Routledge
Taylor & Francis Group

Economic Research-Ekonomska Istraživanja

ISSN: 1331-677X (Print) 1848-9664 (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

The lasting effects of innovation on firm profitability: panel evidence from a transitional economy

Anh Ngoc Mai, Huong Van Vu, Bien Xuan Bui & Tuyen Quang Tran

To cite this article: Anh Ngoc Mai, Huong Van Vu, Bien Xuan Bui & Tuyen Quang Tran (2019) The lasting effects of innovation on firm profitability: panel evidence from a transitional economy, Economic Research-Ekonomska Istraživanja, 32:1, 3411-3430, DOI: 10.1080/1331677X.2019.1660199

To link to this article: https://doi.org/10.1080/1331677X.2019.1660199

Published online: 18 Sep 2019.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2019, VOL. 32, NO. 1, 3411–3430
https://doi.org/10.1080/1331677X.2019.1660199

The lasting effects of innovation on firm profitability: panel evidence from a transitional economy

Anh Ngoc Mai[a], Huong Van Vu[b], Bien Xuan Bui[c] and Tuyen Quang Tran[b]

[a]Faculty of Accounting, Academy of Finance, Hanoi, Vietnam; [b]Center for Data and Socio-Economic Analysis, VNU University of Economics and Business, Hanoi, Vietnam; [c]Financial and Banking University, Hanoi, Vietnam

ABSTRACT

This study is the first to study the lasting effects of innovation on firm profitability in Vietnam. Using a unique panel dataset for the period 2005–2015, our results show that innovators achieve higher profit in comparison with non-innovating firms. The positive effects of innovation on firm profitability are observed not only in the short term but also in the longer term. The benefits of innovation for firm profitability can be seen in higher export probability, better productivity, better access to formal credit, and the ability to secure government support, but only after innovation.

ARTICLE HISTORY
Received 1 November 2018
Accepted 10 June 2019

KEYWORDS
Innovation; firm profitability; SMEs and Vietnam

JEL CLASSIFICATIONS
C21; C23; D22; D25

1. Introduction

The relationship between innovation and firm performance has been discussed widely in previous studies (e.g., Aas & Pedersen, 2011). Theoretically, the role of innovation on firm performance cannot be explained from a single perspective. On the one hand, according to some financial viewpoints, innovation strategies can bring risks for firm (Fernandes & Paunov, 2015). When a firm introduces new products, it must overcome technical challenges, market competition and deal with the sale strategies of competitors. Specifically, firms must allocate more of their budgets to marketing strategies, market research, and investment technology when they introduce innovative products to the market.

These endeavours can result in unexpected budget increases so that investors must supply more capital in the company's operations. Consequently, when companies undertake innovation, they face the problem of significant increases in the cost of goods and this can harm their profitability and the expected returns of shareholders. In addition, Shields and Young (1994) note that when enterprises spend large amounts of capital on research and adopting new technology for product innovation, their financial performance tends to decline because the benefits from introducing new products are only received after customers use and adopt them.

CONTACT Huong Van Vu huongaofvn@gmail.com

On the other hand, the risks associated with innovation projects can be outweighed by the potential higher returns for innovators. The signalling perspective reveals that high-performing firms are likely to engage in innovative activities (Freeman, 1994). This suggests that innovation serves as an indicator that only better firms are likely to innovate. Consequently, innovation can help firms gain higher access to formal credit and better government support programmes.

In addition, Narver and Slater (1990) argue that innovation may increase customer satisfaction and loyalty. Thus, the customer will regularly purchase and introduce products to their friends, resulting in better revenue and increase in firm profitability. Also, innovation is often an important activity that helps enterprises implement effective change in the market, in technology and competitive advantage, as well as impelling them to take necessary action affecting their financial performance and environment (Bisbe & Otley, 2004). More importantly, other studies (e.g., Ali, 1994; Greve & Taylor, 2000) shows that innovation plays an important role in firm profitability because it helps firms produce new brands, strengthen their position in the market, gain competitive advantage, and boost productivity.

While the theoretical perspective is readily understood, the empirical findings are inconclusive. For example, Walker (2004) found that innovation is considered to be a main factor having a positive effect on financial performance, because it helps companies improve their position, establish competitive advantage, and achieve higher performance. Some research, however, indicates a negative linkage between innovative activities and financial performance (e.g., Prajogo & Ahmed, 2006).

The lack of clarity in the findings is a motivation for us to pursue this topic in the Vietnamese context. Vietnam is chosen because the Vietnamese economy is numerically dominated by SMEs and a strategy enhancing SME competitiveness remains the top priority in Vietnam. To enhance SME competitiveness through higher innovation and creativity, a number of policies and programmes have been promulgated and implemented. For example, funds targeted at SME innovation development include the National Technology Innovation Fund, the Vietnam Innovation Project, and the Vietnam Business Venture Fund, all of which offer a great deal of financial and technical support for innovative firm activities. However, a lack of empirical evidence outlining the prospects of firms after becoming innovators adversely affects the government's ability to adopt appropriate policies.

Another motivation for us to pursue this topic arises for several reasons. First, innovative activities can have differing effects on firm performance, depending on length of time (Adner & Levinthal, 2001; Lawless & Anderson, 1996). However, analysis of the effects of innovation on firm performance over time is lacking in most previous studies.

Second, when considering the effect of innovation on firm performance, most previous research applies regression models, such as the pooled OLS model or fixed effect approach. However, these approaches can be challenged because of potential self-selection. To control for unobserved heterogeneity which can explain self-selection, our analysis goes beyond the literature by creating dummy variables that distinguish between firms that are always non-innovative and innovators. Our measures allow us to capture the unobserved heterogeneity between innovating and non-

innovating firms, as well as the net effect of innovation on firm profitability. Finally, the benefits of innovation for firm profitability are tested through several channels, contrasting the situation before and after firms become innovators.

The paper includes four sections. The remainder is organised as follows. Section 2 briefly presents an overview of the existing empirical literature on the effects of innovation. While Section 3 describes our dataset, Section 4 discusses the empirical approach. Finally, Section 5 presents the main results.

2. Literature review

Theoretically, innovation may affect firm performance in two ways. On the one hand, according to some financial viewpoints, innovation strategies can bring risks for firm such as technical challenges, market competition and the sale strategies of competitors (Fernandes & Paunov, 2015). These challenges can result in unexpected budget increases so that investors must supply more capital in the company's operations. Consequently, when companies undertake innovation, they face the problem of significant increases in the cost of goods and this can harm their profitability and the expected returns of shareholders.

On the other hand, the signalling perspective reveals that high-performing firms are likely to engage in innovative activities (Freeman, 1994). Hence, innovation can help firms gain higher access to formal credit and better government support programmes. In addition, Greve and Taylor (2000) show that innovation helps firms strengthen their position in the market, gain competitive advantage, and boost productivity. Furthermore, Narver and Slater (1990) argue that innovation may increase customer satisfaction and loyalty. Thus, the customer will regularly purchase and introduce products to their friends, resulting in better revenue and increase in firm profitability.

