



Kasetsart Journal of Social Sciences

journal homepage: <http://kjss.kasetsart.org>



West Kalimantan-Sarawak border trade: Gravity model

Nurul Bariyah^a, Evan Lau^{b,*}

^a Department of Economics and Development Study, Faculty of Economics and Business, Universitas Tanjungpura, Pontianak 78124, Indonesia

^b Centre for Business, Economics and Finance Forecasting (BEFfore), Faculty of Economics and Business, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

Article Info

Article history:

Received 18 January 2017

Revised 2 May 2017

Accepted 8 May 2017

Available online 31 October 2019

Keywords:

border trade,
gravity model,
Sarawak,
West Kalimantan

Abstract

This study provides a comprehensive analysis of the border economy by focusing on the border trade conducted through the regional port of entry at Entikong (West Kalimantan, Indonesia)-Tebedu (Sarawak, Malaysia), by employing time-series secondary monthly data from January 1998 to September 2006. The vector error correction model exercise for the model indicated that the export equation was the only one in the system in which the error correction term (ECT) is statistically significant. This suggests that export solely bears the brunt of short-run adjustments in bringing about the long-run equilibrium in West Kalimantan, where it acts as the initial receptor of any exogenous shocks that disturb the equilibrium system. The ECT coefficient of -0.839 represents the speed of adjustment of export towards equilibrium. The findings from the Gravity Model confirmed that three out of five independent variables are significantly related to cross-border trade. Of these three variables, economic size has a positive effect while income per capita difference and the ASEAN Free Trade Area have negative long run effects on export. The research suggests that West Kalimantan should focus its efforts on pursuing higher economic growth to lower the income per capita difference with Sarawak. Economic cooperation with Sarawak regarding complementarities should be considered. Enhancement of border economic cooperation between West Kalimantan-Sarawak can be used as leverage for extending the cooperation into wider areas across Borneo Island.

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Introduction

There are four provinces in Indonesia that share a border with other countries: easternmost Papua with Papua New Guinea, Nusa Tenggara Timur with Timor Leste, North Kalimantan with Sabah (Malaysia), and West Kalimantan with Sarawak (Malaysia). Each of these four provinces are located outside Java Island, where the capital city of Jakarta is located (In Indonesia, Java Island is considered more developed compared to outside Java Island). Among these four provinces, West Kalimantan is the only province connected to Sarawak (Malaysia) with relatively good road conditions. The other

three provinces have difficulty maintaining relationships across the border due to geopolitical or security issues as well as barriers due to natural conditions or infrastructure.

From generation to generation, people living along the shared border between West Kalimantan and Sarawak have enjoyed intensive relations in terms of trade and travel. Arman, Suryadi, Mardiansyah, and Bariyah (2001) found that people who take part in cross-border travel and trade via the main crossings are not limited to specific characteristics in terms of sex, age, ethnicity, religious affiliation, occupational status, marital status, family size, education, and residence. These relationships escalated during the Asian economic crisis in 1997 followed by the rupiah's depreciation.

Realizing that border regions across the globe are not homogenous, this study provides a comprehensive analysis of a specific aspect of border economy. The focus is on the empirical regularities of cross-border trade flows conducted

* Corresponding author.

E-mail address: lphevan@unimas.my, lphevan@gmail.com (E. Lau).

through the regional port of entry of Entikong (West Kalimantan, Indonesia)-Tebedu (Sarawak, Malaysia). These two border regions are strategically located across Borneo Island, the third largest island in the world. Supported by a long-established relationship operating under an economic integration scheme, this area offers an excellent opportunity to study the nature of border trade and how or in what condition it might affect or be affected by the economy of the border region.

The first part of the paper describes the West Kalimantan-Sarawak border conditions and relations, while the remainder of the paper is organized as follows: section two provides the theoretical model and relevant literature followed by section three, in which empirical results are presented. This section sets the stage for section four, which offers concluding remarks.

Theoretical Review and Model Specification

The pattern of bilateral trade flows between countries and regions can be analyzed using the Gravity Model. Inspired by Isaac Newton's law of gravity, economists have found an analogue to gravitational forces in the volumes of bilateral trade as part of the extant regional science and geography research (Chaney, 2013; Chen, Yang & Liu, 2008; De Benedictis & Taglioni, 2011; Kepaptsoglou, Karlaftis, & Tsamboulas, 2010; Marto-Sargento, 2007; Reinert & Rajan, 2008; Rivera-Batiz & Oliva, 2003). In its most basic form, the Gravity Model of international trade states that bilateral trade (export or import) between country i and country j is proportional to the countries' sizes as measured by income levels Y_i and Y_j and inversely related to the distance D_{ij} (as a proxy for transport and communication cost) between the trading partners. These relations then are summarized through the following Gravity Equation:

$$T_{ij} = A \frac{Y_i^{\alpha_1} Y_j^{\alpha_2}}{D_{ij}^{\alpha_3}}, i \neq j \quad (1)$$

where T_{ij} is bilateral trade between countries i and j , A is a constant proportionality, Y_i and Y_j are the income levels of countries i and j with weights α_1 and α_2 , respectively, D_{ij} is the distance between countries i and j , and α_3 is the distance decay parameter, measuring the flow sensibility to spatial separation.

