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Corporate innovation efficiency in Southeast Asian countries

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ABSTRACT

This study aims to examine how innovative activities influence corporate innovation efficiency in selected Southeast Asian countries, including Vietnam, Laos, Cambodia, Malaysia, Indonesia, and Thailand. The data were collected from the World Bank, and Tobit regression was used. The research results show that product or service innovation activity and process innovation activity have a positive impact on the innovation efficiency of firms. Moreover, the research finds a difference in the effect of innovative activities on corporate innovation efficiency in country-income groups. The paper is of great significance in the current period because countries in Southeast Asia are encouraging businesses to increase innovation to improve their integration and competitiveness.

Key words: Innovation, Efficiency, Southeast Asia

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INTRODUCTION

Innovation activities play an important role in the development of enterprises[1]. The importance of innovation activity to negative changes in the business environment and the function of innovation is to increase competitiveness toward the goal of increasing the efficiency of the business[2]. Most studies of the literature on innovation focus on the impact of innovative activities on firm performance[3–6]. However, there are limited studies exploring corporate innovation efficiency[7–9].

Innovation activities affect corporate innovation efficiency in the following ways. First, businesses want to survive when the market is increasingly competitive, so innovative activities of products and services will have a positive impact on the efficiency of enterprises. He & Wong (2004)[8] demonstrated the positive impact of product innovation on corporate innovation performance. Fosfuri & Tribó (2008)[7] also said that the innovation activities of products and services have a positive impact on the innovation efficiency of enterprises. Second, marketing innovation helps increase the ability to reach potential customers and expand markets, contributing to improving business efficiency. Johne & Davies (2000)[10] argued that marketing innovation is the key driver of business decisions to increase revenue and improve operational efficiency. Gunday et al. (2011)[4] stated that marketing innovation has an impact on the competitiveness of enterprises. Chen (2006)[11] showed that marketing innovation is proven to have a positive impact on firm performance. Third, enterprises improve their production or distribution processes, and they

will help businesses improve their competitiveness, thereby improving their operational efficiency. Peters (2008)[12] asserted that not all process innovation activities are cost-effective, but they will provide businesses with a way to market their products at competitive prices, contributing to increasing business efficiency. Savitz et al. (2000)[13] found that process innovation has a positive impact on the development and increase of business value. Schmidt & Rammer (2007)[14] argued that process innovation has a positive impact on corporate performance. Finally, organizational innovative activity helps enterprises increase their governance capacity, which has the effect of increasing the efficiency of the business. Organizational innovation will help businesses have more solutions to develop markets and increase business performance (Samuelides, 2001)[15]. Camisón & Villar-López (2014)[16] found that organizational innovation activities increase the competitive advantage of enterprises.

The motivations for choosing Southeast Asia are as follows. Southeastern Asia is one of the most dynamic regions in the world and is in a period of intense innovation to enter the international market. Moreover, the innovation efficiency of domestic enterprises in low-middle-income countries is still very low, mainly depending on foreign enterprises. In contrast, countries belonging to the group of middle-high-income countries have very high innovation efficiency of domestic firms (OECD, 2013)[17]. Hence, an important question that naturally arises is whether the impact of innovation activity on corporate innovation efficiency varies by income across country groups.

In this paper, we examine how innovative activities influence corporate innovation efficiency. To conduct our study, we use data on 889 firms in 06 countries, including Vietnam, Laos, Cambodia, Thailand, Indonesia, and Malaysia, that implemented innovative activities collected by the World Bank. We find that product or service innovative activity and process innovative activity have a positive impact on corporate innovation efficiency. On the other hand, the study confirms that there are differences in the impact of innovative activities on corporate innovation efficiency by country income group. The results are robust for the Tobit regression method with robustness selection.

Our study contributes to the literature on corporate innovation efficiency. First, the research provides a new approach to determine whether there are differences in the impact of innovation activity on corporate innovation efficiency by income group across countries. Previous studies have focused on assessing the impact of innovative activities on corporate innovation efficiency at the national level[7–9]. Second, the study is of great significance in the current period because countries in Southeast Asia are encouraging businesses to increase innovation to improve their integration and competitiveness.

Section 1 is the introduction, and the study is structured into 3 parts: (i) Section 2 presents the data and empirical design, (ii) Section 3 presents the main empirical analyses, and (iii) Section 4 presents the conclusions.

DATA AND EMPIRICAL DESIGN

Sample selection

The data of the study are extracted from the World Bank survey of businesses in Southeast Asia by the World Bank, including Vietnam (2015), Cambodia (2016), Indonesia (2015), Laos (2016), Malaysia (2015), and Thailand (2016). Out of a total of 5,243 enterprises surveyed, we use data from 899 firms that engaged in innovation activities[18].

