7. TRADE AND GROWTH İN THE PACİFİC ISLANDS – EMPİRİCAL EVİDENCE FROM THE BOUNDS TEST TO LEVEL RELATİONSHİPS AND GRANGER CAUSALİTY TESTS –

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Abstract

Although the relationship between international trade and economic growth has found a wide application area in the literature over the years, further attention is needed for small island economies. This study employs the bounds test for Level Relationships and Granger causality tests to investigate a long-run equilibrium relationship between international trade and real income growth, and the direction of causality among themselves in three selected Pacific Islands: Fiji, Papua New Guinea and Solomon Islands. Results reveal that a long run equilibrium relationship can be inferred between international trade and economic growth in the case of Fiji and Solomon Islands whereas economic growth is cointegrated only with exports of goods and services in Papua New Guinea. Granger causality test results show that there are bidirectional causality between exports and economic growth, and between exports

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and imports in Fiji Islands. Economic growth in Solomon Islands stimulates a growth in exports of goods and services, and exports stimulates a growth in imports of goods and services. No causal relationship has been obtained between international trade (both exports and imports) and economic growth in the case of Solomon Islands. The major finding of this study is that trade-led growth hypothesis cannot be inferred for the Pacific Islands.

Keywords: economic growth, long-run equilibrium relationship, Granger causality test

JEL Classification: F43, C5

I. Introduction

International trade of goods and services are a major source of foreign exchange for small countries as well as the larger ones. Small countries, in particular small islands, have more dependency on tourism and trade than the larger ones since their economies are based on only a few sectors. Especially, export-oriented services tend to represent unique characteristics of small islands and therefore provide a basis for a potential comparative advantage (Mehmet and Tahiroglu 2002). There are huge amount of studies investigating empirical relationship between international trade and economic growth (especially, trade-led, export-led and import-led growth hypotheses); however, the precise relationship between international trade and economic growth has often been debated by various lines of research but the existing literature is far from suggesting a clear picture of the exact relationship among themselves (See also Gunduz and Hatemi-J, 2005).

There are various ways through which international trade (including services) expansion can contribute to economic growth (Omotor, 2008). Recent theoretical literature provides two main mechanisms through which international trade may affect growth. The first is its effect on the rate of innovation. The second is its effect on the adoption rate of technologies from more advanced countries that also increases the economy's rate of total factor productivity growth (Proudman et al., 1998). The picture in small island economies might be slightly different from what is observed in comparatively larger economies. Large scale of production and competition ability in international arena seems much less attainable in the small economy context as small economies often are not able to take advantage of scale economies. From this perspective, it can be hypothesized that trade liberalization in small island nations will enable easy access to cheaper imported goods, which would not have otherwise been produced as efficiently in the domestic market. This will, in turn, free up the economy's resources to be used in more productive and more competitive sectors, namely, tourism.

There is an unverified question of whether international trade (exports and imports) growth actually causes economic growth or does economic growth contributes to trade growth instead. Many studies in the literature proved the importance of international trade for economic growth well. Although results on the direction of relationship between international trade and economic growth are still inconclusive (Balaguer and Cantavella-Jorda, 2002), empirical studies prove that international trade is crucial for economic growth of many countries (Shun and Sun, 1998; Xu, 1996; Jin, 1995; Bahmani-Oskooee and Alse, 1993, Marin, 1992; Chow, 1987).

Extensive empirical studies in the literature have adopted the concept of causality proposed by Granger (1969) and Sims (1972) to detect the causal relationship between exports and output. Many of the studies in the empirical literature show conflicting results. Furthermore, although exports are a component of GDP and thus lead directly to the growth of output, while some studies found support for the export-led growth (ELG) hypothesis (i.e. Chow, 1987; Bahmani-Oskooee and Alse, 1993; Xu, 1996), some others have found negative relationship, even for the economies that are well known for their export promoting policies (i.e. Jung and Marshall, 1985; Darrat, 1986; Ahmed and Kwan, 1991; Dodaro, 1993). Furthermore, some empirical studies in the literature confirmed the trade-led growth (TLG) hypothesis for some countries whereas some others rejected it for some other countries, while, on the other hand, some studies in the growth literature support the ELG hypothesis and while some others investigate the import-led growth (ILG) hypothesis (Deme 2002). Exports and imports were also linked to each other in the empirical literature. Narayan and Narayan (2005) indicate that exports and imports are co-integrated only for six out of the 22 least developed countries, and the coefficient on exports is less than one. Arize (2002), on the other hand, found that for 35 of the 50 countries there was evidence of co-integration between exports and imports; and 31 of the 35 countries had a positive export coefficient.

