4.00)*** \end{matrix} + \begin{matrix} 0.40 \\ (2.37)*** \end{matrix} \dot{GY}_{t-1} - \begin{matrix} 0.58 \\ (-0.93) \end{matrix} \dot{PRIY}_t - \begin{matrix} 1.74 \\ (-2.63)*** \end{matrix} \dot{PRIY}_{t-1} + \begin{matrix} 3.54 \\ (4.14)*** \end{matrix} \dot{PUIY}_t - \begin{matrix} 3.59 \\ (-3.86)*** \end{matrix} \dot{PUIY}_{t-1} + \begin{matrix} 0.04 \\ (0.81) \end{matrix} \dot{GELF}_t + \begin{matrix} 0.13 \\ (2.24)*** \end{matrix} \dot{GX}_t - \begin{matrix} 0.09 \\ (-1.64) \end{matrix} \dot{GX}_{t-1} +$$

$$\begin{matrix} 0.03 \\ (1.17) \end{matrix} DV_t - \begin{matrix} 0.04 \\ (-2.10)* \end{matrix} DVOIL_t + \begin{matrix} 0.04 \\ (1.35) \end{matrix} DVOIL_{t-1} - \begin{matrix} 0.07 \\ (-2.75)*** \end{matrix} DVOIL_{t-2}$$

Long run Co - efficients :

$$\dot{GY} = \begin{matrix} -3.84 \\ (-2.64)*** \end{matrix} \dot{PRIY} - \begin{matrix} 0.07 \\ (-0.08) \end{matrix} \dot{PUIY} + \begin{matrix} 0.07 \\ (0.81) \end{matrix} \dot{GELF} + \begin{matrix} 0.07 \\ (0.46) \end{matrix} \dot{GX} + \begin{matrix} 0.04 \\ (1.11) \end{matrix} DV - \begin{matrix} 0.13 \\ (-2.06)* \end{matrix} DVOIL$$

Adjusted R²=0.49, F_(12,21)=3.66, DW=2.15, SE=0.03, SCχ²(1)=0.76, FFχ²(1)=0.01, Nχ²(2)=1.77, Hχ²(1)=0.53

Note: ***,**,* represents significance at the 1, 5 and 10 per cent levels, respectively. Adjusted R² is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SE is the standard error, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroskedasticity.

Significance level of χ²(1)=6.63, χ²(2)=9.21 at the 1 per cent level

5.3.2 EMPIRICAL RESULTS: THE NEOCLASSICAL MODEL EXTENDED TO INCLUDE HUMAN CAPITAL

The focus in this section is to extend the neoclassical model to include human capital factors for New Zealand's economic growth. In turn, four versions of the selected regression equation were run with variations reflecting the different measures of effective labour per capita, namely secondary attainments (*SECER*) university degrees awarded, (*UNIER*) basic vocational attainments (*BASVOCER*) and trade certificates and awards attained (*TRADEER*) as a ratio of total labour force. The results for the equations estimated are shown in Table 5.3. The effective labour force measure, *GELF*, has been removed in the human capital specifications to avoid the problem of multicollinearity.

The adjusted R^2 of 0.48 for the equation representing secondary school attainment (*3a*), is higher than any of the other human capital specifications. Looking at the short-run relationship for secondary educational attainments (*SECER*) the estimated short run coefficient is positive and statistically significant at the 1 per cent level. The coefficient is quite large, and in turn this result supports theories of the positive effects of secondary education for New Zealand's economic growth. The short run public and private investment coefficients obtained are positive but not significant. The export coefficient is positive and significant at the 1 per cent level.

For the long run relationship, the coefficients for private investment and secondary educational attainments are negative although neither of the coefficients are significant. Public sector investment and the growth in exports have the correct positive signs for the coefficients although they are not significant.

Basic vocational attainments (*BASVOCER*) (equation (*3b*)) are introduced next to the equation. The adjusted R^2 or goodness of fit of the data, has fallen slightly to 0.38, compared to the first equation with secondary attainment (0.48). In the short run relationship between basic vocational attainment of human capital and economic growth, the *BASVOCER* coefficient displays the correct positive sign, however, it is not significant. The short run export coefficient is positive and significant at the 5 per cent

level. Public sector investment is also positive and significant, at the 1 per cent level. Private sector investment has a negative coefficient that is significant at the 1 per cent level.

The long run growth rate of exports is a key contributing factor for New Zealand's growth. Private sector investment is negative with a significance level of 1 per cent. Public sector investment is positive but not significant. The long run *BASVOCER* coefficient changes to become negative and significant at the 5 per cent level, with a coefficient value of 6.95. According to the results, long run basic vocational attainments have declined in New Zealand for the period 1960 to 1996.

Introducing university degrees awarded (*UNI ER*) (equation (3c)) to the specification produces an adjusted R^2 value of 0.31. The short and long run *UNI ER* coefficients are positive, however they are not significant in either specification. The short run export and public sector investment coefficients are both positive and significant at the 1 per cent level, the long run coefficients however, are not significant. Additionally private sector investment is negative but not significant over time.

The fourth and final equation (3d), in the neoclassical human capital model introduces trade certificates (*TRADEER*). The adjusted R^2 value is 0.31. The short run coefficient for *TRADEER* is negative but not significant. The short run private and public sector investment coefficients are statistically significant at the 1 per cent level. The coefficient value for private investment is negative while public investment is positive. The short run coefficient for exports is positive and significant at the 5 per cent level.

The long run coefficient for the growth rate in exports is also positive and significant at the 5 per cent level. Thus, exports contribute positively to New Zealand's economic growth, for example, the long run significant export coefficient suggests that a one per cent increase in exports leads to a 0.18 per cent increase in growth. For the long run relationship, both private and public investment are negative and significant at the 1 per cent and 10 per cent levels, respectively.

These results are not consistent with expectations of human capital theory in the case of New Zealand for the period 1960 to 1996. At best, long run basic vocational attainment

is the only variable to have a statistically significant effect yet it has declined over time. This suggests that human capital has not contributed to economic growth in terms of the effective labour measures as utilised here. The long run university attainment coefficient is positive but not significant. It may be useful to re-run the same regressions on university degrees awarded in 5 to 10 years, for example, so as to assess its lagged impact upon growth because the number of university degrees awarded within the last few years has grown almost exponentially (refer Figure 5.1). In turn, the dramatic increase in the number of degrees awarded in recent years, could be a result of technological progress, or a shrinking labour market, favouring the demand for higher education.

Table 5.3 Empirical Results for New Zealand's Economic Growth (1960-1996): The Neoclassical Model Extended to Include Human Capital

Equation (3a): Neoclassical Production Function with Secondary Attainments

$$\begin{aligned} \dot{GY} = & 0.13 + 0.28\dot{GY}_{t-1} + 1.25PRIY_t - 1.92PRIY_{t-1} + 0.84PUIY_t - 2.14PUIY_{t-1} + 2.16PUIY_{t-2} + 0.14\dot{GX}_t - 0.08\dot{GX}_{t-1} \\ & (0.95) \quad (1.65) \quad (1.43) \quad (-2.69)^{***} \quad (0.83) \quad (-1.90)^{**} \quad (2.30)^{***} \quad (2.22)^{***} \quad (-1.41) \\ & + 0.06\dot{GX}_{t-2} + 9.92SECER_t - 12.07SECER_{t-1} \\ & (1.03) \quad (2.54)^{***} \quad (-3.22)^{***} \end{aligned}$$

Long run Co - efficient :

$$\dot{GY} = -0.94PRIY + 1.21PUIY + 0.17\dot{GX} - 3.01SECER$$

(-0.89) (1.34) (0.88) (-1.09)

Adjusted R²=0.48, F_(11,22)=3.80, DW=1.66, SE=0.03, S χ^2 (1)=1.63, FF χ^2 (1)=0.11, N χ^2 (2)=0.72, H χ^2 (1)=0.20