Regarding empirical evidence, to date, there have been numerous empirical studies using datasets from different countries to consider the importance of innovation for firm performance. A pioneering effort to examine the relationship between innovation and profitability at firm level was studies that utilised a panel dataset of English firms (Geroski, Machin, & Van Reenen, 1993; Geroski & Machin, 1992). Their findings reveal that innovating firms are persistently more profitable than non-innovating firms because innovators have superior internal capabilities, introduce multiple innovations over time, gain higher market position from competition (Geroski et al., 1993). Another important early contribution, Leiponen (2000), used a dataset that included Finnish firms, and also indicated that profitability of innovators is determined differently from that of non-innovators and profitability gains were the result of innovation. Their findings were replicated across many countries, including highly industrialised countries, U.S. (Calantone, Cavusgil, & Zhao, 2002; Cho & Pucik, 2005; Ken & Tsai, 2010) Ireland and Northern Ireland (Love, Roper, & Du, 2009), UK (Cefis & Ciccarelli, 2005; Geroski et al., 1993); Finland (Saunila, Ukko, & Rantanen, 2014), Asian countries, e.g., Sri Lanka (De Mel, McKenzie, & Woodruff, 2009), South Korea (Han, Kwon, Chung, & Son, 2017) and a growing number of Chinese firm-level studies (Guan, Richard, Tang, & Lau, 2009; Wang & Lin, 2013; Zhou, 2006). Also, recent studies by the scholars from various countries have documented that innovation and the types of innovation bring

the financial value to firms and this in turn enhances firm performance (e.g., Howell, 2018; Rajapathirana & Hui, 2018; Spescha & Woerter, 2018)

However, such significant, positive impact is not always observed. Organisations increasingly consider the problem of greater budgetary oversight of the development and marketing of innovative products (e.g., Pike, Roos, & Marr, 2005; Poh, Ang, & Bai, 2001). Much of this is due to the increase in the costs associated with these endeavours. For example, Lin and Chen (2005) reported that the significant cost of innovation is a challenge to firms seeking to meet shareholder expectations for returns. According to existing evidence, several studies report that the benefits for firm profitability are very minor (Birley & Westhead, 1990), while other studies note the negative effect of innovation on firm performance (e.g., Vermeulen, De Jong, & O'shaughnessy, 2005).

In line of recent interest, several studies focus on considering influence of statement items or accounting regulation on the profitability of firms (e.g., Būmane, 2018; Subačienė et al., 2018). However, other studies (e.g., Narkunienė & Ulbinaitė, 2018; Žižka, Valentová, Pelloneová, & Štichhauerová, 2018) compare the modern methods for performance evaluation of firms and estimate the role of clusters of industry on the innovation performance of firms. Beyond this, Hombert and Matray (2018) consider the linkage between innovation with import activities, and their research indicates that innovation in fact helps U.S. firms escape import competition from China.

In the case of Vietnam, there are a few prominent studies on innovation activities and firm performance. The first research was conducted by Nguyen, Pham, Nguyen, and Nguyen (2008) who used data from a sample survey in 2005, including approximately 2000 private enterprises, and surveys from several provinces. Their study results showed that innovation improves the participation of firms in export activities. However, their results were based on cross-sectional data and a static model that focused only on examining observable characteristics. Consequently, their results failed to control for unobserved factors.

A case study by Tuan, Nhan, Giang, and Ngoc (2016) examined the effect of innovation on the performance of supporting industries in Hanoi, Vietnam, and similarly found that innovation in processes, marketing, and organisation had a positive effect on firm performance in these firms. However, this study also was based on cross-sectional data which focuses only on examining observable characteristics. In addition, the study used data that were collected retrospectively and this raises questions about the possibility of data measurement errors.

The literature has defined some of the main avenues (access to credit, participating in export markets, improvement in productivity, and gaining government support) through which innovation can affect firm profitability (Gkypali, Rafailidis, & Tsekouras, 2015; Hatzikian, 2015; Joyce, Seaman, & Woods, 1994; Rothwell, 1991), but existing evidence is inconclusive. For example, many scholars point out that innovation is considered a mark of a better firm, so that innovation helps firms gain greater government support. However, the risk associated with innovation tends to reduce a firm's likelihood of gaining government support or access to credit. (Fernandes & Paunov, 2015) indicate that innovation is a speculative investment with many risks. Consequently, the government will consider carefully the feasibility of innovation projects before giving support, especially where there is uncertainty about a firm's returns.

Regarding the linkage between innovation and productivity, a positive effect of innovation on productivity is witnessed in both developed and developing countries. For example, Crépon, Duguet, and Mairessec (1998) investigated firm level data from France and provided evidence of the positive effect of innovation on productivity growth. Specifically, French innovators in manufacturing industries experienced greater productivity growth after innovating than their non-innovating counterparts. Evidence for the positive effects of innovation on productivity growth is also observed in Asian countries such as South Korea (Lee & Kang, 2007), Malaysia (Hegde & Shapira, 2007), China (Hu, Jefferson, & Jinchang, 2005) and Latin American countries (e.g., Chudnovsky, López, & Pupato, 2006; Raffo, Lhuillery, & Miotti, 2008) and Griffith, Huergo, Mairesse, and Peters (2006) for a sample of French firms.

Other studies, however, document the negative consequences of learning difficulties, issues with time and costs, correctly adopting new production processes, and difficulties with changing technology (Jovanovic & Nyarko, 1994). The evidence of negative effects of innovation on productivity can be observed in several studies (Lööf & Heshmati, 2006; Mairesse & Robin, 2009; Van Leeuwen & Klomp, 2006). However, Chudnovsky et al. (2006) and Benavente (2006) reveal insignificant linkages between innovation and firm productivity in Argentina and Chile, respectively.

As noted by Mohnen and Hall (2013), the majority of previous studies of innovation and productivity use cross-sectional data, and the results can be biased by unobservable characteristics (Crowley & McCann, 2018). Hence, recent firm-level studies go beyond the previous literature by examining the relationship between firm innovation and productivity using estimations with panel data. For example, a meta-study by Crowley and McCann (2018) using panel data from 13 European countries also showed that, show that innovation enhances firm productivity. Similarly, using a panel dataset from 43 countries in Asia and Europe, Morris (2018) tested directly the relationship between innovation and productivity growth and found strong evidence that productivity improvements are a result of innovation and the results from studies using cross-sectional data may be upward biased.

In summary, based on different datasets from various countries, existing empirical studies of innovation and firm performance have not reached a consensus. While some studies show that innovation improves firm performance, others indicate a negative linkage. Besides, few studies have considered the role of innovation on firm performance over time. Furthermore, previous studies fail to assess the channels promoting innovation or the situation before and after innovation to certify that it really has an effect on these channels. All in all, it is necessary to investigate these topics further in the Vietnamese context.

3. Data and methodology

3.1. Data

To measure the effect of innovation on firms' financial performance in Vietnam, this study utilises two main sources, the first consisting of a new micro dataset of non-state domestic small and medium enterprises covering the years 2005, 2007, 2009, 2011, 2013

and 2015.[1] These data were produced by the Institute of Labour Science and Social Affairs (ILSSA) in collaboration with the Central Institute for Economic Management (CIEM) and Department of Economics, Copenhagen University, Denmark.

The inherent advantages of the dataset are as follows. First, this is a uniquely rich dataset surveyed from 10 provinces in 3 regions of Vietnam: the North, Centre and South (please to see Appendix A). It covers all the major manufacturing sectors, namely food processing, wood products, fabricated metal products and other sectors. The original dataset, made up of 2,821 enterprises, was the result of interviews conducted in 2005; then 2,635 firms were added in 2007. A slightly larger number, 2,655, were interviewed in 2009, then over 2,600 in 2011, 2013 and 2015. This survey of firms has been conducted every 2 years since 2005.

