Economics Development Analysis Journal 10 (1) (2021)

Economics Development Analysis Journal

http://journal.unnes.ac.id/sju/index.php/edaj

Multicollinearity in Tourism Demand Model : Evidence from Indonesia

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Article Info

History of Article
Received October 2020
Accepted December 2020
Pusblished February 2021

Keywords:
Multicollinearity, Relative price, Exchange rate, Substitution price, Tourism demand

Abstract

The demand for tourism in Indonesia continues to increase every year but cannot reach the predetermined target. Studies on tourism demand have been done a lot, especially in Indonesia. The selection of the dependent variable in tourism demand is not problematic and acceptable, however, the selection of the independent variable is still unclear. This study aims to provide an appropriate Indonesian tourism demand model and analyze the determinants of tourism demand in Indonesia. The estimation technique used is a static panel regression. The results of this study prove that there is multicollinearity in the tourism demand model when exchange rate and relative price are combined into one model, showing that relative price are good proxies in representing tourism price, and showing that substitution price are the main determinants of tourism demand in Indonesia. The policy implications recommended in this study are monitoring the economic growth of the origin countries of most tourists visiting Indonesia, improving the quality of Indonesian tourism, and developing the Wonderful Indonesia program.

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ISSN 2252-6560

INTRODUCTION

Tourism has become a major player in international trade and is a sector contributing to national income in many developing countries (UNWTO, 2019). The United Nations of the World Tourism Organization (UNWTO) predicts that tourism will grow by around 3.8% per year from 2010 to 2020 following the financial crisis.

The Asia Pacific occupies the position of the region with the second-highest number of tourists and revenue receipts from the tourism sector in the world after Europe in 2017. 24% of tourists come to the Asia Pacific region of the total world tourist arrivals. Asia Pacific tourism sector revenue is 29% of the total world tourism sector revenue.

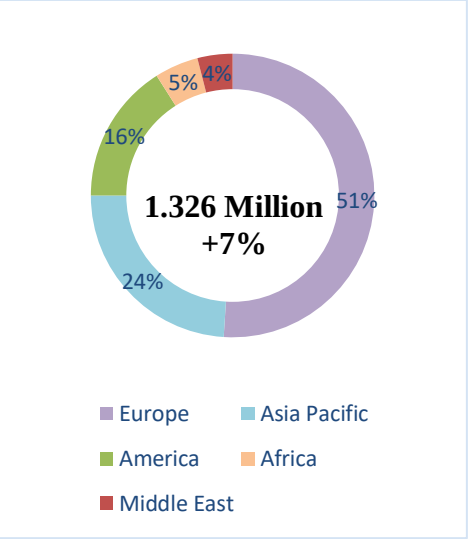


Figure 1. Foreign Tourist Arrivals by Region in Percent, 2017
Source: UNWTO (2019)

In 2019, UNWTO reports that tourist arrivals to the Asia Pacific increased by 6% with the number of tourist arrivals reaching 323 million visits in 2017. Asia Pacific tourism revenue also increased by 3% to reach US $ 390 billion or equivalent to IDR 5,482.5 trillion in 2017.

Southeast Asia has the highest tourism growth in the Asia Pacific region based on the number of tourist arrivals, amounting to 9% in 2017 (UNWTO, 2019). Indonesia as a country in the Southeast Asia region can take advantage of the momentum of the growth of the tourism sector by maximizing various factors that can support the increasing demand for international tourism in Indonesia.

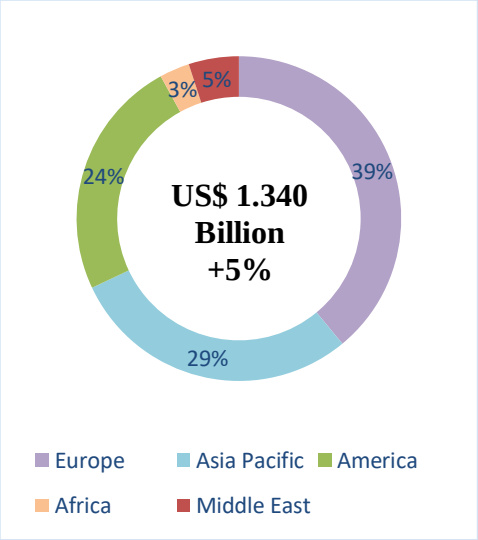
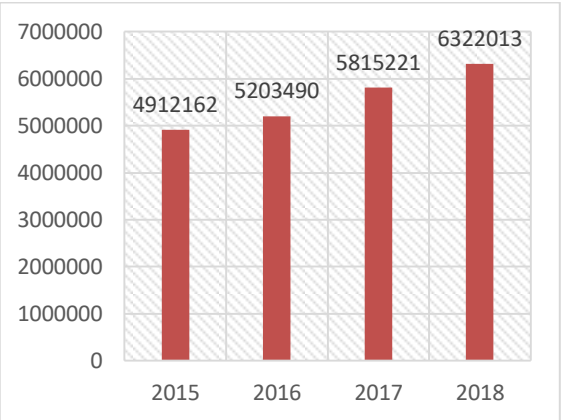


Figure 2. Tourism Sector Revenue Receipts by Region in Percent, 2017
Source: UNWTO (2019)

Figure 3 shows the number of foreign tourist arrivals from Malaysia, Singapore, Australia, Japan and the Philippines from 2015 to 2018. These five countries are the most origin countries for tourists who visit Indonesia. Tourist visits from Malaysia from 2015-2018 amounted to 7,598,157, from Singapore amounted to 6,432,665, from Australia amounted to 4,950,722, from Japan amounted to 2,1778,881, and from the Philippines amounted to 1,093,461.



