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**AN ECONOMETRIC ANALYSIS OF
THE DETERMINANTS OF GROWTH
IN THE KINGDOM OF TONGA
1970-1998**

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

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STATEMENT OF SOURCES

The work presented in this study is the original and independent work of the author, except where otherwise stated or acknowledged. No part of this work has been previously submitted to this, or any other university, for the attainment of a formal qualification.



SIOSAIA TUPOU FALETAU

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ABSTRACT

The importance of determining the factors that contribute to economic growth is vital in the case of Tonga because of the benefits and advantages it provides for the people and their future development. The main objective of this study is to analyse and investigate empirically the macroeconomic factors that promote economic growth and development in Tonga. Economic theories and various studies have presented the variables that may affect growth. These include investment (domestic and foreign), labour force, exports and imports, fiscal policies, tourism receipts, private remittances, foreign aid and its various components. Foreign resources such as aid and private remittances play an important role in the development of small island economies and Tonga's heavy reliance on these factors may also explain their contribution to growth.

The study uses a neoclassical production function to examine the relationships between economic growth in Tonga and the proposed determinants listed above. The cointegration method of Auto-Regressive Distributed Lag is utilised in the analysis. The empirical evidence indicates that factors making a positive contribution to economic growth in Tonga are the growth in exports, tourism receipts, openness to trade, government consumption expenditure, bilateral aid, grant aid and imports. The loan aid, multilateral aid, technical co-operation grants and private remittances, while significant in most cases, show a decline over time. Natural disasters and external market shocks have a strong adverse effect on Tonga's growth rate.

The issue of macroeconomic management is stressed in this study as the key role to be played by the government in order for the available resources to be allocated to the productive sectors of the economy. This can be undertaken through setting stable macroeconomic environment, introducing and maintaining growth-oriented policies and structural reforms in some of the key sectors of the economy. Research should be concentrated on high value niche products and promoting technological development to support the diversification in the export and tourism sectors. Measures should also be adopted to monitor the effectiveness of utilising foreign aid projects, as current aid flows show a decline.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AIDAB	Australian International Development Assistance Bureau
ARDL	Auto-Regressive Distributed Lag
BOP	Balance of Payment
CIF	Cost including Insurance and Freight
COLA	Cost of Living Allowance
CPI	Consumer Price Index
EIU	Economic Intelligence Unit
FID	Foreign Direct Investment
GDE	Gross Domestic Expenditure
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GNP	Gross National Product
HDI	Human Development Index
IMF	International Monetary Fund
ODA	Overseas Development Assistance
OECD	Organisation for Economic Co-operation and Development
R&D	Research & Development
SIC	Small Industry Centre
SPARTECA	South Pacific Regional Trade and Economic Agreement
UK	United Kingdom
UNDP	United Nations Development Programme
US	United States
WTTC	World Travel and Tourism Council

CHAPTER 1: Introduction

1.1 Aims and Objectives

The South Pacific Island nations have diverse physical environments and rich traditional cultures with overall aims and objectives of development growth policies and success for its population. They face a unique set of development challenges, which is reflected in their sluggish growth rates, despite high levels of per capita development assistance flowing into these island states. These problems are largely attributable to their small size, dependence on a narrow range of export commodities and vulnerability to external shocks. Natural disasters have also adversely affected growth in most of the island economies at one time or another (World Bank, 1996). Furthermore, the impact of political disturbances negatively affected growth. The two military coups in Fiji in 1987 provide an example of the detrimental effect that domestic political upheaval can have on economic performance (Gounder, 1999).

The Kingdom of Tonga is a small island nation in the South Pacific that shares most of the economic constraints faced by other Pacific Island countries. The economy is dependent on agriculture and fisheries although the tertiary sector has become more important in recent years. Tonga's level of development is relatively high compared to other South Pacific Island countries, except for Fiji (UNDP, 1994). Tonga has been classified by the World Bank as a lower middle-income country, which has an average per capita income of US\$1,909 in 1996/97 (Tonga Ministry of Finance, 1997) and a human development index (HDI) of 0.72 (UNDP, 1994).

Tonga's growth rate has been erratic over time. This is largely due to its dependence on a few agricultural products concentrated on one market, remittances from Tongans abroad

and foreign grants and loans used to finance its development projects and balance of payment deficits. Tonga also faces difficult socio-economic problems, due to its vulnerability to external market forces and natural disaster, geographic isolation and loss of skilled labour through emigration (ADB, 1996).

The production and export of agricultural products has contributed significantly to Tonga's economic growth. However, the volatility observed in this sector over the last three decades has had serious consequences and major changes on the performance of agricultural production and consequently economic growth. For example, the massive 50 percent decline in the price of copra caused the proportion of total export earnings accounted for by the coconut industry to fall from 70 percent in the 1960s and 1970s to 20 percent by the end of 1980s (Sturton, 1992). The production of bananas, which was Tonga's second biggest export earner, has virtually ceased during the late 1980s due to natural disasters and quarantine restrictions. The recovery of the economy in the early 1990s was due to the emergence of squash and the vanilla bean, contributing to the high growth of the economy.

This study is an inquiry into the causes of economic growth, and contains a country-specific econometric analysis of macroeconomic variables, using time series data from 1970-1998 to determine the key factors that promote economic growth and development in Tonga. The literature review examines those macroeconomic variables influencing growth, including investment (domestic and foreign), labour force, exports and imports, government consumption and revenue, tourism receipts, private remittances, foreign aid and its various components. The features and implications of the neoclassical and endogenous growth models will also be examined to determine the existence of short-term and/or long-term relationships to explain Tonga's growth pattern.

The results obtained from this study should provide empirical and policy implications about the effectiveness of macroeconomic variables on economic growth in Tonga. This will assist the Tongan government to allocate its resources more efficiently by setting

development strategies for the economy, and adopting monetary and fiscal policies that will promote macroeconomic stability and long run economic growth.

Section 1.2 introduces the methodology utilised in this study and the sources of the data employed in the analysis. Section 1.3 lists the chapter outlines of this study.

1.2 Data and Methodology

The growth models utilised in this study are based on the Solow-type neoclassical growth model. This is further extended to incorporate tourism receipts, fiscal variables, foreign aid and its various components, and private remittances. Time series data have been employed to estimate these growth models, and so this analysis uses the finite Auto-Regressive Distributed Lag (ARDL) methodology, which applies time series procedures to avoid spurious correlation in the regression analysis. The ARDL procedure has an advantage over other methodologies in that it avoids the pre-testing requirement of the classification of the order of integration.

The data employed in this study are obtained from four different sources. They are from the Tonga Statistics Department, Tonga Ministry of Finance, Asian Development Bank (ADB) and Organisation for Economic Co-operation and Development (OECD). The lack of a longer, consistent and reliable time series pertaining to the Tongan economy makes any empirical macroeconomic analysis difficult. Therefore these sources have been used simultaneously in order to acquire a complete data set for the analysis undertaken here, i.e. for the period 1970 to 1998.

Data provided by the Tonga Statistics Department were collected from their Provisional National Account (1999), Balance of Payment (BOP) Account report (various years), Population Census reports (1966, 1976, 1986, and provisional 1996 census), Consumer Price Indices Report (various years), Labour Force Survey Report (1990, 1993) and Tonga Statistical Abstract (various years). The data from Tonga's Ministry of Finance,

on the other hand, were obtained from the Budget Statement (1997/98) and the Audited Public Accounts (various years). The ADB data were acquired from the *Key Indicators for Asia and Pacific Countries* (various editions). Data on foreign aid and its various components: multilateral, bilateral, loan, grant and technical co-operation is obtained from OECD's *Geographical Distribution of Financial Flow to Development Countries* (various years).

1.3 Chapter Outline

This thesis contains six chapters. The first chapter introduces the aims and objectives of this study, and describes the structure of the thesis. Chapter 2 reviews the literature on economic growth. The first part of Chapter 2 focuses on the theory of growth models, especially the features and implications of the neoclassical and endogenous growth theories, and the empirical testing of them. The second part surveys the literature on the impact of foreign aid on Pacific Island economies and examines foreign aid's contribution to economic development and growth. Chapter 3 provides an overview of the Tongan economy, with a description of its historical background, and an analysis of its macroeconomic performance. An emphasis is placed on the proposed factors contributing to economic growth in Tonga, examining their respective impact on the economy. Chapter 4 presents the methodologies utilised in the econometric analysis and is divided into three parts. The first part develops the growth models based on the Solow-type neoclassical growth model. The second part explores the estimation method where the finite cointegration method of ARDL estimation was selected. The third part addresses the sources and the data employed in this study. Chapter 5 is devoted to the empirical results of the study. An investigation of the policy implications of the results is added to assist policy makers in promoting long-term economic growth for Tonga. Chapter 6 is the conclusion and discusses future research possibilities arising from this research work.

CHAPTER 2: Literature Review: Economic Growth and Development

2.1 Introduction

The issue of economic growth has attracted considerable interest from economists and researchers over the last two decades. They have sort to explain two things: the causes of observed differences in living standards between countries, and why some countries grow at a faster rate than others - the convergence hypothesis (Barro and Sala-I-Martin, 1994). This study seeks and inquires into the causes and determinants of economic growth.

Most economists highlighted the work of Solow (1956) and Swan (1956) on the neoclassical form of the production function as the starting point for the revival of economic theorising and empirical analysis. This revival led, in the 1980s and 1990s, to the birth of a new wave of theorising, which has been pioneered by Paul Romer (1986). Romer moved the emphasis from the accumulation of plant and equipment to the accumulation of knowledge and human capital. Hence the development of endogenous growth theory, which differed from the neoclassical school by treating growth as the endogenous outcome of an economic system, and not as the result of forces that impinge from outside. Based on these two lines of work, Solow's (1956) and Romer's (1986) economic modelling became a crucial component in analysing the determinants of economic growth.

Section 2.2 is devoted to the literature on the features and implications of growth models. Key insights into the neoclassical and endogenous growth model are highlighted. Section 2.3 surveys the empirical evidences and critiques of growth models focussing on the sources and determinants of economic growth. Since foreign aid is an important source of fund for most Pacific Island economies, Section 2.4

investigates the literature on the relationship between foreign aid and economic growth and its impact on small island economies. Empirical evidences of this relationship is also examines. Section 2.5 outlines some macroeconomic policy issues relevant to sustaining and promoting growth in Tonga. Finally, Section 2.6 presents the summary and the conclusion for this chapter.

2.2 Theoretical Evidence of Economic Growth

The origin of growth theory can be traced back to the work by economists such as Adam Smith (1776), Thomas Malthus (1798), David Ricardo (1817), Frank Ramsey (1928), Allyn Young (1928), Frank Knight (1944) and Joseph Schumpeter (1928). Barro and Sala-I-Martin (1994) regard Ramsey's classic article on household optimisation and intertemporally separable utility functions (widely used today as the Cobb-Douglas production function) as the starting framework of modern growth theory. Harrod (1939) and Domar (1946) attempted to integrate Keynesian analysis with elements of economic growth. Harrod-Domar approaches have further been incorporated into the works of Solow (1956) and Swan (1956) which have led to the neoclassical growth models. This section briefly examines the properties, frameworks, adequacies and inadequacies of the neoclassical growth theory (Sections 2.2.1) and the endogenous growth theories (Section 2.2.2). Section 2.2.3 considers the literature on the role of aid in developing countries' economic growth.

2.2.1 Neoclassical Growth Theory

Ignited by Ramsey's (1928) article on household optimisation, Solow (1956) and Swan (1956) developed the well known neoclassical form of the production function (Mankiw, 1995). The Solow-Swan model focuses on four variables: output (Y), capital (K), labour (L), and knowledge (A), which is also referred to as the effectiveness of labour (Romer, 1996). The production function takes the following form:

$$Y_t = f(K_t, A_t L_t) \quad (1)$$

where 't' denotes time. There are four key assumptions of the neoclassical production function. First, the model assumes constant returns to scale in the two arguments,

capital and effective labour. This allows the production function to be used in its intensive form:

$$y = f(k) \quad (2)$$

where $y = Y/AL$ is the output per unit of effective labour ratio; and $f(k) = F(k,1)$ is the capital per unit of effective labour. The intensive form of the production function implies that the output per unit of effective labour is a function of capital per unit of effective labour.

Second, capital has diminishing returns. This implies that the rate of return to output is negatively related to the stock of capital. Third, there is assumed to be some positive and smooth elasticity of substitution between the inputs. Fourth, time 't' enters the production function indirectly through the input variable so that output changes over time only if inputs change.

The production function is combined with a constant-saving-rate rule to generate a simplified general equilibrium model of the economy (Barro and Sala-I-Martin, 1994). This model suggests that significant weight should be given to the accumulation of capital to generate positive economic growth (Romer, 1996). It assumes that labour and knowledge are determined by outside factors i.e. exogenous. The behaviour of the economy can therefore be characterised by the behaviour of capital. The capital stock per efficiency unit, k , develops according to:

$$\dot{k} = s f(k) - (n + g + \delta)k \quad (3)$$

where: \dot{k} is the rate of change of capital stock per unit of effective labour, and k denotes its derivative with respect to time, s is the rate of saving, n is the population growth rate, g is the rate of growth of technology and δ is the depreciation rate of capital. $s f(k)$ denotes actual investment per unit of effective labour and $(n+g+\delta)k$ is the break even investment.

Following are some findings and predictions arising from the neoclassical growth model. It is important to keep in mind that the model was produced during the 1950s and 1960s where the availability of reliable data for empirical analysis was limited. The empirical testing and criticism of the model will be covered in a later section.

The Solow model predicts that if its production function is “well behaved” an economy, regardless of its starting point, will converge to its balanced growth path. While on this path, labour and knowledge are assumed to grow at a constant rate of $n+g$. Consequently the growth rate of output is determined solely by the rate of technological progress. Barro and Sala-I-Martin (1994) note that technical progress has two effects on the model. The first one is a direct increase in productivity, and the second is an increase in the return to capital that leads to additional investment and thus extra income. Hence the accumulation of capital is a direct consequence of technical change, which is then the only source of growth. However since technical progress is not explained, we may say that growth in this model is exogenous (Romer, 1996).

A second prediction, which has been exploited seriously as an empirical hypothesis in recent years, is the convergence hypothesis. The model states that economic growth is faster the lower the starting level of real per capita GDP, relative to the long run or steady-state position (Barro and Sala-I-Martin, 1994). Barro and Sala-I-Martin state that this property is derived from the assumption of diminishing returns to capital; economies with less capital per worker tend to have higher rates of return and higher growth rates. They go further stating that convergence is conditional when the steady-state levels of capital and output per worker depend on the saving rate, the growth rate of population and the position of the production function. These characteristics may vary between countries.

A third prediction is that per capita growth must eventually cease if there is a lag in knowledge and an absence of continuing improvements in technology (Romer, 1996). Barro and Sala-I-Martin point out that the neoclassical growth theories of the late 1950s and 1960s recognised this deficiency and patched it up by assuming that technological progress occurred in an exogenous manner. This device reconciled the theory, however it created an obvious shortcoming that the long run per capita growth rate is determined entirely by an element outside the model. Thus this growth model explains everything but long run growth (Barro and Sala-I-Martin, 1994, p.11).

Cass (1965) and Koopmans (1965) extended the Solow-Swan model by incorporating Ramsey's analysis on household optimisation, which provided for an endogenous determination of the saving rate. A decentralised, competitive framework in which the productive factors, labour and capital, are paid their marginal products supports equilibrium in this model. Hence the decentralised outcomes are Pareto optimal. This extension allows for richer transitional dynamics in the model, however it does not eliminate the dependence of the long run per capita growth rate on exogenous technological progress (Barro and Sala-I-Martin, 1994).

Arrow (1962) and Sheshinski (1967) constructed models, in which ideas were unintended by-products of production or investment, a mechanism described as learning-by-doing (Barro and Sala-I-Martin, 1994). In this framework, any new level of knowledge immediately spills over to the entire economy, an instantaneous diffusion process that might be technically feasible because knowledge is nonrival. Romer (1986) shows that the competitive framework can be retained in this case to determine an equilibrium rate of technological advance, but the resulting growth rate typically would not be Pareto optimal (cited in Barro, 1991). However he added that the competitive framework would break down if new discoveries depended on purposive research and development (R&D) effort and if innovations spread only gradually to other producers.

Most of the predictions, findings and assumptions of the Solow-Swan neoclassical growth model outlined above have faced a lot of criticism from recent researchers. These researchers have contributed to the new wave in growth theorising and modelling known as the endogenous growth model, which attempts to supply the missing explanation for long run growth. The next section covers this new growth theory.

2.2.2 Endogenous Growth Theory

Over the last two decades there have been numerous studies devoted to the endogenous growth theory, relating to the important factors that account for technical change and consequently, sources of growth. So far the only determinant of growth in

the neoclassical growth model other than capital is a mystery variable, the “effectiveness of labour” (A), whose exact meaning is not specified and whose behaviour is taken as exogenous. Barro and Sala-I-Martin (1994) further note that the motivation behind these researches was that, the determinants of long run economic growth are a crucial issue, far more important than the mechanics of the business cycle or the countercyclical effects of monetary and fiscal policies that prevailed in the early 1970s.

The initial wave can be attributed to the work by Romer (1986), Lucas (1988), Rebelo (1991), which were developed from the work of Arrow (1962), Sheshinski (1967) and Uzawa (1965). Barro and Sala-I-Martin (1994) argued that these models did not really introduce a theory of technological change therefore growth may go on indefinitely because the returns to investment do not diminish as economies develop. However, spillovers of knowledge across producers and external benefits from human capital are parts of this process, but only because they help avoid the tendency for diminishing returns to the accumulation of capital.

Amable (1994) states that the first step for endogenous growth modelling is to escape the straitjacket of the neoclassical growth model, in which the long-term per capita growth rate is pegged by the rate of exogenous technological progress. Thus, the key property of the endogenous growth model is the absence of diminishing returns to capital.

A wide variety of interests and analysis have been applied in this field. Amable (1994) suggested that the endogenous growth theory could be classified into several types. The first type is established based on the form of competitive mechanism on which the models are based, such as the role of increasing returns to scale, and Marshallian externalities. The second typology is devised based on the concept of growth adopted such as the traditional definition (growth of output or productivity) and the growth of utility of a representative consumer. The third typology is based on the sources and determinants of growth (Amable, 1994, p.21). Other models of endogenous growth have insisted on the particular role played by technological innovation and on the importance of the resources devoted to R&D.

For the rest of the literature discussed in this sub-section, I would concentrate on the sources of endogenous growth defined in the broad categories of Barro and Sala-I-Martin (1994). These are investment and growth, innovation and growth, and human capital and growth.

The models presented on investment and growth are based on how externality is linked to the accumulation of a factor that contributes to growth. Barro and Sala-I-Martin (1994) summarise that new ideas and techniques are hidden in equipment and machines, with positive externalities spilling over from the firm that utilises such equipment to other firms in related areas. Kaldor (1957) proposed a technical progress function where productivity increased with the rate of investment, I/K . Arrow (1962) on the other hand took into account the effects of learning by doing. Sheshinski (1967) proposed a production function that shows a positive externality linked to knowledge accumulation. Both Arrow and Sheshinski showed that externalities are a way of dealing with increasing returns to scale without having to relinquish the assumption of perfect competition.

Romer (1986) also considers a model of positive externalities as a by-product of the accumulation of knowledge, where it contains a non-physical component. He states by accumulating capital, the firm tends to accumulate knowledge through the learning by doing process. This knowledge can also benefit other firms. Barro and Sala-I-Martin (1994) point out that an important feature of Romer's model is that the market equilibrium is sub-optimal on the account of the externality involved in the accumulation of knowledge. In fact, market equilibrium is characterised by a lower growth rate and the level of investment than the social optimum. They added that private investment alone might lead to under investment, hence less growth in output.

Other sources of growth are based on innovation. This is conceived mostly as the outcome of the activity of research and development (R&D). The incorporation of R&D theories and imperfect competition into the growth framework began with Romer (1990) and includes significant contributions by Aghion and Howitt (1992) and Grossman and Helpman (1991). Barro and Sala-I-Martin (1994) summarise that in these models some form of ex-post monopoly power rewards technological

advancement that results from purposive R&D activity. If there is no tendency for the economy to run out of ideas, then the growth rate can remain positive in the long run. The rate of growth and the underlying amount of inventive activity tend however, not to be Pareto optimal because of distortions related to the creation of the new goods and methods of production. The long-term growth rate depends on governmental actions, such as taxation, maintenance of rights, and regulation of international trade, financial markets, and other aspects of the economy. The government therefore has great potential for good or ill through its influence on the long-term rate of growth.

Grossman and Helpman's (1991) study hypothesises that innovation can be divided into two classes. The first is expanding product variety, in which new products are aggregated with the old ones in the production and dynamic increases in returns to scale or preference for variety is assumed. The second class is rising product quality where the new goods are of a superior quality hence taking the place of the old product. Barro and Sala-I-Martin (1994) further add that an important difference in the two classes is that market mechanisms may lead to a lower as well as a higher growth rate than would be socially optimal.

The new research also includes models of the diffusion of technology. Whereas the analysis of discovery relates to the rate of technological progress in leading edge economies, the study of diffusions pertains to the manner in which follower economies share by initiation in these advances. Since imitation tends to be cheaper than innovation, the diffusion models predict a form of conditional convergence that resembles the predictions of the neo-classical growth model.

The third sources of growth are based on human capital. In contrast to neo-classical growth model, which assumed the human capital parameter exogenous, endogenous growth models regard human capital as the accumulable factor, and in some models, as the engine of growth (Barro and Sala-I-Martin, 1994, p.35). However the uses of human capital as a factor of growth are not specific. Its definition varies and includes health, strength, and different types of knowledge or intellectual abilities and so on.

The model by Lucas (1988) incorporated the endogenous growth model with the addition of physical capital and an externality running from human capital to production. He argued that the nature of this externality, which is known to be intertemporal, differs from the model of knowledge or technology, which shows interindustry relations. The model shows positive externalities. This indicates that if one person acquires a new skill, others can learn from them either through tutoring or simply by observing their actions. These spillover effects increase the productivity of other people and thus increase social returns (Barro and Sala-I-Martin, 1994). However, Lucas further notes that because the first individual is unable to gain fully from their investment in education and training, there will be an under investment in these activities, and thus lower than socially optimal growth.

Another interesting aspect of Lucas (1988) model is its contribution to international disparities in per capita income. He argued that even though two countries would have identical initial levels of the 'physical capital / human capital' ratio but with different absolute values, both countries would have different growth rates. The country with the higher level of physical capital and human capital will have higher return to physical capital.

Another line of recent research makes population growth endogenous by incorporating an analysis of fertility choice into the neoclassical model. The results are consistent, for example, with the empirical regularity that fertility rates tend to fall with per capita income over the main range of experience, but fertility may rise with per capita income for the poorest countries (Barro and Sala-I-Martin, 1994).

From the above discussion, it suggests that these new variables incorporated in the endogenous growth theory are very important for growth, particularly affecting developing countries. However, one of the severe problems of the developing countries is the lack of capital to meet these requirements of endogenous growth. Foreign aid has been seen to have an important role to play in the provision of some of the resources that developing countries need. In the next section, the role of foreign aid is examined.

2.2.3 Role of Aid in Developing Countries' Economic Growth

The role played by foreign aid in the process of economic development is a highly controversial subject, creating a lot of on-going debate amongst development and economics theorists as to its usefulness and/or effectiveness. Essentially, foreign aid under the Marshall Plan, representing a transfer of US\$ 13.2 billion in the 1948-52 period to Europe, had spurred economic recovery in that region after the end of World War II (OECD, 1985). The flow of foreign aid dates back to the 1950s when a group of high-income countries started a foreign assistance programme to help developing countries to meet their resource needs. Theoretical support for this flow can be traced back to Rostow (1963), who illustrated that poor countries in the first stage of development need foreign savings to “kick start” their economy. In the stages theory of Rostow’s growth analysis, developing countries can then “take-off” toward a stage of “self-sustaining growth”.

