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## Article

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# Health Oriented Spending and its Impact on Sustainable Ecological Footprint of ASEAN Countries: Taking No. of Hospitals, Budget Allocation for Health and R&D as Drivers

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## ABSTRACT

With the increase in the health-related issues among the population, the number of hospitals, and the R&D into the medical science, the budget allocation for health has increased in the ASEAN region. However, increased activity related to healthcare also contributed to ecological degradation. The purpose of this research is to find the impact of these medical activities on the ecological footprint in the ASEAN region. For this purpose, the author collected data spanning 27 years from authentic databases for ASEAN region and applied different tests and techniques to analyze it effectively. The results obtained from these tests suggested that the impact of all the independent variables was positive on ecological footprint, that is, they contributed to degradation of the environment. In the last section of the study, these results are discussed vividly and several implications and benefits associated with this study are discussed. Moreover, the limitations, which can be improved by implementing some recommendations, are also discussed in the study.

## KEY WORDS:

ASEAN, panel data, panel root test, budget allocation for health, number of hospitals, R&D, ecological footprint.

**JEL Classification:** Q01, I15, Q57.

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## 1. Introduction

The population of the world is increasing day by day, which has brought many challenges for numerous countries. It has also given rise to ecological changes which adversely affect human health (Ellis et al., 2017). As a consequence of these health problems, healthcare spending has become crucial for human wellbeing. With the growing population, health needs are rising. In response, healthcare spending has gone up (McCullough, 2016). The total share of gross domestic product (GDP) on health care amounted to 17.9% in 2017 and 18.0% in 2016. Moreover, the use of health-

related technologies and resources is increasing as well, which also affects environmental sustainability (Ahmed et al., 2019). Spending on healthcare is important duty of government for delivering health services to its people to retain and improve the health status and quality of life (Papanicolas et al., 2018).

However, offering these services requires sufficient budget, energy, land and infrastructure. The trend in health oriented spending also poses an array of risks related environmental sustainability (De Soete et al., 2017). The most important initiative of health oriented spending is building healthcare centers and hospitals, to facilitate access to health care services (Winters et al., 2016). The availability and number of hospitals is a significant indicator of any country's healthcare system. Resource allocation and budget allocation

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are crucial for ensuring environmental sustainability (Daverio, 2019). By effectively allocating resources and finances in the healthcare system, maximum output can be achieved (Jones et al., 2013). Many diseases emerge continuously, needing R&D (Virginia & Wells, 2018). Research and development play a significant role in improving the existing healthcare systems and introducing new health technologies that can sustain humanity and environment. Due to the progressively growing population, southeast Asian (ASEAN) countries face many problems in the healthcare sector. The southeast region has one of largest population in world that account for 850 million habitants (Adhari-ani, 2020). In result, the healthcare system is stressed to meet the healthcare demand of ten countries with vast population (Barua et al., 2020). Urbanization also accounts for this problem, as people move to cities to get the best health services, which puts a heavy pressure on health system (Haseeb et al., 2019). Due to limited hospital and unlimited demand, people have to wait longer (Munir et al., 2020). Total 320 million people reside in urban areas of the ASEAN countries, and urban population is expected to be nearly 525 million by 2050, which will increase overall demand of health facilities. All this factors have pushed South-East Asia into a health spending crisis. Health costs rapidly increase, as per report by Sol dance presented at the World Economic Forum on ASEAN (Nambiar et al., 2014). The collective health spending amounted to \$420 billion in 2017, which is projected to increase by 70% in the next ten to twenty years if the situation does not change.

The healthcare system is an integral system of any country, and holds an important place in providing health care services to safeguard and sustain the population's health and well-being. However, extensive demand can lead to many negative outcomes for the environment and the economy, which also impact ecological footprints. Government and health organizations have an opportunity to mitigate ecological footprints by regulating some policies to effectively allocate resources and budgets. However, in the ASEAN region, the government and the healthcare sector is not able implement these solutions properly due to different factors (Rahman et al., 2018). One of them is that there was insufficient source of research on this topic in the ASEAN countries. Most of the studies have (Papagianni

& Tziomalos, 2018) explored healthcare and resource allocation relation with sustainability in developed countries like USA and China. Therefore, the current situation calls for attention from policy makers and researchers. In this case, the current study tried to see how spending on the health care system relates to ecological footprints by setting the following objectives:

- Determining if the number of hospitals influences ecological footprints in ASEAN countries.
- Determining how budget allocation is related to ecological footprints in the ASEAN countries.
- Determine if R&D can impact ecological footprints in ASEAN countries.