The Gravity Model was first introduced independently by Tinbergen (1962) and Poyhonen (1963) and used mainly to analyze the trade flows between European countries. According to Tinbergen (1962), the income level is used in this model because the economic size of the exporting country will determine the quantity of goods it can produce, and the size of the importing country's market will determine the quantity of goods the exporting country can sell. The volume of goods traded depends on the cost of transportation, so geographic distance provides a good proxy. Other than geographic distance, economic distance is also considered to be one important variable in the Gravity Model. Economic distance is measured by the difference in income per capita of the country pair. The inclusion of economic distance allows the study to confirm the validity of the Heckscher-Ohlin (H-O) Theorem or Linder Hypothesis. Trade prediction based on the H-O Theorem is

thus: the larger the difference between countries' income per capita, the higher trade volume between them (see Hirsch & Hashai, 2000). As opposed to the H-O Theorem (Heckscher, 1919; Ohlin, 1933), Linder (1961) provides an alternative hypothesis that income similarity tends to induce trade.

Gravity Models are estimated in terms of natural logarithms. Following this form, the multiplying part of Equation 1 becomes addition while the dividing part becomes subtraction, which leads to the linear equation where the amount of bilateral trade largely depends on economic and geographical proximity variables as follows:

$$\log(T_{ij}) = A + \alpha_1 \log(Y_i) + \alpha_2 \log(Y_j) - \alpha_3 \log(D_{ij}) \quad (2)$$

Where T_{ij} is the endogenous variable, α_0 , α_1 , α_2 and α_3 are the coefficients to be estimated, Y_i , Y_j and D_{ij} are the explanatory variables, and D_{ij} is the error term. In general, α_1 and α_2 are expected to have positive signs ($\alpha_1, \alpha_2 > 0$), while α_3 is expected to have a negative sign ($\alpha_3 < 0$). Equation (2) can be used as the starting point for the following regression equation (3). Due to its log-linear structure, these coefficients are given in terms of elasticity or ratios of percentage changes, which provide measures of the responsiveness of trade flows to the trade potential explanatory variables.

$$\log(T_{ij}) = \alpha_0 + \alpha_1 \log(Y_i) + \alpha_2 \log(Y_j) + \alpha_3 \log(D_{ij}) + \varepsilon_{ij} \quad (3)$$

The Gravity Model adopted in this study can be considered an extended and modified version by implementing six variables: (1) exports, (2) products of real GDP, (3) income per capita differences, (4) fuel prices, (5) exchange rates, and (6) common membership of the ASEAN Free Trade Area (AFTA). The extension of the model is intended to address specific issues relevant to West Kalimantan-Sarawak border trade relation; such as the existence of economic integration, AFTA, and the exchange rate. Studies on the effects of preferential trade agreements (economic integrations) on trade flows have been carried out by a number of researchers, namely Sharma and Chua (2000), Cyrus (2002), and Tang (2003). The main idea is to introduce AFTA, since it is believed to be an important condition to enhance trade between ASEAN countries by providing lower barriers to trade, that is, lower tariff rates among members. Border trade between West Kalimantan and Sarawak are no exceptions regarding lower tariff rates, since the traded goods between West Kalimantan and Sarawak border pair range from SITC 0 to SITC 9, with substantial parts placed under product groups of the fast-track program. However, based on government regulations in Indonesia, since 2008, Entikong is no longer eligible as an import gate due to higher awareness against smuggling activity across Indonesia. The price variable enters the equation in the form of exchange rates as introduced by Brun, Carrere, Guillaumont and de Melo (2005) to address the issue that most border economies still conduct business transactions despite exchange rate fluctuations (see Fullerton, 2003).

Modification of the model takes the products of real GDP to measure the economic size of the border region, and the use of income per capita differences between West Kalimantan and Sarawak to test the validity of the Linder Hypothesis or the

Hecksher-Ohlin Theorem. Finally, the study uses fuel price as an alternative to geographic distance measure in order to capture the dynamic across time. Common perception dictates that a wave of globalization should lead to “the death of distance” or a decline in transport cost. Empirical studies, however, find that the estimated coefficient of distance is generally found to increase rather than decrease over time. Brun et al. (2005) addressed this distance puzzle in the Gravity Model of trade by using more appropriate estimation techniques and a more thorough treatment of transportation costs that includes indices of infrastructure, the price of oil, and composition of trade. With respect to the elasticity value of bilateral trade to distance, the finding confirmed that oil price accounts for 45 percent of the change, while infrastructure accounts for 40 percent of the change and trade composition accounts for the remaining 15 percent. Therefore, fuel price is used in this research as a proper representation of transport cost for trade.

