

Modelling Tourism Demand: An Augmented Gravity Model (Permodelan Permintaan Perlancongan: Model Graviti Tambahan)

Meng-Chang Jong

Universiti Malaysia Sarawak

Chin-Hong Pua

Universiti Malaysia Sarawak

Mohammad Affendy Arip

Universiti Malaysia Sarawak

ABSTRACT

This paper aims to investigate the factors affecting tourism demand in Sabah using an augmented gravity model. In modelling tourism demand, a balanced panel data set of ten countries over 2010-2016 is analyzed using the static panel data approach. The income levels in tourist origin countries and the income level in Sabah are positively affecting Sabah tourism demand. Meanwhile, transportation costs and tourism prices adversely influence tourism demand in Sabah.

Keywords: tourism demand; augmented gravity model; panel analysis; Sabah

ABSTRAK

Kajian ini bertujuan untuk mengkaji faktor yang mempengaruhi permintaan perlancongan di Sabah dengan menggunakan model graviti tambahan. Dalam permodelan permintaan perlancongan, satu set data panel yang seimbang bagi sepuluh negara sepanjang 2010-2016 akan dianalisis dengan menggunakan pendekatan data panel static. Tahap pendapatan di negara-negara asal pelancong dan tahap pendapatan di Sabah mempengaruhi permintaan perlancongan Sabah secara positif. Manakala, kos pengangkutan dan harga perlancongan menjejaskan permintaan perlancongan di Sabah.

Kata Kunci: permintaan perlancongan; model graviti bertambah; analisis panel; Sabah

INTRODUCTION

Market liberalization and globalization have spurred international movements of various services. The tourism industry has a significant share of international transactions in the service industry and has flourished as well in Sabah. The magnificent natural beauty, historical sites, marine environment, and heritage places are attracting domestic and international tourists to Sabah. It is situated at the Borneo, a beautiful island and the 3rd-largest island in the globe. In the late 19th century, Sabah was a British colony, and it gained self-government on 31st August 1963. Sabah together with Malaya, Sarawak, and Singapore formed the Federation of Malaysia on 16th September 1963 (Sabah Tourism Board 2018).

Sabah is a distinctive tourism destination because it is home to the world's largest flower, Rafflesia; one of the tallest mountains in Southeast Asia, Mount Kinabalu; and one of the top dive spots in the world, Sipadan Island. Also, it has 80 ethnic dialects, over 50 languages

and 33 indigenous groups (Sabah State Government 2016). Languages include Bahasa Malaysia, English, Mandarin, and others. Sabah tourism thus has a specific comparative advantage in the tourism market.

Sabah tourism plays a vital role in Sabah's economy. Sabah received 3.9 million tourist arrivals that contributed RM8.3 billion to its gross domestic product (GDP) in 2018 (Sabah Tourism Board 2019). These meant increases of 5.3% and 6.6% in the number of tourist arrivals and tourism contribution to Sabah GDP, respectively, over the past year. In addition, Sabah tourism contributed 8.2% to its GDP in the same year. Table 1 presents the top ten countries contributing to inbound Sabah tourism. They represented 93.6% of the total international tourist arrivals into Sabah in 2018. This indicates that these ten major countries play a vital role in boosting Sabah's tourism. With their significant contribution to the tourism industry, the objective of this study is to identify the determinants affecting Sabah tourism demand in order to ensure its sustainable growth in the long run. The empirical outcome from this



study can be used as a reference for the government and industry players to design feasible tourism plans and promotion packages.

The positive growth in tourist arrivals is also a result of the Sabah Tourism Board's marketing and promotion strategy focused on increasing air accessibility by attracting more foreign airlines to fly in and out from Kota Kinabalu International Airport, Sabah. The Minister of Tourism, Culture and Environment Sabah stated that the airport services were the major supportive industry player and the continuous engagement with Malaysia Airports Berhad was the main driving factor behind its success (Chan 2017). The short distance between the many southern Chinese cities and Sabah is a great benefit that has been tapped by the Sabah Tourism Board, and thus the Chinese constitute the biggest tourism group in Sabah. The continuous joint promotions and strategic partnerships with domestic and foreign airlines have brought more tourists to Sabah.

