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# Impact of Foreign Direct Investment, Tourism and Industrialization on Ecological Footprints in Southeast Asian Countries

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## ABSTRACT

This study examines the impact of foreign direct investment, tourism and industrialization on environmental degradation in Southeast Asian countries. For this purpose, a panel data from 1995-2020 is used for seven countries: Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. A fixed effect model is applied and results indicate that increasing tourism and industrialization raise ecological footprints and thus deteriorate the environment. Foreign direct investment (FDI) has a negative and significant effect on ecological footprints and helps to improve environmental sustainability. Further, the present study uses GDP per capita and results indicate that increasing income exacerbates the environment. Thus, this study recommends that these countries should attract more FDI to decrease ecological footprints.

**KEYWORDS** Ecological footprints; GDP, industrialization; Sustainability; FDI; Tourism

## INTRODUCTION

A healthy civilization necessitates a total ecological footprint of 1.63 world hectares (GHA). With changing consumer habits and population trends, the gap between the two has gradually grown and now exceeds the biosphere's ability to regenerate (Wackernagel et al., 2019). Most of the world's population presently lives in an ecologically depleted area. A country has an ecological deficit because its people anticipate more from nature than their ecosystems can replenish. Furthermore, the majority of the worldwide population lives in an area with an ecological deficit and pay below the global average, making it impossible for them to buy their way out of the resource constraint (Bolton, 1997; Çakmak and Acar, 2022; Zhou et al., 2022).

The concept of the ecological footprint is well known amongst ecological economists. It represents the human impact on the Earth (Moffatt 2000). The use of natural resources has increased immensely globally and shown the pattern of J-shaped curves (Tilman, et al., 2001; Gleick, 2000). Fifty percent of the world's entire land had been affected by the high usage of natural resources by the late 20$^{th}$ century (Hannah, et al., 1994). Annually thirty-eight percent of biomass production is being used (Vitousek 1994). This figure may indicate the increase of GDP per capita in most countries around the world but show threat to biodiversity and future supplies of natural resources (Laurance, 2001). Day by day, industrial expansion increases the use of natural resources. An increase in efficiency in resource usage leads to an increased usage of that resource rather than to a reduction in this use (Jevons, 1865). Environment Kuznets curve shows the reality of the situation. Like crude steel and phosphate rock consumption decreased, per capita GDP increased during 1970 – 1990 (Kageson, 1997). But Kuznets curve does not support the present situation. Most developed countries

increased their economic growth by improving eco-efficiency, which increases ecological footprints. A sustainable country is the country having high GDP per capita along with eco-efficiency. An increase in GDP per capita will increase the consumption of goods and ecological footprints but at the cost of environmental damage. Through effective eco policies, nations can reduce ecological footprints.

FDI is the financial flow in any economy linked with the transfer of management, knowledge and technology to the other countries. Increase in FDI does not decrease income inequality. These results justify the role of FDI on ecological footprints (Asteriou, et al., 2014). As the trade is increasing among nations, pollution-creating industries are shifting toward developing countries with weak regulations and clean industries are migrating toward developed countries. This scenario is called the pollution haven hypothesis by Copeland and Taylor, 1994. The hypothesis of the environment Kuznets curve explains the inverse relationship between income and pollution. When countries are in the phase of industrialization they create more pollution. Still, as they maintain the status of developing enough economy, they intend to decrease the pollution creating sectors. FDI flow is different for different industries. Every industry has its own technological and productive effects and they play different roles on CO2 emissions (Doytch and Uctum, 2016). Impact of FDI on EF is different for countries based on their income level. Countries with high income levels experience consumption-related ecological impact on FDI and middle and low-income countries experience production-related ecological impact on FDI. Countries that are developed enough in the services sector are the clean countries.