Equation (3b): Neoclassical Production Function with Basic Vocational Attainments

$$\begin{aligned} \dot{GY} = & 0.33 + 0.26\dot{GY}_{t-1} - 0.53PRIY_t - 1.20PRIY_{t-1} + 2.58PUIY_t - 2.52PUIY_{t-1} + 0.12\dot{GX}_t + 3.94BASVOCER_t - 9.11BASVOCER_{t-1} \\ & (3.48)^{***} \quad (1.51) \quad (-0.82)^{***} \quad (-1.94)^{**} \quad (3.26)^{***} \quad (-2.77)^{***} \quad (2.11)^{**} \quad (0.67) \quad (-1.64) \end{aligned}$$

Long run Co - efficient :

$$\dot{GY} = -2.33PRIY + 0.08PUIY + 0.16\dot{GX} - 6.95BASVOCER$$

(-2.51)^{***} (0.12) (2.06)^{**} (-1.80)^{**}

Adjusted R²=0.38, F_(8,25)=3.55, DW=1.68, SE=0.03, S χ^2 (1)=2.27, FF χ^2 (1)=0.60, N χ^2 (2)=0.30, H χ^2 (1)=0.25

Equation (3c): Neoclassical Production Function with University Attainments

$$\dot{GY} = 0.12 + 0.45 \dot{GY}_{t-1} - 0.89 PRIY_t + 2.38 PUIY_t - 4.05 PUIY_{t-1} + 1.74 PUIY_{t-2} + 0.15 \dot{GX}_t - 0.06 \dot{GX}_{t-1} + 1.16 UNIER_t$$

(1.12) (2.59)*** (-1.43) (2.97)*** (-3.75)*** (1.78)** (2.13)*** (-1.02) (0.58)

Long run Co - efficient :

$$\dot{GY} = -1.61 PRIY + 0.11 PUIY + 0.15 GX + 2.09 UNIER$$

(-1.22) (0.10) (0.83) (0.57)

Adjusted R²=0.31, F_(8,25)=2.89, DW=2.03, SE=0.03, SCχ²(1)=0.08, FFχ²(1)=1.56, Nχ²(2)=0.47, Hχ²(1)=0.27

Equation (3d): Neoclassical Production Function with Trade Attainments

$$\dot{GY} = 0.33 + 0.36 \dot{GY}_{t-1} - 1.57 PRIY_t + 2.38 PUIY_t - 3.44 PUIY_{t-1} + 0.12 \dot{GX}_t - 6.95 TRADEER_t$$

(2.92)*** (2.17)*** (-2.92)*** (3.08)*** (-3.73)** (2.00)** (-1.33)

Long run Co - efficient :

$$\dot{GY} = -2.46 PRIY - 1.66 PUIY + 0.18 GX - 10.86 TRADEER$$

(-2.09)*** (-1.70)* (1.89)** (-1.29)

Adjusted R²=0.31, F_(6,27)=3.52, DW=1.76, SE=0.03, SCχ²(1)=0.70, FFχ²(1)=1.58, Nχ²(2)=0.06, Hχ²(1)=0.05

Note: ***, **, * represents the significance at the 1, 5 and 10 per cent levels, respectively. Adjusted R² is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SE is the standard error, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroskedasticity.

Significance level of χ²(1)=6.63, χ²(2)=9.21 at the 1 per cent level.

5.4 EMPIRICAL RESULTS: ENDOGENOUS GROWTH MODEL

In the first equation shown in Table 5.4 (equation (4a)), with private and public sector investment, the adjusted R^2 is 0.49. The short-run public investment, growth rate in exports and government consumption expenditure coefficients are positive and significant at the 1 per cent level. Thus, these factors of production contribute to economic growth for New Zealand. Private investment is negative and significant at the 1 per cent level. The effective labour force coefficient is not significant, however the coefficient has the correct positive sign.

In terms of the long run relationships, only the growth in exports coefficient is positive and significant at the 10 per cent level. Growth in the effective labour force and government consumption variables, although positive, does not exert significant influence on New Zealand's economic growth over the period estimated here. In addition, public sector investment is negative but not significant, while public sector investment is negative and significant at the 10 per cent level.

In the second equation shown (4b), estimated to include the effects on New Zealand's growth with the inclusion of the effects of the oil shocks and the post-reform period, with the dummy variables, the adjusted R^2 is 0.49. For the short run relationship, public investment, the growth rate in exports and government consumption expenditure are all positive and statistically significant at the 1 per cent level. Therefore, the factors of production in this specification contribute to economic growth for New Zealand. Total factor productivity has remained the same as in equation (4a) but has declined as compared to the neoclassical specification (equation (2a)) with a coefficient value of 0.23. Private investment is negative and significant at 1 per cent. The effective labour force measure has a positive coefficient but does not appear to be contributing to New Zealand's economic growth.

In terms of the long run effects of each of the variables on New Zealand's economic growth, the growth in exports variable is the only one that is positive and significant at the 10 per cent level. The growth in the effective labour force and government consumption expenditure coefficients, although positive, does not exert significant

influence on New Zealand's economic growth. In addition, public sector investment is negative but not significant, while private sector investment is negative and significant at the 10 per cent level.

Introducing the growth rate in government education expenditure to the endogenous, growth model, in equation (5a), produces an adjusted R^2 value of 0.43. The government education variable has a positive coefficient of 0.17, however it is not significant. The short run coefficients of the growth in exports and public investment are positive and statistically significant at 1 per cent, while private investment, on the other hand, is negative and significant at 1 per cent. Although the variables, *GELF* and *GCGC* have negative coefficient values they do not exert significant influence on New Zealand's economic growth.

For the long run relationship, the growth in exports is the only variable that is significant at 10 per cent. While private and public sector investment and government education expenditure have negative long run coefficients, the coefficients are not significant. The variables estimated to show the impact of the growth in exports, labour force and government consumption are positive. However, none of these variables are statistically significant, and therefore do not contribute to economic growth in this specification. It is interesting to note that adding government education expenditure to the estimation leads to a decrease in the adjusted R^2 to 0.43 from 0.49.

The fourth equation (5b) introduces the dummy variables to the endogenous model specification. Adding government education expenditure, with the dummy variable for the oil shocks and the post-reform period effect, to the estimation leads to an increase in the adjusted R^2 to 0.47 from 0.43 in equation (5a). In the short-run relationship, the variables, public sector investment and the growth in exports are positive and significant at the 1 per cent level. The effective labour force measure, government education expenditure and government consumption expenditure have coefficients that do not appear to be exerting significant influence on New Zealand's economic growth. Private sector investment has a negative coefficient value, however it is not statistically significant. The dummy variable coefficients have the expected signs; positive for the 1984 reforms and negative for the oil shocks of the 1970s. The dummy variable for the reforms is positive and significant at 5 per cent, the dummy variable for the oil shocks is

not significant. Thus, the post reform period has had a positive effect on New Zealand's economic growth.

For the long run relationship, the growth in exports is the only variable that is significant at 5 per cent. This relationship indicates that a 1 per cent increase in exports leads to a 0.27 per cent increase in growth. The long run private investment coefficient is negative at the 5 per cent level. The effective labour force and public investment measures have positive coefficient values, however, neither is significant to New Zealand's economic growth in this specification. Government consumption and government education expenditure in turn have negative coefficients, however, they are not significant. Neither of the long run dummy variable coefficients are significant, yet each has the expected coefficient sign.

