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The Application of the Gravity Model to the Tourism Industry of the Philippines and Select Neighboring Countries

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Abstract: This study uses a modified version of the gravity model in examining the bilateral flow of tourist arrivals in the Philippines and its neighbouring ASEAN countries (Singapore, Malaysia, and Brunei). This study compares and explains the factors and pattern of tourism activities of the selected countries with their respective partner countries by looking at tourism and cultural variables that may contribute to certain tourism patterns. Among several tested variables, the results show that language (official and minority), visa policy, and availability of direct flights explain tourism flows across all selected countries. This may suggest that governments may use a wider variety of languages in their tourism campaigns and marketing collaterals. The easing of a country's visa policy is also highly encouraged as this can stimulate international tourist arrivals. It is also important to equip the tourism industry with direct flights as this proves to be an important factor in attracting tourism arrivals.

Keywords: Tourism, gravity model, culture, tourist arrivals

1 Introduction

The tourism industry is critical to emerging countries' economic progress. Tourism contributes to local infrastructure development while also increasing business and job prospects. The tourism industry accounts for a significant part of the global GDP. To quantify this, according to the World Travel and Tourism Council (WTTC), the contribution of the world's tourism activities in 2019 accounts for 10.4% of the world's GDP. However, because of the worldwide travel restrictions caused by the COVID-19 lockdowns, tourism's GDP contribution has significantly declined to 5.5% in 2020. The total travel and tourism global GDP change in 2020 is at -49%, while the global economy GDP change is 3%. Now, the tourism industry's revival is of utmost importance given the recent gradual resumption of tourism activities in most economies. It is then vital to understand how certain tourism variables impact international arrivals to stimulate the industry.

The gravity model (GM) has been traditionally applied in international economics primarily to bilateral trade between countries. Since then, it has been used in various modes of bilateral flow, not just in trade. For example, Poot et al. (2016) utilize the GM in migration and the labor market, while Qian and Han (2009) use the GM in transportation network, based on optimal expected traffic. It is even utilized in retail and consumer marketing (refer to Bucklin, 1971). In tourism, there is a multitude of research done that looks into international arrivals (refer to Section 2.1).

This study looks into the use of GM in bilateral tourism flow, specifically in international tourist arrivals. This study uses the GM framework to compare and contrast the bilateral tourism flows of the Philippines and three other neighboring countries, namely: Singapore, Malaysia, and Brunei. These three neighboring countries were specifically selected due to their geographic proximity to the Philippines as well as their inclusion in the Association of Southeast Asian Nations.

Guided by related literature, GDP of both origin and destination countries is used as a control variable. Data for these are drawn from the IMF's World Economic Outlook (WEO) database. The traditional GM variables such as bilateral distance between countries, official and minority languages, colonial history, and geographical contiguity are taken from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII[1]) database, as presented in Mayer and Zignago (2006). The bilateral distance between countries is measured as the great-circle distance in kilometers between the capital cities of each country pair (Mayer & Zignago, 2006). Binary variables for the CEPII variables (language, colonial history, and contiguity) are assigned a value of 1 if a country pair share a common official language, a colonial tie, and an adjacent border and a value of 0, otherwise. Binary variables

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[1] Learn more about CEPII variables from http://www.cepii.fr/CEPII/en/cepii/cepii.asp

accessed from the CEPII database are assigned a value of 1 if a country pair share a common language, historical colonial ties, and share an adjacent border. Otherwise, the variable will be assigned a value of 0.

This study augments the basic GM by adding cultural variables from the CEPII database (such as official language, minority language, contiguous, colonial links, and colonizer variables), Worldwide Governance Indicators (WGI), ease of travel variables such as a country's visa policy and access to direct flight connectivity, and the impact of the 2008 financial crisis and the 2003 SARS outbreak (as an industry shock). The inclusion of nontraditional GM variables forms an extended version that exercises the elegance of the theoretical underpinning of the basic GM. The exercise of extending the use of the GM to other forms of bilateral flows, other than the traditionally used trade, is the paper's theoretical contribution.

The study hopes to reaffirm both the flexibility and elegance of the gravity model in its application to the tourism industry specifically affecting international arrivals in the Philippines and select neighboring countries. This study seeks to answer the question: Which variables, used in the augmented GM, are the best determinants of tourism success? The following study uses the Gravity Model to evaluate.

This study's importance comes to light when one draws from its results some policy implications on how policymakers can further encourage tourist participation to stimulate tourism volume by considering the specific factors that affect tourism behavior. Through this, opportunities for economic growth are widened, given the highly open nature of the Philippines. Knowledge of factors other than distance and size can allow appropriate targeting of the tourism industry where these factors are most important.

2 The Gravity Model Theory

Newton's law of universal gravitation has inspired the GM wherein the formula is computed using the force of attraction between two bodies to their masses and distance:

$$F = G\left(\frac{m_1 m_2}{D^2}\right)$$

where F is the force of attraction between the bodies, D is the distance between them, G is a constant, and m_1 and m_2 are the masses of the two bodies (Stay & Kulkarni, 2015). Intuitively, this represents the greater force of attraction among larger masses, while there is less attraction among more distant entities. The elegance of this model is primarily because of the model's ability in describing one of the most stable relationships in economics—that interaction between large economic clusters is stronger than that between smaller ones and that nearby clusters attract each other more than the far-off ones (Rahnema, 2020, p. 1). Van Bergeijk and Brakan (2010, p. 1) explain how simple yet effective this concept is from an empirical point of view and show that a gravity equation can empirically explain several economic phenomena between different locations.

This intuitive relationship can be directly related to the GM in tourism flows, with the origin and destination countries considered as the *planets*, the number of tourism arrivals among those countries as the *gravitational force* depending on the GDPs of the two countries (similar to the economic mass of a country) and their geographical distance. Simply put, the greater the GDP (mass) between the two countries (planets), the greater the tourism flow (gravitational force) (Stay & Kulkarni, 2015).

