

Investigating Trade Costs and Trade flows of Melanesian Countries Using the Heterogeneous Trade Cost Effects Model

Amit Prakash, Lecturer in Economics, The University of Fiji

Abstract

This paper adopts variable trade cost elasticities via flexible gravity equation for Melanesian country pairs. The guiding framework is thin and thick bilateral trade relationship. Thus, the framework is applied to the popular trade cost variables such as regional trade agreement and world trade organization membership. It is anticipated that there may be mixed trade relationship (smaller and larger trade share) among Melanesian economies.

1.0 Introduction

In light of globalization and advanced logistics, the proximity issue of trading has been undermined. It has been argued that the trading partners need not worry about proximity issue due to advancement in transportation. However, Anderson and Wincoop (2004) argued otherwise that the ignorance of trading distance has been exaggerated and trade costs are larger even for highly integrated economies and higher than trade barrier costs. They specified that trade costs matter on the basis; trade costs are large; trade costs are linked to economic policies and trade costs have large welfare implications. Furthermore, Anderson and Wincoop (2004) noted that indirect policy instruments related to trading such as policies on transport, infrastructure, investment, law enforcement and related property rights matter more than the direct policy instruments (tariff and trade barriers) in assessing trade costs.

Trade costs broadly defined, include all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself: transportation costs (both freight costs and time costs), policy barriers (tariffs and nontariff barriers), information costs, contract, enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail) (Anderson and Wincoop, 2004). Novy (2009) recognized that the advantage of using trade cost measure was that it captures a wide range of trade cost components (including components difficult to measure such as language barrier, information costs, bureaucratic red tape, etc).

However, Anderson and Wincoop (2004) acknowledged that measuring trade costs is the major challenge for researchers given that the direct measures of trade costs are remarkably sparse and inaccurate. Furthermore, few direct measures are only available from few components, for instance transportation and insurance costs via the ratio of cost insurance freight and free on-board trade values (Harrigan, 1993; Hummels, 2001a, 2007). In addition, even for direct measures components data coverage is very limited and it is difficult to gather disaggregated trade cost data at the industry or product level. Anderson and Wincoop (2004) retaliated that measuring and inferring the magnitude of trade costs is difficulty however, these findings are crucial for economical usefulness. In addition, economists know little about the magnitude, evolution and determinants of the obstacles to international trade (Jack, Meissner and Novy, 2008).

UNESCAP (2015) disclosed that higher trade costs hinder the ability of countries – especially Landlocked Developing Countries and Small Island Developing States, to fully exploit market aspects prospects presented by multilateral trading system. Trading opportunities are lost to competitors with lower trade costs and the comparative advantage is diluted by rendering their export uncompetitive. Pacific Island Countries (PICs) trade pattern and performance reveal that they have largely followed their comparative advantage which is intrinsically linked to their sizes and remoteness and are highly concentrated in the narrow economic base whereby nearly two-third of PICs exports are primary products (agriculture and natural resources) (Chen, *et al.*, 2014). Furthermore, remoteness inflates the cost disadvantage by making transportation expenses, particularly with fragmentation of production process that require frequent and timely trade in of intermediate goods. World Trade Organization (2015) acknowledged that small island developing states remain relatively marginalized from the global trading as a result of high trade costs.

The Asian Development Bank report (2008) highlights that a trade agreement between PICs and developed countries would be welfare enhancing as the risks of trade diversion outweighing trade creation effects are much less likely. The report goes on to state that the future of Pacific trade lies in the niche markets whether in tourism, ICT -related services, labor services, manufactured goods, or even agriculture. Trading integration among Asia and the Pacific has continued to deepen in areas including new technology and digital connectivity, environmental cooperation, trade

linkages, investment, and value chain participation (ADB, 2022). Chen, *et al.* (2014) highly recommended for trade integration among PICs to create economic prosperity.

The research problem evolves on the baseline that high trade costs effectively isolate countries from the world market and has implication on both the demand and supply side. On the demand side, consumers are not able to take advantage of competitively prices goods from abroad while firms cannot access high quality foreign inputs or exports to overseas market (WTO, 2015). Pacific Island Countries economic size and remoteness erodes comparative advantage and disadvantage trade flows. Trade costs may not explain why some countries are low income but, in combination with other factors they do explain why some countries are struggling to grow and exploit their comparative advantages (WTO, 2015). This research aims to investigate heterogeneous trade costs effect on trade outcomes among Melanesian Countries? The Melanesian countries are Fiji Islands, Papua New Guinea, Solomon Islands and Vanuatu.

