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THE IMPACT OF INNOVATION ON TOTAL FACTOR PRODUCTIVITY OF SMALL AND MEDIUM ENTERPRISES IN VIETNAM

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ABSTRACT
This study aims to analyze the impact of innovation on total factor productivity (TFP) of small and medium enterprises (SMEs) in Vietnam since the level of productivity of this sector has been still low. The study uses the data collected by Central Institute for Economic Management (CIEM) in 2011, 2013 and 2015. By using Generalized Method of Moments model (GMM), the results show that the relationship between new products and TFP has not been proven yet as the p-value is greater than the significance level of 10%, meanwhile the remaining two innovative activities (modified products and new process) have positive effects on TFP. Based on the findings, some implications are suggested for companies to boost their TFP.
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Keyword: Innovation, Total Factor Productivity (TFP), Small and Medium Enterprises (SMEs) in Vietnam

1. INTRODUCTION
In the last decade, the economy of Vietnam has been impressive (McCaig and Pavcnik, 2013). From 2000 to 2015, the growth of GDP (gross domestic products) has increased by 7% per year despite a slight decline from the 2008 crisis. However, the productivity of small and medium enterprises (SMEs), especially in the manufacturing sector, has been stagnating since 2011 (Calza et al., 2018). Bloom and Van Reenen (Bloom and Van Reenen, 2007) also showed that a large number of firms in developing countries has experienced low levels of productivity. Therefore, it is necessary to study the determinants of productivity of SMEs in Vietnam to achieve the sustained growth.

To ensure the survival and growth of SMEs in the economy, innovation has been widely acknowledged as one significant factor to foster SMEs' productivity. It is not directly related to the performance of a firm, but it has an impact on the economy mostly through TFP (Total factor productivity) (Saleem et al., 2019). Innovation is the activity that helps SMEs achieve a competitive advantage in a continuously changing environment. In fact, the relationship between innovation activities and TFP has been mostly examined in developed countries such as England, Argentina and Italy (Geroski,1989; Chudnovsky et al., 2006; Hall et al., 2009) but developing countries like Vietnam.

For the reasons outlined above, this study is conducted to examine the impact of innovation on

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TFP of SMEs in Vietnam. The paper is organized as follows. We first provide a brief literature review of innovation and TFP, and how this activity affects TFP. The next part describes data source, the sample and measurements of dependent, independent and control variables. Section 4 reports the results while section 5 makes some discussions and implications.

2. LITERATURE REVIEW AND HYPOTHESIS

Innovation

Innovation is known as one of the basic tools of growth strategy to penetrate new markets, increase existing market share and give the company a perfect competitive advantage. The global market is increasingly and fiercely competitive so companies have begun to recognize the importance of innovation and conduct more innovative activities (Gunday, 2011). Currently, there is no uniform definition of innovation, so it is understood in many different ways. Innovation can be development (or adaptation) and make a useful and new idea for the organization at suitable times (Van de Ven, 1986; Damanpour & Schneider, 2006). In another aspect, innovation is also a process of collecting, sharing and digesting knowledge, thereby creating new arguments which are applied into products and services (Uzkurt et al. 2013). However, in current studies, OECD's definition is most commonly used. In particular, innovation is the process of implementing a new product or a significant improvement of goods and services, creating a new process or organizational method in business practices or external relations.

Total factor productivity (TFP)

In fact, economic performance is assessed by considering the use of capital and labor inputs. However, in the value-added part, there is a little contribution of capital and labor inputs (factors that can be quantified) and a part of the new value is made by the intangible assets. This part is expressed through the total factor productivity (TFP). Similarly, the definition of Comin (2006) pointed out that TFP is an output which is not explained by traditional measurement inputs such as capital or materials. More generally, the Vietnam Productivity Center (2009) defines TFP as the contribution of intangible factors such as knowledge - experience - labor skills, good economic restructuring, good services, quality of investment capital and management skills. This study uses the definition above to fully reflect on TFP in enterprises.