Aim and Importance of the Study

Having the importance of these issues mentioned above that deserves further attention; this study empirically investigates the possible Level Relationships and causal link between international trade (including exports and imports) and economic growth in the selected Pacific Islands: Fiji, Papua New Guinea and Solomon. There is very huge amount of studies analyzing the relationship between international trade and economic growth in the relevant literature for many years; however, little mention is of small island states around the world. Thus, this study is important in the sense that it is expected to provide an opportunity to discuss this issue for small islands as well by a special focus on the Pacific Islands.

The paper proceeds as follows. Section II defines data and methodology of the study. Section III provides results and discussions and the paper concludes with Section IV.

II. Data and Methodology

Data used in this paper are annual figures covering the period 1960 – 2006 and variables of the study are real gross domestic product (GDP), real exports of goods and services and real imports of goods and services. Data were taken from World Bank Development Indicators (World Bank, 2006) and variables are all at 2000 constant US $ prices. The selection of Fiji, Papua New Guinea and Solomon Islands in the Pacific Ocean were made based on the availability of data from World Bank Development Indicators (2006).

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP)[5] Unit Root Tests are employed to test the integration level and the possible Level Relationships among the variables (Dickey and Fuller 1981; Phillips and Perron 1988). The PP procedures, which compute a residual variance that is robust to auto-correlation, are applied to test for unit roots as an alternative to ADF unit root test.

To investigate a long-run relationship between each pair of variables under consideration, the bounds test for Level Relationships within ARDL (the autoregressive distributed lag) modeling approach was adopted in this study. This model was developed by Pesaran et al. (2001) and can be applied irrespective of the order of integration of the variables (irrespective of whether regressors are purely I (0), purely I (1) or mutually co-integrated). The ARDL modeling approach involves estimating the following error correction models:

$$\Delta \ln Y_t = a_{0_Y} + \sum_{i=1}^{n} b_{i_Y} \Delta \ln Y_{t-i} + \sum_{i=0}^{n} c_{i_Y} \Delta \ln X_{t-i} + \sigma_{1_Y} \ln Y_{t-1} + \sigma_{2_Y} \ln X_{t-i} + \varepsilon_{1t} \quad (1)$$

$$\Delta \ln X_t = a_{0_X} + \sum_{i=1}^{n} b_{i_X} \Delta \ln X_{t-i} + \sum_{i=0}^{n} c_{i_X} \Delta \ln Y_{t-i} + \varpi_{1_X} \ln X_{t-1} + \varpi_{2_X} \ln Y_{t-i} + \varepsilon_{2t} \quad (2)$$

In equations (1) and (2), Δ is the difference operator, $\ln Y_t$ is the log of dependent variable, $\ln X_t$ is the log of independent variable and ε_{1t} and ε_{2t} are serially independent random errors with mean zero and finite covariance matrix.

Again in equations (1) and (2), the F-test is used for investigating a long-run relationship. In the case of a long-run relationship, the F-test indicates which variable should be normalized. In Equation (1), when Y is the dependent variable, the null hypothesis of no Level Relationships is H_0: $\sigma_{1Y} = \sigma_{2Y} = 0$ and the alternative hypothesis of Level Relationships is H_1: $\sigma_{1Y} \neq \sigma_{2Y} \neq 0$. On the other hand, in Equation (2), when X is the dependent variable, the null hypothesis of no Level Relationships is H_0: $\varpi_{1Y} = \varpi_{2Y} = 0$ and the alternative hypothesis of Level Relationships is H_1: $\varpi_{1Y} \neq \varpi_{2Y} \neq 0$.

