OPENNESS CAN BE GOOD FOR GROWTH NEW EVIDENCE ON PANAMA: 1980 - 2015

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ABSTRACT

The nexus between trade and economic growth in Panama has been widely debated. This paper investigates the relationship between exports, imports, and economic growth in Panama. In order to achieve this purpose, annual data for the periods between 1980 and 2015 was tested by using Johansen co-integration analysis of Vector Auto Regression Model and the Granger-Causality tests. According to the result of the analysis, it was determined that there is no relationship between exports, imports and economic growth in Panama. On the other hand, we found that there is a strong evidence of bidirectional causality from imports to economic growth and from exports to economic growth. These results provide evidence that exports and imports, thus, are seen as the source of economic growth in Panama.

KEYWORDS: *export, import, economic growth, Panama, cointegration and causality.*

1. INTRODUCTION:

The relationship between exports, imports and economic growth is always discussed in the literature. The theoretical and empirical studies mainly concentrate on either the relationship between export and growth or between import and growth or the association between export, import and economic growth. Ever since Ricardo's critique on the Corn Laws to the current debate on globalization, few topics in economics have been more hotly contested than the importance of openness to international trade for economic development and growth. The arguments in favor of openness are well known and date back at least to Adam Smith's analysis of market specialization: openness promotes the efficient allocation of resources through comparative advantage, allows the dissemination of knowledge and technological progress, and encourages competition in domestic and international markets; also, recent theoretical models indicate a long-run growth effect when the areas of specialization promoted by trade enjoy increasing returns to scale. But opposing arguments are not too hard to build: if market or institutional imperfections exist, openness can lead to under-utilization of human and capital resources, concentration in extractive economic activities,

or specialization away from technologically advanced, increasing-return sectors the theoretical ambiguity on the effects of openness is reflected in the available empirical evidence. Some papers point to strongly positive growth effects of trade openness. Others point to small positive effects. But others, most notably Harrison (1996) and Rodríguez and Rodrik (2001) have cast doubt on the significance and robustness of the growth benefits of openness. In general, the international trade is considered an important factor for the economic growth especially for a small open economy like Panama economy. Panama is the 114th largest export economy in the world and the 70th most complex economy according to the Economic Complexity Index (ECI). In 2014, Panama exported $4.62B and imported $28.5B, resulting in a negative trade balance of $23.9B. In 2014 the GDP of Panama was $46.2B and its GDP per capita was $20.9k. In 2014 Panama exported $4.62B, making it the 114th largest exporter in the world. During the last five years the exports of Panama have decreased at an annualized rate of -14%, from $9.8B in 2009 to $4.62B in 2014. The most recent exports are led by Passenger and Cargo Ships which represent 12.1% of the total exports of Panama, followed by Refined Petroleum, which account for 12%. In 2014 Panama imported $28.5B, making it the 68th largest importer in the world. During the last five years the imports of Panama have increased at an annualized rate of 1.9%, from $26B in 2009 to $28.5B in 2014. The most recent imports are led by Crude Petroleum which represent 15.1% of the total imports of Panama, followed by Refined Petroleum, which account for 14%. The aim of this paper, therefore, is to econometrically investigate the direct linkages between trade and economic growth of Panama, through employing yearly data for the period 1980-2015. In particular, this work tries to empirically find an answer for the question of whether exports lead economic growth or imports lead economic growth or economic growth leads exports and imports to achieve this objective the paper is structured as follows. In section 2, we present the review literature concerning the nexus between trade and economic growth. Secondly, we discuss the Methodology Model Specification and data used in this study in Section 3. Thirdly, Section 4 presents the empirical results as well as the analysis of the findings. Finally, Section 5 is dedicated to our conclusion.

2. Review literature

The relationship between import, export and economic, has been a subject matter for a substantial body of empirical work. Their nexus is usually investigated in the empirical literature in two different lines: The first line of the existing empirical research attempt to separately examine the importance of export or import on economic growth, the second line

of the empirical works examines the relationship between export and import collectively. With regard to methods haven used to determine the importance of export and/or import to economic growth, there are two main methods. The first one employs simple or multiple regressions, while the second method employs the causality technique. Recently, most of studies have attended to focus on VAR and VEC models and cointegration approach. Our review of literature is limited to studies that focus on the joint impact of both export and import on economic growth.

