4. METHOD OF ANALYSIS

4.1 Introduction

The purpose of this chapter is to identify and describe the method of analysis that is used in this research to gain some insight into the relationship between trade orientation and economic growth. Individual country experience and statistical evidence on the relationship between trade and growth have provided extensive support for outward orientaton policies as effective growth and development strategies (Jung & Marshall, 1985).

This chapter is divided into eight sections. Section two outlines the theoretical framework from which the economic and statistical models are derived. The trade and growth theory model is used to identify the sources of economic growth. Section three mentions the methodological framework adopted in this study. The economic model is specified in section four while section five presents the statistical model employed to test the relationship. The specification of the nature of the data is briefly mentioned in section six. The expected results, that is the signs of the coefficients and their relationship to the dependent variable, will be discussed in the seventh section. Finally, the identification of the data sources, their limitations and statistical software used in the analysis are outlined in section eight.

4.2 Theoretical Framework

4.2.1 Trade and Growth Theory

Overtime a nation's factor endowments, technology and tastes may change. Hence this can affect a nation's production possibility frontier (PPF) either by shifting the PPF outwards or inwards, depending on whether there was a growth or decline in factor endowments and a change in technical progress. A nation's factor endowment for the purpose of this analysis is restricted to capital and labour inputs. That is, it is assumed that there are two factors of production. However, in the real world there are other inputs such as natural resources, land and human capital.

The growth of a nation's population over time usually means a growth in its labour force. Similarly a nation can increase its capital stock by utilising some of its resources

to produce capital. Capital refers to machinery, factories, office buildings, transportation, communication, education and the training of its labour force The growth of a nation's factor endowments through time can contribute to a nation's ability to produce goods and services (Salvatore, 1987).

The effect that a change in technology and the accumulation of capital and labour overtime have on the production process differs. This idea will be made clearer in the sections that follow.

4.2.2 Technology

Technical progress aides the generation of output by providing efficient alternative methods of production, which may result in larger amounts of output being generated from a fixed level of inputs. Technology may be factor neutral, labor saving or capital saving (Appleyard & Field, 1992). Factor neutral technology occurs when the same relative amounts of capital and labour are used as before the technology changed, however the amounts of inputs used per unit of output has fallen. A labour saving technology will result in the use of less capital and less labour per unit of output but the relative amount of capital used rises at constant factor prices. On the other hand when the amount of labour used relative to capital rises at constant factor prices then technology will be capital saving.

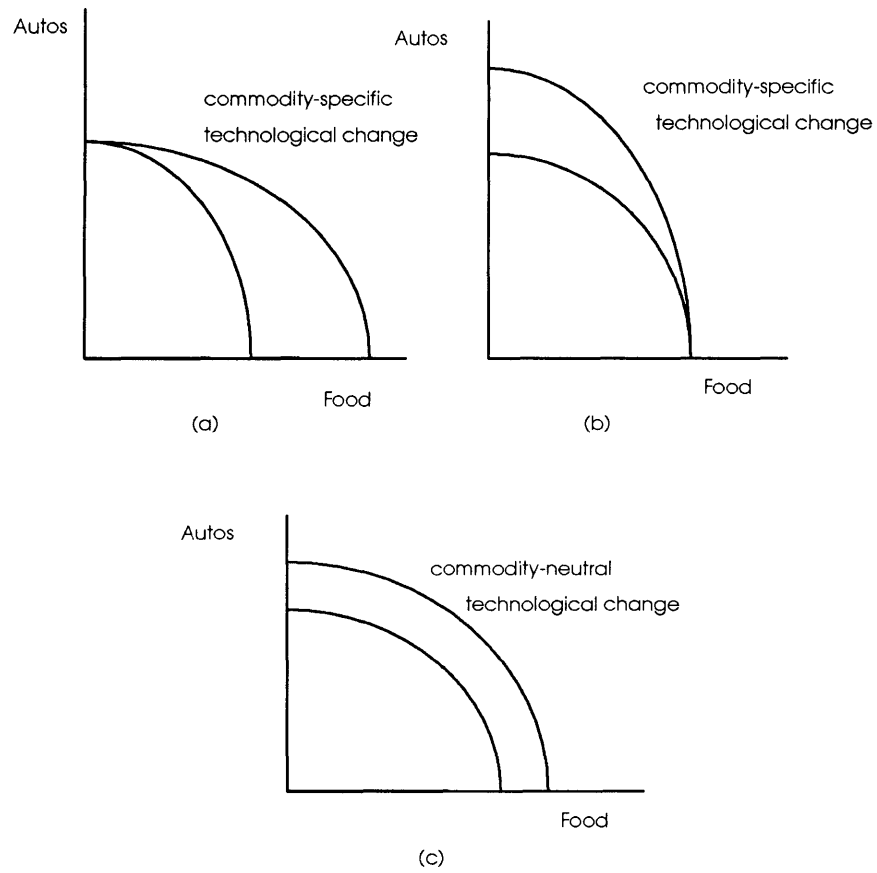
The present analysis will focus on the effect of a factor neutral technology on the production of a specific good. The goods used in the illustration in Figure 4.2.1 are autos (on the vertical axis) and food (on the horizontal axis).

Panel (a) depicts the effect of a factor neutral technology on the production of cars as opposed to food. The production of food has increased due to technology and this causes the PPF to move out on the horizontal axis while the autos output remains the same as it has not been affected by the technology change. On the other hand if technology affects the production of cars instead of food then the PPF would shift out verically (see panel b). Finally should the technology change affect the production of both goods then the PPF will shift out in the same proprtion as shown in panel (c).

4.2.3 Factors of Production

The increased availability of the factors of production also causes economic growth (Appleyard & Field, 1992). An increase in either of the factors or an increase in both

Figure 4.2.1
Effect of Technological Change on the PPF



Source: Appleyard & Field, (1992), *International Economics*, Irwin.

will cause the production frontier to move out. As already mentioned we will restrict our anlaysis to capital and labour inputs although in the real world there are other inputs such as natural resources, land and human capital.

The growth of capital and labour at the same rate implies that the PPF will shift out in a equiproportionate manner. This is known as a factor-neutral effect (see panel a in Figure 4.2.2). However if the availability of one of the factors increases relative to the other then shifts in the PPF will be more complicated (see panels b and c). For illustration purposes the capital intensive good (good A) lies on the vertical axis while the labour intensive good (good B) on the horizontal axis.

If the capital stock increases while the size of the labour force remains constant then the production of the capital intensive good will increase relative to the other and consequently the PPF in panel (b) moves out more on the vertical axis. An increase in capital could also increase productivity in the labour intensive activities because capital could be substituted for labour to some extent. Hence this causes a small shift of the PPF to the right on the horizontal axis (panel b).