The Granger causality tests should be carried out under the vector error correction model (VECM) in the case of Level Relationships among the variables and under the autoregressive model (ARM) in the absence of Level Relationships. By ECM, the short-run deviations of series from their long-run equilibrium path are captured by including an error correction term (See also Narayan and Smyth, 2004). Therefore, the ARM and the ECM can be specified in equations (3) and (4) respectively:

$$\Delta \ln Y_t = \alpha_0 + \varphi_{11}^{p}(L) \Delta \ln Y_t + \varphi_{12}^{q}(L) \Delta \ln X_t + \mu_{1t} \quad (3)$$

$$\Delta \ln X_t = \alpha_1 + \varphi_{21}^{p}(L) \Delta \ln X_t + \varphi_{22}^{q}(L) \Delta \ln Y_t + \delta ECT_{t-1} + \mu_{2t} \quad (4)$$

[5] *PP approach allows for the presence of unknown forms of autocorrelation with a structural break in the time series and conditional heteroscedasticity in the error term.*

Where

$$\varphi_{ij}^{p}(L)=\sum_{n=1}^{P_{ij}}\varphi_{ijn}L^{1} \qquad \varphi_{ij}^{q}(L)=\sum_{n=1}^{Q_{ij}}\varphi_{ijn}L^{1}$$

In equations (3) and (4), Δ denotes the difference operator and L denotes the lag operator where $(L)\Delta \ln Y_t = \Delta \ln Y_{t-1}$. ECT_{t-1} in equation (4) is the lagged error correction term derived from the long-run model. Finally, μ_{1t} and μ_{2t} are serially independent random errors with mean zero and finite covariance matrix. Finally, according to the ECM for causality tests, having statistically significant F and t ratios for ECT_{t-1} in equation (4) would be enough condition to have causation from Y to X. In the case of short-run context, a significant F value of the ARM in equation (3) would be sufficient to assume causation from X to Y.

III. Results and Discussions

Tables 1 to 3 in the Appendix give ADF and PP unit root test results for the variables of the study. Both tests reveal that variables under consideration are all integrated of order one, that is, they are I(1). ADF and PP tests have differed in only two exceptions: real exports real imports of Fiji Islands. The PP test will be taken into consideration in this study due to the fact that PP procedures compute a residual variance that is robust to auto-correlation and are applied to test for unit roots as an alternative to ADF unit root test. Thus, exports and imports of Fiji Islands are also said to be I(1).

Table 1

ADF and PP Tests for Unit Root (Fiji Islands)

Statistics (Level)	ln y	Lag	ln X	Lag	ln M	lag
τ_T (ADF)	-1.48	(1)	-5.60*	(1)	-3.32***	(1)
τ_μ (ADF)	-2.26	(1)	-1.61	(0)	-1.33	(0)
τ (ADF)	2.10	(3)	2.34	(0)	2.88	(0)
τ_T (PP)	-1.50	(3)	-2.44	(32)	-2.63	(6)
τ_μ (PP)	-2.17	(2)	-2.26	(23)	-1.47	(10)
τ (PP)	4.71	(3)	4.70	(40)	4.30	(9)
Statistics (First Difference)	Δln y	Lag	Δln X	Lag	Δln M	Lag
τ_T (ADF)	-7.89*	(0)	-6.34*	(0)	-5.98*	(0)
τ_μ (ADF)	-7.43*	(0)	-6.13*	(0)	-6.00*	(0)
τ (ADF)	-1.03	(4)	-5.42*	(0)	-5.25*	(0)
τ_T (PP)	-7.83*	(3)	-8.57*	(28)	-6.26*	(12)
τ_μ (PP)	-7.39*	(3)	-6.33*	(17)	-6.22*	(11)
τ (PP)	-5.63*	(5)	-5.39*	(5)	-5.23*	(3)

Note:
y represents real gross domestic product; X is total real exports; and M is total real imports. All of the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a

*drift and trend. Numbers in brackets are lag lengths used in ADF test (as determined by AIC set to maximum 3) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). * and *** denote rejection of the null hypothesis at the 1% and 10% levels respectively. Tests for unit roots have been carried out in E-VIEWS 5.1.*

Table 2

ADF and PP Tests for Unit Root (Papua New Guinea)

Statistics (Level)	ln y	Lag	ln X	Lag	Ln M	lag
τ_T (ADF)	-2.62	(1)	-2.37	(1)	-2.47	(3)
τ_μ (ADF)	-1.80	(1)	-0.75	(0)	-1.17	(2)
τ (ADF)	2.46	(1)	3.34	(0)	2.31	(3)
τ_T (PP)	-2.18	(1)	-2.08	(1)	-2.13	(3)
τ_μ (PP)	-2.41	(0)	-0.78	(3)	-0.90	(4)
τ (PP)	4.04	(2)	2.99*	(2)	3.74	(3)
Statistics (First Difference)	∆ln y	Lag	∆ln X	lag	∆ln M	lag
τ_T (ADF)	-4.52*	(0)	-5.54*	(0)	-5.87*	(1)
τ_μ (ADF)	-4.33*	(0)	-5.60*	(0)	-5.91*	(1)
τ (ADF)	-3.34*	(0)	-4.66*	(0)	-2.11*	(2)
τ_T (PP)	-4.49*	(2)	-5.49*	(4)	-5.12*	(5)
τ_μ (PP)	-4.38*	(1)	-5.55*	(4)	-5.19*	(5)
τ (PP)	-3.32*	(1)	-4.66*	(0)	-4.31*	(0)