2.1 The Model

The basic GM is described in this paper as a conventional technique for analyzing bilateral flows between economies, which has traditionally been utilized in trade studies. This gravitational equation can be considered a model representing the degree of spatial interaction between two or more points, similar to a physical phenomenon. Similar to Newton's law of universal gravitation, distance variables are an important element of GM (Krugman et al., 2015). The GM model is defined by Krugman et al. (2015) as the proportionate value to the product of the two nations' GDP, which decreases as the distance between the two countries increases. Using Newton's law of universal gravitation as inspiration, this equation shows an *ideal* volume between two countries:

$$T_{ij} = A \cdot Y_i \cdot \left(\frac{Y_i}{D_{ij}}\right) \quad (1)$$

where T_{ij} is the value of bilateral flow between countries i and j, A is a constant term, Y is the country's GDP, and D is the distance between the two countries (Krugman et al., 2015, p. 44). The two elements that determine the volume of tourism arrivals are the size of the countries' GDPs and the distance between them, as shown in equation (1) (Krugman et al., 2015, p. 45). Intuitively, larger economies travel more because they have more income, attracting large portions of other countries' spending.

The traditional GM is easily estimated using a log-linear specification of equation (1); that is, the econometric specification that OLS can estimate is as follows:

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln q_i + \alpha_2 \ln q_j + \alpha_3 \ln d_{ij} + \varepsilon_{ij} \quad (2)$$

For estimating the parameters and constant for the GM, a variety of regression approaches can be used. The OLS is the simplest approach and can be used after obtaining the natural logarithm of equation (2) (Buys et al., 2006). However, as Santos Silva and Tenreyro (2006) point out, this estimating technique has flaws. First, log-linearization eliminates zero-trade pairings, reducing the number of observations in a shortened sample. Second, trade data is intrinsically heteroscedastic, resulting in conflicting findings when using OLS to estimate a log-linearized equation (Rahnema, 2020). The explanatory variables will be correlated with the errors emerging from the altered equation estimations. Because of these issues, nonlinear least squares (NLS) estimate approach is required. Third, they claim that economic relationships do not need to be perfect; instead, they simply need to hold on average. In this case, Santos Silva and Tenreyro (2006) suggest using Poisson regression. For a discussion of the regression method, see Rahnema (2020).

Several methods can be used to test the tourism demand. Borhan and Arsad (2016, Abstract) have used the autoregressive distributed lag (ARDL) bounds testing approach to investigate the dynamic long-run and short-run relationship between the number of international tourist arrivals from six European countries and four selected economic variables. The economic variables used in their study are exchange rate, gross domestic product, relative price, and substitute relative price. The results of their study show that the number of international tourist arrivals and exchange rate, level of income, and relative price are found to have positive impact on the number of arrivals to Malaysia. Another way to test the tourism demand hypothesis is by using structural equation modelling (SEM) to tourism demand. The study done by Turner and Witt (2001) uses SEM in examining inbound tourism flows to New Zealand. The empirical results from their study show that international trade plays the major role in influencing business tourism demand, retail sales are the major influence on the demand for foreign holidays, and new private car registrations are the major determinant of tourism demand. Other commonly used methods for testing tourism demand are the Ordinary Least Squares (OLS) and Poisson regressions.

Several studies have analyzed factors influencing tourism demand to provide policy levers for government interventions. A meta-analysis done by Crouch (1994) shows that for tourism demand, there is a significant number of independent variables to consider, depending on criteria such as the origin and destination countries, the sample size and frequency, etc. Hence, specific variables must be tested on the different origin and destination countries to see which are significant to their tourism flow. Durbarry (2000) has studied tourism arrivals for the United Kingdom using a gravity framework. His findings reveal that various factors influence tourism expenditure, including costs in rival destinations and exchange rates. Following a gravity approach, Khadaroo and Seetanah (2008) examine panel data of bilateral tourist flows across 28 countries, revealing that transportation infrastructure is a significant factor in tourism flows. A gravity model on the tourism flow of Turkey by Eryiğit et al. (2010, Abstract) confirms the statistical significance of population, distance, GDP per capita, tourism price index, bilateral trade volume, tourism climate index, and "earthquake," contiguity, and crisis (terrorism) dummies. Adeola et al. (2018, Abstract) also use the Poisson regression to find significant drivers of international tourism in Africa. Their results show that taste formation, real exchange rate, infrastructure, political stability and absence of violence, per capita income, FDI, and trade openness are all significant drivers of international tourism into Africa. Goeldner and Ritchie

(2009, p. 363-364) observe tourism demand to be directly related to the person's propensity to travel that can be reflected in their country's GDP or GDP per capita, which signifies their income, showing the capability of visitors to travel either domestically or internationally, and inversely related to the resistance of the link between origin and destination areas (e.g., economic distance, cultural distance, cost of tourism commodities, quality of tourism products, effectiveness of advertising, and seasonality). Den Butter et al. (2014) analyze the impact of the socio-economic and geographical factors on international tourism demand in Greece over 2001 to 2010. The gravity model estimations confirm the important role of distance, trade, income, and political stability. The study of Malaj (2020, p. 152) shows that international tourist arrivals to Albania are positively related to GDPs per capita, total infrastructure investments, political stability and absence of violence/terrorism, and the existence of common borders. In a worldwide perspective, the study of Eugenio-Martin et al. (2018, Abstract) shows that economic development matters and makes a difference to tourists' decision making. Their subsample analysis shows that in countries with high GDP levels, differences in economic development are not significant, whereas in developing countries, they are.

Similar to some studies mentioned above, this paper utilizes GDP, distance, governance and crisis variables (in place of political stability and terrorism), ease of travel, and other noneconomic variables from the CEPII database.

3 Country Tourism Statistics

According to the WTTC, the tourism industry has contributed to 11.1% of Singapore's total GDP in 2019. However, this has sharply decreased by 6.4% in 2020. The travel and tourism GDP change is at -60% versus its -5.5% real economy GDP change. The decrease in international visitors spending amounts to 19.3 billion USD (decline of 74.4%) from 2019. This decline is supported by the evident decline in visitor arrivals starting the first quarter of year 2020. Figure 1 shows the historical trend of international visitor arrivals[2] in Singapore from years 2000 to 2020. Another sharp decline seen in international arrivals for year 2003 was due to the SARS outbreak in the region.

Figure 1. Historical trend of international arrivals in Singapore (1978-2020)

Source: Singapore Tourism Board, n.d.