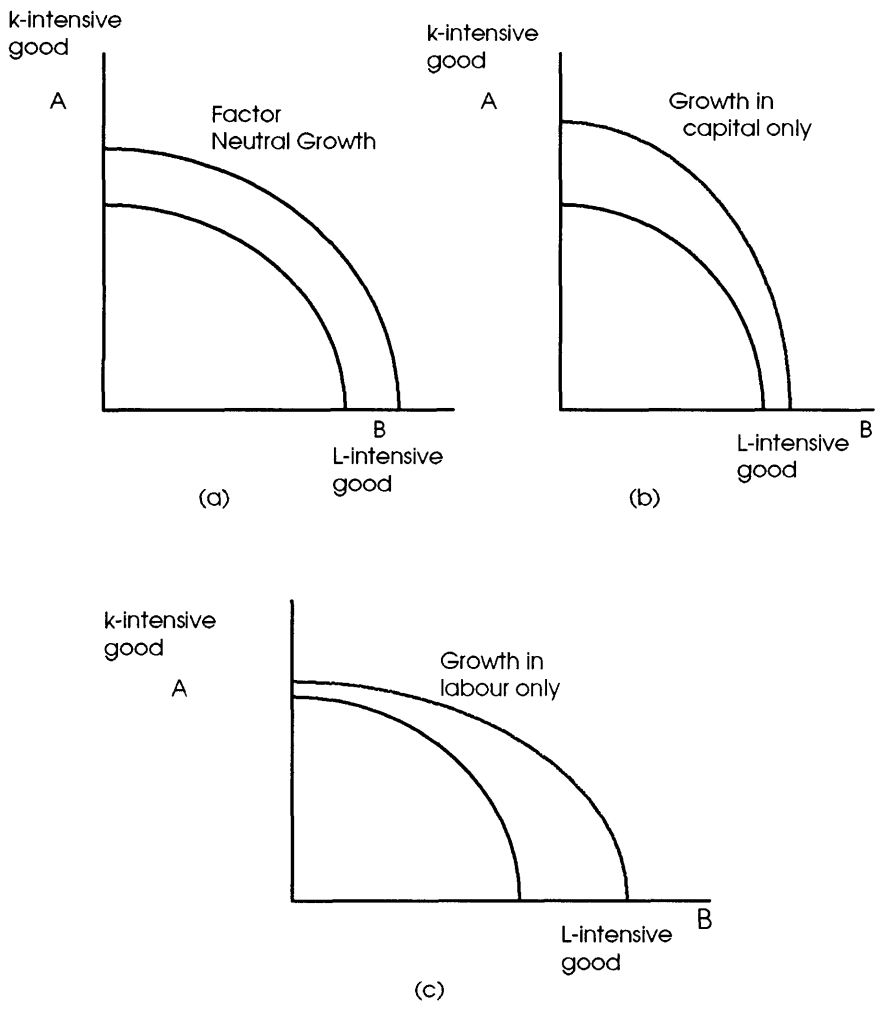
A similar argument can be developed in the case where the size of the labour force has increased while the capital stock remains constant. The PPF shifts out more towards the right due to growth of the labour force while the PPF only shifts up by a small amount (panel c). The increase in the labour force had a greater effect on the production of the labour intensive good compared to the capital intensive good.

4.3 Methodological Framework

The illustrations above show that the production or the total output of a country which is measured by Gross Domestic Product (GDP) or Gross National Product (GNP) can be influenced by a change in technology and growth in the factors of production.

The choice of statistical technique is based on parametric approach. Parametric techniques are often in the form of OLS regression analysis as used by Balassa, 1978; Tyler, 1981; Feder, 1983 and Jung and Marshall, 1985. In practice, most studies use linear production functions. This will be made clearer in the next section.

Figure 4.2.2
Effect of Factor Growth on the PPF



Source : Appleyard & Field, 1992.

The objectives of this study can be achieved by using the agrregate production function framework. To be able to see the effect of export on output growth (GDP) of a country we can include exports as a component of the production function. The most obvious measure of export growth is the actual change in the value of exports from time period to time period (e.g. Balassa,1978; Jung & Marshall, 1985). However, not all writers agree that these are appropiate measures. For example, Michaely (1977) has argued that

> since exports are themselves part of the national product, an autocorrelation is present; and a positive correlation of the two variables is almost inevitable, whatever their true relationship to each other (pp.54)

Contrary to the view above, this study uses the change in the value of exports from year to year because of the problem associated with obtaining consistent data for the non-export sector of the islands under study.

4.4 The Economic Model

The economic model can be derived from the theory of international trade and growth (presented in the previous section). A country's total production or total output can be defined as :

$$Y = C + I + G + X - M \qquad (5)$$

where,

Y	= total output
C	= consumption
I	= investment
G	= government spending
X	= exports
M	= imports

Heller and Porter (1978) further defines C + I + G - M as a country's internal final demand (F). That is:

$$F = C + I + G - M \qquad (6)$$

They state that a country's GNP (Y) is identically equal to the sum of its domestically produced internal demand (F) and its exports (X) :

$$Y = F + X \tag{7}$$

A country's production function is influenced by changes in its factors of production because they can affect the consumption, investment and spending decisions of its citizens and hence total output. The production function can be represented by the following equation:

$$Y = f(K_t L_t A_t) \tag{8}$$

where,

Y = total production (GNP)
K = capital stock
L = labour force
A = technology

and the subcript *t* denotes time.

Any change in the three factors indicates a change in a country's factor endowments and hence total output (Edwards, 1992).

From this simple production function we assume that technology is constant, that is, it is Hicks neutral. We further assume that the elasticities of output with respect to K and L are constant (Edwards, 1992) and therefore equation (8) can be represented in log linear form:

$$y = \beta_0 + \beta_1 l + \beta_2 k \tag{9}$$

where,

y = log GDP (total output)
l = logL (labour)
k = logK (capital)
β_0 = intercept
β_1 and β_2 are slope coefficients.

The hypothesis that export production improves factor productivity means that we can incorporate exports as an input into the production function (Tyler, 1981). Following

Moschos (1989), the assessment of the impact of export on growth can be carried out in a production function framework analysis so that the production function in equation (8) now becomes:

$$Y = f(K_t L_t X_t) \tag{10}$$

The variable X_t denotes exports. It has replaced the technology component because of the assumption that technology is constant. Rewriting equation (9) to include exports gives:

$$y = \beta_0 + \beta_1 l + \beta_2 k + \beta_3 x \tag{11}$$

where,

x = log X (exports)

In equation (11) it is assumed that the rate of technical change is a linear function of export growth (Kavoussi, 1984). However, there is a need to convert the variables to growth rates and this was done by expressing the data in the first differences of the logs.

$$dy = \beta_0 + \beta_1 dl + \beta_2 dk + \beta_3 dx \tag{12}$$

where,

dy = GDP growth rate
dl = labour force growth rate
dk = capital stock growth rate
dx = export growth rate

It is important to note that the specification of the economic relationship in log form has obvious implications for the interpretation of the coefficients of the variables as elasticities and the explanatory variables as growth rates.

4.5 The Statistical Model

The previous section outlined the economic model which can be transformed into a general statistical model by adding an error term to equation (11). Hence equation (11) becomes :

$$y_t = \beta_0 + \beta_1 l_t + \beta_2 k_t + \beta_3 x_t + e_t \tag{13}$$

Re-writing it in growth form:

$$dy_t = \beta_0 + \beta_1 dl_t + \beta_2 dk_t + \beta_3 dx_t + e_t \qquad (14)$$

This study involves the use of both cross sectional and time series data. The time frame of the study for the two island economies is 1967 to 1991. Thus equation (14) can be written as:

$$dy_{it} = \beta_0 + \beta_1 dl_{it} + \beta_2 dk_{it} + \beta_3 dx_{it} + e_{it} \qquad (15)$$

The i refers to the ith country, that is, we have i = *1,2* countries, while t is the corresponding time period (annual), that is, t = *1,2...25* years. The betas - β_0, β_1, β_2 and β_3 are unknown parameters to be estimated. These can be different for different cross sectional units in different time periods. The error term e_{it} is assumed to have a mean zero, $E(e_{it}) = 0$ and constant covariance, $E(e_{it}^2) = \sigma^2$ (Judge, Griffiths, Hill and Lee, 1988).