Accordingly, equation (4) in this study takes the following natural log forms:

$$\log(X_{ij})_t = \alpha_0 + \alpha_1 \log(GDP_i GDP_j)_t + \alpha_2 \log(z)_t + \alpha_3 \log(d_{ij})_t + \alpha_4 \log(ER_{ij})_t + \alpha_5 (AFTA)_t + \varepsilon_{ijt} \quad (4)$$

where X_{ij} represents export values between West Kalimantan and Sarawak through the Entikong-Tebedu custom gate, $GDP_i GDP_j$ represents the products of GDP, that is, the value of GDP West Kalimantan times the value of GDP Sarawak, $Z = (GDPC_i - GDPC_j)$ where $GDPC_i$ is West Kalimantan's income per capita and $GDPC_j$ is Sarawak's income per capita, D_{ij} represents the distance variable approximated by the average fuel price, ER_{ij} represents the middle exchange rate between the Indonesian rupiah and the Malaysian ringgit (RP/RM), While $AFTA$, a dummy variable representing free trade area that took effect in 2003, takes the value of 1 after the trade agreement was effective and 0 before it took effect. Since ε_{ijt} represents an error term, consequently, α_0 , α_1 , α_2 , α_3 , α_4 , and α_5 are the coefficients to be estimated.

All explanatory variables (except the dummy variable of AFTA) and dependent variables are expressed in log forms, and their coefficient interpretation is one of constant elasticity. Thus, a percentage change in independent variables leads to a certain percentage change in the dependent variable X_{ij} . Coefficient α_1 is expected to have a positive sign ($\alpha_1 > 0$), since trade is positively correlated with economic size measured by GDP. The sign of coefficient α_2 is ambiguous ($\alpha_2 > 0$ will support the HO theorem while $\alpha_2 < 0$ will support the Linder Hypothesis), while coefficient α_3 is expected to have a negative sign ($\alpha_3 < 0$). The negative sign of α_3 proves that distance remains a hindrance to trade due to transportation and information costs. Coefficients α_4 and α_5 are expected to have a positive sign ($\alpha_4, \alpha_5 > 0$), representing how depreciation induces exports and trade area enhances trade, respectively.

The study employed time-series secondary monthly data spanning January 1998 to September 2006 (105 observations). Since GDP and income per capita data are only available quarterly and annually, the data were interpolated using an interpolation formula (see Gandolfo, 1981). The period of the

study was chosen for two reason. First, to avoid bias due to the world financial crisis that started in August 2007 that impacted Indonesia and Malaysia. Second, in 2008, the Ministry of Trade Republic of Indonesia launched a new regulation that excludes Entikong as an international port for imports due to security considerations. Since then, the intensity of trade relations between West Kalimantan and Sarawak has decreased significantly.

Methodology

Unit Root Tests

Before conducting the cointegration analysis, we need to establish the stationarity properties of the individual series. Unit roots are vital in examining the stationarity of a time series, because a nonstationary regressor invalidates many standard empirical results (Dritsakis, 2004). In this study, the tests of Dickey and Fuller (1979, ADF) and Kwiatkowski, Phillips, Schmidt, and Shin (1992, KPSS) were employed. The ADF tests the null of nonstationary, while KPSS tests the null of stationary.

Cointegration Test

Having established the stationarity of the variables, we adopted the popular Johansen and Juselius (1990, JJ) method for an investigation of the long-run cointegrating relation among variables. This test utilizes two likelihood ratios (LR) to test statistics for the number of cointegrating vectors: the trace test and the maximum eigenvalue test. As it becomes the norm in the empirical time series econometrics estimation, details of the JJ test were not presented here, but interested readers could refer to the original article regarding its implementation.

Granger Causality Test

If cointegration is detected, the Granger causality must be applied in the vector error correction model (VECM) to avoid problems of misspecification (Granger, 1988). VECM is a special case of VAR that imposes cointegration in its variables. The relevant error correction terms (ECTs) must be included in the VAR to avoid misspecification and omission of the important constraints. Thus, for the cointegrated model, the Granger causality must be conducted in the VECM to test the significance of the ECTs. The existence of a cointegrated relationship in the long run indicates that the residuals from the cointegration equation can be used as an ECT as in the Gravity model as follows:

$$\begin{bmatrix} \Delta X_t \\ \Delta GDP_i GDP_j_t \\ \Delta Z_t \\ \Delta D_t \\ \Delta ER_t \end{bmatrix} = \begin{bmatrix} d_{11} & d_{12} & d_{13} & d_{14} & d_{15} \\ d_{21} & d_{22} & d_{23} & d_{24} & d_{25} \\ d_{31} & d_{32} & d_{33} & d_{34} & d_{35} \\ d_{41} & d_{42} & d_{43} & d_{44} & d_{45} \\ d_{51} & d_{52} & d_{53} & d_{54} & d_{55} \end{bmatrix} \begin{bmatrix} \Delta X_t \\ \Delta GDP_i GDP_j_t \\ \Delta Z_t \\ \Delta D_t \\ \Delta ER_t \end{bmatrix} + \begin{bmatrix} \delta_1 ECT_{t-1} \\ \delta_2 ECT_{t-1} \\ \delta_3 ECT_{t-1} \\ \delta_4 ECT_{t-1} \\ \delta_5 ECT_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \end{bmatrix}$$

where Δ is the lag operator, ECT refers to the error-correction term derived from the long run cointegrating relationship via the Johansen method, α_1 , α_2 , α_3 , α_4 , and α_5 are constants, and ε_1 , ε_2 , ε_3 , ε_4 , and ε_5 are serially uncorrelated random error terms with means of zero.

Results and Discussion

The results of the ADF and KPSS tests indicated that all variables are nonstationary at the level form but are stationary in their first difference for both countries¹. Therefore, the results suggested that all variables have the same order of integration, that is $I(1)$. Since it had been determined that all variables are integrated of order 1, then the cointegration test was implemented. The results in Table 1 are presented in two different panels. The null hypothesis of the no cointegrating vector ($r = 0$) is in favor of at least one to five cointegrating vectors. Both models (with and without AFTA) reject the null hypothesis of no cointegrating vector. Therefore, rejecting the null hypothesis of no cointegration implies that the five variables do not drift apart and share at least a common stochastic trend in the long run.

The results shown in Table 2 provide strong evidence that economic size denoted by GDP_i/GDP_j has a significant long-run effect on exports in the case of West Kalimantan-Sarawak cross-border trade flows. This reflects the outward orientation strategy adopted by the Indonesian economy starting in the

1980s. The relevance of the relationship between GDP and exports in West Kalimantan is highly supported by the data; that is, 98.26 percent of West Kalimantan's total export consists of commodities produced mainly in the industrial sector of West Kalimantan, while most of those goods are consumed in Sarawak (Badan Pusat Statistik [BPS], 2006).

Second, the finding provides support for the Linder Hypothesis, whereas the smaller the difference of income per capita between West Kalimantan and Sarawak, the more intensive trade is carried out between the two. Income per capita based on Linder (1961) is used as proxy to consumer preferences/demand pattern. Similar income per capita means similar demand patterns between Sarawak and Malaysia. Similarity in preferences explains why West Kalimantan products are in high demand in Sarawak, and vice versa. Being highly popular, incentives to pursue this opportunity arise among exporters. Government policy tries to strengthen the border due to security issues and the prevention of illegal trading encounters stiff reaction from border traders and exporters.

Table 1 Cointegration results

Model 1: $[X_{ijt}, GDP_i/GDP_j, Z, D_{ijt}, ER_{ijt}]$, $k = 6$			
H_0 :		H_1 :	Statistic
λ_{trace} tests			λ_{trace} value
$r = 0$		$r > 0$	87.484*
$r \leq 1$		$r > 1$	41.757
$r \leq 2$		$r > 2$	16.923
$r \leq 3$		$r > 3$	3.180
$r \leq 4$		$r > 4$	0.015
λ_{max} tests			λ_{max} value
$r = 0$		$r = 1$	45.726*
$r = 1$		$r = 2$	24.834
$r = 2$		$r = 3$	13.743
$r = 3$		$r = 4$	3.165
$r = 4$		$r = 5$	0.015
Model 2: $[X_{ijt}, GDP_i/GDP_j, Z, D_{ijt}, ER_{ijt}, AFTA]$, $k = 6$			
λ_{trace} tests			λ_{trace} value
$r = 0$		$r > 0$	111.945*
$r \leq 1$		$r > 1$	63.389
$r \leq 2$		$r > 2$	36.646
$r \leq 3$		$r > 3$	13.845
$r \leq 4$		$r > 4$	4.590
$r \leq 5$		$r > 5$	0.593
λ_{max} tests			λ_{max} value
$r = 0$		$r = 1$	48.555*
$r = 1$		$r = 2$	26.742
$r = 2$		$r = 3$	22.801
$r = 3$		$r = 4$	9.255
$r = 4$		$r = 5$	3.997
$r = 5$		$r = 6$	0.593

r indicates the number of cointegrating relationships. (*) indicates rejection of the null hypothesis at the 5 percent level. k = lag length. Dummy variable *AFTA* is treated as an exogenous variable in the system. Critical values are taken from Johansen and Juselius (1990). Trace test and maximum eigenvalue test indicate one cointegrating equation (s) at the 5 percent level.

¹ Results for unit root tests are not provided in this paper for brevity but can be made available upon request.