2.0 Literature Review

The Pacific Island Countries are less competitive in manufacturing and services sectors (tradeable services involving back office processing) due to limited infrastructure and need for human capital development. Winters and Martins (2004) added that PICs have absolute disadvantage across industries due the economic size. Gani (2010) used gravity model to estimate trade flow using time series cross country data for period of 1981-2005. The findings revealed that distance is a friction to PICs trade with USA. Chen, *et al.* (2014) in the gravity model specification on Pacific Island Countries used dummy variables for same preferential trade agreements and colonial ties in addition to economic size and distance. The regression findings identified remoteness (distance) as a barrier while preferential trade agreements and colonial ties supported trade flows in the Pacific. Though trade barriers have decline substantially in the Pacific, high trade costs due to poor logistics, bureaucratic regulation and weak instructions have remained constraint to potential benefit from trade agreements (Maiti and Kumar, 2016).

The standard gravity equation framework yields single coefficients to assess the trade effects of possible trade costs proxies – such as bilateral distance, dummy variables for regional trade agreements, World Trade Organization membership, etc. Thus, characterized by constant trade

cost elasticity whereby trade effects are homogeneous across all country pairs. Most of the prior research have exploited trade flow effects via gravity model. Anderson and Wincoop (2003) provided a theoretical refinement of the traditional gravity model (henceforth, “theory-based” gravity model) to include multilateral trade resistance variables. The findings favor rich relationship between domestic and international trade costs, market structure and political economy. Nevertheless, they recommended; estimates based on the structural gravity models can be improved, possible extension of existing gravity models, better treatment of aggregation and endogeneity problems and better estimates of substitution elasticities are all likely to improve our understanding of trade costs.

On the other hand, Jack, Meissner and Novy (2008) derive trade costs from gravity model. They use log-linear versions of typical gravity by substituting an arbitrary trade costs function. The determinants in the log-linear model of trade costs include logarithm of distance between two countries, the log product of each country pair’s ratio of customs revenue to total imports, bilateral nominal exchange rate volatility, an indicator variable for whether the two countries had a fixed exchange rate with one another and an indicator for whether the two countries were in the British Empire. Jack, Meissner and Novy (2010) derive a micro-founded measure of aggregate bilateral trade costs that is consistent with leading theories of international trade. They built on Head and Ries (2001) ideology to obtain measure by backing out the trade costs wedge that is implied by the gravity equation. The wedge captures the difference between observed trade flows and hypothetical benchmark of frictionless trade therefore inferring trade costs from trade flows. The gravity model of international trade is very much applicable now as it was in the past and the model has been theoretically and empirically valid (Jack, Meissner and Novy, 2010).

3.0 Methodology

The research methodology is guided by Chen and Novy (2021). The key variable of interest is the bilateral import shares that is bilateral import share per good of the exporting country. To test whether the trade cost effects are heterogeneous *across country pairs, and also within country pairs by direction of trade*, two methodological approaches have been utilized in the literature (1) modification of the standard gravity specification similar from the literature (flexible gravity model) and (2) estimating the translog gravity equation using regression. However, regressing

explanatory variable of trade costs with import share will expose simultaneity biasness. The issue is addressed by letting trade costs effects vary across predicted import share. Firstly, predicted share is generated by regressing import shares on time-invariant geography related variable such as distance. Secondly, trade costs effects are assessed across predicted import shares. To deal with heteroskedasticity and to include zero import shares in the sample, empirical technique used by Chen and Novy (2021), the Poisson Pseudo Maximum Likelihood (PPML) estimator, is used for this study.

Santos, Silva and Tenreyro (2006) highlighted that there were two issues with using OLS estimates of the log-linearized gravity model. Firstly, the logarithm automatically drops observations for which the reported trade value is zero, thus this is a significant issue empirically, because zeros are very common. Secondly, OLS gives inconsistent parameter estimates if the disturbance term in standard gravity model is heteroskedastic, and its variance depends on one or more of the regressor. The reason for this effect is that trade data empirically exhibit more variation (standard variation over mean) for smaller trade values resulting in a higher variance for error term