Table 1: Studies related to the relationship between exports, imports and economic growth

Study	Data	Method	Keys findings
Khaled R.M. Elbeydi and al (2010)	1980 – 2007 (annual): Libya	Cointegration analysis, VECM and Granger Causality tests	The export promotion policy contributes to the economic growth in Libya.
Dilawar Khan and al (2012)	1972 – 2009 (annual): Pakistan	Cointegration analysis, VECM and Granger causality tests	The existence of long-run correlation among exports, imports, and economic growth. Exports and imports are considered an essential part for economic growth of Pakistan. Economic growth has an important impact on exports and imports.
Velnampy.T and Achchuthan. S (2013)	1970 – 2010 (annual): Sri Lanka	Correlation analysis and regression analysis	Exports and imports have the significant positive relationship with each other. Also the result shows that exports and imports have a significant impact on the economic growth.
Güngör Turan and Bernard Karamanaj (2014)	1984 – 2012 (annual): Albania	OLS	Exports have a positive impact on the economic growth, however imports have a negative impact on the economic growth.
Auro Kumar Sahoo, Dukhabandhu Sahoo and Naresh Chandra Sahu (2014)	1981 – 2010 (annual): India	Cointegration analysis, VECM, ARCH and Granger causality tests	Mineral exports, industrial production, and economic growth are cointegrated, indicating an existence of a long run equilibrium relationship among variables. There is a long-run Granger causality relationship running from economic growth and industrial production to the mineral export.
Hussain M and Saaed A.(2014)	1977 – 2012 (annual): Tunisia	Cointegration analysis, VECM and Granger causality tests	There is unidirectional causality from imports to GDP. As imports do lead GDP.
Musibau Adetunji Babatunde (2014)	1960 – 2014 (annual): Nigeria	Cointegration analysis and Granger causality tests	There is a bidirectional causality between aggregate exports and imports, but unidirectional causality from oil exports to oil imports and from non-oil imports to non-oil exports.

Sachin N. Mehta (2015)	1976 – 2014 (annual): India	Engle Granger Cointegration analysis, VECM and Granger causality tests	There is a long run co-integrating relationship between Gross Domestic Products (GDP), Export, and Import in India. In long term the results of Granger causality tests show that GDP leads to Exports but Exports does not lead to GDP, also GDP does not lead to Import and Import do not lead to GDP. Finally Export lead to Imports but Imports do not lead to Exports.
Serhat Yüksel and Sinemis Zengin (2016)	1961- 2014 (annual): Argentina, Brazil, China, Malaysia, Mexico and Turkey	Engle Granger Cointegration analysis, VECM and Granger causality tests	The increase in exports causes higher growth rate in Argentina. There is also a causal relationship between import to export in China and Turkey. Then, exports cause higher imports in Malaysia. Finally, the relationship between import, export and growth rate is not same for all developing countries.
Masoud Albiman Md and Suleiman NN (2016)	1967 – 2010 (annual): Malaysia	Cointegration analysis, VAR and Granger causality tests	There is a causal relationship from exports to economic growth and from exports to imports.

3. Data and methodology

Our investigation starts by studying the integration properties of the data, conducting a systems cointegrating analysis, and checking Granger causality tests. The data are annual Panama observations uttered and expressed by natural logarithms for the sample period running from 1980 to 2015. Data were sources from World Development Indicators (WDI), which includes logarithm of real GDP measure of economic growth, logarithm of exports of goods and services (Current US$) and logarithm of imports of goods and services (Current US$).The empirical model used to test the relationship between GDP, exports and imports. Can be specified by the following form:

$$\mathbf{GDPt=f\ (exports,\ imports)\ (1.1)}$$

The function can also be represented in a log-linear econometric format thus:

$$\mathbf{LGDP\ t=\alpha + \beta Lexports\ t + \beta 1\ Limports\ t + \varepsilon t\ (1.2)}$$

Where: α is the constant term,'t' is the time trend, and 'ε' is the random error term assumed to be normally, identically and independently distributed.