Second, the dataset contains the main information on innovation, types of innovation, and firm characteristics, such as the export status of the enterprise, the number of labourers, productive capital, location, and economic indicators as well as the firm's financial performance. This makes it possible to test the role of innovation in a firm's performance. However, to capture the unobserved heterogeneity between firms that never innovate and those that do, this research is restricted to these two groups, the non-innovative SMEs and those willing to try new approaches.

Covering the period 2005–15, the second data source is the result of a survey of the Vietnam aggregated provincial competitiveness index (PCI)[2] carried out by the Vietnam Competitiveness Initiative and the Vietnam Chamber of Commerce and Industry for the purpose of evaluating the institutional quality of provincial governments. In addition to the aggregated PCI index, the survey provides the same nine institutional sub-indices covering the same period, including entry costs, land access and security of tenure, transparency and access to information, time costs and regulatory compliance, informal charges, policy bias, proactivity of provincial leadership, labour and training, and legal institutions.[3]

The combination of the SME and PCI surveys provides a unique panel dataset for firms on the provincial level that allows considering the role of innovation on firm profitability controlling for differences in provincial characteristics and business environment. A potential problem with time variant data is that they are often expressed in current prices. Therefore, our data on current variables are deflated to 1994 prices using GDP deflators to avoid biases that might arise because of inflation. The statistical descriptions of variables in the regression are presented in Table 1.

3.2. Methodology

The empirical specification of the role of innovation in firm performance is kept as close as possible to the approach adopted in previous studies (e.g., Rand & Torm, 2012) as outlined below:

$$Y_{it} = \varphi_0 + \varphi_3 S_i + \varphi_4 D_{it} + \varphi_1 X_{it} + \varphi_2 Z_{it} + u_{it} \quad (1)$$

where i indexes firms, t reflects time, φ_0, φ_1, $\varphi_2, \varphi_3, \varphi_4$ are parameters to be estimated. Y_{it} represents gross profit. As indicated in the introduction, analysing the impact of innovation on firm performance has been challenging, due to potential

Table 1. Summary statistics for model variables by firm type.

Variable	Definitions	Non-innovative, non-converting firms			Converting (from non-innovation to innovation)		
Dependent variables		N	Mean	SD	N	Mean	SD
Profitability, (log, real 1000VND)	Real profits of firms in year t	2,265	3.81	1.52	10,262	4.41	1.61
Independent variables							
Leverage	The ratio between total debt and total assets	2,265	0.065	0.214	10,270	0.09	0.27
Firm size in log	The number of employees	2,258	1.38	0.919	10,255	1.94	1.13
Firm age in log	The number of years since established	2,256	2.44	0.73	10,250	2.47	0.68
Formal status	1 if firms have a tax code, 0 otherwise	1,882	0.46	0.49	8,915	0.66	0.47
Gender of owner/manager	1 if the gender of owner/manager is male, 0 otherwise	2,265	0.57	0.49	10,270	0.65	0.47
Education of owner/manager	1 if owner/manager has graduated with secondary education or higher, 0 otherwise	2,265	0.84	0.36	10,269	0.90	0.29
Share of female employees	The ratio of total female workers to total employment	2,264	0.42	0.267	10,264	0.36	0.26
Share of production workers	The ratio of total production workers to total employment	2,262	0.609	0.24	10,255	0.66	0.21
Urban dummy	1 if firm located in urban regions, 0 otherwise	2,265	0.36	1.10	10,270	0.42	0.49
Medium high-tech dummy	1 if firms belong to low technology sectors, 0 otherwise	2,264	0.273	0.445	10,264	0.35	0.47
PCI	The aggregated index measuring institutional quality of various provinces	2,265	57.67	5.1	10,270	58.07	5.55
Firm has applied for formal credit	1 if firm has applied for bank loans or other formal credit, 0 otherwise	1,910	0.22	0.41	8,437	0.33	0.47
Firm has access to formal credit	1 if firm has obtained for bank loans or other formal credit, 0 otherwise	1,910	0.21	0.40	8,437	0.32	0.46
Government support	1 if firm gets government support, 0 otherwise	1,910	0.21	0.40	8,434	0.278	0.44
Export	1 if firms participate in exporting market, 0 otherwise	2,265	0.015	0.12	10,262	0.06	0.23
Labour productivity	Value added per total employees	2,258	2.80	1.25	10,254	3.01	1.17

unobserved heterogeneity between innovators and firms that remain non-innovating. Specifically, firms choosing to innovate may have different underlying characteristics, such as the owner's abilities and business practices.

To mitigate potential self-selection bias, this study exploits the panel nature of our dataset. Specifically, we adopt the common understanding of 'innovator' found in the literature (e.g., Nguyen et al., 2008) and define an innovator as a firm that introduces new products, makes any improvements in existing products, or introduces new production processes. We construct two dummy variables based on the original innovating status of a firm; 0 if a firm is non-innovating and 1 if the firm introduced new products, made major improvements in existing products, or if the firm introduced new production processes.

First, in our panel dataset, an innovator (S_i) equals 1 for all years in which a firm decided to innovate, irrespective of the year it became an innovator; and 0 if the firm remained non-innovating throughout the research period. This dummy allows us to capture the unobserved heterogeneity between innovating and non-innovating firms (the base group). Second, the variable of status (D_{it}) (0 if a firm is non-innovating, 1 if the firm is innovative) considers the net effect of innovation on firm performance.

Among independent variables, X_{it} is a vector of firm characteristics. First, firm size and firm age are included in the model because they represent the differences in efficiency among firms (Jovanovic, 1982). Firms with higher efficiency are assumed to achieve higher performance.

In addition, the formal status of firms (registered or unregistered) is considered to be an independent variable in the model. Based on the theoretical model and empirical findings (e.g., Boly, 2018; Rand & Torm, 2012), it is expected that formal firms have a higher probability of profitability than informal ones. In addition, we control for the average skill level of employees by using the share of production and service workers compared to the share of white-collar workers (Rand & Torm, 2012). Other controlled variables are added in the model and represent the quality of human capital, including the gender and educational level of owners or managers (Rand & Torm, 2012)

Following the lead of previous studies, vector Z_{it} includes other characteristics. For example, types of technology may be an important factor for firm growth (Shiferaw, 2009). To account for this, the study includes a dummy variable for the medium- and high-tech sector taking the value of 1, and 0 otherwise (details of the level of technology in Vietnam, please to see Appendix B). In addition, to capture the fact that the provinces in Vietnam are relatively autonomous (Malesky, 2010), the location of firms is considered to be one of the independent covariates in the model. To control for the differences among provinces, this study uses a dummy variable taking the value of 1 if provinces are in urban regions (Hanoi, Haiphong and Ho Chi Minh) and 0 otherwise.