Likewise, this is also the case for Malaysia, wherein while the tourism sector has contributed to 11.7% of Malaysia's GDP back in 2019, it has decreased in 2020 to only 5.2% contribution to GDP. Malaysia's travel and tourism GDP change is at -58% versus its -5.6% real economy GDP change, while the decrease in international visitors spending amounts to 18 billion USD (decline of 84%) from 2019. Figure 2 shows the historical trend of international visitor arrivals in Malaysia from years 2000 to

[2] Data for international visitor arrivals are compiled from SG Arrival Cards completed by all visitors arriving in Singapore at the points of entry.

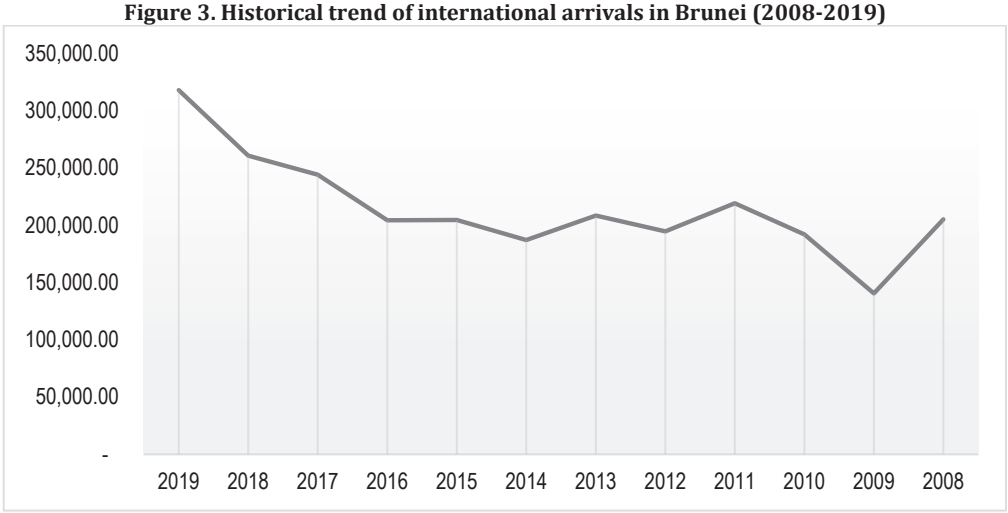
2020. Aside from the 2020 decline in arrivals, the SARS outbreak has also caused a decline in arrivals for year 2003 for Malaysia.

Figure 2. Historical trend of international arrivals in Malaysia (2000-2020)

Source: Tourism Malaysia, n.d.

On the other hand, Brunei's tourism sector has contributed to 5.6% of its 2019 GDP and only slightly decreased in 2020 to 4.1%. The change in travel and tourism GDP is at -26.8% versus its -1.2% real economy GDP change. The decrease in international visitors spending amounts to 105 million USD (decline of 74.4%) from 2019. Figure 3 shows the historical trend of international visitor arrivals in Brunei from years 2008 to 2019. Comparing the three countries, it is noticed that Singapore and Malaysia's decline in tourism contribution-to-GDP halved from 2019 to 2020 while Brunei's decline was less. It shows that compared to Brunei, Singapore and Malaysia have a bigger dependency on the tourism sector.

Figure 3. Historical trend of international arrivals in Brunei (2008-2019)

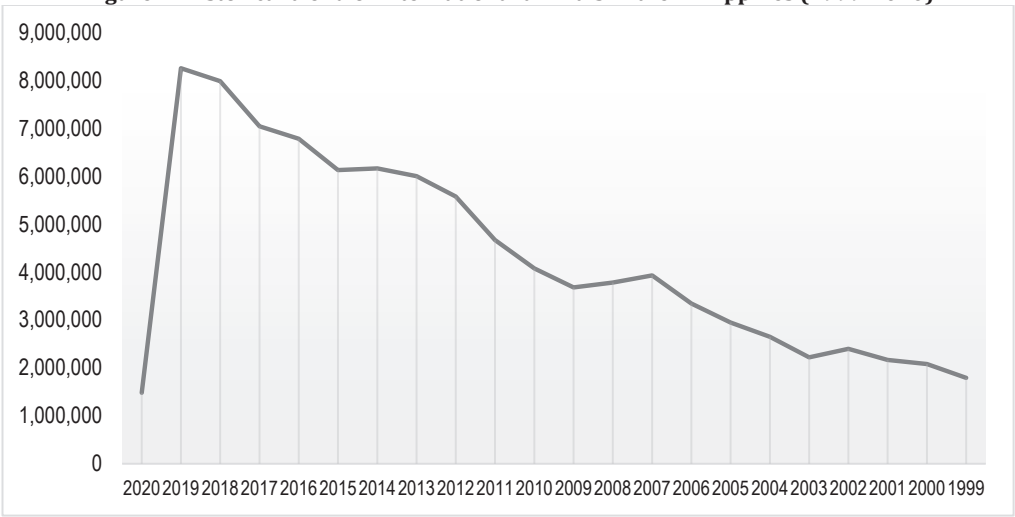


Source: Ministry of Primary Resources and Tourism, Brunei, (n.d.)

The Philippines' total contribution of travel and tourism to GDP is 22.5% as of 2019 and has decreased to 14.6% come 2020. The change in travel and tourism GDP is at -41.4% compared to the decline of 9.5% real economy GDP. This decline in the contribution of tourism to GDP is evident with the sharp decrease of international arrivals for 2020 as seen in Figure 4. Meanwhile, the 2019 total contribution of travel and tourism to total employment is at 22.8%, which then declined to 19.2% come 2020. The decline of 21.1% in employment is caused by the significant decrease in tourist arrivals

(Figure 4), resulting in many foreclosed tourism businesses. The change in international visitor spending is at -78.8% in 2020, while domestic visitor spending is at -35.5%. The tourism industry's contribution to the Philippines' GDP is much larger than that of Singapore, Malaysia, and Brunei. However, the decline caused by the suppressed tourism activities in 2020 has a similar trend as of Singapore and Malaysia. It can be said that the GDP of the Philippines also has a strong dependency to the tourism sector.

