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Innovation and SMEs performance: evidence from Vietnam

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Abstract

Purpose – The purpose of this paper is to examine the effect of innovation on the performance of small and medium-sized enterprises (SMEs) in Vietnam.

Design/methodology/approach – The paper uses data from the surveys on SMEs in Vietnam conducted by the Development Economics Research Group at the University of Copenhagen, the United Nations University's World Institute for Development Economics Research, Central Institute for Economic Management and Institute of Labor Science and Social Affairs, and applies least squared regressions and 2SLS regressions to examine the effect of innovation on the performance of SMEs.

Findings – The authors find that SMEs with innovation tend to perform better than SMEs without innovation. The authors further show that the positive effect of innovation on firm performance mainly comes from the effect of improvement of existing products, an important type of innovation in SMEs. This result is

JEL classification – G31, G32, O32

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Data availability statement: The data that support the findings of this study are openly available at www.wider.unu.edu/database/viet-nam-sme-database

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persistent when the authors use propensity matching score and 2SLS regression with instrumental variable approaches. Overall, the results show the important role of innovation in enhancing the firm performance of SMEs, which sheds light on the literature on the controversial relation between innovation and SMEs performance in the world.

Research limitations/implications – The major limitation of the paper is the lack of data. Although the database used in the paper is widely used to analyze SMEs in Vietnam, it covers about 2,500 firms in only nine provinces/cities in Vietnam.

Practical implications – Policymakers should enact relevant policies to support SMEs with innovation activities, thereby increasing firm performance and their competitiveness. For instance, encouragement policies or financial incentives (tax reduction or subsidies) for innovative firms should be implemented and/or fostered.

Originality/value – To the best of the authors' knowledge, this is the first paper to examine the effect of different types of innovation on the performance of SMEs in Vietnam.

Keywords Firm performance, Innovation, SMEs, Vietnam

Paper type Research paper

1. Introduction

Small and medium-sized enterprises (SMEs) have been playing a vital role in fostering economic growth in not only developed but also developing economies (Ayyagari *et al.*, 2011; Love and Roper, 2015; OECD, 2018; Wellalage and Locke, 2020). In developing countries, SMEs constitute over 90% of all companies outside the agricultural sector, generate a major source of employment and contribute to the domestic and export earnings and overall added value (Love and Roper, 2015). Similarly, in Vietnam, SMEs accounted for 98% of all enterprises, 40% of gross domestic products and 50% of employment [1]. Therefore, the development and improvement of SMEs performance have attracted much attention of policymakers, practitioners, as well as firm owners and board of directors.

There are several factors affecting SMEs performance such as capital investment, human resources and marketing. Among them, innovation has been considered one of the most important drivers (Grupp, 1998; Cheng *et al.*, 2013; Kim and Huarng, 2011). Innovation also contributes to sustain competitive advantage (Subramaniam and Youndt, 2005; Chen and Huang, 2010; Zubielqui *et al.*, 2019; and Vrontis *et al.*, 2021). However, empirical studies on the relation between innovation and SMEs performance provide mixed results. On the one hand, some studies indicate a positive relation between them (Bolton, 1993; Matsuo, 2006; Alam and Adeyinka, 2021). On the other hand, some conclude that there is no impact of innovation on firm performance (Hitt *et al.*, 1997; David *et al.*, 2014; Koellinger, 2008; Dunk, 2011).

In this paper, we enrich the current literature on the relation between innovation and SMEs performance by investigating this relation in Vietnam. Using the sample of 2,389 SMEs, we show that innovation significantly enhances SMEs performance measured either by the total value added, total revenue growth or gross profit ratios.

We further examine the effect of each type of innovation on SMEs' performance. As discussed in the literature (Ayyagari *et al.*, 2011; OECD, 2018; Wellalage and Locke, 2020), innovations in SMEs are mainly "new-to-firm" innovations which are different from fundamental inventions usually developed by large companies. We follow the literature and define innovation as one of the three forms:

(1) improvement of existing products;

(2) introduction of new technology; and

(3) introduction of new products.

We show that only improvement of existing products significantly affects SMEs performance.

Why does improvement of existing products matter for SMEs? While improvement of existing products is a type of incremental innovation "which provides products with new features, benefits or improvements to the existing technology in the existing market" (Tont and Tont, 2016), either new technologies or new products are associated with radical innovation which results in a new market infrastructure. In terms of investment, it usually costs more to invest in new technologies or products (Ayyagari *et al.*, 2011). However, firms usually capitalize the benefits of new technologies or new products in the long term because these types of innovation require firms to create demand previously unrecognized by customers (Garcia and Calatone, 2002). Given that SMEs usually lack resources (Freel, 2000; Lee *et al.*, 2015), improvement of existing products is a better choice for SMEs. This is because the improvement of existing products cost less and, at the same time, allows firms to quickly realize the gains from the improved products (Tobiassen and Pettersen, 2018), enhancing SMEs' competitiveness and performance.

Because the number of firms with innovation is smaller than the number of firms without innovation, we robustly test our results by matching firms with innovation with their counterparts based on firm characteristics. Using the propensity score matching method, for each firm with innovation, we choose one firm without innovation in the same industry and the year having the nearest propensity score. Using this matching sample, we run regressions of SMEs performances on innovation and other control variables. Consistent with the previous results, we show that firms with innovation tend to perform better.