The relationship between innovation and TFP

According to Emmanuel Duguet (2003), TFP growth may depend on whether the ability to innovate is high or not. A small innovation may not have a significant impact on TFP but it will have a gradual effect and lead to big changes later. For SMEs, through promoting creative activities, they will have an advantage in production, business activities and using human resources, which contributes to TFP growth to reach the expected level (Cassiman & partner, 2010). However, in empirical studies, some cases mentioned that innovation does not change or change only a part of TFP of enterprises (Mairesse & Mohnen, 2002).

In the case of developed countries, Duguet's study (2003) indicated that fundamental innovations (including product innovation and technological innovation) contribute significantly to the growth and development of TFP. In developing countries, Freel (2000) found that among businesses in fast-developing countries, companies that innovate have shown higher productivity than traditional ones. Innovative activities also give the company new faces and policies, which

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promotes the operational efficiency growth, especially leading to increased market share, higher production efficiency and higher TFP (Shefer and Frenkel, 2005). At the same time, higher levels of innovation make business productivity change in a positive way (Gurhan Gunday et al., 2011).

Hypothesis: Innovation has a positive impact on TFP in enterprises.

3. METHOD

3.1. Measurement

In this study, TFP is measured by following this formula:

Estimating productivity by Ordinary Least Squares – OLS produces biased results for TFP's estimation; therefore, using method introduced by Levinsohn and Petrin (2003) to estimate TFP provides better results (Van Beveren, 2012). In this study, TFP is estimated following proposals of Levinsohn and Petrin, begins with linear production function:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \omega_{it} + \eta_{it}$$

$\omega_{it} = \beta_0 + v_{it}$ is defined as the current productivity of a firm and η_t is error uncorrelated to independent variables. Therefore, productivity can be estimated by the following equation:

$$\hat{\omega}_{it} = \hat{\beta}_0 + \hat{v}_{it} = y_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it}$$

Finally, to estimate TFP, we take natural logarithm of $\hat{\omega}_{it}$. TFP is used to examine effects of distinctive independent variables to TFP.

In this study, y_t is logarithm of firms' value added; l_t is logarithm of total number of labors within organizations, k_t is logarithm of the total value of capital; m_t is investment in machinery and equipment.

Dependent, independent and control variables are shown as table 1

Table 1: Variable measurements

Variable		Measurement
INNO	New product	Whether the firm launches a new product into the market (1=Yes, 0= No)
	Modified current products	Whether the firm modifies their current products (1=Yes, 0= No)
	New process	Whether the firm applies a new manufacturing process (1=Yes, 0= No)
TFP	LnVA	Ln (Value added)
	LnCap	Ln (The total value of capital at the end of year)
	Ln_mm	Ln (The total value of investment in machinery and equipment)
Control variables	Export	Whether the firm exports their goods (1=Yes, 0= No)
	Labor	Ln (the total number of firms' employees)
	Ownership	Ownership is divided into 5 forms: households, private sectors, cooperatives, limited companies, joint-stock companies
	Firm age	Ln (fiscal year – established year)
	Trend	Trend = 1 if surveyed year is 2011 Trend = 2 if surveyed year is 2013 Trend = 3 if surveyed year is 2015

3.2. Data

The data source of this study is from SMEs surveys. SMEs surveys are jointly carried out for

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every two years by University of Copenhagen, General Statistics Office (GSO) of Vietnam, Vietnamese Institute of Labor Science and Social Affairs (ILSSA), and Central Institute for Economic Management (CIEM) of Vietnamese Ministry of Investment and Planning. The sample includes about 2600 firms located in 10 Vietnamese provinces including Ha Noi, Phu Tho, Ha Tay, Hai Phong, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Ho Chi Minh City and Long An. For example, the 2011 survey consists of 2552 firms while the figures for 2013 and 2015 surveys are 2575 and 2649 firms, respectively.