During the same time, many capital-deficient countries adopted rapid economic growth as their most important national economic goal. As a consequence, most of these countries resorted to foreign capital as the primary means to achieve that goal. Unfortunately, the growth experience by some of these countries has not been very satisfactory (Chenery and Strout, 1966). This empirical phenomenon, along with other considerations, led to the emergence of the anti-aid view, which maintains that external capital exerts significant negative effects on the recipient countries. According to this view, foreign aid substitutes rather than complements domestic resources, helps import inappropriate technology, distorts domestic income distribution, and is biased towards a bigger, inefficient and corrupt government (Griffin, 1970; Bauer, 1976).

Chenery and Strout (1966) argued that foreign aid could be used to bridge the gap between domestic savings and domestic investment, thus providing the economy with the chance to become economically autonomous. Cassen *et al.*, (1994) supports the view that the primary objective of foreign aid is to assist the recipient country make the transition from economic stagnation to self-sustaining economic growth. Hence in the long run, the recipient country should be able to build up their productive

capacity, increase investment, thus leading to an increase of output growth (Cassen *et al.*, 1994, p.26).

Griffin (1970) disagrees with this traditional view of the effect of foreign aid on economic growth in the poor countries. He argues that flows of foreign aid might have a negative impact on domestic saving and subsequently capital formation, and thus on growth. In support, many empirical studies of the macroeconomic impact of aid using data from the 1960s such as Mosley (1987), White (1992) and Tsikata (1998), concluded that aid has no significant positive impact on growth. Moreover, during the 1980s, several African countries experienced negative economic growth despite a substantial increase of aid inflow to these countries (White, 1992a, p.175). These have cast doubt on the ability of foreign aid to increase growth.

Some of the studies have taken the government regulatory activities into consideration. Attention has been directed toward the ways in which the recipient's economic policies have been conducive to growth. Much of this literature has regarded a need for a stable macroeconomic environment, open trade regimes, protected property rights, efficient public bureaucracies as well as political stability as they are important for long-term growth. Singh (1985; cited in Mbaku, 1993, pp.137-150) however, concluded that state intervention in the economy has a negative impact on economic growth and renders the aid-growth relationship statistically weak. The study by Burnside and Dollar (1997) proved that aid raises growth in the countries with sound macroeconomic policies and good quality public services. This finding re-emphasises the role of foreign aid and its strategies in promoting growth.

Concerning the impact of aid on government budgets or aid fungibility, Feyzioglu *et al.*'s (1998) cross-country study states that aid-financed project is always fungible (Feyzioglu *et al.*, 1998; cited in Xayavong, 1999). The World Bank, however, argued that fungibility made aid ineffective only if the objectives of both the donor and recipient country are different (World Bank, 1989, pp.62-67). The main highlights of the studies undertaken in this area emphasise the importance of an appropriate macroeconomic policy mix to address issues of competitiveness and the crowding out of private investment (Tsikata, 1998).

It is apparent that foreign aid has wide economic effects that may be channelled toward growth through its impact on the domestic investment and export sector (Gounder, 1995). The impact of aid on growth can be positive or negative, depending on whether it crowds in or crowds out the private sector, which in turn depends on the economic policy and institutional equality of the recipient country. Empirical evidences of aid effectiveness, mostly in the cross-country studies have indicated that foreign aid only acts as a catalysts to economic growth in countries with a good economic environments i.e. low inflation, small fiscal imbalances, and a free trade regime.

2.3 Empirical Evidence and Critiques of Growth Models

In the previous section, we have gone through the vast improvement and acceleration in the development of growth theory. Following the path pioneered by Romer (1986) and Lucas (1988), endogenous growth theory has led to a resurgence of the interest in the determinants of long-term growth. However, has the new growth theory succeeded in providing a better guide to explain actual growth experience than the neoclassical growth model? This section attempts to look at the empirical evidences of the growth theory, with an emphasis placed on the empirical studies on the determinants of growth.

Baumol's (1986) model, which showed evidence of convergence in the neoclassical model in the long run, was criticised by both Romer (1986) and DeLong (1988) for selection bias. Baumol used Maddison's dataset, which included only countries that were industrialised by 1979. That is countries that did not converge were not included in the data so Romer and DeLong argued that Baumol's model was almost guaranteed to show convergence. When the study was expanded to include countries that were considered 'rich' in 1870 the convergence no longer appeared.

Barro and Sala-I-Martin (1992) and Mankiw *et al.* (1992) disagreed with the early endogenous growth theorists' claim that the neoclassical model predicted poorer countries would grow at a faster rate than rich ones. However, they stated the model's prediction was that the growth rate of a country would be inversely related to

the distance from its steady state. Thus poor countries would converge with rich ones only if they were to all end up at the same point.

The development by Summers and Heston (1991) of GDP data for 130 countries between 1950 and 1985 enabled empirical tests to be made with regard to the convergence hypothesis of the neoclassical models. Most of the research studies show that poor countries do not grow faster than richer countries, in fact the opposite was true according to some studies. This has discredited the neoclassical model and given favour to a new alternative model that does not consider diminishing returns: endogenous growth theories.

Barro and Sala-I-Martin (1994) chose to use regional data to test for conditional convergence. They did this “because regional area within a country shared the same legal system, similar technologies, and similar types of people populated them” so these regions are more likely to converge to the same steady state. They used data on per capita personal income for the US states between 1880 and 1990 and found convergence of the states at just over 2 percent per year. They also studied income for 47 Japanese prefectures between 1930 and 1990, and showed a similar speed of convergence. Western European regions were also used and resulted in convergence at 2 percent per year. This convergence is slow, which makes the transition periods long and therefore empirically significant. A 2 percent convergence means it takes 35 years to move half way between an economy’s current position and it’s steady state.

Barro and Sala-I-Martin (1994) conclude that the slow rate of convergence is evidence of constant returns to capital (and thus endogenous growth) and technical diffusion. However Mankiw, Romer and Weil (1992) suggest this slow rate is the result of differences in human capital and found no proof for the endogenous growth models. It should be noted here that both these studies, and many others, are based on cross-sectional comparisons that unearth correlations and relationships, but do not establish what causes what.

Pack (1994) pointed out that most empirical research generated by endogenous growth theory has tested earlier growth models, rather than testing endogenous theory

itself. He went on to say that most of the empirical work has utilised observations across countries and imposed extremely strong assumptions about international production functions. Unless there is some demonstration forthcoming that the theory is useful in explaining the growth pattern over time of national economies, it will remain a rich expansion of existing growth theory rather than a powerful organising framework for thinking about actual growth phenomena.

The lack of data from different countries and time periods has resulted in few tests on research and development variables as an important determinant of growth for developing countries. However, evidence from some macroeconomic studies show that research and development investment may have significant spillover effects. For instance, Coe and Helpman (1995) examined the impact of domestic and foreign R&D on the total factor productivity. They found that there are beneficial effects on domestic productivity, and that the effects were stronger the more open the economy is to overseas trade.

Barro (1991) and Barro and Lee (1993) presented evidence from a broad cross-section of countries to show that human capital formation, measured by years of schooling, is an important contributor to growth. Countries at a given level of development tend to experience faster growth rates if they start with a higher proportion of teenagers in secondary education. Levine and Renelt (1991) study supported these results. Also Maynes, Brooks, and Davidson (1996) supported the importance of human capital to the growth process. They measured the educational attainment and productivity of the labour force and found that the growth dividend to the economy of increased educational attainment within the labour force increased as the economy matured.

Sala-I-Martin (1994) examined the impact of government policy on economic growth. He concluded that government policy affects growth but the area which causes the correlation is unclear. Barro (1991) added that political stability also plays a role. He deduced that political instability is inversely related to investment and growth. Aschauer (1989) shows that public investment in non-military infrastructure is highly productive, while the role of public expenditure in general has brought out conflicting results.

2.4 Contribution of Foreign Aid to Island Economies' Economic Growth

Many researchers believe foreign development assistance has been instrumental in promoting economic growth in many poor countries. Knapman (1986) states that foreign economic assistance could facilitate capital formation by augmenting domestic saving. It is hoped foreign aid would assist developing countries meet its shortfall of foreign exchange earnings. However, he argues that this was not what had been observed in most South Pacific Island nations. Aid tended to create a need for more aid, thus leading to a condition of permanent aid dependency (Knapman, 1986). The Economic Intelligence Unit (EIU) Country Report (1997) supports this view with regards to the case of Tonga. It is found that the Overseas Development Assistance (ODA) had financed 70 percent to 90 percent of the government annual capital budget since 1990. This represented 20-30 percent of total annual government spending. Friedman (1964) notes that the principal obstacle to development in the poor countries has been the inefficient allocation of resources. He points out that the efficient allocation of resources is more important than their mere availability.

The failure of most South Pacific Island nations to achieve economic growth and development despite all the foreign assistance flows is a great concern. Cole (1993) reports that despite the efforts of planners and policy makers aided by a constant flow of consultants and external advisers, the economies of these countries have by far failed to grow at the rates achieved by micro states in similar circumstances in other regions. This situation is a matter of concern given the need for these countries to be economically viable and independent.

Cole (1993) re-emphasises the importance of the private sector. He uses Fiji's garment manufacturing industry to show that growth through export earnings and inflows of direct foreign investment result if the private sector is encouraged to become more efficient and effective in the international market place. Khan and Reinhart (1990) uses growth models derived from the aggregate production function to show that private sector investment plays a much larger role in the growth process than public sector investment. Their study also indicate that trade liberalisation encourages faster economic growth.

Islam (1992) studies the impact of foreign aid on economic growth using Bangladesh as a case study. He found that domestic resources exert a stronger impact on growth than foreign resources. In fact, foreign aid in its highly aggregate form did not significantly contribute to growth. Mbaku (1993) followed the same reasoning and approach with an econometric study on foreign aid and economic growth for Cameroon and reported similar results.

Viviani (1998) employs the methodology and model used by Islam and Mbaku to data from Fiji. His work re-emphasised the importance of the private sector, however the results indicated that private sector investment is significantly weak in contributing to growth. The tourism sector on the other hand, produced some promising results and contributed positively to growth. Gounder (1999) found that total foreign aid (ODA) in an aggregate form contributes to Fiji's economic growth. The significance of total ODA supports the view that foreign aid plays a significant role in the economic development of Fiji. This results differs from that of Islam (1992) and Mbaku (1993) who found that aid in its aggregate form did not contribute to growth in the case of Bangladesh and Cameroon, respectively.

The discomposition of total aid into bilateral and multilateral form for Fiji shows that bilateral aid has a positive and significant impact on growth while multilateral aid contribution is positive but not significant (Gounder, 1999). Grant aid and also technical cooperation grant also contributes to growth in Fiji. In the case of Bangladesh and Cameroon, Islam (1992) and Mbaku (1993) found that dismantling aid into grant form did not contribute to growth, however loan aid shows positive coefficient and statistically significant. Islam and Mbaku suggest that since grant aid is not repaid, the government authorities misuse aid, thus resulting in a greater degree of administrative inefficiencies and mis-management, and therefore, problems of effective utilisation, leakage to consumption, corruption and political instability.

The aid literature points out that foreign aid is a significant factor contributing to economic growth in most of the South Pacific Island economies. Bertram (1993) and Knapman (1986) point out that aid is an important flow to island economies in order to meet the resource gap. While island economies are dependent on aid flows and

their contribution is vital, neither study undertakes any empirical investigation. However only Gounder (1999) shows any empirical evidence for Fiji. Private sector investment and tourism also make an important contribution and so should be encouraged. It should be noted also that generally the aid literature points out that foreign aid substitutes rather than complements domestic resources, helps import inappropriate technology, distorts domestic income distribution, and is biased towards a bigger inefficient and corrupt government in those countries where aid does not contribute to growth (Weisskoff, 1972a, 1972b; Griffin and Enos, 1970; Griffin, 1970).

2.5 Macroeconomic Policy Issues in Tonga

Tonga is a small island country faced with most of the economic constraints that other Pacific Island countries have. Its small size, lack of natural resources, geographic isolation, and chronic balance of payments problem have forced it to rely on foreign aid and remittances from nationals living abroad for economic development. The importance to Tonga of stable economic growth cannot be over-emphasised. It needs a strong economy: politically and economically to sustain and to continue to improve the standard of living for its people.

An International Monetary Fund Mission (August, 1997) proposed a number of policy issues that the Tongan government need to address to ensure growth in the future. The Mission identified the economy's key weaknesses. They are as follows: small numbers of primary products that dominate commercial production and exports, a large public sector that crowds out private activities and a heavy dependence on foreign aid and private transfers from Tongans living abroad. It recommended that measures be adopted to break out of these dependencies and create a business environment that encourages private investment and diversify growth led by the private sector.

Tonga has traditionally had a cautious approach towards the conduct of fiscal and monetary policy, reflected in the stability of the domestic financial market in the 1980s. However the recent emergence of internal and external imbalances suggest

that macroeconomic policy has departed from this approach. There are now regular budget deficits, high rates of inflation and increased pressure on the balance of payments from imports.

The level of foreign reserves is a key indicator of financial stability. This fell rapidly in the early 1990s. This decline is a sign to the Kingdom of Tonga pointing out that a decline in foreign reserves may lead to a fall in investment and business confidence, thus an outflow of capital and consequently government bankruptcy. The impact of a monetary policy tightening to reverse this decline would distress economic activity, so the monitoring of this situation is very crucial. Thus, fiscal policy needs to be coordinated with monetary policy to support the tight overall policy stance.

Further to these recommendations, available resources need to be concentrated in the areas that determine growth. As covered in the early sections, foreign aid is appropriate but only to “kick start” the economy to a stage of self-sustaining growth. Investment, exports, tourism, labour force, government policies and so on are the factors that contribute to growth world-wide. Thus it is important to analyse the determinants of growth for Tonga. The results obtained from the research should provide the behaviour of these various variables and their impact on economic growth in Tonga. It would assist the Tongan government in allocating its resources efficiently, in the setting of development strategies for the economy and directing and formulating the appropriate monetary and fiscal policy towards restoring macroeconomic stability and promoting economic growth.

2.6 Summary and Conclusion

This chapter describes the growth theories and discusses empirical results of various studies explaining growth by using cross-section analysis and also specific country analysis. Despite the considerable theoretical and empirical research undertaken over the past years, it is clear that the impact of economic growth and its determinants are not consistent with the theory and its assumptions for the developing countries of several regions and specific developing countries.

In most empirical studies, investment appears to be the variable most significantly contributing to economic growth, however the cause of this correlation is unclear. There has been limited investigation of endogenous growth theory, but what evidence there is suggests that education, health and R&D have positive contributions to growth. These factors also reflect on the performance of the country's labour force. Several studies report the importance of effective government policies that contribute positively to growth. Some developing country studies however, point out that it is not known if policies of financial repression, or trade or price distortions may cause the negative impact on growth. To employ various expansions of growth models in the case of Tonga, it is useful to see the behaviour of the various variables that contribute to growth and also make suggestions that may lead to efficiency and higher growth.

CHAPTER 3: Economy of Tonga: An Overview

3.1 Introduction

The South Pacific Island Countries face a unique set of development challenges. Their physical environments and cultural ways and values of living provide the population of these island nations with traditional lifestyles. Economic growth has been slow despite high levels of overall investment and foreign aid. This is attributed to their size, dependence on a narrow range of export commodities and vulnerability to external shocks (World Bank, 1996).

Tonga is located in the world's largest ocean, the Pacific Ocean and is an archipelago of 171 islands of which 36 are inhabited and has a land area of 747 square kilometres. It has a population of approximately less than 98 thousand in 1996 (Tonga Statistics Department, 1996). Although Tonga's land area is small, the soil is fertile and the climate is semi-tropical without undue extremes of temperature and humidity. The natural endowments enable Tonga to develop a variety of niche export items, specifically in the agricultural and marine sectors.

Tonga is a Constitutional Monarchy. A notable feature of the Kingdom is its long-standing record of political stability. Tonga was never colonised. Religion and family ties play an important role in their social affairs. The Population Census (1996) indicates that about 99 percent of the population belongs to or participates in a Christian church activity. Christianity is the official religion, and the churches are well established and deeply involved in providing education and community development services (AIDAB, 1991).

Tonga, like other developing nations, strives for development. Development is considered necessary as it brings social, economic, spiritual wellbeing and improvements to the people's living standards. Table 3.1 presents the selected economic and social indicators for some of the Pacific Island countries, comparing Tonga's performances to that of the island economies.

According to the UNDP's human development indicators, presented in Table 3.1, Tonga's level of development is relatively high compared to other South Pacific Island countries, except for Fiji. Tonga's Gross National Product (GNP) per capita in 1995/96 of US\$1,909 puts it in the lower middle-income group of countries. Social indicators are consistent with those of a middle-income developing country with an adult literacy rate of 99 percent, life expectancy at birth of 69 years and 7.1 mean years of schooling (UNDP, 1994). In the ranking of South Pacific Island Countries according to the human development index (HDI), Tonga's index of 0.72 came second to Fiji, which records an HDI value of 0.86. However, despite these indicators of a middle-income country, its growth rate has been erratic over time reflecting its dependence on few primary agricultural outputs. Tonga also faces difficult socio-economic problems, especially those associated with vulnerability to external market forces, natural disaster such as cyclones, geographic isolation, a chronic balance of payments deficit and the loss of skilled labour through emigration (ADB, 1996).

Table 3.1. Selected Indicators on some Pacific Island Countries, 1994

Country	Life expectancy at birth	Adult Literacy rate %	Mean years of schooling	GDP per capita (US\$)	Human Development Index (HDI)
Fiji	71.8	91	6.8	1,991	0.86
Tonga	69.0	99	7.1	1,396	0.72
Tuvalu	67.2	99	6.8	1,068	0.65
Western Samoa	63.1	98	9.1	722	0.58
Kiribati	60.2	93	6.1	461	0.44
Vanuatu	62.8	64	4.0	1,020	0.42
Solomon Islands	60.7	23	2.8	529	0.19
Papua New Guinea	49.6	52	2.1	999	0.14

Source: Pacific Human Development Report, UNDP, 1994.

This chapter provides an overview of the economy of Tonga. A brief outline of the Kingdom's historical background is covered in Section 3.2. The macroeconomic performance of this island economy is examined for the period 1970 to 1998. It also highlights the main strengths and weaknesses regarding economic growth. Section 3.3 will look at some of the factors that contribute to economic growth in general and their contribution to growth in Tonga. Finally, Section 3.4 presents the summary and conclusion.

3.2 Overview of the Kingdom of Tonga

3.2.1 Country Context

The Kingdom of Tonga comprises of four groups of islands extending over a north-south axis: Tongatapu and 'Eua in the South; Ha'apai in the middle; Vava'u in the North; and the two small Niua groups in the far North (Statistics Department, 1998). The latest census, 1996, indicates that 66.7 percent of the total population of 97,784 resided in Tongatapu, 16.8 percent in Vava'u, 9.1 percent in Ha'apai, 5.1 percent in 'Eua and 2.3 percent in the Niua groups (Tonga Statistics Department, 1996).

Archaeological evidence indicates that the islands of Tonga have been settled since at least 1140 BC, and local traditions have carefully preserved the names of Tonga sovereigns for about 1000 years (Haas, 1977, p.85). Many of the islands are coral with a covering of volcanic ash, comparatively flat and often encircled by fringing reefs. There are also some islands of volcanic origin, notably in the west of the Ha'apai group. The land is very fertile and has a tropical maritime climate. On Tongatapu, the average annual temperature is 23⁰C and average rainfall per year is 1,775mm. Vava'u on the other hand is much wetter with rainfall averaging 2,289mm per year (EIU, 1997).

The Kingdom of Tonga is a constitutional monarchy under the constitution of 1875. In the 19th century, King George Tupou, the founder of the present Royal Family united the Tongan Islands, abolished the system of semi-serfdom and established a land system which provided young men with a plot of land of their own. From 1900

to 1970, Tonga had Treaties of Friendship and Protection with Britain. The United Kingdom (UK) managed Tonga's foreign relations and guaranteed Tonga protection against external attack but had little involvement in the domestic affairs. Tonga adopted a similar model to the British regarding citizen's rights, obligations and the government system.

The Monarch presides over the highest authority in the Tongan government, assisted by the Privy Council, which consists of the ministers of the crown and the governors of Ha'apai and Vava'u. The Prime Minister and his cabinet are responsible for the overall administration of the government on behalf of the Privy Councils. The Legislative Assembly consists of all Cabinet Ministers, the two governors, nine representatives elected by the hereditary nobles and nine representatives elected by the people.

Apart from its land and sea, Tonga has very few natural resources for the promotion of economic growth. Like other Pacific Island economies, growth potential has been constrained by factors such as remote location, small domestic market, narrow resource base, the scarcity of skilled labour and a vulnerability to shocks. However, recent changes in the global economic environment have created opportunities for economic diversification in Tonga. The next sub-section gives an outline of the economic performances of the economy during the last three decades, i.e. from 1970 to 1997.

3.2.2 Macroeconomic Performance of the Economy

Tonga has achieved reasonably good economic growth in the past decades, but its performance has at times been erratic, reflecting its narrow production base. There are clear signs of narrowing in the niche opportunities for squash and vanilla beans, which provided the basis for good growth in the early 1990s. This suggests the need to diversify the economic base of the economy (ADB, 1998).

This sub-section will look at the performance of the Tongan economy nationally and internationally. First, national account statistics are analysed, examining the

country's national income per capita over the past 20 years, the economic growth level, savings and investment, and its sectoral performance. Second, the performance of the external sector, covering trade and the balance of payments is examined. Third, is an analysis of the private sector. The fourth sub-section will cover the importance of this research to the Tongan economy.

3.2.2.1 National Accounts

The Kingdom of Tonga's GDP per capita income for 1996/97 is estimated at T\$2,349 pa'anga which is equivalent to US\$1,908, and for 1997/98 is T\$2,444 (US\$1,786) (Tonga Statistics Department, 1999). This is derived from the provisional estimate of gross domestic product, at current prices divided by the total population. As stated earlier, this level of per capita income puts Tonga in the lower middle-income group of countries and its social indicators consistent with those of middle-income countries. These indicators are the latest and show a stagnant and slow climb in the Kingdom's per capita income, only realised in the late 1960s. For the year 1969/70, Tonga recorded a GDP per capita of T\$145 pa'anga which is equivalent to US\$178, and T\$241 (US\$409) in 1974/75, T\$436 (US\$562) in 1979/80, T\$773 (US\$804) in 1984/85. In 1986/87, the Kingdom broke into the one thousand level with a per capita income of T\$1,037 (US\$823) and in 1989/90 recorded T\$1,286 pa'anga per capita (US\$1,213) (Statistics Department, 1999). These statistics are shown in Table 3.2.

The improvement in GDP per capita is attributed to the diversification in the agricultural sector with niche markets for products such as squash and vanilla beans starting in the late 1980s. In addition, significant efforts were made during 1975-1980 to facilitate industrial manufacturing development in the Kingdom. Tourism receipts also increased but there is much potential for further development in the tourism sector.

Table 3.2 provides a summary of selected indicators from the national account statistics. These include the Kingdom's nominal and real GDP per capita, real growth rates by production sector, GDP by Expenditure, total population, exchange rate (per US\$1) and the inflation rate for the selected years 1970-80 (average) to the period

1992/93 to 1996/97. Averages over the 1970-80 and 1980-90 are also included for comparison over the period shown here.

Saving and Investment

Details on gross domestic expenditure (GDE) from the Tonga Statistics Department are only available up to the year 1994/95. As shown in Table 3.2, the statistics show that from 1974/75 to 1994/95 the Tonga's final consumption expenditure had always exceeded its GDP, implying negative gross domestic saving in the economy. This situation reflects the large resource gap Tonga faces and the generous supply of external savings in the form of private remittances, external aid in form of grants and concessionary loans. From 1974/75 to 1979/80, Tonga's gross domestic saving recorded on average negative 7.5 percent of GDP, negative 15 percent in the last decade and an average of negative 12.7 percent during the period 1990/91 to 1994/95. Investment on the other hand, which is represented by gross fixed capital formation, shows an average of 24 percent of GDP during the 1970s, 23 percent in the 1980s and 14 percent of GDP in 1994/95. The decline in Tonga's investment to GDP ratio is attributed to the closedown of the dessicated coconut factory in 1989, and the leather and garment industries in 1993/94. The significance of current transfers and factor income from abroad, which over the last two decades recorded an average of 30 percent of GDP, led to an improvement of the gross national saving to a positive 8.6 percent of GDP in 1994/95. These gross national saving and capital inflows were the main sources of finance towards gross domestic investment (Tonga Ministry of Finance, 1997).