The empirical methodology used in this study is in two stages and is to determine the degree of integration of each variable. In the econometric literature several statistical tests are used to

determine the degree of integration of a variable. The test that will be used as part of this study is testing Augmented Dickey-Fuller (ADF) and Phillips-Perron test (PP).

Once the order of integration of the known series is determinate, the next step is to review the possible presence of cointegration relationships that can long exist between the variables. This analysis will be following the cointegration test procedure of Johansen (1988) more effective than the two-step strategy of Engle and Granger (1987) when the sample is small and the high number of variables (before the cointegration test, we look for the number of delays from the optimum choice criterion of use SC). If there are cointegrating relationships we will use the VECM model, if no one applies the VAR model. Finally, we apply Granger causality test.

The general form of ADF test is estimated by the following regression:

$$\mathbf{\Delta Y_1} = \boldsymbol{a} + \boldsymbol{\beta}\mathbf{Y_{t-1}} + \sum_{i=1}^{n} \boldsymbol{\beta_1}\, \mathbf{\Delta Y_i} + \boldsymbol{\varepsilon_t} - - - - - - - \mathbf{(1.3)}$$

The general form of PP test is estimated by the following regression:

$$\mathbf{\Delta y_t} = \mathbf{\Delta y_{t-1}} + \boldsymbol{\varepsilon_t} \qquad \mathbf{(1.4)}$$

The VAR-based cointegration test using the methodology developed in Johansen (1991, 1995) is described below:

Consider a VAR of order p

$$\boldsymbol{Y_t} = \boldsymbol{\mu} + \boldsymbol{\Delta_t}\mathbf{Y_{t-1}} + - - - - - - + \boldsymbol{\Delta_p}\mathbf{Y_{t-p}} + \boldsymbol{\varepsilon_t} - - - - - - - \mathbf{(1.5)}$$

If the economic variables are not cointegrated, we can proceed to use the Vector Auto-regression (VAR) representation. This VAR can be rewritten as follows:

$$\mathbf{\Delta Y_t} = \boldsymbol{\mu} + \boldsymbol{\eta_{Yt-1}} + \sum_{i=1}^{p-1} \boldsymbol{\tau_1}\, \mathbf{\Delta Y_{t-1}} + \boldsymbol{\varepsilon_t} - - - - - - - \mathbf{(1.6)}$$

In the absence of cointegration, the unrestricted VAR in first difference is estimated, which takes the following form:

$$\mathbf{\Delta GDP_t} = \sum_{i=1}^{n} \boldsymbol{\beta_{1t}}\, \mathbf{\Delta GDP_{t-1}} + \sum_{i=1}^{n} \boldsymbol{C_1}\, \boldsymbol{\Delta e^{t-1}} + \sum_{i=1}^{n} \boldsymbol{d_{1t}}\, \mathbf{\Delta Imp_{t-1}} + \boldsymbol{\varepsilon_{2t}} \ldots \mathbf{(1.7)}$$

$$\boldsymbol{\Delta e^t} = \sum_{i=1}^{n} \boldsymbol{\beta_{3t}}\, \mathbf{\Delta GDP_{t-1}} + \sum_{i=1}^{n} \boldsymbol{C_{3t}}\, \boldsymbol{\Delta e^{t-1}} + \sum_{i=1}^{n} \boldsymbol{d_{3t}}\, \mathbf{\Delta Imp_{t-1}} + \boldsymbol{\varepsilon_{3t}} \ldots \mathbf{(1.8)}$$

$$\mathbf{\Delta\ Im\ p_t} = \sum_{i=1}^{n} \boldsymbol{\beta_{3t}}\, \mathbf{\Delta GDP_{t-1}} + \sum_{i=1}^{n} \boldsymbol{C_{3t}}\, \boldsymbol{\Delta e^{t-1}} + \sum_{i=1}^{n} \boldsymbol{d_{3t}}\, \mathbf{\Delta Imp_{t-1}} + \boldsymbol{\varepsilon_{3t}} \ldots \mathbf{(1.9)}$$

