Long-run relationship among energy exports, manufacturing exports and economic growth in Trinidad and Tobago.

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Introduction

Research question:

How to promote manufacturing exports in a resource rich, small, open economy?

Research aim:

To determine the nature and causal relationship among energy exports, manufacturing exports and economic growth.

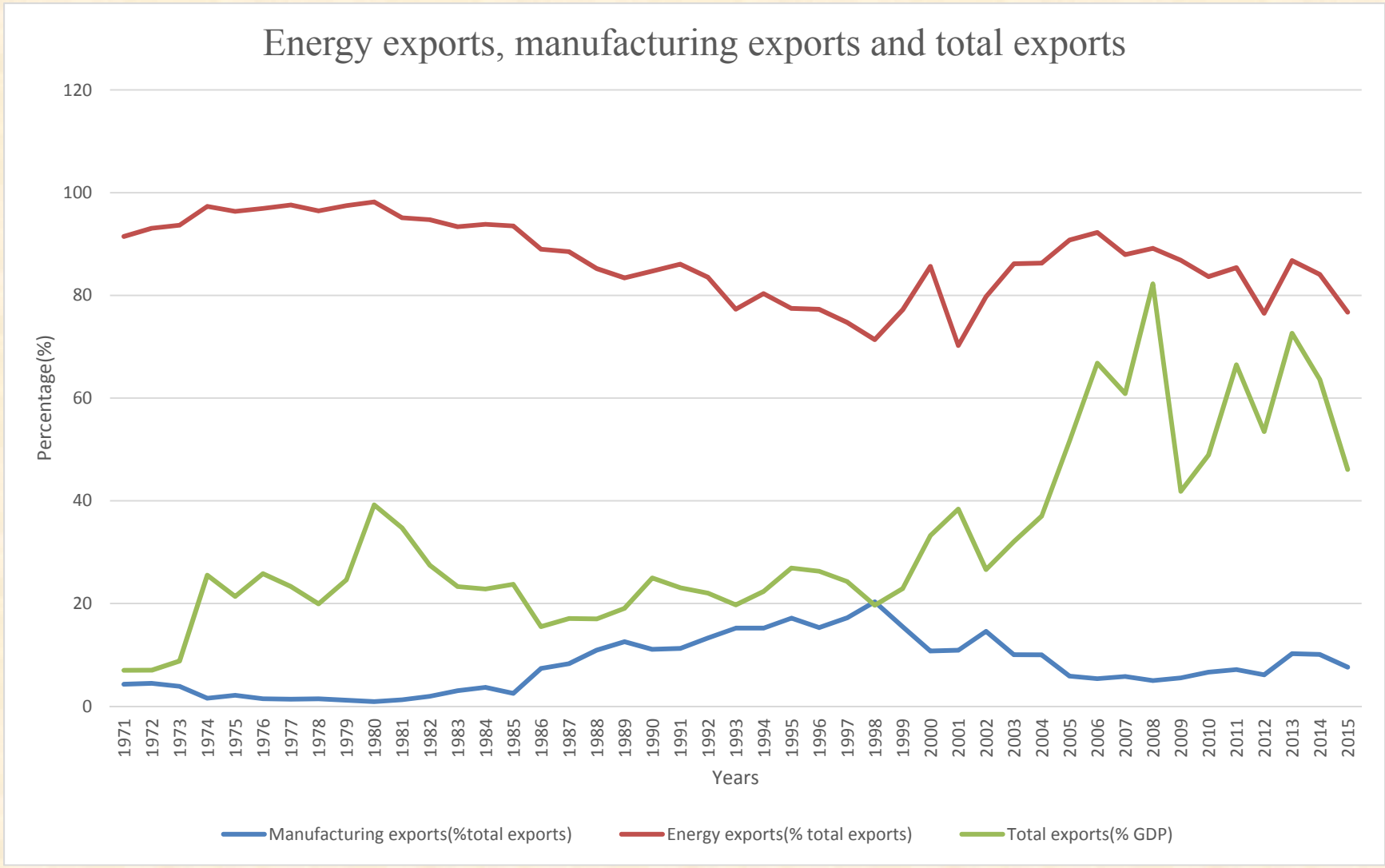
Theoretical relation

- The relationship between energy exports and economic growth can be either positive or negative (Auty 1990, Rudd 1996, Bature 2014).
- The relationship between manufacturing exports and economic growth can be either positive or negative.(Export-led growth). (Smith 2001, Raheem 2016, Feder and Fosu 1990).
- The relationship between energy exports and manufacturing exports was negative.(Dutch disease). (Sachs and Warner 2001, Corden and Neary 1982, Auty 1990, 2016 Gelb 1988, Hosein and Tewarie 2004).
- The direction of causality among these variables take two forms; bi-directional (Mukhtar 2017, Torayeh 2014) or unidirectional (Shihab 2014).