Note:

*y represents real gross domestic product; X is total real exports; and M is total real imports. All of the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test (as determined by AIC set to maximum 3) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). * denotes rejection of the null hypothesis at the 1% level respectively. Tests for unit roots have been carried out in E-VIEWS 5.1*

Table 3

ADF and PP Tests for Unit Root (Solomon Islands)

Statistics (Level)	ln y	Lag	ln Exp	Lag	Ln Imp	lag
τ_T (ADF)	-2.14	(3)	-2.61	(3)	-2.06	(0)
τ_μ (ADF)	-0.71	(0)	-1.27	(0)	-1.38	(0)
τ (ADF)	2.48	(0)	1.39	(2)	1.13	(0)
τ_T (PP)	-1.74	(4)	-2.42	(1)	-2.26	(3)
τ_μ (PP)	-0.71	(4)	-1.27	(2)	-1.38	(1)
τ (PP)	2.49	(4)	-1.31	(2)	1.14	(1)

Statistics (First Difference)	∆ln y	Lag	∆ln Exp	lag	∆ln Imp	lag
τ_T (ADF)	-2.75	(2)	-5.62*	(1)	-6.67*	(0)
τ_μ (ADF)	-2.78***	(2)	-5.67*	(1)	-6.73*	(0)
τ (ADF)	-2.21**	(2)	-5.42*	(1)	-6.59*	(0)
τ_T (PP)	-7.00*	(4)	-5.70*	(3)	-6.67*	(1)
τ_μ (PP)	-7.06*	(4)	-5.77*	(3)	-6.73*	(1)
τ (PP)	-6.39*	(4)	-5.72*	(1)	-6.60*	(2)

Note:
*y represents real gross domestic product; X is total real exports; and M is total real imports. All of the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test (as determined by AIC set to maximum 3) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). *, ** and *** denote rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. Tests for unit roots have been carried out in E-VIEWS 5.1*

Having the fact that international trade variables (exports and imports) and real GDP are stationary at their first difference, a long-run equilibrium relationship will be now investigated by using the bounds test for Level Relationships within ARDL modeling approach. Tables 5 through 7 in the Appendix give the results of the bounds test for Level Relationships between international trade variables and real income for the Pacific islands under three different scenarios as also suggested by Pesaran *et al*. (2001: 295-296), that are with restricted deterministic trends (F_{IV}), with unrestricted deterministic trends (F_V) and without deterministic trends (F_{III}). Intercepts in these scenarios are all unrestricted[6]. Critical values for F and t statistics are presented in Table 4 in the Appendix as taken from Narayan (2005) and Pesaran *et al*. (2001) respectively to be used in this study.

Table 4

Critical Values for ARDL Modeling Approach

	0.10		0.05		0.01	
k = 2	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
F_{IV}	3.57	4.29	4.23	5.03	5.81	6.79
F_V	4.38	5.35	5.25	6.30	7.34	8.64
F_{III}	3.33	4.31	4.07	5.19	5.82	7.30
t_V	-3.13	-3.63	-3.41	-3.95	-3.96	-4.53
t_{III}	-2.57	-3.21	-2.86	-3.53	-3.43	-4.10

Source: Narayan (2005) for F-statistics and Pesaran et. al (2001) for t statistics.

[6] *For detailed information, please refer to Pesaran* et al. *(2001), pp. 295-296.*

Note: k is the number of regressors for dependent variable in ARDL models, F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing $\sigma_{1Y} = 0$ in Equation (1) and $\varpi_{1Y} = 0$ in Equation (2) respectively with and without deterministic linear trend.