We also try to address the endogeneity problem that may exist due to the possible omission of unobservable factors affecting both innovation and firm performance. To deal with this endogeneity, we use the 2SLS approach with instrumental variable. We choose a SME's social network with politicians and civil servants as an external instrumental variable for innovation. This is because the social network with politicians and civil servants can help SMEs acquires more knowledge from outsiders, which makes firms more innovative (Zubielqui *et al.*, 2019). Furthermore, this social network is less likely to directly affect firm performance. Our results are robust under this 2SLS setting.

Our paper contributes to two literature strands. First, our results shed light on the literature on the controversial relation between innovation and SMEs performance in the world. While Koellinger (2008) and David *et al.* (2014) show no relation between innovation and firm performance, other studies document that innovation significantly improve firm performance (Pett and Wolff, 2009; Gunday *et al.*, 2011; Lee *et al.*, 2019; Radicic and Djalilov, 2019). Similarly, when examining the impact of product and process innovations on manufacturing firm performance in Indonesia, Malaysia and Vietnam, Na and Kang (2019) document that new operating technologies are negatively related to sales growth, but product innovation is positively correlated with sales growth. Our findings support the latter. Second, we document that innovation, especially improvement of existing products, is an important determinant of the performance of SMEs in Vietnam. This result is consistent with the findings in Lin *et al.* (2013), who documented the positive effects of green product innovation on firm performance in Vietnam.

The remainder of paper is as follows. Section 2 reviews the literature. Section 3 describes data and provides descriptive statistics. Section 4 presents and discusses research results. Section 5 provides conclusion, policy implications and limitations.

2. Literature review

The relation between innovation and SMEs performance has been widely discussed in the literature. However, the results are mixed. Using a sample of UK manufacturing firms, Geroski *et al.* (1993) and Geroski (1995) find that innovation has both direct and transitory positive effects on firm profit, accounting profitability and stock market rates of return and growth. Bolton (1993) and Matsuo (2006) also reveal a positive relationship between innovation and firm performance. Brown (1997), Tidd *et al.* (2001) and McAdam and Keogh (2004) confirmed that innovation is a vital determinant in accomplishing firms' goals and successful competition and that firms with innovation activities are more dynamic in the competitive market. Similarly, Pett and Wolff (2009) conduct research on SMEs in the USA and find the positive effect of product and process innovation on SMEs' performance. Using a sample of 174 Spanish manufacturing SMEs, Soto-Acosta *et al.* (2016) show that e-business is positively related to firm performance. Zubielqui *et al.* (2019) use a sample of 291 Australian SMEs and show that knowledge transfers are significantly correlated to firm performance. Azar and Ciabuschi (2017) document that innovation enhances the performance of Swedish export ventures. Similarly, many other empirical students demonstrate the role of innovation in enhancing various firm performance indicators such as productivity, financial performance, market performance or export performance (Gunday *et al.*, 2011; Lee *et al.*, 2019; Nguyen *et al.*, 2008; Radicic and Djalilov, 2019; Rajapathirana and Hui, 2018; Wadho and Chaudhry, 2018).

In contrast to the positive relation between innovation and SMEs performance, several studies (David *et al.*, 2014; Koellinger, 2008; Dunk, 2011) document no evidence for the relationship between innovation and firm performance. In a study in Brazil, David *et al.* (2014) show no relation between innovation and firms' financial indicators such as return on assets, return on equity and return on sales. Similarly, Koellinger (2008) finds no relation between innovation and firm profitability in Europe. In contrast, Bowen *et al.* (2010) show that this relation is uncertain.

The third strand in the literature on the relation between innovation and SMEs performance provides mixed results. For instance, using a sample of SMEs in Europe, Koellinger (2008) finds that product or process innovation activities have a positive impact on turnover and employment but not on profits. Studying a sample of firms in the automotive supplier sector in Turkey, Atalay *et al.* (2013) show that firms with process innovation activities have higher performance than noninnovative firms. However, they document that the organizational and marketing innovation activities do not affect firm performance.

The effect of innovation on the performance of firms in Asian-Pacific countries is divergent. Na and Kang (2019) examine the impact of product and process innovations on manufacturing firm performance in Indonesia, Malaysia and Vietnam and document inconsistent effects. They show that product innovation is positively associated with sales growth, while new operating technologies are negatively related to sales growth. Surveying 614 textile and wearing apparel manufacturers in Pakistan, Wadho and Chaudhry (2018) find that product innovation enhances labor productivity and higher labor productivity growth. In more detail, a 10% increase in innovative sales per worker results in a greater than 10% increase in labor productivity as well as labor productivity growth. Xu *et al.* (2019) investigate the impact of technology on the performance of firms in manufacturing sector in China and find the positive effect. Similarly, Rosli and Sidek (2013) collected 284 SMEs in the food and beverage, textiles and clothing and wood-based subindustries in Malaysia. They document that product innovation and process innovation significantly increase firm performance.

In Vietnam, Lin *et al.* (2013) show that the effect of green product innovation on firm performance is positive. Calza *et al.* (2019) document that the possession of an internationally recognized standard certificate can increase the Vietnamese SMEs' productivity. Similarly, Nham *et al.* (2016) study a sample of 150 supporting firms and find positive effects of process, marketing and organizational innovations on firm performance.