The purpose of pooling time series and cross sectional data is to account for differences in behaviour across cross sectional units and also differences in behaviour within cross-sectional units overtime (Judge et al., 1988). The effect of the behaviour of independent variables on the dependent variable may be captured by looking at behavioural differences in individuals or geographical locations over time, or, behavioural differences based on sex, race, level of education and marital status (Judge et al., 1988). Several methods have been developed to estimate the relationship between the dependent variable and independent variables of time series and cross-sectional data: (i) the Constant Coefficient models; (ii) Fixed Error models and (iii) the Random Error models (Judge et al., 1988). The choice between models depends on the assumptions made about the data. The analyst is faced with the problem of choosing the most efficient estimation procedure.

4.5.1 Constant Coefficient Model

It could be assumed that all countries have the same coefficients so that the model looks as follows :

$$Y_{it} = \beta_0 + \beta_1 x_{it} + \ldots + \beta_k x_{kit} + \varepsilon_{it} \qquad (16)$$

Assumptions concerning heteroskedasticity in cross sectional data and serial correlation in time series data have to be made. This further breaks the model down to 2 models - the cross-sectionally heteroscedatic and time wise autoregressive model (CHTA), and the cross sectionally correlated and timewise autoregressive model (CCTA). The first takes into account the presence of heteroscedasticity while the second is concerned with serial correlation (Judge et al., 1988).

The constant coefficients model is assumed to capture the differences overtime and across individuals through its disturbance term (Judge et al., 1988). However, it is quite restrictive compared to the dummy variable and error components models.

4.5.2 Fixed Error Model(s)

The fixed error models treat the parameters, β_{ki}, fixed where i is the ith country and k the kth parameter (Judge et al., 1988). It is fixed because of the assumption that the errors associated with parameters behave in a systematic pattern. It consists of the dummy variable and the seemingly unrelated models.

The dummy variable model (DVM) is commonly used to pool different samples of data into one sample. The basic idea behind the DVM is to use the intercept term to capture the differences between the countries. The general equation for the DVM is given by:

$$Y_{it} = \sum_{j=1}^{N} \beta_{0j} D_{jt} + \sum_{k=1}^{K} \beta_k x_{kit} + e_{it} \qquad (17)$$

where ,

i = 1,2,...,N refers to a cross sectional unit, hereafter referred to as country

t = 1,2,...,T refers to a given time period

$D_{jt} = \begin{cases} 1 & \text{if } j = i \\ 0 & \text{otherwise} \end{cases}$: refers to the dummy variables

Y_{it} = is an observation on the dependent variable for country i and time t

x_{kit}= is an observation on the kth explanatory variable for country i and time t

e_{it} = is the random error for the ith country and the tth time period

β_k = k = 1,...K, are slope coefficients, and as implied by the subscripts, are assumed to be constant overtime and countries

β_{0j}= are the intercept terms assumed to capture all behavioural differences between countries although they are assumed to be

different for each country, but constant over time.

j = is the *j*th dummy variable

The seemingly unrelated model (SUR) is more appropiate when all coefficients vary. It is assumed that the response of the dependent variable Y_{it} to an explanatory variable x_{kit} will be different for different individuals, but for a given individual it is constant overtime (Judge et al., 1988). The SUR model is discussed in detail in section 4.4.7.

4.5.3 Random Error Model(s)

Sometimes the parameters β_{ki}, are treated randomly. They are random because of the assumption that the cross-sectional units (i.e. the countries) which appear in the sample were randomly chosen and taken to be representative of a larger population. The differences observed between cross-section units are therefore taken to be random (Griffiths et al., 1993). The random error model consists of two other models: error components and the Swany models.

The random variable is equal to a mean plus an error term:

$$\beta_{0i} = \bar{\beta}_0 + \mu_i \qquad \text{where } i = 1,...N \qquad (18)$$

$\bar{\beta}_0$ is an unknown parameter that represents the population mean intercept and the term μ_i is the unobserved error which accounts for differences between cross section units with a zero mean and constant covariance. The general model is given by:

$$Y_{it} = (\bar{\beta}_0 + \mu_i) + \sum_{k=1}^{K} \beta_k X_{kit} + e_{it} \qquad (19)$$

Re-writing (19):

$$Y_{it} = \bar{\beta}_0 + \sum_{k=1}^{K} \beta_k X_{kit} + \mu_{it} \qquad (20)$$

where, $\mu_{it} = \mu_i + e_{it}$, a composite error. This is known as the error components model. The Swany model is mentioned for completeness, but it will not be covered in any detail.

4.5.4 Choice of a Model

The constant coefficient model is not an appropiate choice because as already mentioned it is quite restrictive in its approach. The use of the random error model may not lead us to achieve the objectives of this research. The reason for this lies in the assumptions of the model. That is, the random error model assumes that the countries involved in the study were randomly chosen and therefore taken to be representative of larger population. The Pacific islands countries were not chosen randomly, and because of their minority in relation to the world's economy, they cannot be taken as representative of the world. There are also problems with the DVM in terms of a loss of efficiency due to the increased number of parameters (i.e. the dummy variables) to be estimated as it causes a loss in degrees of freedom.

Since the chosen countries are taken from a region classified as the South Pacific, implying that countries in this region have similar characteristics, it is therefore still more appropiate to treat the parameters, β_k, as fixed. Economic performance can be explained by the labour, capital and export variables but there are also other important factors common to both islands. Such factors include natural resources, trade policies, size and geographical isolation that can also impact economic growth. Since there are difficulties in including this sort of information in the model we can observe them in the error terms of the equations using the *Seemingly Unrelated Regression* model.

4.5.5 The Seemingly Unrelated Regression Model (SUR)

The SUR model presents another method of pooling time series and cross sectional data while treating the parameters fixed. The general form of the model is given by :

$$Y_i = \beta_i X_i + e_i \quad i = 1,...M \text{ the number of equations} \qquad (21)$$

This model uses a system of equations operating on the assumption that there is correlation between the disturbance terms of the different equations. The correlation between the disturbances from different equations at a given time is known as *contemporaneous correlation.* When contemporaneous correlation exists then it is more efficient to estimate all equations jointly rather than separately using ordinary least squares (OLS) (Judge et al., 1988). This joint technique is known as the SUR model.

Recall, that the pooled data set can be described by the growth equation (14). The growth equations for the two islands can therefore be represented by the following equations:

Fiji: $dy_F = \beta_{0F} + \beta_1 dl_F + \beta_2 dk_F + \beta_3 dx_F + e_F$ (22)

PNG: $dy_P = \beta_{0P} + \beta_1 dl_P + \beta_2 dk_P + \beta_3 dx_P + e_P$ (23)

The omitted factors (variables) will be included in the error terms of the equations for the islands, e_F and e_P, and therefore natural to assume that the error terms, e_F and e_P are related (Griffiths et al., 1993).