Table 5.4 Empirical Results for New Zealand's Economic Growth (1960-1996): The Endogenous Model

Equation (4a): Endogenous Production Function

$$\dot{GY} = 0.23 + 0.58\dot{GY}_{t-1} + 0.02\dot{GELF}_t - 1.35\dot{PRIY}_t + 1.68\dot{PUIY}_t - 2.27\dot{PUIY}_{t-1} + 0.12\dot{GX}_t + 0.31\dot{GCGC}_t - 3.00\dot{GCGC}_{t-1}$$

(2.99)*** (3.65)*** (0.43) (-3.02)*** (3.10)*** (-3.47)*** (2.18)*** (2.64)*** (-2.30)***

Long run Co-efficients:

$$\dot{GY} = 0.05\dot{GELF} - 3.23\dot{PRIY} - 1.41\dot{PUIY} + 0.28\dot{GX} + 0.03\dot{GCGC}$$

(0.43) (-1.73)* (-1.29) (1.71)* (0.07)

Adjusted R²=0.49, F_(8,25)=4.99, DW=2.33, SE=0.03, SCχ²(1)=2.55, FFχ²(1)=0.00, Nχ²(2)=2.08, Hχ²(1)=1.00

Equation (4b): Endogenous Production Function with Dummy Variables

$$\dot{GY} = 0.23 + 0.51\dot{GY}_{t-1} + 0.37\dot{GELF}_t - 0.70\dot{PRIY}_t - 1.18\dot{PRIY}_{t-1} + 2.87\dot{PUIY}_t - 2.51\dot{PUIY}_{t-1} + 0.18\dot{GX}_t + 0.25\dot{GCGC}_t - 0.34\dot{GCGC}_{t-1} +$$

(2.80)*** (2.93)*** (0.67) (-1.11) (-1.73)* (3.49)*** (-2.97)*** (3.19)*** (1.90)** (-2.44)***

$$0.04\dot{DV}_t - 0.00\dot{DVOIL}_t$$

(2.04)** (-0.16)

Long run Co-efficients:

$$\dot{GY} = 0.08\dot{GELF} - 3.84\dot{PRIY} - 0.72\dot{PUIY} + 0.37\dot{GX} - 0.19\dot{GCGC} + 0.09\dot{DV} - 0.01\dot{DVOIL}$$

(0.68) (-2.10)** (-0.66) (2.09)** (-0.53) (1.64) (-0.16)

Adjusted R²=0.49, F_(11,22)=3.92, DW=2.09, SE=0.03, SCχ²(1)=2.56, FFχ²(1)=1.54, Nχ²(2)=2.05, Hχ²(1)=1.32

Equation (5a): Endogenous Production Function Extended to include Government Education Expenditure

$$\dot{GY} = \begin{matrix} 0.20 \\ (2.48)*** \end{matrix} + \begin{matrix} 0.52\dot{GY}_{t-1} \\ (3.07)*** \end{matrix} - \begin{matrix} 1.12PRIY_t \\ (-2.44)*** \end{matrix} + \begin{matrix} 2.13PUIY_t \\ (2.80)*** \end{matrix} - \begin{matrix} 2.70PUIY_{t-1} \\ (-3.05)*** \end{matrix} + \begin{matrix} 0.13GX_t \\ (2.44)*** \end{matrix} + \begin{matrix} 0.03GELF_t \\ (0.63) \end{matrix} + \begin{matrix} 0.15GCGC_t \\ (0.74) \end{matrix} + \begin{matrix} 0.17GE_t \\ (1.22) \end{matrix} - \begin{matrix} 0.23GE_{t-1} \\ (-2.38)*** \end{matrix}$$

Long run Co-efficients:

$$\dot{GY} = -2.32PRIY - 1.19PUIY + 0.27GX + 0.07GELF + 0.31GCGC - 0.13GE$$

(-1.63) (-1.20) (1.86)** (0.62) (0.69) (-0.39)

Adjusted R²=0.43, F_(9,24)=3.82, DW=1.98, SE=0.03, SCχ²(1)=0.00, FFχ²(1)=0.59, Nχ²(2)=2.85, Hχ²(1)=0.59

Equation (5b): Endogenous Production Function Extended to Include Government Education Expenditure with Dummy Variables

$$\dot{GY} = \begin{matrix} 0.23 \\ (2.70)*** \end{matrix} + \begin{matrix} 0.51\dot{GY}_{t-1} \\ (2.79)*** \end{matrix} - \begin{matrix} 0.70PRIY_t \\ (-1.09) \end{matrix} - \begin{matrix} 1.18PRIY_{t-1} \\ (1.67) \end{matrix} + \begin{matrix} 2.87PUIY_t \\ (3.40)*** \end{matrix} - \begin{matrix} 2.751PUIY_{t-1} \\ (-2.90)*** \end{matrix} + \begin{matrix} 0.18GX_t \\ (3.10)*** \end{matrix} + \begin{matrix} 0.04GELF_t \\ (0.65) \end{matrix} + \begin{matrix} 0.25GCGC_t \\ (1.20) \end{matrix} - \begin{matrix} 0.34GCGC_{t-1} \\ (-2.38)*** \end{matrix}$$

$$+ \begin{matrix} 0.01GE_t \\ (0.06) \end{matrix} + \begin{matrix} 0.04DV_t \\ (1.92)** \end{matrix} - \begin{matrix} 0.00DVOIL_t \\ (-0.15) \end{matrix}$$

Long run Co-efficients:

$$\dot{GY} = -3.81PRIY + 0.72PUIY + 0.36GX + 0.07GELF - 0.20GCGC - 0.01GE + 0.09DV - 0.01DVOIL$$

(-1.97)** (0.64) (2.00)** (0.66) (-0.44) (-0.05) (1.51) (-0.15)

Adjusted R²=0.47, F_(12,21)=3.43, DW=2.09, SE=0.03, SCχ²(1)=0.23, FFχ²(1)=1.62, Nχ²(2)=2.02, Hχ²(1)=1.35

Note: ***, **, * represents significance at the 1, 5 and 10 per cent levels, respectively. Adjusted R² is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SE is the standard error, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroskedasticity. Significance level of χ²(1)=6.63, χ²(2)=9.21 at the 1 per cent level.

5.4.1 EMPIRICAL RESULTS: THE ENDOGENOUS GROWTH MODEL EXTENDED TO INCLUDE HUMAN CAPITAL

The endogenous growth model extended to include human capital is reported in table 5.5. Not one of the four measures of effective labour utilised in this study is significant or positive in the short or long run specifications for New Zealand's economic growth over the period 1960-1996.

Equation (6a) has an adjusted R^2 of 0.55. Total factor productivity is significant at the 1 per cent level with a coefficient of 0.26. Private and public sector investment have positive coefficients but neither coefficient is significant. The short run coefficients, for the growth in exports, government consumption expenditure and secondary attainment, have the correct signs and are significant at the 1 per cent level. *SECER* has a coefficient value of 9.47. For the short run relationship between *SECER* and growth, the relationship suggests that a 1 per cent increase in secondary attainments will lead to a 9.47 per cent rise in growth.

For the long run relationship, exports are positive and significant at 1 per cent. Thus, a 1 per cent increase in exports leads to a 0.20 per cent increase in economic growth for New Zealand. Private sector investment is negative and significant at the 1 per cent level. The remaining long run coefficients however, are not statistically significant in this specification.

Equation (6b) has an adjusted R^2 of 0.48. Total factor productivity has improved slightly in equation (6a), with a coefficient value of 0.28. For the short run relationship, private investment is not significant. The short run coefficients for public sector investment and the growth rate in exports are positive and significant at the 1 per cent level. Government consumption expenditure is also positive and significant, at 5 per cent. The *BASVOCER* coefficient has the correct positive sign, but it is not statistically significant.

The long run coefficients estimated here show that the growth in exports is favourable with a significance level at 5 per cent. Therefore, a 1 per cent increase in exports leads

to a 0.28 per cent increase in economic growth. The private sector investment coefficient is negative and significant at the 5 per cent level. Public sector investment and government consumption expenditure are not exerting any positive influence on New Zealand's economic growth in this specification. The coefficient of *BASVOCER* is fairly high, yet is negative and not significant.

Equation (6c) introduces trade attainments in the estimation of the endogenous production function model. In this specification, short run public sector investment, growth in exports and government consumption expenditure coefficients are positive and significant at the 1 per cent level. Private sector investment has a negative and non-significant short run coefficient. The variable *TRADER* has a negative coefficient but it is not statistically significant.

For the long run relationship in the specification, the exports coefficient is positive and significant suggesting a one per cent increase in exports leads to a 0.33 per cent increase in growth. The private sector investment coefficient is negative at 5 per cent. Public sector investment and government consumption expenditure are not contributing to New Zealand's economic growth in the long run specification. The coefficient value for the *TRADER* variable is high at 9.13, but it is negative and not significant. Thus, the trade certificate component of the human capital factor does not explain economic growth within New Zealand.