Gross Domestic Product, which is the measure of domestic economic activity, is the internationally accepted basis for calculating the growth rate of the economy. The Asian Development Bank and the World Bank have classified Tonga's economic growth in the past three decades as low, erratic and stagnant. This was based on a country study of selected countries in the Pacific, including Tonga. The study concludes that Pacific Island countries as a group recorded an average annual growth rate of 2.1 percent during the period 1983-93. In addition, the growth pattern is a series of growth spurts followed by plunges that effectively cancel each other out.

This is not surprising in Pacific Island countries, as they are extremely vulnerable to external shocks (World Bank, 1996).

Table 3.2. Tonga: National Account Indicators, Selected Years 1970-80 (average) to 1996/97

	Average 1970-80	Average 1980-90	1992/93	1993/94	1994/95	1995/96	1996/97
Nominal GDP:							
In GDP _{fc} T\$ million	24.6	81.9	169.2	177.7	201.5	209.7	209.9
In GDP _{mp} T\$ million	28.2	96.7	198.6	212.2	237.0	245.7	247.2
In GDP _{mp} US\$ million	32.6	80.1	147.3	153.4	171.1	184.6	187.1
Per Capita (US\$)	367	850	1,519	1,580	1,757	1,888	1,908
(Percentage Change)							
Constant GDP (1984/85 prices):	4.7	1.5	2.8	10.0	6.3	-3.7	-1.4
Agriculture, forestry, & fisheries	-1.3	0.3	2.7	13.3	12.1	-9.2	-3.0
Manufacturing	6.0	3.7	5.7	-14.9	-11.5	11.9	0.6
Construction	10.6	4.5	7.0	28.8	6.5	3.0	-14.8
Commerce, restaurants, & hotel	16.4	0.6	4.8	7.1	-1.6	-6.0	-5.6
Transport and Communication	22.0	1.7	2.0	6.3	5.1	1.4	1.7
Finance and real estate	4.4	7.0	11.4	4.7	5.4	-5.7	3.1
(Percentage of Total GDP)							
GDP (1984/85 prices) :							
Agriculture, forestry, & fisheries			37.1	38.2	40.3	38.0	37.4
Manufacturing			5.0	3.8	3.2	3.7	3.8
Construction			5.7	6.7	6.7	7.1	6.2
Commerce, restaurants, & hotel			14.2	13.8	12.8	12.5	11.9
Transport and Communication			7.4	7.2	7.1	7.5	7.7
Finance and real estate			6.8	6.4	6.4	6.3	6.5
(Percentage of Total GDP)							
GDP by Expenditure							
Government final consumption	15.6	16.2	17.7	17.8	18.5	Na	Na
Private final consumption	92.1	98.7	91.9	92.7	96.6	Na	Na
Gross fixed capital formation	23.9	23.5	15.8	14.9	13.9	Na	Na
Change in Stocks	2.4	1.4	2.3	2.6	-0.2	Na	Na
Exports of goods and services	31.2	26.7	19.9	21.6	20.8	Na	Na
Less: Imports of goods and serv.	65.0	66.5	47.5	49.5	49.6	Na	Na
Gross Domestic Saving	-7.5	-15.0	-9.6	-10.4	-15.1	Na	Na
Population	87,811	94,024	97,400	97,700	97,100	97,700	97,784
Inflation Rate (percent change)	9.5	11.5	8.0	0.9	1.0	1.3	3.1
Exchange Rate with US\$1	0.8245	1.1876	1.3471	1.3841	1.3202	1.2709	1.2323

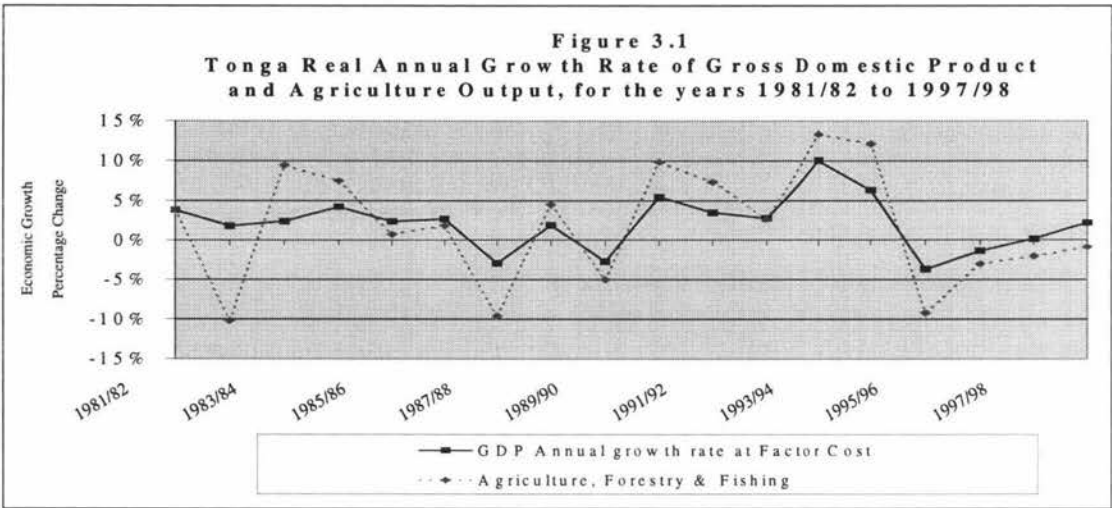
Source: Tonga Statistics Department, 1999.

Notes: Na: not available; fc: factor cost; mp: market prices.

Economic Growth

Figure 3.1 indicates the trend in Tonga's real economic growth rates and the fluctuation in agriculture output. During the period 1981-1987, the economy recorded an average annual growth rate of 2.9 percent. However, the next three years from 1987/88 to 1989/90 saw the Kingdom in a recession recording an average growth rate of negative 1.6 percent. This recession stemmed from a drought that hit the country

in 1987. The economy recovered in 1990 and 1991 growing strongly at over 5 percent on average, due mainly to vigorous expansion in the agricultural sector, especially the rapid development of the squash export industry (ADB, 1996). In 1991/92 the economy was struck again by a drought with the aftermath following on to 1992/93. This had slowed down growth from the previous two years level to only 2.8 percent. In 1993/94, recovery in the agricultural output, higher export volume and buoyant domestic demand boosted growth to 10 percent.



Source: Tonga Statistics Department, 1999.

The economic momentum of the preceding years did not continue during 1994/95 and 1995/96 as growth slackened to 6.3 percent in 1994/95 and then fell in 1995/96 to negative 3.7 percent. The main reason for the deceleration in growth was the decline in the value of agricultural output. Export prices for squash – the main export commodity, fell sharply in 1994/95 and induced many farmers to shift to more traditional crops. Although prices subsequently improved in 1995/96, the volume was only half of what it was the year before. Slower growth in the tourism sector also contributed to the fall in the growth rate. The prospect for 1996/97 to 1998/99 was a slow recovery in the economy as it recorded a positive average growth rate of 0.3 percent (ADB, 1997, 1998).

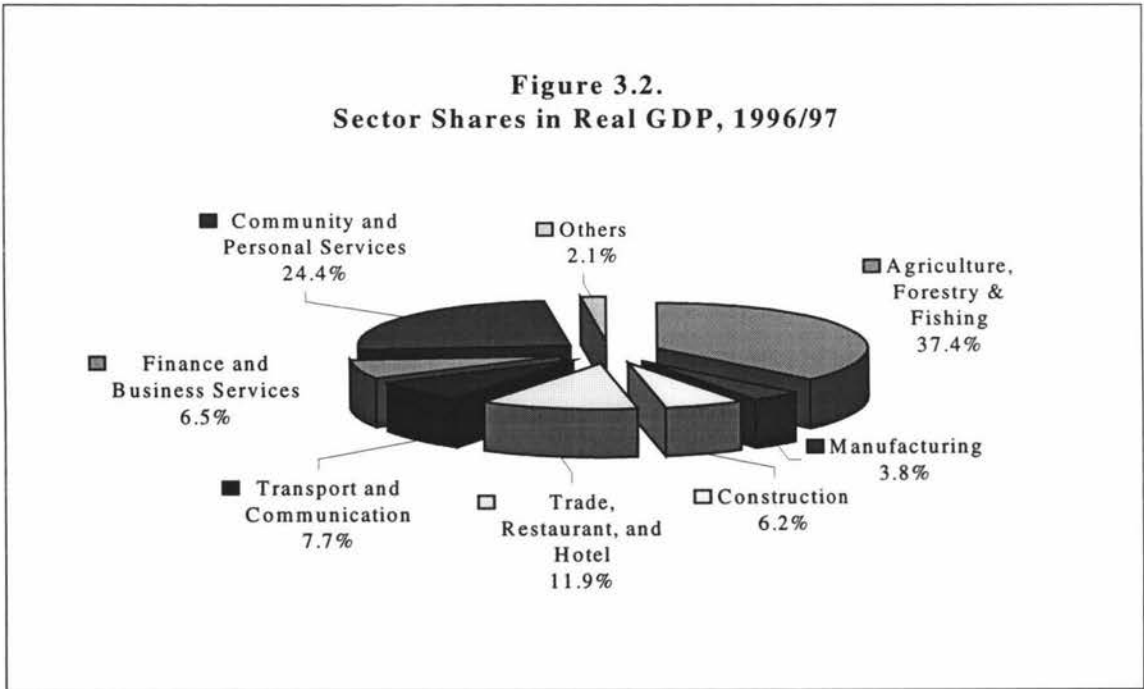
Sectoral Production

The Tongan economy has gone through some structural changes in sectoral contribution to GDP during recent years. However, economic development has

always been constrained due to lack of resources and vulnerability to shocks. During the early 1970s, the primary sector comprising of agriculture, forestry and fisheries contributed over 54 percent of total GDP. Its relative importance has declined since recording an average of 42.3 percent contribution in the late 1970s, 37.7 percent average in 1980s and 37.3 percent in the 1990s (Tonga Statistics Department, 1999). The percentage share of these sectors to GDP for the year 1996/97 is shown in the pie chart in Figure 3.2 and also in Table 3.2.

The tertiary sector comprises of trade, restaurants and hotels, transport and communication, finance and business services, community and personal services and ownership of dwellings. By 1996/97, this sector dominated the percentage contribution to GDP, accounting for 50 percent of the total (Tonga Ministry of Finance, 1997). The main engine for this sector's rapid growth is the increase in communication activities, the establishment of the two new banks and further development of tourism.

Secondary sectors comprising of mining and quarrying, manufacturing, electricity, water supply and construction least contribute to GDP with only 12.6 percent (Tonga Ministry of Finance, 1997).



Source: Tonga Ministry of Finance, 1997.

Agriculture, Forestry and Fisheries

Agriculture still remains as the single main contributor to GDP and being the most important determinant of growth in the recent years, as indicated by the graph in Figure 3.1. It is predominantly based on smallholder production and dominated by production for domestic consumption, both subsistence and for market. The leading export products are squash, vanilla beans, kava products and fish. Root crops (notably yams), fish, bananas, a variety of fresh vegetables, pork and poultry dominate agricultural production for the domestic market.

The agriculture, forestry and fisheries sector accounts for about 37 percent of GDP and constitutes at least 40 percent of the total formal employment (Tonga Ministry of Finance, 1997). AIDAB (1991) reports that during the period 1981/82-1989/90, agricultural output stagnated and its contribution to GDP declined by an annual average of negative 0.3 percent. This was due to a fall in the production of coconut products (notably coconut oil and dessicated coconut).

The early 1990s saw rapid growth owing mainly to the success with squash, and that consequently led to the overall growth of GDP. Such an estimation of the importance of agriculture in relation to GDP and employment may probably understate the role of agriculture in the economy. A major reason for this is the tendency to underestimate the value of production from the mixed rural subsistence sub-sector is due, for example, to valuation difficulties (ADB, 1991).

The decline in the importance and production of copra in the late eighties was a major set-back to the Tongan economy. However, this did lead to the emergence of the squash industry. Butternut squash was introduced in 1988 by a New Zealand firm, which hoped to supply the Japanese market during the November-January period, between the end of the Japanese growing season and the beginning of exports from New Zealand. This experiment was highly successful with the climatic conditions proving favourable and the crop proved profitable. Thus the number of growers increased in 1994/95 to over 2,000 growers, which was known as the "squash fever". Production and export volumes rose rapidly. From 4,000 tonnes in 1989/90, exports

rose to nearly 6,000 tonnes in the following year, then soared to 18,500 tonnes in 1991/92 (IMF, 1997). Unfortunately, much of that volume was rejected due to poor quality, thus creating low prices and considerable damage to Tonga's reputation. A quota system was introduced in 1992/93, limiting the total volume of squash export (IMF, 1997).¹ In 1993/94, despite the imposed quota, export volumes increased to over 18,000 tonnes accompanied by an increase in price resulting in an overall growth in the economy. In the following year, squash production was 17,000 tonnes but prices dropped due to quality problems. The 1995/96 crop was further adversely affected by a drought resulting in exports falling to merely 9,000 tonnes. In 1996/97, further fall in price and diseases affecting the crop contributed to the deterioration in this sector.

Manufacturing and Construction

In the late 1970s, the government made significant efforts to develop its manufacturing industries. These included the establishment of the Tonga Development Bank in 1977 to assist export-oriented businesses by providing loans at below-market interest rates, the enactment of the Industrial Development Incentives Act in 1978; and the creation of the Rural Development Fund in 1979. The Small Industry Centre (SIC) was created in 1980 to assist with the provision of buildings, utilities and infrastructure facilities (ADB, 1996, p.7). The main export activities include knitwear products and leather garments, which accounted for two-thirds of the manufactured exports. The main items for the domestic market include food products such as beer, fruit processing, snacks food, meat products, soft drinks; and construction materials such as paints, varnishes, furniture and cement blocks (Tonga Statistics Department, 1993).

Despite these efforts, the boost to the manufacturing sector was only temporary. Hence, its share in GDP has not grown significantly over the years, in fact recording an average of less than 5 percent in the last two decades. The failure of the

¹ The quota was introduced on a voluntary basis in 1992/93 and set at 10,000 tonnes; in the next year 1993/94 it was raised to 13,000, with actual exports far in excess. In 1994/95, the quota became binding and was set at 17,000 tonnes, raised to 17,500 tonnes in 1995/94. In early 1996 it was abolished.

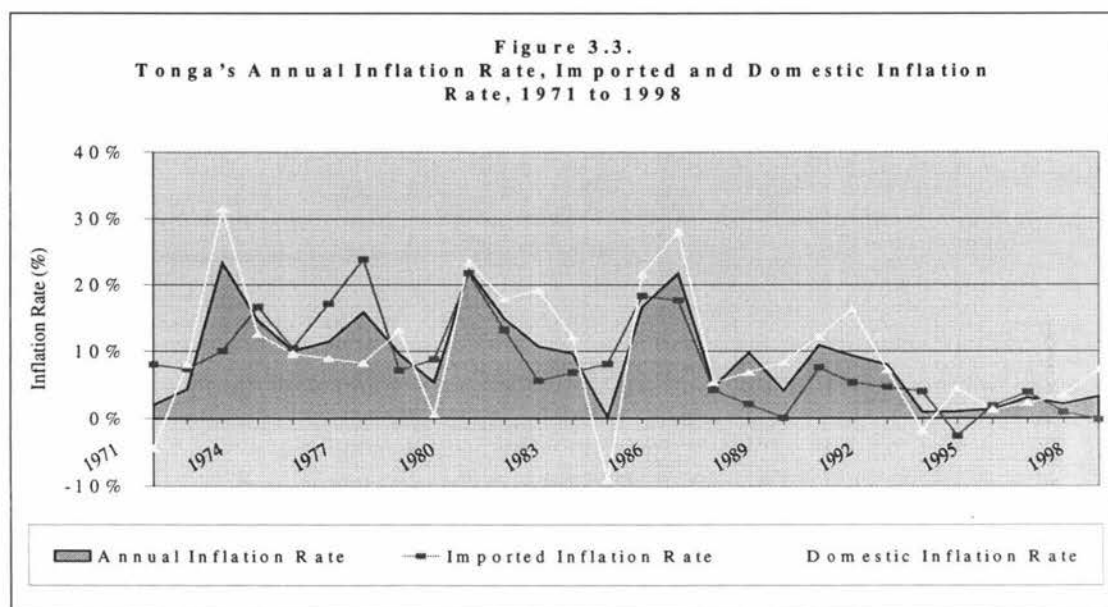
manufacturing sector to achieve higher rates of growth is attributed to the concentration of production in the domestic market and high transport costs associated with the import of raw materials. Furthermore, manufacturing protections in New Zealand and Australia under the SPARTECA Agreement have been reduced, creating a disadvantage to the exporters from Tonga and other Pacific Island countries. The government has recognised this, together with the unsuccessful attempt of the Industrial Development Incentives Act to encourage the development of a competitive manufacturing sector. Thus, the government is presently considering a comprehensive reform of the current industrial development regime (ADB, 1996).

The construction activity is heavily influenced by externally financed development projects. During the period 1976/77 to 1982/83, this sector had grown rapidly from the negative level of growth and recorded on average growth rate of 37.3 percent. This is attributed to the creation of the Tonga Development Bank in 1977 and Small Industry Centre in 1980. The performances of the construction sector fluctuated after that period until 1991/92 when it picked up again until 1994/95 recording an average growth of 13.7 percent during this period. This was attributed to the construction of the National Reserve Bank of Tonga in 1993/94 and Queen Salote Memorial Hall. The tightening of monetary conditions in 1995 contributed to the slow-down in this sector.

Prices

Inflation in Tonga, measured by the Consumer Price Index (CPI), had been erratic but climbed an upward trend as indicated by the shaded line graph in Figure 3.3. On average, the annual inflation rate during the 1970s was 10.8 percent, which was attributed mainly to an increase in prices of imported goods. During the early eighties up to 1986, the annual recorded inflation rate was an average rate of 13.7 percent where both imported and local inflation contributed to this increase. However, the local inflation rate reached 16.1 percent on average. The late 1980s onward to the 1990s, annual inflation rate slow down to 4.9 percent on average with the imported inflation recording 2.7 percent and local rate of 6.1 percent (Tonga Ministry of Finance, 1997).

There are two main reasons for this erratic behaviour in consumer prices. The first is attributed to the combination of a strong domestic demand particularly for food products, as well as variability in food prices. During the 1980s, Tonga was beset by a series of destabilising climatic conditions - cyclone and drought - which reduced food supplies and escalated food prices. The second reason was the selection of an inappropriate currency peg for the Tongan Pa'anga i.e. the Australian dollar. However this policy was changed in 1991, and the currency is now pegged to a basket of currencies. This helped reduce the impact of erratic currency fluctuations on domestic prices.



Source: Tonga, Statistics Department, 1999.

Exchange Rate

The Pa'anga is pegged to a basket of currencies made up of the Australian, United States and New Zealand dollars. These currencies are the principal currencies in which foreign exchange receipts are received. The share of the Japanese yen to the Pa'anga is small despite the importance of exports to Japan. Tonga's effective exchange rate has remained stable since the basket of currencies was introduced. The real effective exchange rate depreciated in 1994/95 when inflation dipped to zero, but appreciated in 1995/96 on the back of the nominal appreciation of the New Zealand and the Australian dollars.

Employment and Wages

There is no detailed or up-to-date statistical information concerning employment and wages for Tonga to the year 1997/98. However information on labour was gathered from various sources, such as population censuses and the labour force surveys. The details are summarised in Table 3.3 below.

Table 3.3. Population and Labour Statistics of Tonga, Census Years: 1966-1996

	Census 1966	Census 1976	Census 1986	Survey 1990	Survey 1993	Census 1996
Total Population	77,429	90,085	93,049	95,408	97,686	96,020
Working Age Population > 16 years		50,047	54,928	68,549	70,286	58,102
Economically Active	18,998	21,435	23,745	32,013	35,033	33,908
Percentage of population	24.5	23.8	25.5	33.6	35.9	35.3
Employed (Total)	18,998	18,626	21,604	30,670	34,574	29,406
Male	17,900	15,883	17,558	20,954	21,379	18,402
Female	1,098	2,743	4,046	9,716	13,195	11,004
Participation Rate						
Male (%)	83.2	71.8	69.6			75.3
Female (%)	5.4	13.5	17.8			41.7
Unemployment (%)						
Male (%)		12.1	6.4			15.2
Female (%)		18.3	18.7			9.9
Employment by industry						
Agriculture, forestry and fishing	74.0	51.2	49.1	38.1	39.4	33.8
Manufacturing	2.6	2.1	2.7	15.1	22.2	22.8
Community social services	18.5	21.9	23.5	23.0	25.7	24.9
Trade, restaurant, hotel	2.2	4.4	7.0	8.5	6.4	8.5

Source: Tonga Statistics Department (various years).

Tonga's labour force was last estimated to be 34,000 or 35.3 percent of the total population, as seen in the Population Census 1996 (see Table 3.3). The average unemployment rate was estimated at 12 percent, with youth unemployment reaching almost 20 percent. Of the total labour force, 34 percent were employed in the agriculture and fisheries sectors, 25 percent in the community, social and personal services sectors, and 23 percent in the manufacturing sector (Table 3.3).

A steady emigration of skilled labour has kept the growth rate of the labour force down between 1 and 1.4 percent (IMF, 1997). The selective nature of emigration has caused shortages of certain types of skilled workers, most notably in agricultural production. Emigration is also known to contribute large amounts of foreign receipts to the Kingdom of Tonga through private remittances. This trend seems likely to persist and is bound to have significant effects on both the rate and pattern of economic growth.

The 1993 Labour Survey identified 13,195 full time paid employees. Of these 8,104 persons were males and 5,091 were females. Average weekly earnings were \$96.40. With respect to earning by sector, the community sector recorded the highest with \$106.55 per week (pw), followed by construction (\$91.40 pw), finance (\$88.70 pw), transport (\$85.44 pw), and agriculture (\$80.62 pw). Government increased the salary of Civil Servants with the cost of living adjustment (COLA) of 10 percent for the period 1994/95 and 1995/96 (Tonga Ministry of Finance, 1997).

3.2.2.2 External Sector

Tonga's external balance of payments has been characterised by substantial trade deficits and negative balances on its service account. This has been offset in most years by surplus in the transfer accounts, both official and private. In 1993/94 and 1994/95, the current account turned negative, due to the combined effect of declining squash exports, imports that kept growing due to expansionary monetary and fiscal conditions and an increase in the development expenditure. Capital accounts however, recorded positive level spurts with the exception of changes in the assets of the Tongan Trust Funds (passport sales). Frequent deficits over the years in this account reflected the repayments of concessionary loans and rise in the portfolio investment outflow.

Overall, the balance of payments recorded surpluses in the early 1980s and then deficits during the period 1986/87 to 1989/90 highlighting the fall of the copra industry and the drought that hit the country during that period. However, in 1990/91 the balance of payments improved to a surplus until the sharp decline in 1994/95. As

a result gross foreign reserves reached a peak of T\$49.8 million in 1992/93 and fell to T\$30.8 million by the end of June 1995. However the year 1996/97 showed some recovery in foreign reserves, but only due to the tightening monetary policy (IMF, 1997). Table 3.4 shows the components and trends of the balance of payments for the period 1992/93 to 1996/97.