3. Data, variables measurement and descriptive statistics

3.1 Data

We use data from the surveys on SMEs in Vietnam conducted by the Development Economics Research Group at the University of Copenhagen, the United Nations University's World Institute for Development Economics Research, Central Institute for Economic Management and Institute of Labor Science and Social Affairs. The surveys collected data in 2011, 2013 and 2015 from approximately 2,500 nonstate manufacturing SMEs in nine provinces and cities of Vietnam, including Hai Phong, Ha Noi (including Ha Tay), Phu Tho, Nghe An, Quang Nam, Lam Dong, Khanh Hoa, Ho Chi Minh City and Long An.

This survey includes various types of innovation activities and firm performance indicators [2]. We remove any observations with missing values for the variables used in this paper. To reduce the effects of outliers, we winsorize all variables used in our paper at 1% and 99% percentiles. Our final sample has 4,069 observations.

3.2 Variables measurement

As discussed in Le *et al.* (2022), patents or research and development (R&D) are not useful to measure innovation in SMEs. First, patents and R&D are highly sector-biased, which are not proper to capture innovation outside of high-tech industries where SMEs account for a large fraction. Second, the number of SMEs engaged in these activities is very small (Hall *et al.*, 2013). Third, SMEs usually play an important role in the near-to-market development, which is called "new-to-firm innovations" (OECD, 2018). Therefore, we follow the previous studies on innovation in SMEs (Ayyagari *et al.*, 2011; Lee *et al.*, 2015) and a widely-used manual by OECD to define innovation activities as having any of the three types:

(1) improvement of existing products (or change specification);

(2) introduction of new technology or new production process; and

(3) introduction of new product groups.

Based on these categories, we construct five corresponding innovation variables, including:

(1) INNO1 equals 1 if a firm improves any existing product, and 0 otherwise;

(2) INNO2 equals 1 if a firm introduced any new technology or production process, and 0 otherwise;

(3) INNO3 equals 1 if a firm introduced any new product, and 0 otherwise;

(4) INNOD equals 1 if a firm has any innovation activities, and 0 otherwise; and

(5) AINNO (in logarithm) is the number of innovation activities (ranging from 0 to 3) that a firm had, and 0 otherwise.

We measure performance with three indicators, including the ratio of total value added over total assets (TVAD), the total revenue growth rate (SALEG) and the ratio of total gross profit over total assets (GPA). To control time-invariant heterogeneities, we use the change in these indicators between two surveys (first difference).

We include in Appendix the list of all variables along with the description on their measurement.

3.3 Descriptive statistics

Table 1 provides the descriptive statistics for all the variables used in our paper. It shows that 32.9% of SMEs in our sample engaged in at least one type of innovation (INNOD). However, the majority of innovation activities comes from the INNO1 and INNO2 categories. In more detail, 28.1% of SMEs reported that they engaged in some improvements to their existing products (INNO1), and 10.3% of these firms introduced new technology (INNO2) within two-year periods of the surveys. In contrast, only 2.2% of SMEs introduced new products (INNO3) within two years of the surveys. Consistent with the findings in other countries (Ayyagari *et al.*, 2007), our evidence demonstrates that innovation in Vietnamese SMEs is mainly "new-to-firm" innovation rather than fundamental invention.

Regarding firm characteristics, the results in Table 1 show that the tangible assets ratio of SMEs in our sample ranges from 16.9% to 99.2% with the average of 77.3%. On average, these SMEs have a total debt ratio of 7.3%. This ratio indicates that the SMEs in Vietnam borrow significantly less debt than the large public firms (Le *et al.*, 2022). However, this result is consistent with other studies on SMEs (Beck *et al.*, 2008).

The results in Table 1 also demonstrate that the SMEs have an average sales volume of about VND 7bn (around US$337,000). With this size, the SMEs in our sample are very small. However, they are not young with an average age of 15.5 years. They also hold 9.8% cash to total assets and invest 8.8% of assets in capital expenditure on average.

Table 1 also shows the descriptive statistics of the three variables of firm performance. The change in the ratio of total value added over total assets over two years averages 5.9%,

Variable	MEAN	STD	MIN	25th Pctl	MEDIAN	75th Pctl	MAX	*N*
Innovation								
INNOD	0.329	0.470	0.000	0.000	0.000	1.000	1.000	4,069
AINNO	0.259	0.384	0.000	0.000	0.000	0.693	1.386	4,069
INNO1	0.282	0.450	0.000	0.000	0.000	1.000	1.000	4,069
INNO2	0.103	0.304	0.000	0.000	0.000	0.000	1.000	4,069
INNO3	0.022	0.148	0.000	0.000	0.000	0.000	1.000	4,069
Firm characteristics								
TANG	0.773	0.212	0.169	0.668	0.846	0.936	0.992	4,069
LSALE	6.977	1.559	4.025	5.886	6.802	7.937	10.910	4,069
TDEBT	0.073	0.143	0.000	0.000	0.002	0.076	0.696	4,069
CASH	0.095	0.111	0.002	0.021	0.054	0.123	0.505	4,069
LAGE	2.804	0.469	1.609	2.485	2.773	3.135	4.190	4,069
CEAT	0.080	0.150	0.000	0.000	0.003	0.089	0.685	4,069
Firm performance								
ΔTVAD	0.055	0.498	−2.445	−0.094	0.021	0.185	2.505	4,069
ΔSALEG	0.020	0.123	−0.445	−0.034	0.009	0.062	1.005	4,069
ΔGPA	0.032	0.351	−1.784	−0.066	0.009	0.120	1.782	4,069
Instrumental variable								
NETWORK	1.469	2.647	0.000	0.000	1.000	2.000	100.000	4,069

Notes: This table reports the descriptive statistics for the main variables for firms in our sample. All variables are defined in Appendix. All variables are winsorized at 1st and 99th percentiles
Source: Authors' own calculation

Table 1.
Descriptive statistics

while the average of percentage change in sales is 2.2%. Moreover, the average of change in the ratio of total gross profit over total assets over two years is 3.2%.

The activities of innovation depend on the industries where firms operate. Therefore, to further understand firm innovation in our sample, we report the innovation activities for firms in each industry. The results are reported in Table 2.

The results in Table 2 show that only one SME in each of agriculture and services industries [3]. These SMEs engaged in innovation activities. Moreover, SMEs in leather, electronics, computers, jewelry, music equipment, watches, toys and medical equipment industries tend to invest more in innovation. In contrast, SMEs in the refined petroleum industry do not have any innovation activities during the periods of the surveys.

4. Empirical results

In this section, we investigate the effects of innovation on firm performance by using three different approaches. First, we use an ordinary least square (OLS) regression model for the whole sample. The benefit of this approach is that all SMEs in our sample can be considered, including SMEs with and without innovation. Besides this approach, we use the propensity score matching method, which matches SMEs with innovation and SMEs without innovation. This alternative method allows us to deal with the imbalance in the number of innovative SMEs and noninnovative SMEs in our sample. Finally, we use 2SLS with instrumental variable to address the endogeneity issue which may occur in the relation between innovation and firm performance.

Industries	FREQ	INNOD	AINNO	INNO1	INNO2	INNO3
Agriculture	1	1.000	0.693	0.000	1.000	0.000
Services	1	1.000	1.099	0.000	1.000	1.000
Leather	79	0.494	0.383	0.025	0.494	0.076
Furniture, jewelry, music equipment, watches, toys and medical equipment	336	0.485	0.375	0.048	0.423	0.113
Electronic machinery, computers, radio, TV, etc.	106	0.462	0.408	0.075	0.415	0.198
Paper	105	0.448	0.375	0.029	0.390	0.190
Apparel	188	0.441	0.341	0.032	0.394	0.101
Rubber	219	0.397	0.312	0.018	0.374	0.096
Recycling, etc.	8	0.375	0.260	0.125	0.250	0.000
Textiles	164	0.366	0.293	0.018	0.341	0.104
Fabricated metal products	709	0.358	0.278	0.027	0.324	0.082
Motor vehicles, etc.	24	0.333	0.356	0.083	0.333	0.250
Other transport equipment	12	0.333	0.299	0.083	0.333	0.083
Non-metallic mineral products	172	0.320	0.255	0.029	0.262	0.116
Publishing and printing	106	0.311	0.250	0.000	0.264	0.132
Basic metals	52	0.308	0.250	0.019	0.269	0.115
Wood	407	0.292	0.222	0.015	0.258	0.066
Chemical products, etc.	74	0.257	0.227	0.000	0.230	0.149
Food and beverages	1,292	0.230	0.179	0.011	0.166	0.102
Refined petroleum, etc.	14	0.000	0.000	0.000	0.000	0.000
Total	4,069	0.329	0.259	0.022	0.282	0.103

Note: This table presents the descriptive statistics of firm innovation by industries
Source: Authors' own calculation

Table 2.
Innovation by industries

4.1 Base-line regression model

We use an OLS regression model to investigate the impact of innovation on firm performance. Our base-line regression model is as follows:

$$\Delta\text{Performance}_{i,t+2} = \alpha + \beta_1 \text{INNO}_{i,t} + \beta_2 \text{FIRM} - \text{CHAR}_{i,t} + \beta_3 \text{IND} - \text{DUMMY}_j + \beta_4 \text{TIME} - \text{DUMMY}_t + \varepsilon_i \quad (1)$$

where Performance is one of the three variables used to measure firm performance (TVAD, SALEG and GPA); INNO is one of the five innovation variables (INNOD, AINNO, INNO1, INNO2 and INNO3); FIRM-CHAR$_i$ is a vector of firm characteristics; IND-DUMMY is the industry dummy variables; TIME-DUMMY is the time dummy variables, and subscripts i and t refer to firm i and year t, respectively. All variables are presented in Appendix. We expect our coefficient of interest, β_1, to be positive and significant.

Previous studies (Koellinger, 2008; Pham *et al.*, 2018) document that several firm characteristics such as cash holding, investment, debt ratio, firm age and tangible assets are significantly correlated with innovation and firm performance. Therefore, we control for these variables in our regressions. In more detail, we control for the ratio of total fixed assets to total assets (TANG), ratio of total debt to total assets (TDEBT), ratio of total cash and deposits to total assets (CASH), firm age (LAGE) and ratio of investment in physical capitals to total assets (CEAT).

We also control for industry fixed-effects because both innovation and firm performance depend on the industries in which firms are operating. We control for time effects because firm performance is highly related to business cycles. The results from this regression model are reported in Table 3.