The final equation (6d) looks at the effect of the contribution of university degrees awarded on New Zealand's economic growth. The short run private sector investment coefficient is negative at the 1 per cent level. The short run public sector investment, growth in exports and government consumption expenditure variables are all positive and statistically significant at the 1 per cent level. *UNIEN* has a negative short run coefficient value, however, it is not significant. The growth rate in exports is positive and significant in the long run at 5 per cent. Except for the long run exports coefficient, the other remaining variables have negative coefficients, however, none of their coefficient values are significant. Thus, only exports contribute to economic growth, whereby a 1 per cent increase in exports leads to a 0.35 per cent increase in growth.

Table 5.5 Empirical Results for New Zealand's Economic Growth (1960-1996): The Endogenous Growth Model Extended to Include Human Capital

Equation (6a): Endogenous Production Function with Secondary Attainments

$$\begin{aligned} \dot{GY} = & 0.26 + 0.34\dot{GY}_{t-1} + 0.74PRIY_t - 2.05PRIY_{t-1} + 0.61PUIY_t + 0.13GX_t + 0.25GCGC_t - 0.43GCGC_{t-1} + 9.47SECER_t \\ & (2.48)^{***} \quad (2.25)^{***} \quad (1.34) \quad (-3.18)^{***} \quad (1.23) \quad (2.51)^{***} \quad (2.14)^{***} \quad (-3.41)^{***} \quad (3.33)^{***} \\ & -12.01SECER_{t-1} \\ & (-4.27)^{***} \end{aligned}$$

Long run Co-efficients:

$$\begin{aligned} \dot{GY} = & -1.987PRIY + 0.93PUIY + 0.20GX - 0.27GCGC - 3.85SECER \\ & (-2.14)^{***} \quad (1.13) \quad (2.21)^{***} \quad (-1.03) \quad (-1.35) \end{aligned}$$

Adjusted R²=0.55, F_(9,24)=5.57, DW=1.96, SE=0.03, SCχ²(1)=0.02, FFχ²(1)=1.47, Nχ²(2)=17.86, Hχ²(1)=0.31

Equation (6b): Endogenous Production Function with Basic Vocational Attainments

$$\begin{aligned} \dot{GY} = & 0.28 + 0.46\dot{GY}_{t-1} - 0.84PRIY_t - 0.69PRIY_{t-1} + 2.25PUIY_t - 2.32PUIY_{t-1} + 0.15GX_t + 0.26GCGC_t - 0.28GCGC_{t-1} \\ & (3.21)*** \quad (2.58)*** \quad (-1.38) \quad (-1.15) \quad (2.88)*** \quad (-2.68)*** \quad (2.83)*** \quad (2.03)** \quad (-2.06)** \\ & + 2.80BASVOCER_t - 6.76BASVOCER_{t-1} \\ & (0.52) \quad (-1.31) \end{aligned}$$

Long run Co - efficient :

$$\dot{GY} = -2.82PRIY - 0.13PUIY + 0.28GX - 0.04GCGC - 7.29BASVOCER \\ (-2.11)** \quad (-0.15) \quad (2.09)** \quad (-0.12) \quad (-1.50)$$

Adjusted R²=0.48, F_(10,23)=4.06, DW=1.77, SE=0.03, SCχ²(1)=1.31, FFχ²(1)=3.84, Nχ²(2)=1.75, Hχ²(1)=0.70

Equation (6c): Endogenous Production Function with Trade Attainments

$$\begin{aligned} \dot{GY} = & 0.27 + 0.53\dot{GY}_{t-1} - 1.39PRIY_t + 1.97PUIY_t - 2.81PUIY_{t-1} + 0.16GX_t + 0.31GCGC_t - 0.30GCGC_{t-1} - 4.29TRADEER_t \\ & (2.66)*** \quad (3.21)*** \quad (-2.89)*** \quad (2.59)*** \quad (-3.26)*** \quad (2.92)*** \quad (2.54)*** \quad (-2.17)*** \quad (-0.89) \end{aligned}$$

Long run Co - efficient :

$$\dot{GY} = -2.97PRIY - 1.78PUIY + 0.33GX + 0.02GCGC - 9.13TRADEER \\ (-1.84)** \quad (-1.48) \quad (2.02)** \quad (0.05) \quad (-0.90)$$

Adjusted R²=0.46, F_(8,25)=4.56, DW=1.85, SE=0.03, SCχ²(1)=0.14, FFχ²(1)=0.06, Nχ²(2)=0.86, Hχ²(1)=0.89

Equation (6d): Endogenous Production Function with University Attainments

$$\dot{GY}_t = 0.21 + 0.56\dot{GY}_{t-1} - 1.22PRIY_t + 2.13PUIY_t - 2.70PUIY_{t-1} + 0.16\dot{GX}_t + 0.31\dot{GCGC}_t - 0.34\dot{GCGC}_{t-1} - 0.19UNIER_t$$

(2.73)*** (3.38)*** (-2.45)*** (2.80)*** (-3.09)*** (2.79)*** (2.51)*** (-2.43)*** (-0.10)

Long run Co - efficient :

$$\dot{GY} = -2.77PRIY - 1.31PUIY + 0.35\dot{GX} - 0.07\dot{GCGC} - 0.44UNIER$$

(-1.62) (-1.05) (1.86) (-0.17) (-0.10)

**

Adjusted R²=0.45, F_(8,25)=4.33, DW=1.99, SE=0.03, SCχ²(1)=0.01, FFχ²(1)=0.69, Nχ²(2)=0.70, Hχ²(1)=1.48

Note: ***,**, * represents significance at the 1, 5 and 10 per cent levels, respectively. Adjusted R² is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SE is the standard error, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroskedasticity. Significance level of χ²(1)=6.63, χ²(2)=9.21 at the 1 per cent level.

5.4.2 EMPIRICAL RESULTS: THE ENDOGENOUS MODEL EXTENDED TO INCLUDE THE GROWTH RATE IN TOURISM

The international tourism receipts variable (*GTR*) is next to be introduced to the endogenous growth model specification. The estimated results are reported in table 5.6. The first equation (7a) has an adjusted R^2 value of 0.54 and there are no problems with the model diagnostics. The short run tourism coefficient is positive and statistically significant at the 5 per cent level. Growth in exports and government consumption expenditure coefficients have the correct signs (positive) and are statistically significant at the 1 per cent level. Although growth in the effective labour force coefficient is positive it is not significant, thus it does not contribute to New Zealand's economic growth in this specification. The short run private sector investment coefficient is negative and significant at the 1 per cent level, indicating a decline. Public sector investment is positive and significant at 5 per cent.

For the long-run relationship, growth in exports is the only variable that is positive and significant at 5 per cent. Apart from growth in the effective labour force, all the other long run estimated coefficients have negative coefficients indicating a decline over the period. The contribution of the long run tourism variable has also declined.

The second equation (7b), with dummy variables, has an adjusted R^2 of 0.48 and the model diagnostics indicate there are no problems of serial correlation, heteroskedasticity, normality of the residuals and functional form. Total factor productivity is significant and positive at the 1 per cent level. In addition, the short run effective labour force variable is positive and significant in this specification at the 1 per cent level with a coefficient of 0.13. The short run coefficients for the growth rate of exports and tourism receipts are also both significant at the 1 per cent level. Public and private investment and government consumption have the correct positive signs for the coefficients although they are not significant. Both the dummy variables have the expected signs for the coefficients, however, they too are not significant.

For the long run relationship, the variables growth in exports, effective labour force and tourism receipts appear to contribute positively and significantly at the 1 per cent level.