Assumptions of SUR model :

1. $E[e_{it}] = 0$ i = 1,...N and t = 1,...T, -implies that all disturbances have a zero mean
2. $\text{var}(e_{it}) = E[e^2{}_{it}] = \delta_i{}^2$, -implies disturbance variance is constant
3. $\text{cov}(e_{it} e_{js}) = E[e_{it} e_{js}] = 0$ for $t \neq s$ and i,j = 1,2 -autocorrelation does not exist
4. contemporaneous correlation; $\text{cov}(e_i\ e_j) \neq 0$ i,j=1,2

The specific statistical model is therefore expressed by equations (22) and (23).

4.6 Specification of the Nature of the Series

Often when dealing with time series data there is a tendency to treat them as stationary processes. A formal definition of a stationary processes is given by Pindyck & Rubinfeld (1991) which states that a time series $y_1 \ldots y_t$ can be thought of as being generated by a set of jointly distributed random variable. That is, people always tend to assume that the movement or change of the process is fixed or stochastic in nature. In the real world, many of the time series observations are not generated by stationary processes. For instance the factors that accounted for GNP growth in this year may differ from those that affected GNP in the last couple of years.

Granger and Newbold (1974) have identified the problem caused by regressing nonstationary economic series on one another. They have called it 'spurious regressions'. It simply means that regression results when nonstationary data is used may yield significant results which may have no real meaning. That is the estimates obtained from OLS regressions will be biased and inconsistent. Therefore it was important to determine the nature of the variables.

Unit root tests were undertaken to test for stationarity in the data. The augmented Dickey-Fuller (DF) and the Phillips-Perron (PP) tests were used to test the data. If the data are found to be nonstationary then stationarity could be achieved by differencing the data once or more (Griffiths, Hill and Judge, 1993).

The augmented DF regression equations are:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^{P} \gamma \Delta Y_{t-j} + \varepsilon_t \qquad \text{and} \qquad (24)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum_{j=1}^{P} \gamma_j \Delta Y_{t-j} + \varepsilon_t \qquad (25)$$

where ε_t for t=1,...T is assumed to white noise. Equation (24) is with constant and has no trend while equation (25) is with constant and with trend. The reason for the augmentation of the lagged differences p is to ensure that the errors are uncorrelated.

The null hypothesis (H_0) for the unit root test is given by:

(i) $H_0: \alpha_1 = 0$ in equation (24);
(ii) $H_0: \alpha_1 = 0$ in equation (25);

while the null hypothesis for the trend and constant test are given by :

(iii) $H_0: \alpha_0 = \alpha_1 = 0$ in (24)
(iv) $H_0: \alpha_0 = \alpha_1 = \alpha_2 = 0$ in (25)
(v) $H_0: \alpha_1 = \alpha_2 = 0$ in (25)

The H_0 in (i) and (ii) states that there is unit root present. The H_0 in (iv), and (v) state that there is no deterministic trend in the data. The t-ratio is used to test the significance of the unit root hypothesis while an F-type test is used to test jointly for a unit root and a deterministic trend in the series.

The decision rule to employ when deciding whether to reject or not to reject the null hypothesis is given by:

1. Reject $H_0: \alpha_1 = 0$, that there is unit root, if the t-ratio is less than Dickey-Fuller t-critical value.

2. Reject $H_0: \alpha_0 = \alpha_1 = 0$; unit root, no constant
   $H_0: \alpha_0 = \alpha_1 = \alpha_2 = 0$; unit root, no constant, no trend
   $H_0: \alpha_1 = \alpha_2 = 0$; unit root, no trend,
   if the F-type test is greater than the Dickey-Fuller (Φ_i) critical value.

The test statistic and critical values are given in the unit root test output from Shazam.

4.7 Expectations of Results

4.7.1 Direction of Relationship

At first glance we can say that the relationship between total output and capital is positive provided that labour and exports remain constant. Similarly the same could be said about the individual relationships of labour and exports to total output given that everything else remains constant. This hypothesised relationship stems from the trade-growth literature discussed in section 4.2. Growth in a nation's factor endowments (labour and capital) contibutes to its ability to produce goods and services.

4.7.2 Magnitude of Coefficients

(a) Labour

Assuming that the islands are labour abundant an increase in labour may be subject to diminishing returns at some point in time. Hence, the sign for labour coefficient, β_1, may be positive or negative. However, the islands are engaged mainly in the production of labour intensive goods, for instance agricultural and mining goods. According to the assumptions made under the neoclassical and Hecksher-Ohlin models, a country will specialise in the production of goods in which it has comparative advantage (ie. production of primary goods) and the production of that good which uses its abundant factor intensively (ie labour). With this in mind we can therefore say that an increase in the size of the labour force, in which the islands are abundant, will increase production of the goods in which they have comparative advantage. Hence the sign of the labour force is expected to be positive and large in magnitude.

(b) Capital

The island countries are said to be capital-scarce and therefore any increase in capital would increase a country's total output. An increase in capital could also increase the productivity of the labour force and hence increase total production. The sign for the capital coefficient, β_2, is expected to be positive but relatively small.

(c) Export

The sign for the export coefficient, $\beta 3$, is expected to be positive. Exports provide foreign exchange which increases a country's capacity to allocate resources to improving the productivity of the factors of production.

4.8 Data

4.8.1 Data Sources

The data are mainly of secondary nature. They were obtained from the IMF, *International Financial Statistics Yearbook* for the years 1992 and 1993 and the World Bank, *World Tables* for 1988 and 1993. Other data were obtained from the Asian Development Bank's (ADB) various issues of the *Key Indicators of Developing Asia*

and Pacific Countries. The data have been collected in local currencies from the period 1967 to 1991.

Data for the capital stock were generated using a rough-brush measure suggested by Treadgold (1992). The capital-output ratio of 3.0 and a depreciation rate of five percent for both islands are based on the estimates used by Treadgold (1992). It is assumed that the capital-ouput ratio over time and across countries are constant. Such an assumption would be difficult to defend in its specifics but it may not be too inaccurate as a rough approximation.

Time-series and cross-sectional data were collected, giving two samples with 25 observations each. The two samples represent the two island countries, Fiji and Papua New Guinea, while the 25 observations are the annual data for each island on the following 4 variables: GDP (Y), labour force (L), capital stock (K), and exports (X).

The data have been expressed in real values to remove the effects of inflationary trends. All values were deflated into constant prices as 1980 as the base year. As mentioned earlier in the chapter, the logarithmic form of the data were used to 'smoothen' the series.

4.8.2 Data Limitations

It is of no doubt that the objectives of this study would have been better achieved if data for at least four other developing Pacific island countries could have been obtained. The original intention of the research was to study the trade orientations and economic performances of six pacific islands: Fiji, PNG, Solomon Islands, Vanuatu, Tonga and Western Samoa, and then to carry out a comparative study. However, the unavailability of data for the smaller islands for the period under study made this task impossible.

Data from Fiji and PNG can be obtained for the 25 year period under study and hence the research will concentrate on these two islands, identifying their trade strategies and hence their economic performances.

Also with only 25 observations, that is the sample is not large enough, it is quite difficult to determine with any degree of reliability the long-run relationship between economic growth (measured by GDP), labour, capital and exports.