Source: Central Bureau of Statistics (2019)
Figure 3. Foreign Tourists Visit to Indonesia,2015-2018

From this figure, it can be seen that the growth of foreign tourist arrivals continues to increase every year from these five countries from 4,912,162 in 2015 to reach 6,322,013 in 2018. This is because based on a survey conducted by the Visa-Pacific Asia Travel Association (PATA) in 2015, Indonesia is an attractive tourist place, many new tourist attractions, beautiful natural scenery, and affordable prices (Ministry of Tourism and Creative Economy of the Republic of Indonesia, 2016).

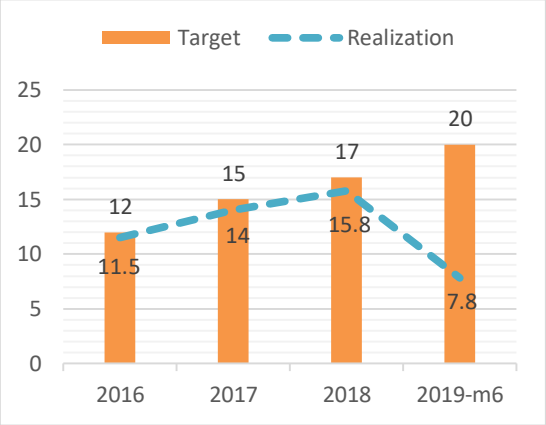


Figure 4. Target and Realization of International Tourism Demand in Indonesia, 2016 until 2019-m6
Source: Ministry of Tourism and Creative Economy of the Republic of Indonesia (2019)
Note: 2019-m6 is the accumulated demand for tourism until June 2019

The demand for tourism in Indonesia continues to increase every year, but the problem is that the demand for tourism in Indonesia still cannot reach the predetermined target (Ministry of Tourism and Creative Economy of the Republic of Indonesia, 2018). The target of international tourism demand in 2016 was 12 million visits, but the realization was only 11.5 million visits. The target for 2017 is 15 million visits, but the realization is only 14 million visits. The target for 2018 was 17 million visits, but the realization was only 15.8 million visits. The target for 2019 was 20 million visits with 1.5 million visits per month, the realization in the first semester was only 1.3 million visits per month, so this target was revised to 18 million visits in 2019 (Ministry of Tourism and Creative Economy of the Republic of Indonesia, 2019).

This problem needs to be resolved by identifying the factors that determine the demand for international tourism in Indonesia. Determination of the factors affecting tourism demand or the independent variable must be done carefully, because there is a calculation component in one variable, so that there is a potential for problems with classical assumptions, especially multicollinearity.

Studies on tourism demand have been done a lot, especially in Indonesia (Muryani et al., 2020; Pujiharini & Ichihashi, 2016; Tan et al., 2002). The selection of the dependent variable in tourism demand is not problematic and acceptable. Several studies on tourism demand use the dependent variable on the number of tourist visits (Khoshnevis Yazdi & Khanalizadeh, 2017; Surugiu et al., 2016; Zhang et al., 2009). Other studies use tourist spending for the dependent variable (Hanly& Wade, 2007; Li et al., 2004; Uysal & Roubi, 1999), and some even use both (Filipe et al., 2017; Rossello´-Nadal & He, 2019; H. Song et al., 2010)

The selection of the independent variable is still unclear, how the model is built and which should be included in the model (Dogru et al., 2017).The price variable is one focus that must be considered. Proxies for calculating tourism prices can use the exchange rate of the destination country against the US dollar, bilateral exchange rate, the Consumer Price Index (CPI), and the Consumer Price Index (CPI) adjusted to the exchange rate (Dogru et al., 2017; Filipe et al., 2017; Tavares & Leitao, 2016).

Tavares & Leitao (2016) use the Brazilian exchange rate against the US dollar as a proxy for tourism price. Meanwhile, Muryani et al. (2020) use relative price, namely CPI which is adjusted to the exchange rate as a proxy for tourism price. Patsouratis et al. (2005) include the exchange rate and CPI as tourism prices. Vogt & Wittayakorn (2010) combine the variables of the exchange rate and tourism price,

but the price used is weighted CPI, so it is not a problem to unify these two variables in one model.