Thus, a 1 per cent increase in exports leads to a 0.13 per cent increase in growth, a 1 per cent increase in the labour force also leads to a 0.13 per cent increase in growth. The contribution of the tourism variable indicates that a 1 per cent increase in tourism leads to an increase of 0.09 per cent in growth. The long run public sector investment and government consumption coefficients, although positive, are not statistically significant. The long run private sector investment coefficient has a negative value at the 1 per cent level of significance indicating a decline in private investment. Again, the dummy variables have the appropriate signs for the coefficients yet neither of the coefficients are significant.

5.4.3 EMPIRICAL RESULTS: THE ENDOGENOUS MODEL EXTENDED TO INCLUDE THE GROWTH RATE IN INFLATION

The adjusted R^2 of this equation (8a) is 0.49 and there are no concerns with regards to the model diagnostics. For the short-run inflation relationship with growth, it is negative and significant at the 5 per cent level. The short run public sector investment, growth in exports and government consumption expenditure coefficients, estimated are positive and significant at the 1 per cent level. Private sector investment is negative at the 1 per cent level of significance. The effective labour force has a negative short run coefficient but it is not significant.

For the long-run relationship, inflation is negative and statistically significant at the 10 per cent level, i.e. a 1 per cent increase in the growth of inflation leads to a 0.39 per cent decrease in economic growth for New Zealand. In turn inflation does impact significantly on New Zealand's economic growth over the period. The long run private investment coefficient is negative and significant with a coefficient value of 2.45. Long run public sector investment, effective labour force, and government education expenditure coefficients are not significant. Additionally the long run coefficient of the growth in exports is positive and significant, indicating that a 1 per cent increase in exports leads to a 0.29 increase in economic growth.

The adjusted R^2 of equation (8b), with dummy variables, is 0.54 and there are no concerns with regards to the model diagnostics. Total factor productivity has a

coefficient value of 0.22 at the 1 per cent level of significance. Public sector investment and the growth in exports are the only short run coefficients that are positive and statistically significant at the 1 per cent level. Government consumption expenditure has the correct coefficient sign and is significant at the 5 per cent level. The short run private sector investment coefficient is not significant in this specification. The short run inflation coefficient has a negative value, significant at the 5 per cent level. The effective labour force short run coefficient has the correct sign but it is not significantly different from zero. The *DVOIL* variable is positive but not significantly different from zero. The *DV* coefficient is positive and significant at the 5 per cent level.

In terms of the long run relationship, the growth in exports appears to be the only variable contributing positively and significantly to New Zealand's economic growth. A 1 percent increase in exports leads to a 0.29 per cent increase in growth. Private sector long run investment has a negative coefficient and is significant at the 1 per cent level. The long run inflation coefficient is also negative and significant, at the 5 per cent level. Introducing the growth rate of inflation to the endogenous growth model specification indicates that inflation has a negative impact on economic growth. From equation (7b) the private sector investment coefficient for the specification including tourism receipts is -1.73 as compared to a coefficient value of -2.90 with the introduction of inflation. This result is expected because inflation directly affects the choice of real balances which ultimately affects the rate of growth through its impact on the rate of capital accumulation and the productivity of capital. Public sector investment and effective labour force long run coefficients, although positive, are not statistically significant. Both dummy variables are positive yet not significantly different from zero.

The final estimated specification (equation (9a)), combines all the variables proposed and provides a good fit of the data in terms of the conventional tests of adjusted R^2 (0.73) and F statistics significant at the 1 per cent level. In addition there are no problems of serial correlation, functional form, normality of the residuals and heteroskedasticity. In terms of the short-run relationship, private investment has a positive sign but it is not significant. Short run public sector investment, growth in exports, government education expenditure and tourist receipts coefficients are all positive and significant at the 1 per cent level. The short run growth in the effective labour force coefficient is positive, however it is not notably different from zero. The

coefficient for short run inflation is negative and significant at the 1 per cent level. These results are similar to those seen in earlier equations. The long-run relationship for the inflation coefficient is the same as that in the short-run. Thus, a 1 per cent increase in inflation decreases growth by 0.43 per cent. Private investment and inflation have declined in the long run and each variable is significant. The public sector investment, export and tourism coefficients are positive and significant at the 1 per cent level, thus contributing positively to growth in the long run relationship. The effective labour force long run coefficient, although positive, is not significant. The coefficients for government education and government consumption expenditure are negative however, not significant.

Equation (9b) is the same as equation (9a), however the dummy variable for the 1984 reforms has been included. Unfortunately, the econometric package, Microfit Version 4 (Pesaran and Pesaran, 1997), only allows equations to be estimated with a maximum of ten variables. Therefore, specifications to include the dummy variables, for the oil shocks and the post-reform period, need to be estimated separately. The adjusted R^2 has fallen noticeably from 0.73 to 0.62. Total factor productivity has risen to 0.18. Short run private sector investment, growth in exports and tourism coefficients have positive coefficient values and are significant at the 1 per cent level. The short run effective labour force coefficient, is positive and significant at the 10 per cent level. The short run coefficients for government consumption and government education expenditure have positive signs but are not exerting significant influence on New Zealand's economic growth. Short run inflation growth has the expected negative coefficient sign and is statistically significant at the 1 per cent level. The short run dummy variable has a positive coefficient value but it is not significant.

In the long run relationship, public sector investment, growth in exports and tourism receipts coefficients are positive and significant at 1 per cent. Long run private sector investment and inflation coefficients are negative and significant at the 1 per cent level. The long run effective labour force. and government consumption coefficients have the correct positive coefficient signs but are not significant. Long run government education expenditure has a negative coefficient however it is not significant. The long run coefficient for the post-reform dummy variable is positive but not significant. Therefore, in this long run specification, one cannot make too much of the effects of the

variables, effective labour force, government consumption expenditure, government education expenditure and the dummy variable, on New Zealand's economic growth.

The final equation (9c), introduces the dummy variable for the oil shocks of the 1970s. The adjusted R^2 for this equation has decreased further to 0.59 and the fit of the equation has dropped as well from 6.12 to 5.47. Total factor productivity on the other hand has improved fractionally. In terms of the short run, the inclusion of the *DVOIL* variable has significant effects on the level of investment, both public and private. Neither of the disaggregated short run investment coefficients are significant, although the coefficient values are positive. The short run growth in exports coefficient is positive and significant at the 1 per cent level. The short run effective labour force coefficient, although positive, is not significant. Short run growth in the government consumption expenditure coefficient also has the appropriate positive value but it is not significant. The short run inflation coefficient is negative and significant at the 1 per cent level. The government education expenditure coefficient in the short run, is positive but not significant. The short run tourism receipts coefficient has a positive coefficient value, significant at the 1 per cent level. The short run coefficient for *DVOIL* has the expected negative sign but is not significant.

In terms of the long run relationship, the private sector investment coefficient is negative and significant at 1 per cent while the public sector investment coefficient is positive but not significant. These long run relationship results are consistent with previous equations. The long run export coefficient is positive and significant at the 1 per cent level. The long run effective labour force coefficient, although positive, is not significant. Long run inflation growth over the period is negative and significant, at the 1 per cent level. The government education expenditure variable has a negative coefficient and is not statistically significant. The long run tourism coefficient is positive and significant at the 1 per cent level. The long run government consumption expenditure coefficient is positive but not significant. The long run *DVOIL* coefficient is negative and not significant, as in the short run specification.