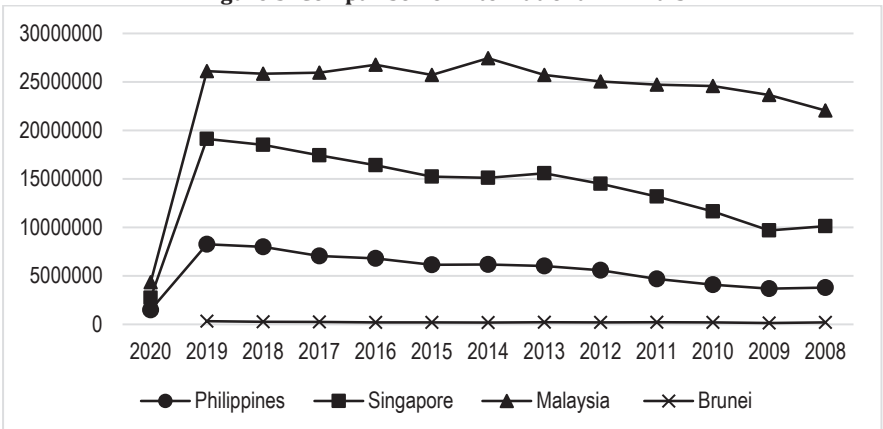
Figure 4. Historical trend of international arrivals in the Philippines (1999-2020)



Source: Department of Tourism (n.d.)

Contrasting the four selected countries, it is observed that Malaysia has the greatest number of international arrivals across the four selected countries, followed by Singapore, then the Philippines, and, lastly, Brunei. The drop in arrivals in the year 2020, for all four countries, has constituted only 16% of the arrivals for year 2019. The total decline of about 74% for the year 2020 has been caused by the restriction in air movement following the international COVID-19 lockdown policies. Aside from the decline in the year 2020, Figure 5 also shows a decline for the years 2008 and 2009. The Asian financial crisis in years 2008 to 2009 could have affected the drop in international arrivals while the COVID pandemic could have caused the sharp decline in the international arrivals for the year 2020.

Figure 5: Comparison of International Arrivals



Sources: Department of Tourism (n.d.); Singapore Tourism Board (n.d.); Tourism Malaysia, (n.d.); Ministry of Primary Resources and Tourism, Brunei (n.d.)

4 Methodology and Data Requirements

The basic GM is modified to analyze tourism in the Philippines and selected countries. The GDPs of both origin and destination countries, used as a control variable, are collected from the IMF's WEO database, while data for tourist arrivals are generated using per-country outbound tourism files accessed via World Tourism Organization's Yearbook of Tourism Statistics, Compendium of Tourism Statistics, and data files.

The model includes tourism factors that may have influenced the international flow pattern of several origin countries to Singapore, Malaysia, Brunei, and the Philippines. The model for Singapore has 42 origin countries with bilateral data from 1978 to 2019, while the model for Malaysia has 39 origin countries with bilateral data from 1997 to 2019. Due to data limitations for Brunei's model, it only has 19 origin countries with bilateral data from 2008 to 2019. The Philippine model has a wider set with 120 origin countries from 1995 to 2019.

Distance in kilometers (KM), which proxies for trade costs in traditional gravity models, is retrieved from the CEPII distance measures. The distance variable is in the form of a simple distance measure. Only one city is necessary to calculate international distances, that is, from the capital of both countries in kilometers (Mayer & Zignago, 2006, p. 10). The distance variable may consider transport technology but does not change radically because of this. GDP and distance account for the traditional GM variables. The other factors represent the tourism dummy variables.

The traditional model states that the larger the economic mass or GDP of countries, the more flow is expected between them. It also shows a negative relationship between distance and flow since the greater the distance between countries, the fewer transactions between them. At the same time, the extended model focuses on the analysis of the effects of tourism variables such as traditional CEPII variables (official language, minority language, contiguous, colonial links, and colonizer), governance indicators, connectivity indicators such as visa-free policy and direct flight availability, the 2008 Asian financial crisis, and the 2003 SARS outbreak.

The CEPII file provides a dataset with several variables (based on the CIA World Factbook) that identify for each country up to four long-term and up to three short-term colonizers in the country's whole history (Mayer & Zignago, 2006, p. 8). The database provides the other bilateral data aside from the simple distance variable used for this gravity model, which are the following: (1) Official or national languages and languages spoken by at least 20% of the population of the country (COMLANG_OFF) and the minority language (COMLANG_ETHNO) if language is spoken by at least 9% of the population in both countries, (2) contiguous variable to indicate whether the two countries are contiguous and share the same border (CONTIGUOUS), (3) have had a common colonizer after 1945 (COLONIZER), (4) have ever had a colonial link (COLONY), and (5) have had a colonial relationship after 1945 (COL45) (Mayer & Zignago, 2006, p. 12). Several language variables describe different indices of linguistic proximity. There may be up to three official languages for each country, the languages spoken by more than 20% of the population and those spoken by a segment of 9% to 20% of the population) (Mayer & Zignago, 2006, p. 9). Economists also often use colonial linkage variables to proxy for similarities in cultural, political, or legal institutions (Mayer & Zignago, 2006, p. 8).

The Worldwide Governance Indicators reports aggregate and individual governance indicators over the period 1996 to 2018, for six dimensions of governance: (1) Voice and Accountability, (2) Political Stability and Absence of Violence, (3) Government Effectiveness, (4) Regulatory Quality, (5) Rule of Law, and (6) Control of Corruption (World Bank, n.d., para. 1). Singapore tops most dimensions of governance except for voice and quality. These aggregate indicators combine the views of many enterprises, citizens, and expert survey respondents in industrial and developing countries (World Bank, n.d., para. 2).

Connectivity indicators are composed of (1) visa policy and (2) the availability of direct flights to any international airport in the country of destination. The visa policy variable signifies visa-free access to the country and does not include electronic visas. These visa policies are manually sourced online through individual websites of the origin countries. At the same time, the data for the availability of direct flights is sourced manually through www.skyscanner.com.

Year-dummies for years 2003 and 2008 to 2009 have been included in the augmented GM to see if these may have impacted tourism arrivals for the selected countries. Tourist arrivals in year 2003 has shown significant decline (refer to Section 3) because of the 2003 SARS outbreak, while the global

financial crisis of 2008 to 2009 had a significant impact on the global economy. These crisis variables are added to the model to test if there is an impact on tourism arrivals for Singapore, Malaysia, Brunei, and the Philippines.