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The unavailability of data on the actual capital stock and labour force of the two islands resulted in the use of approximations and proxies. The capital stock data as mentioned were generated using a method suggested by Treadgold (1992). Growth of the capital stock can also be measured using capital formation or investment figures (Kavoussi, 1984 and Tyler, 1981). The population growth was used as a proxy for labour force growth of Papua New Guinea because data on the labour force in wage employment and levels of employment in PNG are not reliable. This was used by Feder (1982). Other measures for labour growth used by other researchers have been employment figures (Bonelli 1992) and population figures multiplied by the participation rate (Moschos 1989). Employment figures were used as a proxy for the labour force growth of Fiji.

4.8.3 Statistical Package Used

The Shazam Statistical Application Package, version 7.0 (White, 1993) was used to conduct all specification tests (that is the unit root tests) and to estimate the SUR and OLS models.

5. EMPIRICAL RESULTS AND DISCUSSION

5.1 Unit Root Test Results

The nature of time series data to yield spurious estimates and t-statistics made it important to test for the nature of the variables. This was to determine whether the time series observations were generated by stationary or non-stationary processes. To test for this aspect unit root tests were conducted using the augmented Dickey-Fuller (DF) and Phillips Peron tests. However, since unit root tests cannot be carried out on a combined data, for example pooled data sets, all the series were tested on a country by country basis after transforming the data to natural logs. The variables were tested in levels as well as in the first and second differences.

The augmented DF tests in levels indicated that most of the series have unit roots or in other words were nonstationary in logs. Only the capital stock growth rates of Papua New Guinea was determined to be stationary. In first differences the export and GDP variables for Fiji and the GDP and labour variables of PNG were found to be stationary. Applying second differences to the remaining nonstationary variables resulted in stationarity for these variables. When the Phillips-Peron test was applied most of the variables were stationary except for the GDP and labour variables. The small sample size is the most likely explanation for the inconsistency of the results. The detailed results are given in Tables 5.1.1 and 5.1.2.

Based on the test results the data were then expressed in the first differences of the logs (differenced in first levels) before regressing the variables on each other. According to Granger and Newbold (1974) the use of nonstationary data can yield misleading results and commit serious error inferences. It must be mentioned that since the model is expressed in 'growth rates', that is $\log y_t - \log y_{t-1}$, there should not be any problem with achieving stationarity.

5.2 Estimation of the Seemingly Unrelated Model

The statistical equations (23) and (24) were estimated jointly using the SUR model with variables expressed in growth rates of 24 time series observations. A restricted and an unrestricted form of the model was estimated. The type of restrictions carried out are

explained below. Regressing the variables jointly yielded the results as shown in Tables 5.2.1 and 5.2.2.

5.2.1 Testing for Constant Returns to Scale

The model can be presented by the production function equations:

$$\text{Fiji: } dy_F = \beta_{0F} + \beta_1 dl_F + \beta_2 dk_F + \beta_3 dx_F + e_F \qquad \text{(recall equation 22)}$$

$$\text{PNG: } dy_P = \beta_{0P} + \beta_1 dl_P + \beta_2 dk_P + \beta_3 dx_P + e_P \qquad \text{(recall equation 23)}$$

The production functions for the countries were assumed to exhibit constant returns to scale and therefore it was necessary to test for this aspect. The null hypothesis states that:

$$H_0 : \beta_{1F} + \beta_{2F} + \beta_{3F} = 1$$
$$H_0 : \beta_{1P} + \beta_{2P} + \beta_{3P} = 1$$

The alternative hypothesis on the other hand states that the above statements do not equate to one. The test statistic is the Wald chi-square statistic where H_0 is rejected if the chi-squared statistic is greater than the critical chi-squared distribution value. The test results show that the computed test value is less than the critical value and therefore fail to reject the the null hypothesis. The SUR model was then estimated based on the restrictions of constant returns to scale.

5.2.2 Testing for Contemporaneous Correlation

This test is to determine whether the growth of the two economies were related given that they were from the same geographical location. The test is known as *Breusch-Pagan LM* test. An appropiate test statistic is given by:

$$\lambda = T \sum_{i=2}^{M} \sum_{j=1}^{i-1} r_{ij}^2 \qquad (26)$$

The test statistic λ has an asymptotic χ^2 - distribution with M(M-1)/2 degrees of freedom, where M is the number of equations and r_{ij}^2 are squared correlations used in the computation of λ (Griffiths et al., 1993).

The null hypothesis can be stated a follows:

$$H_0 : \sigma_{FP} = \sigma_{PF} = 0$$

The alternative hypothesis states that there is contemporaneous correlation between the two countries. The null hypothesis is rejected if $\chi^2 \rangle \chi^2_{(df)}$ - distribution at a pre-specified level.

Under the unrestricted model the computed chi-squared from the shazam output is 0.94038 and the critical value with 1 degrees of freedom at 5 per cent level is, χ^2 = 3.84146. Since the computed χ^2 is less than $\chi^2_{0.05,(1)}$, the critical value, H_0 is not rejected. Therefore it can be concluded that there is no contemporaneous correlation between the two islands for these data. The two island countries seem to be two entirely independent economies.

Similarly, contemporaneous testing was carried out for the restricted SUR model. Since χ^2=0.93379 is less than the critical value (3.84146) there is still no evidence to reject the contemporaneous correlation hypothesis. The same conclusion was arrived at as that obtained under the unrestricted SUR model.

These conclusions lead us to conduct separate Ordinary Least Squares (OLS) estimation on the two countries. According to Kmenta (1986) there is no gain in efficiency by using the SUR estimation if no correlation exists between the countries. In other words, the SUR and OLS estimation are equivalent.

Testing for the significance of the variables under the SUR model is not necessary at this stage due to a change in method of estimation as mentioned above. Tests of this kind will be carried out on the results for the OLS model.

Table 5.1.1
Dickey-Fuller Unit Root Test Results

Variable	In levels	1st Diffs	2nd Diffs	Conclusion
Fiji :				
Yf	nonstationary	***stationary***	***stationary***	I(2)
Lf	nonstationary	nonstationary	nonstationary	I(3)
Kf	nonstationary	nonstationary	***stationary***	I(2)
Xf	nonstationary	***stationary***		I(1)
PNG :				
Yp	nonstationary	***stationary***		I(1)
Lp	nonstationary	nonstationary		I(1)
Kp	***stationary***	***stationary***	***stationary***	I(0)
Xp	nonstationary	nonstationary	***stationary***	I(2)

Table 5.1.2
Phillip-Perron Unit Root Test Results

Variable	In levels	Conclusion
Fiji :		
Yf	nonstationary	I(1)
Lf	nonstationary	I(1)
Kf	***stationary***	I(0)
Xf	***stationary***	I(0)
PNG :		
Yp	***stationary***	I(0)
Lp	nonstationary	I(1)
Kp	***stationary***	I(0)
Xp	***stationary***	I(0)

Note: I(0)- stationary in level
I(1)- stationary in first differences
I(2)- stationary in second differences etc.