Table 3.4. Tonga: Balance of Payment, 1992/93 to 1996/97

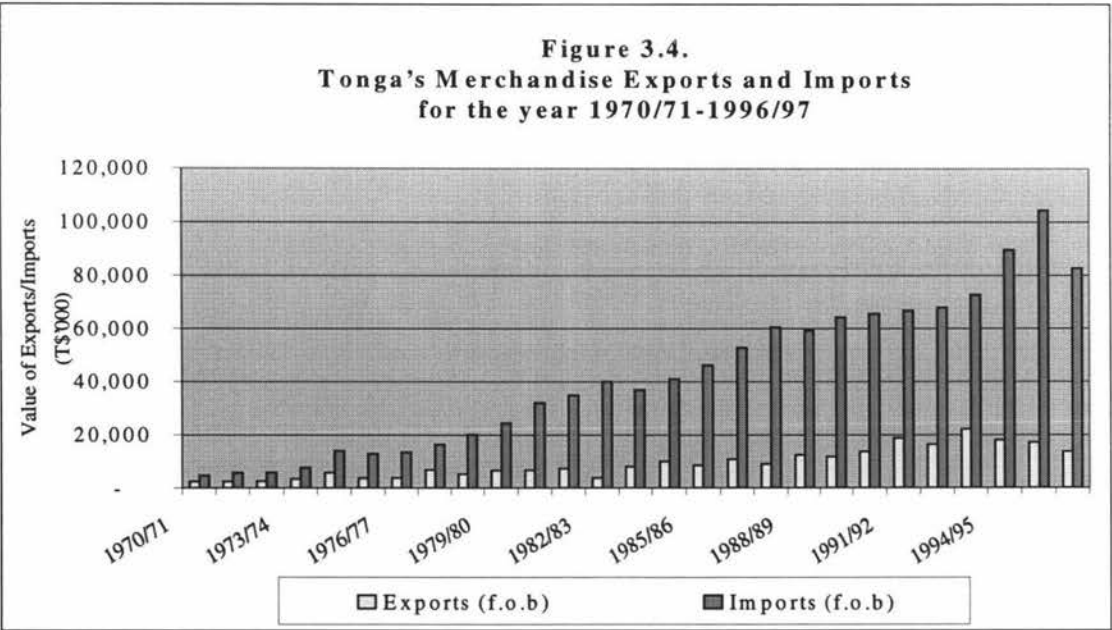
Years ending June	1992/93	1993/94	1994/95	1995/96	1996/97
Exports, f.o.b.	16.3	22.0	18.0	17.0	13.5
Imports, f.o.b.	67.7	72.6	89.5	104.2	82.7
Merchandise Trade Balance	-51.4	-50.6	-71.5	-87.2	-69.2
Services (net)	-3.2	-23.3	-27.2	-15.6	-5.7
Investment income (net)	3.1	11.6	4.7	6.2	6.4
Official Transfer (net)	9.5	1.1	5.2	8.4	10.8
Private Transfer (net)	47.9	24.9	23.8	31.4	39.0
Current Account Balance	5.9	-36.3	-65.1	-56.8	-18.7
In US Dollars	4.4	-26.2	-49.3	-44.7	-15.1
Percent of GDP	3.0%	-17.1%	-29.7%	-24.9%	-8.1%
Capital Account Balance	4.3	43.5	55.7	53.7	26.1
In US Dollars	3.2	31.4	42.2	42.2	21.2
Percent of GDP	2.2%	20.5%	25.4%	23.6%	11.3%
Balance of Payment	10.2	7.2	-9.3	-3.1	7.4
In US Dollars	7.6	5.2	-7.1	-2.4	6.0
Percent of GDP	5.2%	3.4%	-4.3%	-1.4%	3.2%
Errors and Omission	-0.0	-0.5	-0.9	1.1	-0.4
Gross International Reserve	49.8	43.1	32.8	30.8	37.8
In US Dollars	36.9	31.1	24.8	24.2	30.7
Exchange Rates: T\$ per US\$ (average)	1.3471	1.3841	1.3202	1.2709	1.2323

Source: Tonga Statistics Department (various).

In recent years exports have declined as a generator of foreign exchange, despite efforts to encourage and stimulate growth in the export sector. These trends follow earlier patterns dating from the late 1960s when exports were able to finance 67 percent of imports. This ratio declined to 36 percent at the beginning of the 1970s and 17 percent by the end of the 1980s (Sturton, 1992). The 1970-1990 period witnessed a massive 50 percent decline in the real price of Tonga's traditional main

export commodity, copra. As a consequence the coconut industry, whose share had represented more than 70 percent of total export earnings in 1970, was reduced to 20 percent by the end of 1980s. The production of bananas, which had been Tonga's second most important export earner, virtually vanished during the late 1980s due to natural disasters, quarantine restrictions, and the termination of the subsidy scheme in New Zealand. However, the export of large volumes of squash in the early 1990s reversed the trend again and the export to import ratio rose to 22 percent in 1990/91, 24 percent in 1992/93 and 30.3 percent by 1993/94. However, this ratio dropped to a low of 16.3 percent in 1995/96 and 1996/97 as exports of squash fall and imports rose rapidly.

Despite the decline since 1993/94, squash remained the principal export commodity, accounting for about half of the total exports during the 1990s. Other principal export commodities for Tonga include fish, vanilla beans and kava. Coconut products as an important export item of Tonga had declined throughout the 1980s and hit an all time low in 1990-91. The exports of manufacturing products have been declining continuously over the years, which is attributed mainly to the close down of the coconut and knitwear industry. Japan, Australia and New Zealand are the main trading partners for Tongan exports.



Source: Tonga Statistics Department, (various years).

Imports on the other hand grew rapidly over the years. This is indicated by the trends in Figure 3.4. The increase was concentrated in consumer goods, which accounted for 40 percent of total imports, and intermediate goods (50 percent) many of the latter apparently used for final consumption. Imports of capital goods have remained relatively static in recent years, with fluctuations due to the implementation of development projects (IMF, 1997, p.27). Tonga recorded an average growth of imports of 22.5 percent during 1970/71-1979/80, 10.7 percent in the 1980s and an average of 4.5 percent import growth in the 1990s. The main trading partners for imports are Australia and New Zealand for consumer and intermediate goods; Japan for motor vehicles (new and re-conditioned) and Fiji as the source of petroleum products.

3.2.2.3 Private Sector Development

Even though private sector development in Tonga is well under way, it is evident that government economic policy is to further encourage private sector activity as a means of achieving high and stable growth for Tonga. Considerable initiations have been made to build a facilitative environment for private sector investment and entrepreneurship. Basic infrastructure facilities, such as developed factory sites and business and tourism promotion services, have been provided as well as a range of fiscal incentives. Training programs for local entrepreneurs have been established in order to facilitate labour skills and improve the business management of small businesses.

Most of the private sector activities in Tonga include agricultural farming, fishing companies, manufacturing businesses, construction companies, distributive trade, restaurants and hotels, transport and communication including shipping, airlines and telecommunication companies, and financial services. The performances of these sectors with regards to their contribution to growth in Tonga have been covered in earlier sections.

Despite the effort to promote these sectors, there is evidence that lack of private saving and investment have contributed to the stagnant growth of the economy. There

is potential for development, thus the government should identify the sectors where it has comparative advantage and focus resources there through monitoring with fiscal and/or monetary policy. Recommendations by the ADB (1996) and in the IMF (1997) country report regarding the need for structural reform, particularly the tax system and the privatisation of some government public enterprise were also presented by AIDAB (1991), Sturton (1992), and Soakai (1995).

3.3 Factors Contributing to Growth in Tonga

3.3.1 Investment

Capital accumulation results when some proportion of present income is saved and invested in order to argument future output and income. New factories, machinery, equipment, and material 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. This directly productive investment is supplemented by investment in what is known as social and economic infrastructure – roads, electricity, water and sanitation, communication – which is used for facilitation and integration of economic activities.

Similarly, investment in human resources can improve the quality, and therefore the quantity of capital accumulation has the same or a more powerful effect on production. 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 investment in buildings, equipment, and materials.

Investment is one of the important variables in most of the growth models, as discussed in Chapter Two. However, according to the available statistics and analysis in Section 3.2.2.1 regarding investment in Tonga, this is not so. This variable will be looked at in this study to test its contribution to economic growth in Tonga.

3.3.2 Trade

There are two main channels through which trade policies are generally agreed to affect economic growth. That is outward-oriented trade policies, such as export promotion and trade liberalisation, i.e. the openness of a country to the rest of the world (Black, 1999). Export expansion allows countries to earn foreign exchange, which can promote the importation of advanced capital goods and materials. By increasing exports, it allows the economies to specialise in the production of specific products. By 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.

The performance of Tonga's exports and imports has been covered in Section 3.2.2.2. Their impact on growth has been obviously important, particularly the export of agricultural products. This relationship will also be looked at in this study.

3.3.3 Labour Force

An increase in the labour force of a country has 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. However, in this study, time series data on labour force growth is not available so the population growth rate will be used as a proxy to estimate the equations to analyse the effect on growth.

3.3.4 Foreign Assistance

A lot of studies have looked at the importance of foreign aid to developing countries and its impact on growth. This issue has been discussed in detail in Section 2.4 in Chapter Two. It is also evident in the case of Tonga that the Tongan government relies on foreign assistance for its economic development i.e. Overseas Development

Assistance (ODA) financed about 70-90 percent of the government's annual capital budget, and represents 20-30 percent of its total annual expenditure (EIU, 1997).

Tonga, over the years, has received substantial amount of aid (ODA), amounting to about US\$ 999 million (1995 constant prices), during the period 1970 to 1998. Over 90 percent of this amount has been allocated bilaterally, of which most aid is in grant form, as well as a major portion provided as technical co-operation grants. The major donors of foreign aid to Tonga are Australia, New Zealand and Japan (UNDP, various years). Various multilateral agencies such as Asian Development Bank (ADB), International Monetary Fund (IMF) have also contributed aid to Tonga.

Analysing the aid-growth relationship is important and should be clarified as to how it influences economic growth. These various components of aid: bilateral, multilateral, grant, loan and technical co-operation are used in the regression analysis to estimate the effect of individual aid flow on growth in Tonga.

3.3.5. Tourism Receipts

Tonga's tourism industry is largely underdeveloped. Tourist arrivals are small but have increased steadily in recent years, providing on average US\$3.3 million tourism receipts earning in the 1970s, US\$7.3 million average in the 1980s, and US\$12.8 million in 1996/97 (Tonga Tourism Bureau, various years). The government's firm commitment to tourism development is evidenced by the present plans to prepare a comprehensive National Tourism Plan to guide further development in this sector (Tonga Ministry Finance, 1997). Including the growth in tourism receipts in this analysis to measure its impact on economic growth is crucial for development. The importance and significance of this sector may suggest the area to focus the resources on future development, particularly taking the case of Maldives for example, which has shown the importance of tourism sector in the growth performance of the economy.

Overall the purpose of this research is to identify and examine the key factors that contribute to the economic development and growth of Tonga. Other factors that

should be considered on how they affect economic growth include foreign receipts from private remittances, the impact of inflation rate, government consumption expenditure and government revenue on growth.

3.4 Summary and Conclusion

Tonga is a small island economy, which faces the characteristics of the vulnerability. It has experienced an average performance in the past decade but its overall performance has been erratic. Much of the positive performance has been based on a strong growth in the agricultural sector, particularly squash and vanilla. However there are signs of a narrowing in these niche opportunities, which may be expected to affect the overall growth. This highlights the need for Tonga to continue with its efforts to diversify its economic base by reducing its dependency on few primary agricultural outputs alone.

This concern is also reflected in the balance of payments accounts. Exports have declined since 1993/94, mainly due to the fall in the export of squash. This was accompanied by a general increase in imports resulting in the deterioration of the balance of trade. However, this did not pose a major concern in the past, as there was a stable inflow of external transfers in the form of remittances that financed the substantial trade account deficit. Recently, however, a decline in transfers has been noticed prompting the need to strengthen the export sector, and thus reducing the heavy reliance on external transfers. The next chapter develops a growth model for Tonga, applying the economic theory discussed in Chapter 2 and the issues discussed in this chapter.

CHAPTER 4: Growth Models: An Empirical Investigation

4.1 Introduction

In Chapter Two, theoretical and empirical aspects of economic growth and its proposed determinants have been examined. The determinants of economic growth include such variables as investment, human capital, exports and imports, labour force, inflation, openness to trade, tourism receipts, foreign aid, private remittances, government revenue and government consumption expenditure.

The important question this study seeks to answer is whether or not these determinants of economic growth listed above have had significant impact on Tonga's growth over the past three decades. This chapter aims to explore this relationship further, by developing a growth model explaining the effects of these determinants on the growth pattern of Tonga.

Smith (1776), Malthus (1798) and Ricardo (1817) put forward theories of growth as early as the eighteenth century. Recent decades have seen empirical analysis developed through the Harod-Domar growth model, Solow's neoclassical model and the endogenous growth theories. At the conceptual level, this work follows the study by Black (1998), who developed a growth model for the determinants of growth for New Zealand based on studies by Khan and Reinhart (1990), De Gregorio (1993), Brooks, Maynes and Davidson (1996), and Edwards (1997). The study also utilises the work by Ram (1987) on export-led growth and Gounder (1999) on the aid-growth nexus.

This chapter is organised as follows: Section 4.2 provides concepts and frameworks for modelling the impacts of macroeconomic variables on the Tongan economy's

growth rate. Section 4.3 provides the estimation methods, the hypotheses used in the model, and testing of the validity of the models. In Section 4.4, the sources and limitations of the data employed in the study are discussed and the summary of the chapter is presented in Section 4.5.

4.2 Economic Growth: Empirical Models

This study consists of an econometric analysis of a country-specific study for Tonga, using time series data from 1970/71 to 1997/98. The model is developed based on the more general specification of the neoclassical framework of the Solow model (1956). This specification is extended to include tourism receipts (Sub-section 4.2.1), macro variables (Sub-section 4.2.2) and foreign aid and its various components (Sub-section 4.2.3).

This study for Tonga differs from some earlier studies in several aspects. Firstly, the production function employed includes other variables such as foreign aid and remittances to improve mis-specification of the models. Secondly, the neo-classical model is explained and several macroeconomic variables that have an impact on fiscal behaviour and policy have been used. Thirdly, while it has generally been argued that aid contributes to island economies' growth, no empirical study for Tonga has been undertaken. Thus, this study presents the aid-growth relationship for Tonga. Moreover, aid is also disaggregated into bilateral aid, multilateral aid, grant aid, loan aid, and technical co-operation grants to measure the separate effect of each of these components on Tonga's economic growth. Fourthly, this study focuses on the twenty-eight years of time series data that is available for Tonga.

The specification framework for the econometric analysis is structured in the following form starting from Solow's aggregate production function.

$$Y = Af(K, L, Z) \tag{i}$$

Where Y is the aggregate level of real output, K is the stock of physical capital, L is the labour input, and Z is a vector including other input factors that affect growth.

The variable 'A' measures the productivity of factor inputs. Taking total differentials of both sides with respect to time t , and then dividing both sides by output Y , we obtain the standard specifications of the neoclassical growth equation. This equation (ii) indicates that growth of output is a function of growth in the labour force, ratio of investment to output, and changes in the additional factor input, vector Z . The dot on top of the variable indicates its growth rates over time.

$$\dot{Y} = \beta_0 + \beta_1 \dot{L} + \beta_2 (I/Y) + \beta_3 \dot{Z} + \mu_t \quad (\text{ii})$$

The coefficients of each variable represent the elasticity of output with respect to a percentage change in that variable. Hence, β_1 is the elasticity of output with respect to changes in the labour force, β_2 is the marginal productivity of capital or investment and β_3 is the elasticity of output with respect to changes in factor inputs, such as exports. The constant term (β_0) is assumed to capture the growth in productivity and μ_t represents the error term.

These two equations (i and ii) constitute the basis for the estimate of economic growth in this study. There are two ways that this study will expand the above growth equation. Firstly, by extending vector Z to include performances of the export, tourism, and government sectors, where the effect of export sector on growth is an indicator of the openness of the economy to trade. The tourism sector's impact is important for Tonga as tourism's contribution to GDP has increase over time. The government sector includes the share of government consumption expenditure to GDP (GGC), the ratio of government revenue to GDP (GRY) and changes in price indices (I), to measure the macroeconomic impact of these variables on Tonga's economic growth.

The other expansion of the neoclassical growth model is based on the accumulation of capital as indicated by the investment variable. Investment is financed either domestically through domestic saving or externally through foreign aid, foreign direct investment and an inflow of capital or a combination of any or all of these. Foreign aid and its various components are also extended to measure their impact on growth.

The rest of this section sets out the empirical framework to examine Tonga's growth based on these various extensions.

Ram's (1987) model of export-led growth suggests that a good export performance and outward orientation might lead to a high economic growth rate. This is based on the grounds that in a number of developing countries, the growth of exports and imports have led to the development of infrastructure, transport and communications and growth in some of the service sectors. The impact of the growth in exports on economic growth for Tonga is included in the specification (1a). Ram defined equation (1a) as the neoclassical growth model expanded to exports and non-export sectors (Ram, 1987; Black, 1998; Gounder, 1999). This specification is re-estimated in equation (1b) to include the growth in imports as imports for island economies make up a larger proportion of flow of goods. The specific models take the following form for Tonga:

$$\dot{Y} = \alpha_0 + \alpha_1 \dot{L}f + \alpha_2 (I/Y) + \alpha_3 \dot{X} + \mu_{1t} \quad (1a)$$

$$\dot{Y} = \beta_0 + \beta_1 \dot{L}f + \beta_2 (I/Y) + \beta_3 \dot{M} + \mu_{2t} \quad (1b)$$

Where \dot{Y} is the annual growth rate of GDP

$\dot{L}f$ is the annual growth rate of labour force, proxied by the population growth rate

I/Y is the total investment-output ratio

\dot{X} is the annual growth rate of exports

\dot{M} is the annual growth rate of imports

μ_{1t}, μ_{2t} are the random error terms

It is important to note that exports and imports have not been entered the equation simultaneously to avoid the multicollinearity problem. Multicollinearity in the data and other diagnostic tests, such as serial correlation, normality of the residuals, functional form, heteroscedasticity will be discussed in the next section. As mentioned in the previous chapter, Tonga's geographic isolation and smallness in size had created some socio-economic problems, particularly the vulnerability to external

market forces and natural disasters. Equation (2) includes a dummy variable (DVNG) to capture the effect of these shocks, such as hurricanes, cyclones, earthquake, and price effects on the economy leading to negative growth rates experienced by Tonga. Taking this impact into account using the dummy variable shows the specific equation form:

$$\dot{Y} = \delta_0 + \delta_1 L\dot{f} + \delta_2(I/Y) + \delta_3 \dot{X} + \delta_4 DVNG + \mu_{3t} \quad (2a)$$

$$\dot{Y} = \phi_0 + \phi_1 L\dot{f} + \phi_2(I/Y) + \phi_3 \dot{M} + \phi_4 DVNG + \mu_{4t} \quad (2b)$$

DVNG: is the dummy variable showing the value of 1 for the years Tonga experienced cyclones and other effects, or zero otherwise.

An important contribution in the analysis of the neoclassical model as given by Reinhart and Khan (1990) is the disaggregation of total investment into public sector and private sector investment as a ratio of GDP (see also Black, 1998; Gounder, 1999). Unfortunately for Tonga's case, data for this disaggregation is not available, therefore it has not been included in the model.

4.2.1 Neoclassical Model Extended to include Macro Variables

This section examines the effects of macroeconomic variables, such as government revenue, government expenditure and its components, external debt and financing and monetary variables such as the money supply (M1), the inflation rate and the exchange rate on growth. A key limitation to this study is the unavailability of consistent and continuity of a longer time series data, particularly for the monetary variables.

In the next step, various equations incorporate some of the macroeconomic variables i.e. government consumption expenditure, government revenue, and inflation rate to the neoclassical model of equation (2a) stated above. Maynes, Brooks and Davidson (1996), Edwards (1997), De Gregorio (1993) and Black (1998) have incorporated most of these variables in their respective work to analyse the impact of macroeconomic effects on growth.

Maynes, Brooks and Davidson (1996) suggest that government consumption and government expenditure on education are two of the main government activities that may enhance growth. A similar argument is presented by Black (1998); Ram (1986); Kormendi and Meguire (1985). Maynes, Brooks and Davidson also used a variable OPEN, which is the sum of exports and imports as a ratio of GDP, to measure the openness of the economy. Their results found evidence that openness to trade using the above measure contributed positively to growth. Kormendi and Meguire (1985), Landau (1986), Edwards (1997) and Black (1998) report similar results.

De Gregorio (1993) assesses empirically the relationship between inflation and long-run growth using a group of twelve Latin American countries. He emphasises in his study the effect of inflation on the rate of investment and on the productivity of investment. He argues that inflation affects directly 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).

Equations (3a) to (3g) show several Solow-type neoclassical growth models extended to include macroeconomic variables mentioned above for Tonga. They take the following specific forms:

$$\dot{Y} = \varsigma_0 + \varsigma_1 \dot{L}f + \varsigma_2 (I/Y) + \varsigma_3 \dot{X} + \varsigma_4 GCY + \varsigma_5 DVNG + \mu_{9t} \quad (3a)$$

$$\dot{Y} = \tau_0 + \tau_1 \dot{L}f + \tau_2 (I/Y) + \tau_3 \dot{X} + \tau_4 GCY + \tau_5 I + \tau_6 DVNG + \mu_{10t} \quad (3b)$$

$$\dot{Y} = \upsilon_0 + \upsilon_1 \dot{L}f + \upsilon_2 (I/Y) + \upsilon_3 \dot{X} + \upsilon_4 GRY + \upsilon_5 DVNG + \mu_{11t} \quad (3c)$$

$$\dot{Y} = \omega_0 + \omega_1 \dot{L}f + \omega_2 (I/Y) + \omega_3 \dot{X} + \omega_4 GRY + \omega_5 I + \omega_6 DVNG + \mu_{12t} \quad (3d)$$

$$\dot{Y} = \xi_0 + \xi_1 \dot{L}f + \xi_2 (I/Y) + \xi_3 \dot{X} + \xi_4 GRY + \xi_5 GCY + \xi_6 DVNG + \mu_{13t} \quad (3e)$$

$$\dot{Y} = \rho_0 + \rho_1 \dot{L}f + \rho_2 (I/Y) + \rho_3 OPEN + \rho_4 DVNG + \mu_{14t} \quad (3f)$$

$$\dot{Y} = \vartheta_0 + \vartheta_1 \dot{L}f + \vartheta_2 (I/Y) + \vartheta_3 OPEN + \vartheta_4 GRY + \vartheta_5 GCY + \vartheta_6 DVNG + \mu_{15t} \quad (3g)$$

Regression equation (3a) estimates how the annual growth rate in the labour force ($\dot{L}f$), investment-income ratio (I/Y), annual growth of exports (\dot{X}), ratio of the government consumption to GDP (GCY) and the impact of natural disasters,

represented by the dummy variable (DVNG) affect economic growth. Equation (3b) extends equation (3a) to include the impact of inflation rate on growth. Equation (3c) and (3d) re-estimates equation (3a) and (3b) by substituting the government revenue ratio to GDP for the share of government consumption to GDP. Equation (3e) includes the government revenue to GDP ratio and government consumption to GDP ratio into the model. Annual growth of exports is substituted with openness (OPEN) in equation (3f) and lastly equation (3g) incorporates the government revenue to GDP ratio, government consumption to GDP ratio and openness in the growth model.

Each of the variables incorporated in the model discussed above will indicate how Tonga's economy is affected by these important sectors that contribute to growth. It is important to note that the behaviour of these various effect on the economy may lead to policy implications for Tonga and make necessary adjustments for long-term growth.

4.2.2 Neoclassical Model Extended to include Tourism Receipts

In Chapter 3, evidence has indicated that the tourism sector in Tonga is one of the growing sectors in the economy, together with the fishing industry and agriculture sector. Its contribution to growth is somehow still unclear, as the measure used by the Tonga Statistics Department mixed the value added from tourism with other sectors such as commerce, hotels and restaurants in the by industry GDP, in the national account.

Black (1998) reported in her study of the determinants of growth in New Zealand that research by the World Travel and Tourism Council (WTTC) showed that tourism is becoming one of the world's largest industries. Her empirical results support this statement, as the coefficient of tourism receipts was the highest that contributed positively to New Zealand's economic growth. Since New Zealand, together with Australia, are Tonga's main trading partners, both in goods and services, it is applicable to include tourism receipts in the growth model and test for its impact on the economy's growth.