In 2018, the services sector is the main economic contributor to Sabah's income which contributed 44.0% of GDP in Sabah. Meanwhile, the contribution of agriculture and construction sector to Sabah's GDP only accounted for 27.6% and 8.3%, respectively (Department of Statistics Malaysia 2020). With the significant contribution of services sector in Sabah, the tourism industry is one the key income-generating industries to further promote economic growth in Sabah. So, it is important to ensure the tourism industry is performing at the optimum level in order to maximize benefits for the local population and economy. The tourism industry will have adverse impacts if it is not performing at the expected rate. Locals will lose their jobs, living standards will be affected, and economic development will slow.

Figure 1 lists the top ten inbound tourist countries and growth rates in Sabah from 2003 to 2018. It is obvious that tourist rates fluctuated, and show a downward trend across the years. This illustrates

TABLE 1. Top ten inbound tourist countries to Sabah tourism, 2018

Country	Tourist Arrivals (Person)	Percentage (%)
China	593,623	46.6%
South Korea	337,100	26.5%
Indonesia	109,771	8.6%
Brunei	56,259	4.4%
Taiwan	49,771	3.9%
Philippines	28,611	2.2%
UK & Ireland	33,245	2.6%
Singapore	21,482	1.7%
Australia	19,357	1.5%
Japan	25,102	2.0%
Total	1,361,567	100.0%

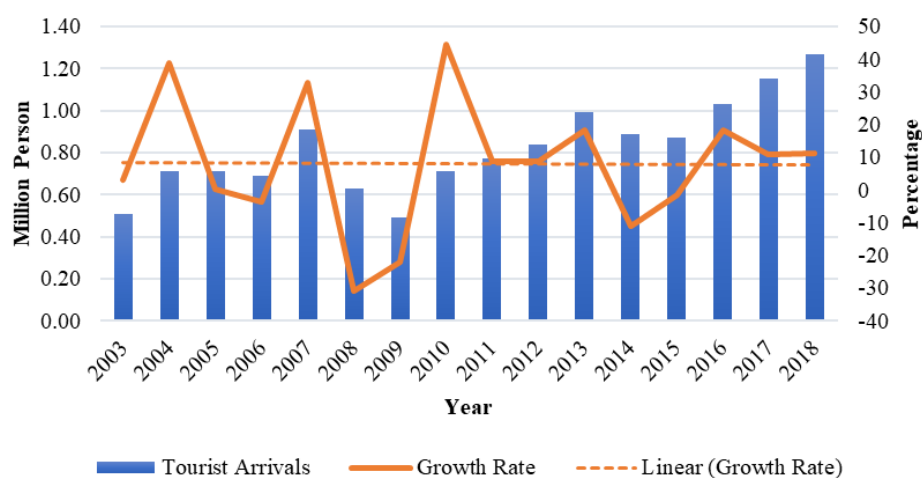


FIGURE 1. Top ten inbound tourist countries and growth rate into Sabah, 2003-2018

Source: Sabah Tourism Board 2018

that the number of tourist arrivals is increasing at the diminishing rate. Thus, extra attention is needed by the government and tourism players. We can in particular observe several sharp falls in 2005, 2006, 2008, 2011, 2014 and 2017 in Sabah tourism due to domestic kidnapping issues, global financial crisis and incidents in the Malaysian airline industry. This shows that Sabah tourism is a fragile industry and sensitive to internal and external shocks. Therefore, it is critical to create a tourism demand model to identify the determinants influencing Sabah tourism.

LITERATURE REVIEW

The theoretical framework that supports tourism demand model is mainly based on the consumer theory (Morley 1992; Syriopoulos & Sinclair 1993; Divisekera 2003; Morley et al. 2014). The individual utility is assumed to be derived from the consumption of a vector of goods and services as well as from the visits to different destinations. The utility of an individual stems from destination attributes such as comfortable climate, magnificent scenery, and sociocultural features. In sum, the utility function of the tourist represents general preferences in traveling abroad, and other goods and services are assumed to be weakly linked.

