
**Papua New Guinea Global Trade Potential:
Evidence from the Gravity Model Analysis.
(*Work in Progress*)**

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Background and Introduction

- ▶ Papua New Guinea (PNG) is the largest country and economy in the Pacific, representing 80% of the Pacific's economy and population.
- ▶ PNG's economy is expected to grow by 4.0 per cent in 2023, with non-resources and resources growth at 4.6 per cent and 2.0 per cent respectively.
- ▶ With the expansion of their mineral and energy exports from the last decade, they are expected to experience significant growth in total export values in coming years.
- ▶ There is a long historical background on the theories supporting the connections between trade and economic growth. (Romer, 1986; Lucas, 1988; Solow, 1994) all supported the theory that openness to trade propelled economic growth.
- ▶ The question that we attempt to answer is whether PNG can take advantage of their trade potential as they enter into post-COVID with a promising mineral and energy sector. Using an augmented Gravity Model with OLS we attempt to investigate PNG's trade potential between 13 countries using cross section data.

Papua New Guinea Trade Overview (WTO 2021)

- ▶ PNG is a low-income country (2021) (USD):
 - GDP – 26,937
 - Per Capita GDP - 2,898
 - CA Balance (% of GDP) – 22.0%
 - Trade (% of GDP) – 28.2%
- ▶ It is the largest country by geography, population and GDP in the Pacific with an estimated population of 10.1m in 2022. According to Lowly Institute, the population estimates varies between 9 to 12 million.
- ▶ **Trade:**
 - In 2021, PNG registered a trade-to-GDP ratio of 54.5%, and merchandise trade accounted for 92.9% of Papua New Guinea's total trade. (merchandise exports grew by 5.5% from 2017-2021)
 - The services trade share of total trade by Papua New Guinea amounted to 7.1% in 2021 (services exports contracted by 3.7%, following a year of 68.1% decline in 2020).

Papua New Guinea Trade Overview (WTO 2021)

	2021	2010-2021	2020	2021
Million USD	Value	(Annual % change)		
Merchandise Exports f.ob	10,433	6	-19	12
Merchandise Imports f.ob	3,024	-1	-19	-8
Commercial Service Exports	98	-9	-68	-4
Commercial Service Imports	935	-9	-15	-32

Papua New Guinea Trade Overview (WTO 2021)

Top Exported Products	Value (USD)	% of Total Exports
Mineral fuels including oil	5.9 b	50
Gems, precious metals	\$1.8 b	14.9
Ores, slag, ash	\$1.1 b	9.2
Animal/vegetable fats, oils, waxes	\$955.3 m	8.0
Nickel	\$665.5 m	5.6
Wood	\$627.4 m	5.3
Meat/seafood preparations	\$246.1 m	2.1
Coffee, tea, spices	\$206.2 m	1.7
Fish	\$165.1 m	1.4
Cocoa	\$93.8 m	0.8

Papua New Guinea Trade Balances (ADB 2021)

	2015	2016	2017	2018	2019	2020	2021
Papua New Guinea	5,876	5,861	6,408	7,032	7,904	6,701	8,866
The Pacific	3,600	3,620	4,059	4,325	5,305	4,480	6,489
Southeast Asia	135,668	133,110	138,299	110,844	123,462	114,862	113,116
Developing Asia	711,968	631,437	576,948	443,011	539,086	488,739	508,892
Fiji	-912	-996	-1,093	-1,320	-1,122	-967	-920

Papua New Guinea Trade Overview

▶ Major Trade Partners (2021):

- China - 25% of its exports and 24.7% of its imports.
- Japan - 25.4% of exports and 4.3% of imports by value were traded with.
- Australia;
- Singapore;
- Taiwan, China;
- The Republic of Korea;
- The Netherlands;
- Malaysia;
- India; and
- Indonesia.

What are they doing?

- ▶ Medium Term Development Plan III (2018-2022) - \$7.8b investment plan.
- ▶ Trade policy review.
- ▶ Refocusing on the fiscal consolidation.
- ▶ Legal and Regulatory Framework.
- ▶ Investment and Competition Policy.
- ▶ Good Governance.
- ▶ Trade Related Infrastructure.

Survey of Literature.

- ▶ There is a wide range of applied research where the Gravity Model is used to examine the bilateral trade patterns and trade relationships.
 - Bergstrand 1985 and 1989,
 - Oguledo and Macphee 1994
 - Frankel 1997
 - Karemera *et al.* 1999
 - Mathur 1999, and
 - Sharma and Chua 2000,
- ▶ The Gravity Model were all used by the above authors to determine the aggregate bilateral trade and the product level trade.
- ▶ Other areas such as trade costs, non-tariffs barriers, regional integration etc were covered by these authors.

Survey of Literature.