Table 5.2.1
Unrestricted Production Function Estimation (SUR)

Variable	Estimated Coefficient	Standard Error	T-Ratio
Fiji:			
constant	0.0024029	0.018852	0.12746
dl_F	0.33794	0.22259	1.5182
dk_F	0.30864	0.38779	0.79589
dx_F	0.27499*	0.097561	2.8187
R^2=0.3262			
Papua New Guinea (PNG):			
constant	-0.17957	0.29973	-0.59911
dl_P	7.3515	12.968	0.56692
dk_P	0.57189	0.038514	1.4849
dx_P	0.13645*	0.048580	2.8087
R^2=0.3193			

Breush-Pagan LM test with χ^2 -distribution is 0.94038
(critical value = 3.84146)

Note: 1. * denotes significance at 5% level
2. ** denotes significance at 10% level
3. two-tailed tests

Table 5.2.2
Restricted Production Function Estimation (SUR)

Variable	Estimated Coefficient	Standard Error	T-Ratio
Fiji:			
constant	0.0003867	0.008995	0.042993
dl_F	0.35954**	0.20224	1.7778
dk_P	0.35821**	0.17634	2.0314
dx_F	0.28225*	0.093219	3.0278
R^2=0.3239			
Papua New Guinea (PNG):			
constant	-0.014933	0.010317	-1.4474
dl_P	0.21738	0.37588	0.57832
dk_P	0.64081**	0.36849	1.7390
dx_P	0.14181*	0.047987	2.9553
R^2=0.3118			
Breusch-Pagan LM test with χ^2 -distribution is 0.93379 (critical value = 3.84146)			

Note: 1. *denotes significance at 5% level
2. ** denotes significance at 10% level
3. two-tailed test

5.3 Estimation of the OLS Model

Following the rejection of the comtemporaneous correlation hypothesis we can now estimate the production functions for the two islands using the ordinary least squares procedure. The first model (model 1) will be estimated without a dummy variable while the second model (model 2) will incorporate a dummy variable. The inclusion of the dummy variable is to see whether economic growth could have been affected by the degree of openess in the economy. Due to the fact that Fiji officially adopted an export oriented trade strategy in 1989 while PNG has maintained a relatively open economy over the whole period under study, the dummy variable will be included in the production function of Fiji only.

We assume that autonomous growth is affected by the degree of openess in an economy and we can include this information by adding a dummy variable to the production function of Fiji. The dummy variable can be defined as:

$$D_t = \begin{cases} 1, & \text{if t = 1989 onwards} \\ 0, & \text{otherwise} \end{cases}$$

The general form for Fiji's production function is now given by:

$$dy_{Ft} = \beta_{0Ft} + \delta D_t + \beta_1 dl_{Ft} + \beta_2 dk_{Ft} + \beta_3 dx_{Ft} + e_{Ft} \qquad (27)$$

where the intercept,

$$\beta_{0F} = \beta_{0Ft} + \delta D_t \qquad (28)$$

The results for model 1 and model 2 are presented in Tables 5.3.1 and 5.3.2. Since no dummy variable was included for PNG the results remain the same in both models. Only the results for Fiji have changed.

5.3.1 Testing for Constant Returns to Scale

Unlike the SUR model, the constant returns to scale test was conducted separately on each country for the OLS estimation. The test statistic is now the F-distribution. The null hypothesis is given by:

$$H_0 : \beta_{1F} + \beta_{2F} + \beta_{3F} = 1$$
$$H_0 : \beta_{1P} + \beta_{2P} + \beta_{3P} = 1$$

The null hypothesis is rejected if the F-test statistic is greater than the critical value of the F-distribution. For model 1 the hypothesis of constant returns to scale was not rejected for both Fiji and PNG. Restrictions were then carried out on model 1 and the results are shown in Table 5.3.1.

The same testing procedure was carried out on model 2 with the dummy variable incorporated into Fiji's production function equation. Again, there was no evidence to reject the constant returns to scale hypothesis and therefore applied restriction to the model. Results are given in Table 5.3.2.

5.3.2 Testing for Significance

This form of hypothesis testing is to determine whether the estimated coefficients were significantly different from zero. This requires the use of a two-tailed test. The test is to determine whether the growth of the economies concerned is influenced by the specified explanatory variables. The null hypotheses to be tested are:

$$H_0:\beta_1 = 0;\ H_0:\beta_2 = 0;\ H_0:\beta_3 = 0,$$

which are tested against the alternative hypotheses that:

$$H_a:\beta_k \neq 0$$

The decision rule is to reject H_0 when the absolute value of the t-ratio, $|t|$, is greater than the critical value at a pre-specified significance level and degrees of freedom. Recall that the degrees of freedom is *(T-k-1)*, where *T* represents the number of observations while *k* refers to the number of coefficients. For this study the five per cent and 10 per cent levels are used with 19 degrees of freedom. At the five per cent level the critical value of the t-statistic is 2.093 while the t-statistic for the 10 per cent level is 1.729. For model 2 with 18 degrees of freedom the corresponding critical values are 2.10 (5%) and 1.729 (10%). [The t-statistics critical values can be found in the appendix of most Econometric textbooks]

Table 5.3.1
Model 1- No Dummy Variable
Unrestricted & Restricted Production Functions (OLS)

Variable	Unrestricted Coefficient	Restricted Coefficient
Fiji :		
constant	0.0049642 (0.020844)	0.00025930 (0.0095958)
dl_F	0.36824 (0.24838)	0.39485 (0.22049)**
dk_F	0.26183 (0.42974)	0.35961 (0.19216)**
dx_F	0.23728 (0.10863)*	0.24554 (0.10139)*
	R^2=0.3303	R^2=0.3281
LM (Autocorrelation)		
1	-2.58	
2	0.66	
3	0.10	
4	-1.86	
5	1.52	
6	-0.27	
7	-0.48	
RESET (1) (critical value at 5%=4.38)	0.46	
RESET (2) (critical value at 5%=3.55)	0.45	
RESET (3) (critical value at 5%=3.20)	0.49	
B-P-G χ^2 Test	2.41	

Papua New Guinea:

constant	-0.17164 (0.33217)	-0.015520 (0.011089)
dl_P	6.9224 (14.375)	0.16497 (0.40974)
dk_P	0.63396 (0.42990)	0.69584 (0.40161)**
dx_P	0.13480 (0.0540)*	0.13919 (0.052192)*
	R^2=0.3201	R^2=0.3125
LM (Autocorrelation)		
1	1.79	
2	-1.53	
3	-1.10	
4	0.88	
5	0.36	
6	-1.89	
7	-1.69	
RESET (2)		
(critical value at 5%=4.38)	1.08	
RESET (3)		
(critical value at 5%=3.55)	0.53	
RESET (4)		
(critical value at 5%=3.20)	0.35	
B-P-G χ^2 Test	1.86	

Note:
1. * denotes significance at 5% level.
2. ** denotes significance at 10% level.
3. two-tailed tests.
4. standard errors in parantheses.
5. LM: Lagrange Multiplier Test for autocorrelation.
6. RESET: Test for functional misspecification.
7. B-P-G χ^2 Test: Breusch-Pagan-Godfrey Chi-square test for heteroscedasticity.
8. Diagnostic testing is valid only for the unrestricted production functions.

Table 5.3.2
Model 2 - Dummy Variable
Unrestricted and Restricted Production Function for Fiji (OLS)

Variable	Unrestricted Coefficient	Restricted Coefficient
constant	0.0019066	0.0011922
	(0.02388)	(0.010603)
D_F	0.009612	0.011182
	(0.03371)	(0.031152)
dl_F	0.35821	0.37127
	(0.25671)	(0.23459)
dk_F	0.32248	0.38641**
	(0.48868)	(0.21000)
dx_F	0.23769*	0.24232*
	(0.11123)	(0.10395)
	R^2=0.3331	R^2=0.3324

Note: 1. * denotes significance at 5% level
2. ** denotes significance at 10% level
3. standard errors in parantheses

(a) Model 1

Results for the unconstrained model showed that only the export variables were significant at the five per cent and 10 per cent levels for the two island states. This implies that the export input has a strong effect on the economic growths of the islands which was an expected result.

