AN EMPIRICAL EXAMINATION OF THE EXPORT-LED GROWTH HYPOTHESIS IN FIJI

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Abstract

This paper examines the nature, as well as the strength of the causal relationship between real exports growth and real GDP growth for Fiji. Granger causality tests, under a VAR framework, were used to examine whether growth in real exports causes real GDP growth or vice versa. Moreover, in an effort to gauge the strength of the causality, the paper tested the influence of a third variable by using Block Exogeinity tests. Other measures, f-tests and variance decomposition tests, were also used to assess the strength of this relationship on an in-sample basis. Overall, the results showed that growth in real exports does cause real GDP growth. Moreover, it was found that the trade-weighted trading partner GDP (lagged one year) and real imports, from the late 1980s, have played an important role in enforcing the relationship between real exports growth and real GDP growth. In broad terms, therefore, the results of this study are supportive of the export oriented, outward-looking approach to trade relations adopted by policymakers over the past decade.

1.0 Introduction

The notion that exports drive economic growth has been subject to considerable debate in the development and growth literature for many decades. In the export-led growth (ELG) debate, the most frequently asked questions are: Is exports growth the engine of economic growth, is economic growth the engine of exports growth, is there a two-way (feedback) relationship between these variables or is there no causality between them at all?

Broadly, the focus of the ELG debate is whether a country is better served by orienting trade policies to export promotion or import substitution. The traditional Neo-classical view has been that economic growth can be achieved by an expansion in exports. The Asian Newly Industrialising Countries (NIC's), particularly Hong Kong, Singapore, Korea, Taiwan, Malaysia, and Thailand are often cited as examples of countries that have experienced export-driven growth. Over the past 30 years, these NIC's have approximately doubled their standard of living every 10 years. Their experiences have shown that openness to trade is a mechanism for achieving more rapid and efficient growth, as well as better utilisation of resources. (Findlay and Watson, 1996)

In Fiji's case, after independence in 1970, policymakers began promoting import substitution industries (particularly in the manufacturing sector) through high tariff protection, import licensing and quotas. Even though these industries were inefficient and charged high prices for products offered to consumers, the Government continued with its import substitution policies, as consumers were generally able to tolerate it. This was largely due to the fact that Fiji enjoyed a period of remarkable growth

in the national income level in the 1970s, largely driven by a massive expansion in the sugar industry and, to a lesser extent, by rising tourism numbers (UNESCAP,[1] 2000).

However, by the early 1980s, the fragility of the industrial sector became apparent as growth in the sugar industry began to falter, following a series of natural disasters. Hence, the slowdown in the sugar industry, coupled with the high rates of effective protection in the manufacturing sector, compounded a gradual contraction in the economy. In addition, the economic climate changed dramatically with the coups of 1987.[2] There was an immediate outflow of capital, tourist arrivals plummeted and sugar production fell sharply (UNESCAP, 2000).

Facing such an economic situation, Fiji could not continue with its inefficient import substitution polices. Hence, in the late 1980s, Government reoriented its trade policy from import substitution to export promotion, with particular emphasis on encouraging the expansion of the private sector as a means of achieving economic development. In an effort to encourage export industries, the Government set up tax-free factory/zone schemes, aimed at the production and export of garments, textiles and footwear. These schemes coincided with the removal of quota restrictions by the Australian Government, in addition to duty free restrictions, which were initially[3] provided by Australia and New Zealand to Fiji and other

[1] United Nations Economic and Social Commission for Asia and the Pacific.
[2] In 1987, the first coup took place in May, while the second one occurred in September.
[3] When SPARTECA was signed in 1981 between Australia, New Zealand and the Forum Island Countries (FICs), it just allowed duty free access for the products of FICs into the markets of Australia and New Zealand, subject to rules of origin regulations. These regulations stipulated that for a product to enter into the markets of Australia and New Zealand, it should have 50 percent or more local area content in it.

FICs, under the South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA).[4] This boosted the Textiles, Clothing and Footwear (TCF) industry in Fiji. In addition, the Government replaced import licensing with a streamlined tariff system, which allowed for a gradual reduction of tariff rates (UNESCAP, 2000).

Indeed, with the onset of globalisation and the gradual move by most countries towards free trade (in line with the World Trade Organisation (WTO) regulations), Fiji has continued with its export oriented, outward looking approach to trade relations in the past decade. Import restrictions have been further lifted in favour of export promotion and as such, Fiji now has a more open economy with increased values of both exports and imports. On average in the 1990s, Fiji's openness ratio (measured by the sum of nominal domestic exports and nominal imports, divided by nominal GDP) rose to 0.74, compared with a ratio of 0.67 in the 1980s.

Therefore, the objective of this study is to empirically examine the nature, as well as the strength of the causal relationship between growth in exports and real Gross Domestic Product (GDP) growth in Fiji.

Granger causality tests are used to assess whether real exports growth causes real GDP growth or vice versa. In addition, f-tests, block exogeinity tests and variance decomposition tests are used to measure the strength of this relationship on an in-sample basis. All these tests are carried out under the VAR framework.