Table 2: Descriptive analysis

Variables		Observations	Mean	Standard deviation
TFP		4,812	10.2973	.7704523
INNO	New product	4,812	.1134663	.3171949
	Modified current products	4,812	.2369077	.4252294
	New process	4,812	.0839568	.2773518
Control variables	Export	4,812	.0644223	.2455292
	Labor	4,812	1.892969	1.150693
	Ownership	4,812	1.862635	1.34322
	Firm age	4,812	2.605234	.6015798

From the summary statistic of the sample represented in table 2, for introducing new products, on average, only about 11.34% of firms from the whole sample launched new goods in the studied period. In addition, the figures for modified product and applying new process in manufacturing are 23.69% and 8.39% respectively. Regarding to export, there is just roughly 6.44% researched firms exporting their goods to other countries. Moreover, the average firm is around 2.6 years old. Finally, over the period from 2011-2015, on average, TFP is approximately 10.29 unit.

3.3. Data processing

Although the data is generally structured as a cross-sectional structure for each year, a subgroup of SME firms is repeatedly interviewed from year to year. This advantage enables us to construct a panel sample of manufacturing firms from 2011 to 2015 for this study, which includes 4 steps:

- Firstly, the data was collected from three different SMEs surveys taken place in 2011, 2013 and 2015.
- Secondly, we calculated and extracted necessary indicators for the study based on the given data sources.
- Next, we eliminate observations which have insufficient information and negative value added (VA).
- Finally, due to the studied period from 2011 to 2015, we select companies that have been working continuously during the given time.

Therefore, the final data includes 1604 firms from each survey, which means there are 4812 researched organizations in total.

There are several different methods to estimate statistic models. OLS model needs to meet some assumptions which many researchers have been testing and indicating that coefficients are

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inconsistent and biased. Therefore, other alternative methods introduced to fix OLS problems such as Fixed Effect method (FE), Random Effect method (RE), Generalized Least Squares (GLS) are proposed to produce homoscedasticity; estimating by instrument variable (IV) or Two-stage Least-Square (2SLS) when endogeneity problem occurs. Recognizing issues in regression models always can be done by using tests. However, Generalized Method of Moments (GMM) is considered to be a general method of those mentioned common methods. Even if endogeneity conditions are violated, GMM still produces consistent, unbiased and effective coefficients. GMM, in general, is used for panel data; especially, when repeated year (T) is many times smaller than observations (N), or inconsistency data.

The regression equation is as follow:

$$\mathbf{TFP}_{i,t} = \alpha_0 + \alpha_1 \mathbf{INNO}_{i,t} + \alpha_2 \mathbf{Control}_{i,t} + \varepsilon_i$$

While $\mathbf{TFP}_{i,t}$ measures the firm's current productivity for a firm i and a year t, $\mathbf{INNO}_{i,t}$ denotes innovation activities that are employed by a firm i, in a year t. Innovation activities include a wide range of activities that are carried out by a firm over the previous years. Additionally, $\mathbf{Control}_{i,t}$ is a vector of control variables for firm characteristics from the main specification. In particular, control variables include (1) whether a firm exports their products (2) the total number of workers (3) form of ownership (4) firm age (5) trend.

4. RESULT

To analyze the impact of innovation on TFP, to begin with, we run a correlation table (Table 3) to appraise the strength of the relations. In addition, to get further quantitative analysis, we use GMM model, the results are indicated in table 4.

Table 3: Correlations between studied variables

	TFP	New product	Modified current products	New process
TFP	1.0000			
New product	0.0233	1.0000		
Modified current products	0.0798	-0.0129	1.0000	
New process	0.0826	0.0146	0.2666	1.0000

Table 3 indicates the correlations between all variables in the study. It is clear that all of the correlations between TFP and innovation activities are positive. In other words, the more innovative activities are implemented within a firm, the more TFP within these organization is to gain. It is noticeable that the correlation between applying new manufacturing process and TFP is the strongest one (the figure is 0.0826), while the weakest one is of introducing new goods (0.0233).