Results in Tables 5 through 7 in the Appendix suggest that the application of the bounds F-test using ARDL modeling approach suggest the existence of a level relationship (a long-run relationship) between each pair of dependent variable and its regressor in the cases of Fiji and Solomon Islands since the null hypotheses of H_0: $\sigma_{1Y} = \sigma_{2Y} = 0$ and H_0: $\varpi_{1Y} = \varpi_{2Y} = 0$ are rejected at 0.01, 0.05 or 0.10 levels. In the case of Papua New Guinea, the only level relationship was found between exports of goods and services and real income when real GDP is dependent variable. On the other hand, the results from the application of the bounds t-test in each ARDL model are less clear-cut and do not mainly allow the imposition of the trend restrictions in the models since they are not significant except t_v and t_{III} ratios in (X / y) of Fiji Islands, t_v in (M / y) of Fiji Islands, t_v and t_{iii} in (X / y) of Solomon Islands, and t_{iii} in (M / X) of Solomon islands (See Pesaran *et al*., 2001: 312).

Table 5

The Bounds Test for Co-integration (Fiji Islands)

Variables	With Deterministic Trends			Without Deterministic Trend		Conclusion H_0
	F_{IV}	F_V	t_V	F_{III}	t_{III}	
(1) y and X						
F_y (y / X)	5.10[c]	7.27[c]	-3.14[b]	6.27[c]	-3.18[b]	Rejected
F_X (X / y)	4.36[c]	16.75[c]	-7.52[c]	8.42[c]	-4.20[c]	Rejected
(2) y and M						
F_y (y / M)	5.14[c]	6.79[c]	-2.33[a]	7.22[c]	-3.03[b]	Rejected
F_M (M / y)	5.30[c]	7.93[c]	-4.21[c]	6.05[c]	-2.87[b]	Rejected
(3) X and M						
F_X (X / M)	18.14[c]	16.39[c]	-4.81[c]	11.70[c]	-2.85[a]	Rejected
F_M (M / X)	14.75[c]	9.58[c]	-2.93[a]	11.36[c]	-2.93[a]	Rejected

Note:

Akaike Information Criterion (AIC) and Schwartz Criteria (SC) were used to select the number of lags required in the co-integration test. Both gave the same level of lag order, VAR= 1. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing $\sigma_{1Y} = 0$ in Equation (1) and $\varpi_{1Y} = 0$ in Equation (2) respectively with and without deterministic linear trend. [a] indicates that the statistic lies below the lower bound, [b] that it falls within the lower and upper bounds, and [c] that it lies above the upper bound.

Table 6

The Bounds Test for Co-integration (Papua New Guinea)

Variables	With Deterministic Trends F_{IV}	F_V	t_V	Without Deterministic Trend F_{III}	t_{III}	Conclusion
(1) y and X						
F_y (y / X)	5.17[c]	5.10[c]	-1.39[a]	4.40[c]	0.06[a]	Rejected
F_X (X / y)	3.10[a]	2.62[a]	-1.85[a]	3.22[a]	-1.87[a]	Accepted
(2) y and M						
F_y (y / M)	3.16[a]	2.96[a]	-2.34[a]	2.73[a]	-1.47[a]	Accepted
F_M (M / y)	1.91[a]	1.56[a]	-2.20[a]	1.48[a]	-2.01[a]	Accepted
(3) X and M						
F_X (X / M)	3.16[a]	2.59[a]	-3.55[b]	3.49[b]	-3.83[a]	Accepted
F_M (M / X)	2.06[a]	1.70[a]	-2.36[a]	1.24[a]	-1.77[a]	Accepted

Note:
Akaike Information Criterion (AIC) and Schwartz Criteria (SC) were used to select the number of lags required in the co-integration test. Both gave the same level of lag order, VAR= 1. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing σ_{1Y} = 0 in Equation (1) and ϖ_{1Y} = 0 in Equation (2) respectively with and without deterministic linear trend. [a] indicates that the statistic lies below the lower bound, [b] that it falls within the lower and upper bounds, and [c] that it lies above the upper bound.