The rest of the paper is structured as follows: Section two provides a brief description of the possible relationships that may exist between

[4] Cited in the Fiji Islands Ministry of Foreign Affairs and External Trade's website.

exports and GDP. Section three provides a brief review of the empirical literature. Section four presents the empirical methods and results, while the last section concludes the paper.

2.0 Export-led Growth; Growth-led Exports; Bi-directional Causality or Causal Independence?[5]

There are a number of reasons within the trade theory to support the ELG proposition. Firstly, an expansion in exports may signify an increase in external demand for a country's output and thus serve to increase total output (Giles and Williams, 2000). Secondly, Verdoon (1949) states that an expansion in exports may support specialisation in the production of export products. This, in turn, may cause the general level of skills to rise in the exports sector, thus increasing productivity levels. Consequently, there would be a rearrangement of resources from the (relatively) inefficient non-trade sector to the highly productive exports sector. This productivity change may then lead to higher output growth. Thirdly, Chenery and Strouts (1966) propose that a rise in exports would raise foreign exchange earnings, making it easier for a country to import more inputs to meet domestic and external demand. Usage of more inputs (especially raw materials and machinery) would, in turn, lead to an expansion in the aggregate output level. Fourthly, an outward oriented trade policy may also provide a country with access to advanced technologies, learning-by-doing gains and better management practices,

[5]Works quoted in this section are cited in Giles and Williams (2000).

which may result in further efficiency gains (Hart, 1983).

However, support for the ELG hypothesis is not unanimous. There are a number of alternative views, one of which contends that, rather, countries experience growth-driven exports. Lancaster (1980) and Krugman (1984) justified this growth-led exports orthodoxy. According to these authors, economic growth leads to the enhancement of skills and technology in the various sectors of an economy. The advancement of skills and technology creates a comparative advantage for the country in a number of products. This, in turn, facilitates an expansion in exports for those commodities, in which the nation has achieved a secure comparative advantage.

Other views also include the existence of a feedback or bi-directional relationship between exports and GDP. Helpman and Krugman (1985) postulate that exports may arise from the realisation of economies of scale, due to productivity gains; the rise in exports may enable further cost reductions, which may result in further productivity gains and so on. Bhagwati (1988) reasons out that increased trade produces more income, which in turn, leads to more trade and hence, the cycle continues.

However, some authors contend that it may be the case that no causal relationship between exports and economic growth exists, particularly when the growth paths of these two time series variables are determined by other unrelated variables (such as investment) in the economic system (Pack, 1988).

3.0 Empirical Literature Review

The empirical literature for the ELG hypothesis has basically taken

two forms over the past years. Firstly, cross-country studies have been carried out to find support for this hypothesis. Secondly, researchers have conducted individual country analysis of this hypothesis over time. Within these two general forms, authors have used a variety of econometric techniques to test for the much-debated ELG proposition.

Jung and Marshall (1985) reported that in the 1960s and 70s, a large number of studies were conducted to test the ELG hypothesis. A vast majority of these studies revealed that exports was driving growth in the countries studied and hence, recommendations were made that trade policies in these countries should be oriented towards export promotion. These early studies mainly performed Ordinary Least Squares (OLS) regression and simple correlation coefficient tests, using a growth variable (as the dependent variable) and an export variable (as the independent variable). Results from some of these studies[6] are discussed in the following paragraph.

Voivodas (1973) conducted a cross-country study of 22 Least Developed Countries, using time series data from 1956 to 1967, to test the export promotion hypothesis. This study regressed real GDP growth against real exports (as a share of real GDP), as well as some country-specific dummy variables, and found that exports was causing growth in all the countries studied. Michaely (1977) did a cross-country study of 41 countries to examine the ELG proposition. The author used time series data from 1950 to 1973 and performed simple rank correlation tests, using growth in Gross National Product (GNP) per capita and growth in exports

[6] Cited in Jung and Marshall (1985).

(as a share of output). The results showed that exports growth was driving GNP growth in all the countries studied. Balassa (1978) also undertook a cross-country study of 10 developing countries to test for the ELG hypothesis. He used two different time periods (1960-66 and 1967-73) and regressed GNP growth against real exports growth, labour force growth, domestic investment (as a share of output) and foreign investment (as a share of output). Like the preceding studies, the results of his study also found that real exports growth was causing real GNP growth. In another study, Fajana (1979) used time series data (from 1954 to 1974) for Nigeria and regressed real GDP growth against real exports (as a share of real GDP), and growth in the trade and current account balances. The results showed significant support for the export promotion hypothesis in Nigeria for the review period.

Ram (1987)[7] also undertook a cross-country study of 88 developing countries to test the ELG hypothesis. Fiji was one of the 88 developing countries studied by Ram. Undertaking a simple OLS regression of real GDP growth against real exports growth, population growth, real investment (as a share of output), and a dummy variable to take into account the effects of the 1973 oil price hikes, he showed that out of the 88 developing countries studied, 39 (including Fiji) had experienced ELG from 1960 to 1982.