This study uses a Poisson regression method proposed by Silva and Tenreyro (2006). It is also used widely by other researchers (see, for example, Spring & Grossmann, 2013; Lee, 2013; Beronilla et al., 2016). It is interesting to note that most of the articles about GM use Poisson regression, which is estimated using quasi-maximum likelihood estimators. It is important to emphasize that the dependent variable data used in these models remains unspecified and does not consider the distribution required for Poisson regression. However, as Verbeek (2017) highlights, consistent estimation of conditional means can be done without the need to report conditional distributions since the Poisson distribution is not valid in these models, the Poisson-pseudo-maximum likelihood (PPML) estimator, as Santos Silva and Tenreyro (2006) suggest.

In this study, the model used is modified to include other factors influencing international tourism arrival activities. The extended model analyzes the effects of cultural variables and other cultural similarities or dissimilarities between visiting partners in the appreciation of possible policy creation related to the cultural symmetries of tourists. The model specified also includes control variables that account for region-specific or country-specific factors and other factors that may hinder or facilitate international tourism flows. The equation below is the study's general hypothesis and main equation:

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln q_i + \alpha_2 \ln q_j + \alpha_3 \ln dist_{ij} + \alpha_4 Connectivity_{ij} + \alpha_5 Contiguous_{ij} + \alpha_6 LangOff_{ij} + \alpha_7 LangMin_{\mathrm{ij}} + \alpha_8 Colony_{\mathrm{ij}} + \alpha_9 Colonizer_{\mathrm{ij}} + \alpha_{10} Col45_{\mathrm{ij}} + \alpha_{11} Governance_{\mathrm{j}} + \alpha_{12} Visa_{ij} + \alpha_{13} Crisis_{ij} + \varepsilon_{ij}$$

The list of variables is tabulated below:

Table 1. List of Variables

Variable	Description
T_{ij}	Tourism arrival data of country *i* with country *j*
q_i	Annual GDP data for country *i*
q_j	Annual GDP data for country *j*
$dist_{ij}$	Distance in kilometers between countries *i* and *j*
$Contiguous_{ij}$	Shared border of countries *i* and *j*
$LangOff_{ij}$	common official language
$LangMin_{ij}$	A second language is spoken by at least 9% of the population
$Colony_{ij}$	Common Colonial link
$Colonizer_{ij}$	Common colonizer after 1945
$Col45_{ij}$	Has colonial relationship after 1945
$Governance_j$	Governance indicators of the destination country
$Connectivity_{ij}$	Availability of direct flights to any international airports in the destination country
$Visa_{ij}$	Visa-free policy of country i to country j
$Crisis_{ij}$	Asian Financial crisis for years 2008-2009
ε_{ij}	Error term

5 Empirical Results

5.1 Singapore

The results for the regression for Singapore's tourism GM are seen in Tables 2 to 5. Table 2 shows that the GDP of the origin country is significant to tourism flows while the GDP of the destination country, Singapore, is not significant to the tourism flow. This means that the flow of tourists can be determined by the economic power of the country of origin. This is intuitive since travelers from a

country with greater GDP have more spending power. Distance is consistently significant and negatively signed in relationship to the tourism flow, which is expected from the model. The farther you are from the destination country, the less likely you are to travel to that destination, given the higher cost of travel.

Table 2. Tourism model with CEPII Variables

	(1) TOURISM	(2) TOURISM	(3) TOURISM	(4) TOURISM	(5) TOURISM
GDP Origin	0.0710***	0.0714***	0.0722***	0.0721***	0.0721***
	(0.00162)	(0.00171)	(0.00171)	(0.00180)	(0.00180)
GDP Destination	0.00176	0.00177	-0.000269	-0.000255	-0.000255
	(0.00345)	(0.00343)	(0.00344)	(0.00340)	(0.00340)
DISTANCE	-0.134***	-0.128***	-0.128***	-0.128***	-0.128***
	(0.00352)	(0.00340)	(0.00344)	(0.00370)	(0.00370)
Official Language		0.0522***	0.0409***	0.0411***	0.0411***
		(0.00569)	(0.00555)	(0.00586)	(0.00586)
Minority Language		-0.00607	-0.0137*	-0.0137*	-0.0137*
		(0.00544)	(0.00545)	(0.00531)	(0.00531)
Contiguous			0.142***	0.142***	0.142***
			(0.00677)	(0.00737)	(0.00737)
Colonizer				-0.000502	-0.000502
				(0.00667)	(0.00667)
Constant	2.662***	2.595***	2.612***	2.613***	2.613***
	(0.0529)	(0.0540)	(0.0543)	(0.0599)	(0.0599)
Observations	1327	1327	1327	1327	1327
R2	0.635	0.651	0.670	0.670	0.670

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

As for the other CEPII dummy variables, only Singapore's official language and contiguity are significant to international arrivals. This means that knowing any of the four official languages in Singapore (English, Malay, Tamil, and Mandarin) will likely influence your travel to Singapore. Countries contiguous to Singapore (such as Malaysia and Indonesia) will also likely influence travel to Singapore since contiguity is significant to the tourism model.

Table 3 includes the governance index variable to the model. The table shows that the governance variables do not show significance to the tourism gravity model. It may be because Singapore, as a tourism destination, has ever since held a good governance image and has not been tagged as unsafe or problematic.

Table 3. Tourism model with Governance Index Variables

	(1) TOURISM	(2) TOURISM
GDP Origin	0.0710***	0.0711***
	(0.00162)	(0.00178)
GDP Destination	0.00176	-0.000564
	(0.00345)	(0.00880)
DISTANCE	-0.134***	-0.143***
	(0.00352)	(0.00377)
Governance		0.0114
		(0.00743)
Constant	2.662***	2.759***
	(0.0529)	(0.113)
Observations	1327	706
R2	0.635	0.658

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 4 integrates two ease of travel variables to the tourism GM. A variable used as a proxy for the ease of travel is the availability of direct flights, while the other indicator is the visa policy for non-Singaporeans. Both variables are significant and positively signed for the tourism model. This means

that having a direct flight to Singapore will influence travel to the country. Likewise, having a lenient visa policy, such as visa-free access, will positively influence travel to a destination.