Salman (2010) in the tourism demand model using the exchange rate and relative prices in one model. Liu et al. (2018) in tourism demand model also includes exchange rate and relative price in one model. Meanwhile, Rosselló et al. (2005) distinguish between these two variables in different models but do not show multicollinearity test results.

Based on the previous description, the research gap is that there are studies that use the exchange rate as a proxy for tourism price, some use relative price a proxy for tourism prices, and some use both.

The hypothesis of Lim (1997) states that the exchange rate and relative price are the same proxies in calculating tourism price. The unification of exchange rate variables and relative price in one model results in a classic assumption problem, namely multicollinearity.

The novelty of this research is to find a suitable proxy for tourism price for the Indonesian case study. This study also proves Lim's hypothesis that relative prices and exchange rates are the same proxies of tourism price that have not been researched for the Indonesian case study. The purpose of this study is to provide an appropriate Indonesian tourism demand model and to analyze the determinants of tourism demand in Indonesia.

Lim (1997) shows that the general tourism demand model is as follows:

$$DT_{ij} = f(Y_j, TC_{ij}, RP_{ij}, ER_{ij}, QF_i),$$

where DT_{ij} is the demand for international travel services from origin country j to destination country i; Y_j is income from origin country j; TC_{ij} is the cost of transportation between destination country i and origin country j; RP_{ij} is the relative price (ratio of prices in destination country i or alternatively to origin country j); ER_{ij} is the exchange rate of the currency of destination country i per currency of origin country j; QF_i is a qualitative factor that occurs in the destination country i.

The dependent variable that is most widely used in the tourism demand model is the number of tourist visits (Peng et al., 2014). This is because data on the number of tourist visits is easy to obtain and is available annually in all countries. Several studies used the dependent variable lag as the independent variable showing the word of mouth effects (Lim, 1997). The effect of word of mouth is expected to have a positive sign so that previous tourist visits will increase tourist visits in that period (Buigut & Amendah, 2016; Fateh Habibi et al., 2009).

The income variable is one of the most important independent variables in the demand model. Income is expected to have a positive effect on tourism demand. The increase in income will increase the number of tourist visits (Lim, 1997). Income can be calculated using the Industrial Production Index (IPI), Gross Domestic Product (GDP), Gross Domestic Product (GDP) per Capita, or disposable income (Dogru et al., 2017; Karabulut et al., 2020; H. Song et al., 2010).

Transportation cost is used in several studies. The effect of transportation cost is expected to be negative on tourism demand (Lim, 1997). An increase in transportation cost to a destination country will reduce the number of tourist visits to that destination country (Dritsakis, 2004; Muchapondwa & Pimhidzai, 2011; Wamboye et al., 2020).

Relative price is an important independent variable in the demand model. The relative price between the country of origin and the destination country is expected to have a negative effect, namely that an increase in the relative price of tourism in the destination country will reduce the number of tourist visits in the country of origin (Lim, 1997). If the relative price in question is the relative price of the country of origin with the alternative country, then it is expected that there will be a positive effect, where an increase in relative prices in the alternative country will reduce its demand in that country and will increase tourism demand in the destination country (Chen & Haynes, 2015; Lorde et al., 2016; Shen & Song, 2011; Haiyan Song et al., 2003).

Exchange rate depreciation indicates that domestic prices are getting cheaper. Thus, the depreciation of the exchange rate in the destination country can increase the number of tourist visits, and vice versa. The Exchange rate can be used as a proxy for tourism price, for this reason, the unification of exchange rates and relative prices in one model will result in multicollinearity (Lim, 1997). The Exchange rate must be included in the demand model simultaneously or according to the consumer price index (Meo et al., 2018; Vita & Kyaw, 2013).

Qualitative factors can have a positive or negative impact on the number of tourist visits (Lim, 1997). Qualitative factors that have a positive impact include organizational members, promotions/advertisements, free visa policy, and others. Qualitative factors that have a negative impact include natural disasters, terrorism, financial crises, pandemics/disease epidemics, and others. Countries with many seasons can also include seasonal factors as a qualitative factor variable in the form of a dummy variable (Falk, 2014; Page et al., 2012; Polyzos et al., 2020).

Table 1. Data, Descriptions, and Data Sources

Data	Descriptions	Data Sources
TA (Tourist Arrival)	The number of foreign tourist arrivals according to nationality.	Central Bureau of Statistics (BPS Indonesia)
Y (Income)	Real Gross Domestic Product (RGDP): $$Y = \frac{Nominal\ GDP}{CPI/100}$$	International Financial Statistics
RP (Relative Price)	$$RP = \frac{CPI_{Indo} / Exchange\ Rate_{Indo}}{CPI_{Negara\ asal} / Exchange\ Rate_{Negara\ asal}}$$	International Financial Statistics
PS (Price of Substitute)	$$PS = \frac{CPI_j}{Exchange\ Rate_j} . \omega_{jt}$$ The country of substitution is Thailand (outside the country of observation because it avoids multicollinearity). CPIj and Exchange Ratej belong to Thailand. W is obtained from the weight of the number of tourists from the country of origin to Thailand and Indonesia, which when added together is equal to 1.	ASEAN Statistics
EX (Exchange Rate)	The cross exchange rate is measured in nominal terms with the following calculations: $$EX = \frac{Dolar / Rupiah}{Dolar / Currency\ of\ origin\ country}$$	International Financial Statistics
EXD (Exchange Rate USD/RP)	US dollar exchange rate per Rupiah: $$EXD = \frac{1}{RP/DOL}$$	International Financial Statistics
D (Dummy) = "Wonderful Indonesia"	Value 1 for 2011Q1-2017Q4 and 0 for 2007Q1-2010Q4.	Indonesian Ministry of Tourism