Increased tourism can lead to increased ecological footprints in any environment. The negative impact of tourism occurs on ecological footprints because the environment cannot cope with increased levels of tourists. Natural areas are on high threat because of the conservative and typical tourism (Collins and Cooper 2017). Increase in population and tourism increase cause threat to natural resources. Increased tourism increases pollution, soil erosion, and natural habitat loss, extinction of species and forest fires (Adedoyin et al., 2021). Tourism also put pressure on the local residents to struggle for the use of resources like it puts pressure on water resources. The tourism industry overuses the water for pools, hotels, etc., leading to the degradation of water supplies and shortages. The maintenance of golf courses in tourist areas diminishes freshwater resources. Massive flow of tourism leads to land utilization, sewage problems, waste pollution, seasonality of labor, adjustments in natural systems and social inequity (Rodella *et al*., 2017). Waste is the worse problem now a day. If the tourist is morally developed enough and thinks about ecological footprints, then tourist can waste the same way while at home. This behavior will cause a smaller environmental footprint on the community. These negative effects of tourism strongly impact cultural and natural resources, which are important for communities that rely mostly on a tourism-based economy (Aref et al., 2009; Holland et al., 2021).

The visitors' decision to visit the chosen place is influenced by a concept of tourists in their thoughts (Moutinho, 1987; Jenkins, 1999). The pioneer study offered the Tourism-Led-Growth-Hypothesis and created empirical bonds to define the connection of tourism and economic growth. This widely held notion contends that tourism fosters economic events that ensure long-run economic prosperity and shown important avenues via which the tourist sector positively influences economic growth Foreign exchange is one of the ways via which foreign visitors convert their currencies to the places to which they go (Brida et al., 2016). The tourism sector may assist host countries balance their payments by increasing the value of their export account. The validity of the tourist-led-growth-hypothesis is concerned with the environmental cost of tourism sector expansion (Liu et al., 2022).

Industrialization leads to increased pollution levels, whether ground, sea or air. Industrialization in developed and developing countries is the main cause of CO2 emissions, which is deteriorating the environment. Environmental pollution is increasing day by day due to electricity production, burning of fossil fuels. Healthcare expenditures are increasing day by day due to industrialization. Industrialization leads to urbanization which causes environment degradation (Zheng, et al., 2021). In long run, urbanization and industrialization leads toward environmental pollution. Environmental degradation is increased bay by day due to burning of fossil fuels for the purpose of industrial growth. This industrial growth leads towards high level of pollution and heavy energy usage.

The impact of foreign direct investment, tourism, and industrialization on environmental deterioration in Southeast Asian countries is investigated in this study. A panel data set from 1995 to 2020 for seven nations was used for this purpose: Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. The study is organized as follows, section 2 is about research method, section 3 is results and discussion and section 4 conclude the study.

## RESEARCH METHOD

2.1. *Emprical model*

The panael data technique is used in this investigation. Panel data has several benefits, according to Baltagi (2008). We used widely known methods to evaluate the influence of foreign direct investment, tourism, and industrialization on the ecological footprints of Southeast Asian countries, including common effects, fixed effects, and random effects models. The common effects model assumes consistent coefficients across nations and time and employs the OLS estimation process.The OLS equation is as follows

$$lnEF_{it} = \phi_i + \beta_1 lnTour_{it} + \beta_2 lnFDI_{it} + \beta_3 lnInd_{it} + \beta_4 lnGPC + \varepsilon_{it} \quad (1)$$

Where, EF is ecological footprints, Tour is tourism, FDI is foreign direct investment and GPC is the GDP per capita. In the above equation, i is the identifier for cross-sections and *t* denotes the time.

The Fixed Effects model behaves well in that it captures cross-country differences. This research employed a dummy variable for each nation for this reason since each country has a varied amount of ecological impact. As a result, we may construct equations for the Fixed Effects model as follows:

$$lnEF_{it} = \phi_1 + \phi_2 D_2 + \phi_3 D_3 \ldots + \phi_6 D_6 + \beta_1 lnTour_{it} + \beta_2 lnFDI_{it} + \beta_3 lnInd_{it} + \beta_4 lnGPC + \varepsilon_{it} \quad (2)$$

Where $D_i$ represents the dummy variable for country i. To avoid the dummy-variable trap, 6 dummy variables are added for 7 nations. Six dummy variables and the intercept will be used to represent cross-country differences for all seven nations included in the sample.
However, the cross-country differences may always be caught by distinct intercepts. In this scenario, we must include an error term in addition to the common intercept. This method is known as the random effects model or the error correction model. It can identify the intercept independently for each nation; that is, the intercept is of random nature with a fixed mean and a random component u (it )with a mean of zero and a variance of two. It implies that all seven nations included in the model share a common mean, with the difference represented by introducing $u_{it}$ )as an error term.

$$lnEF_{it} = \phi_i + \beta_1 lnTour_{it} + \beta_2 lnFDI_{it} + \beta_3 lnInd_{it} + \beta_4 lnGPC + \varepsilon_{it} + u_{it} \quad (1)$$

*2.2. Data and Variable description*

This research makes use of ecological footprint data from the Global Footprint Network. The notion of ecological footprint was created in the early 1990s at the University of British Columbia by Canadian ecologist William Rees and Swiss-born regional planner Mathis Wackernagel. An ecological footprint is the entire amount of land necessary to maintain an activity or population. It quantifies the ecological assets required by a given population or product to produce the natural resources it consumes (such as plant-based food and fiber products, livestock and fish products, timber and other forest products, and space for urban infrastructure) and to absorb its waste, particularly carbon emissions. The Ecological Footprint and Biocapacity values are provided in global hectares, which are internationally equivalent, standardized hectares with world average production (www.footprintnetwork.org). This analysis used data from seven Southeast Asian nations from 1995 to 2020: Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.

Furthermore, the current study investigates the impact of four variables on ecological footprints as an independent variable. These variables include foreign direct investment, tourism, industrialization, and GDP per capita. The rationale for adopting these variables stems from their significance to South East Asian countries. Tourism, for example, is fast expanding in these countries. Furthermore, these countries are growing, with industrialization expanding over time and attracting foreign direct investment. Regardless, these countries are characterized as Asian tigers, with per capita income increasing over the last three decades. The data of these variables are obtained from world development indicators, World Bank (databank.worldbank.org) from 1995 to 2020.

## RESULTS AND DISCUSSION

Table 1 shows the descriptive stats of EF, FDI, Industrialization, IT (International Tourism) and GDP/capita of 7 Southeast Asian countries. The average level of EF in these countries is 1032 from year 1995 to 2020. The highest average of ecological footprints among these countries is of Singapore having 1036 and the smallest average is of Cambodia, Indonesia, Malaysia, Thailand and Vietnam having 1032. The average level of FDI among these countries is 173.77 million among which Singapore has the smallest and Indonesia has the largest. Industrialization has the average of 34.64 among which the highest is in Indonesia equal to 43.48 and the smallest is in Cambodia of 24.05. The average level of international tourism (IT) receipts among these countries is 95.64; the highest is of Thailand and the lowest is of Indonesia and Singapore. GDP/capita is of average 8379.89 among these countries. Highest level of GDP/capita is in Malaysia and lowest is in Cambodia. Singapore has highest variability in EF among the other countries. Cambodia and Thailand are showing smaller FDI variations than the other countries showing a standard deviation of 69.78. The variation in industrialization is small in Vietnam of 3.07 which shows the poor development in the country. Singapore has the highest variation in GDP per capita among the other countries, while Cambodia has the lowest.