Why Trinidad and Tobago?

- Trinidad and Tobago is an energy dependent country.
- The high dependence on the energy sector and energy exports make the economy highly vulnerable.
- Promoting the manufacturing exports as a means of diversification may be important to the economy. However, there is a decline of manufacturing exports as a share of total exports.

Background


Energy exports, manufacturing exports and total exports
120
100
80
60
40
20
0
Percentage(%)
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Years
Manufacturing exports(%total exports)
Energy exports(% total exports)
Total exports(% GDP)

Data: Variables and data sources

Real Energy Exports	Calculated using UNcomtrade data: the sum of SITC 3 and SITC 5 and then deflated using the US CPI.
Real Manufacturing Exports	Calculated using UNcomtrade data: the sum of SITC 6 and SITC 8 and then deflated using the US CPI.
Real Gross Domestic Product per capita	Calculated using World development indicators (nominal GDP per capita and converted using GDP deflator and dividing by population).
Population	Handbook of key Economic indicators.
Exchange Rate	Handbook of key Economic indicators.
US CPI	World development indicators.
GDP Deflator	World development indicators.
Dummy for natural gas	Created in Excel using data from World development indicators.
Dummy for the exchange rate	Created in Excel using the data from the handbook of key economic indicators.

Source: Author's Compilation

Methodology

1. Unit root tests: ADF, PP, KPSS for stationarity.
2. Obtain the optimal lag length to be used for the model moving forward. Lag lengths were compared using the lag length criteria; AIC, SIC, FPE, and BIC to determine the lowest value hence the optimal length.
3. Cointegration using the (ARDL) Bounds test model. The ARDL model was chosen since it allowed for the testing of cointegration using a combination of I(0) and I(1) variables.

Methodology

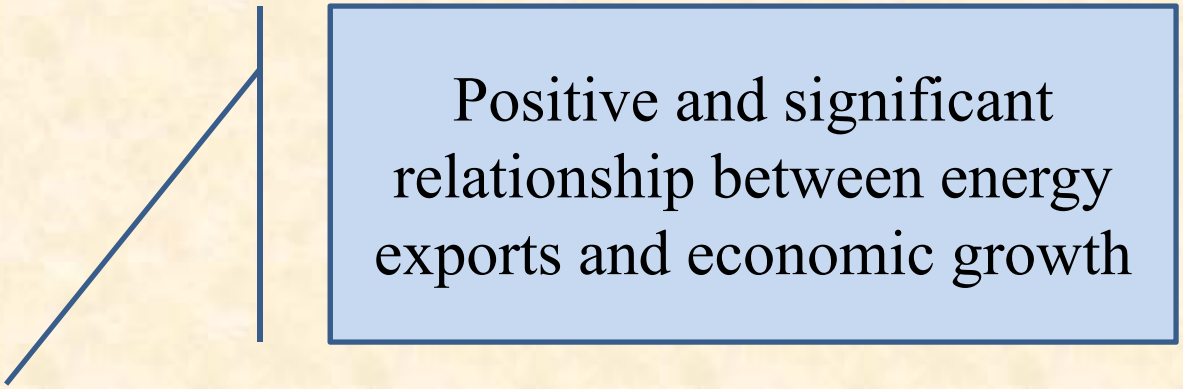
The equation utilised to capture both the short run and long run relationship:

$$\Delta \mathbf{rgdpc}_t = \mathbf{b}_0 + \underline{\mathbf{b}_1 \mathbf{rgdpc}}_{t-1} + \underline{\mathbf{b}_2 \mathbf{rex}}_{t-1} + \underline{\mathbf{b}_3 \mathbf{rmex}}_{t-1} + {}^{m-1}\sum_{i=1} \boldsymbol{\theta}_{1i} \Delta \mathbf{rgdpc}_{t-i} + {}^{m-1}\sum_{i=0} \boldsymbol{\theta}_{2i} \Delta \mathbf{rex}_{t-i} + {}^{m-1}\sum_{i=0} \boldsymbol{\theta}_{3i} \Delta \mathbf{rmex}_{t-i} \mathbf{v}_t$$