When the constant returns to scale restriction was imposed on the production functions of Fiji and PNG, most of the input factors were significant, except for the labour variable of PNG. The labour force input for PNG showed that changes in this variable did not have any significant effect on the total production of the country. This result was quite contrary to prior expectations. A more detailed discussion of this result is given in section 5.4.

(b) Model 2

Again, only the export variable is significant for the unrestricted production function. For the constrained production function the capital and export variables were significant enough to influence total production. The labour force input was not significant (that is barely insignificant) which is contrary to prior expectations. The dummy variable which measures whether trade orientation had any significant effect on the growth of the economy appeared insignificant which is quite an unexpected result. Detailed discussion on these results will be covered in section 5.4.

5.3.3 Estimation Results

Diagnostic testing was carried out for the original unconstrained model (See results in Table 5.3.1, Model 1). Chow tests were performed on each observation for both countries to detect any structural breaks. Fiji showed no evidence of structural instability except for the period 1988-1990 when it officially adopted an outward oriented strategy. Papua New Guinea showed structural break during 1982 to 1986 when the effects of the recession settled into the economy. Agricultural production declined, gold and copper production fell during this period as a result of low export prices.

The LM statistics for the two islands showed no evidence of autocorrelation as the lags were insignificant at the five per cent level. The Breusch-Pagan Godfrey chi-square test

for heteroscedasticity also showed no evidence of heteroscedasticity. Reset tests do not reveal any specification bias at the five per cent level for any of the islands.

The empirical results are not exactly consistent with the nonsample information. Fiji produces with decreasing returns to scale: $b_1 + b_2 + b_3 < 1$, while PNG produces with increasing returns to scale: $b_1 + b_2 + b_3 > 1$. Failure to reject the assumption of constant returns to scale resulted in the restriction carried out on the production functions to include the non-sample information.

In summary, the restricted OLS produced much better results for both islands. It is reasonable to expect that the combination of both sample and non-sample information will produce more precise estimation. This is supported by the lower standard errors of the restricted model resulting in significant results. The lower R^2 (the propotion of variation in the dependent variable explained by the explanatory variables) values of the restricted are simply due to the fact that it does not track the sample observations as well as the unrestricted (Griffiths et al., 1993), however, the restricted procedure produces more reasonable estimates due to the inclusion of the non-sample information. The discussions will therefore be based on results of the restricted model.

5.4 Discussion of Results

5.4.1 Intercept (Constant)

(a) Model 1

The intercept terms for the two countries are different again implying two different economies. The constant term means that when the growth effects of labour, capital and exports are zero then the growth of an economy will depend on the magnitude of the constant term. According to the statistical results zero growth in the labour, capital and export inputs will see the economies grow at near zero per cent for Fiji while PNG may experience a negative growth of about 0.02 per cent. The intercept term can be modelled as a trend term which implicitly captures technical progress (Greenaway and Sapford, 1994). In accordance with the results, technology may have had no effect on the total production or it may be the case that the available technology was inappropiate to the production means of the islands.

(b) Model 2

When the dummy variable assumed the value of zero, implying a relatively more protective regime, Fiji's economy is seen to experience negative growth at a rate of about 0.001 per cent. However, if it becomes more open to world trade then economic growth is almost zero at 0.0001 per cent. It was expected that autonomous growth would be larger under a more open economy but since the dummy variable only takes the value of one three times no real trend can be depicted from this short period.

5.4.2 Dummy Variable (Degree of Openess)

The dummy variable (D_F) was insignificant but nevetheless had a positive effect on the total output growth of Fiji. The positive correlation between total output and the degree of openess was expected. The empirical results (indicated by the data) may not be significant due to the reason that Fiji has just since 1989 adopted an outward oriented strategy. As a consequence this may not show up in the results because the dummy variable only takes the value of one three times (that is, from 1989 to 1991). Again, no trend can be depicted from this short term period.

5.4.3 Labour force

The labour force input for Fiji significantly affected total output growth in that country. Meanwhile PNG did not produce the same results in that its labour variable did not have any significance effect on PNG's total output growth. A 10 per cent increase in the growth rate of the labour force boosted the GDP growth rate of Fiji by 3.95 per cent, while the it only contributed about 1.65 per cent to PNG's output growth.

The positive relationship between labour force growth and the growth rate of production was the expected result for both islands as productivity is expected to rise with an increase in the labour force, given that the islands have comparative advantage in producing primary goods (i.e., agricultural goods) and are labour abundant. The islands are abundant in labour relative to capital and their production processes centred around labour intensive activities, for instance agriculture and mining. And according to theory, countries should specialise in the production of that good which uses its abundant factor (in this case labour) intensively (refer to section 4.6). Countries will also export this good.

Fiji is an agriculturally based economy with sugar as its main crop and and copra as the second main crop. About 22 000 smallholders are involved in the cultivation of sugarcane while the Fiji Sugar Corporation is responsible for processing the crop. It makes up about 15 per cent of GDP (Browne & Scott, 1989). Sugar is the main export crop with copra second.

Papua New Guinea is also an agricultural country as the majority of its inhabitants rely on it for their existence. It accounts for about one third of total output (Browne & Scott, 1989). The mining sector has been growing in importance with the export of metals such as copper, gold and silver, accounting for two thirds of total exports. In fact it has become the dominant sector in the economy as the output generated from the agricultural sector has declined over the years. The processing of forestry products is the third major sector in PNG.

The effect or significance of the labour input on PNG's total production was found to be low because of the country's highly unskilled labour force. About one per cent of the total population are non citizens but fill about half of the administrative and managerial posts (Stein, 1991). The unskilled labour force is a result of deficiencies associated with the education system. Only about five per cent of those in the formal workforce completed secondary schooling (Stein, 1991). A highly unskilled labour force implies low labour productivity. In additon, the cost of labour relative to its productivity is quite high.

With an abundant supply of labour as well as concentrating in the production of primary commodities, an increase in the size of the labour force will undoubtedly raise the growth rate of output for both islands.

5.4.4 Capital Stock

The capital stock variable for both island states were significant and positively affected economic growth. This is evident from the positive signs of the coefficients and their corresponding t-statistics. The results likewise suggest that the elasticities of capital with respect to output growth were 0.36 and 0.70 for Fiji and PNG respectively. These figures could actually be interpreted as the marginal productivities of capital. The value for PNG is quite high compared to Fiji.

The effect of an open economy on investment in Fiji was fairly significant given the results of model 2. Treadgold (1992) notes that investment in Fiji was quite low during its more protective stages of development.

A positive association between capital and economic growth as well as significant estimates were the expected results, given that these island countries are relatively capital scarce. Therefore any increase in capital stock will tend to increase productivity. Capital accumulation was very much needed to sustain productivity increases in the labour input and also to develop the mining, manufacturing and tourism sectors of the countries. The growth of the capital stock has been associated with the growth of investment in a given time period.