RESEARCH METHODS

This This study uses panel data with a cross-section of 5 countries, namely Malaysia, Singapore, and the Philippines (as ASEAN member countries that visit Indonesia the most) and Australia and Japan (as non-ASEAN countries that visit Indonesia the most). The time span used during 2007q1 -2017q4 so that a total of 220 observations in this study. The selection of this period is due to the availability of existing data based on the variables in this study.

All models are transformed into natural logarithms for smoothing the data and avoiding distribution abnormalities in the data. The transformation into natural logarithms can flatten the data so that it is simpler, for example the GDP variable has units of million dollars and the relative price variable is in rupiah per dollar, the difference in units and far numbers can be flattened to produce an accurate estimate (Nau, 2014; Haiyan Song et al., 2003). So the natural logarithm is needed because the percentage change in the original value will be almost the same as the change in the value of the natural logarithm (Nau, 2014; Haiyan Song et al., 2003).

In various economic situations, especially the relationship between price and demand, the marginal effect of the independent variable on the dependent variable is linear in terms of percentage change rather than absolute change, so the application of natural logarithms is appropriate (Lee & Chang, 2008). Models that use natural logarithmic transformations can also capture more of the influence sensitivity for the independent variable to the dependent variable (Deng, 2007).

This research model is replication. The replication model is research that aims to abort or strengthen the theory or hypothesis used in previous studies with a more valid model design.

Model 1 includes RP as the tourism price variable:

$$lnTA_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnRP_{ijt} + \beta_3 lnPS_{ijt} + \beta_4 D_{it} + \varepsilon_{ijt} \quad (1)$$

Model 2 includes EX as the tourism price variable:

$$lnTA_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnEX_{ijt} + \beta_3 lnPS_{ijt} + \beta_4 D_{it} + \varepsilon_{ijt} \quad (2)$$

Model 3 includes EXD as the tourism price variable:

$$lnTA_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnEXD_{jt} + \beta_3 lnPS_{ijt} + \beta_4 D_{it} + \varepsilon_{ijt} \quad (3)$$

Model 4 includes RP and EX as proof of multicollinearity:

$$lnTA_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnRP_{ijt} + \beta_3 lnEX_{ijt} + \beta_4 lnPS_{ijt} + \beta_5 D_{it} + \varepsilon_{ijt} \quad (4)$$

Model 5 includes RP and EXD as proof of multicollinearity:

$$lnTA_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnRP_{ijt} + \beta_3 lnEXD_{jt} + \beta_4 lnPS_{ijt} + \beta_5 D_{it} + \varepsilon_{ijt} \quad (5)$$

The notation description is as follows:

- TA_{ijt} is the number of tourist visits from country of origin i to destination country j at time t
- Y_{it} is the gross domestic product of tourist from country of origin i at time t
- RP_{ijt} is the relative price of tourism from country of origin i to destination country j at time t
- EX_{ijt} is the bilateral exchange rate between origin country i and destination country j at time t
- EXD_{jt} is the exchange rate of destination country j against USD at time t
- PS_{ijt} is the substitution price from country of origin i to country of alternative destination j at time t
- D_{it} is a dummy for Wonderful Indonesia carried out by destination country j at time t
- And ε_{ijt} is the error term

This study uses static panel data regression. Panel data regression provides a coherent process for selecting the best model among PLS (Pooled Least Square), REM

(Random Effect Model); and FEM (Fixed Effect Model).

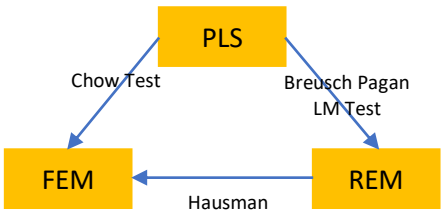


Figure 5. Model Selection in Static Panel Data Regression

The regression process begins with setting the quarterly data so it can be read by the STATA 13 application. Then adjust the panel data format and continue with PLS and REM regression. The selection between PLS and REM uses the Breusch Pagan LM Test. The null hypothesis is PLS and the alternative hypothesis is REM.

If REM is selected, then FEM regression is performed. The Hausman test is used to choose between REM or FEM. The null hypothesis is REM and the alternative hypothesis is FEM. If PLS is selected at the beginning, then the FEM regression is carried out and tested with the Chow test where the null hypothesis is PLS and the alternative hypothesis is FEM.