## 2. Literature Review

### 2.1. Number of hospitals and ecological footprints

The increase in population has also increased the number of hospitals. More people means increased demand for healthcare services, and to meet this demands demand hospitals are required. Expansion of hospital networks has caused many negative and positive impacts on environment (Xiao et al., 2018). Most of the studies (Sandhu et al., 2019) highlighted the negative side of the increased number of hospitals and healthcare centers. Healthcare organizations such as hospitals, clinics and healthcare centers are crucial for maintaining the efficiency of a healthcare system to sustain public health, to control causalities. However, adverse effects and risks imposed on environment by these organizations cannot be overlooked (Eckelman & Sherman, 2018). In 2015, there were over 164,500 hospitals and this number is steadily increasing (Singh, 2019). Hospitals require significant amounts of energy for smooth operation.

The increased number of hospitals have increased the energy consumption, which is reason ecological footprint contribution (García-Sanz-Calcedo et al., 2019). If the demand is greater than the supply, it reinforces the resource deficit, which is very harmful for sustainability of environment and joint emissions according to (Dhillon & Kaur, 2015). The hospitals work for 24 hours and seven days a week (24/7) and have several functions and activities to process, such as heating, cooling, cleaning, testing, scanning, ventilation. All of these are carried out by consuming electricity, gas and other energy sources (García-Sanz-Calcedo et al., 2018). Hospitals use various machines and equipment for diagnosis

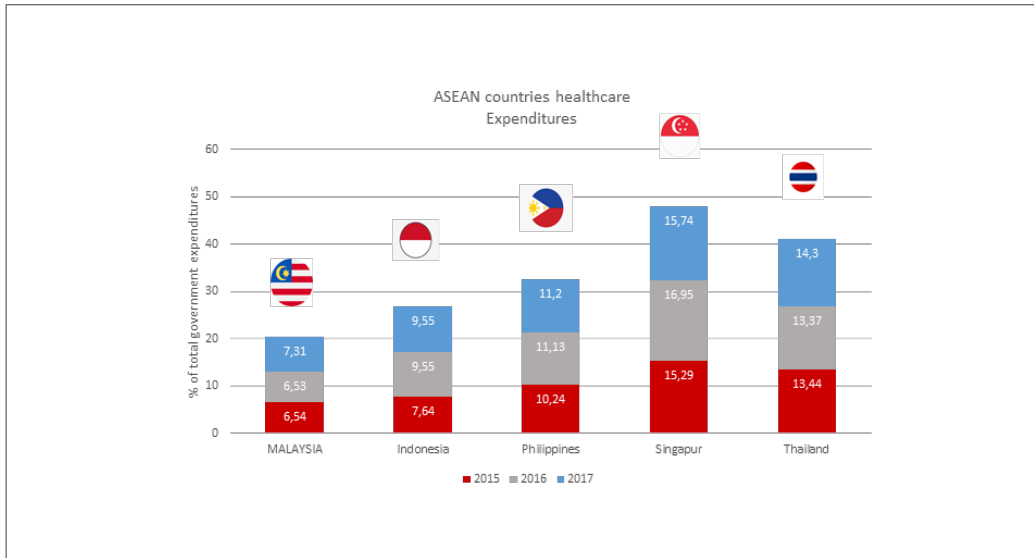


Figure 1. Healthcare.

and treatment that require power to run. All these activities consume a great amount of energy that contribute to the ecological footprint. Hospital organizations are responsible for massive energy consumption. According to (2019), in the hospital sector, energy consumption amounted to 10.3% of the total energy consumption which was 210.42 billion kWh of energy. This enormous consumption also causes greenhouse gases and carbon dioxide to emanate, which is a major contributor to air pollution. (Eckelman & Sherman, 2016) claimed that healthcare facilities are responsible for 9.8% greenhouse gas and hazardous particulates. Moreover, these energy resources are limited, so excessive use can lead to problems regarding natural capacity. In addition, construction of hospital facilities is done by utilizing land, the density in hospital buildings causes loss of land that reduces landscape and habitat fragmentation. The healthcare sector produces massive quantities of waste. Mismanagement of this waste brings destructive consequences that give rise to diseases, pollution of underground water resources and infertility of soil which influence ecological footprints. Considering all of this, the following hypothesis is formulated:

H1: The number of hospitals is significantly related to ecological footprints

## 2.2. Budget Allocation and Ecological Footprints

Budget allocation is key for developing and promoting a good healthcare system, and it is considered a crucial driver in health spending and its importance has been raised in many studies (Anderson et al., 2020). Budget allocation is used to allocate funds and finances to support different programs. Budget allocation is a key function of government - through it, the government distributes funds and resources to different sectors. Budgeting limits the use of funds, which helps reduce undue consumption and keep balance between expenditures and budget that maintained balance between ecological footprints. This also helps keep track of ecological footprint by planning the expenditure of resources (Paramesh et al., 2019). The proper allocation, distribution, arrangements and utilization of funds in the public sector are key in enabling sustainable development. Through budget planning, governments can effectively allot and utilize resources equally into different areas even in weaker areas to promote balanced growth and sustainability as stated by (Mauro et al., 2017). Moreover, planned and organized budget serves as a lever in regulating the demand of resources for any government to ensure economic stability and growth. With the passage of time, the demand for energy resources is increasing, which contributes

to the ecological footprint (Bello et al., 2018). In 2016 the ecological footprints per capita was 2.75(GH) and it was 1.1% above nature capacity. Considerably, budget allocation keeps ecological foot-prints under control by regulating funds. Budget allocation puts a limit on funds, which also controls resources consumption. All resources for energy and power consumption are purchased which requires funds. By limiting these funds, energy consumption can also be controlled (Pichler et al., 2019).

Healthcare budgets re used to allocate funds to the healthcare sector. A proper budget is an indicator of a government's commitment to health policy. With the increase in population, the health sector has also expanded. However, the increasing healthcare costs can cripple economies. Only in the OECD countries health expenditures have increased by 9% in 2016. The disproportion between health expenditures can push any economy into crisis. The ASEAN countries face health crises (Rahman et al., 2018) as they spent more than 422 billion dollars in 2017 and 2018. Moreover, health care spending in China has doubled in 2018. Budget allocation plays a key role in regulating spending and consumption of resources that safeguard environment and harmonize ecological footprints. The following hypothesis is consistent with the above studies

H2: Budget allocation is significantly related to ecological footprints

### ***2.3. Research and Development and Ecological Footprints***

Research and development is a significant phenomenon that is extensively covered in the literature, and there are many studies (Hameed et al., 2018; Helbig et al., 2017; Ul-Hameed et al., 2018) which stress the significance of R&D. All the industrial, economical, technological and environmental development is done via R&D. Research and development holds a vital role in today's world. It helps in getting rid of problems by introducing new ways and techniques (Donovan & Snow, 2017). Research and development is considered substantial for economic and environment sustainability which is widely used by organizations, governments, researchers, and environmentalists. In healthcare, R&D has great contribution, it has evolved health practices by introducing new techniques and methods. It has also played role in improving environment performance by introducing green prac-

tices, effective waste management policies that protect environment sustainability (Beyeler et al., 2019).

Research and development is of utmost importance in the ecological context - it has helped create new ideas and techniques to cope up with emerging environmental challenges. Ecologists rely heavily on R&D for sustaining environment as it provides effective solutions and alternatives to get over adversity to protect environment and ecological foot prints (Santos et al., 2019). The climate change and global warming force ecofriendly and sustainable practices, in this context R&D has been the main driver that has helped environmentalists and practitioners to achieve them. Through R&D different eco-friendly practices have come into existence such as green practices, biomass, renewable energy that can reduce 18% to 26% of current energy consumption (Hwang et al., 2017). Taking into account the rapid climate change and increased pollution, many organizations and countries pour a lot of funds into R&D to determine the factors affecting our environment and how we can mitigate the negative consequences (Simpkin et al., 2019). The most important role of R&D is detection of the underlying causes of problems by in-depth analysis. The enlarged population growth, globalization, transportations and energy consumption have been a big concern for all of us, because these resources are non-renewable and limited. They are gradually degrading, and if the consumption remains same than it will cause imbalance between the ecological footprints and bio-capacity (Hwang et al., 2017). However, thanks to R & D has provided a wide range of solutions and ideas that can help preserve remaining resources by introducing environment friendly practices. These include, among others, green practices, recycling, hybrid, solar power and many more that ensure sustainability and preservations of nature.

H3: Research and development is significantly related to ecological footprints

## **3. Methodology**

### ***3.1. Data***

Data collection is the first step in the research process after identification of the research objectives. The collection of data requires attention and focus since the authenticity and accuracy of results for the techniques used during the research process is

dependent on the data collection stage. In this regard, the researcher has collected panel data for this study which has been basically collected from the ten countries of ASEAN region. This data was comprised of 27 years and has been collected over the time period of 1990 till 2017 from authentic resources or data bases which include World Bank database, Global Economy database and the governmental websites of the countries under study.

### 3.2. Model Selection

For the formation of the regression equation or model, the researcher needs to consider the measurement units that have been defined for each of the independent, dependent and control variables. This research has one dependent variable which is Ecological Footprint (EFP). This variable is defined as the impact of urban and human activities on the environment and it is measured in terms of global hectare (gha). The data for this variable has been collected from the National Footprint Accounts (NFA) (Network, 2018). There are three explanatory variables used in this study that include the Number of hospitals (NOH), Budget Allocation for health (BAH) and the Research and Development. The number of hospitals in each country is taken from the national websites. The measure of BAH and R&D is taken as their respective percentage in the GDP. The data for them both has been taken from the databases of World Bank. Population growth (POP) and Per capita income (PCI) are two control variables taken in this research. POP is the measure of ratio of yearly population increase and PCI is the measure of dollars for per capita income. These variables have also gotten their data from WDI of World Bank.

After defining all these measurement units, the author has finally generated a regression equation that will be used in the next steps of the research process. This equation is given as follows:

$$EFP_{it} = \alpha + \beta_1 NOH_{it} + \beta_2 BAH_{it} + \beta_3 RAD_{it} + \beta_4 POP_{it} + \beta_5 PCI_{it} + \varepsilon_{it} \quad (1)$$

In this equation, EFP represents Ecological Footprint, BAH represents Budget Allocation for health, NOH represents Number of hospitals, RAD represents R&D, POP represents Population growth, PCI

represents Per capita income while  $\varepsilon_{it}$  shows any term of error.

### 3.3. Estimation Procedure

The estimation procedures used in this study are having various purposes and benefits that have been covered in this section.

#### 3.3.1. Panel unit root test

The first test that is used in the research process is the unit root test. The purpose of using this test is to find out the order of integration of the selected variables along with the level at which they become stationary. If the panel data has been taken from regions like the ASEAN region that are dependent on each other in political and economic terms, then there is a chance of having panel roots in the data, therefore panel unit test has been used here. The most important aim of using unit root tests is to find out the integrating relationship among the variables (Im et al., 2003). Another important purpose of these tests is to find out the stochastic properties of the variables. There are multiple options of tests that are used for the above-mentioned purposes include Levin Lin Chu LLC and Im Pesaran Shin IPS unit root tests. IPS has been used by the researcher as the basic differentiation of these tests is that LLC gives best results when data is homogeneous while IPS provides heterogeneous autoregressive process that is needed in this study (Pesaran et al., 2001). Null hypothesis of this test indicates the presence of unit root and non-stationary of data while the alternate hypothesis indicates the absence of unit root and static of data.

#### 3.3.2. Panel cointegration test

Panel co-integration tests are used for two purposes. The first is to find out if there is any cointegrating relationship between the variables and the second purpose is to probe any long run equilibrium relationship among the variables. The researcher has used the tests by Kao and Pedroni that can fulfill the above-mentioned purposes. The null hypothesis in these tests indicates that there is no cointegration existing among the variables while the alternate hypothesis in that cointegrated relationships exist among the variables (Engle & Granger, 1987).

Cointegration tests are further divisible into two different approaches i.e. within dimension and between dimension approaches. The has used four test statistics (v-statistic, rho-statistic, PP-statistic and ADF statistic) for the within dimension testing and in the same fashion the between dimension testing has been done using three statistic values (rho-statistic, PP-statistic and ADF statistic). Pedroni cointegration test to be applied here, has the following equation:

$$y_{i,t} = \alpha_i + \delta_{i,t} + \beta_1 X_{1,i,t} + \beta_2 X_{2,i,t} + \dots + \beta_n X_{n,i,t} + \varepsilon_{i,t} \quad (2)$$

### 3.3.3. Coefficient estimation procedure

Two basically used techniques for coefficient estimation in case of cointegrating variables are FMOLS and DOLS. These techniques are used for conducting estimation of coefficients of the variables in order to investigate the existence of any long run relationship among them. These coefficients tell both the magnitude and the direction of the relationship between the variables (Im et al., 2003). It should be mentioned here that these two tests are derived from OLS which is an old technique that was used for the same purpose but has since been replaced by these modified techniques as it resulted in some issues such as serial correlation and endogenous variable existence issues. The author has used FMOLS technique in this study which can be given in the form of an equation as follows:

$$\hat{\beta}_{FM} = \left( \sum_{i=1}^N \sum_{t=1}^T (x_{i,t} - \bar{x}_i)^2 \right)^{-1} \sum_{i=1}^N \left( \sum_{t=1}^T (x_{i,t} - \bar{x}_i) \overline{EFP}_{i,t} - T \hat{\delta}_{eu} \right) \quad (3)$$

In this equation,  $\overline{EFP}_{i,t}$  is the transformed variable of ecological footprint due to endogeneity correction while  $\hat{\delta}_{eu}$  represents the serial correlation correction by FMOLS.

### 3.3.4. Granger Casualty Test

To test if there is any causal relationship between the variables, the researcher has used the Dumitrescu and Hurlin Granger casualty test. This test has been adopted by the author after the estimation of coefficients of variables and ultimately the long run relationships between them. The basic purpose of these tests is to find out the existence and direction of any casual relationship existing among the variables (Dumitrescu & Hurlin,

2012). This test is also based on the process of null and alternate hypothesis which indicates the absence and presence of casual relationships respectively. A general equation related to this test can be given as follows:

$$x_t = \sum_{i=1}^{\infty} a_i x(t-i) + c_1 + \mu_{1(t)}$$

$$x_t = \sum_{i=1}^{\infty} a_i x(t-i) + \sum_{j=1}^{\infty} b_j y(t-j) + c_2 + \mu_{2(t)}$$

## 4. Empirical Analysis

The smart PLS 3.0, in this study was used to measure the both model measurement and structural model. The measurement model regards as the assessment of the factors that shows that the level of properly the factors loading and reflecting their constructs. To measure the measurement model through the process of PLS-SEM, measuring the reliabilityt mediating effect of innovation between responsible leadership and environmental performance with the result of ( $\beta=.267$ ,  $p<.05=0.000$  and  $t>1.96=6.071$ ). So, H5 is accepted. The indirect and significant mediating effe

### 4.1. Results of Panel Unit Root Test

In this research, the author has applied Im Pesaran Shin (IPS) unit root test. This test has been applied with the core purpose of checking the order of integration and stationary condition of the variables. The researcher has given the results in Table 1 given below. It can be seen in the table that different values for constant as well as constant plus trend have been given in contexts of level and first difference of the variables. The level side of the table shows non-stationary properties for the data as some variables are rejecting while some are accepting the Null hypothesis of unit root presence. However, when all the variables of the study are first differenced, the result shows that they reject the null hypothesis in entirety. This rejection of the null hypothesis shows that there is no unit root and the data has become stationary. It can be concluded from the results that the data is non-stationary in the level series of the table while it becomes stationary in the first difference series of the table.

### 4.2. Results of Panel Cointegration Test

For the purpose of analyzing the presence of cointegrated relationships between the variables, as well as the long



**Table 1.** Unit Root Test

Constructs	Level		1 <sup>st</sup> Difference	
	Constant	Constant+ Trend	Constant	Constant+ Trend
EFP	-3.3994*	-3.6203*	-5.4884*	-5.2923***
NOH	-2.5393	-2.8299	-6.3449**	-6.9391**
BAH	-3.2993*	-3.2943*	-5.2421**	-5.3095***
RAD	-2.2943	-2.2984	-7.2015**	-7.3995**
POP	-4.2994*	-4.2994*	-5.0390**	-6.2985**
PCI	-3.2004	-3.2984	-6.2945**	-6.6294***

Note: In this table, \* represents that the rejection is one percent significant, \*\* shows that rejection is five percent significant, \*\*\* shows that rejection is ten percent significant

run relationships among them, the author used the Pedroni cointegration test. The results of this test are given in the Table 3 by the author. These results are divided into two kind of test statistic values for two basic approaches i.e. within dimension and between dimension that have been used by the author. The table shows that three out of four test statistics of within approach have rejected the null hypothesis created in context of cointegration. On the other hand, one out of two test statistic values in the between dimension section have also rejected the null hypothesis. Overall, five out of seven test statistics have rejected the null hypothesis of no cointegration. This rejection points out towards the presence of cointegrated relationships among the variables.

#### 4.3. Results of Coefficient Estimation Procedure

After the previous tests confirmed that there is cointegrated and long run relationships between variables, the author has used the FMOLS technique of coefficient estimation to measure the magnitude and direction of the impact that the independent and control variables have on the dependent variables of this study. The results of FMOLS have been made visible in Table 4. The results show that NOH is significant at 5% and impacts EFP by 12.3% in the positive direction. BAH is also significant and increases EFP by 15.4% with being significant at 1%.

RAD shows significance at 1% level and shows increasing impact of 12.2% on EFP. POP is insignificant and PCI is significant with an impact of 13.3% increase in EFP.

#### 4.4. Results of Coefficient Estimation Procedure

In the last, the author has used the Granger casualty test for checking if there is any casual relationship between the variables and the results that have been shown in the Table 4 which clearly suggest that there are either unidirectional or bidirectional causal relationships between the different research variables. There is a causal relationship between NOH and EFP, RAD and EFP, PCI and EFP, BAH and NOH, POP and NOH, POP and BAH, POP and RAD, and between PCI and POP. In this table, it is clearly seen that all the causal relationships have occurred at the significance level of 1%. The magnitudes of these causalities have been shown Table 4.

## 5. Discussion and Conclusions

### 5.1. Discussion

To investigate the impact of the independent variables of ecological footprint, the author has constructed 3 hypotheses. The first hypothesis stated the impact of NOH on EFP, second stated the impact of BAH on EFP and the last stated the impact of RAD on EFP. All three of these



Table 2. Panel Cointegration Test

Alternative hypothesis: common AR coeffs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-3.647878*	0.0763	2.986648	0.7479
Panel rho-Statistic	3.864635	0.0345	4.466847	0.0236
Panel PP-Statistic	-1.865453**	0.0007	-6.255796	0.0005
Panel ADF-Statistic	0.865388***	0.7549	-0.457568	0.8754
Alternative hypothesis: individual AR coeffs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	5.076543*	0.00004		
Group PP-Statistic	-4.865437	0.0000		
Group ADF-Statistic	-1.566848**	0.8643		
Kao test.	Statistic	Prob.		
ADF	-4.864678*	0.0432		

Note: In this table, \* represents that the rejection is one percent significant, \*\* shows that rejection is five percent significant, \*\*\* shows that rejection is ten percent significant

Table 3. Coefficient Estimation Test

Variable	Value	Pooled	Grouped
NOH	Beta	0.123**	0.133**
	SE.	0.489	0.534
BAH	Beta	0.154*	0.123**
	SE	0.488	0.883
RAD	Beta	0.122*	0.134*
	SE	0.773	0.877

**Table 3.** Coefficient Estimation Test (Continued)

Variable	Value	Pooled	Grouped
POP	Beta	0.087	0.008
	SE	0.883	0.787
PCI	Beta	0.133*	0.222*
	SE	0.564	0.387
Adj. R Square	Beta	0.701**	0.719**
	SE	0.878	0.844

Note; In this table, \* represents one percent significance level, \*\* shows five percent significance level, \*\*\* shows ten percent significance level

**Table 4.** Coefficient Estimation Test (Continued)

Variables	EFP	NOH	BAH	RAD	POP	PCI
EFP	0.746					
NOH	0.388*	0.761				
BAH	0.398	0.538*	0.836			
RAD	0.243*	0.231	0.289	0.697		
POP	0.399	0.333*	0.649*	0.232*	0.893	
PCI	0.299*	0.0337	0.188	0.198	0.432*	0.843

Note: In this table, \* represents one percent significance level, \*\* shows five percent significance level

hypotheses have been accepted and the variables have been found to have significant and positive impacts on the EFP in ASEAN region. The previous researches have also found similar results. Pant (2012) found that the waste management in the small hospitals and clinics is very inefficient and causes major degradation to the environment. Radha et al. (2009) also found that biomedical waste from hospitals leads to increased degradation of

the environment. several other researchers can also support these findings (Babanyara et al., 2013; El-kanater, 2011; Goldberg et al., 1996; Tufail & Khalid, 2008).

## 5.2. Conclusion

The current study has been conducted with the aim of finding the impact of NOH, BAH and RAD on EFP. For this purpose panel data from reliable sources was col-

lected by the researcher for the years 1990 till 2017 i.e. 27 years. Several tests and approaches such as unit root, cointegration, coefficient estimation etc. were run on the gathered data, the results obtained from these tests led to the following key findings:

(a) Increase in the number of hospitals, the budget for health and the R&D into the area of medical sciences has led to an increased impact on the ecological footprint in the ASEAN region. The major cause of this increased environmental degradation by the medical sector is that the increase in number of hospitals also means an increase in the biomedical waste being produced by the country. Budget allocation and research also increase the waste production indirectly by increasing the activities related to medical and health.

(b) Per capita income also has been found to increase the impact on ecological footprint in light of this research. The PCI also leads to increased medical waste indirectly as a larger PCI will lead to more expenditure on medical sector by every individual and therefore causing increased waste.

### 5.3. Implication

Many theoretical, practical and policy making implications have been identified by the author related to this study. Several aspects of how the medical related activities, expenditures and research can cause increase in the degradation of the environment by increasing the ecological footprint have been discussed. The peer researchers may use the presented theory in their studies to increase the literature and improve the quality. The results will also assist the policy and law making bodies to develop efficient waste collection mechanisms for the Medical facilities so that the impact on environment can be reduced. Apart from these implications, this study also provides the hospital administrations to develop such policies and practices that can help them improve their role in their country's environmental sustainability.

### 5.4. Limitations and Future Research Recommendations

It is a known fact that there is always a chance of improving the area of research or study. Therefore, several limitations have been identified that can be improved by other researchers in the future. The first limitation is the small sample size of the data collected in this study. In addition, the study is region specific i.e. ASEAN coun-

tries only. Moreover, the researcher has used a limited set of tests and approaches. In order to overcome these limitations, the future researchers are recommended to increase the scope by adding data of more years and increasing the selected regions countries beyond the ASEAN region so that the scope of the study can be broadened. These researchers must also use tests other than those that have been employed in the current research.

## 6. Conclusion

This study was conducted on the Thai tourist industry and the social, environmental and financial performance of the industry has been determined in the presence of responsible leadership with the mediating role of innovation. According to the study results, the role of responsible leadership is very important in improving the financial and non-financial performance of the firm. Responsible leadership develops good relations among various stakeholders, and ensures openness and cooperation which encourage the employees to stay innovative. Such positivity makes available multi-dimensional benefits to the organization. Moreover, in the presence of responsible leadership companies are able to achieve higher level of financial, social and environmental performance. Likewise, responsible leadership engages the employees in innovative activities which ultimately positively affect the triple-bottom-line performance TBL including financial, social, and environmental aspects of the firm.

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