Table 2 Normalized cointegrating vectors

Normalized cointegrating vectors	Variable	Estimated coefficient	t Statistics
$X_{ij} = f(GDP_i GDP_j, Z, D_{ij} ER_{ij})$	$GDP_i GDP_j$	3.064	[3.663]*
	Z	-3.577	[-2.568]*
	D_{ij}	-0.140	[-0.284]
	ER_{ij}	-1.540	[-1.310]
$X_{ij} = f(GDP_i GDP_j, Z, D_{ij} ER_{ij} AFTA)$	$GDP_i GDP_j$	3.554	[4.561]*
	Z	-4.170	[-3.186]*
	D_{ij}	0.266	[0.519]
	ER_{ij}	-1.076	[-0.995]
	$AFTA$	-0.400	[-2.048]*

(*) indicates rejection of the null hypothesis at the 5 percent level.

Third, the distance variable approximated by fuel price has a negative sign. The sign implies that the greater the distance between West Kalimantan and Sarawak, the less export there is between the two. But despite its correct sign, the coefficient was not significant. Fuel price in Indonesia was gradually adjusted over time due to the slashing of the fuel price subsidy by the government of Indonesia. Slight changes in fuel price over time do not seem to behave as an impeding factor in West Kalimantan-Sarawak trade relations; such a phenomenon is related to the underlying condition of close geographic, cultural, and historic ties between this border pair. Further justification of the insignificant role of distance is that trade is conducted via a land port instead of a sea port. In cases where trade is conducted through sea port facilities, many obstacles such as unpredictable weather conditions, lack of proper infrastructure, and inefficient handling may increase the transport cost significantly. Thus, distance plays an important role in either enhancing or deterring trade.

Fourth, the exchange rate had no significant effect on cross-border trade flows as happened initially, in the case of traditional trade conducted by border communities along the border line of West Kalimantan. Similar to traditional trade, market mechanisms that drive the rupiah to depreciate created advantages for domestic goods and services in terms of export price from foreign countries' perspectives. Cheaper export products have succeeded in increasing export from West Kalimantan in the short run when the rupiah was at its lowest rate during the economic crisis. In the long run, however, the competitiveness will not last due to the dependency of the export sector on import content. Such dependency explains why the relation between exchange rate and export is not significant as well as the negative sign of this variable during the period of study.

Fifth, adding *AFTA* leads to a somewhat similar conclusion in terms of the significance of variables in the model, as can be seen from Table 2. The inclusion of *AFTA*, however, leads to surprising results in terms of the sign or direction of the relationship, in which common membership in a trading bloc is associated with lower trade. Kahouli and Maktouf (2014) found in their research that the dummy for regional trade arrangement produced very unstable and unpredictable results.

The negative sign of the dummy *AFTA* variable explains that cross-border trade under the implementation of *AFTA* is less than that when *AFTA* had not yet been enacted. The success of *AFTA* has typically been measured by intra-ASEAN trade; that is, the aggregate level of trade. Since border trade conducted via the Entikong-Tebedu gate point comprises only 0.1 percent of the total trade between Indonesia and Malaysia, the results imply that the benefit of integration is not yet being enjoyed by state-level trade. In other words, the local or central government policy stand has a direct influence on border trade activities rather than sub-regional cooperation. Thus, *AFTA* can be considered a necessary, but not sufficient, condition to intensify trade between West Kalimantan-Sarawak².

Cyrus (2002) found that informal trading arrangements have stronger and more significant effects on trade than formal trading arrangements. Other empirical findings also provided no support for the *AFTA* trading arrangements affecting ASEAN trade (see for example Sharma & Chua, 2000; Siah, 2004). The partnership basis is also an important factor that sustains border trade between West Kalimantan and Sarawak. Most border traders have conducted their businesses for quite some time and have already established good partnerships with their Sarawak counterparts. Just as country-level trade is designated towards traditional destination, micro-level border trade is also designated towards traditional destination, that is, the existing partners of border traders.

The results of the Granger causality test based on the error-correction model are summarized in Table 3. Unidirectional causality runs from export toward exchange rate, from economic distance (approximated by income per capita differences) toward economic size (approximated by product of GDP), and from economic distance toward exchange rate. The short-run nature of the dynamic relationship can be explained by performing a foreign exchange market analysis under a flexible exchange rate regime in which the value of foreign exchange is determined by its demand and supply. The rupiah's price of RM is determined by the supply and demand of RM. Assuming that all other things hold constant, increasing export from West Kalimantan to Sarawak increases the supply of RM and leads to appreciation of the rupiah and vice versa.

² We are grateful for the concern raised by the reviewer on this issue. Since 2008, Indonesia's central government has been engaged in negotiation with Malaysia's counterpart on regulation in border trade. This prolonged process has led to highly fluctuating trade across the border. Using the percentage of border trade between Entikong-Tebedu from the total trade volume of the countries, we found that values ranged from 0.01 percent in 2008 to 0.09 percent in 2016. This was mainly due to the fact that *AFTA* is a regionally based agreement rather than dealing with sub-regional border trade cooperation. The next course of action for this sub-regional integration would be in programs enhancing border trading.