If the model was chosen is FEM or PLS, a classic assumption test is needed as a diagnostic test. This test consists of multicollinearity, heteroscedasticity, and autocorrelation tests. If the VIF value is more than equal to 10, then there is multicollinearity. The null hypothesis for heteroscedasticity test is homoscedasticity and the alternative hypothesis is heteroscedasticity. The null hypothesis for autocorrelation is that there is no autocorrelation and the alternative hypothesis is that there is autocorrelation.

RESULTS AND DISCUSSION

In model 1, when the PLS and REM regressions are done, the next step is to do the Breusch Pagan LM test. The result of the test shows that the p-value <alpha is 0.000 <0.05, which means rejecting the null hypothesis and accepting the alternative hypothesis, namely that the chosen model is REM. After FEM regression and Hausman test, the results show p-value> alpha, namely 0.3289> 0.05, which means accepting the null hypothesis and rejecting the alternative hypothesis. So model 1 is best if use the Random Effect estimation technique. Likewise, for models 2 and 3 were the best estimation technique is using the Random Effect.

In model 4, when the PLS and REM regressions are done, the next step is to do the Breusch Pagan LM test. The results of the test show p-value> alpha, which is 1,000 <0.05, meaning that it accepts the null hypothesis, that is, the chosen model is PLS. After the FEM regression and Chow test were carried out, the results showed a p-value <alpha, namely 0.000 <0.05, meaning that it rejected the null hypothesis and accepted the alternative hypothesis. So model 4 is best if you use the Fixed Effect estimation technique.

Table 2. Best Model Selection Test

Model	Prob > Chibar2		Selected Model
	Breusch Pagan LM Test	Hausman Test	Chow Test	
Model 1	0.0000	0.3289	0.0000	REM
Model 2	0.0000	0.3082	0.0000	REM
Model 3	0.0000	0.3589	0.0000	REM
Model 4	1.0000	-	0.0000	FEM
Model 5	0.0000	0.0127	0.0000	FEM

When Model 5 was tested using the Breusch Pagan LM test, it showed that the REM model was chosen. Then the Hausman test was performed after the FEM regression to choose between FEM and REM. The results show that accepting the alternative hypothesis, the best model for model 5 is the Fix Effect.

The REM estimation technique in models 1, 2, and 3 does not need to be tested using the classical assumption test, while models 4 and 5 that use FEM need to be tested using classical assumptions. The results of testing the classical assumptions of models 4 and 5 show that the value of VIF> 10 with mean VIF> 10 means that models 4 and 5 prove that combining the exchange rate and relative price variables as a proxy for tourism prices in one model can cause high multicollinearity. These results support the hypothesis of Lim (1997)that exchange rates and relative prices must be separated. Based on the heteroscedasticity test, the results showed rejecting the null hypothesis where the p-value <alpha is 0.000 <0.05, which means that models 4 and 5 have heteroscedasticity problems. The autocorrelation test results show acceptance of the alternative hypothesis where p-value> alpha means there is no autocorrelation problem. The results generally show that models 4 and 5 are not suitable as models for tourism demand in Indonesia so that results are not interpreted.

Table 3. Diagnostic Test (Classical Assumptions)

Test	Model 4	Model 5
Multicollinearity (mean VIF)	4388.53	612.39
Heteroscedasticity	0.0000	0.0000
Autocorrelation	0.1587	0.2224

The estimation results of models 1, 2 and 3 are similar, namely the positive impact of income on tourism demand. An increase in income of 1% will increase tourism demand by 0.72% in model 1, 0.74% in model 2, and 0.71% in model 3 with a 95% confidence level, ceteris paribus (other variables outside the model are assumed to be fixed or unchanged). These results are consistent with expectations and theories that tourist income in the home country has a positive impact on tourism demand in the destination country. So these results are in line with research conducted by Eugenio-martin & Campos-soria (2011); Filipe et al. (2017); Ouerfelli (2008) stated that the increase in income will increase the number of visits by foreign tourists. The coefficient of income is less than 1, meaning this result is in line with Muryani et al. (2020) that Indonesian tourism is a normal good.

Table 4. Estimation Results of Models 1, 2, and 3

Variables	Model 1 (REM)		Model 2 (REM)		Model 3 (REM)	
	Coef.	SE.	Coef.	SE.	Coef.	SE.
C	9.0795***	1.29	8.1881***	1.42	6.3748***	1.06
lnYit	0.7214***	0.09	0.7398***	0.09	0.7064***	0.07
lnRPijt	0.5254***	0.07				
lnEXijt			0.5405***	0.09		
lnEXDjt					-0.9372***	0.06
lnPSijt	-1.2792***	0.09	-1.2072***	0.09	-1.5439***	0.07
Dit	0.1489***	0.03	0.2266***	0.03	0.1910***	0.02