**Table 1: Descriptive Statistics**

| | **Cambodia** | **Indonesia** | **Malaysia** | **Philippines** | **Singapore** | **Thailand** | **Vietnam** |
|---|---|---|---|---|---|---|---|
| Ecological Footprints | | | | | | | |
| Mean | 1032 | 1032 | 1032 | 1033 | 1036 | 1032 | 1032 |
| Min. | 1004.2 | 1004.2 | 1004.2 | 1004.2 | 1004.2 | 1004.2 | 1004.2 |
| Max. | 1106 | 1106 | 1106 | 1106 | 1106 | 1106 | 1106 |
| SD | 38.82 | 38.78 | 38.66 | 38.43 | 41.01 | 38.83 | 38.78 |
| FDI | | | | | | | |
| Mean | 172.37 | 177.87 | 174.41 | 171.03 | 170.51 | 172.38 | 177.87 |
| Min. | 102.2 | 102.2 | 102.2 | 102.2 | 102.2 | 102.2 | 102.2 |
| Max. | 293.6 | 293.6 | 293.6 | 293.6 | 293.6 | 293.6 | 293.6 |
| SD | 69.78 | 73.54 | 69.9 | 70.55 | 71.02 | 69.78 | 73.54 |
| Industrialization | | | | | | | |
| Mean | 24.05 | 43.48 | 42.47 | 32.68 | 27.94 | 36.98 | 34.86 |
| Min. | 14.26 | 38.26 | 35.92 | 28.39 | 23.3 | 33.09 | 28.75 |
| Max. | 34.801 | 48.06 | 48.53 | 35.66 | 32.46 | 39.92 | 40.21 |
| SD | 5.44 | 3.04 | 3.75 | 2.09 | 3.34 | 1.71 | 3.07 |
| International trade | | | | | | | |
| Mean | 95.54 | 94.84 | 96.61 | 95.53 | 94.84 | 96.61 | 95.54 |
| Min. | 71 | 71 | 71 | 71 | 71 | 71 | 71 |
| Max. | 117 | 117 | 117 | 117 | 117 | 117 | 117 |
| SD | 19.66 | 19.18 | 19.02 | 19.66 | 19.18 | 19.02 | 19.66 |
| GDP per capita | | | | | | | |
| Mean | 754.41 | 2244.4 | 7410.38 | 1999.51 | 40742 | 4283.1 | 1225.49 |
| Min, | 268.99 | 463.95 | 3263.3 | 990.57 | 21700 | 1845.8 | 276.81 |
| Max. | 1643.1 | 4135.2 | 11433 | 3485.3 | 66679 | 7817 | 2785.7 |
| SD | 449.81 | 1307.72 | 2992.01 | 896.15 | 16180.02 | 1943.05 | 859.65 |

The fixed effect estimates and their probability values are shown in the table above. The results are in line with the previous literature (few literatures to be added here). The results show that the GDP per capita, industrialization and

international tourism positively and significantly influence ecological footprint by 0.36%, 0.22% and 0.04% respectively. Increase in GDP per capita is associated with growth in urban population, growth in consumption and production which exerts pressure on the ecological footprint of the already environmentally sensitive countries. Similarly, industrialization influences a country's soil, air and water quality. The major problem with industrialization is the carbon emissions generated from burning fossil fuels which directly impact the ecological footprint. Tourism often puts enormous pressure on natural resources through over-consumption and local land use, leading to soil erosion, increased pollution, natural habitat loss, and more pressure on endangered species. The impact of FDI inflows on ecological footprint is negative by -0.0007% but this impact is negligible and insignificant in Southeast Asian countries. This could be because FDI inflows not only bring opportunities for export expansion, growth and prosperity in a country but increases their competence through inflow of technology and capital to deal with the climate conditions and reduce their ecological footprint.

Table. 2: Fixed effects results

| | **Dependent variable: Ecological footprint** | |
|---|---|---|
| **Variables** | **Coefficients** | **p-value** |
| L_GDPPC | 0.359 | 0.000 |
| FDI | -0.0007 | 0.945 |
| L_Industrialization | 0.223 | 0.001 |
| L_International Tourism | 0.041 | 0.04 |
| C | 2.162 | 0.000 |
| R-square | 0.726 | |
| Hausman Test | P-value | 0.001 |

## CONCLUSION

The impact of foreign direct investment, tourism, and industrialization on environmental deterioration in Southeast Asian countries is investigated in this study. A panel data set from 1995 to 2020 for seven nations was used for this purpose: Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. A fixed effect model results show that increased tourism and industrialization increase ecological footprints and consequently damage the environment. Foreign direct investment has a major negative impact on ecological footprints and contributes to environmental sustainability. Furthermore, the current study employs GDP per capita as a control variable, and the results show that growing income worsens the environment. Thus, this study recommends that these countries should attract more FDI to decrease ecological footprints and thus to improve sustainability.

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