Table 5.6 Empirical Results for New Zealand's Economic Growth (1960-1996): The Endogenous Model Extended to Include Tourism and Inflation

Equation (7a): Endogenous Production Function Extended to Include Tourism

$$\begin{aligned} \dot{GY} = & 0.18 + 0.57\dot{GY}_{t-1} - 1.10PRIY_t + 1.55PUIY_t - 1.89PUIY_{t-1} + 0.18\dot{GX}_t + 0.01\dot{GELF}_t + 0.27\dot{GCGC}_t - 0.36\dot{GCGC}_{t-1} + 0.05\dot{GTR}_t \\ & (2.45)^{***} \quad (3.39)^{***} \quad (-2.56)^{***} \quad (2.11)^{**} \quad (-2.21)^{***} \quad (3.35)^{***} \quad (0.13) \quad (2.31)^{***} \quad (-2.82)^{***} \quad (1.77)^{**} \\ & - 0.06\dot{GTR}_{t-1} \\ & (-1.66) \end{aligned}$$

Long run Co - efficient :

$$\begin{aligned} \dot{GY} = & - 2.54PRIY - 0.78PUIY + 0.42\dot{GX} + 0.02\dot{GELF} - 0.22\dot{GCGC} - 0.02\dot{GTR} \\ & (-1.67) \quad (-0.88) \quad (1.89)^{**} \quad (0.13) \quad (-0.52) \quad (-0.18) \end{aligned}$$

Adjusted R²=0.54, F_(10,23)=4.83, DW=1.96, SE=0.03, SCχ²(1)=0.15, FFχ²(1)=0.30, Nχ²(2)=0.41, Hχ²(1)=0.08

Equation (7b): Endogenous Production Function Extended to Include Tourism with Dummy Variables

$$\begin{aligned} \dot{GY} = & 0.23 + 0.25PRIY_t - 1.98PRIY_{t-1} + 0.56PUIY_t + 0.13\dot{GX}_t + 0.13\dot{GELF}_t + 0.17\dot{GCGC}_t + 0.09\dot{GTR}_t + 0.03DV_t - 0.03DVOIL_t \\ & (3.27)^{***} \quad (0.48) \quad (-3.12) \quad (1.16) \quad (2.59)^{***} \quad (2.42) \quad (1.39) \quad (3.39)^{***} \quad (1.37) \quad (-1.37) \end{aligned}$$

Long run Co - efficient :

$$\begin{aligned} \dot{GY} = & - 1.73PRIY + 0.56PUIY + 0.13\dot{GX} + 0.13\dot{GELF} + 0.17\dot{GCGC} + 0.09\dot{GTR} + 0.03DV - 0.03DVOIL \\ & (-3.43)^{***} \quad (1.16) \quad (2.59)^{***} \quad (2.42)^{***} \quad (1.39) \quad (3.39)^{***} \quad (1.37) \quad (-1.37) \end{aligned}$$

Adjusted R²=0.48, F_(9,25)=4.52, DW=1.90, SE=0.03, SCχ²(1)=0.15, FFχ²(1)=1.17, Nχ²(2)=0.65, Hχ²(1)=0.92

Equation (8a): Endogenous Production Function Extended to include Inflation

$$\dot{GY} = 0.22 + 0.49\dot{GY}_{t-1} - 1.25PRIY_t + 2.11PUIY_t - 2.44PUIY_{t-1} + 0.15GX_t - 0.01GELF_t + 0.30GCGC_t - 0.35GCGC_{t-1} - 0.20GI_t$$

(2.91)*** (3.04)*** (-2.87)*** (2.95)*** (-2.89)*** (2.76)*** (-0.16) (2.54)*** (-2.65)*** (-1.82)**

Long run Co - efficient :

$$\dot{GY} = -2.45PRIY - 0.63PUIY + 0.29GX - 0.02GELF - 0.09GCGC - 0.39GI$$

(-1.86)** (-0.79) (2.02)** (-0.16) (-0.27) (-1.75)*

Adjusted R²=0.49, F_(9,24)=4.59, DW=2.07, SE=0.03, SCχ²(1)=0.25, FFχ²(1)=1.71, Nχ²(2)=0.12, Hχ²(1)=1.87

Equation (8b): Endogenous Production Function Extended to Include Inflation with Dummy Variables

$$\dot{GY} = 0.22 + 0.37\dot{GY}_{t-1} - 0.36PRIY_t - 0.146PRIY_{t-1} + 2.78PUIY_t - 2.13PUIY_{t-1} + 0.18GX_t + 0.03GELF_t + 0.23GCGC_t -$$

(2.93)*** (2.56)*** (-0.62) (-2.32)*** (3.58)*** (-2.69)*** (3.31)*** (0.49) (1.88)**

$$0.35GCGC_{t-1} - 0.23GI_t + 0.04DV_t - 0.01DVOIL_t$$

(-2.63)*** (-2.10)** (1.93)** (0.31)

Long run Co - efficient :

$$\dot{GY} = -2.90PRIY + 1.04PUIY + 0.29GX + 0.04GELF - 0.18GCGC - 0.36GI + 0.06DV + 0.01DVOIL$$

(-2.49)*** (1.28) (2.51)*** (0.49) (-0.70) (-2.07)** (0.31) (0.31)

Adjusted R²=0.54, F_(12,22)=4.31, DW=1.98, SE=0.03, SCχ²(1)=0.00, FFχ²(1)=1.25, Nχ²(2)=2.01, Hχ²(1)=1.44

Equation (9a): Endogenous Production Function Extended to Include All Proposed Variables

$$\begin{aligned} \dot{GY} = & 0.16 + 0.19PRIY_t - 1.36PRIY_{t-1} + 1.96PUIY_t - 2.72PUIY_{t-1} + 1.50PUIY_{t-2} + 0.19GX_t + 0.02GELF_t - 0.25GCGC_t \\ & (2.23)^{***} \quad (0.44) \quad (-3.28)^{***} \quad (3.26)^{***} \quad (-3.37)^{***} \quad (2.15)^{***} \quad (4.22)^{***} \quad (0.44) \quad (-1.42) \\ \\ - & 0.38GI_t - 0.34GI_{t-1} + 0.34GI_{t-2} + 0.26GE_t - 0.16GE_{t-1} - 0.22GE_{t-2} + 0.07GTR_t \\ & (-2.99)^{***} \quad (-2.35)^{***} \quad (2.80)^{***} \quad (2.34)^{***} \quad (-2.17)^{***} \quad (-2.89)^{***} \quad (3.07)^{***} \end{aligned}$$

Long run Co - efficient :

$$\begin{aligned} \dot{GY} = & -1.17PRIY + 0.74PUIY + 0.19GX + 0.02GELF - 0.38GI - 0.13GE + 0.07GTR - 0.25GCGC \\ & (-2.77)^{***} \quad (2.16)^{***} \quad (4.22)^{***} \quad (0.44) \quad (-4.10)^{***} \quad (-1.17) \quad (3.07)^{***} \quad (-1.42) \end{aligned}$$

Adjusted R²=0.73, F_(15,18)=6.96, DW=2.00, SE=0.02, SCχ²(1)=0.21, FFχ²(1)=2.66, Nχ²(2)=1.48, Hχ²(1)=0.71

Equation (9b): Endogenous Production Function Extended to include All Proposed variables with Dummy variable

$$\begin{aligned} \dot{GY} = & \underset{(3.25)^{***}}{0.18} + \underset{(0.91)}{0.39PRIY_t} - \underset{(-3.51)^{***}}{1.96PRIY_{t-1}} + \underset{(1.99)^{**}}{0.81PUIY_t} + \underset{(3.41)^{***}}{0.15GX_t} + \underset{(1.68)^*}{0.08GELF_t} + \underset{(1.33)}{0.21GCGC_t} - \underset{(-3.40)^{***}}{0.33GI_t} + \underset{(0.39)}{0.04GE_t} - \underset{(-2.54)^{***}}{0.19GE_{t-1}} \\ & + \underset{(3.64)^{***}}{0.08GTR_t} + \underset{(1.46)}{0.03DV_t} \end{aligned}$$

Long run Co - efficient :

$$\dot{GY} = \underset{(-3.69)^{***}}{-1.57PRIY} + \underset{(1.99)^{***}}{0.81PUIY} + \underset{(3.40)^{***}}{0.15GX} + \underset{(1.68)}{0.08GELF} - \underset{(-3.40)^{***}}{0.33GI} - \underset{(-1.19)}{0.15GE} + \underset{(3.64)^{***}}{0.08GTR} + \underset{(1.33)}{0.21GCGC} + \underset{(1.46)}{0.03DV}$$

Adjusted R²=0.62, F_(11,23)=6.12, DW=2.15, SE=0.03, SCχ²(1)=0.52, FFχ²(1)=0.05, Nχ²(2)=1.25, Hχ²(1)=2.73