The Poisson quasi-maximum likelihood estimator is proposed by Santos, Silva and Tenreyro (2006) as a pragmatic solution to both the problems. The Poisson regression model is defined in general terms by the discrete distribution:

$$\Pr(X_{ij} = k | \widehat{X}_{ij}) = (e^{-\widehat{X}_{ij}} (e^{\widehat{X}_{ij}}))^k / k!, k = 0, 1, 2, \dots, n \quad (1)$$

The expected value and variance are the modeled exports:

$$E [X_{ij}] = \widehat{X}_{ij}; Var[X_{ij}] = \widehat{X}_{ij} \quad (2)$$

The log likelihood associated with the distribution is

$$Log L = \sum_{ij} Log \Pr(X_{ij} | \widehat{X}_{ij}) = \sum_{ij} \{-\widehat{X}_{ij} + X_{ij} * Log \widehat{X}_{ij} - Log X_{ij}!\} \quad (3)$$

Zero observations can be directly incorporated in the Poisson Maximum Likelihood (ML) regression. It also naturally accounts for the observed dispersion (according to (2) the coefficient of the variation goes as $1/\sqrt{\widehat{X}_{ij}}$). Heteroskedasticity can be handled with a robust covariance matrix and this approach gives consistent estimates regardless of how data are in fact distributed, that is they do not need to be Poisson at all, nor even count data. Recent simulation evidence shows that Poisson performs well compared with other candidate estimators from the literature (Santos Silva and Tenreyro, 2011).

The translog gravity equation:

$$\frac{x_{ij}/y_i}{n_i} = -\theta \ln(t_{ij}) + D_i + \theta \ln(T_j) \quad (4)$$

Where x_{ij} is the bilateral trade flow between exporting country i and importing country j , y_i is the importer's income and n_i denotes the number of goods of country i . The dependent variable is the bilateral import share x_{ij}/y_j per good (n_i) of the exporting country. $\theta > 0$ is a translog preference parameter. D_i and T_j denote exporter and importer specific terms given by:

$$D_i = \frac{y_i/y^w}{n_i} + \theta \sum \frac{y_s}{y^w} \ln\left(\frac{t_{is}}{T_s}\right)$$

$$\ln(T_j) = \sum \frac{n_s}{N} \ln(t_{sj})$$

Where y^w denotes world income, S is the number of countries and N is the number of products in the world with $N \geq S$. T_j is akin to a multilateral resistance term since it represents a weighted average of bilateral trade costs.

Furthermore, in the translog gravity model, the variable elasticity is as follows:

$$n_{ij} = - \frac{\theta}{\frac{(x_{ij}/y_i)}{n_i}} \quad (5)$$

The trade costs elasticity is the preference parameter θ divided by the import share per good. Therefore, the larger a given import share the smaller the trade cost elasticity in absolute magnitude. The ij subscript indicate that the elasticity varies across country pair.

The aim is to investigate whether the trade effects of independent variables as captured by the parameters is heterogeneous across bilateral import share per good as predicted by the theoretical framework. If we allow the parameters to vary with import shares, there will be simultaneity bias problem as the independent variable would vary with the values taken by the dependent variable (Novy, 2013).

To address that, the standard gravity model specification is modified by letting the independent variables vary across predicted import shares. For that there is two steps: (1) regressing import shares per good on geography-related variable (distance) to generate predicted shares.

$$\left(\frac{x_{ij,t}/y_{j,t}}{n_{i,t}}\right) = \exp(\delta K_{ij} + D_{i,t} + D_{j,t}) + v_{i,j,t}$$

Where K_{ij} includes geography-related variables that is logarithmic bilateral distance. The time varying pair variables not included as they are not geography related and therefore more likely endogenous. The predicted shares is denoted by $\left(\frac{\widehat{x_{ij,t}/y_{jt}}}{n_{i,t}}\right)$.

In the second step, the independent variable is interacted with the logarithmic predicted import shares with parameter as the key coefficient of interest. The heterogeneous trade cost effect is estimated as:

$$\left(\frac{x_{ij,t}/y_{j,t}}{n_{i,t}}\right) = \exp(\beta_1 RTA_{ij,t} + \beta_2 RTA_{ij,t} \times \ln\left(\frac{\widehat{x_{ij,t}/y_{jt}}}{n_{i,t}}\right) + \beta_3 WTO\ membership_{ij,t} + \beta_4 WTO\ membership_{ij,t} \times \ln\left(\frac{\widehat{x_{ij,t}/y_{jt}}}{n_{i,t}}\right) + D_{i,t} + D_{j,t} + D_{ij} \epsilon_{ij,t} \quad (6)$$

Since this specification includes exporter-year, importer year and country pair fixed effect, the main effect of the logarithmic predicted import share drops out of the regression. The trade effect of the independent variables is given by $\varepsilon_1 + \varepsilon_2 \ln\left(\frac{\overline{x_{i,j,t}}/\overline{y_{j,t}}}{n_{i,t}}\right)$ and therefore depends on two components that is change in trade costs due to the independent variable and the log predicted import share.