Empirical design

Following Minh (2020)[9], we consider the following model:

$$InnoPerf_i = \alpha_0 + \beta_1 ProdInno_i + \beta_2 MarInno_i + \beta_3 ProInno_i + \beta_4 OrgaInno_i + \boxtimes Control_i + \mu_i$$

where i indexes the firm; α is the intercept coefficient; β and $\boxtimes$ are the regression coefficients of the independent variables; and μ is the standard error. *InnoPerf* is the dependent variable that measures corporate innovation efficiency. Following previous research[8,9,19],

we measure innovation performance to equal the percentage of sales due to new products or services on total revenue.

The independent variables of interest are product or service innovation activity (*ProdInno*), marketing innovation activity (*MarInno*), process innovation activity (*ProInno)*, and organizational innovation activity (OrgaInno), following Minh (2020)[9]. These variables take the value of one if the firm has implemented innovative activities and 0 otherwise. To control variations in a firm's characteristics, we include the ratio of export revenue to total revenue (*Export*), the natural logarithm of the total number of employees (*Size*), and the number of years from the year of establishment to the present of the enterprise (*Age*), following Minh (2020)[9].

For cross-sectional data, there are many analytical methods used, but for data of dependent variables with values from 0 to 1, the Tobit regression analysis method is the most suitable[20]. To limit the assumptions of the Tobit regression model, we use the robustness estimation method to find the optimal estimators by ignoring the limitations.

Table 1 presents summary statistics of the variables used in the analyses. As shown, the sample mean of *InnoPerf* equals 0.296. Minh (2020)[9] reported that the average value of InnoPerf equaled 0.206 for firms in Vietnam.

Correlation Coefficients Matrix

According to the results of Table 2, the coefficients between the innovative activities variable and corporate innovation performance are positive, suggesting that innovative activities are associated with a higher level of corporate innovation efficiency. Moreover, the table also presents a positive link between corporate innovation efficiency and firm size. On the other hand, the correlation coefficient between the independent variables in the model is relatively low, and the coefficients are all below 0.5. Therefore, it is less likely that multicollinearity occurs in the model[21].

MAIN EMPIRICAL ANALYSES

The analysis results in Table 3 show that the coefficients on *ProdInno* are positive and significant at the 1% level across all specifications, suggesting that product or service innovation activity leads to a significant increase in corporate innovation efficiency. This result is explained by the fact that when an enterprise introduces a new product or service that is significantly improved in terms of its characteristics or uses, it will help the enterprise improve its competitiveness and continue to approach newer customers, thereby

Table 1: Summary statistics

Variable	Observations	Mean	Median	Minimum	Maximum
InnoPerf	899	0.296	0.303	0	1
ProdInno	899	0.508	0.500	0	1
MarInno	899	0.502	0.500	0	1
ProInno	899	0.553	0.497	0	1
OrgaInno	899	0.586	0.492	0	1
Export	899	14.468	28.735	0	100
Size	899	218,832	702,093	2	9,000
Age	899	18.14	10.777	1	93

This table reports summary statistics for the main variables in the model. Appendix A provides a detailed variable definition.

Table 2: Correlation Matrix

Variable	InnoPerf	ProdInno	MarInno	ProInno	OrgaInno	Export	Size	Age
InnoPerf	1.000							
ProdInno	0.323***	1.000						
MarInno	0.081**	0.045	1.000					
ProInno	0.105***	0.048	0.199***	1.000				
OrgaInno	0.063*	-0.026	0.325***	0.413***	1.000			
Export	0.042	0.021	0.055*	0.089***	0.082**	1.000		
Size	0.179***	0.262***	0.088***	0.144***	0.066**	0.274***	1.000	
Age	-0.026	0.074**	0.100***	0.121***	0.093***	0.111***	0.358***	1.000

This table reports the correlation coefficient matrix between the independent variables in the model. Appendix A provides a detailed variable definition. Significance levels of 10%, 5%, and 1% are denoted by *, **, and ***, respectively.

improving the innovation efficiency of the business. The finding of a positive link between product or service innovation activity and corporate innovation efficiency is relevant to the results of some recent research, for example, Gunday et al. (2011)[4], Minh (2020)[9].

The Table 3 results also suggest that the coefficients on *ProInno* are positive and significant at the 10% level, indicating that process innovation activity leads to a significant increase in corporate innovation efficiency. The finding explained that when businesses improve the production or distribution process of products, it will help businesses reach customers more effectively and contribute to increasing competitiveness, thereby positively impacting the innovation efficiency of enterprises. The results of this study are consistent with those of Savitz et al. (2000)[13], Veugelers (2008)[22], and Minh (2020)[9].

