Export Led Growth in the Caribbean: Evidence from a panel cointegration assessment

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Introduction

- As small open economies, the export sector of the Caribbean region is a substantial source of economic growth, accounting for, on average, 43 percent of GDP since 2010.

- Theoretically, exports has been linked to increased productivity through numerous avenues (Feder, 1982). Export oriented sectors are assumed to increase factor productivity which acts as an externality, eventually radiating into the non export sector.

- From a Caribbean perspective, the extent to which the export sector has successfully spawned growth through productivity in other sectors remain ambiguous. While this has been a significant topic for policy makers, there are no recent studies on the ELG hypothesis for the region. The few available studies are dated and focus on a single country through time series data analysis.

Theoretical Support for ELG

Export Led Growth

Classical comparative advantage theory

Adam Smith(1776): theory of Absolute Advantage.

David Ricardo(1817): theory of Comparative Advantage

Mills (1909): Trade broadens production scope and markets

Heckscher – Ohlin theory (Ohlin,1933): Factor endowments drive trade.

Controlling rent seeking

Krueger (1974): competition from openness will result in the better allocation of resources.

Bongolia (2001): trade openness helps to regulate corruption

Technology diffusion and knowledge spillovers

Arrow (1962): *"learning is the product of experience"*

Romer (1986): Endogenous growth model

Grossman and Helpman (1991): transmission of resources and knowledge

Evolution of empirical literature

- Early studies conducted cross sectional analyses using correlation and least squares techniques. Some of the classic work done in this era are those by Emery (1967), Kravis (1970), and Balassa (1978).
- This stage was succeeded by a production function approach. The often cited papers in this period include those of Michalopolous and Jay (1973), Balassa (1978), Tyler (1981) and Feder (1983).
- During the 1970's and 80's, there was a switch in the concentration from cross sectional studies to time series studies. Foundation studies in this period include those of Jung and Marshall (1985) and Chow (1987).
- Recent studies have utilised more sophisticated time series econometric techniques including co-integration tests. Some of the key research work thus far, in this field, has been that of Bahmani-Oskooee et. al. (1991), Biswal et. al. (1996) and Ghatak et. al. (1997).
- The most recent studies utilize econometric techniques to test the long run relationship between the variables using panel data. Some prominent studies in this area of study includes Bahmani-Oskooee, Economidou and Goswami (2005), Parida and Sahoo (2007) and Dreger and Herzer (2013.

Panel data empirical literature

Author(s)	Countries/Years	Method	Concluding Remarks
Biyase and Zwane (2014)	30 African Countries (1990-2005)	Pooled OLS, Fixed Effect, Random Effects, 2SLS	Export Led Growth
Parida and Sahoo (2007)	4 Asian Countries	Pedroni Panel Cointegration	Export and Manufacturing Industry Export-led Growth Hypothesis
Dreger and Herzer (2013)	45 developing countries (1971-2005)	Pedroni Panel Cointegration, FMOLS, DOLS	Long run export decreasing growth, short run export led growth
Bahmani-Oskooee, Economidou and Goswami (2005)	61 developing countries 1960-1999	Panel Cointegration	Exports as the dependent variable, there is evidence of cointegration When the dependent variable is output there is no indication of cointegration
Pazim (2007)	Philippines, Indonesia and Malaysia 1985-2002	(a) pooled ordinary least squares (b) one way fixed effects (c) two way fixed effects d) one way random effects	BIMP-EAGA countries are not export-driven economies
Yee Eee (2016)	Sub Saharan Africa	Panel Cointegration, FMOLS and DOLS	Positive relation from exports to growth

Model

- The model is based on a simple production function as introduced from early cross sectional works by Balassa (1978), Tyler (1981) and Feder (1983) An AK type Cobb Douglas Production function is modelled such that:

$$Y_{it} = A_{it} K_{it}^{\alpha i}$$

- The relevance of exports in this function is through its effect on the countries' economic growth rates through changes in productivity, therefore,

$$A_{it} = f(X_{it}) = X_{it}^{\beta i}$$

- Exports are already part of a country's output, therefore a positive and significant relationship is expected to exist between exports and output even without any changes in productivity. Therefore, exports are subtracted from GDP, to give the new dependent variable log of non-export GDP. Further specification to include a constant, trend term (where relevant) and the residual gives the equation to be estimated.