Table 3 Causality based on VECM

Dependent variable	χ^2 (p value)					ECT [t statistic]
	ΔX_{ij}	$GDP_i GDP_j$	ΔZ	ΔD_{ij}	ER_{ij}	$\varepsilon(\Psi_{t-1})$
ΔX_{ij}	-	8.429 (0.208)	2.305 (0.890)	9.701 (0.138)	4.397 (0.623)	-0.839 [-4.337]*
$\Delta GDP_i GDP_j$	10.766 (0.100)	-	15.338 (0.018)*	1.075 (0.983)	6.719 (0.348)	-0.011 [-0.386]
ΔZ	7.622 (0.267)	2.187 (0.902)	-	2.267 (0.894)	5.046 (0.538)	0.000 [0.011]
ΔD_{ij}	5.001 (0.544)	3.950 (0.683)	7.252 (0.298)	-	4.775 (0.573)	0.126 [1.918]
ΔER_{ij}	14.199 (0.028)*	4.598 (0.596)	13.279 (0.039)*	1.872 (0.931)	-	0.024 [0.929]

Notes: All variables are in first differences (denoted by Δ) with the exception of the lagged error correction terms $[\varepsilon(\Psi_{t-1})]$ generated from the Johansen order of cointegration tests conducted in Table 1. The ECT was derived by normalizing the co-integrating vectors on X_{ij} thereby resulting in one set of residuals for the model. VECMs were based on 6 lag structures. Values in parentheses are P values. Values in square brackets are t values. (*) indicates significance at the 5 percent level.

Another channel revealed in the system was the causality that runs from economic distance (Z) toward economic size ($GDP_i GDP_j$) and exchange rate (ER_{ij}). Referring back to Table 2, the Gravity Model of West Kalimantan supports the Linder Hypothesis, of which the demand patterns between West Kalimantan and Sarawak tend to enhance trade. Increasing trade activities in turn influences the exchange rate, as elaborated in the short-run dynamic of export and exchange rate previously. This situation explains the causality relationships between economic distance and exchange rate.

The dynamic short-run relationship between economic distance and economic size is revealed through the transmission mechanism as follows: as economic distance enhances trade between West Kalimantan and Sarawak, it influences both economies positively by increasing economic size. Following traditional trade theory, when countries specialize in the production of goods/services based on their comparative advantage and trade with each other, the output (GDP) of the involved economies will be greater as they share the gain from trade. The larger the difference between these economies' factor proportions and the more intensive the trade between them is (H-O theorem), the larger their economic size will become. Another scenario is under the Linder Hypothesis, which also provides support for the relationship between economic distance and economic size through trade activities. In the particular case of West Kalimantan-Sarawak, where trade between West Kalimantan and Sarawak is equally intensive in differentiated products, similarity in economic size and factor proportion have become an important factor in enhancing trade and in turn create larger output/economic size.

Furthermore, we found that the export equation was the only one in the system in which the ECT is statistically significant. This suggests that export bears the sole brunt of short-run adjustments in bringing about the long-run equilibrium in West Kalimantan, where it acts as the initial receptor of any exogenous shocks that disturb the equilibrium system. The ECT coefficient of -0.839 represents the speed of adjustment of export towards equilibrium. This means that 83.9 percent of disequilibrium can be corrected each month;

that is, equilibrium is achieved in less than two months.

The short-run relationships reveal interdependency among variables in the short run, as can be seen in Figure 1.

**Figure 1** Short run dynamic causal chain base on pairwise Granger causality

Concluding Remarks

It can be concluded that in order to benefit from cross-border trade, West Kalimantan-Sarawak border regions should increase economic size vertically through the development process and horizontally through enlargement of the economy. An increase in economic size vertically means West Kalimantan should focus on the development of its economy and achieve higher and more sustainable economic growth. By doing so, West Kalimantan will establish a strong export base to serve the growing market of Sarawak or a larger area. The idea of pursuing a higher GDP to generate exports in West Kalimantan is relevant, since the data revealed that 98.26 percent of West Kalimantan's total export consists of commodities produced in West Kalimantan. These commodities are mostly consumed in Sarawak.

Efforts to pursue economic growth will also lead to a lower income gap between Sarawak and West Kalimantan. In 2015, Sarawak's income per capita reached RM 45,423, while West Kalimantan's income per capita was approximately RM 5,581. As the income per capita of West Kalimantan increases and gets nearer to Sarawak's income per capita, the border trade between West Kalimantan and Sarawak will become more intensive due to their greater similarity in preferences.