However, Jung and Marshall (1985) pointed out that studies using OLS regression and simple correlation coefficient tests contained a serious weakness. Even though these techniques clearly showed that there was a

[7] Cited in Giles and Williams (2000).

correlation between exports growth and GDP growth, they were not able to clearly examine the direction of this causal relationship.

Hence, Jung and Marshall (1985) tried to solve this problem by using bi-variate Granger causality tests, under the VAR framework, to analyse the relationship between real exports and real GDP for 37 developing countries between 1950 and 1981. Depending on the outcome of the Granger causality tests, they then characterised the countries in their sample as exhibiting one of the four causal patterns: Export Promotion (ELG), Internally Generated Exports (growth-led exports), Export-Reducing Growth, or Growth-Reducing Exports. These characterisations were made on the basis of the signs, as well as the significance of the sum of the coefficients on lags of real exports growth in the equation for real GDP growth. Jung and Marshall (1985) found evidence for the ELG hypothesis in only 4 of the 37 developing countries: Indonesia, Egypt, Costa Rica and Ecuador. The results of their study implied that evidence in favour of this hypothesis was in fact weaker than previous studies had indicated.

In a similar study, Chow (1987) performed bi-variate Sims Granger causality tests on 8[8] of the "most successful export-oriented" NICs, using the growth rate of manufacturing output (used as a measure for industrial development) and real manufactured export growth. With two exceptions (no causality in Argentina and causality from exports to growth in Mexico), Chow found bi-directional causality in the other countries studied. Like the findings from Jung and Marshall's (1985) study, the results of his study also revealed that support in favour of the ELG proposition was weaker

[8] These countries were Argentina, Brazil, Hong Kong, Israel, Korea, Mexico, Singapore and Taiwan.

than initially expected.

In other works, the ELG hypothesis was tested for West Germany, Japan, the United States (US), the United Kingdom (UK) and Italy, by Sharma et al. (1991), using quarterly data from 1960 to 1987. The authors used real GNP, real exports, labour force and real capital formation and conducted four-variable Granger likelihood ratio tests. Variance decomposition tests were also carried out, under the VAR framework, to gauge the strength of the causal relationship between real exports and real GNP. The results showed weak evidence in favour of export-driven growth in the countries studied. Only two countries (West Germany and Japan) showed evidence of ELG from 1960-1987. The UK and the US had experienced growth-driven exports, while no causality could be found in Italy during the review period.

For Australia,[9] the ELG hypothesis was tested by Karunaratne (1997), using quarterly seasonally adjusted data from the first quarter of 1971 to the fourth quarter of 1992. The author employed variance decomposition tests and impulse response functions, using real GDP per capita, exports, Organisation of Economic Co-operation and Development's Industrial Production index, the trade-weighted real exchange rate index, the Terms of Trade index and a technological innovation variable (proxied by telephone penetration, as measured by telephone lines per capita). The results generally showed that Australia had experienced bi-directional causality between real GDP per capita and exports during the review period. In a later ELG study, Shan and Sun

[9] The Australian ELG studies were cited in Giles and Williams (2000).

(1998) found that Australia had experienced growth-led exports between 1978 and 1996. For this study, the authors used quarterly data for real manufactured output, manufactured exports, labour force, real imports and real gross fixed capital expenditure and performed five-variable Granger Wald tests.

For Fiji, a rigorous individual country analysis on the nature, as well as the strength of the causality between real exports growth and real GDP growth has not been undertaken so far. Hence, employing the VAR framework, this paper attempts to explore this issue in detail.

4.0 Empirical Methods

4.1 Data

This study used time series data on real exports, real GDP,[10] real imports, investment, labour force, trade-weighted trading partner GDP, the Real Effective Exchange Rate (REER) index and public spending on education (used as a proxy for investment in human capital).[11] The sample period chosen for this study was from 1971 to 2001.

All variables in this study were tested in natural log form for the presence of a unit root, using the Dickey-Fuller (1979) and the Phillips-Perron (1988) tests. These tests allow for a unit root null hypothesis to be

[10] Real GDP (net of exports) is used, as some authors (see Giles and Williams, 2000) have suggested that causality results between exports and GDP may reveal a spurious causality, particularly if exports themselves are part of GDP. Hence, from here onwards, whenever real GDP is mentioned, it is taken to mean real GDP (net of real exports) or non-trade GDP.

[11] Appendix A provides a description of the data sources, as well as how the variables were constructed.

tested against a stationary alternative.

The results in Table 1 suggest that investment and public spending on education do not have the presence of a unit root, that is, they are stationary or I(0). However, the time series for the other variables were nonstationary, I(1). Accordingly, each of these variables was first differenced to make it stationary, after which none of them had the presence of a unit root.