Most of the previous studies employed exchange rate (Martin & Witt 1988; Vita & Kyaw 2013; Dogru et al. 2017; Sharma & Pal 2019), tourism security (George 2003; Salleh et al. 2014), trade volume (Habibi et al. 2009; Leitao 2010; Chaisumpunsakul & Pholphirul 2017), lagged dependent variable (Song & Li 2008; Peng et al. 2015; Dogru et al. 2017) and dummy variable (Lim 1997; Tsui et al. 2014; Priego et al. 2015) as the independent variables in tourism demand model. Meanwhile, this study employed gravity model as a guideline to model Sabah tourism demand model.

The gravity model developed by Tinbergen (1962) was derived from Newton's theory of gravitation to illustrate international trade patterns and to examine the flow of objects between two destinations. Since tourism can be considered as a trade in services and flow of tourists, so it fit well in tourism study. In addition, the advantages of this technique are that the geographical distance and source country characteristics can be clearly taken into account. The gravity model is adopted when the model consists of a distance variable.

The gravity model was extensively employed in previous tourism demand studies such as those of Kosnan et al. (2013), Kaplan and Aktas (2016), Yazdi and Khanalizadeh (2016), Gouveia et al. (2017), Chaney (2018), and Xu et al. (2020). The gravity model is derived from Newton's universal law of gravitation to illustrate international trade patterns and to examine the flow of objects between two destinations. Gravity model

also has been extensively utilised to justify migration (Karemera et al. 2000; Gil-Pareja et al. 2007; Mamertino & Sinclair 2019), international trade flows (McCallum 1995; Rose 2000; Anderson & Wincoop 2003; Chaney 2018), and foreign direct investment (Bergstrand & Egger 2007; Morley et al. 2014; Falk 2016; Mosikari et al. 2019).

In previous studies, tourism demand was proxied by tourist arrivals (Song & Li 2008; Song et al. 2012; Puah et al. 2018) or tourism receipts (Au & Law 2002; Witt et al. 2004; Song et al. 2010; Smeral & Weber 2010; Husein & Kara 2020). Meanwhile, the independent variables consisted of income variable, price variable and cost variable. The income level was usually measured by the GDP of the tourist origin country such as in Kum et al. (2015), Thien et al. (2015), Kaplan and Aktas (2016), and Puah et al. (2018). Their empirical results showed that the income variable is a significant variable that positively affects tourism demand.

Furthermore, tourism price was employed by Song and Li (2008), Puah et al. (2014), Lorde et al. (2015), Dogru et al. (2017), Tanjung et al. (2017), and Husein and Kara (2020) to examine the price impact towards tourism demand. Their findings proven that tourism price was negatively related to tourism demand. Furthermore, transportation cost was another common variable chosen as a determinant in the tourism demand model. It is usually proxied by distance of either countries, crude oil price, or airfare price. An adverse relationship between the transportation cost and tourism demand was detected in the study of Khadaroo and Seetanah (2007), Chaiboonsri et al. (2009), Chaiboonsri et al. (2010), Eryigit et al. (2010), Priego et al. (2015), and Kaplan and Aktas (2016). This is because increase in travel cost implies that the travelling cost is more expensive and hence this condition will discourage tourists to travel abroad.

METHODOLOGY

The gravity model has been selected because it is a preferable model in which the tourists visit other travel destinations due to the attractiveness and uniqueness. The advantages of this technique are that the geographical distance and source country characteristics can be clearly taken into account (Morley et al. 2014). The gravity model is a combination of several factors: tourist flows between source and destination countries, economic size of source and destination countries, and geographical distance between origin and destination countries as shown in Equation (1):

$$T_{ijt} = \beta_0 \frac{(GDP_{it}) \times (GDP_{jt})}{Dist_{ijt}} \varepsilon_{ijt} \quad (1)$$

where T indicates tourist flows between origin and destination country; GDP refers to gross domestic product of origin and destination country, which is the proxy of income level; $Dist$ denotes the geographical distance between the countries to refer transportation cost; i refers to origin countries; j proxies to destination country; t indicates time. For estimation purposes, Equation (1) will be expressed in the logarithmic form as shown in Equation (2):

$$LT_{ijt} = \beta_0 + \alpha LGDP_{it} + \lambda LGDP_{jt} + \zeta LDist_{ijt} + \varepsilon_{ijt} \quad (2)$$