Equation (9c): Endogenous Production Function Extended to include All Proposed variables with Dummy variable for Oil Shocks

$$\begin{aligned} \dot{GY} = & 0.19 + 0.18\dot{PRIY}_t - 1.51\dot{PRIY}_{t-1} + 0.34\dot{PUIY}_t + 0.14\dot{GX}_t + 0.07\dot{GELF}_t + 0.17\dot{GCGC}_t - 0.34\dot{GI}_t + 0.08\dot{GE}_t - 0.18\dot{GE}_{t-1} \\ & (2.95)^{***} \quad (0.41) \quad (-3.17)^{**} \quad (1.20) \quad (2.97)^{***} \quad (1.48) \quad (1.06) \quad (-3.14)^{***} \quad (0.64) \quad (-2.15)^{***} \\ & + 0.09\dot{GTR}_t - 0.01\dot{DVOIL}_t \\ & (3.60)^{***} \quad (0.39) \end{aligned}$$

Long run Co-efficients :

$$\begin{aligned} \dot{GY} = & -1.33\dot{PRIY} + 0.34\dot{PUIY} + 0.14\dot{GX} + 0.07\dot{GELF} - 0.34\dot{GI} - 0.10\dot{GE} + 0.09\dot{GTR} + 0.17\dot{GCGC} - 0.01\dot{DVOIL} \\ & (-3.11)^{***} \quad (1.20) \quad (2.97)^{***} \quad (1.48) \quad (-3.14)^{***} \quad (-0.83) \quad (3.60)^{***} \quad (1.06) \quad (-0.39) \end{aligned}$$

Adjusted R²=0.59, F_(11,23)=5.47, DW=1.98, SE=0.03, SCχ²(1)=0.03, FFχ²(1)=0.16, Nχ²(2)=0.43, Hχ²(1)=2.84

Note: ***, **, * represents the significance at the 1, 5 and 10 per cent levels, respectively. Adjusted R² is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SE is the standard error, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroskedasticity. Significance level of χ²(1)=6.63, χ²(2)=9.21 at the 1 per cent level.

5.5 CONCLUSION

The empirical results presented in this chapter provide some important implications for economic growth for New Zealand. Overall the factors that contribute positively to economic growth in New Zealand are public sector investment, exports and tourism receipts.

The growth rate of exports, in both the neoclassical and endogenous models, has continuous positive and significant coefficients and this in turn suggests that export-led growth has strong support for New Zealand. The post-1984 trade policy adjustments have altered New Zealand's production, demand and trade incentives notably, with trade policy now much less biased against exports and inappropriate resource allocation. Trade policy liberalisation has not appeared to have removed the trade base, if anything it may have broadened it.

Public sector investment has a positive and significant effect on New Zealand's economic growth. However, given the almost continual existence of public sector debt financing for the period under review, one may speculate on the extent to which expenditures curtailed higher levels of public capital expenditure and so retarded infrastructure development. The latter could well be detrimental to accelerating growth. Alternatively and/or concurrently there is also the phenomenon of "crowding out" occurring as repeated budget deficit financing potentially acts as a constraining factor on private sector investment and expectations.

International tourism receipts is significant in the specifications estimated to include all the proposed variables. As mentioned tourism is New Zealand's top foreign exchange earner. The World Tourism Organisation predicted in 1993 that world tourism would grow at 3 to 3.5 per cent through to the year 2000 (New Zealand Official Yearbook). However, deterioration in the economies of several Asian countries has led to a significant drop in the number of tourists from those countries. Nonetheless, given further expected growth in tourism, the tourism industry will continue to be a leading generator of economic growth and employment for New Zealand.

Private sector investment has a consistently negative and significant coefficient which in turn suggest growth in private sector investment has declined over the period. Moreover, in the case of New Zealand the political and economic uncertainty since the late 1970s, and more so after the government reforms of 1984, has led to the inability to stimulate private investment in the productive sectors.

The results in this analysis indicate that inflation adversely affects the economy, thus affecting economic growth in New Zealand. Inflation since the Reserve Bank Act of 1989, has been significantly lower than it was throughout most of the previous 20 years. In addition, there is no evidence, judging by the New Zealand experience, that maintaining low inflation has been at the expense of growth and the overall structure of employment. This is not to say however, that evidence does not exist to indicate a change in the number of jobs allocated in society. According to De Gregorio (1993), inflation affects negatively the efficiency of investment through its negative effects on the employment ratio. Equation (8a), the endogenous model, shows that the correlation between inflation and the employment variable is negative but not significantly different from zero. This result implies that the employment channel from inflation to growth is at most weak. Nonetheless the growth in private investment has a significant negative correlation with inflation. The findings of this study suggest that the main channel through which inflation affects growth is through its reduction in the productivity of capital.

Government education and government consumption expenditure do not appear to exert a significant amount of influence on New Zealand's economic growth for the period 1960-1996. In all the equations estimated, the short run coefficients are significant but in the long run the coefficient values are not generally significantly different from zero. Referring to the graphs presented earlier in this chapter, the growth rates of these proposed variables do not appear to have changed dramatically over the period 1960-1996. This would clarify the inability of either of these variables to explain economic growth.

Overall, the human capital growth specifications for both the neoclassical and endogenous models have reasonable explanatory power, however, none of the estimated coefficients are positive and statistically significant. The conclusions based on the

empirical results differ from those obtained by Maynes, Brookes, and Davidson (1996), who concluded that there was evidence to support the growth of human capital in their study of Australia.

The negative coefficients for the educational attainments in the human capital models suggest that New Zealand needs to favour development and adjustment strategies. The previous system of labour relations and the wage-setting mechanism compressed relative wages across skill levels, discouraging human capital development and leaving a relatively high proportion of workers with no formal qualifications. In the same token, however, it should be noted that for the period 1960 to late 1970s, New Zealand experienced low unemployment and a scarceness of employees. Formal qualifications were not required to obtain employment. Nonetheless, new labour arrangements in the wake of the reforms, such as the Employment Contracts Act 1991, have increased the rewards for skills and encouraged investment in human capital. This negative effect could be positive in another 5 to 10 years. The final conclusions for this analysis of New Zealand and future channels for research are presented in the penultimate chapter.

Chapter Six

CONCLUSION

6.1 INTRODUCTION

This study explores empirically New Zealand's economic growth by applying Auto-Regressive Distributed lag cointegration regression analysis to time series data, for the period 1960-1996, using various aggregate production function models. The models estimated are based on neoclassical and endogenous growth theories. The main objectives were to examine the impacts of trade, trade liberalisation, investment, human capital, inflation, tourism, and government policies on New Zealand's economic growth. The models estimated here have reasonably high explanatory power and different econometric tests indicate that the fit of each of the models is relatively good. The empirical results emphasise some intriguing points. This chapter is laid out as follows: section 6.2 gives a brief description of each chapter in this analysis. Section 6.3 discusses the major findings of this study and section 6.4 suggests further research in this area of economic growth analysis for New Zealand.

6.2 CHAPTER SUMMARY

Considering the focus of this study is on economic growth, Chapter one introduces briefly the concepts of economic growth, explaining various definitions of the determinants used in this study, the evolution of economic growth and its historical development.

Chapter two reviews the academic literature surrounding economic growth and suggests that despite the myriad of attempts undertaken by various economists, economic growth and its determinants to date still appear to remain largely ambiguous. In turn the literature review reveals the need for further empirical analysis into this area. Nonetheless, the more generally agreed determinants of economic growth, according to

academic literature to date include: trade, inflation, investment, human capital, research and development expenditure, government consumption and government education expenditure.

A descriptive analysis of the New Zealand economy, dating back to the mid-nineteenth century is provided in chapter three, in order to identify some of the characteristics and more important implications in New Zealand's economic development. New Zealand's economic growth has steadily fallen since the late 1970s and has been a cause for concern for many years. Particular attention is paid to the extensive Fourth Labour Government reforms introduced in 1984, which were implemented in an effort to turn New Zealand's growth performance around. From the survey of recent literature the reforms have appeared to have positive effects on New Zealand's economic growth.