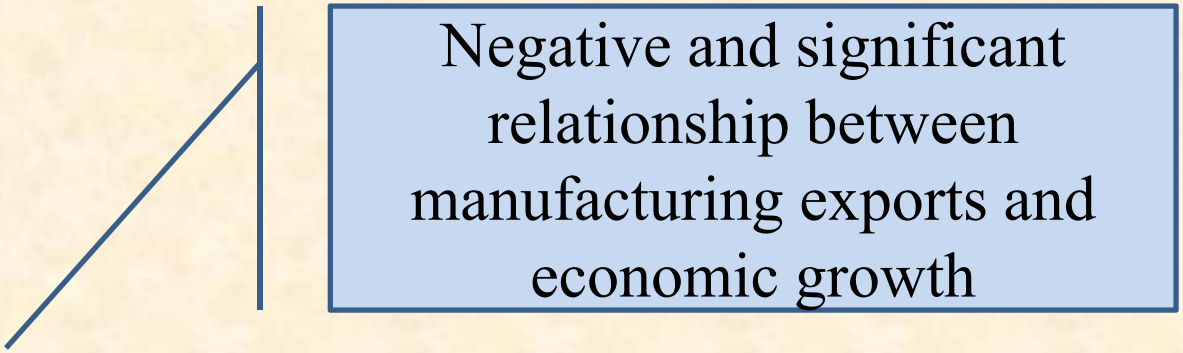
4. The Toda and Yamamoto approach to examine the direction of causality among the variables. This test allows for both unidirectional and bidirectional causality between variables.

Results

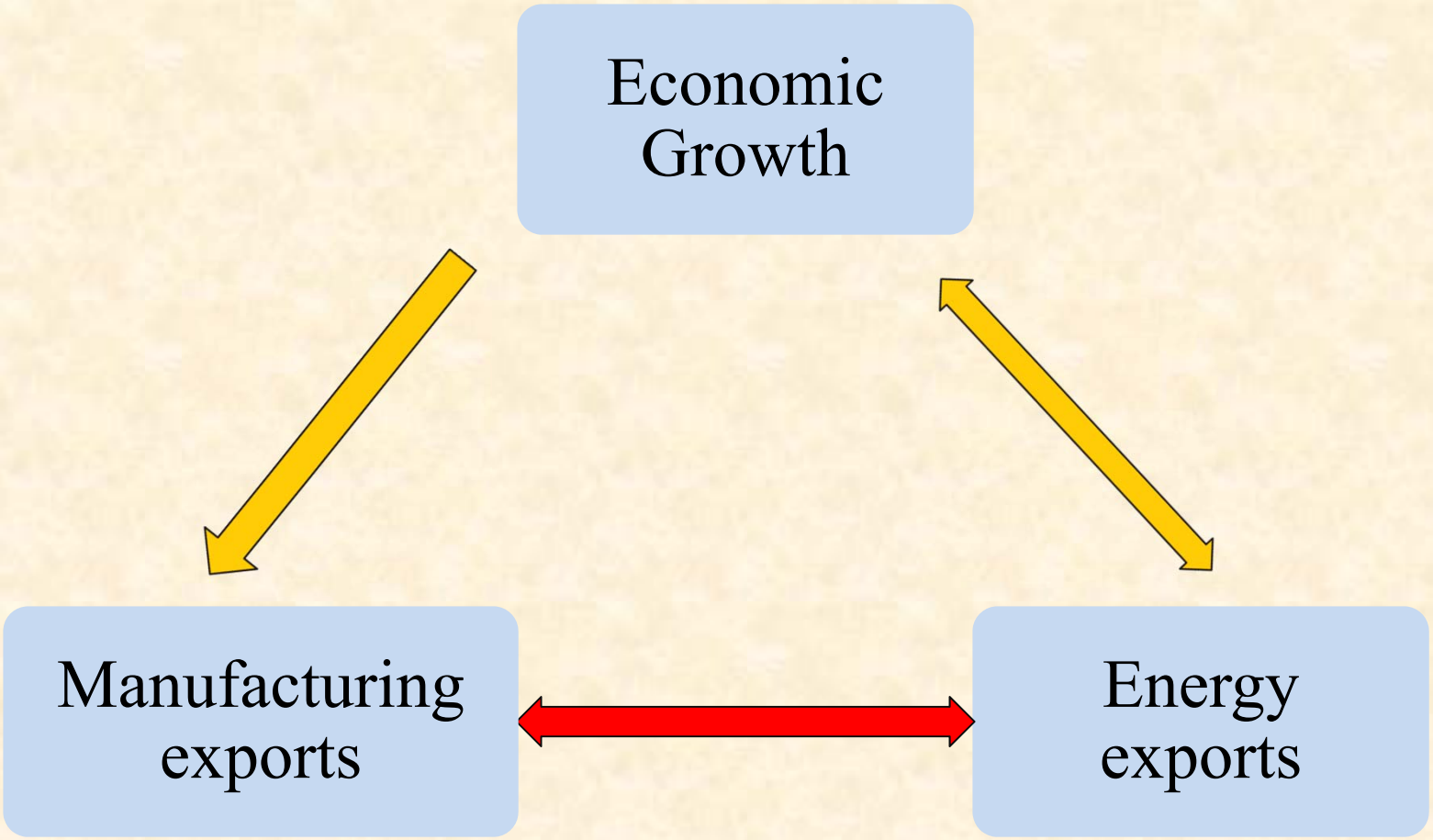
Relationship between energy exports and economic growth.