Based on consumer theory, price is a key component influences consumer demand and their utility curve. Seetaram et al. (2016) also pointed out that the tourism price is a fundamental requirement in the tourism demand function. This is because the tourism price can determine the sensitivity or reaction of tourists towards changes in prices in the destination country, and thus the tourism players can design their desired policies to attract more tourists. Therefore, for the case of Sabah, the price variable is adopted in the model specification. The augmented gravity model is as follows:

$$LTA_{ijt} = \beta_0 + \beta_1 LGDP_{it} + \beta_2 LGDPSB_{jt} + \beta_3 LTC_{ijt} + \beta_4 LTP_{ijt} + \varepsilon_{ijt} \quad (3)$$

where LTA refers to the logarithmic form of tourist arrivals, $LGDP$ indicates the logarithmic form of the income level in the origin countries, $LGDPSB$ proxies the logarithmic form of the income level in Sabah, LTC denotes the logarithmic form of transportation cost, and lastly, LTP is the logarithmic form of the tourism price. For a destination country, more services are likely to be offered as the country becomes wealthier. For origin countries, a rise in their income will increase their demand to travel abroad if tourism is considered as a normal good. Thus, a positive relationship is expected to be associated between the income level in origin and destination countries with tourism demand.

The transportation cost in the gravity model is usually measured by geographical distance between capital cities of the source and destination countries. The great circle formula usually measures geographic distance by taking into account the shortest distance between two points on a sphere (Mayer & Zignago 2011). One of the drawbacks in employing geographic distance to proxy cost of transportation is that it is time-invariant. Therefore, this study measures the transportation cost by multiplying the geographic distance with crude oil price as shown in Equation (4). This variable is predicted to have an adverse impact on the tourism demand.

$$TC_{ijt} = Dist_{ijt} \times Crude\ oil\ price_t \quad (4)$$

Consumer theory suggests that price variable is an important factor influencing demand behaviour of an individual. In most literature, the price variable is measured by dividing the consumer price indexes in

source and destination countries. In this study, the price variable is multiplied with the exchange rate to capture the actual price differences between the countries. Dogru, Turk, and Crouch (2017) mentioned that the tourism price becomes significant when it is adjusted by relevant exchange rates. Thus, the measurement of price variable in this study is as below:

$$TP_{ijt} = \frac{CPI_{it}}{CPI_{jt}} \times ER_{ijt} \quad (5)$$

The static panel data approach is adopted to examine tourism demand in Sabah. The advantages of panel analysis are controlling heterogeneity of an individual, more informative data, less collinearity among the variables, more variability, more degrees of freedom and more efficiency (Hsiao 2003; Baltagi 2005; Song & Li 2008). The three possible models under the static panel data approach are Pooled Ordinary Least Squares (POLS) model, Random Effects (RE) model, and Fixed Effects (FE) model.

Sabah tourism demand is measured by tourist arrivals from ten major countries: China, South Korea, Indonesia, Brunei, Taiwan, United Kingdom, Philippines, Australia, Japan and Singapore. These countries comprise more than 90% of the international tourist arrivals in Sabah. The augmented gravity model using annual data covering the period 2010 to 2016 was employed to estimate tourism demand. The sources of data were obtained from Ministry of Tourism, Culture and Environment Sabah, CEIC and Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). The period of study is from 2010 to 2016. LTA refers to the tourist arrivals, $LGDP$ indicates the income level in the origin countries, $LGDPSB$ proxies the income level in Sabah, LTC denotes the transportation cost, and lastly, LTP is the tourism price.