4. Empirical analysis:

For the variables to be stationary, the rule states that; ADF statistical test must be more than Critical test at level 5% and also the value of the probability must be less than 5% (Table 2 and Table 3). Second for the selection of the lag order, the SC criterion is used to determine the optimal number of lags (Table 4). Third, to determined the cointegration analysis the rule states that, if the statistic of the trace is greater than the critical value at 5% and with a probability less than 5%, this means that there is a cointegration relation, if one of its conditions is absent; it indicates that there is no co-integration relation between the variables realized (Table 5). Fourth, the estimation of the VAR model; after the extraction of the linear regression equation located in the VAR model to have if the independent variables affect the dependent variable**.** C (1) must be significant, and the coefficient of C (1) should be negative for the VAR model to be significant (Table 6 and Table 7). And finally, to investigate the causality between GDP and exports, on the one hand, and GDP and imports, on the other, a simple Granger causality test has been performed, by estimating the vector autoregressive processes for GDP, exports, and imports.

Table 2: Tests for Unit Root: ADF

Variable	ADF Level with constant only			ADF First Difference with constant only		
	Test critical values	test statistic	Probability	Test critical values	test statistic	Probability
LGDP 1% level	-3.632900	2.225264	0.9999	-3.639407	-3.252107	0.0254
LGDP 5% level	-2.948404			-2.951125		
LGDP 10% level	-2.612874			-2.614300		
LEXPORT 1% level	-3.699871	0.947205	0.9946	-3.699871	-4.258073	0.0026
LEXPORT 5% level	-2.976263			-2.976263		
LEXPORT10% level	-2.627420			-2.627420		
LIMPORT 1% level	-3.632900	0.352912	0.9778	-3.639407	-4.663625	0.0007
LIMPORT 5% level	-2.948404			-2.951125		
LIMPORT 10% level	-2.612874			-2.614300		

Table 3: Tests for Unit root (PP)

Variable	PP Level with constant only			PP First Difference with constant only		
	Test critical values	test statistic	Probability	Test critical values	test statistic	Probability
LGDP 1% level	-3.632900	2.225264	0.9999	-3.639407	-3.289346	0.0233
LGDP 5% level	-2.948404			-2.951125		
LGDP 10% level	-2.612874			-2.614300		
LEXPORT 1% level	-3.632900	0.668386	0.9896	-3.639407	-3.861216	0.0057
LEXPORT 5% level	-2.948404			-2.951125		
LEXPORT10% level	-2.612874			-2.614300		
LIMPORT 1% level	-3.632900	0.352912	0.9778	-3.639407	-4.686261	0.0006
LIMPORT 5% level	-2.948404			-2.951125		
LIMPORT 10% level	-2.612874			-2.614300		

Table 4: Lag order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	34.33122	NA	2.66e-05	-2.021369	-1.882596	-1.976133
1	143.7778	190.6488	4.09e-08	-8.501792	-7.946700*	-8.320846
2	156.6140	19.87536*	3.26e-08*	-8.749287	-7.777877	-8.432632*
3	161.1148	6.097979	4.57e-08	-8.459022	-7.071293	-8.006657
4	173.1464	13.97214	4.13e-08	-8.654607	-6.850559	-8.066532
5	184.8434	11.31966	4.09e-08	-8.828606*	-6.608239	-8.104822

Table 5: Cointegration Test

Included observations: 34 after adjustments				
Trend assumption: Linear deterministic trend				
Series: LOG(GDP) LOG(EXPORTS) LOG(IMPORTS)				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Prob. ****
None	0.347832	20.01591	29.79707	0.4218
At most 1	0.110957	5.482529	15.49471	0.7556
At most 2	0.042702	1.483788	3.841466	0.2232
Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigen value)				
Hypothesized No. of CE(s)	**Eigen value**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob. ****
None	0.347832	14.53338	21.13162	0.3229
At most 1	0.110957	3.998742	14.26460	0.8595
At most 2	0.042702	1.483788	3.841466	0.2232
Max-Eigen value test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Normalized cointegrating coefficients (standard error in parentheses)				
LOG(GDP)	LOG(EXPORT)	LOG(IMPORT)		
1.000000	-2.543025	1.335595		
	(0.73279)	(0.71447)		