Table 1: *Unit Root Tests*

Variable	Dickey-Fuller Test		Phillips-Perrron Test	
	I(1)	I(2)	I(1)	I(2)
Real GDP	-1.300	-4.682**	-1.449	-7.334**
Real Exports	-0.328	-3.063*	-0.179	-4.209**
Real Imports	-1.292	-4.389**	-0.802	-5.209**
Investment	-2.994*	-2.690	-3.763**	-5.054**
Labour Force	-2.048	-2.861	-2.413	-4.296**
Trading Partner GDP (lagged one year)	-2.561	-5.332**	-2.613	-3.922**
REER index	-0.839	-3.491*	-0.597	-6.837**
Public Spending on Education	-3.425*	-2.290	-3.141*	-7.001**

An ** (*) indicates rejection of hypothesis of a unit root at the one (five) percent level.

4.2 VAR Methodology

VAR methodology is used to examine the nature and strength of the causal relationship between real exports growth and real GDP growth. VARs[12] are dynamic systems of equations in which the current level of

[12] See Mills (1990).

each variable depends on past movements in that variable, other endogenous variables and the current value of all exogenous variables in the system.

All the variables used in this study are in first difference form.[13] Each VAR is estimated with two lags of each variable in the system. The number of lags was determined by estimating models of three or more lags, then using likelihood ratio tests to compare these with models of two lags. The results showed that the difference between the test statistics for models with three or more lags and models with two lags was small enough to conclude that there are no more than two lags of each variable in the system. The basic structure of the VAR is specified below:

$$Y_t = A_1 Y_{t-1} + ... + A_p Y_{t-p} + BX_t + e_t \qquad (1)$$

Where:

Y_t is a vector of endogenous variables; real GDP growth, real exports growth, real investment growth, labour force growth, growth in trading partner GDP (lagged one year), growth in the REER index and growth in public spending on education

X_t is a vector of exogenous variables; in this study, there are no exogenous variables, as all the variables are determined within the system

$A_1 ... A_p$ and B are matrices of coefficients to be estimated

[13] Even though investment and public spending on education were stationary in levels, they were first differenced together with other non-stationary variables, as this study focuses on the growth rates of the variables of interest.

e_t is a vector of error terms

4.3 Granger Causality Test

In many previous studies[14] on the causality between exports and GDP in different countries, Granger causality tests[15] have been one of the most commonly used methods. This is because it not only tests the correlation between two variables (as is tested by traditional approaches, such as simple correlation coefficient tests and OLS regression), but also very clearly specifies the direction of causality. Hence, Granger causality tests, under the VAR framework, were used to examine the direction of causation between real GDP growth and growth in real exports.

4.3.1 Granger Causality Test Results

Table 2 depicts that the hypothesis of a zero real exports growth coefficient in the real GDP growth equation is rejected at the one percent level of significance. On the other hand, the hypothesis that the coefficient of real GDP growth is zero in the real exports growth equation could not be rejected, even at the ten percent level of significance. Hence, the results clearly suggest that Granger causality runs only one way, from real exports growth to real GDP growth in Fiji.

[14] See Jung and Marshall (1985); Chow (1987); Oxley (1993); Ghartey (1993); Reizman et al. (1996); Dutt and Ghosh (1996).
[15] See Appendix B for a detailed discussion on Granger causality tests.

Table 2: *VAR Pairwise Granger causality tests between real exports growth and real GDP growth* [1]

Null Hypotheses	F-statistic (p-value)
H_1: real exports growth $\not\Rightarrow$ real GDP growth	6.685 (0.005)**
H_2: real GDP growth $\not\Rightarrow$ real exports growth	2.114 (0.143)

1. Calculated values for f-tests of the hypothesis that the coefficients on lags of explanatory variables are jointly zero. An **(*) denotes significance at the 1(5) percent level.

4.3.2 Discussion of Granger Causality Test Results

Based on the results of the Granger causality tests, there is strong support for the notion that changes in the lagged values of real exports growth causes changes in real GDP growth in the current year. However, no causality could be found running from the lagged values of real GDP growth to the current value of real exports growth.

4.4 In-sample Tests

This section builds on the results of the previous section and tries to gauge the strength of real exports growth and real GDP growth relationship. This is basically done by assessing the predictive power of real exports growth on real GDP growth, on an in-sample basis. The basic structure of the VAR is the same as outlined in section 4.2.

The methodology involves examining F-tests, block exogeneity tests[16] and variance decomposition tests. The F-tests measure whether real

[16] See Appendix C for a thorough discussion on block exogeneity tests.

exports growth is significant in predicting/causing real GDP growth. On the other hand, the block exogeinity test determines whether a "third variable"[17] is important in the causal relationship between real exports growth and real GDP growth. Finally, variance decomposition tests[18] supplement the F-tests and the block exogeneity tests by further examining the strength of the causality.