EMPIRICAL RESULTS AND DISCUSSIONS

Table 2 summarizes the result for the panel data model of ten groups of origin countries. The computed F -test is statistically significant at 1 percent level, indicating that the data can be pooled together and share a common intercept across the cross-section units in the Sabah. Next, we proceed to Breusch-Pagan LM test to identify whether Pooled OLS model or RE model is preferable. The empirical result suggests that the RE model is more desirable than the Pooled OLS model because the null hypothesis of Pooled OLS model is a preferable model has been rejected at 1 percent significant level. Lastly, we determine whether the RE or FE model is the best model to identify tourism demand in Sabah. The Hausman test also proved that the FE model is a desirable model, as the null hypothesis of Hausman test is rejected at 5 percent significant level. Therefore, the

TABLE 2. Results of Static Linear Panel Data Models for Sabah

Variable	DEPENDENT Variable: <i>LTA</i>			
	Pooled OLS	Random Effects	Fixed Effects	Fixed Effects (Robust Standard Errors)
Constant	-39.60** (17.82)	-5.26 (16.64)	0.68 (17.95)	-39.60*** (9.64)
<i>LGDP</i>	0.43*** (0.10)	0.26 (0.17)	0.50* (0.28)	0.43*** (0.05)
<i>LGDPSB</i>	2.16*** (0.78)	0.54 (0.71)	-0.15 (0.75)	2.16*** (0.42)
<i>LTC</i>	-0.81*** (0.15)	-0.26 (0.22)	0.08 (0.24)	-0.81*** (0.05)
<i>LTP</i>	-0.09*** (0.03)	-0.07 (0.08)	0.43 (0.38)	-0.09*** (0.01)
F-Test [p-value]			13.54*** [0.00]	
Breusch-Pagan LM Test [p-value]		128.67*** [0.00]	-	-
Hausman Test [p-value]	-		11.29** [0.02]	-
Multicollinearity	-	-	3.13	-
Heteroskedasticity [p-value]	-	-	104.84*** [0.00]	-
Serial Correlation [p-value]	-	-	5.64** [0.04]	-
Observations	70	70	70	70

Notes: Asterisk ***, **, and * represent 1, 5, and 10 percent levels of significance, respectively. The figures in brackets are *t*-statistics

FE model is the best model to identify the determinants affecting tourism demand in Sabah.

Then, a series of diagnostic tests were conducted to ensure the goodness-of-fit of the model. The empirical finding shows that the VIF value is less than 10, indicating that the model does not encounter a multicollinearity problem. However, it does have a heteroskedasticity and serial correlation problem, as the null hypotheses have been rejected at 1 percent and 5 percent significant level, respectively. These issues can be rectified by using panel-corrected standard errors. After rectifying these problems, the final FE model is presented in the last column of Table 2. The empirical findings prove that all determinants significantly influence tourism demand in Sabah. A positive relationship is detected for *LGDP* and *LGDPSB* while *LTC* and *LTP* adversely impact tourism demand in Sabah.

The estimated coefficient of *LGDP* suggests that the number of tourist arrivals into Sabah will increase by 0.43 percent when their income levels rise by 1 percent. This indicates that Sabah is one of their preference tourism destinations if they have higher income. Additionally, the economic performance in Sabah has a positive impact on Sabah tourism demand. The empirical finding implies that a 1 percent rise in *LGDPSB* will attract 2.16 percent more tourist arrivals into Sabah. Better economic performance in Sabah reflects that its tourism industry is developed extensively and more funding is

invested to offer better tourism facilities, products and services.

Conversely, the estimate for *LTC* is significant and negative. Tourist arrivals decreased by approximately 0.81% for every 1 percent increase in transportation cost. Therefore, despite tourists' higher income levels, there is still some fallout when the cost of a trip to Sabah increases. Similarly, the *LTP* is adversely influencing tourism demand in Sabah. The estimated coefficient of *LTP* indicates that a 1 percent rise in tourism price will discourage 0.09 percent of tourists from traveling to Sabah.

CONCLUSION

This study employs the gravity model to model tourism demand for Sabah. The gravity model is augmented by adopting an additional tourism variable, tourism price, to capture extra tourism information based on consumer theory. The model is estimated using a static panel data approach by employing yearly data on ten major countries from 2010 through 2016. The empirical findings proved that all selected determinants are significant in explaining tourism demand for Sabah; that is, origin and destination income, transportation cost and tourism price are all key determinants. The origin and destination income are positively associated with

tourism demand, while transportation cost and tourism price are adversely affecting tourism demand in Sabah.

The findings of this study have a number of practical implications. Firstly, the monitoring of the economic performance of tourists' origin countries by the Sabah government is essential, because tourist income positively affects tourism demand in Sabah. For example, Sabah can offer more luxury tourism packages for high-spending tourists. Secondly, the economic size in Sabah is proven as an influential factor on tourist inflows in Sabah. The government and industry players have to offer more tourism products and events to attract additional tourists to visit Sabah, and thus to increase the income level in Sabah. With abundant capital, the government can further develop the tourism infrastructure and facilities to ensure its competitiveness and attractiveness, and the tourists can feel the worthiness of money they spent during their trip.

Thirdly, the government can arrange for more international flights with other potential countries in order to reduce cost of travel for long-haul tourists. It may reduce the time and travel cost when more international direct flights are available to Sabah. Lastly, the pricing strategy plays a crucial role. New and effective sales strategy can attract more international tourists. Therefore, a proper pricing strategy is important to attract different segments of tourists to travel to and spend in Sabah. The present study is the only empirical investigation into the determinants affecting tourism demand in Sabah, thus contributing to the current literature. However, considerably more work will need to be done to identify more determinants affecting tourism demand in Sabah using different approaches.

REFERENCES

- Alegre, J. & Sard, M. 2015. When demand drops and prices rise: tourist packages in the Balearic Islands during the economic crisis. *Tourism Management* 46: 375-385.
- Anderson, J.E. & Wincoop, E.V. 2003. Gravity with gravitas: a solution to the border puzzle. *The American Economic Review* 93(1): 170-192.
- Au, N. & Law, R. 2002. Categorical classification of tourism dining. *Annals of Tourism Research* 29(3): 819-833.
- Baltagi B.H. 2005. *Econometric analysis of panel data* (3rd ed.). Great Britain: Antony Rowe Ltd, Chippenham, Wiltshire.
- Bergstrand, J.H. & Egger, P. 2007. A knowledge and physical capital model of international trade flows, foreign direct investment, and multinational enterprises. *Journal of International Economics* 73: 278-308.
- Chaiboonsri, C., Chaitip, P. & Rangaswamy, N. 2009. Modelling international tourism demand in Thailand. *Annals of the University of Petroşani, Economics* 9(3): 125-146.
- Chaiboonsri, C., Sriboonjit, J., Sriwichailamphan, T., Chaitip, P. & Sriboonchitta, S. 2010. A panel cointegration analysis: an application to international tourism demand of Thailand. *Annals of the University of Petroşani, Economics* 10(3): 69-86.
- Chaisumpunsakul, W. & Pholphirul, P. 2017. Does international trade promote international tourism demand? evidence from Thailand's trading partners. *Kasetsart Journal of Social Sciences*. <http://www.sciencedirect.com/science/article/pii/> (accessed 27 December 2017).
- Chan, J. 2017. Sabah hits record tourist numbers for 2016. <http://www.themalaymailonline.com/malaysia/article/sabah-hits-record-tourist-numbers-for-2016> (accessed 22 March 2018)
- Chaney, T. 2018. The gravity equation in international trade: an explanation. *Journal of Political Economy* 126(1): 150-177.
- Department of Statistics Malaysia. 2020. *Labour force survey (LFS) time series statistics by state, 1982-2019*. Putrajaya: Department of Statistics Malaysia.
- Divisekera, S. 2003. A model of demand for international tourism. *Annals of Tourism Research* 30(1): 31-49.
- Dogru, T., Sirakaya-Turk, E. & Crouch, G.I. 2017. Remodeling international tourism demand: old theory and new evidence. *Tourism Management* 60: 47-55.
- Eryigit, M., Kotil, E. & Eryigit, R. 2010. Factors affecting international tourism flows to Turkey: a gravity model approach. *Tourism Economics* 16(3): 585-595.
- Falk, M. 2016. A gravity model of foreign direct investment in the hospitality industry. *Tourism Management* 55: 225-237.
- George, R. 2003. Tourist's perceptions of safety and security while visiting Cape Town. *Tourism Management* 24: 575-585.
- Gil-Pareja, S., Llorca-Vivero, R. & Martinez-Serrano, J.A. 2007. The effect of EMU on tourism. *Review of International Economics* 15(2): 302-312.
- Gouveia, S., Rebelo, J., Lina, L.G. & Guedes, A. 2017. International demand for the Douro (Portugal) river cruises: a gravity model approach. *Tourism Economics* 23(8): 1679-1686.
- Habibi, F., Rahim, K.A., Ramchandran, S. & Chin, L. 2009. Dynamic model for international tourism demand for Malaysia: panel data evidence. *International Research Journal of Finance* 33: 207-217.
- Hsiao C. 2014. *Analysis of Panel Data*. Third Edition. Cambridge: United Kingdom: Cambridge University Press.
- Husein, J. & Kara, S.M. 2020. Nonlinear ARDL estimation of tourism demand for Puerto Rico from the USA. *Tourism Management* 77: 1-4.
- Kaplan, F. & Aktas, A.R. 2016. The Turkey tourism demand: a gravity model. *The Empirical Economics Letters* 15(3): 265-272.
- Karemera, D., Oguledo, V.I. & Davis, B. 2000. A gravity model analysis of international migration to North America. *Applied Economics* 32(13): 1745-1755.
- Khadaroo, J. & Seetanah, B. 2007. Transport infrastructure and tourism development. *Annals of Tourism Research* 34(4): 1021-1032.
- Kosnan, S.S.A., Ismail, N.W. & Kaliappan, S.R. 2013. Determinants of international tourism in Malaysia: evidence from gravity model. *Jurnal Ekonomi Malaysia* 47(1): 131-138.

