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Essays on determinants of innovation of small- and medium-sized enterprises

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Table of Contents

Introduction

Innovation is a main engine for economic growth and development is widely accepted in the literature (Aghion et al., 2014; Aghion & Howitt, 1998; Almeida & Fernandes, 2008; Grossman & Helpman, 1994; Romer, 1990). At the micro level, innovation determines the firm performance (Audretsch, 1995; Audretsch et al., 2014; Brouwer et al., 1993; Coad & Rao, 2008). Innovation is also a crucial channel through which social capital has impacts on economic performance (Soete et al., 2010; Thompson, 2018; Audretsch et al., 2018). Akçomak and Ter Weel (2009) show that social capital improves economic growth by fostering innovation. Similarly, the process that firms in developing countries participate in innovative activities such as product imitation, which boosts accumulation of social capital, is effective to generate economic performance (Agénor & Dinh, 2015). Putnam (2000) documents that in the United States during the 20th century social capital had a diminishing effect on economic performance due to technological progress. Putnam's prediction is later confirmed in other studies (Antoci et al., 2013).

While the performance of small and medium-sized enterprises (SMEs) depends largely upon their ability to acquire external resources and knowledge (Partanen et al., 2020; Molodchik et al., 2020). It has been argued that external resources and knowledge sourcing provide advantages associated to endorsements from exchange partners (Chang, 2004; Stuart et al., 1999). However, SMEs find it difficult to gain access to external resources particularly compared to larger counterparts (Lee et al., 2015). Therefore, it is recognized that identifying contingencies which facilitate access to external resources as social capital is a major importance for SMEs (Aldrich & Kim, 2007; Hernández-Carrión et al., 2017; Masiello & Izzo, 2019). SMEs use their social capital to obtain information, advice, and support (Aldrich & Zimmer, 1986; Westlund & Bolton, 2003), access financial capital (Uzzi, 1999; Shane &

Cable, 2002; Giudici et al., 2018), enhance the perceptions of external actors about the quality of their firms (Stuart et al., 1999; Inkpen & Tsang, 2005). While those studies focus on the benefits of social capital (Coleman, 1990; Putnam, 1993), there are potential costs deriving from too high levels of social capital (Burt, 1992; Uzzi, 1997; Laursen et al., 2012b). Too much social capital can trap firms into particular networks (Burt, 1992; Uzzi, 1997; Gu et al., 2008) and prevent them from searching for opportunities outside the network (Adler & Kwon, 2002; Wincent et al., 2016). Unlike previous studies on social capital which tend to focus on firms in developed countries, in this thesis, I analyze SMEs operating in a transition economy. Although it could be expected that social capital might operate differently in different contexts (Batjargal, 2010), there are not much information on the link between social capital and performance of SMEs in transition economies (Batjargal, 2007) and moderation effects of innovation on their link.

Moreover, firm innovation is shaped by both internal and external factors. Internal factors include ability of firms to innovate, firm investment, and research and development (R&D). External factors relate to the local and global business environment such as formal and informal institutions, networks, global value chains and intangible assets. Corruption as informal institution at local business environment has significant effects on firm innovation in both low-income countries (Ayyagari et al., 2014; de Waldemar, 2012; Nguyen et al., 2016; Paunov, 2016; Xie et al., 2019) and high-income countries (Dincer, 2019; Ellis et al., 2019; Heo et al., 2020; Wen et al., 2020). Empirical studies suggest that whether corruption is sanding or greasing the wheels of firm innovation is largely shaped by contextual factors. As a subset of general corruption, tax corruption refers to the unlawful exercise of public office by tax officials for their personal benefits (June et al., 2008: 12). Cai et al. (2018: 2) argue that "lower taxes may reduce resources that firms spend on tax evasion, such as costs of bribing tax

officers, which can be instead used on innovation activities." Tax corruption is an important form of corruption in many developing countries. Yet, there exist to date very few, if any, rigorous studies that explicitly examine the impact of tax corruption on innovation, possibly due to the lack of relevant data at the firm level.

In terms of global business environment, the growing importance of global value chains (GVCs) in the international organization of production represents a major shift in international trade, and hence in the international competitiveness of firms (Grossman & Rossi-Hansberg, 2008; Montalbano, Nenci, & Pietrobelli, 2018; Reddy, Chundakkadan, & Sasidharan, 2020). Participation in GVCs provides SMEs with an opportunity of accessing new technologies, knowledge and information, and of forming trade networks (Gereffi, Humphrey, & Sturgeon, 2005; Montalbano et al., 2018; Reddy et al., 2020). A large amount of literature is available on the impact of participation in global value chains on innovation and several transmission mechanisms through which internationalized firms are more likely to introduce new products and processes have been identified (Lema, Quadros, & Schmitz, 2015; Morrison, Pietrobelli, & Rabellotti, 2008; Taglioni & Winkler, 2016).

Moreover, the gains in value added along GVCs depend on the position of the firms in the development stage of the global production network. Higher value is added both upstream and downstream, and that the lowest value-added is in the middle of the value chain. Therefore, investments in intangible assets help firms to improve their gains in value-added through GVCs (Dedrick, Kraemer, & Linden, 2010; Gereffi, 1999; Mudambi, 2007, 2008; Shin, Kraemer, & Dedrick, 2009, 2012). The studies that investigated the role of intangible assets in creating and appropriating value in GVCs. Intangible assets are a vital driver of innovation, growth and international competitiveness at both the firm and country level, especially in advanced countries (Andrews & De Serres, 2012; Dosi, Grazzi, & Moschella, 2015; Dosi, Pavitt, &

Soete, 1990; Fagerberg, 1994; Laursen & Meliciani, 2010). Intangible assets can play different roles in value appropriation, depending on the innovative characteristics of each asset (product innovation or process innovation) and on the stage of GVC participation (upstream, downstream). R&D and design ideally lie upstream in the 'smiling of value creation', while marketing, advertising and brand management are located in a relatively downstream position. However, the effects of investments in intangible assets in driving the GVC participation and governance form of GVCs of a firm on innovation have not received adequate attention.

The thesis aims to explore the determinants of innovation and its moderation effects on the relationship between social capital and performance of SMEs in Vietnam. The thesis will address the following research questions: 1) How is social capital helpful or harmful for performance of SMEs? And how does innovation moderate the relationship between social capital and performance of SMEs? (Chapter 1); 2) How is tax corruption affect innovation in Viet Nam? (Chapter 2); and 3) Do participation in GVCs and governance of GVCs affect the innovation of Vietnamese firms? Does innovation depend positively on firms' investment in intangible assets? And does investment in intangible assets positively moderate the impact of GVC participation and governance of GVCs on innovation? (Chapter 3).

The thesis is organized as follows: Chapter 1 explores how social capital affects the performance of SMEs and innovation moderates the relationship between social capital and SMEs' performance in a transition economy. Social capital is referred to as firm's social interactions with formal and informal creditors, which is financial social capital, and social interactions with politicians and civil servants, which is political social capital. Using a control function estimation method with longitudinal data from repeated surveys of SMEs in Vietnam from 2005 to 2015, I find an inverted U-shaped relationship between social capital and SMEs' performance, which is measured by gross profit and labor productivity. I further show that

there is a positive complementary effect between innovation and social capital in affecting performance of SMEs.

Chapter 2 examines the influence of tax administration corruption on different types of innovation inputs and outputs in Vietnam. It utilizes firm-level panel data derived from biennial surveys of SMEs in Vietnam from 2005 to 2015. In terms of estimation method, the study applies the control function method for a dynamic binary response panel data model with endogenous explanatory variables, state dependence, and initial condition problems simultaneously. The key estimation results confirm the grease-the-wheels hypothesis that petty tax corruption positively affects all types of firm innovative activities. It is further found that innovation outputs and machinery innovation input of an SME are positively determined by its innovation 2 years earlier and innovation in the initial period. The key finding of the study implies that it is a challenge for governments in transition economies to fight against tax corruption, especially for Vietnam, which is known to be a high tax collection, high tax effort country.

Finally, chapter 3 studies the role of investments of firms in intangible assets on the relationship between participation in global value chains (GVCs) and innovation in Vietnamese SMEs. I also apply the control function approach for dynamic binary response panel data model. I show that both participation in GVCs and different forms of GVC positively affect the product upgrading of SMEs in Vietnam for firms that have invested in intangible assets. These findings qualify the learning-by-participating of the GVC model by showing that the gains from GVC participation are not automatic and instead require firms to invest in building absorptive capacities.

Chapter 1 Social Capital and Firm Performance in Transition Economies: Evidence from Small- and Medium-Sized Enterprises in Vietnam[1]

1.1 Introduction

The performance of small and medium-sized enterprises (SMEs) depends largely upon their ability to acquire external resources and knowledge (Molodchik, Jardon, & Yachmeneva, 2020; Partanen, Kauppila, Sepulveda, & Gabrielsson, 2020). It has been argued that external resources and knowledge sourcing provide advantages associated to endorsements from exchange partners (Chang, 2004; Stuart, Hoang, & Hybels, 1999), furnish direct access to complementary resources (Chung, Singh, & Lee, 2000), facilitate the identification of new business opportunities (Batjargal, 2010; Granovetter, 1985) and guarantee access to new markets (Coviello, 2006).

Nevertheless, in the current business arena, it is difficult for SMEs to gain access to external resources particularly compared to larger counterparts (Lee, Sameen, & Cowling, 2015). Therefore, it is recognized that identifying contingencies which facilitate access to external resources is of major importance for SMEs (Aldrich & Kim, 2007; Hernández-Carrión, Camarero-Izquierdo, & Gutiérrez-Cillán, 2017; Masiello & Izzo, 2019).

The social capital literature suggests that socially better-connected firms will be in a better position to achieve the desired results (Adler & Kwon, 2002; Batjargal, 2003; Batjargal & Liu, 2004; Burt, 2000; Nahapiet & Ghoshal, 1998; Rodrigo-Alarcón, Parra-Requena, & Ruiz-Ortega, 2020). It also describes the potential costs of networking activities (Burt, 1992; Laursen, Masciarelli, & Prencipe, 2012b; Uzzi, 1997). High levels of social capital may

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overload firms with obligations to partners (Gu, Hung, & Tse, 2008), limit firms' openness to new ideas and alternative ways of doing things (Gargiulo & Benassi, 1999; Nahapiet & Ghoshal, 1998; Wincent, Thorgren, & Anokhin, 2016), and increase flows of redundant information since firms are likely to concentrate exchanges of knowledge on network members (Burt, 1992; Uzzi, 1997).

Social capital is defined variously in the literature (Adler & Kwon, 2002). There is, however, an agreement that it consists of networks of relationships and the resources inherent to these networks (Bourdieu, 1986; Coleman, 1988; Nahapiet & Ghoshal, 1998). Bourdieu (1980: 2) defines social capital as "the sum of the resources, actual or virtual, that accrue to an individual or group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition". In this paper, we focus on network size[2] (Burt, 1992; Greve & Salaff, 2003), which is defined as the number of direct ties involving individual units (firms) (Marsden & Campbell, 1984). We rely on environment-related social capital, which is understood as the relations a firm establishes with key decision makers in its external environment (Westlund & Nilsson, 2005: 1082). We focus on political social capital i.e. links to social politicians and civil servants, and financial social capital i.e. links to banks and other financial institutions. In transition economies those decision makers affect SMEs' performance by enabling them to overcome barriers deriving from economic and institutional instability (H. Li & Atuahene-Gima, 2001; Luo, 2003; Park & Luo, 2001). Additionally, socal capital improves indirectly economic performance via innovation channel (Audretsch, Seitz, & Rouch, 2018; Soete, Verspagen, & Ter Weel, 2010; Thompson, 2018) that there is the evidence from European Union countries (Akçomak & Ter Weel, 2009) and developing countries (Agénor & Dinh, 2015). While Putnam (2000) shows a positive association between

[2] We also use network intensity, which is frequency of network assistance to conduct robustness analysis. However, the network intensity data was not surveyed in 2005.

social capital and economic growth in the first 20th century, and in the late 20th century, there is a reduced effect due to technological progress, time and money pressure.

Relying on social capital theory (Bourdieu, 1986; Burt, 1992; Coleman, 1988) and resource-based theory of competitive advantage (Grant, 1991; Penrose, 1959; Peteraf, 1993), the present study seeks to analyze whether and how social capital can become a source of competitive advantage for SMEs. While those studies focus on the benefits of social capital (Coleman, 1990; Putnam, 1993), there are potential costs deriving from too high levels of social capital (Burt, 1992; Uzzi, 1997; Laursen et al., 2012b). Too much social capital can trap firms into particular networks (Burt, 1992; Uzzi, 1997; Gu et al., 2008) and prevent them from searching for opportunities outside the network (Adler & Kwon, 2002; Wincent et al., 2016). Unlike previous studies which tend to focus on firms in developed countries, in this paper I analyze SMEs operating in a transition economy. Although it could be expected that social capital might operate differently in different contexts (Batjargal, 2010), there are not much information on the link between distinct forms of social capital i.e. financial and political social capital and performance of SMEs in transition economies (Batjargal, 2007) and moderation effects of innovation on their link.

My study is conducted in a unique context of Vietnam, where the transition process is resulting in more dynamic social exchanges than other Western societies (World Bank, 2017a). Since 2006, Vietnam has restructured to improve the quality and efficiency of economic growth. A law on promotion of SMEs was promulgated in 2017, which was aimed at providing SMEs with better access to finance, lower corporate income tax, and support for innovation. Moreover, social interactions in Vietnam are deeply embedded in local cultural and historical traditions (Poon, Thai, & Naybor, 2012; Ralston, Terpstra-Tong, Maignan, & Napier, 2006).

This setting makes Vietnam an interesting context for the study, which could shed light on the roles of local culture and social structures on SMEs' performance.

This paper uses unique panel data from six rounds of biennial surveys of SMEs in Vietnam conducted from 2005 to 2015 to investigate the effects of social capital together with innovation serving as a moderating factor on the SMEs' performance. I apply the control function method for the correlated random effects (CRE) estimation with panel data to deal with unobserved firm heterogeneity and endogeneity problems (Wooldridge, 2010, 2019). I find an inverted U-shaped relationship between SMEs' social capital and performance. I further analyze the moderating role of innovation in affecting the inverted U-shaped relationship between SMEs' social capital and performance (Haans, Pieters, & He, 2016). The results show that innovation moderates this inverted U-shaped relationship by either flattening the inverted U-shaped curve or shifting the inflection point, depending on types of social capital. This study adds to our understanding of the role and boundary conditions of social capital in a small business context. By applying the theories developed and tested in a Western social environment to a sample of SMEs in a transition economy, I contribute to the management research literature.

The remainder of this chapter is structured as follows. The next section provides a theoretical background and hypothesis development, which is followed by a section presenting methodology and data. In the fourth section, the empirical results obtained are interpreted, which is followed by a section on sensitivity tests. The final section offers discussion and concluding remarks.

1.2 Theoretical background and hypothesis development

Starting from the notion of market imperfections, the resource-based theory of competitive advantage states that owning valuable, rare, inimitable, and non-substitutable resources is a source of sustainable competitive advantage for firms (Barney, 1991; Grant, 1991; Hitt, Bierman, Shimizu, & Kochhar, 2001; Penrose, 1959; Peteraf, 1993). Since firms cannot generate all the resources they require internally, they need to conduct exchanges with other organizations (Chesbrough, 2006; Laursen & Salter, 2006; Von Hippel, 1988).

Various works consider the firm's social capital as a resource in itself which if correctly managed, can facilitate the firm's acquisition of external resources and knowledge (Auh & Menguc, 2005; Nahapiet & Ghoshal, 1998). This approach to social capital represents an emerging theoretical thread which emphasizes the inherent value of social structures (Hernández-Carrión et al., 2017). Social capital theory contends that firms' social ties with external actors are likely to influence their strategies due to the information, trust, and risk reduction benefits inherent in these relations (Bourdieu, 1986; Nahapiet & Ghoshal, 1998).

The importance of social ties is amplified by the SME context since small firms' social ties are known to be critical for the entrepreneurial process (Aldrich & Zimmer, 1986; Partanen et al., 2020; Stam & Elfring, 2008). SMEs use their social capital to obtain information, advice, and support (Aldrich & Zimmer, 1986; Westlund & Bolton, 2003), access financial capital (Giudici, Guerini, & Rossi-Lamastra, 2018; Shane & Cable, 2002; Uzzi, 1999), enhance the perceptions of external actors about the quality of their firms (Inkpen & Tsang, 2005; Stuart et al., 1999), and mediate the relationship between corporate entrepreneurship and SME performance (Simsek & Heavey, 2011).

The literature on social capital posits that social interactions with external actors facilitate firms' identification of new opportunities (Bhagavatula, Elfring, Van Tilburg, & Van

De Bunt, 2010; Liao & Welsch, 2005), increase the probability of product innovation (Laursen, Masciarelli, & Prencipe, 2012a; Pirolo & Presutti, 2010; Tappeiner, Hauser, & Walde, 2008), facilitate the mobilization of resources (Batjargal, 2003; Giudici et al., 2018), and build legitimacy (Elfring & Hulsink, 2003) which reduces the "liability of newness" in early stage business (Laursen, Masciarelli, & Reichstein, 2016). While those studies focus on the benefits of social capital (Coleman, 1990; Putnam, 1993), there are potential costs deriving from too high levels of social capital (Burt, 1992; Laursen et al., 2012b; Uzzi, 1997). Too much social capital can trap firms into particular networks (Burt, 1992; Gu et al., 2008; Uzzi, 1997) and prevent them from searching for opportunities outside the network (Adler & Kwon, 2002; Wincent et al., 2016).

The notion of social capital has been studied extensively in Western contexts. Putnam's (1993) analysis of social capital inspired an extensive literature on social interaction and community participation. In transition economies, it has been suggested that entrepreneurs' and managers' social capital has an impact on firms' revenues and profitability (Batjargal, 2003; Peng & Luo, 2000). In China, Batjargal (2010) analyzes an indigenous social phenomenon known as guanxi (connections) which are the Chinese version of a social network (King, 1991). Chinese guanxi ties facilitate entrepreneurs' access to resources (Sedaitis, 1998), enhance firm performance (Batjargal, 2007; Park & Luo, 2001), increase job mobility (Bian & Ang, 1997), and facilitate the raising of venture capital (Batjargal & Liu, 2004).

The role of social capital is particularly relevant for transition economies where it is difficult for firms to rely on formal infrastructures to acquire external knowledge and resources (Mateut, 2018). In those economies, the structural uncertainty derived from economic and institutional instability implies more problems for firms (Rawski, 1994). As structural uncertainty increases, resource sharing among the actors becomes more necessary. Under

conditions of greater structural uncertainty, social relationships become particularly essential for firms since they allow more stable and reliable flows of resources (Khoshmaram, Shiri, Shinnar, & Savari, 2020; Luo, 2003). This applies to the Vietnamese culture which emphasizes collectivism over individualism (Ralston, Van Thang, & Napier, 1999). In such environments, actors are evaluated on the basis of both their own competence and that of other individuals linked to them (Chen, Chen, & Xin, 2004; Nam, Sonobe, & Otsuka, 2010).

Political social capital and SMEs' performance

Political networking refers to the extent to which firms cultivate relationships with government officials and administrative and regulatory agencies to obtain benefits (H. Li & Atuahene-Gima, 2001; Xin & Pearce, 1996). Evidence on the importance for firms of political connections has been documented for countries with different economic systems (Faccio, 2006; Fisman, 2001; Goldman, Rocholl, & So, 2009). There are various reasons why politically connected firms might achieve better performance compared to other firms. First, networking with individuals with political influence is an important strategy for firms to secure lower taxation, award of government contracts, and reduced regulatory requirements (Faccio, 2006; Goldman et al., 2009). All of these privileges increase their performance (Peng & Heath, 1996). Second, politicians are often external to the business world and can provide the SME with an independent opinion of the organization, the market conditions, and customers' needs and demands which eventually has a positive effect on performance (Faccio, 2006; Goldman et al., 2009).

However, the political networking effects on firm performance are not universal and may be context specific (Xin & Pearce, 1996). In a transition economy, firms report that among the main factors affecting their performance, the political environment is the most influential, most complex, and least predictable (Tan & Litsschert, 1994).

To alleviate resources deficiencies in a context of high structural uncertainty (Pfeffer & Salancik, 2003), SMEs in transition economies tend to develop relationships with government officials (Tsang, 1996; Zhao & Aram, 1995) who may be able to help them attenuate their difficulties and identify new opportunities (Peng & Luo, 2000). In countries where legal enforcement is ineffective, SMEs with close political ties can exploit the power of their government connections to support their transactions and prevent unlawful competition. Research on the Chinese context shows that social ties with officials helped firms achieve more institutional support to mitigate the challenges arising from uncertainty (Peng & Luo, 2000; Xin & Pearce, 1996). Similarly, Markussen and Tarp (2014) find that political connections help entrepreneurs to increase their investment in agricultural land and secure the land rights in Vietnam. Nee (1992) and Walder (1995) argue that a network strategy linking small newly founded firms and local officials leads to better firm performance.

Although previous research argues in favor of a positive effect of political networking on firm performance in transition economies (Fan, Wong, & Zhang, 2007), I would suggest that too high a level of political social capital could be harmful for two main reasons. First, political networking might oblige a firm to return the favors or exchange favors with political actors (Luo, 2003; Walder, 1995). Those obligations could potentially result in damage and costs to the firm (Fan et al., 2007; Malesky & Taussig, 2009). In China, Fan et al. (2007) show that highly politically connected entrepreneurs significantly under-performed their unconnected counterparts since they faced high costs of disengagement and often became over-dependent on their political network. Malesky and Taussig (2009) provide similar results for Vietnam. Second, in transition economies, political networking does not involve agreement between equals and the SMEs usually benefit relatively less than the government officials from

these links since the latter can extract excessive rents from their relationships with the firms (Che & Qian, 1998; Fan et al., 2007; Sheng, Zhou, & Li, 2011). In sum, we hypothesize that:

H1a: Political social capital is curvilinearly (inverted U-shaped) related to the SMEs' performance.

Financial social capital and SMEs' performance

Accessing financial resources has always been a major problem for SMEs (Carter & Auken, 2006) and affects their chances of success (Arinaitwe, 2006). Moral hazard and adverse selection suggest that obtaining external finance is particularly difficult for SMEs because these firms tend to be more informationally opaque compared to larger firms (Berger & Udell, 2002; Stiglitz & Weiss, 1981). SMEs with the capabilities to conduct major projects may be unable to obtain finance because of their inability to provide evidence to potential external providers of their capabilities and assurance that the funding will not be diverted to an alternative project. In transition economies, insufficient institutional infrastructures generate an uncertain business environment which lowers the trust among actors (Atuahene-Gima & Li, 2002). As a result, information obtained from external social ties "may be more trustworthy, richer, and more useful than information gained by other means" (Luo, 2003: 1317). In Vietnam, shortage of credit has been cited as the most critical problem for SMEs (CIEM, 2016). SMEs in Vietnam reported two main difficulties related to acquiring formal credit: complicated lending procedures, and lack of collateral. As a result, SMEs often have to depend on their social networks to obtain credit.

Previous studies support the importance of firm-bank relationships to enable credit availability and ease credit terms such as interest rates and collateral requirements (Elsas & Krahnen, 1998; Harhoff & Körting, 1998; Petersen & Rajan, 1994). I posit that one of the most powerful means available to SMEs to reduce information problems is networking with

individuals employed in the banking sector. By exploiting this social capital, external providers of finance can acquire information on the SMEs before making their lending decisions. Thus, social capital could have a positive effect on performance by reducing the cost to the firm of acquiring credit (Alexy, Block, Sandner, & Ter Wal, 2012). A large network of social ties to banks is beneficial for the firm because it enlarges the pool of potential lenders, and allows the firm to play the banks off against one another (Alexy et al., 2012; Baker, 1990; Uzzi, 1999). However, too many contacts with external providers of finance can result in a complicated social network which is difficult for the firm to manage (Uzzi, 1999). The study by Petersen and Rajan (1994) on the relationship between the firm and its creditors shows that close ties to creditors increase the firm's likelihood of finding funding. If the firm attempts to widen its network to include multiple providers of finance, this can increase interest rates and reduce the availability of funding. Cole (1998) provides evidence that a potential creditor is less likely to extend a loan to a firm with multiple providers of finance. Therefore, we hypothesize that:

H1b: Financial social capital is curvilinearly (inverted U-shaped) related to the SMEs' performance.

The moderating role of innovation on the relationship between SMEs' social capital and performance

Innovation is a crucial channel through which social capital has impacts on economic growth (Audretsch et al., 2018; Soete et al., 2010; Thompson, 2018). Akçomak and Ter Weel (2009) incorporate social capital in the production function and show that social capital improves economic growth by fostering innovation in European Union countries. Similarly, the process that firms in developing countries participate in innovative activities such as product imitation, which boosts accumulation of social capital, is effective to generate economic growth (Agénor & Dinh, 2015). Putnam (2000) documents that in the United States

during the 20th century social capital had a diminishing effect on economic growth due to technological progress. Putnam's prediction is later confirmed in other studies (Antoci, Sabatini, & Sodini, 2013).

Haans et al. (2016) suggest that there are two distinct types of moderation effect on the inverted U-shaped relationship and they should be tested separately: (i) the shape will become flatter or steeper; and (ii) the inflection point will shift. The first effect is grounded in the literature on absorptive capacity (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998) that to benefit from external resources and knowledge transmitted through social capital, firms must invest in in-house knowledge, which improves performance. Prior knowledge provides firms with an appropriate lens to recognize the value of external knowledge, to absorb this knowledge, and to filter out information of little relevance (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998). In the absence of prior knowledge, a firm might find it difficult to appreciate the value of external resources and knowledge with a potential consequence of inability to understand its application. Not all firms can be expected to benefit equally from social capital. Those that invest more in innovation should benefit more from both political and financial social capital thanks to their in-house knowledge.

The second effect is based on the high level of dysfunctional competition in transition economies. Dysfunctional competition implies copyright and patent violation, and difficulties related to monitoring and enforcing contracts (H. Li & Zhang, 2007). Under those conditions, the benefits resulting from the development of new technologies and products are better retained by SMEs with high levels of political social capital which is associated to legitimacy and government protection. Therefore, political networking represents a complementary asset to materialize the benefits of innovation (Q. Lu, 2000). In contrast, firms with low levels of political social capital may find that the benefits of their innovation are involuntarily leaked to

other firms which then copy their innovation or break contracts (H. Li & Zhang, 2007). Therefore, in transition economies we expect a complementary effect between innovation and political social capital which affects firms' performance. Thus, we hypothesize that:

H2a: Innovation moderates the inverted U-shaped relationship between political social capital and SMEs' performance.

I also expect that the value of innovation for SMEs' performance will increase with higher levels of financial social capital. In transition economies characterized by poorly specified property rights, weak market mechanisms, and institutional uncertainty, investors make their decisions to offer funding to SMEs based on current projects and future strategies (Nee, 1992). SMEs' financial social capital signals investors' trust in the current strategies and the firm's future growth which is an incentive for other creditors to provide additional financial support for innovative projects, leading to the increase in the value of innovation for SMEs' performance. Therefore, I predict a positive moderating effect of innovation on the relationship between SMEs' financial social capital and performance.

H2b: Innovation moderates the inverted U-shaped relationship between financial social capital and SMEs' performance.

1.3 Data and methodology

1.3.1 Data

I use unbalanced panel data from six rounds of biennial surveys of SMEs in Vietnam, which have been conducted from 2005 to 2015 by the Institute of Labor, Science and Social Affairs, the Central Institute for Economic Management (CIEM), the University of Copenhagen, and the United Nations University World Institute for Development Economic Research (UNU - WIDER). The surveys cover randomly selected manufacturing SMEs in 10 provinces in

Vietnam. A stratified random sample was created during each round of survey (Rand & Tarp, 2007). The number of SMEs in selected provinces covered about 60 percent of the population of non-state manufacturing firms in Vietnam (The General Statistics Office of Vietnam, 2016a). In each round, more than 2,500 SMEs were surveyed and the total number of sampled SMEs for six rounds of surveys adds up to around 15,000. The SMEs surveyed included survivals from the previous surveys and newly added SMEs which were randomly selected from the population. According to CIEM (2016), and Rand and Tarp (2007), the tracer survey feature of the data helps to capture the dynamics of the business environment in Vietnam.

The data collected were for the previous year. For example, data collected in the 2005 survey provide information on the characteristics of the SMEs, their production, and social capital in 2004. The sampled SMEs belong to different industries including food products, beverages, textiles, wearing apparel and leather products, wood products, paper products, printing and reproduction of recorded media, petroleum products, chemical, pharmaceutical, plastic products, non-metallic, mineral products, basic metal and metal product, electronic products, equipment, machinery, transport equipment, and furniture.

Measures

The dependent variable in our regressions is SMEs' performance, which is measured in conventional ways by gross profit and labor productivity (Batjargal, 2003; Schulze, Lubatkin, Dino, & Buchholtz, 2001). Gross profit is calculated as value added minus wage payment. Value added is equal to sales revenue minus intermediate costs. I use the logarithm of real gross profit in our regressions, which causes removal of the SMEs with negative profit.[3] Following Lieberman and Kang (2008), I measure real labor productivity by taking the

[3] As a result, we removed these SMEs from our sample. The number of removed SMEs were 18, 10, 8, 7, 46, and 70 in 2005, 2007, 2009, 2011, 2013 and 2015, respectively.

logarithm of value added divided by the number of regular workers. Real gross profit and labor productivity were obtained by deflating them with GDP deflators.

I use SMEs' network size (Burt, 1992; Greve & Salaff, 2003; Marsden & Campbell, 1984; Santarelli & Tran, 2013) to measure social capital. Political social capital is measured by the number of politicians and civil servants, who were contacted by the owner/manager of an SME at least once every three months and provided substantial contributions to the business operations of the SME. To measure financial social capital, I use the number of credit providers who were contacted by the owner/manager of an SME at least once every three months and provided a substantial contribution to the business operations of the SME.[4] Credit providers include formal and informal lenders to the SMEs. Formal providers are commercial banks and other formal financial institutions. Informal providers include input suppliers with delayed payments and friends and relatives of the SMEs' owner/manager.

The moderating variable *innovation* takes the value of "1" if an SME has reported at least one of the followings: 1) development of a new product, 2) improvement of an existing product, or 3) development of a new production process, and "0" otherwise. The SME's owner/manager during the survey was requested to answer the question "having innovative activities during the last two years". Because the innovative activities had been conducted before the time of the SMEs' survey, I may reasonably assume that the innovation variable with the lagged values is not endogenous.

In our regressions, I control for capital since it is often used to proxy for economic size (Koch & McGrath, 1996). I include the logarithm of the year-end value of the total *fixed assets*, which is deflated by the GDP deflator. Variable *Firm Age* is included to control for any

[4] We used the question "In this year, how many people do you have regular contact at least once every 3 months, which you find useful for your business operations?" in the questionnaire to capture network size of SME, which is answered for politicians and credit provider separately. We also measure financial and political social capital using different variables providing information on the number of times that bank officers and politicians and civil servants assisted the owner/manager over firm operational issues during the previous year. We will discuss about them in Sensitivity Tests section.

advantages associated with the evolution of work practices or learning curve advantages (Guthrie, 2001). *Firm Age* is measured as the logarithm of number of years of operation of the SME. *Firm Size* is likely to have an important effect on performance because larger enterprises are associated with larger scale operations (Koch & McGrath, 1996). Therefore, I control for *Firm Size* using the logarithm of the number of regular workers. I also include the square of *Firm Size (Firm Size^2)* to measure any possible diminishing effects. A firm's participation in exporting activities influences its performance. I, thus, include a dummy variable for exporter, which is equal to "1" if an SME exports and "0" otherwise. In addition, I control for *Infrastructure* conditions, which is a dummy variable taking the value of "1" if there is a main road leading to an SME and "0" otherwise. In Vietnam, more than 91 percent of passengers and 70 percent of freight are transported by road. These ratios have been increasing (Ministry of Transport of Vietnam, 2013). Thus, access to a road has an essential influence on SMEs' performance. The literature shows that there are industry differences in terms of firm performance (Koch & McGrath, 1996). Dummy variables are, hence, used to control for *Industry* effects. Previous studies demonstrate that geography has an effect on firm performance (Audretsch & Keilbach, 2004). I, therefore, control for the *Provincial Location* of SMEs using dummy variables. Finally, I include time dummy variables to control for business cycles. Table 1.1 presents the basic statistics of the main variables. Table 1.2 presents the correlation coefficients of the variables. All the correlation coefficients of the independent variables are of our expectation.

[Insert Table 1.1 here]

[Insert Table 1.2 here]

1.3.2 Estimation strategy

Regression specification

To test the inverted U-shaped relationship between SMEs' social capital and performance I apply the following regression:

$$PER_{it} = \alpha_0 + \alpha_1 SC_{it} + \alpha_2 SC_{it}^2 + \alpha_3 IN_{it} + \gamma X_{it} + c_{1i} + \varepsilon_{1it} \quad (1)$$

where PER_{it} is the logarithm of gross profit or the logarithm of labor productivity of SME i at time t; SC_{it} denotes political or financial social capital; IN_{it} is innovation; X_{it} is a set of control variables including the logarithm of the fix assets, firm age, firm size, square of firm size, exporter, infrastructure, time dummies, industry dummies, and provincial location dummies; ε_{1it} is the idiosyncratic errors and c_{1i} is the firm fixed effect or unobserved heterogeneity. Under the hypothesis of a curvilinear effect of social capital (H1a and H1b), I expect the sign of α_2 to be negative in Equation (1).

To test Hypotheses H2a and H2b, I adjust Equation (1) to allow for interaction between social capital and innovation. The estimation function is as follows.

$$PER_{it} = \beta_0 + \beta_1 SC_{it} + \beta_2 SC_{it}^2 + \beta_3 SC.IN_{it} + \beta_4 SC^2.IN_{it} + \beta_5 IN_{it} + \varphi X_{it} + c_{2i} + \varepsilon_{2i} \quad (2)$$

where $SC.IN_{it}$ and $SC^2.IN_{it}$ are interaction terms between social capital and the square of social capital with innovation, respectively; ε_{2it} is the idiosyncratic errors and c_{2i} is the firm fixed effect; The other variables are the same as in Equation (1).

Endogeneity problems with non-linear estimation

Social capital is potentially endogenous in both Equations (1) and (2) since it could be correlated with the idiosyncratic errors (ε_{it}) and/or unobserved firm heterogeneity (c_i). I may apply the Fixed Effects (FE) or Random Effects (RE) methods along with relevant instrumental variables by using two-stage least squares (2SLS) estimation with panel data, which eliminate the endogeneity. Nevertheless, firm performance is a nonlinear function of social capital in both equations. Wooldridge (2010, Section 11.2) suggests a correlated random effects (CRE)

approach, which was pioneered by Mundlak (1978), along with instrumental variables by using a control function method. This method is consistent with the FE and RE instrumental variables methods. Moreover, it is more efficient and flexible with unbalanced panel data and nonlinear panel data models (Joshi & Wooldridge, 2019; Wooldridge, 2010, 2019). In terms of the CRE approach, we can add the time averages of the time-variant independent variables to eliminate the unobserved heterogeneity, which is identical to the FE models. The CRE approach has an advantage over the FE model as it can estimate the effects of both time-variant and time-invariant independent variables. The advantage remains with changing variables such as innovation dummy, export dummy, infrastructure, industry, and location in our unbalanced panel data[5] (Mundlak, 1978; Wooldridge, 2010).

In the 2SLS estimation method, the fitted value of the endogenous variable, which is obtained from the reduced-form equation in the first stage, is used in the second stage. In the control function method, the CRE residuals, fixed effects residuals, random effects residuals, or pooled OLS residuals are obtained from the reduced-form equation in the first stage and used in the second stage. If these residuals are statistically significant in the second stage, social capital is statistically endogenous and the instrumental method is needed. I apply the CRE instrument variable estimation by using the control function method for our nonlinear panel data models. The instrument variable determines the endogenous social capital variable but does not affect firm performance.

Social capital of a person is, by its nature, contingent on his/her past (Chung et al., 2000). I, thus, use the previous work's experience/position of an SME's owner/manager as an instrument. Being either a local cadre at the commune, district, or province level or a member

[5] For example, we tried to compute the transition probabilities of innovation and export, the results show that the high persistence in non-innovative and non-export status is around 70% and 98%, respectively.

of an organization such as a farmers' union or women' union[6] prior to owning/managing the SME provide the owner/manager with an advantage to build up his/her political or financial connections with others. The instrument *Local Cadres* (LCs) is likely to determine political and financial social capital but does not have influence on SMEs' performance.

I estimate the reduced-form Equation (3) in the first stage by the CRE approach to obtain the CRE residuals $\hat{v}_{it}$ and take its square of $\hat{v}_{it}$, $\hat{v}_{it}^2$. These components and the time averages of the time-variant covariates as $\overline{LCs}_i$, $\overline{IN}_i$ and $\bar{X}_i$ are substituted in Equations (1) and (2). I then have control function Equations (4) and (5), respectively.[7] This procedure is similar to the Hausman's test (1978) to detect endogeneity (Joshi & Wooldridge, 2019; Wooldridge, 2010, Section 9.5.3).

$$SC_{it} = \pi_0 + \pi_1 LCs_{it} + \pi_2 \overline{LCs}_{it} + \pi_3 IN_{it} + \pi_4 \overline{IN}_i + \theta X_{it} + \theta' \bar{X}_i + c_{3i} + \varepsilon_{3i} \quad (3)$$

$$PER_{it} = \alpha_0 + \alpha_1 SC_{it} + \alpha_2 SC_{it}^2 + \alpha_3 IN_{it} + \gamma X_{it} + \gamma' \bar{Z}_{1i} + \rho_1 \hat{v}_{it} + \rho_2 \hat{v}_{it}^2 + a_{1i} + e_{1it} \quad (4)$$

$$PER_{it} = \beta_0 + \beta_1 SC_{it} + \beta_2 SC_{it}^2 + \beta_3 SC.IN_{it} + \beta_4 SC^2.IN_{it} + \beta_5 IN_{it} + \varphi X_{it} + \varphi' \bar{Z}_{2i} + \rho_3 \hat{v}_{it} + \rho_4 \hat{v}_{it}^2 + a_{2i} + e_{2it} \quad (5)$$

Wooldridge (2010, p. 270) suggests that we have to include two control functions ($\hat{v}_{it}$ and $\hat{v}_{it}^2$) to account for the endogeneity of SC_{it} and SC_{it}^2 in Equation (4), and SC_{it}, SC_{it}^2, $SC.IN_{it}$ and $SC^2.IN_{it}$ in Equation (5). The CRE approach is used to estimate the first stage Equation (3), and the second stage Equations (4) and (5) by implementing standard RE estimator. Additionally, I control for heterogeneity and serial correlation in the idiosyncratic errors (e_{1it} and e_{2it}) in Equations (4) and (5), respectively, by using a cluster-robust standard error

[6] This instrument variable is utilized by answering the question "What was the previous main work's experience/positions of respondent before owning or managing this firm? in the questionnaire.

[7] $\bar{Z}_{1i}$ in equation (4) includes $\overline{LCs}_i$, $\overline{IN}_i$, $\bar{X}_i$ and the time averages of social capital and the square of social capital. $\bar{Z}_{2i}$ in equation (5) includes $\bar{Z}_{1i}$ and the time averages of interaction variables ($SC.IN_{it}$ and $SC^2.IN_{it}$), which are able to eliminate the unobserved firm heterogeneity in the second stage.

(Wooldridge, 2010).[8] The result of CRE estimator from the first stage Equation (3) in Table 3 shows that our instrument variable, LCs_{it}, is valid when its coefficients for both political social capital and financial social capital, which is measured by either network size or network intensity, are significant. A significant joint test of $\hat{v}_{it}$ and $\hat{v}_{it}^2$ indicates that social capital is endogenous (see the results in Tables 4 and 5).

[Insert Table 1.3 here]

Testing for an inverted U-shaped relationship and moderating effects

I test the hypotheses that both financial and political social capital have an inverted U-shaped relationship with SMEs' performance by estimating α_2 in Equation (4). The finding that α_2 is negative and significant is not sufficient to draw conclusions about this relationship. According to Lind and Mehlum (2010) and Haans et al. (2016), to confirm the inverted U-shaped relationship requires three conditions. First, α_2 must be negative and significant. Second, the slopes of the lower and upper bounds of the performance curve as a function of social capital must be respectively significantly positive and negative. If only one is significant, merely one half of the U-shaped curve is disclosed by the data. Third, the inflection point should be within the data range based on checking the 95% confidence interval for the inflection point.[9]

By estimating Equation (5), I are interested in how innovation moderates the effects of social capital on SMEs' performance. According to Haans et al. (2016), it is necessary to show whether there is a shift of the inflection point (ip) and a flattening out or steepening of the firm performance curve as a function of social capital. From Equation (5), I take the first order condition with respect to social capital and set it to zero. I obtain Equation (6) as follows.

$$SC^{ip} = \frac{-\beta_1 - \beta_3 IN}{2\beta_2 + 2\beta_4 IN} \quad (6)$$

[8] We use the command xtreg y x, re vce(cluster firmid) in Stata 16 to estimate equations (4) and (5).
[9] To test for inverted U-shaped relationships, we use Lind and Mehlum's (2019) user-written utest command in Stata.

Equation (6) provides the value of social capital at the inflection point. If the change in this value with respect to different states of innovation is statistically significant, I can conclude that the inflection point shifts. If the dummy variable for innovation equals "0" and "1", the values are respectively $SC_0^{ip} = \frac{-\beta_1}{2\beta_2}$ and $SC_1^{ip} = \frac{-\beta_1-\beta_3}{2\beta_2+2\beta_4}$. We test whether SC_0^{ip} is significantly different from SC_1^{ip}.[10]

To conclude about the flattening or steepening of the performance curve, I count on the sign of β_4 in Equation (5) (Haans et al., 2016). If β_4 is positive and significant, flattening prevails. If β_4 is negative and significant, steepening prevails.

1.4 Regression results

I investigate the effects of social capital and its interaction with innovation on the SMEs' performance in Equations (4) and (5), respectively, by applying the control function methods for CRE panel data approach. The second-stage regression results along with the test for firm effects, the test for endogeneity of social capital (Joshi & Wooldridge, 2019; Wooldridge, 2010, 2015, 2019), and the test for inflection point shift (Haans et al., 2016) are reported in Table 1.4. Table 1.5 presents the test for inverted U-shaped relationship between social capital and SMEs' performance as suggested by Lind and Mehlum (2010) and Haans et al. (2016).

[Insert Table 1.4 here]

[Insert Table 1.5 here]

Testing values for firm effects and endogeneity of social capital in Columns from (1) to (4) in Table 1.4 are significant,[11] showing that the control function method for the CRE

[10] We use the nlcom and test commands in Stata to test for this difference.

[11] Only value of jointly testing for endogeneity of financial social capital – chi2(2) = 4.15, p-value = 0.1258, in column (3) for operating profit is weak confirmation. However, the residual of financial social capital is still significant at 10%, which may confirm its endogeneity. Furthermore, we estimate equation (4) without controlling for endogeneity by using the 'native' RE models and the CRE models, results in Table A1.1 and Table A1.2, respectively, in the Appendix are consistent with Table 4 columns from (1) to (4).

approach with an instrumental variable is better to account for the unobserved heterogeneity and endogeneity than the RE approach with an instrumental variable (Joshi & Wooldridge, 2019; Wooldridge, 2010).

Results in Columns (1) and (2) in Table 1.4 show that the coefficients of the square of political social capital (PSC^2) are negative and significant, suggesting an inverted U-shaped relationship between political social capital and gross profit and labor productivity. The second and third conditions of this inverted U-shaped relationship are shown in Table 1.5. The slopes at the lower bound are positive and significant. The slopes at the upper bound are negative and significant for the gross profit and labor productivity equations. The values of the political social capital at the inflection point are 14 or 18 for the gross profit and labor productivity equations, respectively. These values are in the fourth quartile of the political social capital values. These values indicate that if an SME owner/manager has more than 14 or 18 political social connections, they are no longer beneficiary to performance. The 95% Fieller interval for the inflection points are within the data range of [0; 50], indicating that political social capital has a positive but diminishing effect on SMEs' performance, which supports Hypothesis 1a.

Findings for the relationship between financial social capital and SMEs' performance are presented in Tables 1.4 with Column (3) for gross profit and Column (4) for labor productivity. The square of financial social capital variables (FSC^2) are negative in Column (3) and Column (4) but insignificant. In Table 1.5, the slopes at the lower bound are positive and significant. The slopes at the upper bound are negative but not significant. These results confirm only the left half of the U-shaped relationship, which is on a positive trend (Haans et al., 2016) between SMEs' performance and financial social capital. These findings partly support Hypothesis 1b.

Estimations of the moderating effects of innovation on the relationship between political social capital and financial social capital and SMEs' performance are presented in Table 1.4 in Columns (5) and (6), and Columns (7) and (8), respectively.

The estimation of gross profit and labor productivity with political social capital in Columns (5) and (6) in Table 1.4, respectively. The results of testing for inflection point shift with innovation and without innovation are statistically insignificant, with chi2(1) = 0.86 for profit and chi2(1) = 0.44 for labor productivity. The flattening of the performance curve occurs because the coefficients of PSC^2*IN in Columns (5) and (6) in Table 1.4 are positive and statistically significant.

Figure 1.1 and Figure 1.2 show the effects of political social capital on gross profit and labor productivity with and without innovation, respectively. The flattened curves with innovation confirm the positive moderating effect of innovation on the inverted U-shaped relationship between political social capital and SMEs' performance. The findings confirm that innovation significantly shifts the curves depicting the relationship between political social capital and SMEs' performance. The fact that innovation does not affect the infection points, which partly supports Hypothesis 2a.

[Insert Figure 1.1 here]

[Insert Figure 1.2 here]

In the estimation of gross profit and labor productivity with financial social capital presented in Columns (7) and (8) of Table 1.4, the results of testing for inflection point shift are statistically insignificant with chi2(1) = 0.16 for gross profit and chi2(1) = 0.32 for labor productivity. I do not find a steepening or flatting process of the performance curve as the coefficients of FSC^2*IN in Columns (7) and (8) are statistically insignificant. The coefficients

of FSC*IN are also statistically insignificant. These findings show that innovation does not shift the inflection point nor change the curve showing the effects of financial social capital on SME's performance, thus, not supporting Hypothesis 2b. I, however, re-estimate Equation (5) and then predict the marginal effects to determine the effect of the range of financial social capital values conditioning on innovation by using only interaction IN and FSC variables. As a result, Figure 1.3 for gross profit and Figure 1.4 for labor productivity show that the differences in average marginal effects are significant for values of financial social capital less than 10 and 12, respectively.[12]

[Insert Figure 1.3 here]

[Insert Figure 1.4 here]

In all eight estimation models in Table 1.4, the coefficients of innovation (IN variable) are positive and statistically significant, confirming that innovation enhances SMEs' performance (Mohnen & Hall, 2013). I observe also that the fixed assets have positive and significant effects on SMEs' performance. This finding implies that an SME can achieve higher performance by investing in physical capital. The number of years of operation of an SME has a positive and significant effect on gross profit, suggesting that older SMEs have larger gross profit than others. Firm age does not have any effects on labor productivity. Performance is a non-linear function of firm size. Additionally, exporter has statistically significant effects on performance. Finally, access to a main road has no impact on SMEs' performance.

[12] We re-estimate equation (5) by removing SC_{it}^2, $SC^2.IN_{it}$, and $\hat{v}_{it}^2$, then we use "margins, dydx(IN) at(FSC=(0(1)60)) vsquish" and "marginsplot, recast(line) yline(0) xlabel(0(2)60) xlabel(, angle(90))" commands in Stata 16 to obtain Figure 1.3 and Figure 1.4.

1.5 Sensitivity tests

I conduct additional sensitivity tests to confirm our analysis. First, I calculate general social capital (GSC) as the sum of political and financial social capital. I then re-estimate Equations (3), (4), and (5) with GSC. The regression results in Table A1.3 in the Appendix show that social capital has an inverted U-shaped relationship with SMEs' performance. Innovation is found to have positive moderating effects to flatten the inverted U-shaped relationship between GSC and SMEs' performance. These results are consistent with my previous findings.

Second, I realize that political and financial social capital variables have the conditional standard deviation exceeding the conditional mean due to many zero values when SMEs reported not having any networks with politicians or credit providers. I thus re-estimate Equation (3) as count models by using the CRE approach for Poisson and Negative binomial models instead of the CRE approach for the linear panel data models in the first stage.[13] The regression results reported int Table A1.4 and Table A1.5 in the Appendix for the Poisson model and for the negative binomial, respectively, are similar to those in Table 1.4, indicating that my results are robust regardless of the estimation techniques.

Finally, I use the political and financial social capital measured by network intensity, i.e. the number of politicians and civil servants' assisting times (PSC NI) and the number of credit providers' assisting times (FSC NI).[14] The regression results presented in Table A1.6 in the Appendix are consistent with those in Table 1.4, indicating that my results are robust regardless of measures of social capital.

[13] We estimated equation (3) by using glm command in Stata 16 with poisson or negative binomial in family function and log in link function options along with firm-clustered standard errors.
[14] We used the question "How many times per year did your networks assist in issues related to the operation of your firm?". Note that this question was not mentioned in the 2005 survey questionnaire.

1.6 Discussion

I set out to study the effect of social capital on performance of SMEs in a transition economy. To frame our analysis, I base on the resourced-based theory of competitive advantage and the theories on social capital (Batjargal, 2010; Hernández-Carrión et al., 2017; Hughes, Morgan, Ireland, & Hughes, 2014; Peteraf, 1993). I distinguish between political and financial social capital. In this particular context of a transition economy where formal institutional frameworks are under-developed, I find that the relationship SMEs' owners/managers forge with key decision makers in their external environment are important. I find an inverted U-shaped relationship between political social capital and SMEs' performance. In addition, SMEs' performance increases with political social capital. If the level of political social capital is, however, too high, it is difficult for the SMEs to manage (Fan et al., 2007; Sheng et al., 2011). In other words, political social capital has positive effects on SMEs' performance up to its certain level, upon which a negative and decreasing effect sets in. I are able to identify the tipping points for political social capital and general social capital. The relationship between financial social capital and SMEs' performance only presents the increasing part of the inverted U-shaped curve. The positive effects of financial social capital on SMEs' performance are also up to a certain level (Alexy et al., 2012; Baker, 1990; Petersen & Rajan, 1994). Beyond that I do not find any harmful effects for SMEs' performance, which is opposite to Cole (1998) and Uzzi (1999).

An additional finding is about the moderating role of innovation on the relationship between social capital and SMEs' performance. I find a complementary effect between high levels of innovation and political social capital. This result might be explained by the fact that innovation increases the absorptive capacity of SMEs, which enables them to better utilize the value of external resources and knowledge. This finding is in agreement with previous studies

that political social capital enhances SMEs' legitimacy and government protection in retaining the benefits deriving from good technological competence or high levels of innovation (H. Li & Zhang, 2007; Q. Lu, 2000). It is noted that for both innovative and non-innovative SMEs the relationship between political social capital and SMEs' performance has an inverted U-shaped pattern with the same level of peak values. My results show a positive effect of financial social capital on SMEs' performance up to a certain level and then it disappears. In any case, it is found that innovation contributes to SMEs' performance and, thus, it is justified for financial institutions to provide SMEs with funding for innovation (Mateut, 2018).

From a theoretical point of view, this chapter makes several important contributions. First, it adds to the social capital literature by analyzing the role of social capital in a small business context (Hernández-Carrión et al., 2017) and testing the inverted U-shaped effects of social capital and the moderating effects of innovation on the performance of SMEs. The study adds to both social capital theory and resource-based theory of competitive advantage (Batjargal, 2010; Peteraf, 1993) by revealing the effects on SMEs' performance of both political and financial social capital. It highlights different impacts of different types social ties on SMEs' performance and, thus, is in line with other studies (Hernández-Carrión et al., 2017). This study further provides insights into the boundary conditions of social capital by analyzing the moderating role of innovation. Innovation provides SMEs with the prior knowledge and absorptive capacity required to evaluate, filter out, accept and understand the value of external resources acquired through social capital (Cohen & Levinthal, 1990; Hughes et al., 2014; Lane & Lubatkin, 1998). Overall, my study tests the theories developed in Western social environments on a sample of SMEs from a transition economy and, thus, contributing to the management research literature (Peng, 2003).

1.7 Conclusions

The chapter explores how social capital affects the performance of small- and medium-sized enterprises (SMEs) in a transition economy. Social capital is referred to as firm's social interactions with formal and informal creditors, which is financial social capital, and social interactions with politicians and civil servants, which is political social capital. Using a control function estimation method with longitudinal data from repeated surveys of small- and medium-sized enterprises (SMEs) in Vietnam, I find an inverted U-shaped relationship between social capital and SMEs' performance, which is measured by gross profit and labor productivity. I further show that there is a positive complementary effect between innovation and social capital in affecting performance of SMEs.

This chapter has some important practical implications. In transition economies, owners/managers of SMEs should consider both political and financial social capital as valuable contextual resources for increasing their performance. They should be, however, aware that a too high level of social capital could have negative effects as maintaining it will become too costly. My results confirm that innovation moderates the relationship between social capital and SMEs' performance, depending on types of social capital. Therefore, investing more in innovation is warranted for the SMEs to achieve better performance.

This study has implications for policy makers. As Hernández-Carrión et al. (2017) point out, public authorities are important for facilitating entrepreneurs' access to or contact with external actors. Organizing programs in which entrepreneurs, credit providers, and policy makers jointly participate, or creating formal associations to promote relational links among actors would enhance SMEs' performance.

This chapter has some limitations. First, my analysis focuses on a single transition economy. Future research should be conducted in other economies with similar settings to have full understanding of the relationship between social capital, innovation, and SMEs' performance. In particular, future work could examine the effect of social capital on performance by comparing developed and transition economies. Future work could analyze the effect of other forms of social capital on SMEs. The present study could be complemented by analyzing the three dimensions of social capital identified by Nahapiet and Ghoshal (1998), that is structural, relational, and cognitive social capital, in order to better understand which features of SMEs' networking activity (cohesion, relational orientation) improves access to useful resources. In addition, a sectoral study would allow identification of the degree to which social capital affects the performance of each type of business. Insights from such an analysis could improve entrepreneurs' decision making about how to work with the external actors in their environment.

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List of Figures

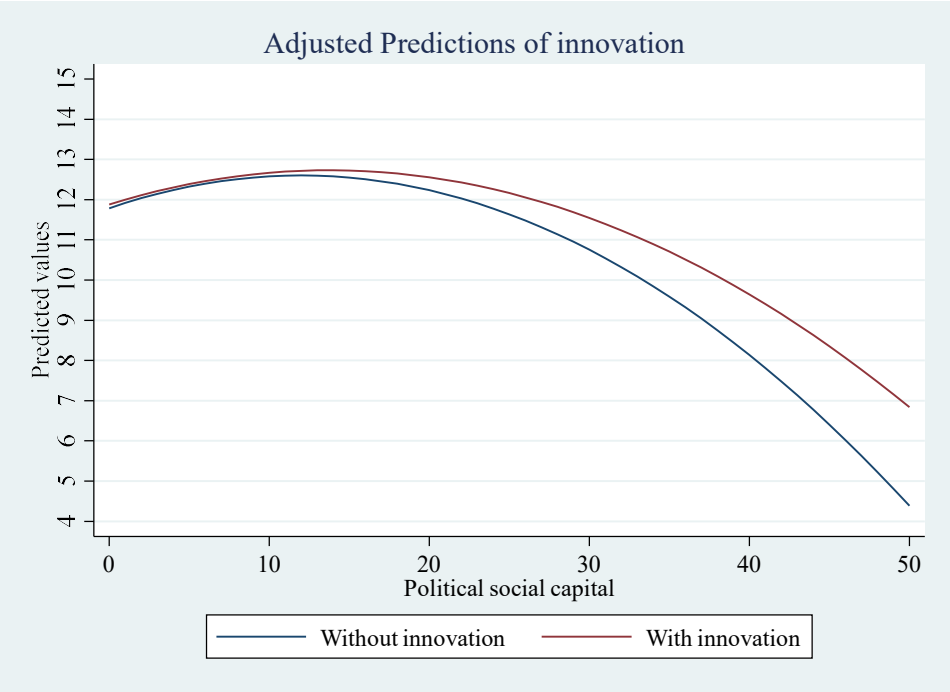

Figure 1.1 Relationship between the logarithm of gross profit and political social capital with innovation as a moderator

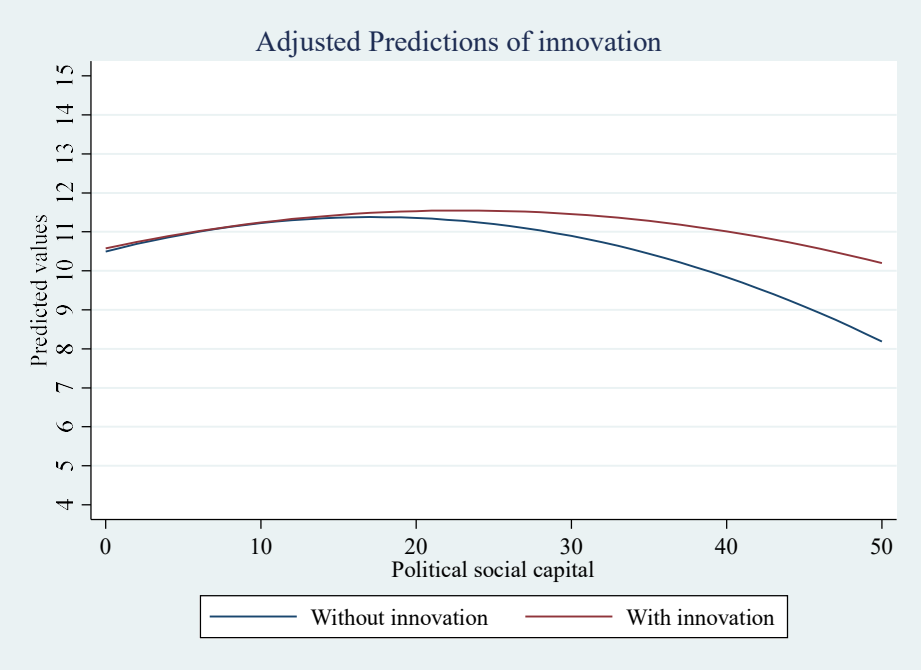

Figure 1.2 Relationship between the logarithm of labor productivity and political social capital with innovation as a moderator

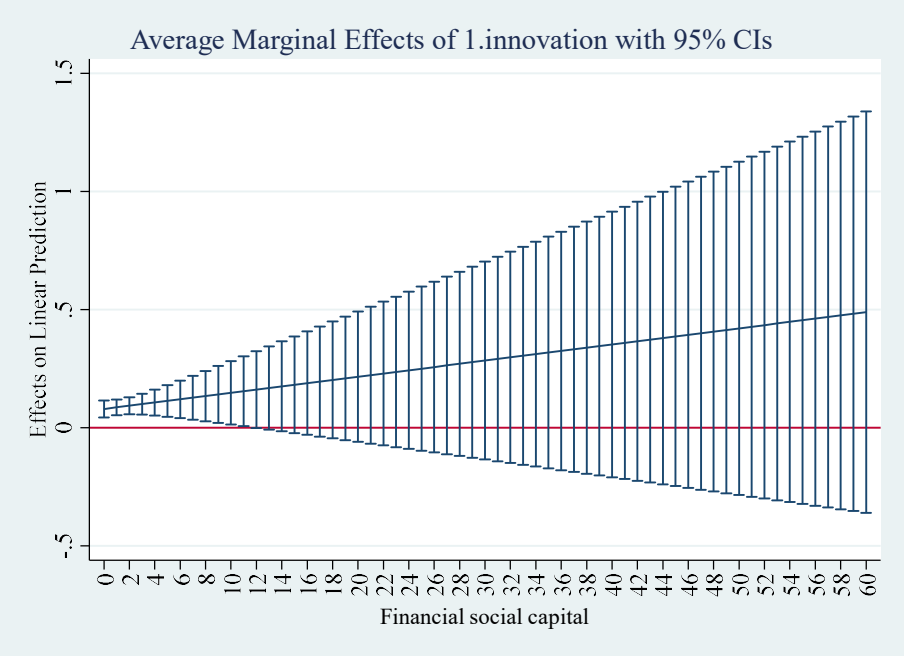

Figure 1.3 Relationship between the logarithm of gross profit and political social capital with innovation as a moderator

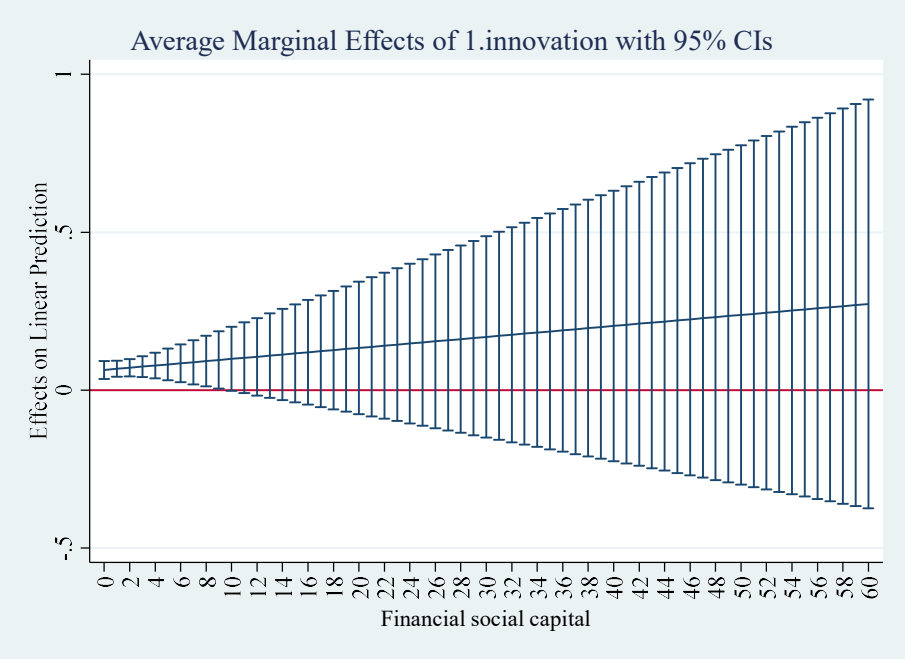

Figure 1.4 Relationship between the logarithm of labor productivity and political social capital with innovation as a moderator

List of Tables

Table 1.1 Basic statistics of main variables

Variable	Definitions	Mean	Standard deviation	Min	Max
Dependent variable					
Profit	Logarithm of real total gross profit	12.019	1.493	5.04	19.76
Productivity	Logarithm of real value added in thousand Vietnam Dong divided by the number of regular workers	10.678	0.786	6.52	17.11
Main independent variables					
PSC	Political social capital, which is measured by the number of politicians and civil servants with whom the owner/manager of the SME contacts at least once every three months	1.529	2.520	0.00	50.00
FSC	Financial social capital, which is measured by the number of credit providers with whom the owner/manager of the SME contacts at least once every three months	1.104	1.987	0.00	60.00
IN	Innovation of the SME, which is proxied by a dummy variable that takes the value of 1 if the SME has attained at least one of three categories of innovation: 1) development of new products; 2) improvement of existing products; and 3) development of new production process, and 0 otherwise	0.433	0.495	0.00	1.00
Control variables					
Fixed assets	Logarithm of real fix assets in thousand Vietnam Dong	12.931	2.712	2.76	20.91
Firm age	Logarithm of years of operation of the SME	2.408	0.709	0.69	4.34
Firm size	Logarithm of the number of regular workers	1.857	1.171	0.00	7.56
Exporter	Export of the SME, which is proxied by a dummy variable that takes the value 1 if the SME exports, and 0 otherwise	0.062	0.242	0.00	1.00
Infrastructure	Infrastructure condition, which is proxied by a dummy variable that takes the value of 1 if there is a main road leading to the SME and 0 otherwise	0.792	0.406	0.00	1.00
Instrumental variable					
LCs	Local cadres, which is proxied by a dummy variable that takes the value 1 if the previous main work's experience/positions of SME's owner/manager being local cadres, or mass organizations (e.g. farmers' union, women' union), and 0 otherwise	0.122	0.327	0.00	1.00

Note: n = 15,14

Table 1.2 Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11
1. Profit	1.000										
2. Productivity	0.766***	1.000									
3. PSC	0.163***	0.094***	1.000								
4. FSC	0.237***	0.140***	0.347***	1.000							
5. IN	0.219***	0.114***	0.071***	0.060***	1.000						
6. Fixed assets	0.529***	0.301***	0.100***	0.132***	0.186***	1.000					
7. Firm age	-0.170***	-0.134***	-0.003	-0.028***	-0.102***	-0.159***	1.000				
8. Firm size	0.798***	0.307***	0.173***	0.250***	0.250***	0.531***	-0.170***	1.000	1.000		
9. Firm size^2	0.751***	0.248***	0.173***	0.251***	0.220***	0.474***	-0.135***	0.945***	1.000		
10. Exporter	0.346***	0.159***	0.092***	0.106***	0.112***	0.186***	-0.051***	0.387***	0.434***	1.000	
11. Infrastructure	0.197***	0.173***	0.053***	0.067***	0.073***	0.101***	-0.073***	0.189***	0.161***	0.052***	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.3 The CRE estimation results from the first stage of Equation (3) – Instrumental variable, LCs

	(1) PSC	(2) FSC
LCs	0.5563***	0.2894***
	(0.0876)	(0.0634)
IN	0.1312**	0.0567
	(0.0522)	(0.0378)
Fixed assets	0.0817***	0.0086
	(0.0208)	(0.0151)
Firm age	-0.1214**	-0.0228
	(0.0587)	(0.0425)
Firm size	0.0343	0.1651**
	(0.1058)	(0.0766)
Firm size^2	0.0083	0.0022
	(0.0222)	(0.0161)
Exporter	0.2917*	-0.1389
	(0.1538)	(0.1112)
Infrastructure	0.0298	0.0908*
	(0.0689)	(0.0499)
_cons	-0.8515***	-0.6324**
	(0.2973)	(0.2801)
Provincial location dummies	YES	YES
Year dummies	YES	YES
Industry dummies	YES	YES
N	15147	15147
R^2	0.1085	0.1316

Standard errors in parentheses; The time averages of the time-variant covariates as $\overline{LCs}_i$, $\overline{IN}_i$ and $\bar{X}_i$ are excluded from Table. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.4 Estimation results from firm performance Equations (4) and (5) using control function methods for the CRE estimator

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
PSC	0.1268**	0.0921**			0.1360**	0.1025**		
	(0.0539)	(0.0421)			(0.0544)	(0.0426)		
PSC^2	-0.0045***	-0.0025**			-0.0057***	-0.0030**		
	(0.0016)	(0.0012)			(0.0019)	(0.0013)		
PSC*IN					-0.0126	-0.0180**		
					(0.0095)	(0.0076)		
PSC^2*IN					0.0012**	0.0011***		
					(0.0006)	(0.0004)		
FSC			0.2131**	0.1642**			0.2118**	0.1627**
			(0.1035)	(0.0805)			(0.1035)	(0.0805)
FSC^2			-0.0022	-0.0031			-0.0029	-0.0033
			(0.0029)	(0.0022)			(0.0029)	(0.0023)
FSC*IN							-0.0017	-0.0001
							(0.0105)	(0.0083)
FSC^2*IN							0.0007	0.0003
							(0.0004)	(0.0003)
IN	0.0842***	0.0656***	0.0867***	0.0676***	0.0951***	0.0850***	0.0853***	0.0661***
	(0.0173)	(0.0134)	(0.0169)	(0.0131)	(0.0207)	(0.0162)	(0.0193)	(0.0153)
Fixed assets	0.0896***	0.0698***	0.0968***	0.0752***	0.0897***	0.0699***	0.0967***	0.0751***
	(0.0084)	(0.0067)	(0.0072)	(0.0057)	(0.0084)	(0.0067)	(0.0072)	(0.0057)
Firm age	0.0431**	0.0261	0.0350*	0.0197	0.0435**	0.0265	0.0354*	0.0199
	(0.0210)	(0.0167)	(0.0201)	(0.0159)	(0.0210)	(0.0167)	(0.0201)	(0.0159)
Firm size	0.4368***	-0.2823***	0.4069***	-0.3048***	0.4370***	-0.2828***	0.4080***	-0.3041***
	(0.0339)	(0.0304)	(0.0380)	(0.0331)	(0.0339)	(0.0304)	(0.0380)	(0.0331)
Firm size^2	0.0188**	0.0010	0.0189**	0.0012	0.0188**	0.0011	0.0188**	0.0011
	(0.0082)	(0.0063)	(0.0082)	(0.0064)	(0.0082)	(0.0063)	(0.0082)	(0.0064)
Exporter	0.1057*	0.1528***	0.1623***	0.1936***	0.1078*	0.1548***	0.1616***	0.1932***
	(0.0612)	(0.0443)	(0.0604)	(0.0434)	(0.0613)	(0.0443)	(0.0604)	(0.0434)

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
Infrastructure	0.0055	0.0167	-0.0095	0.0056	0.0058	0.0170	-0.0092	0.0058
	(0.0202)	(0.0166)	(0.0218)	(0.0178)	(0.0202)	(0.0166)	(0.0218)	(0.0178)
$\hat{v}_{it}$ - PSC	-0.0961*	-0.0688*			-0.0945*	-0.0683		
	(0.0536)	(0.0417)			(0.0536)	(0.0417)		
$\hat{v}_{it}^2$ - PSC	0.0045***	0.0023*			0.0046**	0.0018		
	(0.0017)	(0.0012)			(0.0018)	(0.0013)		
$\hat{v}_{it}$ - FSC			-0.1962*	-0.1435*			-0.1933*	-0.1417*
			(0.1031)	(0.0802)			(0.1031)	(0.0802)
$\hat{v}_{it}^2$ - FSC			0.0024	0.0030			0.0027	0.0031
			(0.0029)	(0.0022)			(0.0030)	(0.0023)
_cons	7.9018***	8.2748***	7.9784***	8.3322***	7.9001***	8.2681***	7.9846***	8.3318***
	(0.1299)	(0.1001)	(0.1376)	(0.1057)	(0.1304)	(0.1003)	(0.1382)	(0.1062)
Testing for firm effects in equation (4) – chi2 (30)	1398.06***	1507.25***	1352.97***	1486.20***				
Testing for endogeneity in equation (4) – chi2(2)	10.06***	6.08**	4.15	4.81*				
Testing for infection point shift in equation (5) – chi2(1)[a]					0.86	0.44	0.16	0.32
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
N	15042	15147	15042	15147	15042	15147	15042	15147
R2	0.7943	0.4548	0.7944	0.4549	0.7959	0.4597	0.7960	0.4600

Robust standard errors in parentheses clustered at the firm; the time averages of the time-variant covariates in equations (4) and (5) are excluded from Table.

[a] The results of the test for nonlinear combinations of parameter estimates is from nlcom and test commands in Stata. The residuals, $\hat{v}_{it}$, are obtained from equation (3) by using the CRE estimator; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.5 Testing for the inverted U-shaped relationship between social capital and firm performance

	Profit		Productivity		Profit		Productivity	
	Political Social Capital		Political Social Capital		Financial Social Capital		Financial Social Capital	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Interval	0	50	0	50	0	60	0	60
Slope	0.127	-0.327	0.092	-0.159	0.213	-0.053	0.164	-0.204
t-value	2.350	-1.988	2.189	-1.339	2.058	-0.155	2.039	-0.763
P-value	0.009	0.023	0.014	0.090	0.019	0.438	0.020	0.223
95% Fieller interval for inflection point	2.388		35.796	2.090	48.504		Out of range	
Inflection point	14		18		48		27	

Note: The results in this Table are obtained using the utest command in Stata which was provided by Lind and Mehlum (2019)

Appendix

Table A1.1 Results from Equations (1) and (2) using the random effects models

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
PSC	0.0176***	0.0181***			0.0305***	0.0338***		
	(0.0040)	(0.0031)			(0.0070)	(0.0057)		
PSC^2	-0.0003**	-0.0004***			-0.0015***	-0.0016***		
	(0.0001)	(0.0001)			(0.0005)	(0.0004)		
PSC*IN					-0.0176**	-0.0231***		
					(0.0086)	(0.0068)		
PSC^2*IN					0.0013**	0.0014***		
					(0.0005)	(0.0004)		
FSC			0.0285***	0.0290***			0.0278***	0.0302***
			(0.0050)	(0.0039)			(0.0073)	(0.0058)
FSC^2			-0.0003*	-0.0005***			-0.0005	-0.0007**
			(0.0001)	(0.0001)			(0.0004)	(0.0003)
FSC*IN							0.0036	-0.0009
							(0.0095)	(0.0075)
FSC^2*IN							0.0003	0.0003
							(0.0004)	(0.0004)
IN	0.1290***	0.1050***	0.1292***	0.1053***	0.1461***	0.1297***	0.1234***	0.1046***
	(0.0142)	(0.0110)	(0.0142)	(0.0110)	(0.0176)	(0.0140)	(0.0163)	(0.0131)
Fixed assets	0.1504***	0.1254***	0.1509***	0.1258***	0.1503***	0.1253***	0.1508***	0.1258***
	(0.0058)	(0.0047)	(0.0058)	(0.0047)	(0.0058)	(0.0047)	(0.0058)	(0.0047)
Firm age	-0.0458***	-0.0690***	-0.0442***	-0.0676***	-0.0456***	-0.0688***	-0.0441***	-0.0676***
	(0.0117)	(0.0096)	(0.0116)	(0.0096)	(0.0117)	(0.0096)	(0.0116)	(0.0096)
Firm size	0.6042***	0.0006	0.6004***	-0.0021	0.6030***	-0.0012	0.6014***	-0.0019
	(0.0239)	(0.0208)	(0.0238)	(0.0207)	(0.0239)	(0.0208)	(0.0238)	(0.0207)
Firm size^2	0.0274***	-0.0144***	0.0269***	-0.0151***	0.0276***	-0.0141***	0.0266***	-0.0152***

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
	(0.0051)	(0.0040)	(0.0050)	(0.0040)	(0.0051)	(0.0040)	(0.0050)	(0.0040)
Exporter	0.2005***	0.2074***	0.2016***	0.2074***	0.2019***	0.2092***	0.2010***	0.2072***
	(0.0442)	(0.0312)	(0.0441)	(0.0311)	(0.0442)	(0.0312)	(0.0441)	(0.0310)
Infrastructure	0.0733***	0.0907***	0.0727***	0.0905***	0.0733***	0.0908***	0.0726***	0.0904***
	(0.0168)	(0.0140)	(0.0167)	(0.0140)	(0.0168)	(0.0140)	(0.0167)	(0.0140)
_cons	8.4812***	8.7868***	8.4834***	8.7875***	8.4728***	8.7750***	8.4865***	8.7881***
	(0.0844)	(0.0671)	(0.0843)	(0.0669)	(0.0845)	(0.0671)	(0.0846)	(0.0671)
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
N	15042	15147	15043	15148	15042	15147	15043	15148

Robust standard errors in parentheses clustered at the firm; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A1.2 Results from Equations (1) and (2) using the CRE models

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
PSC	0.0168***	0.0163***			0.0289***	0.0295***		
	(0.0044)	(0.0033)			(0.0077)	(0.0062)		
PSC^2	-0.0003*	-0.0003***			-0.0013**	-0.0013***		
	(0.0001)	(0.0001)			(0.0006)	(0.0004)		
PSC*IN					-0.0164*	-0.0195***		
					(0.0094)	(0.0074)		
PSC^2*IN					0.0012**	0.0011***		
					(0.0006)	(0.0004)		
FSC			0.0107*	0.0127***			0.0121*	0.0136**
			(0.0059)	(0.0045)			(0.0074)	(0.0058)
FSC^2			0.0002	-0.0001			-0.0002	-0.0003
			(0.0002)	(0.0001)			(0.0003)	(0.0003)
FSC*IN							-0.0032	-0.0019
							(0.0103)	(0.0080)
FSC^2*IN							0.0008*	0.0004
							(0.0004)	(0.0003)
IN	0.0979***	0.0755***	0.0991***	0.0768***	0.1143***	0.0970***	0.0988***	0.0768***
	(0.0159)	(0.0123)	(0.0158)	(0.0122)	(0.0197)	(0.0155)	(0.0182)	(0.0145)
Fixed assets	0.0977***	0.0756***	0.0987***	0.0766***	0.0977***	0.0756***	0.0986***	0.0765***
	(0.0071)	(0.0056)	(0.0071)	(0.0056)	(0.0071)	(0.0056)	(0.0071)	(0.0056)
Firm age	0.0324	0.0183	0.0312	0.0169	0.0330*	0.0188	0.0316	0.0171
	(0.0200)	(0.0158)	(0.0200)	(0.0158)	(0.0200)	(0.0158)	(0.0200)	(0.0158)
Firm size	0.4411***	-0.2793***	0.4400***	-0.2802***	0.4407***	-0.2802***	0.4405***	-0.2799***
	(0.0339)	(0.0304)	(0.0339)	(0.0305)	(0.0339)	(0.0304)	(0.0340)	(0.0305)
Firm size^2	0.0192**	0.0014	0.0192**	0.0013	0.0193**	0.0016	0.0191**	0.0013
	(0.0081)	(0.0063)	(0.0082)	(0.0063)	(0.0081)	(0.0063)	(0.0082)	(0.0063)
Exporter	0.1330**	0.1728***	0.1378**	0.1757***	0.1351**	0.1752***	0.1376**	0.1756***
	(0.0589)	(0.0421)	(0.0589)	(0.0423)	(0.0589)	(0.0422)	(0.0589)	(0.0422)

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
Infrastructure	0.0078	0.0183	0.0078	0.0183	0.0082	0.0187	0.0079	0.0184
	(0.0202)	(0.0166)	(0.0202)	(0.0166)	(0.0202)	(0.0166)	(0.0202)	(0.0166)
_cons	7.8541***	8.2376***	7.8838***	8.2629***	7.8511***	8.2291***	7.8909***	8.2623***
	(0.1213)	(0.0937)	(0.1211)	(0.0931)	(0.1218)	(0.0939)	(0.1218)	(0.0937)
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
N	15042	15147	15043	15148	15042	15147	15043	15148

Robust standard errors in parentheses clustered at the firm; the time averages of the time-variant covariates are excluded from Table; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A1.3 Estimation results of general social capital from firm performance Equations (4) and (5) using control function methods for the CRE estimator

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity
GSC	0.0845**	0.0641**	0.0896**	0.0691**
	(0.0355)	(0.0277)	(0.0357)	(0.0280)
GSC^2	-0.0018***	-0.0013***	-0.0024***	-0.0016***
	(0.0006)	(0.0005)	(0.0007)	(0.0005)
GSC*IN			-0.0084	-0.0103*
			(0.0067)	(0.0054)
GSC^2*IN			0.0006**	0.0005**
			(0.0003)	(0.0002)
IN	0.0850***	0.0663***	0.0971***	0.0845***
	(0.0172)	(0.0133)	(0.0220)	(0.0175)
Fixed assets	0.0919***	0.0715***	0.0920***	0.0716***
	(0.0078)	(0.0062)	(0.0078)	(0.0063)
Firm age	0.0407**	0.0242	0.0409**	0.0244
	(0.0206)	(0.0163)	(0.0206)	(0.0163)
Firm size	0.4252***	-0.2910***	0.4257***	-0.2912***
	(0.0346)	(0.0308)	(0.0347)	(0.0308)
Firm size^2	0.0191**	0.0012	0.0191**	0.0013
	(0.0082)	(0.0063)	(0.0082)	(0.0064)
Exporter	0.1241**	0.1661***	0.1235**	0.1661***
	(0.0592)	(0.0426)	(0.0592)	(0.0425)
Infrastructure	0.0001	0.0126	0.0006	0.0131
	(0.0204)	(0.0168)	(0.0204)	(0.0168)
$\hat{v}_{it}$ - GSC	-0.0630*	-0.0451	-0.0610*	-0.0438
	(0.0352)	(0.0275)	(0.0353)	(0.0275)
$\hat{v}_{it}^2$ - GSC	0.0019***	0.0012**	0.0020***	0.0011**
	(0.0007)	(0.0005)	(0.0007)	(0.0005)
_cons	7.9337***	8.3002***	7.9293***	8.2874***
	(0.1325)	(0.1020)	(0.1334)	(0.1026)
Provincial location dummies	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
N	15043	15148	15043	15148

Robust standard errors in parentheses clustered at the firm; the time averages of the time-variant covariates in equations (4) and (5) are excluded from Table. The residuals, $\hat{v}_{it}$, are obtained from equation (3) by using the CRE estimator; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A1.4 Estimation results from firm performance Equations (4) and (5) using control function methods for the CRE estimator (Poisson models in the first stage)

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
PSC	0.177***	0.114***			0.190***	0.130***		
	(0.0341)	(0.0257)			(0.0348)	(0.0265)		
PSC^2	-0.004***	-0.002***			-0.005***	-0.003***		
	(0.0012)	(0.0009)			(0.0015)	(0.0010)		
PSC*IN					-0.015	-0.019**		
					(0.0095)	(0.0076)		
PSC^2*IN					0.001**	0.001***		
					(0.0006)	(0.0004)		
FSC			0.167***	0.106***			0.166***	0.106***
			(0.0361)	(0.0259)			(0.0362)	(0.0260)
FSC^2			-0.003	-0.004**			-0.004	-0.004**
			(0.0026)	(0.0019)			(0.0026)	(0.0019)
FSC*IN							-0.002	0.000
							(0.0105)	(0.0082)
FSC^2*IN							0.001	0.000
							(0.0004)	(0.0003)
IN	0.077***	0.063***	0.089***	0.071***	0.090***	0.082***	0.088***	0.069***
	(0.0163)	(0.0127)	(0.0159)	(0.0123)	(0.0200)	(0.0158)	(0.0183)	(0.0146)
Fixed assets	0.085***	0.068***	0.097***	0.076***	0.085***	0.068***	0.097***	0.075***
	(0.0075)	(0.0059)	(0.0071)	(0.0056)	(0.0075)	(0.0059)	(0.0071)	(0.0056)
Firm age	0.049**	0.029*	0.034*	0.019	0.050**	0.030*	0.035*	0.019
	(0.0203)	(0.0161)	(0.0200)	(0.0157)	(0.0203)	(0.0161)	(0.0200)	(0.0158)
Firm size	0.435***	-0.283***	0.415***	-0.295***	0.434***	-0.284***	0.416***	-0.294***
	(0.0339)	(0.0304)	(0.0343)	(0.0307)	(0.0339)	(0.0304)	(0.0343)	(0.0307)
Firm size^2	0.018**	0.001	0.019**	0.001	0.018**	0.001	0.019**	0.001
	(0.0081)	(0.0063)	(0.0081)	(0.0063)	(0.0081)	(0.0063)	(0.0081)	(0.0063)
Exporter	0.090	0.147***	0.157***	0.186***	0.092	0.147***	0.157***	0.186***

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
	(0.0599)	(0.0431)	(0.0589)	(0.0422)	(0.0600)	(0.0431)	(0.0589)	(0.0422)
Infrastructure	0.004	0.016	-0.005	0.011	0.004	0.016	-0.005	0.011
	(0.0202)	(0.0166)	(0.0203)	(0.0167)	(0.0202)	(0.0166)	(0.0203)	(0.0167)
$\hat{v}_{it}$ - PSC	-0.148***	-0.092***			-0.150***	-0.095***		
	(0.0330)	(0.0247)			(0.0330)	(0.0248)		
$\hat{v}_{it}^2$ - PSC	0.004***	0.002**			0.004***	0.002**		
	(0.0013)	(0.0010)			(0.0014)	(0.0010)		
$\hat{v}_{it}$ - FSC			-0.148***	-0.083***			-0.146***	-0.083***
			(0.0334)	(0.0240)			(0.0334)	(0.0240)
$\hat{v}_{it}^2$ - FSC			0.003	0.004**			0.004	0.004**
			(0.0026)	(0.0019)			(0.0026)	(0.0020)
_cons	7.943***	8.293***	7.965***	8.304***	7.942***	8.288***	7.969***	8.303***
	(0.1222)	(0.0950)	(0.1215)	(0.0945)	(0.1226)	(0.0951)	(0.1220)	(0.0949)
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
N	15042	15147	15043	15148	15042	15147	15043	15148

Robust standard errors in parentheses clustered at the firm; the time averages of the time-variant covariates in equations (4) and (5) are excluded from Table. The residuals, $\hat{v}_{it}$, are obtained from equation (3) by using the CRE approach with Poisson models; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A1.5 Estimation results from firm performance Equations (4) and (5) using control function methods for the CRE estimator (Negative binomial models in the first stage)

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
PSC	0.152***	0.101***			0.165***	0.116***		
	(0.0291)	(0.0221)			(0.0299)	(0.0229)		
PSC^2	-0.004***	-0.002***			-0.005***	-0.003***		
	(0.0013)	(0.0009)			(0.0015)	(0.0010)		
PSC*IN					-0.014	-0.019**		
					(0.0095)	(0.0076)		
PSC^2*IN					0.001**	0.001***		
					(0.0006)	(0.0004)		
FSC			0.124***	0.082***			0.123***	0.082***
			(0.0288)	(0.0206)			(0.0290)	(0.0208)
FSC^2			-0.003	-0.003**			-0.003	-0.004**
			(0.0023)	(0.0017)			(0.0023)	(0.0017)
FSC*IN							-0.002	0.000
							(0.0105)	(0.0082)
FSC^2*IN							0.001	0.000
							(0.0004)	(0.0003)
IN	0.081***	0.065***	0.091***	0.072***	0.094***	0.084***	0.089***	0.070***
	(0.0162)	(0.0126)	(0.0159)	(0.0123)	(0.0199)	(0.0157)	(0.0183)	(0.0146)
Fixed assets	0.086***	0.068***	0.097***	0.076***	0.085***	0.068***	0.097***	0.075***
	(0.0075)	(0.0059)	(0.0071)	(0.0056)	(0.0075)	(0.0059)	(0.0071)	(0.0056)
Firm age	0.047**	0.027*	0.034*	0.019	0.047**	0.028*	0.035*	0.019
	(0.0203)	(0.0160)	(0.0200)	(0.0157)	(0.0202)	(0.0160)	(0.0200)	(0.0158)
Firm size	0.430***	-0.286***	0.420***	-0.292***	0.430***	-0.287***	0.421***	-0.292***
	(0.0340)	(0.0305)	(0.0342)	(0.0306)	(0.0340)	(0.0305)	(0.0343)	(0.0306)
Firm size^2	0.021***	0.003	0.020**	0.002	0.021***	0.003	0.020**	0.002
	(0.0082)	(0.0063)	(0.0081)	(0.0063)	(0.0082)	(0.0063)	(0.0081)	(0.0063)
Exporter	0.107*	0.157***	0.151**	0.183***	0.109*	0.158***	0.151**	0.183***

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
	(0.0595)	(0.0427)	(0.0589)	(0.0422)	(0.0595)	(0.0427)	(0.0589)	(0.0422)
Infrastructure	0.004	0.016	-0.003	0.012	0.004	0.016	-0.002	0.012
	(0.0202)	(0.0166)	(0.0203)	(0.0167)	(0.0202)	(0.0166)	(0.0203)	(0.0167)
$\hat{v}_{it}$ - PSC	-0.123***	-0.078***			-0.125***	-0.082***		
	(0.0281)	(0.0212)			(0.0282)	(0.0212)		
$\hat{v}_{it}^2$ - PSC	0.004***	0.002**			0.004***	0.002*		
	(0.0013)	(0.0009)			(0.0014)	(0.0010)		
$\hat{v}_{it}$ - FSC			-0.106***	-0.061***			-0.104***	-0.060***
			(0.0266)	(0.0191)			(0.0266)	(0.0191)
$\hat{v}_{it}^2$ - FSC			0.003	0.003**			0.003	0.003**
			(0.0023)	(0.0017)			(0.0023)	(0.0017)
_cons	7.950***	8.300***	7.964***	8.306***	7.949***	8.295***	7.969***	8.305***
	(0.1226)	(0.0954)	(0.1219)	(0.0949)	(0.1229)	(0.0955)	(0.1225)	(0.0953)
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
N	15042	15147	15043	15148	15042	15147	15043	15148

Robust standard errors in parentheses clustered at the firm; the time averages of the time-variant covariates in equations (4) and (5) are excluded from Table. The residuals, $\hat{v}_{it}$, are obtained from equation (3) by using the CRE approach with Negative binomial models; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A1.6 Estimation results of network intensity (NI)[a] from firm performance Equations (4) and (5) using control function methods for the CRE estimator

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
PSC NI	0.0914**	0.0724**			0.1282***	0.0759**		
	(0.0402)	(0.0360)			(0.0461)	(0.0360)		
PSC NI^2	-0.0008*	-0.0005			-0.0010**	-0.0007**		
	(0.0005)	(0.0003)			(0.0005)	(0.0003)		
PSC NI*IN					-0.0077*	-0.0067**		
					(0.0045)	(0.0033)		
PSC NI^2*IN					0.0002**	0.0001**		
					(0.0001)	(0.0001)		
FSC NI			0.0571**	0.0352*			0.0555**	0.0353**
			(0.0249)	(0.0182)			(0.0241)	(0.0174)
FSC NI^2			-0.0003	-0.0004**			-0.0003	-0.0003*
			(0.0002)	(0.0002)			(0.0002)	(0.0002)
FSC NI*IN							-0.0023	-0.0012
							(0.0040)	(0.0031)
FSC NI^2*IN							0.0000	0.0000
							(0.0001)	(0.0000)
IN	0.0542**	0.0392**	0.0605***	0.0518***	0.0511*	0.0507**	0.0667***	0.0547***
	(0.0228)	(0.0197)	(0.0207)	(0.0158)	(0.0270)	(0.0210)	(0.0222)	(0.0171)
Fixed assets	0.0657***	0.0508***	0.0836***	0.0690***	0.0524***	0.0511***	0.0837***	0.0690***
	(0.0141)	(0.0126)	(0.0082)	(0.0064)	(0.0159)	(0.0126)	(0.0082)	(0.0064)
Firm age	-0.0112	-0.0168	-0.0009	-0.0080	-0.0160	-0.0169	-0.0009	-0.0080
	(0.0243)	(0.0201)	(0.0250)	(0.0197)	(0.0255)	(0.0201)	(0.0250)	(0.0197)
Firm size	0.3683***	-0.3458***	0.3817***	-0.3307***	0.3530***	-0.3461***	0.3830***	-0.3309***
	(0.0444)	(0.0405)	(0.0430)	(0.0375)	(0.0472)	(0.0405)	(0.0427)	(0.0372)
Firm size^2	0.0374***	0.0174**	0.0366***	0.0147*	0.0417***	0.0173**	0.0364***	0.0148*
	(0.0100)	(0.0084)	(0.0101)	(0.0078)	(0.0106)	(0.0083)	(0.0100)	(0.0078)
Exporter	0.1304*	0.1551***	0.1265*	0.1563***	0.1235*	0.1563***	0.1279*	0.1567***

	(1) Profit	(2) Productivity	(3) Profit	(4) Productivity	(5) Profit	(6) Productivity	(7) Profit	(8) Productivity
	(0.0667)	(0.0508)	(0.0690)	(0.0506)	(0.0694)	(0.0508)	(0.0691)	(0.0507)
Infrastructure	-0.0030	0.0033	0.0056	0.0143	-0.0126	0.0043	0.0059	0.0142
	(0.0241)	(0.0210)	(0.0235)	(0.0196)	(0.0256)	(0.0210)	(0.0235)	(0.0195)
$\hat{v}_{it}$ – PSC NI	-0.0826**	-0.0651*			-0.1147**	-0.0647*		
	(0.0401)	(0.0359)			(0.0459)	(0.0359)		
$\hat{v}_{it}^2$ – PSC NI	0.0007	0.0005			0.0009*	0.0006*		
	(0.0005)	(0.0003)			(0.0005)	(0.0003)		
$\hat{v}_{it}$ – FSC NI			-0.0528**	-0.0305*			-0.0506**	-0.0305*
			(0.0247)	(0.0182)			(0.0241)	(0.0174)
$\hat{v}_{it}^2$ – FSC NI			0.0004	0.0005**			0.0003	0.0004*
			(0.0003)	(0.0002)			(0.0003)	(0.0002)
_cons	8.7269***	9.3666***	9.1025***	9.3583***	9.1165***	9.3668***	9.1088***	9.3575***
	(0.1652)	(0.0768)	(0.0943)	(0.0750)	(0.0959)	(0.0769)	(0.0947)	(0.0753)
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
N	12361	12455	12361	12455	12361	12455	12361	12455

[a] Network intensity data was not surveyed in 2005; Robust standard errors in parentheses clustered at the firm; the time averages of the time-variant covariates in equations (4) and (5) are excluded from Table. The residuals, $\hat{v}_{it}$, are obtained from equation (3) by using the CRE approach; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Chapter 2 Effects of tax administration corruption on innovation inputs and outputs: Evidence from small and medium sized enterprises in Vietnam[15]

2.1 Introduction and context

This chapter is concerned with the intersection between two strands of the literature, namely, corruption and innovation. That innovation is a main engine for economic growth and development is widely accepted in the literature (Aghion, Akcigit, & Howitt, 2014; Aghion, Howitt, Howitt, Brant-Collett, & García-Peñalosa, 1998; Almeida & Fernandes, 2008; Grossman & Helpman, 1994; Romer, 1990). At the micro level, innovation determines the growth of firms (Audretsch, 1995; Audretsch, Coad, & Segarra, 2014; Brouwer, Kleinknecht, & Reijnen, 1993; Coad & Rao, 2008). Firm innovation[16] is shaped by both internal and external factors. Internal factors include ability of firms to innovate, firm investment, and research and development (R&D). External factors relates to the business environment, where prevalence of corruption has significant effects on firm innovation in both low-income countries ((Ayyagari, Demirgüç-Kunt, & Maksimovic, 2014; Paunov, 2016; Xie, Qi, & Zhu, 2018) and high-income countries (Dincer 2019; Ellis 2019; Heo et al. 2020; Wen et al. 2020).

Corruption, generally defined as abuse of public office for personal gains (see, for example, June, Chowdhury, Heller, & Werve, 2008: 6), is pervasive across nations and over time. It is widely agreed that corruption has significant effects on economic development (see, for example, Davoodi & Tanzi, 2002; Kaufmann, Kraay, & Mastruzzi, 2011; Leff, 1964;

[15] Authors: Hung Quang Doan, Nam Hoang Vu, Binh Tran-Nam and Ngoc-Anh Nguyen; this chapter has been published in the Empirical Economics.

[16] According to the Organisation for Economic Co-operation and Development (OECD, 2005), firms' innovative activities include both innovation inputs and outputs. The former refers to such activities as expenditure in R&D and investment in non-R&D activities to improve productivity or quality of output. The latter refers to the introduction of new products or new production processes, improvement of existing products, new marketing products, registered patents, etc.

Mauro, 1995). These studies provide two opposing hypotheses about this phenomenon, namely, "sand-the-wheels" and "grease-the-wheels." The second, counterintuitive hypothesis is mainly advanced and supported in the presence of weak institutions (Aidt, 2003; Méon & Sekkat, 2005; Méon & Weill, 2010).

According to the grease-the-wheels viewpoint, corruption may reduce the time spent in queues (Lui, 1985), improve the quality of the civil service (Bayley, 1966; Leys, 2017), reduce the regulations of firm entry (Dreher & Gassebner, 2013; Klapper, Laeven, & Rajan, 2006) and promote efficient growth (Vial & Hanoteau, 2010). Supporting the sand-the-wheels hypothesis, significantly negative effects of corruption on investment are confirmed by, for example, Mauro (1995) and (Wei, 2000). Negative effects of corruption on economic growth are transmitted via its effect on political stability, human capital and private investment (Mo, 2001) or on productivity (Lambsdorff, 2003). Empirical studies suggest that whether corruption is sanding or greasing the wheels of firm innovation is largely shaped by contextual factors.

An important form of corruption in many developing countries is tax administration corruption. Yet, there exist to date very few, if any, rigorous studies that explicitly examine the impact of tax administration corruption on either innovation inputs or innovation outputs, possibly due to the lack of relevant data at the firm level. The present study attempts to fill the gap in the literature by providing an empirical analysis of the impact of tax corruption on innovation of small and medium sized enterprises (SMEs) in Vietnam, using longitudinal data from biennial surveys of SMEs in Vietnam from 2005 to 2015.

Vietnam is chosen for the study for several reasons. First, Vietnam has a dynamic economy in transition with an increasing number of SMEs in the private sector. From a market perspective, Vietnam's continuing growth depends crucially on the growth and innovation of its private sector. Secondly, like many other developing countries, Vietnam has been suffering from widespread corruption in general and tax corruption in particular. In fact, corruption has

been perceived by many different stakeholders as one of the most critical issues facing Vietnam at present (World Bank and Government Inspectorate of Vietnam, 2012). Thirdly, and interestingly, despite widely reported tax corruption, Vietnam is classified as a high-tax-collection and high-tax-effort country in a study of determinants of tax level (Le, Moreno-Dodson, & Bayraktar, 2012: 25).

The present paper seeks to make three contributions to the existing literature on the effects of corruption on firm innovation in Vietnam. The first contribution is that the paper appears, to the best of our knowledge, to be the first that explicitly and rigorously investigates the impact of tax corruption on innovation inputs and outputs at the firm level, whereas Nguyen et al. (2016) is only concerned with general corruption on innovation outputs in Vietnam. Note that, in my study, tax corruption is confined to tax administration corruption, which is measured by the amount of tax bribe from business taxpayers to tax auditors, while Nguyen et al. (2016) only consider the propensity (yes or no) of general bribery. The second contribution is to provide theoretical arguments that shed lights on the positive effect of tax administration corruption on firms' innovative activities, including both innovation inputs and outputs. That is, my theoretical model concurs with the grease-the-wheels hypothesis, which tends to hold for transition or developing economies. The third contribution is the application of an appropriate empirical strategy to the problem under study, which was not employed in Nguyen et al. (2016). More specifically, I apply the control function method for dynamic non-linear panel data models. This estimation methodology is employed to deal with endogeneity, unobserved heterogeneity and initial condition problems simultaneously (Giles & Murtazashvili, 2013; Michler & Josephson, 2017; Papke & Wooldridge, 2008; Wooldridge, 2005). My results show that tax corruption has a far greater impact on innovation than the 'naïve' random effects (RE) and the dynamic RE models.

The remainder of this chapter is structured as follows. Section 2.2 provides a brief review of the literature whereas Section 2.3 briefly considers tax corruption and corporate taxation in Vietnam. Section 2.4 discusses the theoretical framework and estimation strategy, which is followed by sources of data and variable definitions in Section 2.5. In Section 2.6, the empirical results obtained are interpreted and discussed. Section 2.7 offer some concluding remarks and policy recommendations.

2.2 Literature review

In this section, I will first review theoretical arguments and then empirical studies. There are a few theoretical studies on the impact of corruption on innovation. The institutional environments that include formal and informal institutions in which firms must actively response to obtain resources to growth and survive. The institutional theory (North, 2005) is that formal institutions are the fundamentals to form an environment for reducing transaction costs and uncertainty in economic activities. While the institutional reforms in transition economies as Viet Nam are likely to increate policy instability and to be characterized by weak formal institutions, which create an environment that fosters corruption (Xie et al, 2018; Marquis and Raynard, 2015). When corruption become the norms for conducting business, referring to informal institutions. From the perspective of organizational theory, Luo (2005) identifies how corruption negatively affects innovation via two main channels: bribery as a substitute to innovation, and interpersonal trust and trustworthiness. In contrast, it has been argued that corruption may increase efficiency and thus innovation via various channels (Leff, 1964; Lui, 1985; Mahagaonkar, 2010). From this perspective, corruption speeds up the governmental process, reduces uncertainty, and introduces competition to scarce government resources. These two contrasting schools of thought correspond to the above-mentioned sand-the-wheels and grease-the-wheels, respectively.

The number of empirical studies linking corruption and innovation has been growing considerably in the past few years, partly due to data availability. First, there are single- and cross-country studies. Country-specific research focuses on developing or transition economies, for example, Bulgaria (Krastanova, 2014), China (Trinh, 2019; Xia et al., 2018; Xie et al., 2019; Xu & Yano, 2017), Egypt and Tunisia (Goedhuys et al., 2016), India (de Waldemar, 2012), Pakistan (Imran et al., 2020) and Vietnam (Nguyen et al., 2016). The only exception seems to be the US (Dincer, 2019; Ellis et al., 2019). Cross-country studies also concentrate on emerging economies (Krammer, 2019; Paunov, 2016; Pirtea et al., 2019), African economies (Barasa, 2018; Mahagaonkar, 2010) and Eastern European and Central Asian economies (Habiyaremye & Raymond, 2018; Kabadurmuş, 2017). An exception is the member countries of the OECD (Wen et al., 2020), and a mixture of emerging and advanced nations (Heo et al., 2020).

Most empirical studies utilize firm-level data from various versions of the World Bank's Enterprise Surveys. Another important source of data is the European Bank for Reconstruction and Development (EBRD)'s Business Environment and Enterprise Performance Surveys (BEEPs). Some of these studies only consider cross-section of data (Krammer 2019) while others examine longitudinal data (Paunov, 2016; Pirtea et al., 2019; Xu & Yano, 2017). There are also a small number of studies which analyze panel data at the provincial level (Diner, 2019; