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DETERMINING FACTORS OF THE NUMBER OF TOURISTS IN 30 COUNTRIES USING GEOGRAPHYCALLY WEIGHTED PANEL REGRESSION

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ABSTRACT

This study aims to determine the factors that influence the number of tourists in 30 countries. The research method used is quantitative.The research data is secondary data. The research unit is in the form of 30 countries of observation. The research variables were measured in three years of observation, namely 2018, 2019 and 2020. The variables used were the number of tourists (people), the currency exchange rate of tourist countries against the rupiah, GDP per capita, population density, visa-free visit, consumer price index, life expectancy, economic growth and imports. The results obtained are that the factors that influence the number of foreign tourists visiting the observation countries in 2018 to 2020 vary depending on the area of the observation country. Countries with the number of foreign tourist visits influenced by population density and imports are Malaysia and Singapore. Countries with the number of foreign tourist visits influenced by economic growth and imports are China and South Korea. Countries with the number of foreign tourist visits that are influenced by import factors are countriesBangladesh, Brunei Darussalam, Burma, Hong Kong, India, Pakistan, Thailand and Vietnam. While the rest are not influenced by any factor in the model with a 90% confidence level.The Geographically Weighted Panel Regression (GWPR) model that has been formed is appropriate and has a significant difference compared to the panel regression model due to the location effect which also significantly influences the number of foreign tourist visits to the observed countries. The model has an adjusted r-square value of50.84874% which means the model is able to explain the variance of the number of foreign tourists visiting50.84874% only by variablepopulation density, economic growth, and imports. Meanwhile, the rest is influenced by other variables outside the model.

Keywords: GWPR, Number of Foreign Tourists, Panel Regression

ABSTRAK

Penelitian ini bertujuan untuk mengetahui faktor-faktor yang mempengaruhi jumlah wisatawan di 30 negara. Metode penelitian yang digunakan adalah kuantitatif. Data penelitian merupakan data sekunder. Unit penelitian berupa 30 negara observasi. Variabel penelitian diukur dalam tiga tahun pengamatan yaitu tahun 2018, 2019 dan 2020. Variabel yang digunakan adalah jumlah wisatawan (orang), nilai tukar mata uang negara turis terhadap rupiah, PDB per kapita, kepadatan penduduk, visa- kunjungan bebas, indeks harga konsumen, harapan hidup, pertumbuhan ekonomi dan impor. Hasil yang diperoleh adalah faktor-faktor yang mempengaruhi jumlah kunjungan wisman ke negara observasi tahun 2018 hingga 2020 berbeda-beda tergantung wilayah negara observasi. Negara dengan jumlah kunjungan wisman yang dipengaruhi oleh kepadatan penduduk dan impor adalah Malaysia dan Singapura. Negara dengan jumlah kunjungan wisman yang dipengaruhi oleh pertumbuhan ekonomi dan impor adalah China dan Korea Selatan. Negara dengan jumlah kunjungan wisman yang dipengaruhi faktor impor adalah negara Bangladesh, Brunei Darussalam, Burma, Hong Kong, India, Pakistan, Thailand dan Vietnam. Sedangkan sisanya tidak dipengaruhi oleh faktor apapun dalam model dengan tingkat kepercayaan 90%. Model Geographically Weighted Panel Regression (GWPR) yang telah dibentuk sudah sesuai dan memiliki perbedaan yang signifikan dibandingkan dengan model regresi panel karena pengaruh lokasi yang juga berpengaruh signifikan terhadap jumlah kunjungan wisatawan mancanegara ke negara yang diamati. Model tersebut memiliki nilai adjusted r-square sebesar 50,84874% yang berarti model mampu menjelaskan variansi jumlah kunjungan wisman sebesar 50,84874% hanya dengan variabel kepadatan penduduk, pertumbuhan ekonomi, dan impor. Sedangkan sisanya dipengaruhi oleh variabel lain di luar model.

Kata kunci: GWPR, Jumlah Wisman, Regresi Panel

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2 2022
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INTRODUCTION

In general, tourism is a journey undertaken someone temporarily held from somewhere to another place by leaving the original place and with something planning or not the intention to make a living in that place visited, but solely to enjoy the first activities or recreation to satisfy diverse desires. According to Kodhyat (1998) tourism is a journey from somewhere to another place, temporary in nature, carried out individually or in groups, as efforts to find balance or harmony and happiness with the environment in social, cultural, natural and scientific dimensions. While Gamal (2002), tourism is defined as form. a process of temporary departure from one, more towards another place outside his residence. push his departure was due to various good interests because of interests economic, social, cultural, political, religious, health or other interests. Furthermore, Burkart and Medlik (1987) explain tourism as something the temporary and short-term transformation of people to destinations outside the places where they normally live and work, and their activities while living in those destinations. According to the WTO (1999), what is meant by tourism is activity humans traveling to and staying in outside destinations daily environment. Meanwhile, according to RI Law number 10 2009 concerning tourism explained that tourism is an activity travel undertaken by a person or group of people with visiting certain places for purposes of recreation, personal development, or learn the uniqueness of tourist attractions visited in a while.

The decline of the Covid-19 pandemic has made the global tourism sector revive. This has also encouraged many countries in the world to get tens of millions of tourist visits over the past year. Based on data from the United Nations World Tourism Organization (UNWTO), France is the most visited country in the world in 2021. The number of tourist visits to the world's fashion center reached 48.4 million last year. This amount is equivalent to 11% of the total world tourist arrivals. Of these visits, France received revenue of US$40.8 billion or around Rp.622.25 trillion (exchange rate of Rp. 15,251/US$) in 2021. Mexico is in second place with visits of 31.9 million tourists. Then, tourist visits to Spain were as many as 31.2 million people. Turkey received 29.9 million tourist visits. Italy gets 26.9 million tourists. The number of tourist visits to the United States and Greece was 22.1 million people and 14.7 million people, respectively. Austria occupies the eighth position in this list. This country located in Central Europe is visited by 12.7 million tourists.

Based on this background, the formulation of the research problem was obtained, including:

1. What are the factors that influence the number of foreign tourist visits in the 30 observed countries in 2018-2020?
2. What is the GWPR model in the case of the number of foreign tourist visits in the 30 observation countries in 2018-2020?

Based on the formulation of the problem, the objectives of this study were obtained, including:

1. Get the determinants of the number of foreign tourist visits in 30 observation countries in 2018-2020,
2. Get the appropriate Geographically Weighted Panel Regression model.

LITERATURE REVIEW

Geographically Weighted Panel Regression (GWPR)

Geographically weighted panel regression (GWPR) is a panel data regression development model that is weighted by location effects. The combined GWR equation model and panel data regression are formulated

$$y_{it} = \beta_0(u_{it}, v_{it}) + \sum_{k=1}^{p} \beta_k(u_{it}, v_{it}) x_{itk} + \varepsilon_{it}$$
$$; i = 1,2,\ldots,N; t = 1,2,\ldots,T; k = 1,2,\ldots,p$$

Where k is the kth predictor variable; t is the observation time; i is the observation location; yit is the response value of the ith observation at the tth time; xitk is the value of the kth predictor variable at the ith observation at the tth time; is the ith observation constant of the tth time; is the coordinate point of the ith observation location at the tth time; and is a random error.$\beta_0(u_{it}, v_{it})(u_{it}, v_{it})\varepsilon_{it}$

The weighting in the GWPR model depends on the distance between observation points (Yu, 2010). The way to determine the weights is to use a kernel function. GWPR parameters can be determined using the weighted least squares (WLS) approach with an estimator

$$\hat{\boldsymbol{\beta}}(u_{it}, v_{it}) = (\boldsymbol{X}^T \boldsymbol{W}(u_{it}, v_{it}) \boldsymbol{X})^{-1} \boldsymbol{X}^T \boldsymbol{W}(u_{it}, v_{it}) \boldsymbol{Y}$$

Where it denotes the ith location and t-time in the matrix and is the spatial weighting matrix for the i-th observation location and t-time.$\boldsymbol{\beta W}(u_{it}, v_{it})$

Model suitability testing was carried out to find

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
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out if the GWPR model was appropriate because it had differences with the panel regression model. The test hypothesis used (Leung and Zhang, 2000):
H0 :$\beta_k(u_{it}, v_{it}) = \beta_k$
H1 : there is at least one$\beta_k(u_{it}, v_{it}) \neq \beta_k$
Test statistics used

$$F = \frac{\frac{RSS(H_1)}{df_1}}{\frac{RSS(H_0)}{df_2}}$$

With
$RSS(H_0) = \boldsymbol{Y}^T(\boldsymbol{I}-\boldsymbol{H})\boldsymbol{Y}$where$H = \boldsymbol{X}(\boldsymbol{X}^T\boldsymbol{X})^{-1}\boldsymbol{X}^T$
$RSS(H_1) = \boldsymbol{Y}^T(\boldsymbol{I}-\boldsymbol{L})^T(\boldsymbol{I}-\boldsymbol{L})\boldsymbol{Y}$
$df_1 = \frac{\delta_1^2}{\delta_2}$where$\delta_i = tr([(\boldsymbol{I}-\boldsymbol{L})^T(\boldsymbol{I}-\boldsymbol{L})]^i)$
The null hypothesis will be rejected when F < F 1-;df1;df2 or p-value < .$\alpha\alpha$

To find out when the predictor variable significantly influences the response variable, a significance test of model parameters is carried out with the following hypothesis (Qur'aini,2014):
H0 :$\beta_k(u_{it}, v_{it}) = \beta_k$
H1 :$\beta_k(u_{it}, v_{it}) \neq \beta_k$
Test statistics used

$$T_{hitung} = \frac{\hat{\beta}_k(u_i v_i)}{\hat{\sigma}\sqrt{C_{kk}}}$$

Where$\hat{\sigma} = \sqrt{\frac{RSS(H_1)}{\delta_1}}$and Ckk is the k-th diagonal element of the CitCitT matrix with .$C_{it} = (X'W(u_i, v_i)X)^{-1}X'W(u_i, v_i)$The null hypothesis will be rejected when the value |Tcount|>T(/2;df) or p-value <.α

METHOD

Data

This research data is secondary data from the publication of the National Statistics Competition (NSC) semi-final dataset by Satria Data Center for National Achievement 2021. The research unit is in the form of 30 observation countries. The research variables were measured in three years of observation, namely 2018, 2019 and 2020. The structure of the research data is described in the following table:

Table 1. Research Data Structure

Country	Year	Y	X1	X2	…	X8
Country(1)	2019	Y1	X11	X21	…	X81
Country(2)	2019	Y2	X12	X22	…	X82
…	…	…	…	…	…	…
Countries(30)	2019	Yk	X1k	X2k	…	X8k
Country(1)	2020	Yk+1	X1k+1	X2k+1	…	X8k+1
…	…	…	…	…	…	…
Country(k)	2020	Y2k	X12k	X22k	…	X82k
Country(1)	2020	Y2k +1	X12k +1	X22k +1	…	X82k +1
…	…	…	…	…	…	…
Country(k)	2021	Y3k	X13k	X23k	…	X83k

Research Variables

The variables used in this study can be explained in the following table:

Table 2. Research Variables

Variable	Information	Data Scale
Y	Foreign tourists (Person)	Ratio
X1	Foreign tourists' currency exchange rate against the rupiah (exchange rate)	intervals
X2	GDP per capita US$	intervals
X3	Population density per km2	Ratio
X4	Free Short Visit Visa (BVKS)	Nominal
X5	Consumer Price Index	intervals
X6	Life Expectancy (years)	intervals
X7	Economic growth (%)	intervals
X8	Import (US$)	Ratio

Step Analysis

The stages of data analysis in this study, namely:

1) Data exploratory analysis to determine the characteristics of the data.
Data exploratory analysis can use data descriptive statistics and data visualization.
2) Panel data regression model selection
There are three types of panel data regression models, namely the common effect model (CEM), fixed effect model (FEM), random effect model (REM). In selecting the model, the following three tests can be used:
    - Chow's test to compare the CEM (common effect model) and FEM (fixed effect model) models (Greene,2002). The alternative hypothesis test is at least one$a_{0i} \neq a_0$(FEM model is more suitable).critical areaReject H0 when the Fcount value is > or p-value < .$F_{(\alpha, df_1, df_2)}\alpha$With the F test statistics have arithmetic equation:
    $$F = \frac{(R^2_{LSDV} - R^2_{pooled})/N-1}{(1-R^2_{LSDV})/(NT-N-K)}$$
    - Hausman test to compare the REM model (random effect model) and FEM (fixed effect model) (Greene,2002). Alternative hypothesis test is$corr(X_{it}, \varepsilon_{it}) \neq 0$(FEM model is more suitable).with critical areasReject H0 when value or p-value < .

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
E-ISSN: 2541-5360

With the test statistic W has arithmetic equation:$W > \chi^2_{(\alpha,df)}\alpha$

$$W = \left((\hat{\beta}_{FEM}) - (\hat{\beta}_{REM})'(var(\hat{\beta}_{FEM}) - var(\hat{\beta}_{REM})\right)^{-1}\left((\hat{\beta}_{FEM}) - (\hat{\beta}_{REM})\right)$$

- Langrange Multiplier test to compare the CEM (common effect model) and REM (random effect model) models (Greene,2002). Alternative hypothesis test is$\sigma^2_\varepsilon \neq 0$(REM models are more suitable).with critical areasReject H0 when the value . The LM test statistic has an arithmetic equation:$> \chi^2_{(\alpha,1)}$

$$LM = \frac{NT}{2(T-1)}\left(\frac{\sum_{1=1}^{N}(T\varepsilon_i)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\varepsilon_{it}^2} - 1\right)^2$$

3) Parameter estimation of the panel data regression model
Modeling is adjusted to the selected model approach.CEM (the model has no differences in the individual and time dimensions, with the estimation technique is OLS (ordinary least squares)), FEM (inter-time or individual effects on the model, with the estimation technique LSDV (least square dummy variable)), REM (intercept not constant and considered as a random variable with a certain average, so the estimation technique is GLS (generalized least square)) (Pangestika, 2015).
4) Testing panel data regression assumptions
Homoscedasticity assumption, namely the residual of the model has a constant variance from the disturbance and Non-Autocorrelation / serial correlation assumption, namely there is no serial correlation in the error component
5) Testing the kernel function weighting method
Estimation of the GWPR model begins with determining the optimum bandwidth. One of the steps can be done using the AIC (Akaike Information Criterion) method. According to the AIC method, the best model is the one with the fewest AIC values. This method is used to calculate the bandwidth of each weighting function that can be used. In this study, we will compare the Gaussian kernel function and the Bisuare kernel function.
6) GWPR model estimation
Parameter estimation was carried out for each research unit and year of observation with location weights.
7) Model fit test
The model fit test is used to find out if the GWPR model is suitable for use and is better than panel regression due to significant location weighting.
8) Parameter significance test
The test was carried out partially to determine the effect of the model and independent variables on the dependent variable.
9) Coefficient of Determination
The value of the coefficient of determination can show how well the model can describe the variance of the dependent variable.
10) Model interpretation
The model can be interpreted to answer the objectives.

RESULT AND DISCUSSION

Exploratory Data Analysis

The following is a table of descriptive statistics from the data:

Table 3. Data Descriptive Statistics

	Year	Means	StDev	Min	Max	Skew
	2018	311900	639141	2104	2.5e+6	2.74
	2019	335229	705936	1989	2.98e+6	2.87
Y	2020	69948	184096	225	980118	4.52
	2018	8631	10173	1	46897	1.91
	2019	8302	9900	1	46523	2.05
X1	2020	8643	10221	1	47367	1.94
	2018	35350	24706	1279	86430	0.20
	2019	34395	23716	1285	85300	0.18
X2	2020	32783	22804	1194	86602	0.22
	2018	697	1874	9	7953	3.59
	2019	703	1892	9	8045	3.59
X3	2020	703	1886	9	8019	3.59
	2018	124.07	21.81	99,19	173.02	1.32
	2019	126.81	25,41	99.03	182.32	1.37
X5	2020	129.35	29.75	98.82	200.08	1.44
	2018	78,209	5,140	66,867	84,934	-0.77
	2019	78,329	5,073	67,134	85,078	-0.77
X6	2020	79,242	5,012	67,780	85,290	-0.93
	2018	3,119	2,126	0.052	7,864	0.93
	2019	2,144	2,058	-1,680	8.153	1.37
X7	2020	-3,661	3,870	-10.83	2,906	0.09
	2018	4.4e+9	8.9e+9	2.0e+7	4.5e+10	3.78
	2019	3.9e+9	8.6e+9	3.0e+7	4.5e+10	4.07
X8	2020	3.3+9	7.4e+9	6.5e+7	3.9e+10	4.39

Based on table 3, it can be seen that the number of tourists from countries (Y) on average has increased

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
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from 2018 to 2019 of 23,329 foreign tourists but has decreased quite a lot in 2020. This was made possible due to the impact of closing access to several countries due to the covid-19 pandemic in 2020. It is known that the number of tourists from countries has a positive slope value, which means that values are aggregated at low values and spread at high values. The highest number of foreign tourists in three time periods was the number of tourists in Malaysia in 2019. The average foreign exchange rate for foreign tourists against the rupiah (X1) decreased from 2018 to 2019 but increased in 2020. The population density of countries (X3) continues to decrease on average every year of observation, while the CPI value (X5) of countries continues to experience an average increase as well as life expectancy (X6). Countries observed on average experienced economic deflation (increase in economic growth) from 2018 to 2019, but on average countries were observed to experience massive inflation in 2020. Import values continued to decline on average every year. Variables that have greater slope values than other variables are population density and import values. This means that the population density and import values of countries have quite large variations and are not evenly distributed between countries.

Specifically, it can be described the condition of the number of tourist visits from 30 countries in the year of observation as follows:

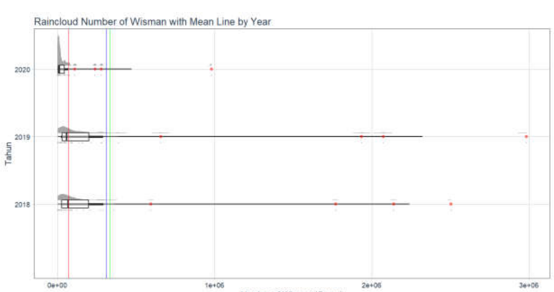

Figure 1. Raincloud Number of foreign tourists in years

Based on Figure 1, it is known that the number of foreign tourists between countries has a fairly large gap. 75% of countries (Q3 value) in 2018 had less than 198,961 tourists, but there were also countries that had a very high number of foreign tourists visiting, amounting to 2,503,344 tourists. In 2019 the number of foreign tourists visiting increased, but experienced a significant decrease in 2020, this can be seen in the boxplot which is getting smaller and shifting to low numbers. In fact, in 2020, the highest number of tourists marked in red is only worth 980,118 foreign tourists.

To find out the relationship between two continuous variables, you can use the Pearson correlation value. This figure shows how strong the relationship between the two variables is without defining the role of the variable (influence or being influenced). Exploratory data can be described heat diagrams of the relationship between the two variables that will be used in this study are as follows:

Figure 2. HeatMap of Pearson's correlation of two continuous variables

The Pearson correlation value means that the closer to the value of ± 1, the stronger the relationship between variables. Based on Figure 2, it can be seen that the variables that have a fairly strong relationship with the number of foreign tourist visits in the observed countries are the Import variable (x8), the economic growth variable (x7). The relationship formed has a positive sign, which means that an increase in the number of foreign tourists visiting is also followed by an increase in economic growth as well as a partial increase in the value of imports. While other variables have a fairly weak relationship.

Panel Regression Model Parameter Estimation

The panel regression model has three models, each of which has the following estimates:

1. Common Effects Model
   Using the help of R software, the estimation results table is obtained as follows:

Table 4. Common effect model parameter estimation results

	Estimates	std.	Error	t-value

Journal of Indonesian Tourism and Policy Studies
Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
E-ISSN: 2541-5360

Intercepts	2.05E+06	1.70E+06	1.2066	0.2311
X1	6.66E-03	5.26E+00	0.0013	0.99899
X2	-2.13E+00	3.43E+00	-0.6219	0.53572
X3	5.73E+01	2.96E+01	1934	0.05661
X4(1)	1.52E+05	2.46E+05	0.6191	0.5376
X5	-4.37E+03	3.23E+03	-1.3498	0.18084
X6	-1.93E+04	2.04E+04	-0.9467	0.34663
X7	1.83E+04	1.26E+04	1.4531	0.15006
X8	3.62E+00	6.57E-01	5.5036	4.25E-07

Total Sum of Squares: 2.8576e+13
Residual Sum of Squares: 1.5526e+13
R-Squared: 0.45668
Adj. R-Squared: 0.40302
F-statistic: 8.51059 on 8 and 81 DF, p-value: 2.4719e-08

Then the model can be rewritten in the form
y =2.05*106+ 0.0066 x1 – 2.13 x2 + 0.573 x3 +1.52*105x4(1) –0.00437x5 – 0.000193x6+0.000183x7+3.62x8

2. Fixed Effects Model
   Obtained parameter estimation table using R software as follows:

Table 5. The estimation results of the fixed effect model parameters

	Estimates	std.	Error	p-values
X1	-7.2179	94.7688	-0.0762	0.93958
X2	-7.7311	13.9322	-0.5549	0.58129
X3	6732191	3099586	2.172	0.03435
X5	2195555	6818301	0.322	0.74871
X6	12734.63	25046.83	0.5084	0.61326
X7	17745.6	9662678	1.8365	0.07189
X8	20,775	2.9888	6,951	5.41E-09

Total Sum of Squares: 6.5422e+12
Residual Sum of Squares: 2.6893e+12
R-Squared: 0.58893
Adj. R-Squared: 0.30972
F-statistic: 10.8475 on 7 and 53 DF,
p-value: 2.1242e-08

With fixed effects (β_0)each country

Austria	Bangladesh	belgium	Brunei Darussalam
-1549360	-9822910	-3449636	-1459445
Burmese	China	Denmark	Finland
-1771089	-9771507	-1786326	-997618
france	Germany	Hong Kong	India
-1767148	-2910867	-49472849	-4815721
Italy	South Korea	Kuwait	Malaysia
-2531669	-3841979	-2306683	-1260614
Netherlands	Norwegian	Pakistan	Portugal
-4283689	-852435	-3255908	-1711640
Qatar	Russia	Saudi Arabia	Singapore
-2646312	-1448073	-1773341	-56863917
spain	Sweden	Switzerland	Thailand
-1622672	-1128080	-2097597	-3859434
United Arab Emirates	Vietnamese		
-2231864	-4177104		

Then the model can be rewritten in the form
$yi=\beta_{0i}$–7.2179x1 – 7.7311x2+6732191x3+2195555x5+12734.63x6 +17745.6x7+20,775x8

3. Random Effects Model
   Obtained parameter estimation table using R software as follows:

Table 6. Parameter estimation results of the random effect model

	Estimates	std.	Error	z-values
Intercepts	3.57E+05	1.95E+6	0.1834	0.8544
X1	4.53E+00	9.62	0.4706	0.6379
X2	1.82E+00	5.20	0.3497	0.7265
X3	2.40E+01	0.517	0.4643	0.6424
X4(1)	7.83E+04	4.23E+5	0.1853	0.8530
X5	1.09E+03	4.45E+3	0.2452	0.8062
X6	-8.55E+03	2.30E+4	-0.3723	0.7096
X7	2.52E+04	8.67E+3	2.9034	0.0036
X8	5.45E+00	1.10	4.9388	7.86E-7

Total Sum of Squares: 8.7496e+12
Residual Sum of Squares: 5.4204e+12
R-Squared: 0.3805
Adj. R-Squared: 0.31931
Chisq: 49.7501 on 8 DF, p-value: 4.5644e-08

With fixed effects (β_0)each country

Austria	Bangladesh	belgium	Brunei Darussalam
-5579.234	-143088.638	-5115.635	-26990.539
Burmese	China	Denmark	Finland
56111.39	-855757.302	16983.637	-25160.685
france	Germany	Hong Kong	India
150466762	5690088	-167940.637	135860.22
Italy	South Korea	Kuwait	Malaysia
49636619	-159647.697	-208146.39	1573522.37
Netherlands	Norwegian	Pakistan	Portugal
57655.485	-3987.72	-56111.39	57931.97
Qatar	Russia	Saudi Arabia	Singapore
-41376.267	3965019	-47890431	178647.354
spain	Sweden	Switzerland	Thailand
101022.53	50796058	-57890.141	-282988.321
United Arab Emirates	Vietnamese		
-120775.118	-229843.357		

Then the model can be rewritten in the form
$yi=\beta_{0i}$+ 3.57*105 + 4.53 x1 + 1.82 x2 +0.24x3+7.83*104x4(1) +0.00109x5 – 0.00855x6+2.52*104x7+5.45x8

Selection Of Panel Data Regression Model

Determination of the estimation method can be done based on the following tests:

1. Chow test
   By using software R, the results are obtained

Table 7. Chow test results

F	df1	df2	*p-values*
9.0351	28	53	6.151e-12

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Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
E-ISSN: 2541-5360

It is known that based on table 7, the results of the chow test have a p-value of6.151e-12. The critical area for rejecting H0 is when the p-value < the significance level (alpha=0.05). Because the p-value is <0.05, the decision taken is to reject H0. It can be concluded that the Fixed Effect model is better to use than the Common Effect.

2. Hausman test
By using software R, the results are obtained

Table 8. Hausman test results

Chi-Square	df	*p-values*
35,738	7	8.122e-06

It is known that based on table 7, the results of the Hausman test have a p-value of8.122e-06. The critical area for rejecting H0 is when the p-value < the significance level (alpha=0.05). Because the p-value is <0.05, the decision taken is to reject H0. It can be concluded that the Fixed Effect model is better used than the Random Effect.

D. Panel Regression Model

Because the best model for panel regression is the fixed effect model, it can be rewritten as the model that stumbles

$yi=\beta_{0i}$–7.2179x1 – 7.7311x2+6732191x3+2195555x5+12734.63x6+17745.6x7+20,775x8

With valuefixed effect (β_0)each country

Austria	Bangladesh	belgium	Brunei Darussalam
-1549360	-9822910	-3449636	-1459445
Burmese	China	Denmark	Finland
-1771089	-9771507	-1786326	-997618
france	Germany	Hong Kong	India
-1767148	-2910867	-49472849	-4815721
Italy	South Korea	Kuwait	Malaysia
-2531669	-3841979	-2306683	-1260614
Netherlands	Norwegian	Pakistan	Portugal
-4283689	-852435	-3255908	-1711640
Qatar	Russia	Saudi Arabia	Singapore
-2646312	-1448073	-1773341	-56863917
spain	Sweden	Switzerland	Thailand
-1622672	-1128080	-2097597	-3859434
United Arab Emirates	Vietnamese		
-2231864	-4177104		

Assumption Test Of Panel Regression Model

There are two assumptions that must be reviewed in the panel data regression model with the following description:

1. Non Heteroscedasticity Assumption Test
The test hypothesis used
H0 :Homoscedasticity
H1 :Heteroscedasticity
With the help of software R, the following results are obtained:

Table 9. Heteroscedasticity Test Results

BP	df	*p-values*
10,544	8	0.2289

The critical area for rejecting H0 is when the p-value < the significance level (alpha=0.05). Because the p-value is > 0.05, the decision taken is to fail to reject H0. It can be concluded that the data has a constant variance from disturbance and meets the assumption of non-heteroscedasticity.

2. Non Autocorrelation Assumption Test
The test hypothesis used
H0 : NoAutocorrelation
H1 :there is a serial correlation (time series) on the error component
With the help of software R, the following results are obtained:

Table 10. Autocorrelation results

Chi-Square	df	*p-values*
21,265	3	9.273e-05

The critical area for rejecting H0 is when the p-value < the significance level (alpha=0.05). Because the p-value is > 0.05, the decision taken is to fail to reject H0. It can be concluded that the data has no serial correlation on the error component. This has fulfilled the non-autocorrelation assumption.

Testing the Kernel Function Weighting Method

Before estimating the GWPR model, the optimum weighting function is first determined by comparing the AIC (Akaike Information Criterion) and R^2 values between the weighting functions. The AIC and R^2 values for the kernel weighting function are presented in the following table:

Table 11. Selection of Weighting Method

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
E-ISSN: 2541-5360

Information	AIC	R2
Bisquare kernels	2566.65	0.6391557
Gaussian Kernels	2583615	0.5239693

The minimum AIC value is owned by the Kernel Bisquare weighting function with the highest R^2 value also owned by the Kernel Bisquare weighting function. Therefore, it can be concluded that the optimal weighting method is the Bisquare kernel function.

Parameter Significance Test for Panel Regression Model

1. Concurrent Test (Test F)
   With the R software results are obtained
   F-statistics : 10.8475
   df1 :7
   df2 :53
   p-values : 2.1242e-08

   Reviewing the p-value < alpha (0.05), it can be concluded that together the panel fixed effect model regression model together with the predictor variable (X) influences the response variable (Y).
2. Partial One-to-One Test
   Based on table 5 it is known that the variable that influences the variable number of foreign tourists in each country is the variable that has a t-value <alpha (10%). Therefore, it can be concluded that the variables that partially affect the number of foreign tourists in each country are population density (x3), economic growth (x7), and import value (x8).