This finding also implies the invalidity of the H-O theorem. Naturally, West Kalimantan is considered to be a relatively labor-rich economy, while Sarawak is considered a relatively capital-rich economy. Trade between them should be intensive,

since trade is a substitute for relative factor scarcity. A possible reason for the invalidity of the H-O theorem is the H-O assumption of factor immobility among nations. In the case of West Kalimantan and Sarawak, labor tends to be mobile among countries, as evidenced by the number of foreign laborers in Sarawak. From Indonesia alone, the number of *TKI* in Sarawak reached up to 200,000 people. Thus, the difference in the existing income per capita between West Kalimantan and Sarawak does not purely represent the relative abundance factor endowed by each economy. Sarawak also enjoys the advantage of being a foreign-labor-rich economy while maintaining its advantage as a relatively capital-abundant economy. West Kalimantan as the economy that lacks capital is also open for foreign investment from Malaysia and other countries. Thus, labor and capital are mobile between economies, contrary to the H-O assumptions. Additionally, the new trade theory, emphasizing as it does economies of scale and product differentiation along with factor proportion, explains that a large volume of trade exists between countries with similar factor proportions (see Helpman, 1998; Krugman, 1994).

An increase in economic size horizontally means that West Kalimantan should cooperate with other economies, especially across Borneo, such as in Sarawak, Sabah, Brunei Darussalam, East Kalimantan, South Kalimantan, and Central Kalimantan. Cooperation that goes beyond trade relations is necessary, since trade liberalization that facilitates market integration has had only a limited impact on growth. Certain empirical findings provide no support for formal trading arrangements to induce trade (Cyrus, 2002) and no significant effect of AFTA trading arrangement on ASEAN trade (see for example Sharma & Chua, 2000; Siah, 2004). This has raised discouragement of trade relations based on integration.

There has been a trend of border trade restriction by the Indonesian Government due to security reasons following various crimes such as smuggling and trafficking. This is proven by the regulation issued by Indonesia's Trade Minister in 2008, followed by a 2010 regulation which excludes Entikong from being identified as an international port for importing five major products. The said regulation was enforced even further in 2014, due to legal violations committed by custom officers who manipulated border trade activities. The sentiment behind the enforcement was not one shared by everyone, however. Border traders and the Malaysian government have been trying to persuade the Indonesian Government to allow trade via the Entikong-Tebedu border crossing since trade value in the border decreased significantly. However, from 2015 until 2019, the Indonesian government will be focusing on developing the border region's infrastructure, with the target of creating 850 kilometers of road connections along the West Kalimantan-Sarawak border, along with establishing border development centers in Aruk, Entikong, Nanga Badau, Jasa, and Jagoi Babang. The entire endeavor has already been allocated a budget of around two trillion rupiah (approximately USD 150 million) by Indonesia's central government. At the same time, both governments are currently engaged in negotiations into mutually beneficial trade relations.

The uniqueness of the West Kalimantan-Sarawak trade relation also lies in the insignificance of the exchange rate and

distance variable approximated by fuel price. Initially, a cheaper export product succeeded in increasing export from West Kalimantan in the short run, while the rupiah plunged to its lowest rate during the economic crisis. In the long run, however, the competitiveness did not last due to the dependency of the export sector on import content. This phenomenon explains the insignificant relationship between exchange rate and export as well as the negative sign of this variable during the study period. The distance variable approximated by fuel price was also not significant, despite its correct sign. Regardless of the increasing trend in the fuel price, trade relations between West Kalimantan and Sarawak kept expanding over the period of analysis. Provocative press entitled 'The Death of Distance' by Cairncross (1997) mentions that various kinds of ICT make geographic distance obsolete. Findings from Demirkan, Goul, Kauffman and Weber (2009) provide support for the positive influence of ICT on distant trade. According to Carrere and de Melo (2009), the importance of distance is driven by regionalization of trade for low-income countries. This may mislead the finding that distance has a negative effect on trade. Border trade between West Kalimantan and Sarawak is conducted through a dry/land port with a higher level of certainty. Combined with recent advancements in communication and transportation technology, the role of distance (fuel price in this case) is becoming less important compared to other determinants of cross-border flows in this particular case.

Conflict of Interest

There is no conflict of interest.

Acknowledgments

The authors gratefully acknowledge financial support from Universiti Malaysia Sarawak (UNIMAS) Geran Penyelidikan Khas (Top Down) 03(TD04)/1054/2013(02).

