

The Impact of Tourism Development on Regional Economic Performance and Unemployment: A Panel Data Analysis of Indonesian Provinces (2018-2020)

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Abstract: This study investigates the impact of tourism development on Gross Regional Domestic Product (GRDP) and unemployment rates across 34 provinces in Indonesia. Using the Post-Double Selection (PDS) method for variable selection and fixed effect regression models for analysis, the study finds that foreign tourism significantly enhances GRDP and reduces unemployment, while domestic tourism shows insignificant economic impact due to inadequate infrastructure and fewer attractions. These findings show the uneven distribution of tourist benefits and the importance of foreign tourism in provincial economic performance and unemployment reduction. Furthermore, the study offers policy recommendations aimed to reduce unemployment and promote Indonesia's inclusive economic growth.

Keywords: tourism development; gross regional domestic product (GRDP); unemployment rates; post-double selection; fixed effect regression

JEL Classification: C2; L83; O18

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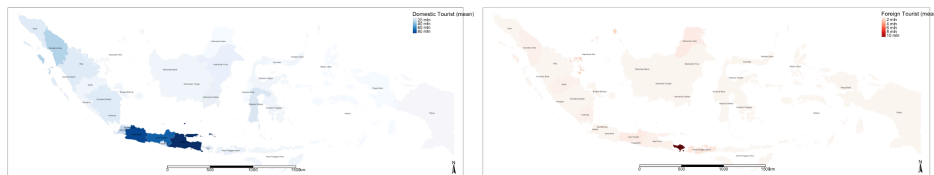
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1 INTRODUCTION

Tourism is one of the leading sectors in Indonesia, contributing to economic performance. According to [Ministry of Tourism and Creative Economy \(2019b\)](#) the tourism sector contributed approximately 4.97% to the national GDP in 2019, underscoring its importance as an economic driver. With its vast geographic expanse and diverse cultural landscape, Indonesia has long been a hub for regional tourism. The dynamics of this sector have far-reaching implications for the nation's economic development and employment landscape ([Sugiyarto et al., 2003](#)). The tourism sector can generate employment, and its multiplier effect on related industries is emerging as a promising avenue for economic enhancement ([Sinclair, 1998](#); [Croes and Vanegas, 2008a](#)). Research indicates that tourism can bring substantial economic benefits, including increased GRDP and job creation ([Ashley et al., 2007](#); [Dwyer et al., 2010](#)). Tourism development also promotes infrastructure improvements and investment in local businesses ([Telfer and Sharpley, 2008](#); [UNWTO, 2013](#)).

Despite tourism's significant contribution to the national economy, Indonesia grapples with low Gross Regional Domestic Product (GRDP) and high unemployment rates across many provinces ([World Bank, 2020](#)). This presents a compelling case for investigating the potential of Indonesian tourism to stimulate economic growth and reduce unemployment. While the tourism sector can generate employment and has a multiplier effect on related industries, the benefits are not evenly distributed, especially in Indonesia.

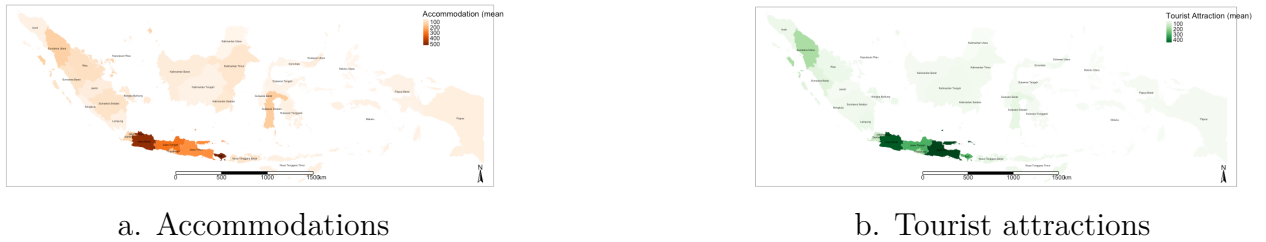
Figure 1: **Distribution of Domestic (Blue) and Foreign (Red) Tourists in Indonesian Provinces (2018-2020)**



Source: Authors' result

According to Figure 1, The distribution of domestic and foreign tourists visiting Indonesia highlights the disparity between provinces in the Java-Bali region and those elsewhere. The concentration of tourism infrastructure and activities in Java and Bali contributes to regional inequalities, leading to underdevelopment and missed opportunities for economic growth in provinces beyond Java and Bali (Hampton and Jeyacheya, 2015; Fall, 2019). Java and Bali, which are prominently displayed on the map, draw most tourists due to their contemporary infrastructure, numerous attractions, and competent workforce. In contrast, Bali Island stands out with its deepest color as the primary destination for the majority of foreign tourists. It is because Bali's distinct blend of cultural diversity, natural beauty, and well-established hospitality services make it a popular destination for international visitors. This desire directly fuels tourist employment, as the arrival of foreign visitors necessitates a greater workforce for various tourism-related activities, such as lodging and dining, entertainment, and transportation, resulting in significant job creation on the island.

Figure 2: **Distribution of Accommodations and Tourist attractions in Indonesian Provinces (2018-2020)**



Source: Authors' result.

Furthermore, Based on Figure 2, the clustering of accommodation facilities and tourist attractions primarily in Java and Bali exacerbates the regional disparity. Specifically, Figure 2a, these areas, characterized by darker shades, host numerous lodgings, enhancing their attractiveness to tourists. In contrast, provinces outside Java and Bali face challenges with limited accommodation infrastructure, which restricts their capacity to effectively accommodate tourists. Additionally, Figure 2b illustrates that the majority of tourist attractions are con-

centrated on Java and Bali islands, underscoring the uneven development of tourism across Indonesia, particularly concerning accommodations and tourist sites. Therefore, prompted by these significant findings, we conduct a deeper analysis to explore the correlation between tourism development—indicated by domestic and foreign tourist numbers—and its impact on GRDP and unemployment.

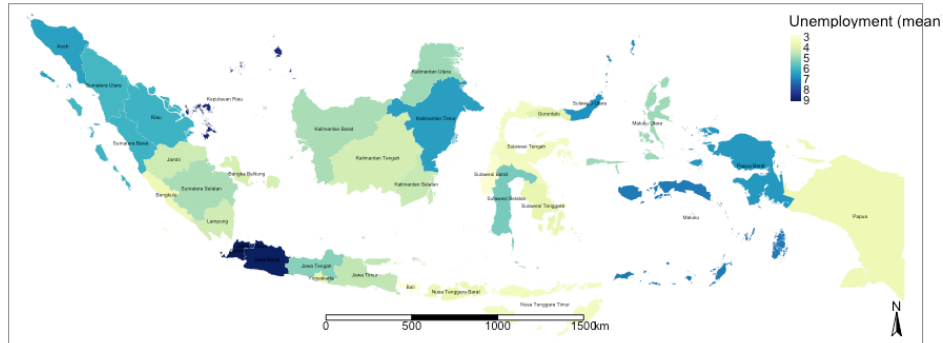
Figure 3: Scatter Plot Diagram: GRDP vs Tourism Development in Indonesian Provinces (2018-2020)



Source: Authors' result.

Our first preliminary findings show a positive association, represented by an upward-sloping line between GRDP variables and tourism arrivals (both domestic and foreign). This emphasizes tourism's economic benefits, consistent with earlier research. Following that, we will examine unemployment in Indonesia in depth.

Figure 4: **Distribution of Unemployment Rate in Indonesian Provinces**
(2018-2020)



Source: Authors' result.

Figure 5: **Scatter Plot Diagram: Unemployment vs Tourism Development in Indonesia Provinces (2018-2020)**



Source: Authors' result.

Based on Figure 4, the unemployment rate in Indonesian provinces varies by region; however, the western provinces generally have greater unemployment rates, but the center

and eastern regions differ. On the other hand, based on Figure 5, the interesting part is that Bali, a popular foreign tourist destination, has decreased unemployment, consistent with the findings of Hampton and Jeyacheya (2015) and Fall (2019). The tourism sector can produce jobs, which can reduce unemployment. In a nutshell, this shows that Indonesian provinces with more foreign tourist arrivals have lower unemployment rates. However, the overall finding is contradictory; with an increased relationship between unemployment and tourism, the scatterplot shows an upward line between tourism development and unemployment. Thus, tourism development may have a small impact on unemployment rates, and other factors should be addressed when understanding unemployment dynamics in these places. To fully understand the economic effects of tourism, variables such as foreign direct investment (FDI), domestic direct investment (DDI), human development index (HDI), accommodations, number of domestic and foreign tourists, and population density must be considered (Gursoy et al., 2012; Tang and Tan, 2015). Moreover, according to the World Travel & Tourism Council (WTT, 2023), the direct contribution of Travel & Tourism to GDP and unemployment is calculated consistently with the output of tourism-characteristic sectors such as accommodation and tourist attractions that directly interact with tourists in National Accounting.

This study contributes to the existing literature by focusing on a province-level analysis of tourism's impact on economic performance and unemployment across Indonesia's 34 provinces from 2018 to 2020. While previous research has often examined national-level impacts of tourism on economic indicators, this study adopts an approach to explore local variations and dynamics within each province. This approach addresses a significant gap in the literature regarding the uneven distribution of tourism benefits and their implications for regional economic development.

Building on the gaps identified above, this study seeks to examine the influence of tourist development on regional economic performance and unemployment in Indonesia's 34 provinces from 2018 to 2020. This study will test numerous hypotheses to understand

better tourism's effects on economic indicators. Moreover, this research is crucial for understanding the interplay between tourism development, economic performance indicators (GRDP), and unemployment rates.

This paper is structured in line with these objectives: **Section 2** provides a comprehensive literature review. **Section 3** elaborates on the theoretical framework guiding the analysis, while **Section 4** details the data sources and sample characteristics essential for empirical investigation. **Section 5** outlines the empirical methods employed to test the hypotheses, followed by **Section 6**, which presents and interprets the study's findings in relation to tourism's impact on economic performance and unemployment across Indonesia's provinces. Finally, **Section 7** concludes with a synthesis of key insights derived from the analysis, offering implications for policy and future research directions.

2 LITERATURE REVIEW

Tourism is crucial in shaping economic performance and socio-economic dynamics in regions worldwide, including Indonesian provinces. This literature review synthesizes existing research to explore how tourism impacts economic indicators such as GRDP, and influences unemployment rates.

2.1 Impact of Domestic Tourists on GRDP

Domestic tourism significantly boosts regional economic growth by driving demand across key tourism sectors. Studies by [Song et al. \(2000\)](#) and [Dwyer et al. \(2010\)](#) emphasize how domestic tourist spending stimulates local economic activities and leads to increases in GRDP through multiplier effects. Empirical evidence, shown by [Ashley et al. \(2007\)](#), confirms that regions with high domestic tourist influxes experience substantial economic benefits, including infrastructure enhancements that improve regional appeal, and the promotion of economic diversity. Additionally, domestic tourism fosters cultural exchange and preservation, enriching local heritage and contributing to a resilient economic base less susceptible

to sector-specific downturns. These findings highlight the pivotal role of domestic tourism in driving sustainable economic development and prosperity within regions.

2.2 Impact of Foreign Tourists on GRDP

Foreign tourists play a pivotal role in enhancing the economic performance of host regions, significantly boosting GRDP. Their spending is vital for countries reliant on tourism income as highlighted by [Sinclair \(1998\)](#) and [Croes and Vanegas \(2008a\)](#). This spending also fosters the development of hotels, resorts, transportation facilities, and other critical infrastructure, thereby stimulating broader economic activity. Empirical evidence from [Song et al. \(2000\)](#) underscores that regions with high international tourist arrivals experience substantial increases in GRDP due to spending on accommodation, dining, entertainment, and related services, which in turn support sectors like retail, transportation, and cultural services. This influence creates hospitality, retail, and transportation jobs, reduces unemployment, promotes economic diversification, and enhances regional resilience against economic shocks.

2.3 Impact of Domestic Tourists on Unemployment

The relationship between domestic tourism and unemployment is crucial for regional economic development, as evidenced by studies from [Chen et al. \(2016\)](#) and [Brida et al. \(2018\)](#). Increasing domestic tourists consistently correlates with job creation and lower unemployment rates by driving demand across sectors like hospitality and services. This growth necessitates a larger workforce to meet rising demand, particularly in hotels, restaurants, recreational facilities, and ancillary services such as tour operations and transportation. The economic impact of domestic tourism is further magnified by its multiplier effect within local economies: expenditures on accommodations, dining, and entertainment ripple through communities, boosting revenue for businesses and prompting expansion and additional hiring. Moreover, domestic tourism fosters sectoral diversification by stimulating growth in SMEs across retail, arts and crafts, and local food production, thereby enhancing economic

resilience and reducing dependence on a narrow range of industries.

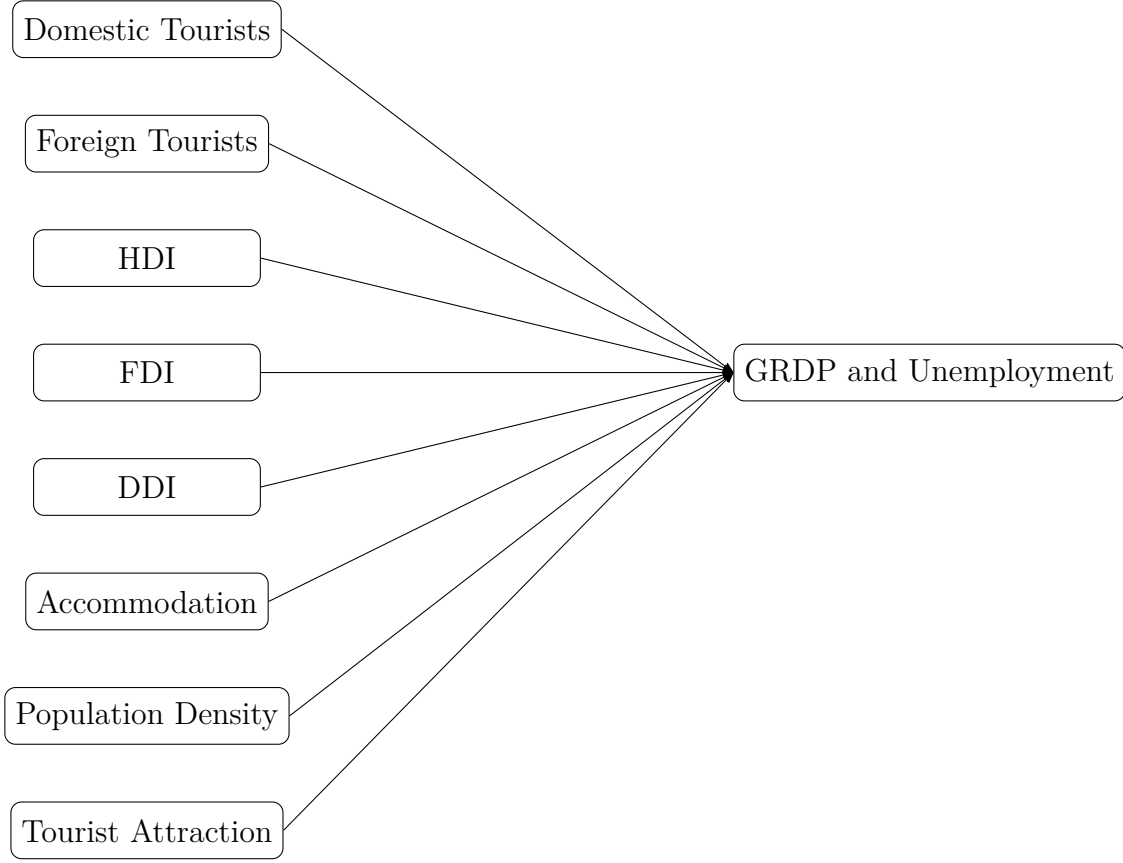
2.4 Impact of Foreign Tourists on Unemployment

The arrival of foreign tourists has a profound impact on reducing unemployment rates in host regions, as highlighted by [Sinclair \(1998\)](#), [Croes and Vanegas \(2008a\)](#), and [Loría et al. \(2017\)](#). Influxes of international visitors stimulate job creation across various sectors, particularly within hospitality, where hotels, restaurants, and recreational facilities expand to meet increased demand. This growth necessitates hiring across roles such as hotel management, front desk services, housekeeping, culinary services, and hospitality staff. Many industries also benefit from transportation, retail, and cultural tourism, which experience increased activity, thereby creating employment opportunities for drivers, sales personnel, logistics staff, and retail businesses offering souvenirs and local crafts. Infrastructure improvements driven by tourism, including upgrades to airports, roads, and public transport systems, further contribute to construction, engineering, and project management job creation. The demand for high-quality service from international tourists also leads to improved employment conditions within the tourism sector, attracting skilled workers, thereby contributing to sustained economic growth and stability for the local economy.

3 THEORETICAL FRAMEWORK

The theoretical framework for this study investigates the impact of tourist development on regional economic performance, with GRDP and unemployment as the outcome or dependent variable. The treatment or independent variable is tourism development, as measured by the number of domestic and foreign tourists. Furthermore, to ensure a thorough analysis, the study contains numerous control variables: HDI, FDI, DDI, accommodation, tourist attraction, and population density. These six factors are crucial in identifying the different impact of tourism on GRDP and unemployment. They improve our ability to gain a more exact and comprehensive understanding of the economic dynamics around tourism.

Figure 6: **Theoretical Framework**



Note(s): In this research, GRDP is the dependent variable for the first model, while unemployment serves as the dependent variable for the second model.

Domestic and international tourism significantly boost GRDP by stimulating spending on local goods and luxury services, respectively, which in turn enhances economic activity and creates employment opportunities in hospitality, food services, retail, and entertainment sectors (Dwyer et al., 2010; Song et al., 2000; Sinclair, 1998; Croes and Vanegas, 2008a). Domestic tourism directly supports employment in these sectors as local businesses expand to meet tourist demands, while foreign tourism generates jobs through investments in tourism-related infrastructure and services.

Controlling for key variables is crucial to accurately assess tourism's impacts on GRDP and unemployment. Including HDI helps isolate tourism's specific economic impact by adjusting for regional variations in human development (Programme, 2019). FDI attracts

capital and expertise that benefit tourism infrastructure while controlling for it separates tourism’s effects from broader investment activities (OECD, 2020). Similarly, DDI captures local investments in tourism-related infrastructure, accurately identifying tourism’s unique contributions to economic output and employment (OECD, 2020).

The number of accommodations and tourist attractions are also critical factors. Controlling for accommodation capacity and tourist attractions isolates the direct impact of tourist numbers on GRDP and employment by accounting for tourism-supporting infrastructure (UNWTO, 2013). Moreover, population density control distinguishes tourism’s economic impacts from those influenced by demographic characteristics, providing a clearer understanding of tourism’s role in regional economies (World Bank, 2020). These variables collectively strengthen analyses of tourism’s economic effects on both GRDP and unemployment.

4 DATA AND SAMPLE

This study utilizes foreign and domestic tourist numbers as proxies for Indonesian tourism development. This research controls for macroeconomic factors (FDI and DDI), tourism employment, human capital (Human Development Index), infrastructure (number of accommodations), tourist attractions, and population density. Data were sourced from Statistics Indonesia. Moreover, The construction of the estimation sample uses purposive or non-probability sampling. Purposive sampling involves deliberately selecting specific individuals or groups based on certain criteria that align with the research objective. In this case, the sample of this study is a balanced panel data consisting of all 34 provinces in Indonesia from 2018 to 2020. The detailed provinces are provided in the Appendix. This period was chosen due to the peak influx of tourists before the Covid-19 pandemic. Detailed provinces are in the Appendix, and the statistical analysis of the variables follows.

Table 1: Statistical Descriptions of Key Variables

Variable	Definition	Source	N	Mean	SD	Min	Max
ln(GRDP)	Log of Gross Regional Domestic Product per capita (Thousand Rupiahs)	Statistics Indonesia	102	10.85	0.55	9.82	12.50
Unemployment	Unemployment rate	Statistics Indonesia	102	5.18	1.85	1.40	10.95
ln(FDI)	Log of foreign direct investment realization (Million US\$)	Statistics Indonesia	102	10.47	2.50	4.93	16.59
ln(DDI)	Log of domestic direct investment realization (Billions of Rupiahs)	Statistics Indonesia	102	15.54	1.45	12.26	18.66
Human development	Human development index	Statistics Indonesia	102	70.84	3.91	60.06	80.77
ln(Accommodations)	Log of the Count of Tourist Lodgings (Unit)	Statistics Indonesia	102	3.86	1.33	0.00	6.31
ln(Tourist Attraction)	Log of the Count of Tourist Attraction (sites)	Statistics Indonesia	102	3.65	1.17	1.39	6.27
ln(Population Density)	Log of the average number of people per unit area (person/sq.km)	Statistics Indonesia	102	4.88	1.59	2.20	9.67
ln(Domestic tourist)	Log of the number of visitors from domestic for leisure or business (Person)	Statistics Indonesia	102	15.54	1.45	12.26	18.66
ln(Foreign tourist)	Log of the number of visitors from abroad for travel or leisure (Person)	Statistics Indonesia	102	10.47	2.50	4.93	16.59

Source: [Badan Pusat Statistik \(2022\)](#) & [Badan Pusat Statistik \(2023\)](#).

To begin, we utilize the Central Limit theorem (CLT) by applying the natural logarithm to normalize all the distributions except the HDI and Unemployment rate since HDI uses the index and the unemployment rate already satisfies the central limit theorem. Table 1 illustrates notable variations within provinces, particularly before being transformed into a logarithmic scale. Some provinces exhibit higher levels of economic development, investment, tourism activity, infrastructure, Human Development Index (HDI), and Gross Regional Domestic Product (GRDP), resulting in disparities in economic situations. As an illustration,

the unemployment rate exhibits significant variation, with an average of 5.18 and a standard deviation of 1.85. Furthermore, the Gross Regional Domestic Product (GRDP), with a mean value of 10.85 and a standard deviation of 0.55, indicates variations in economic performance among different provinces.

5 EMPIRICAL METHOD

5.1 LASSO

By including several covariates, the empirical model aims to eliminate selection bias (omitted variable bias) and improve the regression model's predictive ability. The inclusion of relevant covariates enhances the model's capacity to capture the complexities of the link between financial inclusion and human development. To effectively use the extensive information provided by the variables to predict the outcome variable (Y), a causal machine learning method known as Post-Double Selection (PDS) was employed. This method, developed by [Belloni et al. \(2017\)](#), is often combined with the LASSO approach to enhance regression model performance. The PDS approach consists of two steps: variable selection and parameter estimation. The method uses variable selection to automatically identify and include significant covariates while reducing unimportant parameter estimates to zero, discarding those that contribute nothing to the fit. LASSO penalizes some variables by setting their coefficients to zero. This approach automatically selects relevant variables for the final model, resulting in more accurate and interpretable coefficient estimates.

5.2 Fixed Effect Regression

This study employs fixed-effects estimation to account for variability among Indonesian provinces and over time. The use of panel data analysis, incorporating multiple covariates and the PDS method, allows for a comprehensive investigation of the causal effect between treatment (tourism development) and outcome variables (GRDP and Unemployment). This

approach provides a robust framework for examining complex dynamics, reducing biases, and improving the interpretability of the model's predictions. Moreover, fixed-effects models are more robust than random-effects models for analyzing policy effects using aggregated data ([Wooldridge, 2010](#)). This method is appropriate for panel data analysis, as seen in this study, which spans 34 provinces over three years (2018-2020) and accounts for unobserved time-invariant traits in each province.

5.2.1 Assumption Tests

Numerous diagnostic tests were conducted to assess the validity of the regression assumptions in both models, with all results presented in the Appendix:

- **Normality of Residuals:** The Shapiro-Wilk test on fixed-effect regression residuals showed a normal distribution. Furthermore, logarithmic transformation (LOG) was previously applied, aligning with the Central Limit Theorem (CLT), which states that with a large sample size, sample means or residuals tend towards normality irrespective of the population's distribution.
- **Homoscedasticity:** The Breusch-Pagan tests indicated significant heteroscedasticity in the residuals for both Model 1 (GRDP) (BP = 19.513, df = 8, p = 0.012) and Model 2 (Unemployment) (BP = 54.134, df = 8, p < 0.001), necessitating the use of robust standard errors due to differing variance across levels of the independent variables.
- **Autocorrelation of Residuals:** The Durbin-Watson test was initially applied to test for autocorrelation; however, due to the nature of fixed effects models, the test was not applicable. Instead, the Wooldridge test for serial correlation in both models showed no significant evidence of autocorrelation in the residuals.
- **Multicollinearity:** We also calculated the variance inflation factor (VIF) to detect multicollinearity in the models, which is usually defined as when $VIF > 10$ ([Kutner](#)

et al., 2005). In this case, none of the variables exceeded the threshold, suggesting no severe multicollinearity among the variables in the dataset.

5.2.2 Empirical Model

These tests previously ensure the robustness of the regression models and provide confidence in the validity of the subsequent empirical analysis. Here are the estimated fixed effect regressions:

Model 1:

$$\begin{aligned} \ln(\text{grdp})_{it} = & \beta_0 + \beta_1 \ln(\text{domestic_tourist})_{it} + \beta_2 \ln(\text{foreign_tourist})_{it} + \beta_3 \text{hdi}_{it} \\ & + \beta_4 \ln(\text{accommodation})_{it} + \beta_5 \ln(\text{fdi})_{it} + \beta_6 \ln(\text{ddi})_{it} \\ & + \beta_7 \ln(\text{pop_density})_{it} + \beta_8 \ln(\text{tourist_attraction})_{it} + \epsilon_{it} \end{aligned} \quad (1)$$

Model 2:

$$\begin{aligned} (\text{unemployment})_{it} = & \beta_0 + \beta_1 \ln(\text{domestic_tourist})_{it} + \beta_2 \ln(\text{foreign_tourist})_{it} + \beta_3 \text{hdi}_{it} \\ & + \beta_4 \ln(\text{accommodation})_{it} + \beta_5 \ln(\text{fdi})_{it} + \beta_6 \ln(\text{ddi})_{it} \\ & + \beta_7 \ln(\text{pop_density})_{it} + \beta_8 \ln(\text{tourist_attraction})_{it} + \epsilon_{it} \end{aligned} \quad (2)$$

The intercept term is represented by β_0 , where the coefficients to be estimated are represented by β_n , and the error term is represented by ϵ . The variables i and t represent provinces in Indonesia and specified years in this research, respectively.

6 EMPIRICAL RESULT

6.1 LASSO Result

Using PDS method with LASSO, all control variables in both models are significant predictors for the dependent variable. The detailed results can be seen in the Appendix. Thus, for further analysis, we will include all the control variables.

6.2 Fixed Effect Regression Result

In order to control for factors such as potential endogeneity that simultaneously affect both outcome and treatment variables, we used panel fixed effects as a strategy to control for province-specific factors and time-specific events affecting both the GRDP and unemployment variables. With the panel fixed effects model, we address major sources of potential bias in the regression model, which can arise from the omission of province-specific, historical, or structural factors influencing both the treatment and outcome variables.

Table 2: Panel fixed effect models

VARIABLES	GRDP	Unemployment
Domestic Tourist (log)	0.001 (0.004)	-0.033 (0.022)
Foreign Tourist (log)	0.008** (0.003)	-0.092*** (0.021)
Human Development	0.097*** (0.011)	0.073* (0.041)
Accommodation (log)	0.073** (0.032)	-0.004 (0.029)
Foreign direct investment (log)	0.015*** (0.006)	-0.056 (0.035)
Domestic direct investment (log)	-0.006 (0.007)	0.012 (0.023)
Population Density (log)	-0.869*** (0.080)	-0.802** (0.372)
Tourist attraction (log)	0.039* (0.020)	-0.264 (0.203)
R-squared	0.80484	0.53086
F-statistics	30.9307***	8.4866***
Observations	102	102
Number of Provinces	34	34
Note(s): *** P<0.01, ** P<0.05, * P<0.1		
Robust standard errors are in parentheses.		
Source(s): Authors' estimates		

According to the first model of fixed effect regression result, GRDP, the analyses underscore that tourism development, which is proxied by the number of domestic and foreign tourists' support for tourism's impact on GRDP. This result reveals foreign tourism has a statistically significant positive impact on GRDP with, Specifically an increase in foreign tourists by one unit increases GRDP by 0.008. Unfortunately, domestic tourism does not

have a statistically significant positive impact on GRDP in Indonesian provinces. These findings underscore the importance of foreign tourists in driving GRDP growth. They are consistent with [Blanchard and Katz \(1992\)](#) assertion that international tourists contribute more significantly to economic growth through higher spending, whereas domestic tourism may have a lesser impact due to lower spending or inadequate infrastructure. In general, this model fits well as indicated by the R-squared value of 0.80484, which means that approximately 80.484% of the variation in our dependent variable is explained by the independent variables in this research.

According to the second model, Unemployment, the analyses underscore that tourism development, proxied by both foreign and domestic tourism, has a complex impact on unemployment. Specifically, these results reveal foreign tourists have a statistically significant negative impact on unemployment, indicating that increased foreign tourists by one unit are associated with decreased unemployment rates by 0.092. However, domestic tourism does not have a statistically significant impact on unemployment in Indonesian provinces. The findings suggest that foreign tourism plays a crucial role in reducing unemployment. This is aligned with [Sinclair \(1998\)](#); [Croes and Vanegas \(2008a\)](#); [Loría et al. \(2017\)](#) findings that increasing the number of international visitors significantly reduces the unemployment rate. Moreover, the economic activities generated by international tourism, which include higher spending on services and goods, tend to create more job opportunities in both the formal and informal sectors than domestic tourism. This is because international tourists' expenditures have a more substantial multiplier effect on the local economy ([Organization, 2019](#)). In general, this model fits well as indicated by the R-squared value of 0.53086, which means that approximately 53.086% of the variation in our dependent variable is explained by the independent variables in this research.

7 CONCLUSION

This study significantly contributes to the existing literature by providing a nuanced, province-level analysis of tourism's impact on economic performance and unemployment across Indonesia's 34 provinces from 2018 to 2020. While previous research has often focused on national-level impacts, this study addresses the gap by exploring the local variations and dynamics within each province, thus highlighting the uneven distribution of tourism benefits and their implications for regional economic development. The fixed effect regression analysis indicates that foreign tourism has a statistically significant positive impact on GRDP, highlighting its importance in boosting economic activities. In contrast, domestic tourism does not show a significant effect on GRDP. Additionally, foreign tourism is found to significantly reduce unemployment rates, while domestic tourism does not have a notable impact on employment levels. Thus, The findings suggest that policymakers should focus on attracting more international tourists and improving infrastructure to maximize the economic benefits of tourism. By addressing the disparities in tourism benefits across provinces, Indonesia can foster more balanced regional economic development and leverage tourism as a strategic tool for economic growth and job creation.

7.1 Policy Implications of the analysis

The study highlights the substantial economic contributions of foreign tourism compared to domestic tourism, emphasizing the gaps that exist in terms of infrastructure and tourist attractions across Indonesia's provinces. To address these gaps, policymakers in each province should consider expanding tourist attractions to attract more foreign tourists. Additionally, efforts should focus on enhancing international tourist arrivals through strategic marketing campaigns, streamlined visa procedures, and investments in tourism infrastructure. Simultaneously, initiatives aimed at creating travel incentives, such as reducing the price of plane tickets, improving local infrastructure, and promoting indigenous attractions, are crucial for

fostering domestic tourism growth. Moreover, Investments in education and healthcare are vital to bolster workforce productivity and overall economic growth. Furthermore, Encouraging foreign direct investment through incentives and fostering public-private partnerships can further bolster the tourism sector's development. Moreover, effective urban planning and the promotion of rural tourism can alleviate the adverse impacts of high population density. These integrated strategies are designed to maximize the economic benefits derived from both foreign and domestic tourism, thereby promoting sustainable and inclusive growth. This holistic approach, with its multiplier effect, holds promise for boosting GRDP and significantly reducing unemployment rates across Indonesia, ensuring balanced economic advancement across diverse regions.

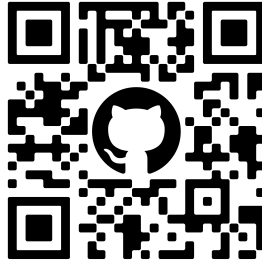
7.2 Limitations

This study focuses solely on the causal effect of international tourist arrivals on regional economic indicators like GRDP and unemployment, without considering other critical factors such as tourist expenditure and length of stay. These variables are essential as they directly support local businesses and sustain economic activities.

Despite efforts to control for these factors using panel fixed effects models, there may still be unobserved variables influencing both tourism and economic indicators concurrently. Future research could explore instrumental variable approaches or natural experiments to mitigate these endogeneity concerns more effectively. Furthermore, analysing spillover effects or spatial autocorrelation in tourism's economic impact could be considered for future analysis. This approach can provide deeper insights into all provinces in Indonesia and their long-term influence on regional economies, expanding our understanding beyond direct effects on GRDP and unemployment.

APPENDIX

The code and data for this paper can be accessed at <https://github.com/IgnatiusHarry/Tourism-Causal>.



List of Indonesia Provinces

Table 3: Categorization of Provinces Based on Island Names in English

Sumatra Island	Java Island
Aceh North Sumatra (Sumatera Utara) South Sumatra (Sumatera Selatan) West Sumatra (Sumatera Barat) Bengkulu Riau Riau Islands (Kepulauan Riau) Jambi Lampung Bangka Belitung Islands (Kep. Bangka Belitung)	Banten (Banten) Jakarta (DKI Jakarta) West Java (Jawa Barat) Central Java (Jawa Tengah) Special Region of Yogyakarta (DI Yogyakarta) East Java (Jawa Timur)
Kalimantan Island	Bali Island
West Kalimantan (Kalimantan Barat) Central Kalimantan (Kalimantan Tengah) South Kalimantan (Kalimantan Selatan) East Kalimantan (Kalimantan Timur) North Kalimantan (Kalimantan Utara)	Bali
Nusa Tenggara Islands	Sulawesi Island
East Nusa Tenggara (NTT) West Nusa Tenggara (NTB)	Gorontalo (Gorontalo) West Sulawesi (Sulawesi Barat) South Sulawesi (Sulawesi Selatan) Southeastern Sulawesi (Sulawesi Tenggara) North Sulawesi (Sulawesi Utara) Central Sulawesi (Sulawesi Tengah)
Maluku and Papua Islands	
Maluku North Maluku (Maluku Utara) West Papua (Papua Barat) Papua	

Note: Categorization of provinces based on island names in English.