▶ Other trade related areas were covered by these authors:

- **Trade Costs:**

- (Rose, 2000),
- (Harrigan, 2001;
- Wilson *et al.*, 2005;
- Djankov *et al.*, 2006;
- Baier and Bergstrand, 2007;
- Jacks *et al.*, 2008),

- **International Borders:**

- (Anderson and Wincoop, 2003;
- Gorodnichenko and Tesar, 2009)

- **For methodological issues:**

- (Egger, 2002;
- Baldwin and Taglioni, 2006;
- Silva and Tenreyro, 2006;
- Helpman *et al.*, 2008).

Survey of Literature.

- ▶ While the gravity model has been increasingly used in international trade to estimate trade potential; very little work has been done to determine factors of PNG global trade potential.
- ▶ This project could be the first empirical initiative to determine and provide such analysis.

Theoretical Justification.

- ▶ The gravity equation has long been an institutionalized topic of research in economics and there has been a great deal of studies on the gravity model itself.
- ▶ The properties of econometric estimations and methodologies make the gravity theory an interesting topic of research and inquiry.
- ▶ The developments of the gravity model can be discussed systematically in several developmental phases:
 - 1885-1962: The Historical Roots of The Gravity Equation.
 - Linder (1961) and Samuelson (1948, 1949)
 - 1962-1966: The Beginning of the Traditional Gravity Model
 - Pöyhönen (1963); Pulliainen (1963) and Linnemann (1966)
 - 1966-2003: The Theoretical Foundations of the Gravity Model
 - Bergstrand, (1990a) and Bergstrand, 1985, 1989)
 - 2003- 2017: The Revival of the Gravity Model.
 - Olivero and Yotov, (2012) and Anderson and Yotov, (2017)

The Model.

- ▶ For estimation of the gravity model, we have followed Frankel (1997), Sharma and Chua (2000) and Batra (2006).
- ▶ With adjustment to suit our needs the model is “augmented” in the sense that several conditioning variables that may affect trade have been included.
- ▶ Thus the gravity model of trade in this study is:

$$\log(\text{Trade}_{ij}) = \alpha_0 + \alpha_1 \log(\text{GDP}_i * \text{GDP}_j) + \alpha_2 \log(\text{PCGDP}_i * \text{PCGDP}_j) + \alpha_3 \left(\frac{\text{TR}}{\text{GDP}_j} \right) + \alpha_4 \log(\text{Distance}_{ij}) + \alpha_5 (\text{RTA}) + \alpha_6 (\text{Com. Lang}) + U_{ij}$$

- ▶ An alternative to the above will take care of the per capita GDP differential as a variable instead of per capita GDP. (Will be discussed in the final paper).

The Model.

- ▶ $Trade_{ij}$ = Value of total trade between PNG (country i) and country j,
- ▶ $(GDP_i) GDP_j$ = Gross Domestic Product of country i (j),
- ▶ $PCGDP_i (PCGDP_j)$ = Per capita GDP of Country i (j)
- ▶ $\left(\frac{TR}{GDP_j}\right)$ = Trade- GDP ratio of country j,
- ▶ $Distance_{ij}$ = Distance between country i and country j
- ▶ RTA = Regional trading agreement (dummy variable),
- ▶ $Com. Lang$ = Common language (dummy variable),
- ▶ U_{ij} = Error term
- ▶ α_0 = Parameters
- ▶ We expect to have positive signs for $\alpha_1, \alpha_2, \alpha_3, \alpha_5$ and α_6
- ▶ α_4 will have negative sign

Data, Methodology and Model Configuration.

- ▶ We will follow two step estimation strategies to explore PNG's global trade potential.
- ▶ In the first stage we have to estimate the initial model and the Per Capita GDP Differential using OLS estimation technique with cross section data for the year 2000 and 2019 covering 14 countries including PNG.
- ▶ The dependent variable is the value of total bilateral trade (export value plus import value will be in US dollar million) of country i (PNG) and country j (PNG's trading partner).
- ▶ The coefficients thus obtained in the first stage will then be used in the second stage to calculate the predicted bilateral trade of PNG with its 13 trading partners around the globe. These predicted trade values will then be analyzed and compared with the actual trade values to explore PNG's global trade potential.
- ▶ Econometric issues such Endogeneity, Multicollinearity, Heteroscedasticity will be taken care of as per econometrical process.

What to Expect?

- ▶ The coefficient of GDP could be positive and highly significant.
- ▶ The two chosen dummy variables (Language and RTA) could be statistically significant.
- ▶ Known facts such as transaction costs and non tariff barriers could be prohibiting growth of PNG growth.
- ▶ Diversification of trade/export to new industries away from LNG and minerals could enhance PNG's trade potential to the global world.
- ▶ It would be interesting to include corruption and other soft issues to see how this could change the trade dynamics in PNG.

Thank You for Listening