The dependent variable is predicted bilateral import share and the independent variables are; distance, regional trade agreement, WTO membership, shared language and colonial ties. The time-varying exporter and importer fixed effect $D_{i,t}$ and $D_{j,t}$ to control for multilateral trade resistance and other exporter and importer specific terms such as income. The country fixed effect D_{ij} is used to absorb all time-invariant bilateral trade frictions in each cross section.

The theoretical framework of flexible trade cost effects extends from the translog gravity equation that predicts variable trade cost elasticities (Novy, 2013). In the framework, thin bilateral trade relationship (characterized by small bilateral import share) are more sensitive to trade cost changes than thick trade relationship (characterized by large bilateral import shares). The intuition is that small import shares are high up on the demand curve where substitutes are available and very sensitive to trade cost changes. On the other hand, large import shares are further down on the demand curve (heavy reliance on trading partner) and very hesitant to trade cost changes. As a result, small import shares have a larger trade cost elasticity in absolute magnitude. The prediction is that a given change in trade cost generates heterogeneous effects on trade flows.

The rationale for heterogeneous trade cost effect is that bilateral import share is different within country pair. The expectation is large trade effects for country pairs associated with smaller import shares while smaller trade effects for country pairs with larger import shares. This implies a heterogeneous effect even within country pairs since bilateral import shares differ depending on the direction of trade. Gravity model fits the data very well. The idea of adopting flexible gravity framework is not necessarily to improve overall fit but to introduce variable trade cost elasticities. This study will use panel data on bilateral trade flows among Melanesian countries. The panel data will be across Melanesian country pairs from 2000 – 2018.

4.0 Discussion

Chen and Novy (2021) found that coefficients on the RTA and WTO interaction terms are negative. The trade effects of RTAs and the WTO are thus heterogeneous and smaller for country pairs with larger import shares. Thus, joining an RTA is associated with 117% more bilateral trade. On the other hand, joining WTO leads to 34% more bilateral trade. They acknowledged that the trade effects of trade agreements and WTO membership are heterogeneous. Chen and Novy (2021) provided strong evidence that the aggregate trade cost elasticity is variable and heterogeneous across country pairs. One potential implication is that the gains from trade liberalization could be mismeasured if research assume a constant trade elasticity (Arkolakis *et al.*, 2012; Melitz and Redding, 2015; Bas *et al.*, 2017 as cited in Chen and Novy, 2021).

Aligning the above with possible similar results for Melanesian countries provides a stronger platform for regional integration. The Melanesian Spearhead Group had engaged in revising the MSG Trade Agreement 2005 and proposed for Melanesian Free Trade Agreement (MFTA). The MFTA drives on promoting regional integration of Economies in MSG. The MFTA broadens regional market opportunities to Trade in Goods, Trade in Services and Labor Mobility. Solomon Islands and Fiji Islands have signed the agreement and are taking steps to ratify the agreement.

All Melanesian countries are members to the World Trade Organization. Vanuatu is the most recent member joining in 2012.

5.0 Conclusion and Policy Implications

Heterogeneous trade cost elasticity is the latest innovation in understanding trade costs effects. The understanding of heterogeneous trade costs will provide input into policy making towards reducing trade costs. Furthermore, the findings from this study will also be useful in understanding the heterogeneous effects of regional trade agreements (PACER Plus, EU trade agreements) and WTO membership (since joining). The rationale for heterogeneous trade cost is that the import share is different within country pairs and thus, we cannot assume the trade effect is homogeneous.

As reflected in the framework (thin and thick bilateral trade relationship), it may be a probable that few Melanesian countries may have smaller import shares (potential to import from outside MSG group countries) while other Melanesian countries may have larger import share (relying heavily on MSG group countries).

The caveat in the research will be accessing reliable and accurate trade flow data. Also, the consistency in time series data for all Melanesian countries. In defining the dependent variable, bilateral import share, a number of key variables is needed and this will be a limitation if not available for all MSG countries.

6.0 Reference

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