Equation (4a) shows the neoclassical growth model extended to include the growth in tourism receipts (TR) and equation (4b) re-estimates the growth equation by substituting exports by imports. These equations are:

$$\dot{Y} = \sigma_0 + \sigma_1 L\dot{f} + \sigma_2(I/Y) + \sigma_3\dot{X} + \sigma_4 TR + \sigma_5 DVNG + \mu_{5t} \quad (4a)$$

$$\dot{Y} = \varsigma_0 + \varsigma_1 L\dot{f} + \varsigma_2(I/Y) + \varsigma_3\dot{M} + \varsigma_4 TR + \varsigma_5 DVNG + \mu_{6t} \quad (4b)$$

TR is the growth rate of tourism receipts

4.2.3 Neoclassical Model Extended to include Foreign Aid and Private Remittances

In the next step, foreign aid is included in the growth model, as Tonga like other island economies relies on aid flows to meet most of its resource needs. To measure the impact of aid on growth is necessary, as no empirical study has been undertaken to indicate its relationship in Tonga. Hence the next set of equations extend the neoclassical growth model to include foreign aid and its various components. The literature on the Aid-Growth nexus has been covered in Chapter Two. It was apparent that for most small island countries, foreign aid has become virtually the only source of external financing and represents a significant part of their national income (Gounder, 1999). Following Gounder's work on the aid-growth nexus using Fiji as a case study, the following regression models are used in this study to measure the impact for Tonga.

These equations take the following specific form to show the aid-growth relationship:

$$\dot{Y} = \varphi_0 + \varphi_1 L\dot{f} + \varphi_2\dot{X} + \varphi_3(I/Y) + \varphi_4 ODAY + \varphi_5 DVNG + \mu_{16t} \quad (5a)$$

$$\dot{Y} = \eta_0 + \eta_1 L\dot{f} + \eta_2\dot{X} + \eta_3(I/Y) + \eta_4 BAY + \eta_5 MAY + \eta_6 FDIY + \eta_7 DVNG + \mu_{18t} \quad (5b)$$

$$\dot{Y} = \kappa_0 + \kappa_1 L\dot{f} + \kappa_2\dot{X} + \kappa_3(I/Y) + \kappa_4 LOANY + \kappa_5 GRATY + \kappa_6 DVNG + \mu_{19t} \quad (5c)$$

$$\dot{Y} = \lambda_0 + \lambda_1 L\dot{f} + \lambda_2\dot{X} + \lambda_3(I/Y) + \lambda_4 LOANY + \lambda_5 TCY + \lambda_6 DVNG + \mu_{20t} \quad (5d)$$

where ODAY is the overseas development assistance-output ratio; FDIY is foreign direct investment-output ratio; \dot{X} is the annual growth rate of exports; BAY is the ratio of bilateral aid to GDP; MAY is the ratio of multilateral aid to GDP; LOANY is the ratio of loan aid to GDP; GRATY is the ratio of grant aid to GDP; and TCY is the ratio of technical co-operation grant to GDP.

Equation (5a) incorporates total aid flows to Tonga as a ratio of GDP (ODAY) into the production function model. In equation (5b) to (5d), ODA is disaggregated into bilateral, multilateral, grant, loan and technical co-operation grants to determine their various impacts on growth.

Another important feature of small island economies are their reliance on private remittances from locals residing overseas for financing household consumption, such as the construction of housing, consumption of food products, etc. The model on foreign aid is expanded in equation (6a) to include the private remittances ratio to GDP (PRY), which is as follows:

$$\dot{Y} = v_0 + v_1 L\dot{f} + v_2 \dot{X} + v_3 ODAY + v_4 FDIY + v_5 PRY + v_6 DVNG + \mu_{21t} \quad (6a)$$

$$\dot{Y} = \chi_0 + \chi_1 L\dot{f} + \chi_2 \dot{M} + \chi_3 ODAY + \chi_4 FDIY + \chi_5 PRY + \chi_6 DVNG + \mu_{22t} \quad (6b)$$

The next section outlined the tests and estimation procedures used in this study. It is important to discuss the econometric estimation used in detail, as this is the main essence of the research and an area that can be further developed in future studies.

4.3 Estimation Procedures

The next step in the development of the macroeconometric growth model for Tonga is the selection of the estimation methods, and the required criteria that will be used to evaluate the goodness of fit and properties of the model. Since the model involves using time series data, the methodology used applies time series procedures to avoid spurious correlation in the regression analysis. Spurious regression results arise when the regression variables suffer nonstationary or have a different integrated order, which is common in time series and cross-country data (Gujarati, 1995). In these

cases many studies suggest that cointegration techniques, formally introduced by Granger (1981), are implemented to avoid the problem (Gounder, 1999). This means that despite being individually nonstationary, a linear combination of two or more time series can be stationary thus, suggesting a long-run relationship between the variables.

This analysis utilises the finite Auto Regressive Distributed Lag (ARDL) method of cointegration advanced by Pesaran *et al.* (1996a), and Pesaran and Shin (1995a) to examine for the short and long-term relationships between economic growth and its proposed determinants. In line with the standard practice in modern time series econometrics, the estimation process begins by testing for the time series properties of the data using the augmented Dickey-Fuller (ADF) test. For detailed discussions on these issues see Gounder (1999). A key advantage of the ARDL procedure over other cointegration methodologies as stated by Pesaran is that it avoids the requirements of pre-testing the classification order of integration i.e. irrespective of whether the variables under consideration are integrated of order one ($I(1)$) or integrated of order zero ($I(0)$). In addition, this method avoids the problems of serial correlation that arise in the use of residual-based cointegration by an appropriate augmentation (Black, 1998).

Pesaran and Pesaran (1997, p.304) outlines two steps for the ARDL methodology. Firstly, compute the F-statistic, which tests the existence of a long-run relationship between the dependent and explanatory variables under investigation. The F-statistic test looks at how significant are the lagged levels of the variables in the error correction form of the underlying ARDL model. The null hypothesis for testing the F-statistic is that the coefficients of these level variables are zero (i.e. there is no long-run relationship between them). This is denoted by $H_0 = \delta_1 = \delta_2 = \delta_3 = 0$, which has a non-standard distribution irrespective of whether the regressors are $I(0)$ or $I(1)$.

Pesaran *et al.* (1996a) have also tabulated the appropriate critical values for different numbers of regressors (k), 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 of $I(1)$, and the other computed assuming all the variables are

I(0). This table provides the critical values for each application, the band covered all the possible classifications of the variables into I(0) and I(1), 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), or fractionally integrated. If the computed statistic falls within the critical value band, the result of the inference is inconclusive and depends on whether the underlying variables are I(0) or I(1). For details see Pesaran and Pesaran (1997).

The second stage of the ARDL procedure is to estimate the coefficients for the short and long run relationships and make inferences about their values. The ARDL estimates of the coefficient are selected based on Schwarz Bayesian Criterion and R-BAR Squared Criterion. Additionally, the goodness of fit criteria and properties of the model are given in the diagnostic tests, which consisted of the Lagrange multiplier test of residual serial correlation, Ramsey's RESET test for functional form, normality of the residuals based on test of skewness and kurtosis, structural stability and heteroscedasticity.

4.4 Sources of Data

The study employs twenty-eight observations of annual time series data for the Kingdom of Tonga covering the period 1970/71 to 1997/98. Most of the data were obtained from three sources, namely, Tonga Statistics Department and Ministry of Finance, various issues of the Asian Development Bank (ADB) *Key Indicators of Developing Asian and Pacific Countries*, and the Organisation for Economic Co-operation and Development (OECD) *Geographical Distribution of Financial Flow to Developing Countries*. A key limitation to this analysis is the lack of consistency and continuity data sets over time for various variables, hence the three sources mentioned above are used simultaneously in order to create a complete data set for the required period 1970/71-1997/98. All data have been thoroughly checked and the variables are converted from nominal Tongan Pa'anga to US\$ currency at 1995 constant prices. The exchange rate of Tongan pa'anga to U.S dollar is computed and an adjustment

factor based on the consumer price indices with Base year 1995 = 100 is employed for this conversion.

Various notes on the data used and their sources are clarified here. Models in this study are estimated using the growth in annual Gross Domestic Product (GDP) as the dependent variable, representing growth in the output or income level in Tonga. GDP portrays the total market value of goods and services produced in Tonga after deducting the cost of goods and services utilised in the process of production. Gross Fixed Capital Formation (GFCF) measuring the level of investment in the economy is employed in the study as a ratio to GDP. This is given as the Total Investment-Income ratio (I/Y) in the regression analysis. The discomposition of investment to its public and private components is not employed in the study due to unavailability of data. These two variables, GDP and GFCF, are obtained from the Tonga Statistics Department National Accounts (1999).

Data for Tonga's labour force is only available in five-year periods, therefore population growth is used to measure the impact of human capital on growth. Inflation (I) was measured using the annual percentage change in the consumer price index (CPI). These two variables, population growth and inflation rate are also obtained from the Tonga Statistics Department.

Exports (X), imports (M), foreign direct investment (FDI) and private remittances have been obtained from the Balance of Payment Accounts, Tonga Statistics Department (1999). Exports are valued free on board (FOB) whereas imports on cost including insurance and freight (CIF). Private remittances are a component of current transfers, in the current accounts. The variable OPEN, which measures the openness of the economy to trade, is derived as the sum of exports and imports to GDP ratio. The data are compiled from the Tonga Statistics Department (1999).

The government consumption expenditure (GC) and government revenue (GR) data were obtained from Tonga Ministry of Finance Budget Statement and the Annual Audited Public Accounts (from various issues). Tourism Receipts (TR) data on the

other hand, was collected from the Tonga Tourism Bureau annual report from various editions. These variables are measure as a ratio of GDP in the regression analysis.

Data on foreign aid (ODA) and its various components: multilateral, bilateral, loan, grant aid and technical co-operation is obtained from OECD's *Geographical Distribution of Financial Flow to Developing Countries*. Other sources of aid inflow are from Tonga's Balance of Payment (BOP) accounts. Aid inflows equal the sum of official transfers (current account) and medium and long term transfers (capital account). Due to inconsistency throughout the time series period in the secondary sources such as Tonga's BOP, data from OECD report is used in the analysis for the earlier period.

A dummy variable (DVNG) is used as an estimation of the impact of natural disasters such as hurricane, cyclone, and earthquake, and economic shocks in Tonga, which takes 1 for the year Tonga experienced negative growth, or zero otherwise.

4.5 Summary and Conclusion

This chapter presents the modelling framework, estimation procedures and data employed to measure the determinants of growth in Tonga. The growth model is developed based on the more general specification of Solow-type neoclassical growth model. This specification is then further extended to incorporate foreign aid and macroeconomic variables. The proposed determinants of growth as discussed in previous chapters such as investment, labour force growth and exports are tested in this study to analyse their effects on Tonga's economic growth. Additional determinants of growth such as imports, tourism receipts, government consumption expenditure, government revenue, the inflation rate, foreign aid and private remittances are also tested to analyse each specific variable's impact on growth.

Many estimation methods and statistical test procedures have been undertaken and discussed which deal with the analysis of time series data. Such procedures are needed in order to overcome the problems of spurious regressions common in time

series data. This study utilises the finite ARDL estimation to examine empirically for the short and long-term relationships between economic growth and its proposed determinants, listed above. This method avoids the spurious correlation in the regression analysis that arise in the used of residual-based cointegration by an appropriate augmentation. The empirical results for each of the regression equations discussed here, together with their implications for Tonga will be reported in the following chapter.

CHAPTER 5: Empirical Results for Tonga's Growth Model

5.1 Introduction

This chapter presents the empirical results for the Solow-type neoclassical production function, utilised to determine the factors that influence economic growth in Tonga, for the period 1970 to 1998. Previous chapters have examined and listed these proposed determinants of growth and some of the macroeconomic variables used in this analysis. The econometric package employed in this study is Microfit Version 4 (Pesaran and Pesaran, 1997). The estimation method of finite Auto Regressive Distributed Lag (ARDL) has been employed to examine the short and long-term relationships between economic growth and its proposed determinants. Since the ARDL method avoids the pre-testing requirement for the stationary properties of the data, the F-test is applied to test for the existence of a long-run relationship between the dependent and the explanatory variables. Based on this methodology, the results reported in this chapter are not spurious and the model diagnostics are not subject to any problems of serial correlation, functional form, normality of the residual, structural instability and heteroscedasticity.

This chapter is constructed as follows: Section 5.2 presents the empirical results for Tonga's growth model together with the validity test of each model. Section 5.3 discusses some of the policy implication arising from the results. Finally, Section 5.4 provides the conclusion for this chapter.

5.2 Empirical Results for Tonga's Growth Models

In this econometric analysis the testing and estimation procedure advanced in Pesaran and Pesaran (1997) is employed to examine the relationship between the proposed determinants of growth and economic growth in Tonga for the period 1970 to 1998. The first step of the analysis was the computation of the F-statistic for each regression equation. This is needed in order to test the significance of the lagged levels of the variables in the error correction form of the underlying ARDL modelling procedure. The results of the F-statistic tests are shown in Table 5.1, together with the critical values for a different number of regressors as tabulated by Pesaran and Pesaran (1997).

Table 5.1 indicate that 15 of the regression equations passed the F-statistic test, meaning that the null hypothesis of "no long-run relationship" between the proposed variables can be rejected, irrespective of the order of their integration for each equation. Seven equations show a long-run relationship at the 99% critical level, three equations passed at the 90% critical level and five at the 95% level of significance. These are indicated by the *, ** or *** signs beside the F-statistic value in Table 5.1.

The next step of the analysis is the estimation and interpretation of the model coefficients with their respective validity test. A complete description of the variables employed in the study is presented in Appendix A. Before presenting the results it is appropriate to present the graphical representation of each variable used in this study. This is presented in Appendix B. These figures give us a fair idea of the behaviour of various variables and the coefficients estimated for each regression equation. The variables employed in this study have been discussed in Chapters 3 and 4.

The empirical results of the growth models using the ARDL estimator have been organised into five sub-sections. The first sub-section presents the results for the standard neoclassical model, which employs population growth (L_f), the investment-output ratio (I/Y) and the annual growth in exports (X) to explain growth. This is further re-estimated to substitute imports (M) for exports and then extended to include a dummy

variable (DVNG), which measures the impact of natural disasters and economic shocks on growth. The second sub-section discusses the addition of tourism receipts (TR) to the neoclassical growth model. The third sub-section incorporates government consumption (GGC), government revenue (GRY) and the inflation rate (I). The fourth sub-section incorporates foreign aid assistance (ODAY) and its various components in the model; and lastly the growth model includes private remittances (PRY) in the fifth sub-section.

Table 5.1. Testing the existence of a long-run relationship: critical value bounds of the F-statistic

Equation	K: degrees of freedom	Critical Value Band at 99% level Intercept and no trend		F-statistic Test	Pass/Fail at various critical level
		I(0)	I(1)		
Eqn. (1a)	3	4.385	5.615	4.3852**	PASS**
Eqn. (1b)	3	4.385	5.615	8.3152***	PASS***
Eqn. (2a)	4	3.817	5.122	4.3452**	PASS**
Eqn. (2b)	4	3.817	5.122	8.3152***	PASS***
Eqn. (3a)	5	3.516	4.781	2.3661*	PASS*
Eqn. (3b)	6	3.267	4.540	9.6458***	PASS***
Eqn. (3c)	5	3.516	4.781	8.1400***	PASS***
Eqn. (3d)	6	3.267	4.540	20.1318***	PASS***
Eqn. (3e)	6	3.267	4.540	8.7860***	PASS***
Eqn. (3f)	4	3.817	5.122	4.9335**	PASS**
Eqn. (3g)	6	3.267	4.540	0.0614	FAIL
Eqn. (4a)	5	3.516	4.781	2.2367	FAIL
Eqn. (4b)	5	3.516	4.781	4.4062**	PASS**
Eqn. (5a)	5	3.516	4.781	4.0249**	PASS**
Eqn. (5b)	7	3.027	4.296	16.2264***	PASS***
Eqn. (5c)	6	3.267	4.540	1.6049	FAIL
Eqn. (5d)	6	3.267	4.540	0.5088	FAIL
Eqn. (6a)	6	3.267	4.540	2.7621*	PASS*
Eqn. (6b)	6	3.267	4.540	2.3622*	PASS*

Note: F-test at various significance level, where ***, **, * represents passing the F-test at the 99% level, 95% level and 90% level, respectively.

5.2.1 Neoclassical Model

This section reports the results for four equations (1a), (1b), (2a), and (2b) respectively, for the base growth model, substituting imports for exports and including the dummy variable. This is presented in Table 5.2 below. With the exception of regression model (1a), all equations have a relatively high explanatory power in terms of the adjusted R^2 values ranging between 48 percent to 71 percent, and the specifications F-statistics are statistically significant at the one percent level for all four equations. The model diagnostic tests of serial correlation (SC), functional form (FF), normality of the residuals (Norm) and heteroscedasticity (H) are not subject to any concern. The results for F tests reported in Table 5.1 assert that equations (1b) and (2b) have long-run relationships between the dependent variable and the explanatory variables at the one percent critical level, and equations (1a) and (2a) have long-run relationships between the variables at the five percent level. The interpretation of each equation will, therefore, include a discussion of the long-run effect on growth, as estimated for all equations.

The goodness of fit test as indicated by the estimated value of adjusted R^2 , shows that the neoclassical production function specification (1a) explains about 18 percent of the variation, however the F-statistic is statistically significant at the ten percent critical level. The total factor productivity, as represented by the constant term, is positive but not significant. In terms of the short-run relationship, the growth in labour force ($L\dot{f}$) coefficient as represented by the growth rate of population is positive and significant at the ten percent level. The annual growth of exports obtains a positive coefficient of 0.13 and is significantly different from zero at the five percent level. The export coefficient represents the elasticity of output to changes in exports, which implies a 0.13 percent increase in economic growth due to a one percentage change in exports. This result supports the view by the ADB (1996), IMF (1997), AIDAB (1991) and Sturton (1992) that growth in the Tongan economy is responsive to the output of the export sector, thus recommends diversification in export-oriented productive sectors.

On the other hand, the investment-output ratio in equation (1a) is the only variable in this specification with a negative coefficient. The investment coefficient is negative, however it is not significant. This coefficient represents the marginal productivity of capital, thus the results of this specification indicate a declining investment sector in Tonga. The long-run relationship indicates the same impact on growth as the short run result. Note that the negative coefficient of the investment-output ratio differs from the theory of the neoclassical growth model in the case of Tonga. The reason for this outcome can be explained by the fact that the investment-output ratio has not grown at the faster level required to contribute to growth in Tonga. See the trend of the investment-output ratio (Appendix B: Figure E), which gives some indication as to why the sign of investment-output ratio coefficient obtained is negative.

The trend indicates a rapid increase in investment-output ratio in the late 1970s to 1981/82 but then it falls and continues to decline. The increase in investment ratio in the later years reflects the change in government policies to encourage the manufacturing sector that had taken place in the Small Industry Centre (SIC) and the establishment of the Tonga Development Bank to accommodate agricultural investments. However, this boost in investment was only temporary and may reflect the inefficiency of allocating resources to the non-productive sector of the economy. The other reason that contributes to the decline in this sector is that Tonga is not able to attract investment which stems from low domestic savings, balance of payment deficits and an erratic inflation rate. The government operates a large public enterprise sector that crowds out investment opportunities and hinders the expansion of private sector investment. Another factor is the inefficient allocation of resources due to private and public sector investment being directed into inappropriate areas thus the reliance on government subsidies may be relatively high. It is not possible to identify the cause of this negative relationship by separating investment into its private and public sector components because the necessary disaggregated investment data is not available for Tonga. Nevertheless, the government should adopt measures that promote investment and identify productive sectors where there is a comparative advantage. This is in line with the reports of AIDAB (1991), ADB

(1996), and IMF (1997) that emphasise the importance of promoting domestic investment, which may also result into foreign investment.

Equation (1b), which substitutes imports for exports in the neoclassical growth model in equation (1a) records a much improved fit to the data recording an adjusted R^2 value of 48 percent and the F-statistic is statistically significant at the one percent level. The total factor productivity is positive but not significant. The short-run effect of the explanatory variables on growth show similar outcomes to the result discussed for the specification with exports. Labour force and investment coefficients are negative but not significant. The growth in imports has a much stronger contribution to growth when compared to exports. The coefficient estimated is 0.38 and it is significant at the one percent level.

In the long-run specification, growth in imports is the only variable that contributes significantly to growth at the one percent level. It has a coefficient of 0.29, which implies that a one percent growth in imports increases economic growth by 0.29 percent. The growth in labour force has a positive sign in the long run but investment's share to GDP is negative. However, neither of these coefficients are significant. The rapid increase in the growth of imports compared to exports reflects the high level of domestic demand, supported by the high level of foreign transfers, especially private remittances (Sturton, 1992). Sturton (1992) notes that this has encouraged investment in activities oriented toward the home market (non-traded goods) and discouraged production for export.

The insignificance of the labour force coefficient can also be explained by the low population growth rate in the past years (Tonga Statistics Department, 1996). Also high rates of migration to neighbouring developed nations especially that of skilled labour searching for a better life may have contributed to the insignificance of the labour force coefficient. The rest of the discussion will not cover the effect of population growth unless any significant changes in the result have occurred when estimated with other macroeconomic variables. The significance of the labour force coefficient in equation

(1a) is associated with the export sector, whereas labour force does not relate to import flows, thus this coefficient is insignificant in both the equations (1a) and (1b).

The next equation (2a) is an extension of the neoclassical model to measure the impact of natural disasters and economic shocks on growth in Tonga. This is represented by the dummy variable, DVNG. The adjusted R^2 value for this equation has increased as compared to equation (1a), to explain 70 percent of the variation and the F-statistic is significant at the one percent level. The total factor productivity is positive, however not significant. The short-run dummy variable coefficient is negative and significant at the one percent level. This implies that natural disasters heavily hinder growth of the economy. As the variable also takes into account changes in the global economy such as price shocks, this is also reflected in the negative coefficient of the dummy variable of -16.78. The share of investment to GDP is positive, however it is not significant. Growth in exports is positive and significant at the ten percent level.

The long-run relationships appear to record similar effects for the explanatory variables as in the short-run effects. The adverse effects of natural disasters and economic shocks (DVNG) indicate a negative coefficient and is significant at the one percent level. Thus the effect of natural disasters and economic shocks leads to a decline of about 17 percent in growth. The long run growth in exports contributes positively and significant at the ten percent level. Thus a one percent increase in exports lead to a 0.06 percent increase in growth.

Equation (2b) includes the dummy variable but substitutes growth in imports for exports. This equation explains about 71 percent of the variation in the data and the F-statistic is significant at the one percent level. The total factor productivity is positive but not significant. The estimation of the short-run relationship indicates that the growth in imports is positive and significant at the five percent level. The significance of the import variable suggests that Tonga relies on imports to meet its resource needs that contribute to growth. The dummy variable has a negative impact in the short and long run and it is significant at the one percent level. The long run coefficient of the dummy

variable of -13.42 indicates an adverse effect on economic growth declining by 13.42 percent if any natural disasters struck or global economic shocks occur. Investment share to GDP is positive in the long run, however the coefficient is not significant.