The rate of investment in Fiji is relatively low by regional standards and when compared to other middle income developing countries. Cutbacks in government spending as a result of tight fiscal policies was partly responsible for this. This was followed by the political instability in the late eighties as a result of the coup which created an unfavourable environment for investors. The vulnerability of the country to natural disasters as well as the protective controls which were aimed at fostering a self sufficient economy also adversely affected the rate of investment. (Treadgold, 1992).

The high effect of capital on output growth of PNG can be attributed to the high demand for capital in the mineral sector. Capital formation has risen in PNG since 1989 and 1990 due to rising investments in the mineral sector. Low rates in previous years was a result of low public investment in the infrastructural services of the country and also deficiencies in project planning and execution (Stein, 1991).

5.4.5 Level of Exports

As can be seen from the estimations, the level of exports greatly affected economic growth for the two islands. According to the results the elasticity of exports with respect to output was 0.25 for Fiji and 0.14 for PNG. The figure for Fiji is comparatively higher than that of PNG. This may be attributed to Fiji's recent commitment (since 1989) to adopt an export oriented trade strategy and also its success in its tourism industry. Fiji in the early and mid-1980s was engaged in import substitution and self sufficient strategies.

The growth rate of PNG's economy is significantly affected by growth in exports. PNG has had a fairly open economy. She is also more endowed with natural resources than

other Pacific island countries. Its exports are more diversified compared to other Pacific island countries (for example Fiji). That is, its exports include agricultural goods, minerals and forestry products. In addition to being rich in natural resources, PNG's geographical location is also an advantage compared to other island countries. Its close location to South East Asian economies, Australia, New Zealand and Japan means that it is well placed and therefore have easier access to big world markets.

5.5 Summary

With the use of a production function to model the effect of export and therefore trade orientation on economic growth, it can be seen that the two islands depended heavily on the labour, capital and export inputs for growth. The only exception was the labour variable for PNG which did not excert a strong influence on economic growth. The effects of the inputs varied between the islands which can be attributed to the different endowments of natural resources, geographical locations and their economic policies towards promoting growth.

The use of a dummy variable to model the change in the growth of total output for Fiji as a result of a more open economy showed that the degree of openess of the economy positively influenced economic growth. The same was not done for PNG as this country has maintained a relatively open economy during the period covered in the study.

6. CONCLUDING REMARKS

6.1 Summary

This research has basically been an attempt to determine whether the positive link of outward orientation to economic growth applied to Pacific island nations in general. Due to problems encountered in acquiring data on most Pacific islands, the study was limited to only two countries, namely Fiji and Papua New Guinea.

In a production function framework, the export variable was used to model the effect of outward orientation, together with the labour and capital variables on the economies of Fiji and PNG. This framework of analysis reflects those used in previous empirical studies which have been summarised in chapter 2. The trade strategies employed by the islands during the period 1967 to 1991 have been identified in chapter 3. The method of analysis employed in order to achieve the objectives of the study were explicitly set out in chapter 4, while the results and discussion were presented in chapter 5.

The level of capital stock and exports were the most important inputs in the production functions of the two islands. The effect of the labour variable was more significant in the case of Fiji compared to PNG. The results reveal that although the islands belong to the same geographical location, there still exists some differences as to the extent of these inputs on total production.

6.2 General Conclusions

The main objective in this research was to see whether outward orientation was positively associated with economic growth. The analyses documented in this paper based on the two islands confirm some of the results of previous empirical work on trade orientation and economic growth. Exports played a key role in the economic performances of Fiji and PNG, as well as the positive influences of the level of capital and labour force.

In effect, the hypothesis that outward orientation is positively linked to economic growth was supported by the results. The insignificant effect of the degree of openess on economic growth was unexpected, but such a result can be explained by the dummy variable only taking the value of one three times.

The results also show that the economies operate independently, although they are located in the same geographical region.

Therefore, given the results of the study, there is no doubt that there is a significant and positive correlation between outward orientation and economic performance. Fiji's economic performance improved under a more open economy compared to an import substitution economy. Papua New Guinea's economic growth has shown steady progress over the years under a relatively open economy. Any economic setbacks experienced by the islands were due to internal factors such as political unrest, frail infrastructural services and problems caused by price instability of primary goods.

Fiji and Papua New Guinea's export-oriented strategies are well supported by assistance from Australia and New Zealand. These two countries provide long term favourable access to their markets for the island countries' exports. For instance the South Pacific Regional Trade and Economic Co-operation Agreement (SPARTECA) has ensured duty free arrangements to clothing, textiles and footwear. Papua New Guinea and Fiji also enjoy duty free access to the European Community markets under the Lome IV agreement.

Overall Fiji and Papua New Guinea's economic growths appear to be highly dependent on their export growth.

6.3 Policy Implications

In light of the results, it is fair to recommend that the islands pursue policies that promote the growth of the export sector. However, it should be pursued with some caution as the South Pacific countries are generally characterised by:

- Small scale size economies implying a limited resource base and hence a narrow export base; and
- Isolation from the main world markets which means that access to world markets is an expensive process.

Policies should therefore be taylored to suit the islands' unique social, political and economic circumstances. Listed below are some of the general recommendations on the adoption of an outward oriented strategy.

- The dynamic structure of the Pacific islands implies that an intervention-led outward orientation strategy would be more suitable, however, it should be based on a political system which is capable of discerning when to intervene and when to allow the economy to respond to world market conditions.

- It is important for the islands to recognise when the trade strategy needs to be changed to suit internal and external conditions. Some of the critics on export-promotion strategies (e.g. Singer, 1988; Kavoussi, 1985) contend that such a strategy would be self-defeating at a time when external demand conditions are unfavourable. Therefore, policies should be flexible.

- It is also a good practice to weigh the benefits and costs of an outward oriented strategy if unsure about the choice of trade strategy that would enhance economic growth.

6.4 Limitations of the Study

The results from this study should be treated with caution when applied to the Pacific region as a whole. As mentioned in the literature review for the islands, there is a wide disparity among the islands in terms of size and resources. Papua New Guinea and Fiji are among the biggest islands of the South Pacific and therefore cannot be representative of the Pacific islands as a whole. The results of the study in fact show that Papua New Guinea and Fiji have independent economies. The analysis to see whether export growth had any effect on economic performance for the two islands were therefore carried out separately, using ordinary least squares. We cannot say with certainty that outward orientation prescribed by economists apply to the South Pacific as a whole, except for the two islands on which the study was based on.

It is also worth mentioning that Fiji and Papua New Guinea are classified by the World Bank as low middle income developing countries. They are not considered as poor nations compared to other developing countries and therefore the positive correlation between export growth and economic growth was probably due to the level of development already existing in these islands. These results would support the conclusion of Michaely's (1977) study.

6.5 Scope for Future Study

Data constraints were mostly responsible for limiting the study to two islands. In particular, data on capital stock and labour force were not readily available for Pacific island countries. A more complete study could have been undertaken with the inclusion of two other smaller islands, for instance Tonga and Western Samoa. This would have enabled us to compare the effect of an export-oriented strategy on smaller islands with the bigger islands. The availability of data for these smaller islands in the future will enable a more complete study.

Secondly, the availability of longer time series would be desirable in detecting long-run relationships between trade and growth. Finally, the use and availability of 'proper' data for capital and labour, instead of the use of proxies, might adequately capture the importance of these variables on the economic growth of countries.