Table 3 shows that innovation is positively correlated with all three measures of firm performance and statistically significant at any conventional level. In terms of economic significance, the coefficient of ΔTVAD, the change in total value added to total assets, is 0.058, suggesting that the total value added of SMEs with innovation is higher than that of the SMEs without innovation by 5.8% points. Also, SMEs with innovation generate 1.6% point more in sales (ΔSALEG) and 3.4% point more in gross profits (ΔGPA) than their counterparts.

The results in Table 3 are consistent with the previous studies. For example, Alam and Adeyinka (2021) show that the adoption of information and communication technology can positively affect the performance of Australian SMEs. Bolton (1993) argues that organizational innovation is positively associated with firm performance. Similarly, Wadho and Chaudhry (2018) document that product innovation leads to higher labor productivity in Pakistan. However, our results are inconsistent with the findings in Na and Kang (2019), which show that new operating technologies are negatively correlated with sales growth in manufacturing SMEs in some South-East Asian countries. Moreover, our findings are also inconsistent with other studies documenting no relationship between innovation and firm performance (Koellinger, 2008; Dunk, 2011).

The effects of other firm characteristics on firm performance are also presented in Table 3. Consistent with previous studies, our results show that SMEs with high tangible assets or more debt tend to have higher profits. In contrast, larger or older firms tend to perform worse. Moreover, firms with high capital expenditure also perform poorer than their counterparts.

To further examine the effect of innovation on SMEs performance, we use an alternative measure of innovation by taking the logarithm of three types of innovation and run regression of firm performance on this innovation variable and other firm characteristics.

Table 3.
Innovation and firm performance

Variable	(1) ΔTVAD	(2) ΔSALEG	(3) ΔGPA	(4) ΔTVAD	(5) ΔSALEG	(6) ΔGPA
INNOD	0.058*** (0.001)	0.016*** (0.000)	0.034*** (0.007)			
AINNO				0.073*** (0.001)	0.020*** (0.000)	0.038** (0.012)
TANG	0.225*** (0.000)	0.015 (0.284)	0.150*** (0.000)	0.226*** (0.000)	0.015 (0.278)	0.151*** (0.000)
LSALE	−0.021*** (0.000)	−0.027*** (0.000)	−0.022*** (0.000)	−0.022*** (0.000)	−0.028*** (0.000)	−0.022*** (0.000)
TDEBT	0.112 (0.115)	0.082*** (0.000)	0.107** (0.032)	0.112 (0.115)	0.082*** (0.000)	0.107** (0.032)
CASH	−0.046 (0.658)	0.016 (0.515)	−0.046 (0.530)	−0.042 (0.685)	0.017 (0.490)	−0.043 (0.555)
LAGE	0.019 (0.282)	−0.021*** (0.000)	0.007 (0.552)	0.019 (0.275)	−0.021*** (0.000)	0.007 (0.545)
CEAT	−0.165** (0.010)	−0.007 (0.637)	−0.119*** (0.008)	−0.165** (0.010)	−0.007 (0.635)	−0.118*** (0.009)
Intercept	−0.095 (0.850)	0.107 (0.369)	−0.024 (0.946)	−0.084 (0.866)	0.109 (0.357)	−0.016 (0.963)
Industry FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
N	4,069	4,069	4,069	4,069	4,069	4,069
Adj. R^2	0.0207	0.0990	0.0283	0.0208	0.0994	0.0281

Notes: This table reports the results from the OLS regression Model (1). All variables are winsorized at 1st and 99th percentiles. *** and ** denotes statistical significance at 1 and 5%, respectively
Source: Authors' own calculation

Consistent with the previous results, Table 3 also shows that the new measure of innovation is positively correlated with the three measures of firm performance and is statistically significant at 1% level.

As discussed in the introduction section, our three measures of innovation capture the differences in the innovation of SMEs. While the improvement of existing productions is a type of incremental innovation which provides the existing products with some new features and/or enhancements, either the new technologies or new products are radical innovation which usually brings the new market segments to the firm. Therefore, their role in enhancing firm performance may be different (Garcia and Calatone, 2002; Tont and Tont, 2016).

To see the effect of different types of innovation on firm performance, we run regressions of firm performance on each type of innovation. The results in Table 4 show that only improvement of existing products (INNO1) is positively correlated with firm performance. These results are reasonable because SMEs can easily capitalize the benefits of the improvement of existing products, while they need time to use the benefits of new technologies or new products. This result implies that the improvement of existing products play an important role in enhancing firm performance in Vietnam.

4.2 Matching sample

In the previous section, we run regressions using the whole sample to examine the effect of innovation on SMEs' performance. In this section, we use the propensity score matching method to match a SME with innovation to a similar firm without innovation in the same industry and year. This method begins with a probit regression model of innovation dummy variable on firm characteristics. Following the current literature (Koellinger, 2008; Vo *et al.*, 2021), we use the set of control variables from the baseline regression model (Model 1), including industry and year dummies. The inclusion of these variables not only ensures that SMEs with and without innovation share the same firm characteristics but also ensures that the coefficient estimators are not driven by the differences in any industry and time.