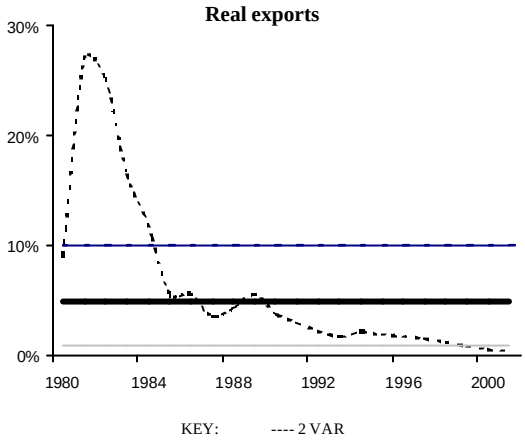
4.4.1 In-sample Test Results and Discussion

From the sample data, the shortest sample period is taken (1971 to 1981) and the F-test is calculated. The procedure then adds one more observation and generates F-tests and the corresponding p-values, repeating this process until the end of the sample (2001).

The results are shown in Figure 1. The graph summarises the results from the test of the joint significance of two lags of real exports growth in the real GDP growth equation.[19]

[17] The rationale behind testing for causality in a three-variable system is discussed in Appendix D.
[18] See Appendix E for a thorough discussion on Variance Decomposition tests, as well as the selection criteria used for accepting the ELG hypothesis from these tests.
[19] For each variable, there are three lines that reflect the p-values from the f-test of the exclusion restriction in the two-variable system. When the line crosses at the 1(grey), 5 (black) or even the 10 percent (dashed line), it implies a rejection of the restriction (exports growth does not cause real GDP growth) at these significance levels.

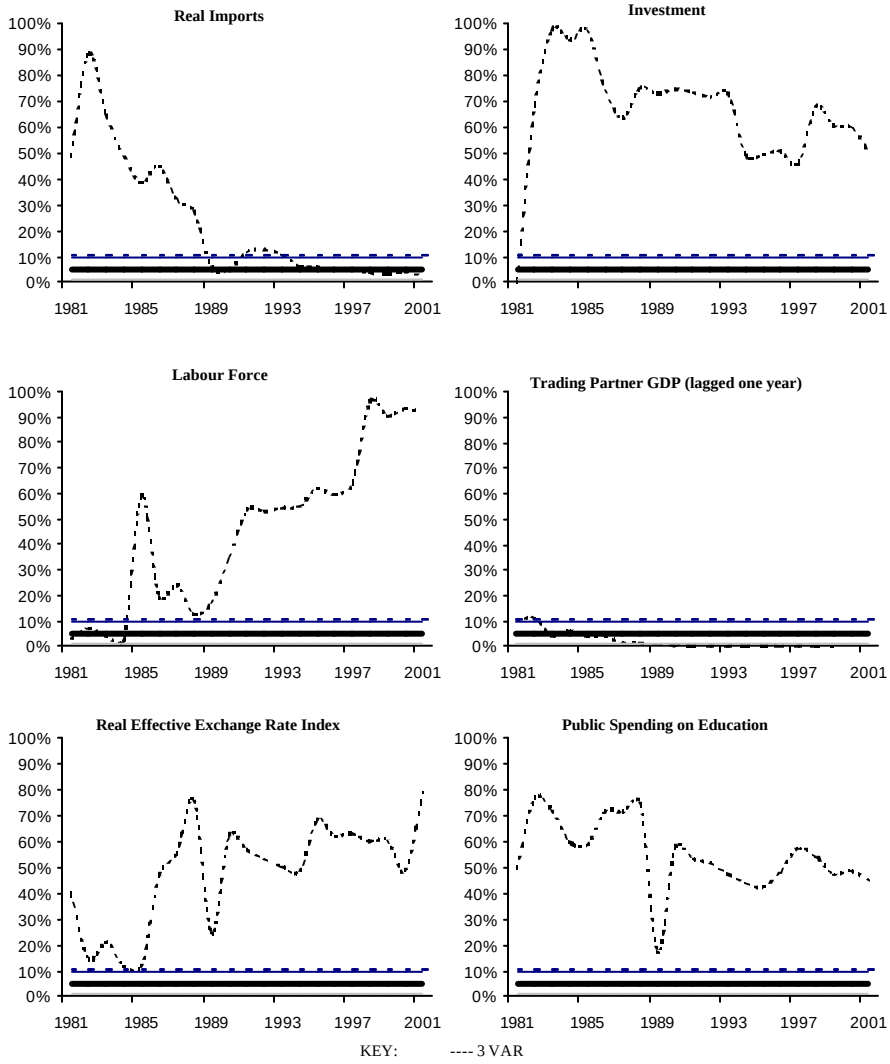
FIGURE 1
F-tests of Real Exports causing Real GDP growth



The F-test results generally show that from 1985 onwards, the causal relationship between real exports growth and real GDP growth is strong.

Similar methods are used for the block exogeneity tests and the p-values are plotted in Figure 2. Six three-variable systems are tested; all containing real exports growth, real GDP growth and a third variable (real imports growth, investment growth, labour force growth, growth in trading partner GDP (lagged one year), growth in the REER index and growth in public spending on education).