LASSO Regression Results - Model 1

```
> # The best Lambda
> best_lambda1 <- cv_lasso1$lambda.min
> cat("Optimal lambda: ", best_lambda1, "\n")
Optimal lambda: 0.00437354
>
> # Model coefficients with optimal lambda
> lasso_coefs1 <- coef(cv_lasso1, s = "lambda.min")
> print(lasso_coefs1)
9 x 1 sparse Matrix of class "dgCMatrix"
              s1
(Intercept)    4.61556192
log_domestic_tourist -0.02467963
log_foreign_tourist  0.05570076
HDI              0.08559414
log_accommodation  0.08424761
log_FDI           0.10993799
log_DDI           0.04270276
log_pop_density   -0.14971816
log_tourist_attraction -0.16917071
```

LASSO Regression Results - Model 2

```
> # The best Lambda
> best_lambda <- cv_lasso$lambda.min
> cat("Lambda optimal: ", best_lambda, "\n")
Lambda optimal: 0.01416856
>
> # Model coefficients with optimal lambda
> lasso_coefs <- coef(cv_lasso, s = "lambda.min")
> print(lasso_coefs)
9 x 1 sparse Matrix of class "dgCMatrix"
              s1
(Intercept)   -1.29459132
log_domestic_tourist -0.16526701
log_foreign_tourist -0.09465478
HDI            0.09411152
log_accommodation  0.54934284
log_FDI          0.24249180
log_DDI          0.09197096
log_pop_density   0.12262558
log_tourist_attraction -0.42002465
```

Assumption Tests - Model 1

Multicollinearity Test

```
> vif(ols_model1)
      log_domestic_tourist      log_foreign_tourist      HDI      log_accommodation
              3.625442              1.442506              2.066590              4.826908
              log_FDI              log_DDI      log_pop_density      log_tourist_attraction
              1.677712              2.524699              3.469975              5.968555
```

Normality, Homoscedasticity, and Autocorrelation of Residual Tests

```
> # Normality Test of Residuals
> shapiro.test(model_grdp$residuals)

      Shapiro-Wilk normality test

data:  model_grdp$residuals
W = 0.99203, p-value = 0.8141

> #Result: P>0.05 = reject H0 (Residual is normal distribution (G000))
>
> # Homoscedasticity Test
> library(lmtest)
> bptest(model_grdp, studentize = FALSE, data =pdata)

      Breusch-Pagan test

data:  model_grdp
BP = 23.452, df = 9, p-value = 0.005256

> #Result: P < 0.05 = Reject H0 (This indicates evidence of heteroscedasticity, meaning that the variance of residuals is not constant across observations.)
>
> # Autocorrelation of Residuals
> # Wooldridge test for autocorrelation in panel data
> wooldridge_test <- pwartest(model_grdp)
> print(wooldridge_test)

      Wooldridge's test for serial correlation in FE panels

data:  model_grdp
F = 1.0984, df1 = 1, df2 = 66, p-value = 0.2984
alternative hypothesis: serial correlation

> #Result: P>0.05 = Fail to reject H0 (No significant evidence of serial correlation in the residuals.)
.
```

Note(s): The solution to the heteroscedasticity is done with the robustness test.

Assumption Tests - Model 2

Multicollinearity Test

```
> vif(ols_model2)
      log_domestic_tourist      log_foreign_tourist      HDI      log_FDI      log_DDI      log_pop_density
              3.621463              1.386681              1.944918              1.538540              2.518162              3.468233
      log_tourist_attraction
              3.936077
```


Normality, Homoscedasticity, and Autocorrelation of Residual Tests

```
> # Classical Assumption Tests
> # Normality Test of Residuals
> shapiro.test(model_unemployment$residuals)

      Shapiro-Wilk normality test

data:  model_unemployment$residuals
W = 0.83147, p-value = 2.004e-09

> #Result: P>0.05 = reject H0 (Residual is normal distribution (GOOD))
>
> # Homoscedasticity Test
> library(lmtest)
> bptest(model_unemployment, studentize = FALSE, data =pdata)

      Breusch-Pagan test

data:  model_unemployment
BP = 54.134, df = 8, p-value = 6.502e-09

> #Result: P < 0.05 = Reject H0 (This indicates evidence of heteroscedasticity, meaning that the variance of residuals is not constant across observations.)
>
> # Autocorrelation of Residuals
> # Wooldridge test for autocorrelation in panel data
> wooldridge_test <- pwttest(model_unemployment)
> print(wooldridge_test)

      Wooldridge's test for serial correlation in FE panels

data:  model_unemployment
F = 0.28747, df1 = 1, df2 = 66, p-value = 0.5936
alternative hypothesis: serial correlation

> #Result: P>0.05 = Fail to reject H0 (No significant evidence of serial correlation in the residuals.)
```

***Note(s):** The solution to the heteroscedasticity is done with the robustness test.*

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