Table 6: Vector Auto-regression Estimates

Vector Auto-regression Estimates			
Sample (adjusted): 1981 2015			
Included observations: 35 after adjustments			
Standard errors in ( ) & t-statistics in [ ]			
	LOG(GDP)	LOG(EXPORTS)	LOG(IMPORTS)
LOG(GDP(-1))	0.822552 (0.06461) [12.7314]	0.027491 (0.13707) [0.20057]	-0.050130 (0.16959) [-0.29558]
LOG(EXPORTS(-1))	0.246135 (0.19860) [1.23934]	0.918077 (0.42133) [2.17898]	0.616301 (0.52132) [1.18218]
LOG(IMPORTS(-1))	-0.025648 (0.16110) [-0.15920]	0.068368 (0.34178) [0.20004]	0.468541 (0.42289) [1.10795]
C	-0.833924 (0.30382) [-2.74484]	-0.274966 (0.64455) [-0.42660]	-0.654151 (0.79751) [-0.82024]

Table 7: Least Squares (Gauss-Newton/Marquardt steps)

Dependent Variable: LOG(GDP)				
Method: Least Squares (Gauss-Newton / Marquardt steps)				
Sample (adjusted): 1981 2015				
Included observations: 35 after adjustments				
LOG(GDP) = C(1)*LOG (GDP (-1)) + C(2)*LOG (EXPORTS (-1)) + C(3)*LOG (IMPORTS (-1)) + C(4)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.822552	0.064608	12.73143	0.0000
C(2)	0.246135	0.198601	1.239344	0.2245
C(3)	-0.025648	0.161103	-0.159200	0.8745
C(4)	-0.833924	0.303816	-2.744837	0.0100

Table 8: Residual Diagnostics Tests

R-squared	0.995916
Adjusted R-squared	0.995521
F-statistic	2519.753
Prob(F-statistic)	0.000000
Breusch-Godfrey Serial Correlation LM Test:	0.1308

Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.8398

Table 9: Granger Causality Tests

Pairwise Granger Causality Tests			
Sample: 1980 2015			
Lags: 1			
Null Hypothesis:	Observation	F-Statistic	Prob.
LOG(EXPORTS) does not Granger Cause LOG(GDP)	35	11.9343	0.0016
LOG(GDP) does not Granger Cause LOG(EXPORTS)		0.02132	0.8848
LOG(IMPORTS) does not Granger Cause LOG(GDP)	35	9.89445	0.0036
LOG(GDP) does not Granger Cause LOG(IMPORTS)		0.26904	0.6075
LOG(IMPORTS) does not Granger Cause LOG(EXPORTS)	35	0.02110	0.8854
LOG(EXPORTS) does not Granger Cause LOG(IMPORTS)		1.62903	0.2110

Tables 2 and 3 show that all the variables (GDP, exports and imports) were differenced once the ADF and PP test were conducted on them; the result reveals that all the variables became stationary at first difference. The table 5 shows the result of the cointegration test. In the table, both trace statistic and maximum Eigenvalue statistic indicate no cointegration at the 5 percent level of significance, meaning that the null hypothesis cannot be rejected at the 5% significance level. This means that there is no cointegrating relation between the variables so tested; this implies that exports, imports and economic growth have no long-run relationship. Also, the table 8 justifies the efficiency and the quality of the estimation of VAR model in the tables 6 and 7. And finally, the table 9 presents the Granger Causality tests. The results of causality between economic growth (GDP), exports and imports are contained in the table 9. The Granger Causality Tests shows that there is a strong evidence of bidirectional causality from import to economic growth and from export to economic growth.

5. CONCLUSION:

The aim of this study was to explain the nexus between exports, imports and economic growth of Panama during the period 1980-2015. The cointegration, VAR model and Granger's causality tests are applied to investigate the relationship between these three variables. The unit root properties of the data were examined using the Augmented Dickey Fuller test (ADF) and Philips-Perron (PP) after that the cointegration and causality tests were conducted. The result shows that there is no relationship between the three variables in Panama. On the other hand, we found that there is a strong evidence of bidirectional causality from imports to economic growth and from exports to economic growth. These results

provide evidence that exports and imports, thus, are seen as the source of economic growth in Panama.

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