$$lnN_{it} = \alpha_i \ln K_{it} + \beta_i lnX_{it} + c_i + d_i t + e_{it}$$

Data

- Data on GDP, exports and gross capital formation (all in constant 2005 $US) was collected for 13 Caribbean countries for the period 1970 to 2013 from the United Nations Statistic Division's Statistical database. The natural logarithms of all the data was taken.
- The countries are namely Antigua and Barbuda, the Bahamas, Barbados, Dominica Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, Suriname, St. Vincent and the Grenadines and Trinidad and Tobago.
- These economies are separated into 10 tourism based economies and three (Guyana, Suriname and Trinidad and Tobago) commodity based.
- This classification was based on the composition of GDP in each country, for the period 2011-2014, the service sector accounts for more than 50% of GDP in economies classified as service based.
- LN denotes logged Non export GDP, LX denotes logged exports and LK denotes logged GCF.

Methodology

Unit Root Tests to ensure that all variables are integrated of the same order. These tests can be separated into two categories:

1) Assuming common unit root processes: Levin, Lin and Chu (LLC) and Breitung tests

2) Assuming individual unit root processes: Im, Pesaran and Shin (IPS), ADF-Fisher and PP-Fisher

Cointegration tests can be conducted if all variables were shown to be integrated of the same order. Two tests for cointegration were used:

1) Pedroni Tests: four "within dimension" statistics or panel statistics and three "between dimensions" statistics or group statistics.

2) Johansen Fisher Tests: Maddala and Wu (1999) uses a Fisher's (1932) consideration to combine individuals tests for cointegration in panel data by combining individual cross-sections Johansen tests for cointegration

Direction of causality: If the variables are cointegrated, the direction of long run causality can be established using:

1) Panel VECM: based on assumptions used for the Johansen Fisher Tests

2) FMOLS and DOLS: Pooled and Grouped coefficients for the independent variables are estimated.

Short Run causality can be determined using the VECM (given cointegration) and the bi-variate Granger Causality test.

Empirical Results: Unit Roots

Variable	Null: Unit root (assumes individual unit root process)									Null: Unit root (assumes common unit root process)					
	IPS			ADF - Fisher			PP - Fisher			LLC			Breitung t-stat		
	All	Com. Based	Ser. Based	All	Com. Based	Ser. Based	All	Com. Based	Ser. Based	All	Com. Based	Ser. Based	All	Com. Based	Ser. Based
LN	0.50	0.54	0.47	0.64	0.37	0.69	0.00	0.00	0.55	0.62	0.98	0.29	0.04	0.19	0.07
DLN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LX	0.89	0.36	0.94	0.91	0.38	0.96	0.89	0.24	0.97	0.58	0.11	0.79	0.24	0.06	0.42
DLX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LK	0.24	0.41	0.25	0.28	0.49	0.23	0.38	0.19	0.53	0.31	0.39	0.34	0.09	0.08	0.21
DLK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Empirical Results: Johansen Fisher

Countries	Hypothesized No. of CE(s)	Fisher Stat (from trace test)	Prob. (from trace test)	Fisher Stat (from max-eigen test)	Prob. (from max eigen test)
All Countries	None ***	47.70	**0.006**	44.37	**0.014**
	At most 1	19.72	0.805	19.83	0.800
	At most 2	12.88	0.985	12.88	0.985
Commodity based Countries	None	6.940	0.326	6.758	0.344
	At most 1	2.832	0.829	4.902	0.556
	At most 2	0.709	0.994	0.709	0.994
Service Based countries	None ***	40.76	**0.004**	37.62	**0.010**
	At most 1	16.89	0.660	14.92	0.780
	At most 2	12.17	0.910	12.17	0.910

Empirical Results: Pedroni

Alternative hypothesis: common AR coefs. (within-dimension)			
Panel Statistics	All countries	Commodity Based	Ser. Based
Panel v-Statistic	0.000*	0.264	0.000*
Panel rho-Statistic	0.021*	0.082*	0.161
Panel PP-Statistic	0.000*	0.000*	0.048*
Panel ADF-Statistic	0.332	0.887	0.021*
Alternative hypothesis: individual AR coefs. (between-dimension)			
Group Statistics	All countries	Commodity Based	Ser. Based
Group rho-Statistic	0.323	0.527	0.287
Group PP-Statistic	0.000*	0.005*	0.008*
Group ADF-Statistic	0.464	0.969	0.130 *