FIGURE 2
Block Exogeneity Tests[20] of a Third Variable Influencing the Causal Relationship between Real exports and Real GDP



[20] For each variable, there are three lines that reflect the p-values from the f-test of the exclusion restriction in the two-variable system. When the line crosses at the 1(grey), 5 (black) or even the 10 percent (dashed line), it implies a rejection of the restriction (exports growth does not cause real GDP growth) at these significance levels.

The block exogeneity test results indicate that growth in investment, labour force growth, growth in the REER index and growth in public spending on education are statistically insignificant in the three-variable system.

However, real imports growth appears to be statistically significant to the system, only from the late 1980s, meaning that imports have played an important role in the export-oriented approach that Fiji has employed over the past decade, in order to achieve economic growth. This result is consistent with the shift in Government's trade policy from import substitution to export promotion in the late 1980s. This change in Government policy meant that a large number of resources were diverted from the inefficient import substitution industries and were instead used in the manufacture of products that could be used for export purposes. This, in turn, led to an increase in exports and hence the aggregate output level.

In addition, the trade-weighted trading partner GDP is statistically significant to the system for the entire in-sample period, implying that this variable has also played an important role in the real exports-real GDP relationship over the past three decades. This result is in line with trade theory, which suggests that an increase in trading partner income leads to more external demand for locally produced goods, thus boosting export growth. Growth in exports, in turn, leads to an increase in production and thus serves to increase the total output level.

For the variance decomposition tests, the results for the 2

specifications[21] are shown in Table 3. The table shows results from the three-variable system - real exports growth, real GDP growth and a third variable. Based on the selection criteria[22] used for accepting the ELG hypothesis for Fiji, the results show a strong causality between real exports growth and real GDP growth in all the six decomposition orderings.[23] Hence, these results strongly confirm the hypothesis that real exports growth causes real GDP growth in Fiji.

[21] As highlighted in Appendix E, the first specification places growth in real exports first in the decomposition ordering, while the second specification places it second.

[22] If real exports growth is able to explain more than 25 percent of the fluctuations in real GDP growth, even when real exports growth is placed second in all the six decomposition orderings, it is a strong indication that real exports growth causes real GDP growth. Refer to Appendix E for a thorough discussion on this selection criteria.

[23] These six decomposition orderings refer to the six (three-variable) systems in the first and second columns of Table 3. In the first column, real exports growth is placed first in the three-variable system, while a third variable (such as real imports growth) is placed second. In the second column, a third variable is placed first, while real exports growth is placed second.

Table 3: *Variance Decomposition Results*

Aggregate in System	Variance of :	Forecast Horizon	Percent of Forecast Innovations Explained by Innovations in the other endogenous variables[1]	
			Ordering[2] RX, RM, RGDP	Ordering[2] RM, RX, RGDP
Real Exports	Real GDP	5	40.912	41.196
			Ordering[2] RX, INV, RGDP	Ordering[2] INV, RX, RGDP
Real Exports	Real GDP	5	31.954	30.331
			Ordering[2] RX, LF, RGDP	Ordering[2] LF, RX, RGDP
Real Exports	Real GDP	5	38.718	37.912
			Ordering[2] RX, TPYL, RGDP	Ordering[2] TPYL, RX, RGDP
Real Exports	Real GDP	5	49.482	40.126
			Ordering[2] RX, REER, RGDP	Ordering[2] REER, RX, RGDP
Real Exports	Real GDP	5	38.547	39.959
			Ordering[2] RX, PSE, RGDP	Ordering[2] PSE, RX, RGDP
Real Exports	Real GDP	5	37.896	44.818

1. Each variance decomposition represents the percent of forecast variance in real GDP growth explained by the innovation associated with real exports growth.
2. RX=real exports growth, RM=real imports growth, INV=investment growth, LF=labour force growth, TPYL=trading partner GDP growth (lagged one year), REER=growth in the Real Effective Exchange Rate index, PSE=growth in public spending on education, RGDP=real GDP growth.

5.0 Conclusions

From the results discussed in this paper, it is clearly evident that Fiji has experienced export-led growth over the past three decades. In addition, it was found that real imports growth (from the late 1980s) and the trade-weighted trading partner GDP (lagged one year) have played an important role in imposing this causal relationship.

The results of this study provide support to the export-oriented, outward-looking approach to trade relations adopted by policymakers over the past decade. The results also suggest that if Fiji wishes to pursue high rates of economic growth, then we have to increase our exports.

Appendix A Data Sources and Construction

Series	Construction and Sources
Real GDP	Gross Domestic Product at constant factor cost (net of real exports). *Reserve Bank of Fiji, Quarterly Review (various issues).*
Real Exports	Nominal domestic exports divided by domestic export unit values. *Fiji Islands Bureau of Statistics, Current Economic Statistics (various issues).*
Real Imports	Nominal imports divided by an index of export unit values of Fiji's five major trading partners in $US, weighted by their respective share of imports to Fiji in the 1970s, 1980s and 1990s, and then converted into the domestic currency at annual average official exchange rates. *IMF International Financial Statistics Yearbooks (2000 and 2001)* *Reserve Bank of Fiji, Quarterly Review (various issues).*
Investment	Private, statutory bodies and Government investment. *Reserve Bank of Fiji, Quarterly Review (various issues).*
Labour force	For 1976, 1986 and 1996, census figures are taken. For the years in between the census years, the initial year's census figure (example, 1966) is subtracted from the latest year's census figure (example, 1976) and then the figure obtained is divided by 10 to get a 10-year average figure between the two census years. This figure is then added sequentially to each year's labour force figure, starting from the census year's labour force figure to get the figure for the next year. The figures for 1997 to 2001 were estimated by growing each previous year's figure by the average labour force growth rate between 1994 to 1996 (3-year average). *Fiji Islands Bureau of Statistics, Census Report, (various issues)*