Note: ***, **, * = significant with alpha 1%, 5%, 10%

An increase in relative prices means that there is an increase in inflation (CPI) or a strengthening of the exchange rate which results in the domestic price of Indonesian tourism being more expensive than the price of tourism in the country of origin which causes a decrease in demand for tourism (Divisekera, 2003; Kim et al., 2018; Patsouratis et al., 2005). An increase in relative prices of 1% in model 1 will increase tourism demand by 0.53% with a 95%

confidence level, ceteris paribus (other variables outside the model are assumed to be fixed or unchanged). This result deviates from expectations and theories. The increase in relative prices should reduce the number of foreign tourist visits to the destination country. However, these results indicate an increase in relative prices will increase tourism demand. This result is in line with Leitão (2015); Muryani et al. (2020); Surugiu et al. (2016) according to them this could be due to changes in prices for alternative destinations that are getting higher, the quality of domestic tourism is considered better, or tourism that is considered luxurious so that changes price increases do not reduce tourism demand.

Table 5. Estimation Results of Models 4 and 5

Variables	Model 4 (FEM)		Model 5 (FEM)	
	Coef.	St.Error	Coef.	St.Error
C	10.8192***	1.3736	6.3163***	1.0171
lnYit	0.8197***	0.0968	0.7118***	0.0705
lnRPijt	1.0973***	0.1619	-0.2075***	0.0749
lnEXijt	-0.9404***	0.2470		
lnEXDjt			-1.1119***	0.0839
lnPSijt	-1.3131***	0.0873	-1.5620***	0.0696
Dit	0.1089***	0.0339	0.2349***	0.0259

Note: ***, **, * = significant with alpha 1%, 5%, 10%

The increase in the Indonesian exchange rate against the currency of the home country (nominal depreciation) of 1% resulted in an increase in tourism demand by 0.54% with a confidence level of 95%, ceteris paribus (other variables outside the model are assumed to be fixed or unchanged). These results are in accordance with expectations and theories. An increase in the exchange rate (depreciation) means that domestic prices are increasingly competitive compared to prices in the tourist home country. This result is supported by previous research for the Indonesian case study conducted by Santi et al. (2013).

Conversely, appreciation will make domestic prices not competitive compared to the tourist's origin country, so that there will be a decrease in tourism demand because foreign tourists will tend to choose to travel to their country or to an alternative country. The results of this study indicate an increase in US Dollar per Rupiah (appreciated) by 1% in decreasing tourism demand by 0.94% with a confidence level of 95%, ceteris paribus (other variables outside the model are assumed to be fixed or unchanged). These results are in line with Tavares & Leitao (2016); Vanegas Sr. (2009) that the appreciation of the exchange rate will reduce the number of foreign tourist visits.

Models 1, 2, and 3 show that an increase in substitution prices of 1% will reduce domestic tourism demand by 1.28% for model 1, 1.21% for model 2, and 1.54% for model 3 with a 95%, ceteris paribus (other variables outside the model are assumed to be fixed or unchanged). This result is not in accordance with expectations, but based on theory, if the prices of other destinations show a negative effect on domestic tourism demand, then both the destination country and the alternative destination country are complementary. The results of this study are in line with Choyakh (2008); F. Habibi & Rahim, (2009); Ouerfelli (2008), namely the negative effect of substitution prices means that Indonesian tourist destinations are considered complementary to Thai tourist destinations. Empirical research for the Indonesian case study shows that Japanese tourists visiting Thailand view Indonesia as a complementary country (Utami et al., 2016).

Models 1, 2, and 3 show that the average increase in tourism demand in Indonesia during the year Wonderful Indonesia was held is 0.15% higher for model 1, 0.23% for model 2, and 0.19% for model 3 compared to the year when

Wonderful Indonesia was not held with a confidence level of 95%, ceteris paribus (other variables outside the model are assumed to be fixed or unchanged). These results are consistent with expectations and the theory that promotion has a positive effect on tourism demand. This result is in line with Seetanah & Sannassee (2015); Shi (2012); Shi & Li (2014) that promotion will be able to increase the number of foreign tourist visits.

The demand for international tourism in Indonesia is influenced by income from tourists. The results show that an increase in income from tourists will increase the demand for international tourism. This means that tourism in Indonesia is a normal good. This evidence is following the theory and results of previous research where the elasticity of income is inelastic, meaning that the increase in income will be greater than the increase in tourism demand in Indonesia (Muryani et al., 2020). In line with this research, the number of foreign tourist arrivals from the five countries studied is also relatively low when compared to other countries. For example, around 10 million tourists from Singapore visited Malaysia and around 4 million tourists from Malaysia visited Thailand, while only 1 million tourists from Singapura and 2 million tourists from Malaysia visited Indonesia (ASEAN Statistics, 2019). This evidence supports the results of the research that there is a positive influence of income on tourism demand in Indonesia but the elasticity is inelastic (see Table 6 in appendix).