Geographically Weighted Panel Regression Model Parameter Estimation

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Negara	Estimasi Parameter				Standard Error				*t-statistics*				*p-value*				local.R2
	Intercept	X3	X7	X8	Intercept	X3	X7	X8	Intercept	X3	X7	X8	Intercept	X3	X7	X8	
Bangladesh	-7450.63	-0.42613	13311.59	6.359266	134312.8	32.58795	17144.1	2.181713	-0.05547	-0.01308	0.776453	2.914804	0.956	0.99	0.445	0.008	0.549734
Burma	-28306.7	-26.7118	18819.42	9.209163	121460.4	30.95649	16708.39	1.734843	-0.23305	-0.86288	1.126346	5.308354	0.818	0.397	0.271	0	0.551751
Brunei Darussalam	110567.2	4.680438	29869.82	5.847214	112610.2	26.17047	17751.77	0.770921	0.981858	0.178844	1.682639	7.584714	0.336	0.86	0.106	0	0.582906
China	-140359	22.05248	42895.35	3.361014	159356.9	40.58738	23045.98	0.670271	-0.88078	0.543334	1.861294	5.01441	0.387	0.592	0.075	0	0.762027
Denmark	-3141.36	142.6523	11450.43	5.465204	141782.9	524.291	29309.31	8.155608	-0.02216	0.272086	0.390675	0.670116	0.983	0.788	0.7	0.509	0.975995
Austria	2676.39	48.4734	7272.768	5.347958	209425.6	911.7355	27018.08	8.073523	0.01278	0.053166	0.269182	0.662407	0.99	0.958	0.79	0.514	0.981296
Finland	1678.562	39.125	5547.821	6.551459	138915	1291.539	38143.6	11.31189	0.012083	0.030293	0.145446	0.579166	0.99	0.976	0.886	0.568	0.988699
France	59339.22	-19.5836	12692.7	5.893778	201743.8	614.2263	21874.2	8.208041	0.294132	-0.03188	0.580259	0.718049	0.771	0.975	0.567	0.48	0.887671
Germany	10871.16	90.45007	14094.26	5.845297	200173.1	622.3062	24937.82	8.222084	0.054309	0.145347	0.565176	0.710926	0.957	0.886	0.577	0.484	0.929234
India	-27983	38.56608	13516	6.076584	156519.2	263.0752	21862.04	3.516854	-0.17878	0.146597	0.61824	1.727846	0.86	0.885	0.542	0.097	0.569071
Italy	18644.34	35.56953	7818.702	5.362772	164469.5	590.5815	19131.25	7.712615	0.11336	0.060228	0.408687	0.695325	0.911	0.952	0.686	0.494	0.970378
Korea Selatan	-79484	23.79045	40032.41	3.329244	136506.9	34.4415	21069.15	0.635428	-0.58227	0.690749	1.900049	5.239377	0.566	0.496	0.07	0	0.773439
Kuwait	-135621	404.9211	8826.823	6.810694	174181	610.9794	30375.79	5.795527	-0.77862	0.662741	0.290587	1.175164	0.444	0.514	0.774	0.252	0.91715
Malaysia	10186.28	-66.8069	25987.56	11.31662	115415.4	31.39932	17283.03	1.622089	0.088258	-2.12765	1.503646	6.97657	0.93	0.044	0.146	0	0.5706
Belgium	56157.31	-2.35338	14992.86	5.750373	228383.8	650.2972	25882.85	8.534375	0.24589	-0.00362	0.579259	0.67379	0.808	0.997	0.568	0.507	0.899952
Hong Kong	29793.66	21.14883	26115.69	3.678747	106027.5	27.51984	17546.75	0.591681	0.280999	0.768494	1.488349	6.217446	0.781	0.45	0.15	0	0.607054
Netherlands	39225.67	36.43067	15367.62	6.007667	200118.5	608.5905	27149.21	8.272906	0.196012	0.059861	0.566043	0.726186	0.846	0.953	0.577	0.475	0.903787
Norway	-872.861	137.474	11934.49	5.801107	137529.8	505.5948	27213.41	8.054589	-0.00635	0.271906	0.438552	0.720224	0.995	0.788	0.665	0.478	0.992616
Pakistan	-82655.5	102.8378	12992.54	7.348881	152344.6	262.0986	22917.81	4.151192	-0.54256	0.392363	0.566919	1.770306	0.593	0.698	0.576	0.09	0.794412
Portugal	26176.69	23.8703	8266.61	5.530055	165406.1	581.2721	18435.82	7.703928	0.158257	0.041066	0.448399	0.717823	0.876	0.968	0.658	0.48	0.955713
Qatar	-137172	320.9224	11086.74	7.534441	168592.3	397.4069	28720.3	5.719663	-0.81363	0.807541	0.386024	1.317288	0.424	0.427	0.703	0.2	0.893934
Russia	4944.77	-100.765	5449.8	7.699132	157308.1	1143.704	39633.28	16.62027	0.031434	-0.0881	0.137506	0.463237	0.975	0.931	0.892	0.647	0.963433
Saudi Arabia	-5366.09	-66.8806	3135.07	3.186396	387774.5	1457.691	38300.22	10.99522	-0.01384	-0.04588	0.081855	0.289798	0.989	0.964	0.935	0.774	0.951161
Singapore	25562.34	-61.4761	26467.71	10.89607	115899.8	30.64844	17499.22	1.538764	0.220556	-2.00585	1.512508	7.081053	0.827	0.056	0.144	0	0.575607
Spain	37491.01	5.643664	8987.043	5.84014	177350.4	590.7276	18921.27	7.822617	0.211395	0.009554	0.47497	0.746571	0.834	0.992	0.639	0.463	0.932508
Sweden	-952.719	144.0267	7652.122	5.146485	129016.1	655.1719	35252.7	9.047722	-0.00738	0.21983	0.217065	0.568816	0.994	0.828	0.83	0.575	0.99376
Switzerland	21165.47	52.49097	10564.85	5.695094	163298.7	573.3437	18756.33	7.681076	0.129612	0.091552	0.563268	0.741445	0.898	0.928	0.579	0.466	0.928593
Thailand	50463.29	-12.9198	21502.48	7.492944	110446.7	27.61935	16641.71	1.078413	0.456902	-0.46778	1.292084	6.94812	0.652	0.644	0.209	0	0.556905
Vietnam	42642.14	-22.3404	23638.24	8.283883	113734.6	28.156	17476.73	1.191241	0.374927	-0.79345	1.352555	6.953994	0.711	0.435	0.189	0	0.565392
United Arab Emirates	-119376	192.4533	11972.2	8.12201	163235.2	289.2889	26406.09	5.541314	-0.73131	0.665263	0.453388	1.465719	0.472	0.512	0.654	0.156	0.868107

Figure 3. GWPR results

In the previous discussion it is known that the variables that affect the number of foreign tourists significantly partially are the variables x3, x7, and x8. Therefore, a GWPR model with these three variables will be formed. With the help of R

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
E-ISSN: 2541-5360

software, we get an estimation of the Geographically Weighted Panel Regression model which has 30 models. The model formed is the i-th country model with the general model:

$yi=\beta_0+\beta_{3i}X3i+\beta_{7i}X7i+\beta_{8i}X8i$

With the i-index denotes the i-th country. The table of estimation results for all model parameters is shown in Fig 3.