Variable	(1) ΔTVAD	(2) ΔSALEG	(3) ΔGPA
INNO1	0.054*** (0.004)	0.012*** (0.007)	0.034** (0.011)
INNO2	0.036 (0.180)	0.011* (0.078)	0.004 (0.831)
INNO3	−0.023 (0.671)	0.015 (0.244)	−0.007 (0.850)
TANG	0.225*** (0.000)	0.016 (0.274)	0.150*** (0.000)
LSALE	−0.022*** (0.000)	−0.028*** (0.000)	−0.022*** (0.000)
TDEBT	0.111 (0.120)	0.082*** (0.000)	0.104** (0.037)
CASH	−0.043 (0.677)	0.018 (0.472)	−0.046 (0.527)
LAGE	0.020 (0.253)	−0.021*** (0.000)	0.008 (0.527)
CEAT	−0.161** (0.012)	−0.007 (0.659)	−0.112** (0.013)
Intercept	−0.088 (0.861)	0.111 (0.349)	−0.024 (0.945)
Industry FE	YES	YES	YES
Time FE	YES	YES	YES
N	4,069	4,069	4,069
Adj. R^2	0.0206	0.0989	0.0278

Notes: This table reports the results from the OLS regression model. All variables are winsorized at 1st and 99th percentiles. ***, ** and * denotes statistical significance at 1, 5 and 10%, respectively
Source: Authors' own calculation

Table 4.
Types of innovation and firm performance

Panel A of Table 5 reports the results from the probit regression. The results show that the model specification can explain a significant variability in innovation, as captured by the Pseudo *R*-square of 10.4% and the *p*-value from the test of fitness of overall model less than 1%. Using this regression model, we estimate the predicted probability or propensity score, for each firm-year observation. We then match SMEs with innovation (treatment group) with SMEs without innovation (control group) having the nearest propensity score. We exclude any industry having only one SME. We end up with 1,175 paired SMEs or 2,350 firm-year observations.

To ensure that the propensity score matching approach is valid, we conduct a diagnostic test to verify that the two groups of firms are not statistically different in predicting innovation. We first regress the innovation variables on the firm characteristics, industry and time dummies for the matched sample. The results in Column 2 of Panel A of Table 5 shows that the Pseudo *R*-square drops to 0.13%, and none of firm characteristics are significantly correlated with innovation. We then compare the firm characteristics of these two groups of SMEs and report the results in Panel B of Table 5. The results show that none of the independent variables are statistically significant from each other, implying that the firm characteristics of two groups are statistically similar. These results verify the validity of the assumption of the propensity score matching method.

We run the Model (1) using the matched sample and report results in Table 6. Consistent with the results reported earlier in Section 4.1, Table 6 shows that innovation is positively

Variable	(1) Whole sample	(2) Matching sample
Panel A: Propensity score matching		
TANG	0.089 (0.581)	−0.103 (0.595)
LSALE	0.162*** (0.000)	−0.027 (0.151)
TDEBT	0.012 (0.951)	0.129 (0.566)
CASH	0.612** (0.029)	−0.050 (0.880)
LAGE	−0.007 (0.890)	0.059 (0.323)
CEAT	0.733*** (0.000)	−0.048 (0.808)
Intercept	−0.857*** (0.001)	0.161 (0.612)
Industry FE	YES	YES
Time FE	YES	YES
N	4,069	2,350
Pseudo R^2	0.1044	0.0013

Panel B: Firm characteristics of innovation firms and noninnovation firms

	Unmatched	Matched						
Variable	Treated	Control	Dif.	*p*-value	Treated	Control	Dif.	*p-value*
LSALE	7.409	6.765	0.644	0.000	7.224	7.316	−0.092	0.140
TANG	0.742	0.789	−0.047	0.000	0.758	0.760	−0.002	0.848
TDEBT	0.094	0.062	0.032	0.000	0.083	0.081	0.002	0.746
CASH	0.103	0.091	0.012	0.001	0.100	0.098	0.001	0.762
LAGE	2.770	2.821	−0.051	0.001	2.788	2.768	0.020	0.268
CEAT	0.108	0.066	0.042	0.000	0.099	0.099	0.000	0.975

Notes: Panel A of this table reports the results from probit model and balancing test using unmatched and matched samples. Panel B shows the descriptive statistics for SMEs in both treatment (innovation) and control (noninnovation) groups. *** and ** denotes statistical significance at 1 and 5%, respectively
Source: Authors' own calculation

Table 5.
Matching sample

Table 6. Innovation and firm performance – matched sample

Variable	(1) ΔTVAD	(2) ΔSALEG	(3) ΔGPA	(4) ΔTVAD	(5) ΔSALEG	(6) ΔGPA
INNOD	0.055*** (0.009)	0.016*** (0.001)	0.028** (0.046)			
AINNO				0.071*** (0.005)	0.020*** (0.001)	0.033* (0.056)
TANG	−0.020** (0.012)	−0.023*** (0.000)	−0.020*** (0.000)	−0.021*** (0.008)	−0.023*** (0.000)	−0.020*** (0.000)
LSALE	0.219*** (0.005)	0.005 (0.770)	0.121** (0.022)	0.220*** (0.005)	0.005 (0.762)	0.121** (0.022)
TDEBT	0.129 (0.149)	0.058*** (0.005)	0.111* (0.068)	0.132 (0.141)	0.058*** (0.005)	0.112* (0.065)
CASH	−0.064 (0.631)	−0.001 (0.976)	−0.094 (0.299)	−0.059 (0.657)	0.000 (0.989)	−0.092 (0.310)
LAGE	0.022 (0.365)	−0.017*** (0.003)	0.013 (0.435)	0.022 (0.351)	−0.016*** (0.003)	0.013 (0.421)
CEAT	−0.104 (0.179)	−0.002 (0.894)	−0.087 (0.101)	−0.106 (0.173)	−0.003 (0.875)	−0.087* (0.098)
Intercept	−0.164 (0.749)	0.064 (0.585)	−0.063 (0.856)	−0.156 (0.761)	0.068 (0.565)	−0.056 (0.871)
Industry FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
N	2,350	2,350	2,350	2,350	2,350	2,350
Adj. R^2	0.0191	0.0779	0.0279	0.0196	0.0778	0.0278