Table 4. Tourism model with Connectivity Variables

	(1) TOURISM	(2) TOURISM	(3) TOURISM
GDP Origin	0.0710*** (0.00162)	0.0638*** (0.00676)	0.0597*** (0.00600)
GDP Destination	0.00176 (0.00345)	-1.079 (3.904)	3.392 (3.436)
DISTANCE	-0.134*** (0.00352)	-0.109*** (0.0144)	-0.113*** (0.0140)
Direct Flights		0.0660* (0.0286)	0.0610** (0.0209)
VISA POLICY			0.166*** (0.0365)
Constant	2.662*** (0.0529)	16.69 (51.22)	-42.09 (45.07)
Observations	1327	40	40
R2	0.635	0.747	0.851

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Lastly, Table 5 shows how the 2003 SARS outbreak and the 2008 financial crisis impact the tourism arrivals of Singapore. The results show that the neither the SARS outbreak nor the financial crisis has significance to the tourism arrivals in Singapore for the years 2003, 2008, and 2009.

Table 5. Tourism model with Financial Crisis Variable

	(1) TOURISM	(2) TOURISM
GDP PARTNER COUNTRY	0.0710*** (0.00162)	0.0711*** (0.00161)
GDP SINGAPORE	0.00176 (0.00345)	0.00234 (0.00346)
DISTANCE	-0.134*** (0.00352)	-0.135*** (0.00353)
2008FinCrisis		-0.0144 (0.00961)
2003SARS		-0.0283 (0.0159)
Constant	2.662*** (0.0529)	2.659*** (0.0530)
Observations	1327	1327
R2	0.635	0.636

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

5.2 Malaysia

The results for the regression for Malaysia's tourism gravity model are seen in Tables 6 to 10. Table 6 shows the basic gravity variables, economic mass, and distance in tourism arrivals data. In column 1, the tourism arrivals gravity equation shows that the basic variables (GDP of both Malaysia and origin countries) are all significant and correctly signed. This means that the economic capacity of both the origin and destination country, Malaysia, plays a significant factor in their tourism arrivals. There then seems to be a preference for richer countries rather than less rich countries. Distance, however, has a negative relationship with tourism arrivals signifying preference for a shorter distance rather than longer distance in tourism arrival activities of Malaysia. These results comply with the basic premise of the GM.

Table 6. Basic Model for Tourism, Export and Total Trade data

	(1) TOURISM
GDP Destination	0.0446*** (0.00592)
GDP Origin	0.0634*** (0.00279)
Distance	-0.156*** (0.00269)
Constant	0.890*** (0.154)
Observations	888
R2	0.725

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 7 shows the GM for tourism arrivals, including noneconomic/cultural variables found in the CEPII database. The table shows the tourism regression results that indicate significance in tourism arrivals for certain cultural factors such as languages, contiguity, and colony. This signifies that having the same official language, minority language, the same border with Malaysia, and the same colonial ties are all significant factors of tourism arrivals in Malaysia.

Table 7. Tourism model with CEPII variables

	(1) TOURISM	(2) TOURISM	(3) TOURISM
GDP Destination	0.0446*** (0.00592)	0.0486*** (0.00563)	0.0510*** (0.00490)
GDP Origin	0.0634*** (0.00279)	0.0586*** (0.00256)	0.0559*** (0.00222)
Distance	-0.156*** (0.00269)	-0.128*** (0.00502)	-0.105*** (0.00613)
Official Language		0.0640*** (0.0118)	0.117*** (0.0117)
Minority Language		0.0553*** (0.0106)	-0.0340*** (0.00999)
Contiguous			0.134*** (0.0130)
Colonizer			-0.0157 (0.00914)
Colony			0.125*** (0.00588)
Constant	0.890*** (0.154)	0.662*** (0.154)	0.464** (0.147)
Observations	888	888	888
R2	0.725	0.748	0.789

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Malaysia's governance indices are also some factors tested to see if they impact tourism arrivals. Table 8 incorporates Malaysia's governance index to tourism arrivals in the gravity model. The governance indices show no significance to tourism arrivals in Malaysia.

Table 8. Tourism model with Governance Index Variables

	(1) TOURISM	(2) TOURISM
GDP Destination	0.0446*** (0.00592)	0.0511* (0.0241)
GDP Origin	0.0634*** (0.00279)	0.0620*** (0.00292)
Distance	-0.156*** (0.00269)	-0.157*** (0.00281)
Corruption		-0.0409 (0.0212)
Human development index		-0.224 (0.374)
Constant	0.890*** (0.154)	0.943* (0.370)
Observations	888	738
R2	0.725	0.731

Note: Standard errors in parentheses; *p < 0.05, **p < 0.01, ***p < 0.001

Intuition dictates that tourism arrivals are also affected by a country's ease of visa policy and the availability of direct flights. These are tested using the connectivity and visa policy variables. The connectivity variable only considers direct international flights from origin to any Malaysian airport. The visa policy variable is a visa-free policy that assumes the ease of entry to any Malaysian airport. As seen in Table 9, both connectivity and visa policy variables are highly significant to Malaysia's tourism arrivals.

Table 9. Tourism model with Connectivity and Visa Policy Variables

	(1) TOURISM	(2) TOURISM
GDP Destination	0.0446*** (0.00592)	0.0453*** (0.00583)
GDP Origin	0.0634*** (0.00279)	0.0628*** (0.00283)
Distance	-0.156*** (0.00269)	-0.144*** (0.00388)
Direct Flights		0.0356*** (0.00801)
VISA POLICY		0.0385*** (0.00744)
Constant	0.890*** (0.154)	0.736*** (0.152)
Observations	888	888
R2	0.725	0.735

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 10 includes the 2003 SARS outbreak and the Asian financial crisis variable for 2008 to 2009 affecting Malaysia and other partner economies. Only the Asian financial crisis is shown to affect tourism arrivals, as seen in Table 10. A possible reason could be related to the study conducted by Purwomarwanto and Ramachandran (2015, Abstract) wherein results show that the Malaysian tourism was significantly affected by the financial crisis evidenced by the dip in performance of the tourism sector in terms of the number of arrivals and hotel occupancy rate for the year 2009. This could have been largely affected by the strong real effective exchange rate which makes price less competitive from a tourist's perspective. However, the study also suggests that the Malaysian tourism industry has resiliently recovered by 2010.