Table 7

The Bounds Test for Co-integration (Solomon Islands)

Variables	With Deterministic Trends F_{IV}	F_V	t_V	Without Deterministic Trend F_{III}	t_{III}	Conclusion
(1) y and X						
F_y (y / X)	16.49[c]	13.82[c]	-2.65[a]	16.57[c]	-2.81[b]	Rejected
F_X (X / y)	19.43[c]	15.78[c]	-3.79[c]	19.40[c]	-3.83[c]	Rejected
(2) y and M						
F_y (y / M)	8.42[c]	6.84[c]	-1.69[a]	8.42[c]	-1.71[a]	Rejected
F_M (M / y)	9.40[c]	8.31[c]	-2.68[a]	9.41[c]	-2.73[b]	Rejected
(3) X and M						
F_X (X / M)	9.76[c]	7.98[c]	-2.95[a]	9.81[c]	-3.05[b]	Rejected
F_M (M / X)	11.69[c]	11.69[c]	-3.01[a]	12.72[c]	-3.53[c]	Rejected

Note:
Akaike Information Criterion (AIC) and Schwartz Criteria (SC) were used to select the number of lags required in the co-integration test. Both gave the same level of lag order, VAR= 1. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing σ_{1Y} = 0 in Equation (1) and ϖ_{1Y} = 0 in Equation (2) respectively with and without deterministic linear trend. [a] indicates that the statistic lies below the lower bound, [b] that it falls within the lower and upper bounds, and [c] that it lies above the upper bound.

On the basis of the bounds test results for Level Relationships, the Granger causality tests require an ECM in the case of each pair of variables for Fiji and Solomon Islands. In the case of Papua New Guinea, an ECM was estimated for (y / X) relationship where ARMs will be estimated for the other pairs of variables that would suggest only short run relationships. There are methods for lag length selection in the recent literature such as AIC (Akaike Information), SIC (Schwartz Information Criterion) and Hsiao's (1979) sequential procedure (which combines Granger's definition of causality and Akaike's minimum final prediction error (FPE) criterion). However, due to the limited number of observations in this study, maximum lag was set to 3 and EC and AR models were estimated for each lag length. Pindyck and Rubinfeld (1998) also point out that it would be best to run the test for a few different lag structures and make sure that the results were not sensitive to the choice of lag length.

Table 8

Granger Causality Tests (Fiji Islands)

Lag Level	1		2		3		
Null Hypothesis	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	Result
(1) y and X							
X does not Granger cause y	0.34	-0.50	1.63	-2.47**	2.71**	-3.25*	y ⇔X
y does not Granger cause X	3.53**	-3.14*	3.28**	0.54	1.60	0.66	
(2) y and M							
M does not Granger cause y	1.89	-2.12**	1.51	-2.32**	1.43	-2.28**	y …. M
y does not Granger cause M	0.36	-0.86	0.27	-0.79	0.56	0.29	
(3) X and M							
X does not Granger cause M	1.05	-0.58	0.61	0.17	2.29***	-3.13	X ⇔ M
M does not Granger cause X	1.62	-2.03**	4.07*	-1.76***	3.88*	2.64	

*Note: 1. *, ** and *** significance at 1%, 5% and 10% levels respectively.*

Table 9

Granger Causality Tests (Papua New Guinea)

Lag Level	1		2		3		
Null Hypothesis	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	Result
(1) y and X							
X does not Granger cause y	5.96*	2.20	4.43*	2.26	3.16**	-0.57	X ≠>y
y does not Granger cause X	6.32**	-	3.72**	-	2.13	-	y ⇒ X

Lag Level	1		2		3		
Null Hypothesis	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	Result
(2) y and M							
M does not Granger cause y	0.00	-	0.00	-	0.07	-	y …. M
y does not Granger cause M	0.08	-	0.13	-	0.08	-	
(3) X and M							
X does not Granger cause M	0.85	-	0.47	-	0.27	-	X …. M
M does not Granger cause X	0.57	-	1.59	-	1.85	-	

*Note: 1. * and ** significance at 1% and 5% levels respectively.*

Table 10

Granger Causality Tests (Solomon Islands)

Lag Level	1		2		3		
Null Hypothesis	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	F – Stat	t_{ECTt-1}	Result
(1) y and X							
X does not Granger cause y	0.49	0.19	0.68	-0.52	1.91	1.03	y ⇒ X
y does not Granger cause X	2.20	-2.44**	1.42	-1.70***	2.11***	-2.91*	
(2) y and M							
M does not Granger cause y	0.66	0.23	0.47	-0.07	0.94	0.89	y .... M
y does not Granger cause M	1.62	-2.19**	1.47	-2.46**	1.45	-2.97*	
(3) X and M							
X does not Granger cause M	2.86***	-1.90***	1.71	-1.84***	1.56	-1.60	X ⇒ M
M does not Granger cause X	0.38	-0.77	0.82	-0.06	0.63	-0.14	