- Kum, H., Aslan, A. & Gungor, M. 2015. Tourism and economic growth: the case of next-11 countries. *International Journal of Economics and Financial Issues* 5(4): 1075-1081.
- Leitao, N.C. 2010. Does trade help to explain tourism demand? the case of Portugal. *Theoretical and Applied Economics* 17(3): 63-74.
- Lim, C. 1997. Review of international tourism demand models. *Annals of Tourism Research* 24(4): 835-849.
- Lorde, T., Li, G. & Airey, D. 2015. Modeling Caribbean tourism demand: an augmented gravity approach. *Journal of Travel Research* 1-11.
- Mamertino, M. & Sinclair, T.M. 2019. Migration and online job search: a gravity model approach. *Economics Letters* 181: 51-53.
- Martin, C.A. & Witt, S.F. 1988. Substitute prices in models of tourism demand. *Annals of Tourism Research* 15: 255-268.
- Mayer, T. & Zignago, S. 2011. *Notes on CEPII's distances measures: The GeoDist database*. CEPII Working Paper Series No. 2011-25.
- McCallum, J. 1995. National borders matter: Anada-U.S. regional trade patterns. *The American Economic Review* 85(3): 615-623.
- Morley, C., Rossello, J. & Maria, S.G. 2014. Gravity models for tourism demand: theory and use. *Annals of Tourism Research* 48: 1-10.
- Morley, C.L. 1992. A microeconomic theory of international tourism demand. *Annals of Tourism Research* 19: 250-267.
- Mosikari, T.J., Nthebe, T.C. & Eita, J. H. 2019. Does corruption hamper inward fdi in South Africa from other African countries? a gravity model analysis. *International Economics* 72(4): 513-532.
- Peng, B., Song, H., Crouch, G.I. & Witt, S.F. 2015. A meta-analysis of international tourism demand elasticities. *Journal of Travel Research* 54(5): 611-633.
- Priego, F.J., Rossello, J. & Maria, S.G. 2015. The impact of climate change on domestic tourism: a gravity model for Spain. *Regional Environment Change* 15(2): 291-300.
- Puah, C.H., Huan, S.H. & Thien, F.T. 2018. Determinants of Chinese demand for tourism in Malaysia. *Business and Economic Horizons* (14)3: 501-512.
- Puah, C.H., Thien, F.T. & Arip, M.A. 2014. Singaporean demand for tourism in Malaysia. *Economics Annals-XXI* 11-12: 32-36.
- Rose, A.K. 2000. One money, one market: estimating the effect of common currencies on trade. *Economic Policy* 15(30): 9-45.
- Sabah State Government. 2016. About Sabah. <http://www.sabah.gov.my/main/en/Home/About> (accessed 15 March 2018).
- Sabah Tourism Board. 2019. Tourism statistics. <https://www.sabahtourism.com/statistics/> (accessed 21 February 2020).
- Sabah Tourism Board. 2018. About Sabah. Retrieved from <http://sabahtourism.com/essentials/about-sabah> (accessed 15 March 2018).
- Salleh, N.H.M., Othman R., Idris, S.H.M., Halim, S.A., Shukor, M.S., Yussof, I., Samsudin, M. & Omar, M. 2014. Development of tourism industry and its impact on Langkawi Island community. *Jurnal Ekonomi Malaysia* 48(2): 71-82.