Relationship between manufacturing exports and economic growth.



Results: TY Causality test.



Recommendations

- Development of manufacturing export processing zone.(Le Yin Zhang, 2003).
- The continued development of the human capital of the country. (Sinanan and Hosein,2010).
- The establishment of more banks geared to providing loans to the manufacturing sector alone at low interest rates. (Simeon 2013).
- Duty free imports of all capital goods and raw materials. (World Bank, 1992).

Recommendations

- Offer a minimum wage to workers in the manufacturing sector. This wage should be indexed against the cost of living. (Hosein, 2008).

- The government may wish to offer a select block of its national scholarships to students wishing to pursue manufacturing related courses.(Hosein, 2008).

- The government may also wish to promote greater training and retraining programs for the manufacturing sector.(Hosein, 2008).

Conclusion

- Energy exports lead to economic growth.
- A contraction in the manufacturing sector due to:

Dutch Disease	**Diversification**
A boom in the energy (booming tradable) sector leads to a contraction in the manufacturing (non-booming tradable) sector. For the Trinidad and Tobago economy, a boom in the country's energy sector(oil and natural gas) led to a fall in the output, GDP, exports and employment in the manufacturing sector.	Countries tend to diversify their export basket until the point where one sector has reached the threshold GDP sufficient to sustain the economy. It is at this point that economies then focus on that one sector hence specializing it in. For the Trinidad and Tobago economy, this was the case where the economy specialized in the energy sector since the GDP was sufficient to sustain the economy. Developing countries tend to reach that threshold GDP much faster.

Appendix 1

Cointegration

B. Bounds test		
Model	Lags	F-statistic
F_{rgdpc} (rgdpc|rex, rmex)	[4,4,4]	4.798**
Narayan (2005) critical values	Lower bounds, I(0)	Upper bounds, I(1)
1%	3.892	5.173
5%	2.85	3.905
10%	2.402	3.345
C. Diagnostic tests		
Test	Statistic	p-value
JB (χ^2_{NORMAL})	2.564	2.774
BG (χ^2_{SERIAL}) [1]	0.419	0.527

Notes: *** indicates significance at the 1% level. We select the lag orders the ARDL equation using Akaike's information criterion (AIC). The critical values for the bounds test are taken from Narayan (2005) for n = 45 and the case of an unrestricted constant.

Appendix 2

A. Long Run. Dependent variable: $rdpc_t$		
Variables	Coefficient	p-value
rex	0.288***	0.0001
rmex	-0.211***	0.0001
Speed of adjustment		
ECT_{t-1}	-0.721***	0.0000
B. Short Run. Dependent variable: $\Delta rgdpc_t$ [4, 2,3, 0,1]		
Variables	Coefficient	p-value
Δrex_{t-I}	-0.735***	0.0000
$\Delta rmex_{t-i}$	0.455	0.1511
C. Diagnostic Tests		
Test	Statistic	p-value
JB (χ^2_{NORMAL})	0.594	0.101
BG (χ^2_{SERIAL}) [1]	0.044	0.836
ARCH (χ^2_{ARCH}) [1]	0.381	0.541
RESET (F_{RESET}) [1]	0.255	0.618

Notes: *** and ** indicates significance at the 1% and 5% levels, respectively. The short-run coefficients are summations while their corresponding p-values refer to the Wald test for joint coefficient significance.

Appendix 3

TY Causality

Null hypothesis	Chi square	p-value
H_0:Δrex−/−>Δrgdpc	53.44***	0.0000
H_0: Δrmex−/−>Δrex	69.10 ***	0.0000
H_0: Δrgdpc−/−>Δrex	74.18***	0.0000
H_0:Δrgdpc−/−>Δrmex	50.84***	0.0000
H_0: Δrex−/−>Δrmex	66.23***	0.0000

Note: ***, ** and * denote 1%, 5% and 10% level of significance respectively.