Second, tourism demand is affected by relative prices with negative effects (Divisekera, 2003; Kim et al., 2018; Patsouratis et al., 2005). The results of this study are not following the theory, but are in line with previous research by (Muryani et al., 2020). Based on the World Travel and Tourism Council report (2017), Indonesia is a country with low tourism price, so it has a high price competitiveness level (see figure 4 in appendix). In line with previous research, because the countries studied in this study have a higher standard of living than Indonesia, the inelastic increase in tourism price is not the main reason for the decline in tourist visits to Indonesia (Muryani et al., 2020).

Third, tourism demand is influenced by exchange rates. This study proves that the use of both bilateral and USD exchange rates, when combined with relative prices in one model, will result in multicollinearity problems so that it is in line with research conducted by Lim (1997). This study also proves that an increase in the exchange rate (depreciation against the country of origin or USD) can increase tourism demand in Indonesia. The results of this study are following the theory and previous research conducted by Utami et al. (2016). Tourist sensitivity is indeed inelastic, but the opposite is true when compared to models that use relative prices. This is something that needs to be considered, namely foreign tourists may pay more attention to the exchange rate, whether it is depreciating or appreciating compared to relative prices. However, relative prices will be more relevant to use because they take into account the inflation rate and show the actual situation in Indonesia where inelastic price increases do not necessarily reduce tourist visits from the countries studied (Dogru et al., 2017; Muryani et al., 2020).

Fourth, tourism demand is positively influenced by substitution prices. The results of this study show different results where the effect of the substitution price is negative, meaning that Thailand is not a substitute country from Indonesia for the country studied in this study. Thailand is a complementary country to Indonesia. This result is in line with previous research conducted by Utami et al. (2016). Foreign tourists, especially those from Asia Pacific (Malaysia, Singapore, Australia, Japan, and the Philippines) visit Thailand and Indonesia the most compared to other countries in Southeast Asia (see Table 6 in appendix), so the results of this study are following the reality (Asean Statistics, 2020).

Fifth, tourism demand in Indonesia is positively influenced by the promotion of "Wonderful Indonesia". This research is in line with research conducted by Maharani P & Andrianto (2016). Maharani P & Andrianto

(2016) also explained that Wonderful Indonesia has a strong influence on tourists' decisions to visit Indonesia. This means that Wonderful Indonesia greatly influences the visits of foreign tourists, so the expansion of this program must be done to encourage more foreign tourist visits to Indonesia.

CONCLUSION

Based on the previous description, it can be concluded that combining exchange rates (both bilateral exchange rate and exchange rate against the US dollar) and relative price in one model can cause multicollinearity problems so that the results are inaccurate. The tourism demand model using relative price shows results that are not in accordance with expectations and theories but in accordance with previous research with Indonesian case studies. Relative price is the right proxy to use as tourism price because it takes into account the inflation rate, but the exchange rate can be captured by the demand model whose results are in accordance with expectations and theories. This is because tourists when travelling will pay more attention to exchange rates than relative prices. Substitution price elasticity is the most elastic, meaning that tourists from Malaysia, Singapore, Australia, Japan and the Philippines are sensitive to substitution prices. This result implies that Thailand is not a substitute country but a complementary country for Indonesian tourism.

The policy implications that can be taken by the government include continuing to monitor the economic growth (business cycle) of the origin country of tourists to anticipate fluctuations in tourist visits. A strategy that can be done is to form a special team to monitor the economy of the country of origin of the most tourists visiting Indonesia. In addition, improving the quality of Indonesian tourism must be improved, starting from public transportation, infrastructure, to facilities at tourist destinations. The development of the Wonderful Indonesia program can also be done in collaboration with Thailand for tour packages because Thailand is a complementary country to Indonesia.

This study has the advantage of proving the existence of multicollinearity in the tourism demand model when entering relative prices and exchange rates simultaneously. Another advantage is comparing the proxies for calculating tourism price between relative prices and exchange rates. The substitution price is also given a different proxy to avoid multicollinearity problem.

The weakness of this research is that the number of cross-sections is only five countries that visit Indonesia the most, the income variable is measured using GDP, and the substitute country is Thailand which is the main destination country for world tourists in Southeast Asia. So, the recommendation for further research is to add cross-sections so that the panel regression is not weak. In addition, the income variable can use disposable income or income per capita. Another recommendation is to add replacement countries while still paying attention to the prevention of multicollinearity.