Notes: This table reports the results from the OLS regression model using matched sample. All variables are winsorized at 1st and 99th percentiles. Balancing test is conducted using nearest-neighbor matching without replacement and caliper = 0.01. ***, ** and * denotes statistical significance at 1, 5 and 10%, respectively

Source: Authors' own calculation

correlated with all three measures of firm performance. For example, the coefficient of innovation on the ratio of total value added is 0.055 (p-value $< 1\%$), implying that SMEs with innovation generate 5.5% more total value added than their counterparts.

4.3 Robustness test using 2SLS regression

In Model (1), we control for several firm characteristics when we examine the relation between innovation activities and SMEs performance. However, there may exist some unobservable factors which may affect both firms' innovation and performance. To deal with this potential endogeneity problem, we use a 2SLS regression with instrument. We use a firm's network with politicians and civil servants (NETWORK) as an external instrumental variable for the two innovation variables (INNOD and AINNO). This is because this NETWORK should be correlated with innovation. According to Zubielqui *et al.* (2019), having high social network can enhance knowledge sharing, which is an important core of innovation. Further, social network politicians and civil servants should have no directive link to SMEs performance.

To further verify the validity of the instrumental variable, we run a regression of innovation on this NETWORK and other firm characteristics and report the results in the first column of Panels A and B of Table 7. The results show that this social network is positively correlated with innovation and is statistically significant at 1% level. We then use the Cragg–Donald Wald F-statistic test to check for weak instruments. The results (F-stat = 16.09 for INNOD and F-stat = 17.84 for AINNO) show that the null hypothesis of weak instrument is rejected, meaning that this social network is a valid instrument for firms' innovation activities.

The results from the second stage of the 2SLS regression with instrumental variable reveal that innovation significantly increases firm performance by enhancing the change in the ratio of total value added over total assets (ΔTVAD), percentage change in sales volume (ΔSALEG) and change in the ratio of total gross profit over total assets (ΔGPA). Consistent with the results in the previous tables, the results in Table 7 show that innovation is an important determinant of firm performance of SMEs in Vietnam.

4.4. Discussion

Our findings indicate that innovative SMEs perform better than noninnovative SMEs. These findings support the notion that innovative firms can perform better in the markets due to their better capability of meeting the changing demands and requirements of their customers (Gunday *et al.*, 2011; Lee *et al.*, 2019; Radicic and Djalilov, 2019; Rajapathirana and Hui, 2018).

In more detail, our findings showed that the positive effect of innovation on firm performance mainly comes from the effect of improvement of existing products. The positive association between improvement of existing products and firm performance is partly in line with previous studies (Caldera, 2010; D'Angelo, 2012). Moreover, we also find an insignificant association between new products and firm performance, which is inconsistent with previous studies (Caldera, 2010; Lee *et al.*, 2019; Ramadani *et al.*, 2019).

In addition, our study shows that for Vietnamese SMEs, new process/technology is insignificantly correlated with firm performance. This finding is partly similar to some previous studies (D'Angelo, 2012) but in contrast with the others (Atalay *et al.*, 2013; Caldera, 2010; Lee *et al.*, 2019). This insignificant association between new process/technology and firm performance suggests that Vietnamese SMEs have not been able to conduct radical innovations that they can capitalize on within a short period of time.

Variable	(1) INNOD	(2) ΔTVAD	(3) ΔSALEG	(4) ΔGPA
Panel A: Innovation measure: INNOD				
NETWORK	0.010*** (0.000)			
INNOD		0.711** (0.033)	0.211** (0.013)	0.865*** (0.003)
TANG	0.034 (0.525)	0.204*** (0.004)	0.009 (0.611)	0.124** (0.046)
LSALE	0.049*** (0.000)	−0.056*** (0.003)	−0.038*** (0.000)	−0.065*** (0.000)
TDEBT	0.013 (0.831)	0.102 (0.213)	0.079*** (0.000)	0.094 (0.192)
CASH	0.197** (0.032)	−0.179 (0.194)	−0.024 (0.500)	−0.215* (0.077)
LAGE	0.000 (0.983)	0.018 (0.378)	−0.021*** (0.000)	0.006 (0.737)
CEAT	0.257*** (0.000)	−0.331*** (0.003)	−0.057** (0.046)	−0.330*** (0.001)
Intercept	0.589 (0.184)	−0.477 (0.434)	−0.007 (0.962)	−0.510 (0.342)
Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
N	4,069	4,069	4,069	4,069
Adj. R^2	0.1405	.	.	.
Panel B: Innovation measure: AINNO				
NETWORK	0.009*** (0.000)			
AINNO		0.823** (0.030)	0.244** (0.011)	1.002*** (0.002)
TANG	0.018 (0.679)	0.214*** (0.002)	0.012 (0.494)	0.135** (0.024)
LSALE	0.047*** (0.000)	−0.059*** (0.003)	−0.039*** (0.000)	−0.070*** (0.000)
TDEBT	0.011 (0.829)	0.102 (0.203)	0.080*** (0.000)	0.094 (0.177)
CASH	0.103 (0.168)	−0.123 (0.323)	−0.007 (0.818)	−0.147 (0.174)
LAGE	−0.003 (0.785)	0.021 (0.294)	−0.020*** (0.000)	0.010 (0.575)
CEAT	0.200*** (0.000)	−0.312*** (0.003)	−0.051* (0.051)	−0.308*** (0.001)
Intercept	0.328 (0.363)	−0.328 (0.573)	0.037 (0.802)	−0.329 (0.515)
Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
N	4,069	4,069	4,069	4,069
Adj. R^2	0.1483	.	.	.