*Note: 1. *, ** and *** significance at 1%, 5% and 10% levels respectively.*

Results of Granger causality tests in Tables 8 through 10 in the Appendix suggest that there are bidirectional causalities between exports and real GDP and between exports and imports in the case of Fiji Islands. No causation was obtained between real GDP and imports. In the case of Papua New Guinea, no causations were obtained between real GDP and exports in the long run context, and between the other pairs of variables in the short run context. And finally, there is unidirectional causality running from real GDP growth to real export growth and from real export growth to real import growth in the case of Solomon Islands. There is no causation between real GDP and imports of Solomon Islands according to the results of ECMs.

Figure 1
Trade and Growth in Fiji Islands

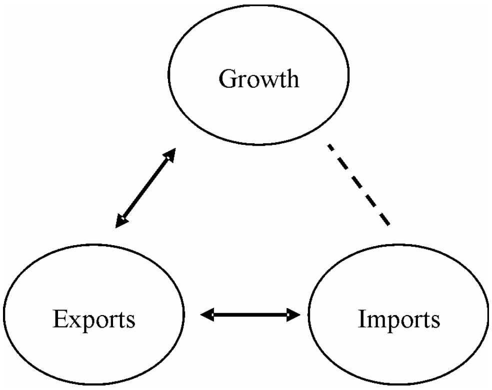


Figure 2
Trade and Growth in Papua New Guinea

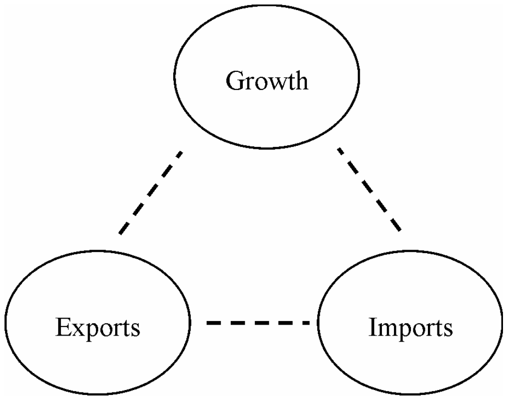
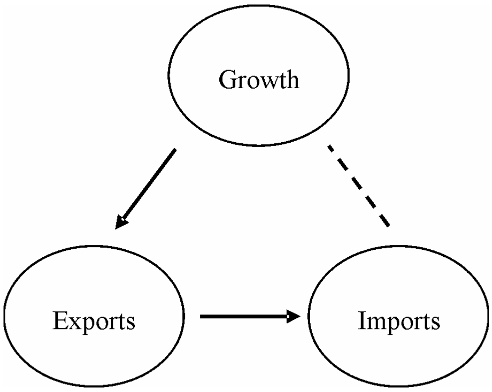


Figure 3
Trade and Growth in Solomon Islands



IV. Conclusion

This study empirically tested the possibility of long-run equilibrium relationship and direction of causality between international trade and real income growth in the Pacific Region. Results of the bounds test for Level Relationships reveal that a long-run equilibrium relationship was confirmed between international trade and economic growth in Fiji and Solomon Islands by using the ARDL modeling approach. The only long run relationship was obtained between exports and economic growth in the case of Papua New Guinea. The major findings of this study as can be also seen from Figure 1 through Figure 3 are that (1) growth in real income stimulates growth in exports of goods and services in Solomon Islands, (2) there are feedback relationships between economic growth and export growth, and between export growth and import growth in Fiji Islands and (3) export growth stimulates growth in imports in the case of Solomon Islands. Finally, no causation was obtained between international trade variables (exports and imports) and economic growth in the case of Papua New Guinea.

The finding of the study that a growth in real income stimulates a growth in exports of Fiji Islands is the same with the finding of Katircioglu (2009) where he found the same result for Cyprus. However, the other results of this study are not consistent with the results of Katircioglu (2009). The major finding of this study is that export-led and import-led growth hypotheses (or trade-led growth hypothesis) cannot be inferred for the islands in the Pacific region. Thus, this study suggests that still there is a need to evaluate the relationship of international trade with economic growth as some of the results of this study are consistent where some others are conflicting with the other studies in the relevant literature. Therefore, a further study is recommended to do a similar study for the other islands around the world for the purpose of comparison with the results of this study and previous studies.

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