A summary of the results of model parameter estimation is obtained in the following table:

Table 12. Summary of GWPR Model Parameter Estimation Results

	Min.	1st Qu.	Median	3rd Qu.	Max.
Intercepts	-1.40E+5	-2.80E+4	3.81E+3	2.98E+4	110567.2
X3	-1.01E+2	-1.29E+1	2.38E+1	9.05E+1	404,921
X7	3.14E+3	8.83E+3	1.28E+4	2.15E+4	42895.35
X8	3.19	5.47	5.87	7.49	11.317

************Diagnostic information***************
Number of data points: 30
Effective number of parameters (2trace(S) - trace(S'S)): 23.66059
Effective degrees of freedom (n-2trace(S) + trace(S'S)): 66.33941
AICc (GWR book, Fotheringham, et al. 2002, p. 61, eq 2.33): 2600.87
AIC (GWR book, Fotheringham, et al 2002, GWR p. 96, eq. 4.22): 2566.65
BIC (GWR book, Fotheringham, et al. 2002,GWR p. 61, eq. 2.34): 2544.68
Residual sum of squares: 1.031148e+13
R-square value : 0.6391557
Adjusted R-square value: 0.5084874

Based on table 12 it is known that there are 30 models formed. It is also known that the average value of the 30 model parameters for each variable is in table 12. Because the country of Malaysia has the highest number of tourists each year of observation, it is especially possible to write down the model formed for the number of foreign tourists from Malaysia.

$y_{Malaysia} = 10186.28 - 66.8069\ X3malaysia + 25987.56\ X7malaysia + 11.31662\ X8malaysia$

Fit of Models

By using Software R, the model fit test results are obtained as follows:

Table 13. Model Fit Test

Model	SSE	df	F	p-values
Global Models	1.602e+13	86	1,455	0.0452
GWPR model	1.031e+13	80.52		

The critical area for rejecting H0 is when the p-value < the significance level (alpha=0.05). Because the p-value is <0.05, the decision taken is to reject H0. It can be concluded that the model is suitable for use because there is a significant influence of geographical location on the model, and the Geographically Weighted Panel Regression (GWPR) model is better to use than the unweighted panel regression model.

Parameter Significance Test

Parameter significance test was carried out for each parameter with the statistical results of the partial t-test and the overall p-value in Figure 3. The test hypothesis used was

H0 : $\beta_{ki} = 0$ *for k=0,1,..., K ; i=1,2,…,30*

H1 : $\beta_{ki} \neq 0$

With the k-index stating the k-th independent variable and the i-index stating the i-th country. The critical area for rejecting H0 is when the p-value < the significance level (alpha=0.01). After testing the significance of the partial parameters, it is known that there are four combinations of decisions and conclusions. In summary, the results of parameter testing can be written as follows:

Table 14. Decisions and conclusions of partial significance test

Decision	Conclusion	Country
Reject H0 on population density and import variables	The number of foreign tourists from country i is partially influenced by population density and import variables	Malaysia, Singapore
Reject H0 on economic growth and import variables	The number of foreign tourists from country i is partially influenced by economic growth and imports	China, South Korea
Reject H0 on the import variable	The number of foreign tourists from country i is partially influenced by the import variable	Bangladesh, Brunei Darussalam, Burma, Hong Kong, India, Pakistan, Thailand, Vietnam
Failed to Reject H0 on all variables	There are no variables that affect the number of foreign tourists from country i at the 90% confidence level.	*(other)*

There is no other combination of decisions

Coefficient of Determination

Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
E-ISSN: 2541-5360

With the help of R software, the coefficient of determination is obtained as follows:

Table 14. The coefficient of determination

Residual sum of squares	*R-square*	*Adjusted R-square*
1.031e+13	0.6391557	0.5084874

Based on table 15it is known that the value of the adjusted r-square model is 50.84874% which means that the GWPR model with the Bisquare kernel weight is able to explain 50.84874% of the variance in the number of tourists in observed countries influenced by the independent variables population density, economic growth, and imports. Meanwhile, the rest is influenced by other variables outside the model. The value of the local determination coefficient is in Appendix 1, which states the r-square value of each Country i model.

Model Interpretation

The model for Malaysia can be taken

$y_{Malaysia} = 10186.28 - 66.8069\ X3malaysia + 25987.56\ X7malaysia + 11.31662\ X8malaysia$

It is known that the results of the partial significance test for the variables that have a significant effect on the number of foreign tourist visits to Malaysia are population density (x3) and imports (x8). Thus, the interpretation of the model is obtained as follows:

1. Every increase of one unit of population density per km2 also reduces the value of the number of foreign tourists visiting by 67 people,
2. Every one hundred thousand US$ increase in imports also increases the number of foreign tourists visiting by 12 people.

CONCLUSION

Based on the results of the analysis above, the conclusions are as follows:

1. The factors that influence the number of foreign tourists visiting the observation countries in 2018 to 2020 vary depending on the area of the observation country. Countries with the number of foreign tourist visits influenced by population density and imports are Malaysia and Singapore. Countries with the number of foreign tourist visits influenced by economic growth and imports are China and South Korea. Countries with the number of foreign tourist visits that are influenced by import factors are countriesBangladesh, Brunei Darussalam, Burma, Hong Kong, India, Pakistan, Thailand and Vietnam. While the rest are not influenced by any factor in the model with a 90% confidence level.
2. The Geographically Weighted Panel Regression (GWPR) model that has been formed is appropriate and has a significant difference compared to the panel regression model due to the location effect which also significantly influences the number of foreign tourist visits to the observed countries. The model has an adjusted r-square value of50.84874% which means the model is able to explain the variance of the number of foreign tourists visiting50.84874% only by variablepopulation density, economic growth, and imports. Meanwhile, the rest is influenced by other variables outside the model.

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Journal of Indonesian Tourism and Policy Studies Vol. 7 No. 2022
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