Empirical Results: Panel VECM

D(LN) = **C(1)***(ETC(-1)) + **C(2)** *D(LN(-1)) + **C(3)***D(LX(-1)) + **C(4)***D(LK(-1)) + **C(5)**

Cointegrating Eq:	**Coefficients of CointEq1 (tstat) ALL**	**Coefficients of CointEq1 Ser. Based**
LN(-1)	1	1
LX(-1)	1.801 (4.86)	2.489 (5.466)
LK(-1)	-3.160 (-8.07)	-3.804 (-8.163)
TREND(70)	0.001 (1.29)	0.002 (1.535)
C	4.762	3.258
Coefficients for D(LN)	Coefficients of VECM(tstat) : ALL	Coefficients of VECM (tstat): Ser. Based
C(1)	0.001 (0.245)	0.004 (0.706)
C(2)	0.062 (1.372)	0.019 (0.352)
C(3)***	0.130 (2.492)	0.101 (1.686)
C(4)**	0.076 (2.327)	0.080 (2.013)
C(5)***	0.023 (3.335)	0.026 (3.267)

Empirical Results: FMOLS and DOLS estimates

Panel Method	Variable	All Countries				Ser. Based Countries			
		FMOLS		DOLS		FMOLS		DOLS	
		Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Pooled (Between)	LX	-0.593	-8.01	-0.587	-6.179	-0.651	-7.468	-0.702	-6.207
	LK	0.39	6.3	0.436	5.203	0.371	5.299	0.41	4.059
Grouped (Within)	LX	-0.519	-10.447	-0.539	-6.911	-0.609	-11.466	-0.67	-7.906
	LK	0.47	10.71	0.557	6.548	0.523	11.407	0.624	6.683

Empirical Results: Individual Coefficients

Individual Coefficients for Dependent Variable: LN									
ID	Country	FMOLS				DOLS			
		All Countries		Ser. Based		All Countries		Ser. Based	
		LX	LK	LX	LK	LX	LK	LX	LK
1	A&B	-2.29	0.81	-2.29	0.81	-2.63	1.12	-2.63	1.12
2	BHS	-0.92	1.06	-0.92	1.06	-0.92	1.13	-0.92	1.13
3	BRB	-0.49	0.20	-0.49	0.20	-0.53	0.23	-0.53	0.23
4	DOM	-0.12	0.09	-0.12	0.09	-0.16	0.11	-0.16	0.11
5	GRE	-0.39	0.26	-0.39	0.26	-0.39	0.24	-0.39	0.24
6	GUY	0.29	0.01	NA	NA	0.38	0.01	NA	NA
7	HAI	-0.29	0.46	-0.29	0.45	-0.32	0.48	-0.32	0.48
8	JAM	-0.59	0.45	-0.59	0.45	-0.62	0.50	-0.62	0.50
9	SKN	-0.31	0.40	-0.31	0.40	-0.32	0.40	-0.32	0.40
10	SLU	-0.04	0.44	-0.04	0.44	-0.08	0.48	-0.08	0.48
11	SUR	-0.92	0.48	NA	NA	-0.67	0.47	NA	NA
12	SVG	-0.65	1.06	-0.65	1.06	-0.73	1.54	-0.73	1.54
13	T&T	-0.02	0.40	NA	NA	-0.01	0.51	NA	NA

What do these results mean?

- What accounts for the negative spillover effects from exports to non export GDP for most Caribbean economies?
- Although no econometric evidence have been presented, the concept of a declining positive contribution of the export sector has become a topic of debate for many Caribbean scholars in the recent years.
- There are numerous reasons cited in the literature for the failure of the theoretically superior export led growth model particularly as it relates Caribbean countries.
- One major reason for the current trade pattern of the region is due to the preferential market access granted to these countries by developed countries, particularly the EU.
- A pivotal avenue by which the economies can improve their situation has to do with their ability to effectively diversify both market and products.

Conclusion

- No significant long run relation between exports and non export GDP for commodity based economies.
- The overall results point to a case of export decreasing non export GDP growth for 12 out of the 13 countries, where Guyana is the exception.
- Using the terminology of Feder (1981), "the marginal externality effect of exports on the output of the non export sector" is negative.
- Furthermore, while there has been no recent econometric evaluation of the export led growth hypothesis in the region, the results of this paper is analytically supported by a cadre of scholars, with one indication that the usual export oriented strategy in the Caribbean has "run out of steam."

Thank You.