Table 5.2. Empirical Results for Tonga's Growth Model: Neoclassical Model 1970-1998

Neoclassical Growth Model: $GY = f(L\dot{f}, (I/Y), \dot{X})$

$$(1.a) \quad GY = 6.75 + 3.44 L\dot{f} - 0.40 (I/Y) + 0.13 \dot{X}_t + 0.10 \dot{X}_{t-1}$$

(0.90) (1.75)* (1.19) (2.19)** (1.55)

Adjusted $R^2 = 0.18$; $F_{(4,22)} = 2.42^*$; D.W = 1.71

Diagnostic Tests: $SC\chi^2(1) = 0.39$; $FF\chi^2(1) = 0.88E-3$; $Norm\chi^2(2) = 2.62$; $H\chi^2(1) = 0.82$

Long Run Coefficients: $GY = 3.44 L\dot{f} - 0.40 (I/Y) + 0.23 X$

(1.75)* (1.19) (2.27)**

Neoclassical Growth Model with Imports

$$(1.b) \quad GY = 4.85 + 2.07 L\dot{f} - 1.59 (I/Y)_t + 1.28 (I/Y)_{t-1} + 0.38 \dot{M}_t - 0.09 \dot{M}_{t-1}$$

(0.76) (1.33) (2.43)** (1.87)* (4.64)*** (1.22)

Adjusted $R^2 = 0.48$; $F_{(5,21)} = 5.73^{***}$; D.W = 2.11

Diagnostic Tests: $SC\chi^2(1) = 0.16$; $FF\chi^2(1) = 2.60$; $Norm\chi^2(2) = 1.12$; $H\chi^2(1) = 0.08$

Long Run Coefficients: $GY = 2.07 L\dot{f} - 0.31 (I/Y) + 0.29 \dot{M}_t$

(1.33) (1.06) (2.81)***

Neoclassical Growth Model with Exports and the Dummy Variable

$$(2.a) \quad GY = 5.54 - 0.25 L\dot{f} + 0.11 (I/Y) + 0.06 \dot{X}_t - 16.78 DVNG$$

(1.22) (0.20) (0.51) (1.67)* (6.62)***

Adjusted $R^2 = 0.70$; $F_{(4,22)} = 15.86^{***}$; D.W = 1.87

Diagnostic Tests: $SC\chi^2(1) = 0.07$; $FF\chi^2(1) = 0.03$; $Norm\chi^2(2) = 0.93$; $H\chi^2(1) = 1.44$

Long Run Coefficients: $GY = -0.25 L\dot{f} + 0.11 (I/Y) + 0.06 \dot{X}_t - 16.78 DVNG$

(0.20) (0.51) (1.67)* (6.62)***

Neoclassical Growth Model with Imports and the Dummy Variable:

$$(2.b) \quad GY = 4.33 - 0.01 L\dot{f} - 0.7 (I/Y)_t + 0.78 (I/Y)_{t-1} + 0.17 \dot{M}_t - 0.08 \dot{M}_{t-1} - 13.42 DVNG$$

(0.91) (0.01) (1.32) (1.48) (2.19)** (1.41) (4.28)***

Adjusted $R^2 = 0.71$; $F_{(6,20)} = 11.76^{***}$; D.W = 2.06

Diagnostic Tests: $SC\chi^2(1) = 0.04$; $FF\chi^2(1) = 0.41$; $Norm\chi^2(2) = 1.60$; $H\chi^2(1) = 2.01$

Long Run Coefficients: $GY = -0.013 L\dot{f} + 0.08 (I/Y)_t + 0.09 \dot{M}_t - 13.42 DVNG$

(0.01) (0.34) (1.04) (4.28)***

Note: significance level as follows: ***=1%, **=5%, *=10%. t ratios in brackets. Adjusted R^2 is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroscedasticity. Significance level of $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$ at the 1 percent level.

5.2.2 Neoclassical Model Extended to Include Macroeconomic Variables

This section reports the results of the neoclassical production models that incorporate macroeconomic variables to explain growth, such as government consumption to GDP ratio (GCY), government revenue as a ratio of GDP (GRY), openness to trade (OPEN) and the inflation rate (I) as variables in the expanded versions of the neoclassical model. Since the dummy variable (DVNG) affects growth in the previous results, it is appropriate to include it in all the growth equations. The results are summarised in Table 5.3, 5.4 and 5.5.

Overall, all equations have a relatively high explanatory power, with the adjusted R^2 values ranging between 72 to 80 percent, and the model diagnostic tests of serial correlation, functional form, normality of the residuals and heteroscedasticity are not subject to any concern. The F-statistic reported in Table 5.1 indicates that there exists a long-run relationship in all equations that pass the test at the one percent level with the exception of equation (3a), which has long-run relationships between the variables at the ten percent significance level.

The first equation (3a) extends the neoclassical growth equation to measure the impact of the government consumption to GDP ratio (GCY) on economic growth. The specification adjusted R^2 value indicates a relatively good fit to the data explaining 73 percent of the variation and the F-statistic is significant at the one percent level. The short-run estimated coefficients indicate that the government consumption share to GDP coefficient is negative and significant at the ten percent level. This is in line with the 'supply side' theory that growth in government consumption spending as a proportion of output yields a negative coefficient (Kormendi and Meguire, 1985). The study by Landau (1986) on the impact of government expenditure, revenue raising and regulations on economic growth in 96 "Less Developed Countries" also found a negative relationship between the share of government consumption to GDP and growth. The impact of the GCY's negative coefficient supports the concern by the ADB (1996) and the IMF (1997) of the distorting consequences arises from Tonga's large public sector. The reports point

out that increases in government expenditures necessitate increased taxes and greater public sector borrowing to maintain fiscal balance, thus consequently hinder growth of the economy. Sturton (1992) and AIDAB (1991) also suggest similar views of government consumption expenditures. The other domestic resources in the economy L_f^* , \dot{X}_t , (I/Y) are positive, however only exports contribute to growth.

In terms of the long run relationships, only the coefficient of the growth in exports is positive and significant at the five percent level. The impact of natural disasters and economic shocks is negative and significant at the one percent level, indicating about 16 percent decline in growth.

The second equation (3b) introduces the impact of inflation on Tonga's economic growth. The adjusted R^2 value explains 72 percent of the variation in the data and the F-statistic is significant at the one percent level. The short run relationship shows that growth in exports and the dummy variable, DVNG, are the only variables with significant effects on growth. The growth in exports is positive and significant at the five percent level and the impact of natural disasters and economic shocks (DVNG) is negative and significant at the one percent level. The inflation coefficient is positive that provides evidence against Stockman's (1981) hypothesis that higher anticipated inflation reduces economic activity (cited in Kormendi and Meguire, 1985). Nevertheless the result is not significant, suggesting that changes in the price level does not affect growth significantly.

The long-run relationships indicate similar result to the specification without the inflation variable i.e. equation (3a), where growth in exports has positive contribution to growth at the five percent level and the dummy variable coefficient has the expected sign and remains significant at the one percent level.

**Table 5.3 Empirical Results for Tonga's Macroeconomic Growth Relationship:
The impact of Government Consumption to GDP Ratio, 1970 to 1998**

Model Extended to include Macroeconomic Variables: government consumption to GDP ratio (GCY),

$$(3a) \quad GY = -0.40 + 0.11 \dot{L}\dot{f} - 0.5 (I/Y)_t + 0.73 (I/Y)_{t-1} + 0.10 \dot{X}_t + 0.06 \dot{X}_{t-1} - 1.14 GCY_t \\ (0.02) \quad (0.09) \quad (1.01) \quad (1.51) \quad (2.33)** \quad (1.53) \quad (1.69)* \\ + 1.3 GCY_{t-1} - 15.6 DVNG \\ (1.66) \quad (6.25)***$$

Adjusted $R^2 = 0.73$; $F_{(8,18)} = 9.76***$; D.W = 1.96

Diagnostic Tests: $SC\chi^2(1) = 0.01$; $FF\chi^2(1) = 3.14$; $Norm\chi^2(2) = 1.83$; $H\chi^2(1) = 1.84$.

Long Run Coefficients:

$$GY = 0.11 \dot{L}\dot{f} + 0.23 (I/Y) + 0.16 \dot{X}_t + 0.16 GCY_t - 15.59 DVNG \\ (0.09) \quad (0.68) \quad (2.21)** \quad (0.17) \quad (6.25)***$$

Model Extended to include Macroeconomic Variables: government consumption to GDP ratio (GCY) and inflation rate (I)

$$(3b) \quad GY = -8.82 + 0.13 \dot{L}\dot{f} - 0.49 (I/Y)_t + 0.77 (I/Y)_{t-1} + 0.10 \dot{X}_t + 0.07 \dot{X}_{t-1} - 0.91 GCY_t \\ (0.37) \quad (0.10) \quad (0.96) \quad (1.56) \quad (2.37)** \quad (1.63) \quad (1.23) \\ + 1.45 GCY_{t-1} + 0.16 I - 16.71 DVNG \\ (1.77)* \quad (0.75) \quad (6.25)***$$

Adjusted $R^2 = 0.72$; $F_{(9,17)} = 8.53***$; D.W = 1.94

Diagnostic Tests: $SC\chi^2(1) = 0.02$; $FF\chi^2(1) = 2.26$; $Norm\chi^2(2) = 1.42$; $H\chi^2(1) = 1.52$

Long Run Coefficients:

$$GY = 0.13 \dot{L}\dot{f} + 0.28 (I/Y) + 0.17 \dot{X}_t + 0.53 GCY_t + 0.16 I - 16.71 DVNG \\ (0.10) \quad (0.81) \quad (2.28)** \quad (0.51) \quad (0.75) \quad (5.70)***$$

Note: significance level as follows: ***=1%, **=5%, *=10%. t ratios in brackets. Adjusted R^2 is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroscedasticity. Significance level of $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$ at the 1 percent level.

Table 5.4 reported the model extended to measure the impact of government revenue share to GDP (GRY) on Tonga's economic growth, which provides a good fit to the data with an adjusted R^2 value of 0.72 and the F-statistic is significant at the one percent level. The short-run coefficient indicates that the government revenue share to GDP is negative, however it is not significant. Landau (1986) reports in his study that negative coefficient for GRY can partly be due to the need to raise revenue to finance the government expenditure. Tonga has traditionally adopted a cautious balance budget approach towards the conduct of fiscal and monetary policy, which had served well in achieving

domestic financial stability. However, marked increases in government expenditure particularly after 1989 have put pressure on the government to raise domestic revenue (AIDAB, 1991; ADB, 1996; IMF, 1997).

In terms of the long-run relationships, the growth in exports is the only variable that contributes positively to economic growth and it is significant at the ten percent level. The share of investment to GDP although positive does not contribute to growth. This supports the ADB (1996) report, which asserts that the decline in the traditional exports in the 1980s coincided with the push by the government to encourage the development of the manufacturing sector by offering a range of tax and duty incentives. After a period of promising growth, the two main export factories producing knitwear and leather garments close down in 1993/94 and the manufacturing sector shifted its focus from export-oriented activities to import-substitution production. This reasoning supports the results of the decline in the investment sector in Tonga and the weakening of the export sector, as shown by the estimated coefficient of these variables.

The fourth equation (3d) includes a combination of inflation with the share of government revenue to GDP. The adjusted R^2 value is quite high at 0.72 and the F-statistic is significant at the one percent level. The total factor productivity has increased to a value of 30.14 and is significant at the five percent level. The short-run estimated coefficients of the explanatory variables show similar effects on growth as that of the previous specification without the inflation rate variable i.e (3c).

However, the long run relationships show some interesting results. The investment-output ratio coefficient is positive and significant at the ten percent level and may reflect the high demand in the domestic market, which increases investment on import substitution activities (Sturton, 1992). The growth in exports coefficient is positive and significant at the five percent level. The sign of inflation coefficient is positive, however it is not significant. Natural disasters and economic shocks have an adverse effect on the economy's growth rate.

**Table 5.4. Empirical Results for Tonga's Macroeconomic Growth Relationship:
The impact of Government Revenue to GDP Ratio 1970 to 1998**

Model Extended to include Macroeconomic Variables: government revenue to GDP ratio (GRY)

$$(3c) \quad GY = 18.25 - 0.58 \dot{L}f_t - 0.24 (I/Y)_t + 0.66 (I/Y)_{t-1} + 0.09 \dot{X}_t + 0.04 \dot{X}_{t-1} - 0.66 GRY_t$$

(1.75)* (0.41) (0.51) (1.35) (2.17)** (1.01) (1.63)

$$- 16.61 DVNG$$

(6.52)***

Adjusted $R^2 = 0.72$; $F_{(7,19)} = 10.43***$; $D.W = 2.04$

Diagnostic Tests: $SC\chi^2(1) = 0.02$; $FF\chi^2(1) = 0.85$; $Norm\chi^2(2) = 1.15$; $H\chi^2(1) = 0.18$

Long Run Coefficients:

$$GY = - 0.58 \dot{L}f_t + 0.42 (I/Y) + 0.13 \dot{X}_t - 0.66 GRY_t - 16.61 DVNG$$

(0.41) (1.57) (1.88)* (1.63) (6.52)***

Model Extended to include Macroeconomic Variables: government revenue to GDP ratio (GRY) and inflation rate (I)

$$(3d) \quad GY = 30.14 - 0.88 \dot{L}f_t - 2.57 \dot{L}f_{t-1} - 0.45 (I/Y)_t + 1.0 (I/Y)_{t-1} + 0.10 \dot{X}_t + 0.05 \dot{X}_{t-1}$$

(2.32)** (0.63) (1.42) (0.86) (1.80)* (2.42)** (1.25)

$$- 0.57 GRY_t - 0.58 GRY_{t-1} + 0.21 I - 18.22 DVNG$$

(1.06) (1.06) (1.07) (6.39)***

Adjusted $R^2 = 0.72$; $F_{(10,16)} = 7.68***$; $D.W = 2.04$

Diagnostic Tests: $SC\chi^2(1) = 0.04$; $FF\chi^2(1) = 0.01$; $Norm\chi^2(2) = 2.99$; $H\chi^2(1) = 0.03$

Long Run Coefficients:

$$GY = - 3.45 \dot{L}f_t + 0.56 (I/Y) + 0.15 \dot{X}_t - 1.15 GRY_t + 0.21 I - 18.22 DVNG$$

(1.42) (1.86)* (2.17)** (2.23)** (1.07) (6.39)***

Model Extended to include Macroeconomic Variables: government consumption to GDP ratio (GCY) and government revenue to GDP ratio (GRY)

$$(3e) \quad GY = 20.97 - 0.89 \dot{L}f_t - 2.53 \dot{L}f_{t-1} - 0.29 (I/Y)_t + 0.85 (I/Y)_{t-1} + 0.12 \dot{X}_t + 0.07 \dot{X}_{t-1}$$

(0.94) (0.69) (1.52) (0.60) (1.88)* (2.87)*** (1.86)*

$$- 0.84 GRY_t - 1.34 GCY_t + 1.42 GCY_{t-1} - 17.63 DVNG$$

(2.04)** (1.86)* (1.95)* (6.76)***

Adjusted $R^2 = 0.77$; $F_{(10,16)} = 9.57***$; $D.W = 2.02$

Diagnostic Tests: $SC\chi^2(1) = 0.02$; $FF\chi^2(1) = 0.17$; $Norm\chi^2(2) = 0.98$; $H\chi^2(1) = 0.51$

Long Run Coefficients:

$$GY = - 3.42 \dot{L}f_t + 0.56 (I/Y) + 0.19 \dot{X}_t - 0.84 GRY_t + 0.09 GCY - 15.81 DVNG$$

(1.54) (1.50) (2.71)*** (2.04)** (0.09) (6.76)***

Note: significance level as follows: ***=1%, **=5%, *=10%. t ratios in brackets. Adjusted R^2 is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroscedasticity. Significance level of $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$ at the 1 percent level.

The fifth equation (3e) adds the government consumption share to GDP (GCY) and government revenue share to GDP (GRY) in the neoclassical model. The R^2 value is 77 percent and the F-statistic is significant at the one percent level. In terms of the short run relationship the growth in exports has a positive contribution to growth and is significant at the one percent level. On the contrary, the coefficients of the share of government consumption to GDP and government revenue-output ratio are both negative and significant at the ten percent and five percent level, respectively.

The long run relationships indicate that investment, exports, and government consumption coefficients to be positive, but only the contribution from exports is significant at the one percent level. The long run estimated coefficient for the share of government revenue to GDP records a negative coefficient and is significant at the five percent level. The positive sign of the export coefficient supports the view that some of the government spending may go to the development of export sector, particularly the agriculture sector.

Although these models do not show the interactive relationship between the explanatory variables, their respective estimated coefficient signs obtained brings forward some important intuition relating to economic growth. The report by AIDAB (1991) emphasises the government on pursuing growth-oriented policies and structural reforms in the key areas of the economy to sustain macroeconomic stability that promotes economic growth. Thus, the role to be played by the government is crucial in utilising and allocating its resources efficiently.

The next two equations (3f) and (3g) introduce another macroeconomic variable, OPEN, which represents the effect of openness to trade, to the neoclassical production function. The exports and imports variables are omitted from this specification to avoid the problem of multicollinearity. This is reported in Table 5.5. Both equations indicate a good fit to the data, and explain about 78 percent and 80 percent of the variation in the data, respectively, and the F-statistics are significant at the one percent level. Equation (3f) short-run relationship indicates that the economy being open to trade exerts

significant influence on growth at the one percent level. This result strongly supports the hypothesis that argues against trade restrictions, which adversely affect the efficiency of an economy through the failure to exploit comparative advantage (Kormendi and Meguire, 1985). In addition, the AIDAB (1991), ADB (1996) and IMF (1997) have recommended in their various reports the need to review the current trade policy in Tonga. The reports point out that the use of tariffs to protect import-substitution industries penalise some of the export-oriented activities, especially the new agriculture initiatives and small manufacturing activities. The share of investment to GDP coefficient is negative and significant in the five percent level.

Table 5.5. Empirical Results for Tonga's Trade Orientation - Growth Relationship, 1970 to 1998

Model Extended to include Macroeconomic Variables: openness to trade (OPEN)

$$(3f) \quad GY = 3.24 + 0.23 GY_{t-1} + 0.58 \dot{L}f_t - 1.18 (I/Y)_t + 1.23 (I/Y)_{t-1} + 0.53 OPEN_t - 0.53 OPEN_{t-1}$$

(0.46) (1.78)* (0.54) (2.17)** (2.53)** (3.03)*** (3.12)***

$$- 10.47 DVNG$$

(3.57)***

$$\text{Adjusted } R^2 = 0.78; F_{(7,19)} = 14.28***; D.W = 2.14$$

$$\text{Diagnostic Tests: } SC\chi^2(1) = 0.29; FF\chi^2(1) = 0.95; Norm\chi^2(2) = 0.86; H\chi^2(1) = 1.84$$

Long Run Coefficients:

$$GY = 0.76 \dot{L}f_t + 0.07 (I/Y)_t + 0.01 OPEN_t - 13.66 DVNG$$

(0.53) (0.14) (0.01) (3.23)***

Model Extended to include Macroeconomic Variables: openness to trade (OPEN), share of government consumption to GDP (GCY) and government revenue to GDP ratio (GRY)

$$(3g) \quad GY = -4.06 + 0.24 GY_{t-1} - 0.34 \dot{L}f_t + 0.58 OPEN_t - 0.54 OPEN_{t-1} - 0.89 (I/Y)_t + 1.38 (I/Y)_{t-1}$$

(0.16) (1.80)* (0.29) (2.90)*** (2.87)*** (1.61) (2.85)***

$$+ 0.17 GCY_t + 0.8 GCY_{t-1} - 0.66 GRY - 10.53 DVNG$$

(0.25) (1.09) (1.75)* (6.81)***

$$\text{Adjusted } R^2 = 0.80; F_{(10,16)} = 11.33***; D.W = 2.31$$

$$\text{Diagnostic Tests: } SC\chi^2(1) = 1.58; FF\chi^2(1) = 2.47; Norm\chi^2(2) = 1.56; H\chi^2(1) = 0.32$$

Long Run Coefficients:

$$GY = -0.45 \dot{L}f_t + 0.05 OPEN_t + 0.64 (I/Y) + 1.28 GCY - 0.89 GRY_t - 13.89 DVNG$$

(0.29) (0.16) (0.96) (1.02) (1.64) (3.26)***

Note: significance level as follows: ***=1%, **=5%, *=10%. *t* ratios in brackets. Adjusted R^2 is the coefficient of determination adjusted for degrees of freedom. *F* is the F-statistic, *DW* is the Durbin Watson test, *SC* is serial correlation, *FF* is functional form, *N* is the normality of the residuals, and *H* is heteroscedasticity. Significance level of $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$ at the 1 percent level.

For the long run relationship, the dummy variable is significant and suggests an adverse impact of natural disasters and economic shocks on growth. The rest of the variables OPEN, the growth in the labour force and the share of investment to GDP have positive coefficients however their contribution to economic growth is not significant. The result for the OPEN variable is consistent with the equation(s) when estimated with either exports or imports variables.

Equation (3g) combines OPEN, share of government consumption to GDP and share of government revenue to GDP into the neoclassical production function. In terms of the short-run estimation, OPEN is the only variable that is positive and exerts significant influence on growth at the one percent level. On the contrary, the share of government revenue to GDP coefficient is negative and is significant at the ten percent level. The dummy variable coefficient has the expected sign; negative and remains significant both in the short and long run at the one percent level, indicating an adverse effect on the economy.

5.2.3 Neoclassical Model Extended to Include Tourism Receipts

The next sets of results indicate the effect of the tourism sector on growth. This is shown in Table 5.6 below. The first equation (4a) shows how growth in tourism receipts influence growth in the neoclassical model, including the dummy variable. Equation (4b) substitutes imports for exports as Tonga relies heavily on imports as well.

Overall, both equations (4a) and (4b) have relatively high explanatory power, with the adjusted R^2 values of 73 percent and 75 percent, respectively, and the F-statistics are statistically significant at the one percent level. Apart from equation (4a), which recorded heteroscedasticity in the variables, the other model diagnostic tests of serial correlation, functional form, and the normality of the residuals are all not subject to any concern. The F-statistic tests in Table 5.1 point out that equation (4a) failed to show any long-run relationships between the variables, whereas for equation (4b) there exists a long-run relationship at the five percent level.

The result for the first equation (4a) indicates that the short run coefficient of the growth in tourism receipts is the only variable to have a positive coefficient and is significant at the ten percent level. This result supports the government commitment to support and promote this sector as a source of foreign earning (Tonga Ministry of Finance, 1997). Thus a one percent increase in tourism lead to a 0.08 percent increase in growth. The negative and statistically significant dummy variable indicates an adverse impact on growth. The rest of the domestic resources $L\dot{f}$, \dot{X}_t , (I/Y) do not contribute to Tonga's economic growth in this specification.

Table 5.6. Empirical Results for Tonga's Tourism Growth Model, 1970-1998

Model Extended to include Tourism Receipts

(4a) $GY = 5.53 - 0.24 L\dot{f} + 0.06 (I/Y) + 0.04 \dot{X}_t + 0.08 TR_t - 14.72 DVNG$
(1.29) (0.21) (0.28) (1.11) (1.93)* (5.63)***

Adjusted $R^2 = 0.73$; $F_{(5,21)} = 15.02***$; D.W = 1.82

Diagnostic Tests: $SC\chi^2(1) = 0.20$; $FF\chi^2(1) = 0.01$; $Norm\chi^2(2) = 0.55$; $H\chi^2(1) = 8.38$

Long Run Coefficients:

$GY = -0.24 L\dot{f} + 0.06 (I/Y) + 0.04 \dot{X}_t + 0.08 TR_t - 14.72 DVNG$
(0.21) (0.28) (1.11) (1.93)* (5.63)***

Model Extended to include Imports, Tourism Receipts and Dummy Variable:

(4b) $GY = 4.62 - 0.19 L\dot{f} - 0.57 (I/Y)_t + 0.62 (I/Y)_{t-1} + 0.11 \dot{M}_t - 0.09 \dot{M}_{t-1} + 0.08 TR_t - 12.58 DVNG$
(1.04) (0.16) (1.15) (1.25) (1.45) (1.66) (1.91)* (4.22)***

Adjusted $R^2 = 0.75$; $F_{(7,19)} = 11.94***$; D.W = 1.84

Diagnostic Tests: $SC\chi^2(1) = 0.20$; $FF\chi^2(1) = 0.29$; $Norm\chi^2(2) = 0.50$; $H\chi^2(1) = 1.68$

Long Run Coefficients:

$GY = -0.19 L\dot{f} + 0.05 (I/Y)_t + 0.03 \dot{M}_t + 0.08 TR_t - 12.58 DVNG$
(0.16) (0.22) (0.32) (1.91)* (4.22)***

Note: significance level as follows: ***=1%, **=5%, *=10%. t ratios in brackets. Adjusted R^2 is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroscedasticity. Significance level of $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$ at the 1 percent level.