Finally, one may argue that changes in innovative status may be endogenous. Hence, in further analysis, as guided by Fisman and Svensson (2007), we will select the mean value of SME innovation in the same industry, in the same locality and in the same year as an instrumental variable. This instrumental variable is appropriate because when the overall level of SME innovation in one industry and specific locality

changes, each SME must make an effort to innovate to survive and develop. First, specifically, the location-industry average type of innovative status (S_i or D_{it}), along with other exogenous variables, is used to estimate the fitted values for b_{ijt}. Then, firm profitability is modelled as a function of the fitted values from the first-stage regression and other exogenous variables.

$$b_{ijt} = f(S_i, D_{it}, X_{ijt,} Z_{ijt}) \tag{2}$$

$$LnY_{ijt} = f(\hat{b}_{ijt,} S_i, D_{it,} X_{ijt,} Z_{ijt}) \tag{3}$$

4. Empirical results and discussion

Table 2 presents the estimated effects of innovation on firm performance. It should be noted that since 'converting' is a time-invariant variable, random effects estimations are used in our regression analysis. However, fixed-effects models and instrumental variable estimations are also used to check for robustness. Columns 1 and 2 of Table 2 show the baseline estimates of the effect of innovation on firm profitability. Estimated coefficients indicate that engaging in innovative activities significantly increases firm profitability. Specifically, switching from non-innovating to innovating status improves firm profitability.

In an extended specification, other controlling variables are added, and the results are reported in columns 3–5 of Table 2. The results show that innovating firms have higher profits and added value than firms that never innovate. The findings imply that after adopting innovation, innovators achieve higher profits in comparison with non-innovators who refuse to innovate. Estimative methods (e.g., OLS) that ignore this difference can overestimate the effect of innovation for firms converting to innovation. Taking a closer look, column 3 of Table 2 reports that adopting innovation leads to an increase in profit in comparison with non-innovators. More specifically, the estimated coefficients of firms converting (after innovation) indicate that innovators gain approximately 10% higher profitability than non-innovators, keeping other variables constant. The results also imply that the effect of innovating status on firm profitability does not change qualitatively when other controls are added.

Considering controlled variables, financial leverage, as measured by the ratio between total debt and total assets, also has a positive effect in all models. Therefore, it is asserted that financial leverage has a strong influence on firm profitability, in agreement with the findings of Vu, Tran, Nguyen, and Lim (2016). Using the advantages of financial leverage, SMEs may achieve higher profits and growth rate, and increase their competitive ability. This finding is supported by González (2013), who argues that when a company uses higher financial leverage, this exerts pressure on managers to conduct activities maximising value, helping the firm earn higher profits with efficient operation.

Examining the effect of formal registration[4] on firm profitability, a statistically significant, positive linkage between the official registration of firms and firm profitability was established, regardless of which model was used. As presented in Table 2, the

Table 2. Impact of innovation on firm profitability.[6]

VARIABLES	RE (1)	FE (2)	RE (3)	FE (4)	RE (5)	FE (6)	IV_GMM (7)	IV_GMM (8)
Converting (from non-innovating to innovating)	0.5242**		0.0895**		0.0882**		0.5333**	
	(0.051)		(0.027)		(0.027)		(0.132)	
Converting (after innovation)	0.1801**	0.1450**	0.0947**	0.1002**	0.1035**	0.1016**		0.1730**
	(0.017)	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)		(0.054)
leverage			0.1145**	0.0478	0.1150**	0.0478	0.1455**	0.1518**
			(0.044)	(0.033)	(0.044)	(0.033)	(0.031)	(0.031)
Firm size in log			0.8433**	0.5348**	0.8414**	0.5345**	0.8769**	0.8889**
			(0.015)	(0.022)	(0.014)	(0.022)	(0.012)	(0.011)
Firm age in log			−0.0576**	0.0463*	−0.0545**	0.0465*	−0.0890**	−0.0699**
			(0.015)	(0.022)	(0.015)	(0.022)	(0.013)	(0.012)
Formal status			0.3755**	0.1392**	0.3529**	0.1386**	0.2994**	0.3328**
			(0.029)	(0.031)	(0.026)	(0.031)	(0.024)	(0.021)
Gender of owner/manager			0.0199	0.0581*	0.0203	0.0575*	−0.0072	0.0053
			(0.020)	(0.026)	(0.020)	(0.026)	(0.019)	(0.018)
Education of owner/manager			0.0783**	0.0309	0.0868**	0.0312	0.0686*	0.1011**
			(0.025)	(0.030)	(0.025)	(0.030)	(0.028)	(0.026)
Share of female employees			−0.1470**	0.0566	−0.1463**	0.0569	−0.2016**	−0.2484**
			(0.039)	(0.053)	(0.039)	(0.053)	(0.039)	(0.035)
Share of production workers			−0.1916**	0.1066*	−0.1816**	0.1079*	−0.3023**	−0.3075**
			(0.046)	(0.048)	(0.045)	(0.048)	(0.045)	(0.044)
Urban dummy			0.1152	−0.0036**	0.1022	−0.0032*	0.1274**	0.1219**
			(0.076)	(0.001)	(0.068)	(0.001)	(0.013)	(0.013)
PCI					0.0103**	0.0017	0.0134**	0.0139**
					(0.002)	(0.002)	(0.002)	(0.002)
Constant	3.0240**	3.4438**	1.7264**	2.0241**	1.1562**	1.9325**	0.8610**	1.0723**
	(0.046)	(0.022)	(0.067)	(0.085)	(0.140)	(0.149)	(0.149)	(0.126)
Observations	12,527	12,527	10,720	10,720	10,720	10,720	10,720	10,720
R-squared		0.470		0.546		0.546	0.700	0.711
Number of panels	3,153	3,153	3,036	3,036	3,036	3,036		
Instrumental variables							Location-industry-year average of switchers (from non-innovation to innovation)	Location-industry-year average of switchers after innovation
Weak identification test (Cragg-Donald Wald F statistic)							312.157	1281.8
[Stock-Yogo weak id test critical value at 10 percent]							16.38	16.38

Notes: The dependent variable is firm profitability. Robust standard errors are in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Models are controlled for year dummies and technological level dummies.

formalisation of a firm's status has a positive, statistically significant effect on profitability. On average, formal registration results in an increase of nearly 14% in firm profitability, keeping other variables constant (FE columns). This result agrees with previous findings (e.g., Boly, 2018) concerning the role of firms' formally registered status on improvement in firm profitability. Official registration benefits firms through greater access to improved equipment, membership in business associations and developing a larger customer base (Boly, 2018). These measures help formally registered firms gain higher profitability than their informal counterparts.

Considering the role of firm characteristics, while more years in business had a negative influence on firm profitability, the positive role of firm size is reflected clearly in the estimation results. In particular, firm size, as measured by total employment, has a statistically significant, positive relationship with firm profitability. In addition, the share of production workers, as proxy for average skill level, has a negative influence on growth in profitability. A negative relationship between these variables and growth in profitability may reflect the important role of the quality of human resources in improving the profitability of Vietnamese enterprises.

In Table 2, we also verify our main findings by a series of robustness checks. First, Fernandes and Paunov (2015) indicate that the benefits of innovation on firm performance depend on market conditions and the business environment in which firms operate. Hence, in a further specification, we add a PCI variable, measuring institutional quality at provincial levels. The results are reported in columns 5 and 6. In addition, the possible endogeneity of firms' innovative status can be addressed by using instrumental variables. The effect of innovative status on firm profitability is displayed in columns 7 and 8 of Table 2. In most cases, however, the positive effect of innovative status on firm performance is still recorded. The main results are displayed in columns 5–8 of Table 2, and other estimated coefficients are available on request.

The validity of our main results was checked further by analysing the effects of innovation over the short and long term. We used four dummy variables to reflect time span. Firms are non-innovative in 2005 but innovative in 2007. The year of innovation is set at 2006 and the number of years since innovating is 1 in 2007.

For firms deciding to innovate in 2007, the number of years since this step is 3 in 2009, 5 in 2011, 7 in 2013, and 9 in 2015. For firms deciding to innovate in 2009, the number of years since taking this step is 1 in 2009, 3 in 2011, 5 in 2013, and 7 in 2015.

For firms innovating in 2011, the number of years since deciding to innovate is 1 in 2013, 3 in 2013, and 5 in 2015. Finally, for firms making this choice in 2013, the number of years since implementing the decision is 1 in 2013, and 3 in 2015.

As reported in Table 3, the effects of innovation on profit are positive and statistically significant for all estimated coefficients for the various time spans, including 1, 3, 5, 7, and 9 years. The results do not change in quality if we use value added instead of firm profitability. The findings support the argument for the benefits of innovation on firm performance in both the short and long terms.

Table 3 also shows that estimated coefficients tend to be larger as the period of time. This can be explained by some reasons. First, as time goes by, innovators with existing capabilities and competences can accumulate resources, managerial knowledge and the

Table 3. Persistence of effects of innovation on firm profitability.

VARIABLES	RE (1)	FE (2)	RE (3)	FE (4)	RE (5)	FE (6)
Period of time since innovation (dummy, 1 year)	0.4385**	0.4332**	0.3677**	0.3434**	0.3341**	0.3351**
	(0.025)	(0.025)	(0.029)	(0.030)	(0.029)	(0.030)
Period of time since innovation (dummy, 3 years	0.5731**	0.5765**	0.5180**	0.4703**	0.4801**	0.4624**
	(0.036)	(0.036)	(0.042)	(0.044)	(0.043)	(0.044)
Period of time since innovation (dummy, 5 years	0.8497**	0.8716**	0.8626**	0.8098**	0.8172**	0.7954**
	(0.048)	(0.049)	(0.052)	(0.056)	(0.052)	(0.056)
Period of time since innovation (dummy, 7 years or more)	0.9044**	0.8900**	0.9195**	0.8362**	0.8604**	0.8190**
	(0.086)	(0.086)	(0.110)	(0.117)	(0.109)	(0.118)
Leverage			0.0161	−0.0502	0.0173	−0.0499
			(0.046)	(0.036)	(0.043)	(0.037)
Firm size in log			0.6073**	0.2091**	0.6582**	0.2151**
			(0.015)	(0.029)	(0.016)	(0.031)
Firm age in log			0.1238**	0.3169**	0.1187**	0.3145**
			(0.019)	(0.029)	(0.019)	(0.029)
Formal status			0.7087**	0.5975**	0.6822**	0.5931**
			(0.030)	(0.041)	(0.030)	(0.041)
Gender of owner/manager					−0.0027	−0.0295
					(0.028)	(0.036)
Education of owner/manager					0.3366**	0.2077**
					(0.037)	(0.044)
Share of female employees					−0.0799	0.0962
					(0.051)	(0.073)
Share of production workers					−0.5059**	−0.0422
					(0.053)	(0.059)
Urban dummy	0.1555	−0.0070*	0.0365	−0.0041+	0.0358	−0.0038
	(0.138)	(0.003)	(0.030)	(0.002)	(0.025)	(0.003)
PCI	0.0550**	0.0487**	0.0500**	0.0482**	0.0487**	0.0484**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	0.8645**	1.3223**	−0.6857**	−0.2929*	−0.5955**	−0.4775**
	(0.107)	(0.110)	(0.116)	(0.147)	(0.134)	(0.165)
Observations	12,520	12,520	10,734	10,734	10,720	10,720
R-squared		0.133		0.185		0.188
Number of panels	3,153	3,153	3,039	3,039	3,036	3,036

Notes: The dependent variable is firm profitability. Models include technological level dummies; robust standard errors in parentheses. Asterisks indicate significance at 10% (+), 5% (*), and 1% (**).

Table 4. Avenues for the influence of innovation on firm profitability.

VARIABLES	Firm has applied for formal credit RE (1)	Firm has access to formal credit RE (2)	Government support RE (3)	Export RE (4)	Labour productivity FE (5)
Converting (from non-innovative to innovative)	0.0364*	0.0422**	0.0155	0.0088*	0.1268**
	(0.015)	(0.015)	(0.014)	(0.004)	(0.024)
Converting (after innovation)	0.0417**	0.0402**	0.0586**	0.0043**	0.0952**
	(0.013)	(0.013)	(0.010)	(0.002)	(0.014)
Leverage	1.0310**	0.9754**	0.0490**	0.0039*	0.0872**
	(0.109)	(0.099)	(0.015)	(0.002)	(0.032)
Firm size in log	0.1231**	0.1224**	0.0626**	0.0152**	0.0424**
	(0.007)	(0.007)	(0.005)	(0.002)	(0.011)
Firm age in log	−0.0250**	−0.0271**	−0.0071	0.0005	−0.0733**
	(0.008)	(0.008)	(0.007)	(0.001)	(0.012)
Formal status	−0.0091	−0.0138	−0.0366**	0.0094**	0.3797**
	(0.015)	(0.014)	(0.012)	(0.003)	(0.024)
Gender of owner/manager	−0.0183	−0.0182	−0.0244*	0.0006	0.0017
	(0.013)	(0.012)	(0.010)	(0.002)	(0.016)
Education of owner/manager	−0.0084	−0.0153	−0.0412**	0.0019	0.0947**
	(0.017)	(0.017)	(0.014)	(0.003)	(0.022)
Share of female employees	−0.0649**	−0.0592**	−0.0368+	0.0128**	−0.2680**
	(0.023)	(0.023)	(0.019)	(0.004)	(0.032)
Share of production workers	0.0665*	0.0705*	−0.0631**	−0.0077	−0.0096
	(0.031)	(0.030)	(0.024)	(0.005)	(0.039)
Urban dummy	−0.2382**	−0.2525**	−0.1451**	−0.0013	0.1003
	(0.014)	(0.014)	(0.012)	(0.002)	(0.067)
PCI	−0.0008	−0.0008	−0.0077**	0.0005**	0.0115**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)
Constant					1.1248**
Observations	8,785	8,786	8,784	10,719	10,725
Number of panels					3,036

Notes: Models include time dummies and technological level dummies; robust standard errors in parentheses. Asterisks indicate significance at 10% (+), 5% (*), and 1% (**). The results of columns 1, 2, 3 and 4 are estimated from Probit.

ability to handle with uncertainty (Herriott, Levinthal, & March, 1985; Levitt & March, 1988). Also, as time is extended, innovators will growth faster, be more efficient than non-innovators (Crépon et al., 1998). As a result, innovators can accumulate reputation and market positions which facilitate relationship and contacts with customers, suppliers as well as potential collaborators (Levitt & March, 1988). These in turn help innovators to gain more profitable than non-innovators over the years.

Finally, to provide additional insight into what drives the positive innovation–firm profitability linkage, Table 4 explores potential avenues through which innovation may have a positive effect on firm outcome. In contrast with previous studies, this analysis considers these avenues both before and after innovation, and therefore advances our understanding whether innovation really benefits firm profitability through such channels as formal access to credit, gaining government support, greater likelihood of engaging in export activity, and productivity.

Manufacturing firms with innovative activities proved to have a higher probability of engaging in export activity than their non-innovating counterparts. The results are consistent with the majority of previous studies (e.g., Nguyen et al., 2008) and indicate that innovation is one of the decisive factors for participating in export trade.

Innovation also seems to be a good predictor of change in labour productivity. The estimated coefficients of innovative status exhibit a statistically significant linkage with firm productivity. Innovation encourages firms to upgrade technology and

productivity, a conclusion that accords with Tran, Huong, Doan, and Tran (2016). Using firm-provincial level panel data from 2005 to 2011, their results show that innovation has a positive effect on firm productivity.

Table 4 also shows that the probability of access to credit coincides with a firm's innovative status. These results are partly consistent with previous studies (e.g., Bellucci, Favaretto, & Giombini, 2014) and show that innovators face less binding credit restrictions than non-innovators. In terms of the linkage between government support and innovation, a significant linkage is reported but only after firms become innovators.

The results of Table 4 also reveal that the linkage of innovation behaviour and dependent variables weakened after converting in line 2, 4 and 5. The results can be explained by the fact that older innovators can face some form of inertia and this in turn can constrain the firms' ability to change, learning and their performance (Majumdar, 1997; Sørensen & Stuart, 2000).

In summary, our results from Table 4 show that innovation develops firms characterised by higher productivity, the probability of exporting, and gaining access to formal credit, which consequently yield returns for innovators.

5. Conclusion

Using a panel dataset of six cycles of SME surveys, this study provides the first evidence of the effect of innovation on firm profitability. Based on the empirical results, some main findings may be summarised as follows.

For factors characteristic of traditional firms, the empirical results are generally consistent with those of other international empirical studies. For example, larger firms achieve higher profitability than their counterparts. In addition, it is not surprising that formally registered firms may enjoy higher profitability than unregistered firms. However, the study finds no evidence of a statistical linkage between the gender of managers and firm profitability.

With regard to the connection between innovation and firm performance, Innovation can benefit firms with significant improvement in profits and may result in higher expected sales and improvement in productivity. At the same time, innovation is a risky activity and a reason why some firms exceed their budget. We find that innovating firms perform better than non-innovators. In addition, our micro-econometric analysis indicates that innovation leads to a further rise in the profits and added value of innovating firms. Also, the study results confirm that innovation has a positive effect on firm performance not only in the short term but also in the long term. Our analysis further indicates that after firms become innovators, the benefits for firm profitability can be secured through several channels, such as improvement in productivity, higher participation in exporting, and gaining government support.

Since changes in firms' innovative status are accompanied by an improvement in profit growth, policy implications can be drawn, for example, that policies promoting innovation (e.g., improvement in credit access and government support) and policies helping to maintain innovative activities through time could be effective, since they may help firms improve growth in profitability and added value.

This study has contributed to the understanding of the linkage between innovation and the profitability of manufacturing SMEs but it still has some limitations that offer

opportunities for future study. First, this study is just right in the research period. Second, according to Stampini and Davis (2009), using innovation as dummy variables minimises measurement errors. However, it does not make allowance for the degree of innovation and this hinders us from conducting a panel regression. In addition, profit does not necessary signal about efficiency of companies' performance; profit can be affected by numerous factors. Furthermore, this study focuses only on non-state manufacturing SMEs in Vietnam. With the availability of comparable data, future work could consider large firms, firms in other ownership categories such as SOEs and FIEs,[5] and firms in other economic sectors such as services or agriculture in order to provide a broader understanding of the linkage between innovation and performance of Vietnamese enterprises.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 502.01-2016.11.

Notes

1. The datasets of SMEs in 2005, 2007 and 2009 are shared kindly by Prof. John Rand, Copenhagen University, while SMEs dataset in 2011, 2013 and 2015 are downloaded from https://www.wider.unu.edu/database/viet-nam-sme-database (The final access by 28/3/2019)
2. The dataset of PCI is downloaded from http://orgeng.pcivietnam.vn/data-catalog/pci-data/ (The final access by 28/3/2019)
3. More details of PCI and nine institutional sub-indices, please to see Vu et.al (2018) and reports of PCI at file:///C:/Users/USER/Downloads/2010_PCI_Report_final.pdf
4. Formal registration reflects formal status of firms and it is measured as a dummy receiving value equal to 1 if firms have a tax code, 0 otherwise. In Vietnam, many firms are informal and without formal registration.
5. SOEs are state owned enterprises, while FIEs are foreign invested enterprises.
6. RE, FE and IV_GMM are Random effect, Fixed effect and Instrumental Variable-GMM estimations respectively.

References

Aas, T. H., & Pedersen, P. E. (2011). The impact of service innovation on firm-level financial performance. *The Service Industries Journal*, *31*(13), 2071–2090. doi:10.1080/02642069.2010.503883

Adner, R., & Levinthal, D. (2001). Demand heterogeneity and technology evolution: Implications for product and process innovation. *Management Science*, *47*(5), 611–628. doi:10.1287/mnsc.47.5.611.10482

Ali, A. (1994). Pioneering versus incremental innovation: Review and research propositions. *Journal of Product Innovation Management*, *11*(1), 46–61. doi:10.1111/1540-5885.1110046

Bellucci, A., Favaretto, I., & Giombini, G. (2014). *Does innovation affect credit access? New empirical evidence from Italian small business lending*. IAW-Diskussionspapiere. Retrieved from https://www.econstor.eu/handle/10419/107650

Benavente, J. (2006). The role of research and innovation in promoting productivity in Chile. *Economics of Innovation and New Technology*, *15*(4–5), 301–315.
Birley, S., & Westhead, P. (1990). Growth and performance contrasts between 'types' of small firms. *Strategic Management Journal*, *11*(7), 535–557. doi:10.1002/smj.4250110705
Bisbe, J., & Otley, D. (2004). The effects of the interactive use of management control systems on product innovation. *Accounting, Organizations and Society*, *29*(8), 709–737. doi:10.1016/j.aos.2003.10.010
Boly, A. (2018). On the short-and medium-term effects of formalisation: Panel evidence from Vietnam. *The Journal of Development Studies*, *54*(4), 641–656. doi:10.1080/00220388.2017.1342817
Būmane, I. (2018). The methodology of the statement of comprehensive income and its impact on profitability: The case of Latvia. *Entrepreneurship and Sustainability Issues*, *6*(1), 77–86. doi:10.9770/jesi.2018.6.1(6)
Calantone, R. J., Cavusgil, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, *31*(6), 515–524. doi:10.1016/S0019-8501(01)00203-6
Cefis, E., & Ciccarelli, M. (2005). Profit differentials and innovation. *Economics of Innovation and New Technology*, *14*(1–2), 43–61.
Cho, H. J., & Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. *Strategic Management Journal*, *26*(6), 555–575. doi:10.1002/smj.461
Chudnovsky, D., López, A., & Pupato, G. (2006). Innovation and productivity in developing countries: A study of Argentine manufacturing firms' behavior (1992–2001). *Research Policy*, *35*(2), 266–288. doi:10.1016/j.respol.2005.10.002
Crépon, B., Duguet, E., & Mairessec, J. (1998). Research, innovation and productivity: An econometric analysis at the firm level. *Economics of Innovation and New Technology*, *7*(2), 115–158. doi:10.1080/10438599800000031
Crowley, F., & McCann, P. (2018). Firm innovation and productivity in Europe: Evidence from innovation-driven and transition-driven economies. *Applied Economics*, *50*(11), 1203–1221. doi:10.1080/00036846.2017.1355543
De Mel, S., McKenzie, D., & Woodruff, C. (2009). *Innovative firms or innovative owners? Determinants of innovation in micro, small, and medium enterprises*. Discussion Paper No. 3962, Bonn Germany.
Fernandes, A. M., & Paunov, C. (2015). The risks of innovation: Are innovating firms less likely to die? *Review of Economics and Statistics*, *97*(3), 638–653. doi:10.1162/REST_a_00446
Fisman, R., & Svensson, J. (2007). Are corruption and taxation really harmful to growth? Firm level evidence. *Journal of Development Economics*, *83*(1), 63–75. doi:10.1016/j.jdeveco.2005.09.009
Freeman, C. (1994). Innovation and growth. In M. Dodgson and R. Rothwell (Eds.), *The Handbook of industrial innovation*. Cheltenham: Edward Elgar.
Geroski, P., & Machin, S. (1992). Do innovating firms outperform non-innovators? *Business Strategy Review*, *3*(2), 79–90. doi:10.1111/j.1467-8616.1992.tb00030.x
Geroski, P., Machin, S., & Van Reenen, J. (1993). The profitability of innovating firms. *The RAND Journal of Economics*, *24*(2), 198–211. doi:10.2307/2555757
Griffith, R., Huergo, E., Mairesse, J., & Peters, B. (2006). Innovation and productivity across four European countries. *Oxford Review of Economic Policy*, *22*(4), 483–498. doi:10.1093/oxrep/grj028
Guan, J. C., Richard, C., Tang, E. P., & Lau, A. K. (2009). Innovation strategy and performance during economic transition: Evidences in Beijing, China. *Research Policy*, *38*(5), 802–812.
Gkypali, A., Rafailidis, A., & Tsekouras, K. (2015). Innovation and export performance: Do young and mature innovative firms differ? *Eurasian Business Review*, *5*(2), 397–415.
González, V. M. (2013). Leverage and corporate performance: International evidence. *International Review of Economics & Finance*, *25*, 169–184. doi:10.1016/j.iref.2012.07.005
Greve, H. R., & Taylor, A. (2000). Innovations as catalysts for organizational change: Shifts in organizational cognition and search. *Administrative Science Quarterly*, *45*(1), 54–80. doi:10.2307/2666979

Hatzikian, Y. (2015). Exploring the link between innovation and firm performance. *Journal of the Knowledge Economy*, *6*(4), 749–768. doi:10.1007/s13132-012-0143-2

Han, Y.-J., Kwon, S. J., Chung, J. Y., & Son, J. S. (2017). The effects of the innovation types of venture firms and government support on firm performance and new job creation: Evidence from South Korea. *Academy of Strategic Management Journal*, *16*(2), 1–14.

Hegde, D., & Shapira, P. (2007). Knowledge, technology trajectories, and innovation in a developing country context: Evidence from a survey of Malaysian firms. *International Journal of Technology Management*, *40*(4), 349–370. doi:10.1504/IJTM.2007.015757

Herriott, S. R., Levinthal, D., & March, J. G. (1985). Learning from experience in organizations. *The American Economic Review*, *75*(2), 298–302.

Howell, A. (2018). Innovation and firm performance in the People's Republic of China: A structural approach with spillovers.

Hombert, J., & Matray, A. (2018). Can innovation help US manufacturing firms escape import competition from China? *The Journal of Finance*, *73*(5), 2003–2039. doi:10.1111/jofi.12691

Hu, A. G., Jefferson, G. H., & Jinchang, Q. (2005). R&D and technology transfer: Firm-level evidence from Chinese industry. *Review of Economics and Statistics*, *87*(4), 780–786.

Joyce, P., Seaman, C., & Woods, A. (1994). The economic growth implications of control and innovation strategies in small businesses. *London Central Training and Enterprise Council*.

Jovanovic, B. (1982). Selection and the evolution of industry. *Econometrica*, *50*(3), 649–670. doi:10.2307/1912606

Jovanovic, B., & Nyarko, Y. (1994). Learning by doing and the choice of technology. *Econometrica*, *64*(6), 1299–1310. doi:10.2307/2171832

Ken, Y., & Tsai, T.-Y. (2010). From successful innovation to market profitability. *International Journal of Organizational Innovation*, *3*(2), 293–308.

Lee, K., & Kang, S.-M. (2007). Innovation types and productivity growth: Evidence from Korean manufacturing firms. *Global Economic Review*, *36*(4), 343–359. doi:10.1080/12265080701694512

Lawless, M. W., & Anderson, P. C. (1996). Generational technological change: Effects of innovation and local rivalry on performance. *Academy of Management Journal*, *39*(5), 1185–1217. doi:10.2307/256996

Leiponen, A. (2000). Competencies, innovation and profitability of firms. *Economics of Innovation and New Technology*, *9*(1), 1–24. doi:10.1080/10438590000000001

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual Review of Sociology*, *14*(1), 319–338. doi:10.1146/annurev.soc.14.1.319

Lööf, H., & Heshmati, A. (2006). On the relationship between innovation and performance: A sensitivity analysis. *Economics of Innovation and New Technology*, *15*(4–5), 317–344.

Love, J. H., Roper, S., & Du, J. (2009). Innovation, ownership and profitability. *International Journal of Industrial Organization*, *27*(3), 424–434.

Lin, B. W., & Chen, J. S. (2005). Corporate technology portfolios and R&D performance measures: A study of technology intensive firms. *R&D Management*, *35*(2), 157–170.

Malesky, E. (2010). *The Vietnam provincial competitiveness index 2010* (USAID/VNCI Policy Paper 15). USAID and VCCI. Retrieved from http://pcivietnam.org/uploads/report/PCI%202010%20final%20report.pdf

Mairesse, J., & Robin, S. (2009). *Innovation and productivity: A firm-level analysis for French manufacturing and services using CIS3 and CIS4 data (1998–2000 and 2002–2004)*. Paris: Crest-Ensae.

Majumdar, S. K. (1997). The impact of size and age on firm-level performance: Some evidence from India. *Review of Industrial Organization*, *12*(2), 231–241.

Mohnen, P., & Hall, B. H. (2013). Innovation and productivity: An update. *Eurasian Business Review*, *3*(1), 47–65.

Morris, D. M. (2018). Innovation and productivity among heterogeneous firms. *Research Policy*, *47*(10), 1918. doi:10.1016/j.respol.2018.07.003

Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. *Journal of Marketing*, *54*(4), 20–35. doi:10.2307/1251757

Narkunienė, J., & Ulbinaitė, A. (2018). Comparative analysis of company performance evaluation methods *Entrepreneurship and Sustainability Issues, VsI Entrepreneurship and Sustainability Center*, *6*(1), 125–138.

Nguyen, A. N., Pham, N. Q., Nguyen, C. D., & Nguyen, N. D. (2008). Innovation and exports in Vietnam's SME sector. *The European Journal of Development Research*, *20*(2), 262–280. doi:10.1080/09578810802060801

Pike, S., Roos, G., & Marr, B. (2005). Strategic management of intangible assets and value drivers in R&D organizations. *R&D Management*, *35*(2), 111–124.

Poh, K.-L., Ang, B., & Bai, F. (2001). A comparative analysis of R&D project evaluation methods. *R&D Management*, *31*(1), 63–75.

Prajogo, D. I., & Ahmed, P. K. (2006). Relationships between innovation stimulus, innovation capacity, and innovation performance. *R&D Management*, *36*(5), 499–515.

Rand, J., & Torm, N. (2012). The benefits of formalization: Evidence from Vietnamese manufacturing SMEs. *World Development*, *40*(5), 983–998. doi:10.1016/j.worlddev.2011.09.004

Rothwell, R. (1991). External networking and innovation in small and medium-sized manufacturing firms in Europe. *Technovation*, *11*(2), 93–112.

Raffo, J., Lhuillery, S., & Miotti, L. (2008). Northern and southern innovativity: A comparison across European and Latin American countries. *The European Journal of Development Research*, *20*(2), 219–239. doi:10.1080/09578810802060777

Rajapathirana, R. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge*, *3*(1), 44–55. doi:10.1016/j.jik.2017.06.002

Saunila, M., Ukko, J., & Rantanen, H. (2014). Does innovation capability really matter for the profitability of SMEs? *Knowledge and Process Management*, *21*(2), 134–142. doi:10.1002/kpm.1442

Shiferaw, A. (2009). Survival of private sector manufacturing establishments in Africa: The role of productivity and ownership. *World Development*, *37*(3), 572–584. doi:10.1016/j.worlddev.2008.08.004

Shields, M. D., & Young, S. M. (1994). Managing innovation costs: A study of cost consciousness behavior by R&D professionals. *Journal of Management Accounting Research*, *6* (1), 175–196.

Sørensen, J. B., & Stuart, T. E. (2000). Aging, obsolescence, and organizational innovation. *Administrative Science Quarterly*, *45*(1), 81–112. doi:10.2307/2666980

Spescha, A., & Woerter, M. (2018). Innovation and firm growth over the business cycle. *Industry and Innovation*, *26*(3), 1–27.

Stampini, M., & Davis, B. (2009). Does nonagricultural labour relax farmers' credit constraints? Evidence from longitudinal data for Vietnam. *Agricultural Economics*, *40*(2), 177–188. doi:10.1111/j.1574-0862.2009.00368.x

Subačienė, R., Alver, L., Brūna, I., Hladika, M., Mokošová, D., & Molín, J. (2018). Evaluation of accounting regulation evolution in selected countries. *Entrepreneurship and Sustainability Issues*, *6*(1), 139–175. doi:10.9770/jesi.2018.6.1(11)

Tran, T. Q., Huong, V. V., Doan, T. T., & Tran, D.-H. (2016). Corruption, provincial institutions and manufacturing firm productivity: New evidence from a transitional economy. *Estudios de Economía*, *43*(2), 199–215.

Tuan, N., Nhan, N., Giang, P., & Ngoc, N. (2016). The effects of innovation on firm performance of supporting industries in Hanoi, Vietnam. *Journal of Industrial Engineering and Management*, *9*(2), 413. doi:10.3926/jiem.1564

Van Leeuwen, G., & Klomp, L. (2006). On the contribution of innovation to multi-factor productivity growth. *Economics of Innovation and New Technology*, *15*(4–5), 367–390. doi:10.1080/10438590500512927

Vermeulen, P. A., De Jong, J. P., & O'shaughnessy, K. (2005). Identifying key determinants for new product introductions and firm performance in small service firms. *The Service Industries Journal*, *25*(5), 625–640. doi:10.1080/02642060500100783

Vu, H., Tran, T. Q., Nguyen, T., & Lim, S. (2016). Corruption, types of corruption and firm financial performance: New evidence from a transitional economy. *Journal of Business Ethics*, *148*(4), 847–858. doi:10.1007/s10551-016-3016-y

Walker, R. M. (2004). *Innovation and organisational performance: Evidence and a research agenda*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1306909
Wang, C. C., & Lin, G. C. (2013). Emerging geography of technological innovation in China's ICT industry: Region, inter-firm linkages and innovative performance in a transitional economy. *Asia Pacific Viewpoint*, *54*(1), 33–48. doi:10.1111/apv.12005
Zhou, K. Z. (2006). Innovation, imitation, and new product performance: The case of China. *Industrial Marketing Management*, *35*(3), 394–402.
Žižka, M., Valentová, V., Pelloneová, N., & Štichhauerová, E. (2018). The effect of clusters on the innovation performance of enterprises: Traditional vs new industries. *Entrepreneurship and Sustainability Issues*, *5*(4), 780–794. doi:10.9770/jesi.2018.5.4(6)

Appendices

Appendix A

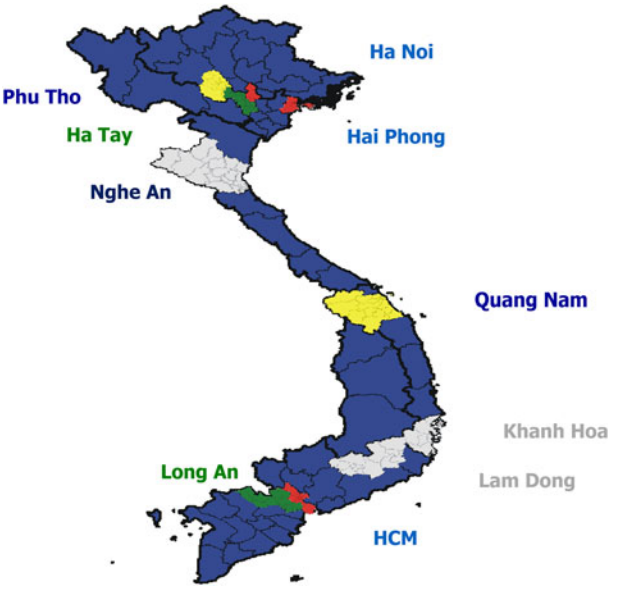

Figure A1. Provinces covered in the survey data.

Appendix B: List of the industries in terms of the level of technology

Group 1: Low technology

D15: Food and beverages
D16: Cigarettes and tobacco
D17: Textile products
D18: Wearing apparel, dressing and dying of fur
D19: Leather and products of leather; leather substitutes; footwear.
D20: Wood and wood products, excluding furniture

D21: Paper and paper products
D22: Printing, publishing, and reproduction of recorded media
D23: Coke and refined petroleum products and nuclear fuel
D36: Furniture and other products not classified elsewhere
D37: Recycles products

Group 2: Medium technology

D24: Chemicals and chemical products
D25: Rubber and plastic products
D26: Other non-metallic mineral products
D27: Iron, steel and non-ferrous metal basic industries
D28: Fabricated metal products, except machinery and equipment

Group 3: High technology

D29: Machinery and equipment
D30: Computer and office equipment
D31: Electrical machinery apparatus, appliances and supplies
D32: Radios, television and telecommunication devices
D33: Medical equipment, optical instruments
D34: Motor vehicles and trailers
D35: Other transport equipment