Series	Construction and Sources
Trade-weighted Trading Partner GDP	Trade-weighted real Gross Domestic Product of Fiji's five major trading partner countries: Australia, New Zealand, the United States of America, the United Kingdom (from 1999, the Euro Zone), and Japan. IMF *International Financial Statistics Yearbooks* (2000 and 2001).
Real Effective Exchange Rate	Real Effective Exchange Rate Index (Base 1990=100), as calculated by the Reserve Bank of Fiji. For the period prior to 1979, an index was constructed using the trade-weighted consumer price indices and bi-lateral exchange rates of Fiji's five major trading partners. IMF *International Financial Statistics Yearbooks* (2000 and 2001). Reserve Bank of Fiji, *Quarterly Review* (various issues).
Public Spending on Education (a proxy for human capital investment)	Total Government spending on primary, secondary and tertiary education. *Actual figures provided by the Ministry of Finance.*

Appendix B Granger Causality Test

The initial attempt at testing for the direction of causality was by Granger (1969). The Granger causality test (named after its founder) assumed that the information relevant to the prediction of the relevant variables, X and Y, was contained solely in the time series data on these variables. This test involves estimating the following pair of Ordinary Least Squares regressions:

$$Y_t = \sum_{i=1}^{n} a_i X_{t-i} + \sum_{j=1}^{n} b_j Y_{t-j} + m_{1t} \qquad (1)$$

$$X_t = \sum_{i=1}^{n} l_i X_{t-i} + \sum_{j=1}^{n} d_j Y_{t-j} + m_{2t} \qquad (2)$$

Where X and Y are the endogenous variables of interest, i and j are the number of lags used a, b, l and d are the parameters to be estimated and m_{1t} and m_{2t} are the error terms or the disturbances that are uncorrelated.

Equation 1 postulates that the current Y is related to the past values of itself, as well as that of X and equation 2 postulates a similar behaviour for X. Basically, the Granger causality test distinguishes between four cases:

1) A *unidirectional causality* from X to Y is indicated if the estimated coefficients on the lagged X in equation 1 are statistically different from zero as a group (i.e., $\sum_{i=1}^{n} a_i$ is not equal to zero) and the set of estimated coefficients on the lagged Y in equation 2 is not

statistically different from zero (i.e., $\sum_{i=1}^{n} d_j$ is equal to zero).

2) Conversely, a *unidirectional causality* from Y to X exists if the set of lagged X coefficients in equation 1 is not statistically different from zero as a group ($\sum_{i=1}^{n} a_i$ is equal to zero) and the set of estimated coefficients on the lagged Y in equation 2 is statistically different from zero (i.e., $\sum_{i=1}^{n} d_j$ is not equal to zero).

3) *Feedback or bi-directional causality*, is suggested when the set of lagged X coefficients in equation 1 and the set of lagged Y coefficients in equation 2 are both statistically different from zero.

4) Finally, *causal independence* is suggested when neither the set of lagged X coefficients in equation 1 nor the set of lagged Y coefficients in equation 2 are statistically different from zero.

More broadly, since the future cannot predict the past, if variable X Granger causes Y, then changes in X should precede changes in Y. Therefore, in a regression of Y on other variables (including its own past values) if we include past or lagged values of X and it significantly improves the prediction of Y, then we can say that X Granger causes Y. A similar definition applies if Y Granger causes X.

Appendix C Block Exogeneity Test[24]

Granger causality is different from a test for exogeneity. An essential requirement for the exogeneity of y_t is that current and past values of x_t do not affect y_t. Therefore, y_t may not be exogenous to x_t even though x_t does not Granger-cause y_t. If $f_{21}(0)$ is not zero, pure shocks to y_t (i.e., e_{yt}) affect the value of y_t even though the $\{x_t\}$ sequence does not Granger-cause the $\{y_t\}$ sequence.

The block exogeneity test is useful for detecting whether to incorporate a variable into a VAR. This multivariate generalisation of the Granger causality test should actually be called a "block causality" test. The issue is to determine whether lags of one variable, w_t, Granger-causes any other of the variables in the system. In the three-variable case with w_t, x_t and y_t, the test is whether lags of w_t Granger-cause either x_t or y_t. Essentially, the block exogeneity restricts all lags of w_t in the x_t and y_t equations to be equal to zero. This cross-equation restriction is properly tested using the likelihood ratio test given by

$$(T - c)(\log\left|\sum_r\right| - \log\left|\sum_u\right|) \qquad (3)$$

where $\sum_u$ and $\sum_r$ are the variance/covariance matrices of the unrestricted and restricted systems, respectively.

[24] Cited in Enders (1996).

The x_t and y_t equations using lagged values of $\{x_t\}$, $\{y_t\}$, and $\{w_t\}$ are estimated and $\sum_u$ is calculated. The equations are then re-estimated excluding the lagged values of $\{w_t\}$ and $\sum_r$ is calculated. The likelihood ratio statistic mentioned above is then formed. This statistic has a chi-square distribution with degrees of freedom equal to $2p$ (since p lagged values of $\{w_t\}$ are excluded from each equation). Here $c = 3p + 1$ since the unrestricted x_t and y_t equations contain p lags of $\{x_t\}$, $\{y_t\}$, and $\{w_t\}$ plus a constant.

Appendix D Rationale Behind Using a "Third Variable" in the Real Exports-Real GDP Relationship

Most of the previous studies (Jung and Marshall, 1985; Chow, 1987; Mallick, 1996; Dutt and Ghosh, 1996) on the causality between exports growth and GDP growth usually only perform a bi-variate analysis, where the variables involved are some representations of GDP and exports. However, Cuadros et al. (2000) state that the relationship between GDP and exports is extremely complex and there exists several other "third variables" (such as, imports and investment) that can influence the causal relationship between real exports and real GDP.

Therefore, in line with previous studies' findings (Cuadros et al., 2000; Reizman et al., 1996) that other important variables can influence the causal relationship between exports and GDP, this study tries to examine whether an important third variable, which can influence the causal relationship between real GDP and real exports, exists in Fiji's case.

Therefore, to incorporate the effects of other variables on the real exports-real GDP relationship, a number of variables were introduced in a three-variable system (which included real exports growth, real GDP growth and a third variable). These variables were; real imports growth, investment growth (private, statutory bodies and Government), labour force growth, trade-weighted trading partner GDP growth (lagged one year), growth in the REER index and finally, growth in public spending on education (which was used as a proxy for human capital investment).

These variables were chosen, as previous studies (Riezman et al., 1996; Sharma et al., 1991) on the ELG hypothesis have used some of these

variables (especially, real imports, investment, and labour force growth) and found that they played an important part in influencing the causal relationship between real GDP and real exports. Moreover, Cuadros et al. (2000) strongly recommended that these variables be used in future export-GDP growth causality studies to assess their contribution in influencing the causal relationship between exports and GDP growth. In addition, the motivation for using the other variables (particularly, the trade-weighted trading partner GDP (lagged one year), the REER index and public spending on education) came from the fact that previous studies[25] done in Fiji showed that these variables were either determinants of exports or economic growth. Hence, using these variables could help us better understand the causal relationship between our two variables of interest.

[25] Prasad (2000) found that the trade-weighted trading partner GDP (a year ago) and the REER index (denoting Fiji's international competitiveness) were significant in determining the current year's export volumes in Fiji, while Dewan and Hussein (2001) found that public spending on education (a proxy for investment in human capital), domestic investment and labour force growth were significant in determining economic growth in 41 middle income developing countries (including Fiji).

Appendix E Variance Decomposition Tests and the Selection Criteria Used for Accepting the ELG Hypothesis From These Tests

According to Reizman et al. (1996), variance decomposition tests measure the percentage of forecast error variance in real GDP growth that can be attributed to innovations in real exports growth, using a flexible time horizon.

The extraction of variance decompositions for a VAR typically requires orthogonalisation of errors, due to correlation of errors. This implies that there is a common element that cannot be identified with any specific variable. Hence, to tackle this problem, the errors are orthogonalised by a Cholesky decomposition. This is an arbitrary method where all of the effect of any common component is attributed to the variable that is placed first in the VAR system. Hence, variance decomposition results are very sensitive to the ordering of the variables in the system. (Hamilton, 1994).

With regards to the selection criteria[26] that would be used for accepting the ELG hypothesis from variance decomposition tests, Fiji would be classified as a country where growth in real exports causes real GDP growth, if real exports growth explains at least 25 percent of the error variance of the 5-year-ahead forecast of real GDP growth, when the real exports growth variable is placed second in the decomposition ordering. By placing growth in real exports second in the decomposition ordering,

[26] The selection criteria used here is similar to that of Reizman et.al (1996).

other variables are given the first chance to explain the variance in the forecast error of real GDP growth. If real exports are able to explain a significant portion (more than 25 percent) of the variance in forecast errors in real GDP growth, even when placed second in the decomposition ordering, it will give a clear signal of the strength of the real exports-real GDP relationship. Based on evidence that a world business cycle lasts for an average of about 5 years (Riezman and Whiteman, 1991), variance decomposition tests use a time horizon of that duration.

For the variance decomposition test, two specifications are observed, where the initial ordering places growth in real exports first in the decomposition ordering, while the second ordering places it second.

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