The next equation (4b) with the combination of growth in imports and growth in tourism receipts indicates a relatively good fit to the data. The adjusted R^2 value explains about 75 percent of the variation in this equation and the F-statistic is significant at the one

percent level. The short-run estimation of tourism receipts indicates a positive effect on growth and is significant at the ten percent level. The dummy variable, DVNG, has a negative coefficient reflecting an adverse effect of natural disasters and economic shocks on economic growth. A one percent increase in tourism receipts leads to a 0.08 percent increase in growth. The growth in imports, although positive, does not contribute to Tonga's growth rate. The positive sign of the long run imports and investment coefficients supports the view that some of the investment activity and imported items are associated with the development of the tourism sector, thus resulting in the positive contribution from this sector on growth.

5.2.4 Neoclassical Model Extended to Include Foreign Aid (ODA)

The next set of results is based on the extension of the neoclassical growth model to include foreign aid to Tonga. This is reported in Table 5.7. In addition, foreign aid is also disaggregated into its various components such as multilateral and bilateral aid, loan and grant aid, and technical co-operation grant is also utilised to determine their separate impact in Tonga's economic growth. Overall, all equations have relatively high explanatory power, with adjusted R^2 values ranging between 68 percent to 75 percent. The model diagnostic tests of serial correlation, functional form, normality of the residuals and heteroscedasticity are of no concern. The F-statistic tests in Table 5.1 indicate that only equation (5a) and (5b) have long-run relationships between the variables. Interpretations of the estimated coefficients are presented below.

The first equation (5a) that incorporates the total aid (ODAY) to Tonga as a proportion of GDP into the neoclassical production function indicates a good fit to the data. The estimated adjusted R^2 explains 70 percent of the variation and the F-statistic is significant at the one percent level. The total factor productivity is positive however it is not significant. The sign and magnitude of the domestic resources coefficients L_f , \dot{X}_t , and (I/Y) show that none of these variables provide any significant impact on growth in the short and long run. Gounder's (1999) study on the impact of foreign aid on Fiji's growth shows similar results and suggests it may be due to poor performance of the domestic

sectors. Sturton (1992) suggests that this poor performance is attributed to the high level of domestic demand, supported by high levels of foreign transfers, especially private remittances, therefore, it encourages investment in activities oriented toward the home market (non-traded goods) and discourages production for export. The dummy variable coefficient is negative and statistically significant, which indicates that the effect of natural disasters and economic shocks hinder growth by 17.16 percent.

The estimated coefficient of foreign aid (ODAY) in the short and long run specification is negative but insignificant. This implies that aid does not contribute to economic growth in Tonga. This is rather confusing as evidence from the Tonga Ministry of Finance (1997/98) indicates that Tonga relies heavily on foreign aid for funding its development budget. In fact from 1990, foreign aid finances 70 to 90 percent of the annual government development budget. Sturton (1992) argues that the large volume of foreign aid is not channelled towards productive sectors of the economy, i.e. promoting private sector development. He explains that this is impossible due to the present policies, which directs foreign aid to support current levels of income and consumption and does not improve the long run growth prospects. However he provides justification for more aid. Islam (1992) and Mbaku (1993) add that the insignificance of the aggregate aid ratio may be caused by the aggregation of different kind of foreign aid into one single category. Thus, this study disaggregates total aid into bilateral and multilateral components.

The coefficient of the bilateral aid to GDP ratio (BAY) and multilateral aid to GDP ratio (MAY) measure the impact of government to government transfer and multilateral agencies (e.g. International Monetary Fund, Asian Development Bank, etc.) respectively on growth. The adjusted R^2 value explains 75 percent of the variation in the data and the F-statistic is significant at the one percent level. The short-run estimated coefficients for domestic resources, i.e. $L\dot{f}$, \dot{x} , and I/Y improve significantly. The \dot{x} is significant at the one percent level, while $L\dot{f}$ and I/Y have positive impact however neither are significant. The positive coefficient of growth in exports indicates effective utilising of aid funds that flow into the exports sector, thus increasing output.

Table 5.7. Empirical Results: Tonga's Growth Model Extended to include Foreign Aid and its various components: 1970 to 1998

Equation with Total Aid:

$$(5a) \quad GY = 6.1 - 0.55 L\dot{f} + 0.05 \dot{X}_t + 0.27 (I/Y) - 0.16 ODAY - 17.16 DVNG$$

(1.34) (0.43) (1.37) (1.02) (1.10) (6.74)***

Adjusted $R^2 = 0.70$; $F_{(5,21)} = 13.05^{***}$; D.W = 2.02

Diagnostic Tests: $SC\chi^2(1) = 0.01$; $FF\chi^2(1) = 0.01$; $Norm\chi^2(2) = 0.27$; $H\chi^2(1) = 5.72$

Long Run Coefficients: $GY = -0.55 L\dot{f} + 0.05 \dot{X}_t + 0.27 (I/Y) - 0.16 ODAY - 17.16 DVNG$

(0.43) (1.37) (1.02) (1.10) (6.74)***

Equation with Bilateral Aid and Multilateral Aid:

$$(5b) \quad GY = 8.95 + 1.15 L\dot{f} + 0.10 \dot{X}_t - 0.23 (I/Y) - 0.10 BAY_t + 0.71 BAY_{t-1} - 2.62 MAY - 0.35 FDIY_t$$

(1.74)* (0.82) (2.79)*** (0.80) (0.53) (2.60)** (2.42)** (1.91)*

$$+ 0.40 FDIY_{t-1} - 18.02 DVNG$$

(2.12)** (7.30)***

Adjusted $R^2 = 0.75$; $F_{(10,16)} = 8.63^{***}$; D.W = 2.02

Diagnostic Tests: $SC\chi^2(1) = 0.02$; $FF\chi^2(1) = 0.02$; $Norm\chi^2(2) = 1.52$; $H\chi^2(1) = 4.40$

Long Run Coefficients:

$$GY = 1.15 L\dot{f} + 0.10 \dot{X}_t - 0.23 (I/Y) + 0.61 BAY - 2.62 MAY + 0.05 FDIY - 14.30 DVNG$$

(0.82) (2.79)*** (0.80) (1.91)* (2.42)** (0.34) (4.34)***

Equation with Grant Aid and Loan Aid:

$$(5c) \quad GY = 6.29 - 0.55 L\dot{f} + 0.05 \dot{X}_t + 0.15 (I/Y) + 0.04 GRATY - 0.16 LOANY - 16.87 DVNG$$

(1.09) (0.40) (1.39) (0.97) (0.60) (0.60) (6.02)***

Adjusted $R^2 = 0.68$; $F_{(6,20)} = 10.37^{***}$; D.W = 2.01

Diagnostic Tests: $SC\chi^2(1) = 0.01$; $FF\chi^2(1) = 0.01$; $Norm\chi^2(2) = 0.28$; $H\chi^2(1) = 5.72$

Long Run Coefficients:

$$GY = -0.55 L\dot{f} + 0.05 \dot{X}_t + 0.25 (I/Y) + 0.04 GRATY - 0.16 LOANY - 16.87 DVNG$$

(0.40) (1.31) (0.97) (0.60) (0.60) (6.02)***

Equation with Technical Co-operation and Loan Aid:

$$(5d) \quad GY = 15.64 - 0.97 L\dot{f}_t - 2.77 L\dot{f}_{t-1} + 0.07 \dot{X}_t + 0.13 (I/Y) - 1.17 TCY - 0.14 LOANY_t -$$

(2.15)** (0.77) (1.40) (1.86)* (0.50) (1.98)* (0.59)

$$- 16.46 DVNG$$

(6.13)***

Adjusted $R^2 = 0.72$; $F_{(7,19)} = 10.51^{***}$; D.W = 1.85

Diagnostic Tests: $SC\chi^2(1) = 0.12$; $FF\chi^2(1) = 0.32$; $Norm\chi^2(2) = 0.27$; $H\chi^2(1) = 3.24$

Long Run Coefficients:

$$GY = -3.74 L\dot{f} + 0.07 \dot{X}_t + 0.13 (I/Y) - 1.17 TCY - 0.14 LOANY_t - 16.46 DVNG$$

(1.48) (1.86)* (0.50) (1.98)* (0.59) (6.13)***

Notes: As for Table 5.6. significance level as follows: ***=1%, **=5%, *=10%. t ratios in brackets.

The foreign resources contribution to growth indicates that bilateral aid to GDP ratio (BAY) is positive in the long run specification and contributes significantly at the ten percent level. On the other hand, the short run MAY and foreign direct investment (FDIY) coefficients are negative and significant at the five percent and ten percent level, respectively. The negative coefficient suggests that over time multilateral aid has declined, as well as FDI, but these coefficient have significantly contributed to growth. Gounder's (1999) results for Fiji indicate positive impacts of bilateral and multilateral aid. For Tonga the empirical result suggests that bilateral aid has been effectively utilised contributing positively to economic growth. The coefficient of the dummy variable (DVNG) has the expected negative sign and remains significant at the one percent level indicating an adverse effect due to natural disasters and economic shocks on the economy.

The third equation (5c) further dismantled total aid into grant aid as a share of GDP (GRATY) and loan aid to GDP ratio (LOANY). The adjusted R^2 values explain 70 percent of the variation and the F-statistic is significant at the one percent level. The total factor productivity is positive and significant at the one percent level. The short-run estimated coefficients reveal that GRATY has a positive relationship with growth, however the relationship is not significant. The LOANY coefficient is negative, however not significant. In addition, when grant aid is further broken down into the technical co-operation grant to GDP ratio (TCY), equation (5d), it has a negative significant effect on growth at the ten percent level. The technical co-operation grant, which normally relates to education and training, seems to have a longer gestation period. This grant aid, however, has declined over time.

These negative relationships between total foreign aid and economic growth support the view that a large proportion of foreign aid to Tonga has either been used for housing, or aid projects or it is leaked into consumption. The problem as stated by the ADB (1996) is that majority of aid projects focuses on developing infrastructure and funding government projects, which support the argument by Sturton (1992) that it does not add directly to the productive stock of fixed capital. Bilateral aid in the long run is positive

and significant which suggest that government-to-government transfers can be effectively utilised and contribute to growth.

Islam (1992) and Mbaku (1993) study found that loan aid (LOANY) has a positive contribution to growth whereas, grant aid (GRATY) has an insignificant negative impact on growth for the case of Bangladesh and Cameroon, respectively. Islam justifies that the poor performance of grant aid is related to the fact that loans are effectively utilised while grants are not. The fact that grants are not repaid, gives government authorities a greater degree of corruption in its utilisation. Gounder (1999), on the other hand, reports that grant aid and technical cooperation aid contribute positively to growth for Fiji, whereas loan aid is insignificant. This is mainly due to its small proportion in the total volume of aid. Overall, in the case of Tonga foreign resources in terms of bilateral aid and the technical co-operation grant aid contribute to growth. As for domestic resources only exports contribute to growth.

5.2.5 Neoclassical Model Extended to Include Private Remittances

The last set of equations determines the influence of private remittances on economic growth. The literature on private remittances suggests the importance of this variable to Small Island nations growth. The results are reported in Table 5.8. Overall, the two equations have a relatively high explanatory power, where the adjusted R^2 is 72 percent and 77 percent, respectively. The model diagnostic tests of serial correlation, functional form, normality of the residuals and heteroscedasticity does not show any problem. The F-statistic tests in Table 5.1 indicate that both equations have long-run relationships at the ten percent significance level.

The first equation (6a) includes private remittances share to GDP (PRY) to the model with total aid to Tonga. The adjusted R^2 explains 72 percent of variation in the data and the F-statistic is significant at the one percent level. The natural disasters affect negatively on growth. The ratio of private remittances to GDP coefficient reveals a

negative impact on economic growth, however it is only in the long run that this coefficient is negative but significant at the five percent level. As for Tonga this evidence contradicts the view that PRY positively contributes to growth. The negative significance of this variable show that private remittance has declined. Sturton (1992) cautiously states that if private remittances could be guaranteed to provide a sustained source of foreign exchange, then it may be argued they form a core component of development strategy. However, the reliability of these transfers in the longer term must be doubted, and this is indicated by the declining trend over recent years (see Appendix B, Figure I). Ahlburg's (1991) study on the impact of migration and remittances in Pacific Island Countries added that growth prospects hinge on the ability to transform remittance flows into productive investment, otherwise it serves only to maintain the recipient's current income and consumption. Private remittances to Tonga are generally used for consumption. Also note that total aid coefficient is positive but not significant in the long run. Domestic resources do not contribute to growth for Tonga.

The second equation (6b) substitutes imports for exports in the equation. The total factor productivity is positive and significant at the one percent level. The impact of the estimated short run coefficient is similar to the specification with exports. However, the positive and significant coefficient of growth in imports suggests that imports contribute to growth. It also supports an earlier suggestion that as investment decreased due to low savings and because of high demand in the domestic market, there is a shift from the export-oriented production to import substitution. Also, weakening of the export sector is attributed to high demand in the domestic consumption that is supported by high levels of transfers, i.e. foreign aid and remittances.

In terms of the long run relationships, growth in imports and ODAY indicate positive contribution to growth, however growth in imports is the only variable to exert significant influence on growth at the five percent level. Foreign direct investment and private remittance are negative and significant which suggest that these factors of growth have declined over time, however are significant for economic growth. The negative and

significant dummy variable that measures the impact of cyclones and economic shocks has adverse effect on Tonga's economic growth.

Table 5.8. Empirical Results for Private Remittance-Growth Relationships: 1970-1998

Model Extended to include Private Remittances and aggregate Total Aid:

$$(6a) \quad GY = 23.66 - 0.60 \dot{L}f + 0.04 \dot{X}_t - 0.16 ODAY_t + 0.29 ODAY_{t-1} - 0.41 FDIY - 0.26 PRY_t \\ (3.21)^{***} (0.47) \quad (1.03) \quad (1.00) \quad (1.55) \quad (1.92)^* \quad (0.88) \\ - 0.58 PRY_{t-1} - 13.68 DVNG_t \\ (2.24)^{**} \quad (4.67)^{***}$$

Adjusted $R^2 = 0.72$; $F_{(9,17)} = 8.43^{***}$; D.W = 2.22

Diagnostic Tests: $SC\chi^2(1) = 0.44$; $FF\chi^2(1) = 0.85$; $Norm\chi^2(2) = 0.24$; $H\chi^2(1) = 0.24$

Long Run Coefficients:

$$GY = -0.60 \dot{L}f + 0.04 \dot{X}_t + 0.13 ODAY_t - 0.41 FDIY - 0.84 PRY_t - 8.99 DVNG_t \\ (0.47) \quad (1.03) \quad (0.73) \quad (1.92)^* \quad (2.14)^{**} \quad (2.08)^{**}$$

Model Extended to include Private Remittances and aggregate Total Aid, substitute Imports for Exports:

$$(6b) \quad GY = 27.19 - 0.31 GY_{t-1} - 0.64 \dot{L}f + 0.17 \dot{M}_t - 0.22 ODAY_t + 0.35 ODAY_{t-1} - 0.56 FDIY_t \\ (3.96)^{***} (2.38)^{**} \quad (0.53) \quad (2.58)^{**} \quad (1.55) \quad (2.15)^{**} \quad (2.78)^{**} \\ - 0.38 PRY_t - 0.55 PRY_{t-1} - 10.29 DVNG \\ (1.38) \quad (2.41)^{**} \quad (3.37)^{***}$$

Adjusted $R^2 = 0.77$; $F_{(9,17)} = 10.66^{***}$; D.W = 2.19

Diagnostic Tests: $SC\chi^2(1) = 0.72$; $FF\chi^2(1) = 1.98$; $Norm\chi^2(2) = 1.09$; $H\chi^2(1) = 0.81$

Long Run Coefficients:

$$GY = -0.48 \dot{L}f + 0.13 \dot{M}_t + 0.10 ODAY - 0.43 FDIY_t - 0.71 PRY_t - 7.85 DVNG \\ (0.54) \quad (2.74)^{**} \quad (0.79) \quad (2.96)^{***} \quad (2.98)^{***} \quad (3.01)^{***}$$

Note: significance level as follows: ***=1%, **=5%, *=10%. t ratios in brackets. Adjusted R^2 is the coefficient of determination adjusted for degrees of freedom. F is the F-statistic, DW is the Durbin Watson test, SC is serial correlation, FF is functional form, N is the normality of the residuals, and H is heteroscedasticity. Significance level of $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$ at the 1 percent level.

5.3 Policy Implications for Tonga

The previous section provides some important and interesting findings that may assist the development of the Kingdom of Tonga. This section, however, is linked to Section 2.5 in Chapter 2, which proposes policies that the government may use as tools for the long-

term development of the economy. Thus, the major findings from this study only confirm the policy implications that may enhance long-run economic growth in Tonga.

The empirical results indicate that the growth rate of exports is the most important determinant in terms of domestic resources that contribute to economic growth in Tonga. However the volume and value of Tongan exports remains low and have not reached its full potential because of the reliance on just a few primary products for commercial production and exports (AIDAB, 1991; ADB, 1996; and IMF, 1997). Other problems faced by the export sector are the inadequate marketing of export products, erratic prices for traditional exports, lack of labour skills and lack of usage of technology and the adverse impact of natural disasters. The results of this study point out that an expansion of the export sector, which consists mainly of agricultural, fisheries products and a few manufacturing products, focussing on export-oriented activities will guarantee a boost in the long-run for Tonga's economic growth. Thus, government policies should strive to encourage and strengthen the development of the productive export sector, focus research on high-value niche products and promote technological development to ensure diversification and the efficient allocation of available resources.

Secondly, the impact of natural disasters has a strong adverse effect on economic growth *via* its impact on agricultural production. The government should direct resources more effectively in terms of subsidy or foreign aid to ensure that productive sectors and the economy as a whole recover quickly from such disasters.

Thirdly, the growth in the tourism sector indicates a positive contribution to economic growth. However, there is still potential for significant expansion of development of the tourism sector as the sector only began in the mid-1980s and also Tonga's distinctive culture, recreational attractions and relaxed lifestyle can be highlighted to attract tourism image (AIDAB, 1991). Continuous government support is required to further promote this sector to meet international tourism demand.

Various studies have theoretically and empirically proved that investment contributes positively to economic growth. On the contrary, this study shows that investment has a negative relationship with economic growth indicating the gap that the Tongan government needs to work on. It is evident from the discussion that a positive shift in the emphasis of investment has taken place, i.e. focus on export-oriented growth rather than import-substitution activities. As mentioned earlier, the government needs to create new initiatives for export investment activities followed by the appropriate fiscal and monetary policy.

The empirical evidence from the study supports the theory that the openness of the economy to trade and imports are positive and have significant effects on growth. This is also supported by the AIDAB, ADB and IMF that Tonga needs to review its current trade policy. However the use of tariffs to protect import-substitution industries penalises some of the export-oriented activities, particularly manufacturing activities. The AIDAB 1991 report adds to the usual arguments against protection through tariffs as protectionism in the current global economic environment is taken as evidence of a less-than-complete commitment to export development. This also partly contributes to dampening the investment sector activity discussed above.

The three macroeconomic variables: government consumption expenditure, government revenue and inflation rates employed in the study appear to have mixed effects on economic growth in Tonga. Government consumption expenditure has a negative contribution in the short run, but is positive and significant in the long run. This is an indication of the government is spending more on consumption than investment. It is important that government policy and the allocation of expenditure is effective and directed at the productive sectors of the economy in order to accelerate economic growth.

Government revenue is indicated to have an adverse impact on growth both in the short and long run. This result supports the 'supply side' theory hypothesis that taxes distort incentives, generally reduce efficient resource allocation and hence reduce economic growth (Kormendi and Meguire, 1985). Tonga's main revenue source, which is foreign

trade taxation, accounted for 12 percent of GDP in 1997/98 or 46 percent of total recurrent revenue (Tonga Ministry of Finance, 1997/98). The Tongan government recognises the problem associated with the heavy reliance on trade taxation and the narrow tax base. The 1996/97 Budget Statement announced an intention to make the existing taxation system more progressive, equitable, simple, efficient, and market oriented (IMF, 1997).

Furthermore, the large size of the public sector attributes to several distorting consequences. First, the increase in public expenditures to accommodate staff and expenses necessitated increased taxes and greater public sector borrowing to maintain fiscal balance. With stagnation in the economy this situation implied both a redistribution of income away from the private sector and a reduction in funds available for private development efforts. Secondly, increase in taxes raise the rate of indirect taxes, which translate into greater taxes on international trade or imports as discussed earlier. Thirdly, the higher taxes and increased aggregate demand have pushed up domestic prices and lead to a loss of competitiveness, which will result in pressure on Tonga's exchange rate and lead to an appreciation of the currency. Therefore, supporting the recommendation by the IMF, ADB and AIDAB, there is a need to re-evaluate and review the current tax system to provide a more investment friendly environment and incentive to encourage outward looking development that is appropriate for economic growth and development.

The inflation rate included in the study shows no major changes in the price level that affect economic growth. The growth in the labour force shows a decline, however it is not significant. The decline in the Kingdom's labour force reflects continuing emigration, especially of skilled labour. This is another challenge for the government, as it needs to allocate its resources to compensate for such changes in the labour force.

Despite the claims by the Tongan government that it needs the funds from foreign aid, grants and concessionary loans, to finance its development budget, this study shows that total foreign aid has not contributed to economic growth in Tonga. This raises the issue

of efficiency and the effectiveness of utilising these funds. The problem is how to effectively channel these very sizeable volumes of resources into private sector investment, which directly result in increased output. Most multilateral agencies advise the Tongan government of the need for structural reforms required in key areas of the economy, a stable macroeconomic environment, and direct government investment to support the development of activities where Tonga enjoys comparative advantage.

5.4 Conclusion

The likelihood of Tonga achieving accelerated growth in the short- and long-term largely depends on trends in the international economy, which is presently recovering from a recessionary period. This chapter has presented the empirical results of an investigation of the determinants of economic growth in Tonga. Factors making a positive contribution to economic growth are the growth rates of exports, tourism receipts, openness to trade, government consumption expenditure, bilateral aid, concessionary loans, private remittances, and imports. The grant aid, multilateral aid and technical co-operation grants, while significant in most cases show a decline over time. The only strongly adverse effect on Tonga's growth rate comes from the impact of natural disasters and external market shocks.

As for the domestic resources, the empirical results also show that investment and labour force in all the equations do not contribute to growth. This could be attributed to low levels of investment and low growth rate in population. Also the emigration of skilled labour contributes to the lack of significance of the labour force variable.

Tonga's economic well-being depends on diversification and reducing the economy's excessive dependence on a few export crops, as well as relying heavily on flows of external grants and private remittances. The increased government expenditures have results in crowding out of private sector investment. The development of the private sector is required to promote investment in agriculture, fisheries, tourism, and

manufacturing. Tonga needs to manage its macroeconomic reforms and implement those policies that will increase export growth. Finally, the government has a crucial role to play in consolidating, mobilising and allocating resources more efficiently, effectively and equitably.

CHAPTER 6: Conclusion and Future Research

6.1 Introduction

The importance of economic growth cannot be emphasised enough because of the benefits and advantages it provides. A lot of developing countries' growth has been hindered due to the lack of resources, savings, investment and the impact of other social and natural factors affecting the economy. Tonga has also faced many of the constraints that have affected economic growth. Hence it is necessary for the government to identify the key macroeconomic factors that promote economic growth so that it can allocate its limited resources more efficiently and effectively. This empirical study has explored the impact of macroeconomic variables i.e. labour force, investment-output ratio, growth in exports and imports, openness of the economy to trade, tourism receipts, government fiscal policies, foreign aid and its components and private remittances on Tonga's economic growth. Growth models of the Solow-type neoclassical equations have been employed for the econometric analysis using the cointegration methods of Auto Regressive Distributed Lag (ARDL).

The chapter summarises, the main findings of this study and highlights the policy implications of Tonga's growth. The chapter is structured as follows: Section 6.2 provides an overall conclusion of the study, stating the important points emphasised in each chapter. Section 6.3 identifies areas of further research for Tonga.