Notes: This table reports the results from the first and second stages of the 2SLS regression of firm performance (ΔTVAD, ΔSALEG and ΔGPA) on firm innovation, other firm characteristics and industry and time dummy variables. Instrumental variable is a firm's network size with politicians and civil servants (NETWORK). All variables are winsorized at 1st and 99th percentiles. ***, ** and * denotes statistical significance at 1, 5 and 10%, respectively

Source: Authors' own calculation

Table 7.
Innovation and firm performance – 2SLS

5. Conclusion

This paper examines the impact of innovation activities on the firm performance of SMEs in Vietnam. The results show around 32.9% of SMEs in our sample engaged in at least one of three innovation forms:

(1) improvement of existing products;

(2) introduction of new technology; and

(3) introduction of new products.

We demonstrate that SMEs with innovation tend to perform better than SMEs without innovation after controlling for firm characteristics. The results hold in all three different approaches we used: OLS regression model, propensity matching score and 2SLS regression model with instrumental variable. The findings suggest that innovation significantly improved the performance of SMEs by enhancing the ratio of total value added over total

assets, total revenue growth rate and ratio of total gross profit over total assets. In addition, further investigation on specific innovation activities show that firm performance is mainly derived from the improvements of existing products.

Our findings bring about some important implications. Because of the importance of innovation, policymakers should enact relevant policies to support SMEs with innovation activities, thereby increasing firm performance and their competitiveness. Innovation activities, especially improvement of existing products, are found to facilitate financial performance in SMEs; however, only a medium proportion of SMEs engage in innovation activities. This is possibly due to high cost associated with the adoption of innovation. Therefore, public policies should aim at relaxing financial constraints that are common in smaller economies (D'Angelo, 2012; Radicic and Djalilov, 2019). For instance, financial incentives (tax reduction or subsidies) or support for easy access to financial or credit sources for innovative firms should be implemented and/or fostered (Ayyagari *et al.*, 2011). Additionally, SMEs often lack high-skilled laborers and modern equipment or infrastructure, preventing them from the adoption of innovation. Public policy should also focus on supporting SMEs with some basic infrastructure and training activities to reduce these gaps between SMEs and larger firms. Such intervention should prioritize the manufacturing SMEs. Regarding managerial implications, SMEs managers should consider adopting an open innovation collaboration with customers (Tobiassen and Pettersen, 2018).

Although the database used in the paper is widely used to analyze SMEs in Vietnam, it covers about 2,500 firms in only nine provinces/cities in Vietnam over three years. The lack of data set is the major limitation of our paper. In addition, our paper only analyzes short-term effects of innovation on firm performance, while some innovation activities may take time to manifest their effects (D'Angelo, 2012). We let the examination of the effects of innovation in a longer term for future research. Moreover, future research may extend our findings to other countries.

Notes

1. www.vietnam-briefing.com/news/facilitating-sme-growth-vietnam.html/
2. The data that support the findings of this study are openly available at www.wider.unu.edu/database/viet-nam-sme-database
3. The raw data contain around 5 SMEs in agriculture sector and around 40 firms in services sectors. Our results are consistent when we delete two firms in agriculture and service industries.

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Appendix

Table A1.
Variable definition

Variable(s)	Definition
Innovation	
INNO1	Dummy variable which is equal to 1 if firm makes any improvements of existing products and 0 otherwise
INNO2	Dummy which is equal to 1 if firm introduces any new production processes/new technology and 0 otherwise
INNO3	Dummy variable which is equal to 1 if firm introduces any new product groups and 0 otherwise
INNOD	Dummy variable which is equal to 1 if firm has at least one innovation activities and 0 otherwise
AINNO	Number of innovation activities in logarithm that firm has
Firm characteristics	
TANG	The ratio of total fixed assets to total assets
LSALE	The natural logarithm of total revenue
TDEBT	The ratio of total debt to total assets
CASH	The ratio of total cash and deposits to total assets
LAGE	The natural logarithm of firm age
CEAT	The ratio of investment in physical capitals to total assets
Firm performance	
ΔTVAD	Change in ratio of total value added over total assets between two surveys
ΔSALEG	Change in total revenue (in logarithm) between two surveys
ΔGPA	Change in the ratio of total gross profit over total assets between two surveys
Instrumental variable	
NETWORK	The number of politicians and civil servants that a SME has contact with

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