Table 10. Tourism model with Financial Crisis Variable

	(1) TOURISM	(2) TOURISM
GDP Destination	0.0446***	0.0431***
	(0.00592)	(0.00611)
GDP Origin	0.0634***	0.0634***
	(0.00279)	(0.00278)
Distance	-0.156***	-0.156***
	(0.00269)	(0.00267)
2008FinCrisis		0.0248**
		(0.00904)
2003SARS		-0.00745
		(0.0136)
Constant	0.890***	0.928***
	(0.154)	(0.160)
Observations	888	888
R2	0.725	0.727

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

5.3 Brunei

The results for tourism regression for Brunei are seen in Tables 11 to 15. Table 11 shows the basic gravity variables, economic mass, and distance. In column 1, the tourism arrivals gravity equation shows that the basic variables (GDP of origin countries and distance) are significant and correctly signed. This means that the economic capacity of the country of origin plays a significant factor in their tourism arrivals. In contrast, the economic mass (in terms of GDP) of the destination country (Brunei) is not a significant factor for tourism arrivals. This can be influenced by the fact that Brunei's economy depends on exploiting its vast petroleum and natural gas reserves. This can also show that there seems to be a preference for richer countries of origin over less rich countries of origin. The distance variable has a negative relationship with tourism arrivals signifying preference for a shorter distance rather than longer distance in tourism arrival activities of Brunei.

Table 11. Basic Model for Tourism, Export and Total Trade data

	(1) TOURISM
GDP Destination	0.120
	(0.261)
GDP Origin	0.0597***
	(0.00378)
Distance	-0.132***
	(0.00672)
Constant	-1.206
	(6.086)
Observations	228
R2	0.567

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 12 shows the GM for tourism arrivals, including noneconomic/cultural variables found in the CEPII database. Table 12 shows the tourism regression results that indicate significance in tourism arrivals for certain cultural factors such as languages, colonizer, and colony. This signifies that having the same language, both the official and minority languages; the common colonial link; and a common colonizer are all factors of tourism arrivals in Brunei.

Table 12. Tourism Model with CEPII Variables

	(1) TOURISM	(2) TOURISM	(3) TOURISM
GDP Destination	0.120	0.117	0.117
	(0.261)	(0.211)	(0.174)
GDP Origin	0.0597***	0.0631***	0.0625***
	(0.00378)	(0.00389)	(0.00375)
Distance	-0.132***	-0.112***	-0.129***
	(0.00672)	(0.00697)	(0.00536)
Official Language		0.203***	0.217***
		(0.00779)	(0.00889)
Minority Language		0.0214*	0.0217*
		(0.0105)	(0.0101)
Colonizer			-0.0274*
			(0.0108)
Colony			0.190***
			(0.00900)
Constant	-1.206	-1.408	-1.260
	(6.086)	(4.939)	(4.068)
Observations	228	228	228
R2	0.567	0.707	0.797

Standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

Brunei's governance indices are also tested to see if those impact tourism arrivals. Table 13 shows the inclusion of Brunei's governance indices in the GM. Only the worldwide governance indicator for regulatory quality shows significance for the tourism arrivals model.

Table 13. Tourism model with Governance Index variables

	(1) TOURISM	(2) TOURISM
GDP Destination	0.120	0.215
	(0.261)	(0.252)
GDP Origin	0.0597***	0.0531***
	(0.00378)	(0.00674)
Distance	-0.132***	-0.109***
	(0.00672)	(0.0120)
Corruption		-0.0610
		(0.0373)
Accountability		-0.0209
		(0.0112)
Government effectiveness		-0.00294
		(0.0573)
Regulatory quality		0.134***
		(0.0336)
Rule of law		-0.0443
		(0.0393)
Political stability		0.00543
		(0.0172)
Constant	-1.206	-3.437
	(6.086)	(5.868)
Observations	228	228
R2	0.567	0.602

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

It may be said that tourism arrivals are affected by a country's ease of visa policy and the availability of direct flights. These are tested using the connectivity and visa policy variables seen in Table 14. The connectivity variable only considers direct flights from origin to any international airport in Brunei. The visa policy variable is a visa-free policy that assumes the ease of entry to any international airport

in Brunei. As seen in Table 14, both connectivity and visa policy variables are highly significant to Brunei's tourism arrivals.

Table 14. Tourism model with Connectivity and Visa Policy Variables

	(1) TOURISM	(2) TOURISM
GDP Destination	0.120	0.116
	(0.261)	(0.220)
GDP Origin	0.0597***	0.0650***
	(0.00378)	(0.00368)
Distance	-0.132***	-0.0860***
	(0.00672)	(0.00749)
Direct Flights		0.138***
		(0.0130)
VISA POLICY		-0.0896***
		(0.0104)
Constant	-1.206	-1.655
	(6.086)	(5.137)
Observations	228	228
R2	0.567	0.695

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 15 includes the Asian financial crisis variable for 2008 to 2009 affecting Brunei and other partner economies. This crisis variable does not affect the tourism arrivals of Brunei.

Table 15. Tourism model with Financial Crisis Variable

	(1) TOURISM	(2) TOURISM
GDP Destination	0.120	0.0556
	(0.261)	(0.268)
GDP Origin	0.0597***	0.0594***
	(0.00378)	(0.00369)
Distance	-0.132***	-0.132***
	(0.00672)	(0.00667)
2008FinCrisis		-0.0116
		(0.0201)
Constant	-1.206	0.306
	(6.086)	(6.264)
Observations	228	228
R2	0.567	0.567

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

5.4 The Philippines

Tables 16 to 20 show the regression results for the Philippines. Table 16 shows the basic gravity model for the Philippines, indicating that the distance variable for the tourism model is correctly signed and is significant to tourism arrivals. However, GDP for both origin and destination is not significant in the tourism model. This result for the GDP Origin is different from the other country models.

Table 16. Basic Model for Tourism Arrivals, Export, and Total trade data

	(1) TOURISM
GDP Destination	0.0244
	(0.0140)
GDP Origin	0.00172
	(0.00265)
Distance	-0.0558***
	(0.0106)
Constant	1.968***
	(0.361)
Observations	1505
R2	0.031

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

In Table 17, where CEPII variables are included, it is seen that official and minority language, colonizer, and colony variables show strong significance to the tourism model. However, it is interesting that the official language and colonizer are incorrectly signed, although significant. Achen (1985) suggests that a probable cause of the incorrectly signed regression coefficients could be that there are omitted variables whose inclusion might produce appropriate signs on the coefficients. Supporting cultural variables such as racial link and literacy rate could compliment the analysis. This suggestion could be included to future research.

Compared to the other country models, the Philippines has the most significant cultural variables. This may indicate that tourism arrivals in the Philippines largely draw from similarities in cultural ties.