In contrast, the study shows that the coefficients for *MarInno* and *OrgaInno* are not significant at the 10% level, implying that we do not find a relationship be-

tween corporate innovative efficiency and marketing innovation activity and organizational innovation activity. The results of this study are in contrast to the results of Johne & Davies (2000)[10], Gunday et al. (2011)[4], and Minh (2020)[9]. They are explained by the characteristics of enterprises in Southeast Asian countries where SMEs are located in these countries, organizational innovation and marketing innovation are often carried out by SMEs because they do not have to cost many initial investment costs in line with enterprise resources (Ramirez et al., 2018)[23]. However, organizational innovation and marketing innovation are considered to be less effective than product and service innovation and process innovation. These results do not show a clear impact of these two types of innovation on the innovation performance of firms. Table 3 presents a negative relation between the number of years of operation and corporate innovation efficiency. This finding highlights that a higher number of years of operation tends to reduce corporate innovation efficiency. On the other hand, corporate inno-

vation efficiency is also positively affected by firm size, suggesting that firms with more employees are associated with more corporate innovation efficiency.

The analysis results in Table 4 show that there are differences in the impact of innovative activities on corporate innovation efficiency by income group of the country. For firms in high-middle-income countries, corporate innovation efficiency is positively affected by product or service innovation activity and organizational innovation activity. In contrast, for firms in low-middle-income countries, all innovative activities positively affect corporate innovation efficiency. The results can be explained by the characteristics of the operating market of enterprises in high-middle-income countries, which is often more competitive than that of enterprises in low-middle-income countries. Moreover, businesses in low-middle-income countries often have limited resources and limited access to new technologies because they require large investment costs. Thus, firms undertake innovative activities that increase their competitiveness, which positively impact corporate innovation efficiency more than businesses in high-middle-income countries.

CONCLUSION

The paper examines how innovative activities influence corporate innovation efficiency in Southeast Asia. We use data on 889 firms in 06 countries, including Vietnam, Laos, Cambodia, Thailand, Indonesia, and Malaysia, that implemented innovation activities collected by World Bank surveys. The results show that product or service innovation activity and process innovation activity have a positive impact on corporate innovation efficiency in Southeast Asia. Moreover, there are differences in the impact of innovative activities on corporate innovation efficiency between low-middle-income and high-middle-income countries.

The study results imply that to enhance innovation efficiency, businesses in Southeast Asia should consider investing in product or service innovation because it brings many innovation effects. However, product or service innovative activity requires many costs, so businesses can consider investing in innovation in stages to reduce capital pressure. Governments should consider policies to support businesses in innovative activities to enhance competitiveness and improve business efficiency in the context of increasing international integration.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

All authors significantly contributed to this work, and approved the final version for publication.

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Table 3: **Tobit regression**

Variable	InnoPerf				
ProdInno	0.178***	-	-	-	0.178***
	(8.93)				(8.92)
MarInno	-	0.044**	-	-	0.026
		(2.24)			(1.39)
ProInno	-	-	0.054***	-	0.038*
			(2.69)		(1.90)
OrgaInno	-	-	-	0,036*	0,019
				(1.86)	(0.96)
Export	0.0001	-0.00008	-0.0001	-0.0001	0,0003
	(0.29)	(-0.21)	(-0.28)	(-0.25)	(0.1)
Size	0.023***	0.037***	0.036***	0.038***	0.022***
	(3.98)	(6.28)	(6.06)	(6.41)	(3.67)
Age	-0.002***	-0.003***	-0.003***	-0.003***	-0.003***
	(-2.76)	(-3.12)	(-3.08)	(-3.05)	(-3.10)
Constant	0.186***	0.223***	0.219***	0.222***	0.151***
	(8.50)	(9.71)	(9.76)	(9.67)	(6.22)
Obs.	899	899	899	899	899
Log likelihood	-143.682	-180.706	-179.562	-181.566	-138.335

This table reports the results of the Tobit regressions method with robust selection by corporate innovation efficiency. Appendix A provides a detailed variable definition. Significance levels of 10%, 5%, and 1% are denoted by *, **, and ***, respectively; t-statistics are reported in parentheses.

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Table 4: Comparison of the impact of innovative activities on corporate innovation efficiency by country income group

Variable	InnoPerf	
	Upper Middle-income	Low Middle-income
ProdInno	0.067**	0.228***
	(2.19)	(8.88)
MarInno	-0.039	0.073***
	(-1.00)	(3.12)
ProInno	-0.028	0.076***
	(-0.72)	(3.27)
OrgaInno	0.0809*	0.076***
	(1.75)	(3.27)
Export	0.0006	0.0001
	(0.93)	(0.04)
Size	-0.013	0.037***
	(-1.13)	(3.47)
Age	-0.002*	-0.002**
	(-1.79)	(-2.00)
Constant	0.426***	0.018
	(9.03)	(0.47)
Observations	305	594
Log likelihood	-12.960	-94.895

This table reports the results of the Tobit regressions method with robust selection by corporate innovation efficiency. Upper middle-income countries include Indonesia, Malaysia, and Thailand. Low middle-income countries include Vietnam, Cambodia, and Laos. Appendix A provides a detailed variable definition. Significance levels of 10%, 5%, and 1% are denoted by *, **, and ***, respectively; t-statistics are reported in parentheses.

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