References

- Arman, S., Suryadi, A., Mardiansyah, R., & Bariyah, N. (2001). *Cross-border travel and trade between West Kalimantan (Indonesia) and Sarawak (Malaysia)* (Research Report). Pontianak, Indonesia: Universitas Tanjungpura.
- Badan Pusat Statistik. (2006). *West Kalimantan in figures*. Pontianak, Indonesia: Kalimantan Barat.
- Brun, J., Carrere, C., Guillaumont, P., & de Melo, J. (2005). Has distance died? Evidence from panel gravity model. *World Bank Economic Review*, 19(1), 99–120.
- Cairncross, F. (1997). *The death of distance, how the communication revolution is changing our lives*. Boston, MA: Harvard Business School Press.
- Carrere, C., & de Melo, J. (2009). Has distance died? An update. Retrieved from <http://www.voxeu.org/index.php?q=node/87>
- Chaney, T. (2013). The gravity equation in international trade: An explanation. Retrieved from <http://www.nber.org/papers/w19285>
- Chen W., Yang Z., & Liu X. (2008). Empirical analysis of Xinjiang's bilateral trade: Gravity model approach. *Chinese Geographical Science*, 18(1), 9–16.
- Cyrus, T. L. (2002). Income in the gravity model of bilateral trade: Does endogeneity matter? *The International Trade Journal*, 16(2), 161–180.
- De Benedictis, L., & Taglioni, D. (2011). Chapter 4: *The gravity model in international trade*. In L. De Benedictis & L. Salvatici (Eds), *The trade impact of European Union preferential policies: An analysis through gravity models*. New York, NY: Springer.
- Demirkan, H., Goul, M., Kauffman, R. J., & Weber, D. M. (2009). *Does distance matter? The influence of ICT on bilateral trade flows*. Retrieved from <http://aiselaisnet.org/globdev2009/17>

- Dickey, D. A., & Fuller, W. A. (1979). Distribution of estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74, 427–431.
- Dritsakis, N. (2004). Defense spending and economic growth: An empirical investigation for Greece and Turkey. *Journal of Policy Modeling*, 26, 249–264.
- Fullerton Jr, T. M. (2003). Recent trends in border economics. *Social Science Journal*, 40, 583–592.
- Gandolfo, G. (1981). *Qualitative analysis and econometric estimation of continuous time dynamic model*. Amsterdam, the Netherlands: North Holland Publishing Company.
- Granger, C. W. J. (1988). Some recent development in a concept of causality. *Journal of Econometrics*, 38, 199–211.
- Helpman, E. (1998). Explaining the structure of foreign trade: Where do we stand? *Weltwirtschaftliches Archiv*, 134(4), 573–589.
- Heckscher, E. F. (1919). The effect of foreign trade on the distribution of income. *Ekonomisk Tidskrift*, pp 497–512. Reprinted in H. S. Ellis & L. A. Metzler. (1950). *Readings in the theory of international trade*. Homewood, IL: Irwin.
- Hirrsch, S., & Hashai, N. (2000). The Arab-Israeli trade potential: The role of distance-sensitive products. *The International Trade Journal*, 14(1), 1–35.
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimated and inference on cointegration with application to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52, 169–209.
- Kahouli, B., & Maktouf, S. (2014). The link between regional integration agreements, trade flows and economic crisis: A static and dynamic gravity model. *International Journal of Development Issues*, 3(1), 35–58. doi: 10.1108/IJDI-11-2013-0082
- Kepaptsoglou, K., Karlaftis, M. G., & Tsamboulas, D. (2010). The gravity model specification for modeling international trade flows and free trade agreement effects: A 10-year review of empirical studies. *The Open Economics Journal*, 3, 1–13.
- Krugman, P. R. (1994). *Rethinking international trade*. Cambridge, UK: MIT Press.
- Kwaitkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics*, 54, 91–115.
- Linder, S. B. (1961). *An essay on trade and transformation*. New York, NY: John Wiley.
- Marto-Sargento, A. L. (2007). Empirical examination of the gravity model in two different context: Estimation and explanation. *Jahrbuch für Regionalwissenschaft*, 27, 103–127.
- Ohlin, B. (1983). *Interregional and international trade*. Cambridge, MA: Harvard University Press (original work published in 1933).
- Poyhonen, P. (1963). A tentative model for the volume of trade between countries. *Weltwirtschaftliches Archiv*, 90, 93–99.
- Reinert, K. A., & Rajan, R. S. (2008). *Princeton encyclopedia of the world economy*. Princeton, NJ: Princeton University Press.
- Rivera-Batiz, L. A., & Oliva, M. A. (2003). *International trade, theory, strategies and evidence*. London, UK: Oxford University Press.
- Sharma, S. C., & Chua, S. Y. (2000). ASEAN: Economic integration and intra-regional trade. *Applied Economics Letters*, 7, 165–169.
- Siah K. L. (2004). *AFTA and the intra-trade patterns among ASEAN-5* (Unpublished master's thesis). Universiti Putra Malaysia, Malaysia.
- Tang, D. (2003). Economic integration among the Asia-Pacific economic cooperation countries: Linder effect on developed and developing countries (1985–1999). *International Trade Journal*, 17(1), 19–49.
- Tinbergen, J. (1962). *Shaping the world economy: Suggestion for an international economic policy*. New York, NY: The Twentieth Century Fund.