Table 4: GMM results

	TFP		
	Coefficient	Robust Std. Err	P_value
GMM			
New product	-.0304214	.0357883	0.395
Modified current	.0495378	.0245741	0.044

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products			
New process	.0720606	.0423913	0.089
Export	.006955	.0487413	0.887
Ownership			
Private sectors	.2924284	.0430045	0.000
Cooperatives	.0247162	.0615416	0.688
Limited companies	.3026044	.0376333	0.000
Joint-stock companies	.1261263	.0584215	0.031
Firm age	-.148094	.0201934	0.000
Labor	.1221382	.0148914	0.000
Trend	.131193	.0140711	0.000
B0	10.08928	.0576101	0.000

Instruments for equation 1: New product Modified current products New process Export 0.OWNERSHIP 1.OWNERSHIP 2.OWNERSHIP 3.OWNERSHIP 4.OWNERSHIP 5.OWNERSHIP Firm age Labor Trend _cons

The regression model is:

$$\mathbf{TFP}_{i,t} = 10.08928 - .0304214*\mathbf{New\ product}_{i,t} + .0495378*\mathbf{Modified\ current\ products}_{i,t} + .0720606*\mathbf{New\ process}_{i,t} + .006955*\mathbf{Export}_{i,t} + .2924284*\mathbf{Private\ sectors}_{i,t} + .0247162*\mathbf{Cooperatives}_{i,t} + .3026044*\mathbf{Limited\ companies}_{i,t} + .1261263*\mathbf{Joint\text{-}stock\ companies}_{i,t} - .148094*\mathbf{Firm\ age}_{i,t} + .1221382*\mathbf{Labor}_{i,t} + .131193*\mathbf{Trend}$$

From table 4, authors come to some significant conclusions:

Firstly, the relationship between launching new products and TFP is not proved yet due to p_value > 0.1. In contrast, the positive influences of modified goods and applying new process on TFP have been proved with statistical meaning at 5% and 10% respectively. In particular, if a firm modifies their current products, TFP will be.0495378 unit higher than before. The similar result can be seen in applying new manufacturing process, meaning that when an organization apply new process, TFP is .0720606 unit higher than that does not. It is also noticeable that the impact of applying new process on TFP is stronger than that of modified products (.0720606 >.0495378).

Secondly, the majority of control variables are proved to have a positive influence on TFP. For example, the coefficient between Labor and TFP is .1221382 > 0; which means when a firm employs more 1 production worker, their TFP is .1221382 unit higher than that does not. This conclusion has statistical meaning at 1%. On the other hand, some relationships between control variables and TFP are not proved yet. For instance, the positive effect of cooperatives on TFP compared to household is not proved due to high p_value (0.688).

5. DISCUSSION AND CONCLUSION

In this study, we consider the impact of innovation on TFP in Vietnamese SMEs. The results of the study indicate that innovation is generally positively related to TFP. This agrees with Bloom & Reenen's study (2011); Chandler & McEvoy's study (2000). Product improvement and process improvement activities contribute positively to the increase of TFP for SMEs.

According to Pierre Mohnen & Bronwyn H. Hall (2013), the growth of organizations can be

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enhanced by bringing many factors of production into business activities (such as increasing investment, using more land and increasing participation of the labors), which helps companies achieve higher output levels with the same resources. In other words, it will affect growth mainly through improving TFP. The study of Ranasinghe (2014) also emphasized that when making more innovation activities, the total output and TFP will be larger. This study also showed similar results as the above studies.

In addition, our study provides some important implications. Firstly, companies must step up innovation activities to made the groundwork for TFP growth. With the current data of Vietnam, the number of enterprises conducting innovation is increasing, which poses a big challenge for enterprises to raise productivity to assert their position in the market. Secondly, businesses need to have access to the change of science and technology. This change will create many advantages for businesses to improve products and production processes so innovation is also more efficient and leads to higher productivity. Accessing to new science and technology also expands knowledge for personnel in the company to improve the quality and efficiency of their operations. Because of data limitations, our study only mentioned output innovations, not investigating input innovation activities of enterprises. In other words, if other study can access to all innovation activities, many other results may be revealed for this.

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