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APPENDIX

Table 6. Foreign Tourist Arrivals by Destination and Origin Countries, 2015-2018

Destination Country	Origin Country	2015	2016	2017	2018
Brunei Darussalam	Australia [AU]	9,972	7,989	8,600	9,702
	Japan [JP]	4,336	4,474	5,191	5,360
	Malaysia [MY]	57,986	54,374	60,030	59,528
	Philippines [PH]	17,922	17,064	23,157	22,319
	Singapore [SG]	16,230	14,473	14,919	14,091
Cambodia	Australia [AU]	134,748	146,806	143,852	127,430
	Japan [JP]	193,330	191,577	203,373	210,471
	Malaysia [MY]	149,389	152,843	179,316	201,116
	Philippines [PH]	84,677	108,032	98,499	92,451
	Singapore [SG]	67,669	70,556	81,063	86,251
Indonesia	Australia [AU]	1,099,058	1,302,292	1,256,927	1,301,478
	Japan [JP]	549,705	545,392	573,310	530,573
	Malaysia [MY]	1,458,593	1,541,197	2,121,888	2,503,344
	Philippines [PH]	273,630	298,910	308,977	217,874
	Singapore [SG]	1,624,058	1,515,699	1,554,119	1,768,744
Lao PDR	Australia [AU]	34,665	33,077	20,886	19,607
	Japan [JP]	43,826	49,191	32,064	38,985
	Malaysia [MY]	24,095	24,391	19,114	26,002
	Philippines [PH]	16,709	16,750	10,168	10,826
	Singapore [SG]	8,258	8,512	6,829	7,692
Malaysia	Australia [AU]	486,948	377,727	351,232	351,500
	Japan [JP]	483,569	413,768	392,777	394,540
	Philippines [PH]	554,917	417,446	370,559	396,062
	Singapore [SG]	12,930,754	13,272,961	12,441,713	10,615,986
Myanmar	Australia [AU]	30,820	34,010	32,628	27,962
	Japan [JP]	90,312	100,784	101,484	104,376
	Malaysia [MY]	40,852	43,931	47,010	47,632
	Philippines [PH]	19,075	16,421	18,143	16,748
	Singapore [SG]	45,125	50,198	61,859	58,657
Philippines	Australia [AU]	241,187	251,098	259,433	279,821
	Japan [JP]	495,662	535,238	584,180	631,801
	Malaysia [MY]	155,814	139,133	143,566	145,242
	Singapore [SG]	181,176	176,057	168,637	171,795
Singapore	Australia [AU]	1,043,568	1,027,314	1,082,001	1,107,224
	Japan [JP]	789,179	783,863	792,873	829,676
	Malaysia [MY]	1,171,077	1,151,584	1,168,384	1,254,022
	Philippines [PH]	673,374	691,643	736,500	778,141
Thailand	Australia [AU]	805,946	813,017	817,218	801,637
	Japan [JP]	1,381,690	1,416,903	1,544,442	1,656,100

	Malaysia [MY]	3,423,397	3,506,199	3,494,488	4,097,604
	Philippines [PH]	310,975	323,860	381,252	432,578
	Singapore [SG]	937,311	1,163,309	1,032,647	1,067,309
Viet Nam	Australia [AU]	303,721	320,678	370,438	386,934
	Japan [JP]	671,379	740,592	798,119	826,674
	Malaysia [MY]	346,584	407,574	480,456	540,119
	Philippines [PH]	99,757	110,967	133,543	151,641
	Singapore [SG]	236,547	257,041	277,658	286,246

Source: ASEAN Statistics, 2019

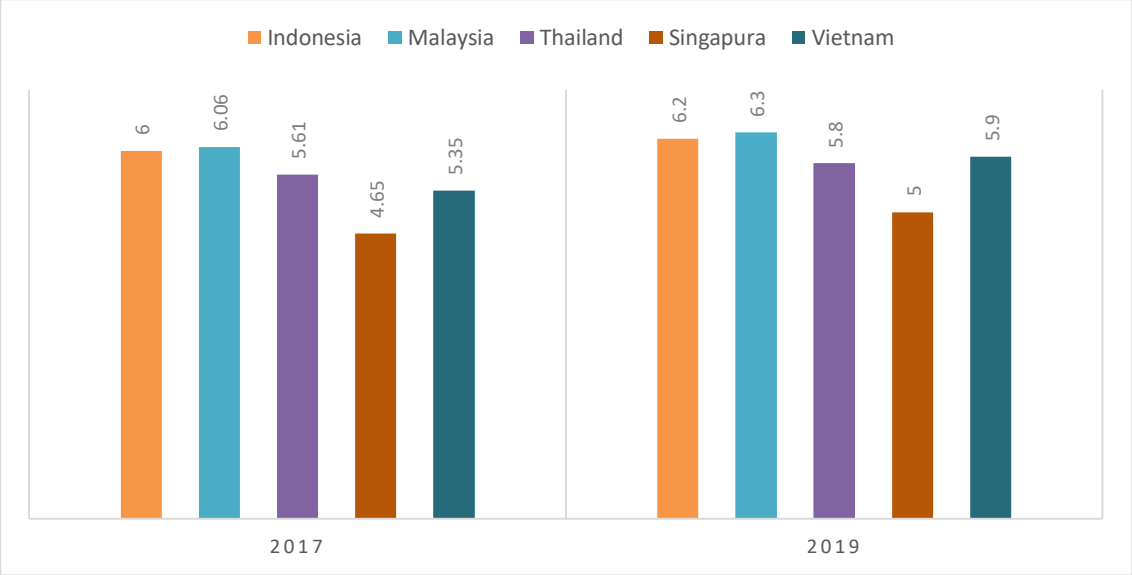

Figure 6. Price Competitiveness, 2017 and 2019
Source: World Travel & Tourism Competitivenss Report 2017-2019, 2020