Chapter four addresses the growth models adopted in this study. The models are neoclassical and endogenous in their focus. Since the data is time-series in nature, the estimation relies on the Auto-Regressive Distributed Lag co-integration technique and other recent econometric tests. The models estimate the significance of the proposed variables, such as inflation, investment, trade, tourism, government policies and human capital, on New Zealand's economic growth for the period 1960-1996.

The results of the empirical analysis are provided in Chapter Five. The results suggest that the models have a reasonable fit to the data, as measured by the adjusted R^2 , and F-statistic values and there are no problems associated with model diagnostics. This study finds that significant weight should be attributed to public investment decisions (such as additions to the stock of infrastructures i.e. highways, streets, water systems and sewers), growth in exports and international tourism receipts, when assessing the role the government plays in the course of economic growth and productivity improvement within New Zealand

Overall, the following variables: growth in exports, tourism receipts and public sector investment, contribute positively to New Zealand's economic growth. Inflation and private sector investment do have an impact on New Zealand's economic growth but their individual effects have declined over the 1960-1996 period.

6.3 FUTURE RESEARCH

The empirical results of this study find that private sector investment has a significant direct impact on long-term growth for New Zealand. However, its effect on growth has declined over the period in question. However this conclusion needs qualification. This analysis pays attention to only the direct effects of private and public investment. By providing the necessary infrastructure, i.e. roads and electricity, public sector investment can, and from the results – does, have strong influence on the rate of growth. By providing a stable macroeconomic background, provision of adequate legal and institutional arrangements for the protection of private property, access to credit and imported inputs by private investors, private sector investment can also have a strong influence on the rate of growth. However, none of these indirect channels are analysed in this paper and this could be an area for focus in the future.

Due to the lack of time series data for New Zealand's research and development expenditure for the period 1960-1996 this variable has been unable to be included in this regression analysis. Further data on the economics of innovation and technological diffusion would be beneficial in order to have detailed micro-information at the country level for further time series regression analysis.

To facilitate the human capital adjustment process the government must move to make the education system and worker programs more responsive, effective and relevant. Considering only the direct effects of education are addressed in this paper the policy implications are straightforward. The government, in conjunction with private provision, should aim at creating conditions, which make education more attractive. These conditions range from the more general - establishing a stable macroeconomic environment, provision of adequate training/ educational institutions - to the more specific ones such as adequate access for all to all institutions and government subsidies for education.

Throughout this study, it has been assumed that economic growth is the “be all” for an optimally efficient economy. Qualification is needed for this statement. This analysis pays attention to only the direct effects of the proposed variables on economic growth. What has not been included, however, yet forms an important avenue for future

research, is the societal and environmental impact of each of the proposed variables on economic growth. In addition, the use of Gross Domestic Product as the best indicator of economic growth has been widely examined. Perhaps in the future there will be a change in the way GDP is measured in the national accounts.

The effects of taxation and foreign direct investment on economic growth could bear fruitful results in the future. While the introduction of taxation and foreign direct investment would complicate the various growth models, it would enable a better understanding of the process of growth for New Zealand and in turn help determine policy actions to be undertaken by government to raise the growth rate.

The results determined in this study bring to the fore some interesting dimensions to the issue of economic growth. On the basis of the various models estimated here, there does seem to be some merit in the roles assigned to the growth in exports, public sector expenditure and tourism receipts in the development process for New Zealand. However, to make a general statement, further empirical analysis is required in order to draw firm conclusions on the determinants of economic growth and it should be highlighted that the results from one country can not be generalised for the case of other countries.

APPENDIX A

Table A.1 List of Variables Used in the Estimated Models

Variable	Description
GY	annual growth of national income
GELF	annual growth rate of the labour force
GX	annual growth rate of exports
GM	annual growth rate of imports
TIY	ratio of total investment/GDP
PRIY	ratio of private sector investment/GDP
PUIY	ratio of public sector investment/GDP
GE	annual growth rate of government expenditure on education
GCGC	annual growth rate of government consumption
GI	annual growth rate in the Consumer Price Index (CPI)
GTR	annual growth rate of tourism receipts
CTRatio	ratio of total revenues on taxes on international trade (imports plus exports)/total trade
OPEN	annual growth rate of exports plus imports/GDP
SECER	growth rate of secondary education attainments
TRADEER	growth rate of trade and technical certificates
BASVOCER	growth rate of colleges and polytechnic graduates
UNIER	growth rate of university degrees and post-graduate degrees awarded
$\mu_{1t...20t}$	error term for each equation

APPENDIX B

Dickey Fuller (DF) and augmented Dickey Fuller (ADF) unit root tests, with and without a trend term, were performed to determine stationarity and order of integration in the data for each variable. The results of these unit-root tests were derived using Microfit 4.0 (Pesaran and Pesaran, 1997). Table B.1 reports the results of these two tests. The absolute value of the tau (t) statistic for most of the variables, exceeds the critical values for the DF and ADF, thus there is no reason to reject the hypothesis that the variables to be employed in this study are stationary. As a result the application of Ordinary Least Squares (OLS) will not result in deceptive regression. However, eight variables have absolute tau values less than the critical values for DF and ADF. To overcome this problem, the Auto-Regressive Distributed Lag (ARDL) method of cointegration is utilised to avoid the requirements of pre-testing the order of integration. Additionally, all model diagnostics were tested and there are no problems of functional form, normality, heteroskedasticity or serial correlation. The analysis cautiously proceeds by applying the ARDL co-ordination technique.

Table B.1 Unit Root Tests For Variables

Variable	Without Trend				With Trend			
	DF		ADF		DF		ADF	
GY	-4.95	(-2.95)	-3.68	(-2.95)	-5.17	(-3.54)	-3.95	(-3.54)
GELF	-6.46	(-2.95)	-3.26	(-2.95)	-6.43	(-3.54)	-2.96	(-3.54)
GX	-6.93	(-2.95)	-7.24	(-2.95)	-6.86	(-3.54)	-7.14	(-3.54)
GM	-7.52	(-2.95)	-4.80	(-2.95)	-7.42	(-3.54)	-4.75	(-3.54)
TIY	-2.71	(-2.95)	-3.57	(-2.95)	-2.63	(-3.54)	-3.78	(-3.54)
PRIY	-1.16	(-2.95)	-1.62	(-2.95)	-2.19	(-3.54)	-2.75	(-3.54)
PUIY	-1.41	(-2.95)	-0.91	(-2.95)	-3.39	(-3.54)	-2.83	(-3.54)
GE	-4.18	(-2.95)	-3.95	(-2.95)	-4.23	(-3.54)	-4.07	(-3.54)
GCGC	-4.97	(-2.95)	-5.32	(-2.95)	-5.26	(-3.54)	-6.09	(-3.54)
GI	-2.17	(-2.95)	-1.71	(-2.95)	-2.16	(-3.54)	-1.62	(-3.54)
GTR	-6.33	(-2.95)	-4.11	(-2.95)	-6.23	(-3.54)	-4.05	(-3.54)
CTRatio	-5.95	(-2.95)	-6.14	(-2.95)	-5.86	(-3.54)	-5.99	(-3.54)
OPEN	-6.01	(-2.95)	-6.32	(-2.95)	-5.93	(-3.54)	-6.20	(-3.54)
SECER	-0.18	(-2.95)	-0.20	(-2.95)	-2.49	(-3.54)	-2.45	(-3.54)
TRADER	-2.51	(-2.95)	-2.53	(-2.95)	-2.40	(-3.54)	-2.50	(-3.54)
BASVOCER	-0.70	(-2.95)	-0.96	(-2.95)	-1.88	(-3.54)	-1.88	(-3.54)
UNIER	1.89	(-2.95)	4.18	(-2.95)	0.68	(-3.54)	4.19	(-3.54)

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Notes: Figures in parentheses are critical t values at the five per cent level of significance.

The critical value for the ADF statistic is -3.29 at the 5 per cent level of significance and -2.90 at the 10 per cent level of significance.

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