6.2 Conclusion

Considering the focus of this study is the determinants of economic growth in Tonga, Chapter 2 has reviewed the academic literature on economic growth. It concentrated on the theory of growth models, especially the neoclassical growth theory, and the

empirical testing of them. Much work has been done in this area in recent years yet the impact of economic growth and its determinants have still not been consistent with the theory and its assumption. The difference in the results may be because of analysing different time periods and the set of countries undertaken. Also the vast and different characteristics of the developing countries in various studies may have led to non-consistent explanation of the independent variable. The importance of investment as a stimulus for economic growth has been emphasised in the literature. Other determinants of growth include growth in exports, openness to trade, development of human capital through training and education, research and development and government policies.

In addition, the impact and importance of foreign aid assistance to economic development in the South Pacific Island nation have also been discussed, however the literature contains mixed results with some analyses indicating an overall positive effect on growth and others indicating a negative impact. Foreign aid does play a significant role in the development of the island economies as these nations rely heavily on this foreign resource to meet its development needs. While the time series analysis for Fiji explains the importance of total aid and its various components on growth, Tonga's heavy reliance on aid and remittance may also explain its contribution to growth. This was discussed in detail in Chapter 5.

Chapter 3 provides a brief descriptive overview of the Tongan economy, covering its historical background and analysing the macroeconomic performance of the economy from 1970 to 1998. Tonga is vulnerable because of its small size and large distance from major trading countries. Efforts have been made to develop niche markets for the export sector and provide infrastructure for the manufacturing, construction, and tourism sector and assist the private sector development. An emphasis has been placed on diversifying the export base to reduce Tonga's dependency on primary agricultural output alone. The chapter concludes by postulating some of the macroeconomic variables that may contribute to economic growth in Tonga. These include investment, trade, tourism receipts, labour force, fiscal policy variables, foreign aid and private remittances.

Chapter 4 develops growth models to explain the relationship between the macroeconomic variables stated above and the economic growth of Tonga. The growth models were developed based on the more general specification of the Solow-type neoclassical growth model. This specification was extended to incorporate the impact of foreign aid, fiscal policy and tourism receipts on growth. The finite cointegration method of ARDL estimation has been utilised to examine empirically the short and long-term relationships between economic growth and its proposed determinants listed above. A key advantage of ARDL procedure is that it avoids the pre-testing requirement of the classification of the order of integration, which is needed in other methodologies. Finally, the chapter addressed the sources of the data employed in this study.

Chapter 5 presents the empirical results for the macroeconomic determinants of economic growth in Tonga for the period 1970 to 1998. Overall, the results indicate that the growth models employed in the study have relatively high explanatory power in terms of the adjusted R^2 and the F-statistic is significant at the one percent level for all the equations. In addition, the model diagnostic tests are not subject to any concern. Thus, the results of this study are reliable and indicate the performance of the Tongan economy over the period 1970 to 1998. The factors indicated by this study to make a positive contribution to economic growth are the growth rates of exports, tourism receipts, openness to trade (OPEN), government consumption expenditure, bilateral aid, concessionary loan, private remittances, and imports in the cases where this variable is substituted for exports. Factors having a strong adverse effect on Tonga's growth rate include natural disasters and external market shocks. Overall, government revenue, grant aid, multilateral aid and technical co-operation grants, have not added to the contribution of growth for Tonga.

Essentially, growths in exports and tourism receipts have significantly influence Tonga's economic growth. In order for the macroeconomic variables in the study to have significant impacts and the economy to achieve accelerated long run economic growth, the role played by government has to be efficient and effective in setting growth-oriented policies and structural reforms in the key areas of the economy. Bilateral aid and grant aid component of total aid also plays a significant role in the

development process of Tonga. Thus, the utilisation of aid should be monitored efficiently so that aid is effective, as the current climate of aid flows show a decline.

The government of Tonga should research high-value niche products and promote technological development in order to diversify the export sector. It also needs to assist in the development and promotion of the tourism sector, promote private sector investment and identify productive activities where a comparative advantage exists. This would require structural reforms in those public enterprises that may be crowding out investment opportunities and funds from the private sector. A review also needs to be undertaken of current trade policy and the tax system to provide an environment for investment, particularly with respect to export-oriented activities. A continued prudent fiscal policy responsibility is also needed. The study indicated a long run positive contribution from government consumption, but increases in government expenditure necessitate an increase in taxes and greater public sector borrowing to maintain fiscal balance. Finally, the government needs to monitor and utilise foreign resources such as overseas aid and private remittances efficiently, effectively and direct them toward productive private sector initiatives, which may increase output directly rather than supporting the current level of income and consumption. In this way, effective government participation will accelerate economic growth and prepare Tonga to face the new millennium with expectations of a better standard of living for all.

6.3 Future Research

The main limitation faced by this study was the unavailability of consistent time series data. This is an area that requires further clarification. The set of data that need clarification is the Gross Domestic Product figure to ensure that it reflects the actual standard of living in Tonga, gross fixed capital formation and the foreign aid data.

A lot of the argument against the impact of foreign aid in Tonga is that it is not directed at growth-oriented activities but housing and aid projects. This raises the question of the efficiency and effectiveness of utilising aid funds, which on its own is

another area for future research. Another area of study is the impact or contribution of foreign aid to the growth of different sectors of the economy.

Some macroeconomic variables were not included in the study due to the unavailability of time series data. These include monetary variables such as the interest rate and money supply, and the breakdown of total investment into public and private sector investment. The extension of the neoclassical growth model to the endogenous growth model was also not undertaken due to lack of time series data on research and development expenditure, educational and health data for human development.

This study undertook an econometric analysis of the direct impact of the proposed macroeconomic variables on economic growth, however none of the indirect interactions of these variables were analysed. This is also an area for future study.

An input-output table may help the government identify the economy's most productive sectors. However this may require the government, particularly the Tonga Statistics Department, to co-operate in the research and development of the country.

APPENDIX A:

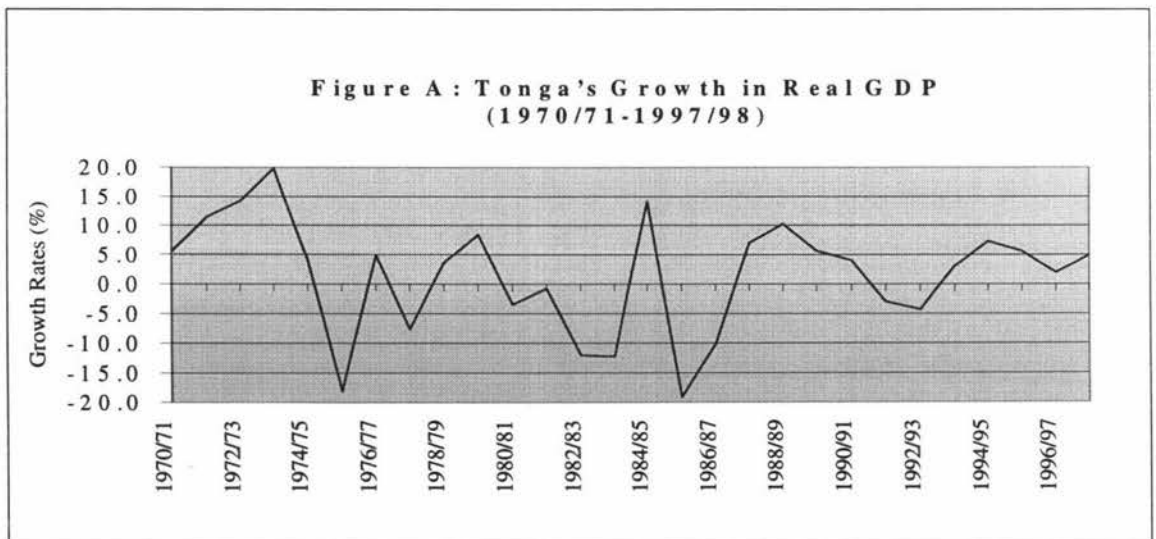
List and Description of the Variables Employed in the Study

Variable:	Description of the variables
GY	Annual growth rate of national income (represented by GDP)
$L_f^{\dot{}}$	Annual growth rate of effective labour force (represented by population growth)
\dot{X}	Annual growth rate of exports
\dot{M}	Annual growth rate of imports
I/Y	Ratio of total investment / GDP
$TR^{\dot{}}$	Annual growth rate of tourism receipts
GGC	Annual growth rate of government consumption
GCY	Ratio of government consumption to GDP
GRY	Ratio of government revenue to GDP
\dot{i}	Inflation rate
OPEN	Ratio of (exports + imports) / GDP
FDIY	Ratio of foreign domestic investment to GDP
ODAY	Ratio of ODA to GDP
LOANY	Ratio of loan to GDP
GRATY	Ratio of grant to GDP
TC	Ratio of technical co-operation grant to GDP
PRY	Ratio of private remittances to GDP
DVNG	Dummy variable for negative growth in GDP
u_{1t}, \dots, u_{20t}	Error terms for each equation

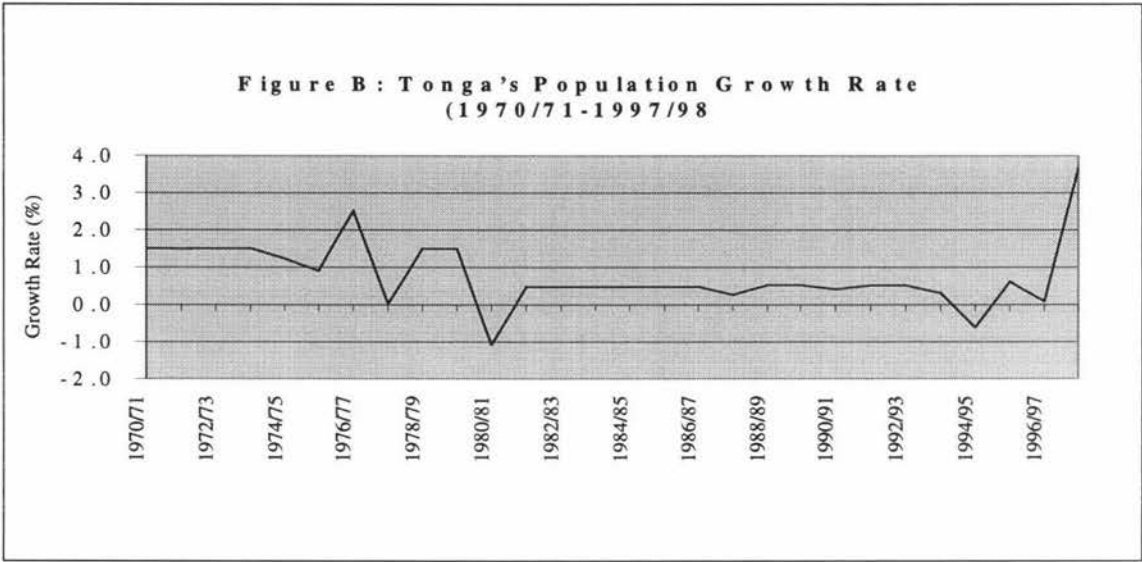
APPENDIX B:

Graphical Representation of the Regression Variables

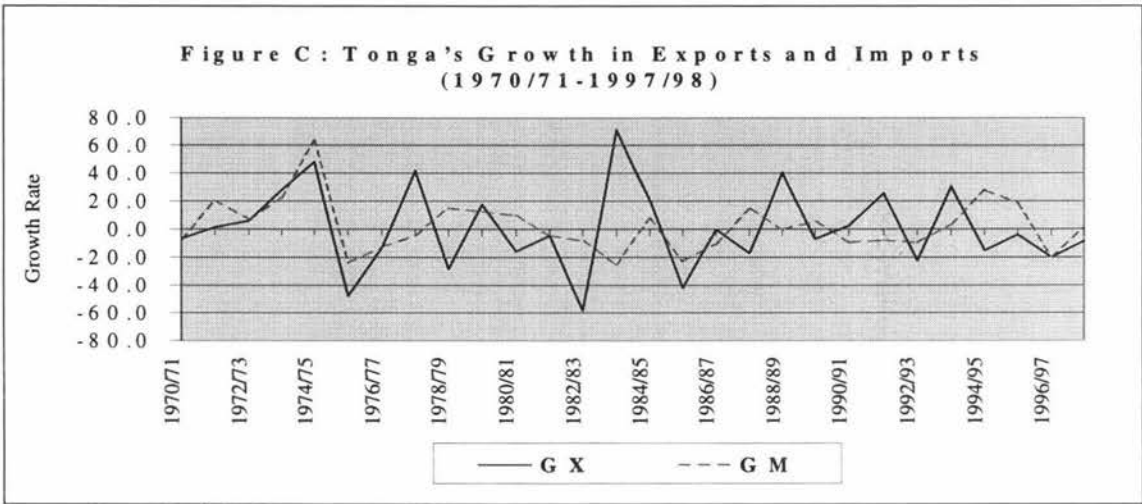
This appendix presents a graphical representation of the trends of the proposed determinants for Tonga's economic growth, which are also employed in the regression analysis reported in Chapter 5. The performances of these variables in the Tongan economy for the last three decades have been discussed briefly in Chapter 3. Thus, Figure A represents the trend of Tonga's growth in GDP, Figure B is the population growth rate, Figure C is the growth in exports and imports, Figure D is the ratio of investment to GDP, Figure E is Tonga's annual inflation rate, Figure F is the growth rates of tourism receipts, Figure G is the government consumption and government revenue percentage share of GDP, Figure H is the ratio of foreign aid, private remittance and foreign direct investment to GDP and lastly Figure I presents the trends of the various component of foreign aid. The descriptions of each variable shown in Figure A to I are presented in Appendix A.



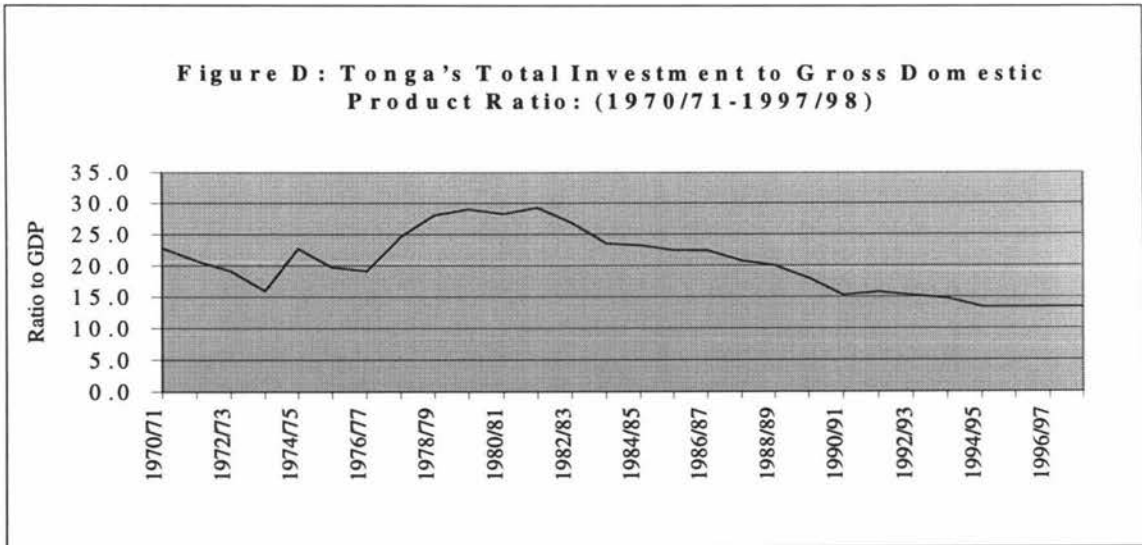
Source: Tonga Statistics Department, 1999.



Source: Tonga Statistics Department, (various issues).

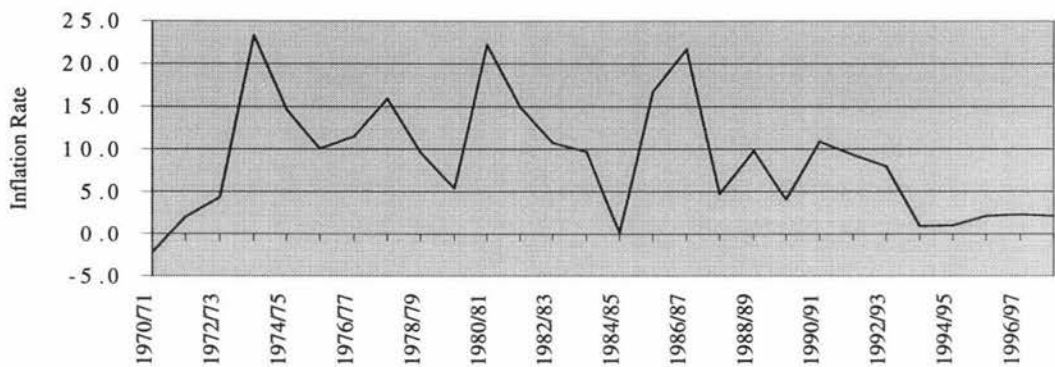


Source: Tonga Statistics Department, 1999.



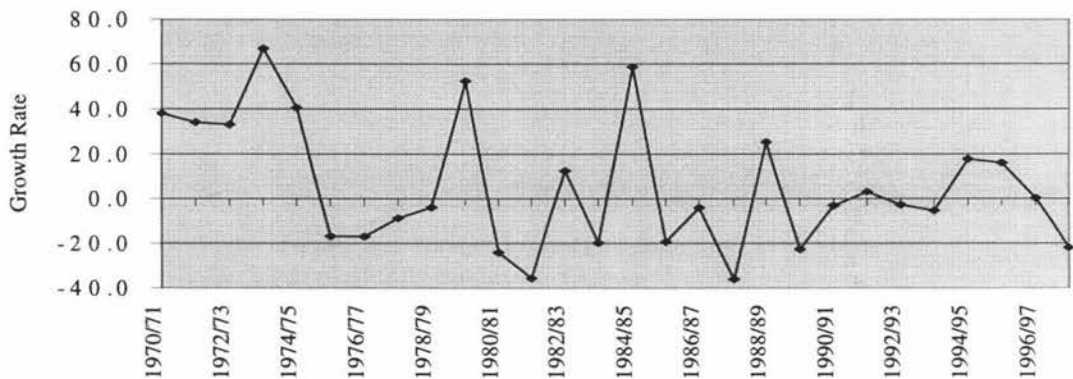
Source: Tonga Statistics Department, 1999.

**Figure E: Tonga's Annual Inflation Rate
1970/71-1997/98**



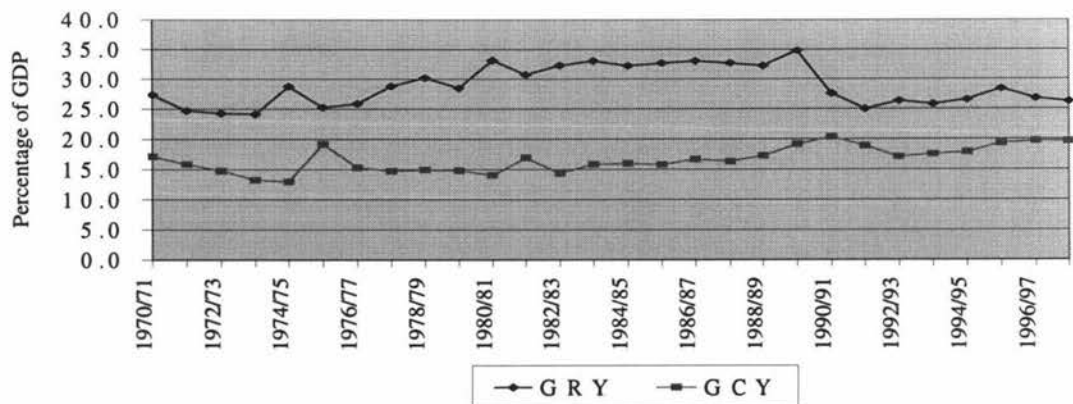
Source: Tonga Statistics Department, (various issues).

**Figure F: Tonga's Growth Rates of Tourism Receipts
1970/71-1997/98**

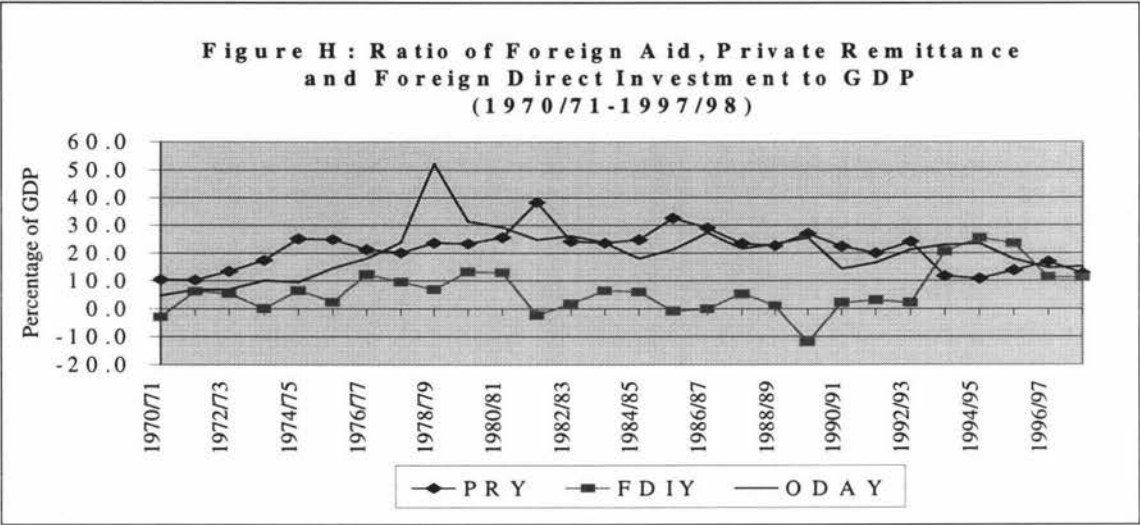


Source: Tonga Tourism Department, (various issues).

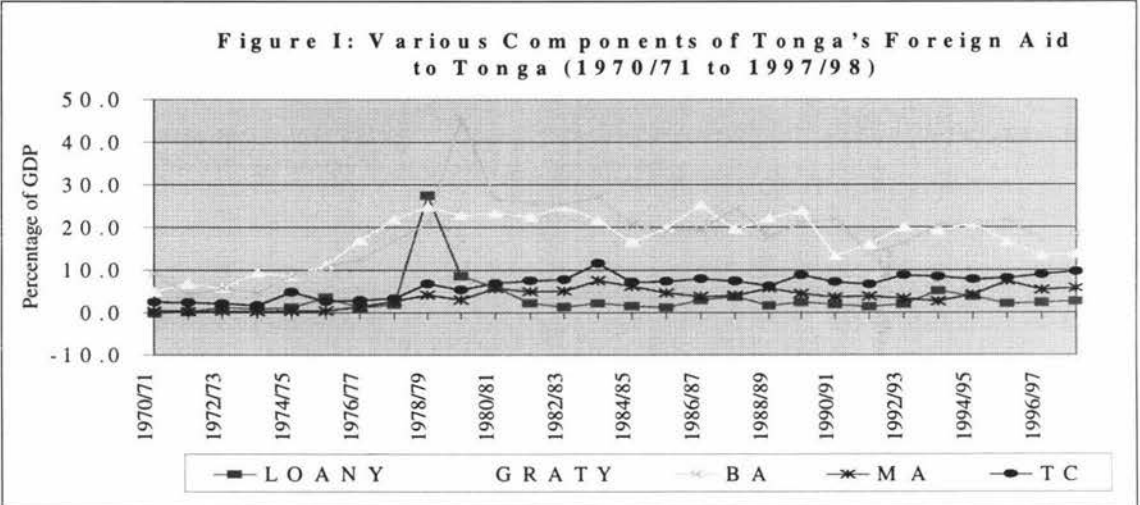
**Figure G: Ratio of Government Revenue and
Government Consumption Expenditure to GDP for
Tonga (1970/71-1997-98)**



Source: Tonga Ministry of Finance, (various issues).



Source: Tonga Statistics Department, 1999; OECD (various issues).



Source: OECD, (various issues).

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