Table 17. Tourism Model with CEPII Variables

	(1) TOURISM	(2) TOURISM	(3) TOURISM
GDP Destination	0.0244	0.0297*	0.0345**
	(0.0140)	(0.0136)	(0.0133)
GDP Origin	0.00172	0.00229	0.00123
	(0.00265)	(0.00262)	(0.00263)
Distance	-0.0558***	-0.0489***	-0.0565***
	(0.0106)	(0.0101)	(0.0102)
Official Language		-0.198***	-0.207***
		(0.0157)	(0.0166)
Minority Language		0.233***	0.229***
		(0.0131)	(0.0132)
Colonizer			-0.140***
			(0.0213)
Colony			0.391***
			(0.0181)
Constant	1.968***	1.730***	1.700***
	(0.361)	(0.351)	(0.344)
Observations	1505	1505	1505
R2	0.031	0.092	0.138

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

As seen in Table 18, the tourism model includes governance index variables that show no significance to tourism arrivals. The model is similar to that of Singapore and Malaysia, indicating that tourism arrivals are not affected by the state of governance in the country.

Table 18. Tourism model with Governance Index Variables

	(1) TOURISM	(2) TOURISM	(3) TOURISM	(4) TOURISM
GDP Destination	0.0244	0.0410	0.102	0.0330
	(0.0140)	(0.0249)	(0.0635)	(0.0177)
GDP Origin	0.00172	0.00163	0.00184	0.00188
	(0.00265)	(0.00276)	(0.00265)	(0.00265)
Distance	-0.0558***	-0.0584***	-0.0555***	-0.0557***
	(0.0106)	(0.0111)	(0.0106)	(0.0106)
Corruption		-0.0337		
		(0.122)		
Accountability		-0.166		
		(0.141)		
Government effectiveness		-0.0764		
		(0.0942)		
Regulatory quality		0.0401		
		(0.115)		
Rule of law		0.168		
		(0.0921)		
Human development index			-1.559	
			(1.213)	
HDI				0.0236
				(0.0259)
Constant	1.968***	1.625*	0.985	1.737***
	(0.361)	(0.668)	(0.870)	(0.461)
Observations	1505	1362	1505	1505
R2	0.031	0.032	0.029	0.031

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

The opposite is true when connectivity variables such as a visa-free policy and the availability of direct flights are included. Table 19 shows that both ease of travel variables (availability of direct flights and visa-free policy) are significant.

Table 19. Tourism model with Connectivity Variables

	(1) TOURISM	(2) TOURISM
GDP Destination	0.0244	0.0495***
	(0.0140)	(0.0101)
GDP Origin	0.00172	0.0116***
	(0.00265)	(0.00205)
Distance	-0.0558***	-0.00597
	(0.0106)	(0.00630)
Direct Flights		0.448***
		(0.00922)
VISA POLICY		-0.0670***
		(0.0148)
Constant	1.968***	0.569*
	(0.361)	(0.271)
Observations	1505	1505
R2	0.031	0.455

Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 20 includes the 2003 SARS outbreak and the 2008 financial crisis variable. Both show no significance to the model.

Table 20. Tourism Model with Financial Crisis Variable

	(1) TOURISM	(2) TOURISM
GDP Destination	0.0244	0.0211
	(0.0140)	(0.0144)
GDP Origin	0.00172	0.00170
	(0.00265)	(0.00265)
Distance	-0.0558***	-0.0558***
	(0.0106)	(0.0106)
2008FinCrisis		0.0129
		(0.0255)
2003SARS		-0.0370
		(0.0448)
Constant	1.968***	2.054***
	(0.361)	(0.371)
Observations	1505	1505
R^2	0.031	0.030

Note: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.5 Summary of Results

For the tourism model, the summary of significant variables per country is tabulated below:

Country	Language	Contiguity	Colonizer	Colony	Visa Policy	Direct Flight	Governance	Crisis
Singapore	√	√	X	X	√	√	X	X
Malaysia	√	√	X	√	√	√	X	√
Brunei	√	X	√	√	√	√	√	X
Philippines	√	X	√	√	√	√	X	X

Consistently significant for all the country's tourism models are language (both official and minority languages), visa policy, and the availability of direct flights to the destination country. This signifies that having a variety of languages and dialects can increase international tourist arrivals. The easing of visa policies is also an important factor in increasing tourist arrivals. Furthermore, having access to direct flights can also increase international tourism.

6 Conclusion and Areas for Further Research

This study attempts to explain the volume and pattern of international tourist arrivals using the augmented GM framework. The study highlights three important variables that show to be significant across all models; these are, namely: language, visa policy, and availability of direct flights. All these are important for policymakers to include in their tourism plans and campaigns. The model shows that it is vital to attract tourists with a country's knowledge of different official and minority languages and ease its visa policy. It is also important to equip the tourism industry with direct flights as this proves to be an important factor in tourism.

This study adds value to the literature through its theoretical, methodological, and policy contributions and implications. Its theoretical contributions are anchored on using the basic GM framework and cultural and tourism-related variables. Its application of the GM to updated data is also a contribution of the study. Its methodological contributions are accounted for by the use of noneconomic data and both the Poisson regression. Lastly, its policy implications suggest that policymakers include efforts on: (1) aligning the economic structure of host countries to cultural factors (official and minority languages) of their partner countries in tourism flows; (2) easing up visa policies; and (3) increasing availability of direct flights in order to encourage more influx to the revival of the tourism industry. This may suggest that governments may use a wider variety of languages in their tourism campaigns and marketing collaterals. The easing of a country's visa policy is also highly

encouraged as this can stimulate international tourist arrivals. It is also important to equip the tourism industry with flights directly to prominent cities in the country as this proves to be an important factor in attracting tourism arrivals.

The study hopes to improve the overall understanding of factors that may contribute to tourism arrivals of the Philippines and its neighboring countries, Singapore, Malaysia, and Brunei. The tourism variables used may be further tightened by segregating the types of tourists into business and leisure travelers. The results of this study show that some variables are incorrectly signed, although significant. This may be caused by possible omitted variables whose inclusion might produce appropriate signs on the coefficients. Supporting cultural variables such as racial link and literacy rate could compliment the analysis. Moreover, further research can be drawn across multilateral and regional groups/countries.

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