- Seetaram, N., Forsyth, P. & Dwyer, L. 2016. Measuring price elasticities of demand for outbound tourism using competitiveness indices. *Annals of Tourism Research* 56: 65-79.
- Sharma, C. & Pal, D. 2019. Exchange rate volatility and tourism demand in India: unraveling the asymmetric relationship. *Journal of Travel Research*. <https://journals.sagepub.com/doi/full/10.1177/0047287519878516> (accessed 5 February 2020).
- Smeral, E. & Weber, A. 2010. Forecasting international tourism trends to 2010. *Annals of Tourism Research* 27(4): 982-1006.
- Song, H., & Li, G. 2008. Tourism demand modeling and forecasting - a review of recent research. *Tourism Management* 29: 203-220.
- Song, H., Dwyer, L., Li, G., & Cao, Z. 2012. Tourism economics research: A review and assessment. *Annals of Tourism Research*, 39(3): 1653-1682.
- Song, H., Li, G., Witt, S.F. & Fei, B. 2010. Tourism demand modelling and forecasting: how should demand be measured? *Tourism Economics* 16: 63-81.
- Syriopoulos, T.C. & Sinclair, M.T. 1993. An econometric study of tourism demand: the aids model of US and European tourism in Mediterranean countries. *Applied Economics* 25: 1541-1552.
- Tanjung, A.F., Thien, F.T., Puah, C.H., Brahmana, R.K. & Sianturi, R.H. 2017. Macroeconomic determinants of Indonesian tourism demand in Malaysia. *Advanced Science Letters* 23(4): 3155-3158.
- Thien, F.T., Puah, C.H., Hassan, M.K. & Arip, M. A. 2015. An ecm analysis of Thai tourism demand in Malaysia. *Mediterranean Journal of Social Sciences* 6(3): 162-168.
- Tinbergen, J. 1962. *Shaping the world economy: suggestions for an international economic policy*. New York: The Twentieth Century Fund.
- Tsui, W.H.K., Gilbey, A. & Balli, H.O. 2014. Estimating airport efficiency of New Zealand airports. *Journal of Air Transport Management* 35: 78-86.
- Vita, G.D. & Kyaw, K.S. 2013. Role of the exchange rate in tourism demand. *Annals of Tourism Research* 43: 624-650.
- Witt, S.F., Song, H. & Anhill, S.W. 2004. Forecasting tourism generated employment: the case of Denmark. *Tourism Economics* 10(2): 167-176.
- Xu, L., Wang, S., Li, J., Tang, L. & Shao, Y. 2020. Modelling international tourism flows to China: a panel data analysis with the gravity model. *Tourism Economics* 25(7): 1047-1069.
- Yazdi, S.K. & Khanalizadeh, B. 2016. Tourism demand: a panel data approach. *Current Issues in Tourism* 20(8): 787-800.

Meng-Chang Jong
 Faculty of Economics and Business
 Universiti Malaysia Sarawak
 94300 Kota Samarahan Sarawak
 MALAYSIA
 E-mail: jmengchang1130@gmail.com

Chin-Hong Puah*
Faculty of Economics and Business
Universiti Malaysia Sarawak
94300 Kota Samarahan Sarawak
MALAYSIA
E-mail: chpuah@unimas.my

Mohammad Affendy Arip
Faculty of Economics and Business
Universiti Malaysia Sarawak
94300 Kota Samarahan Sarawak
MALAYSIA
E-mail: amaffendy@unimas.my

* Corresponding author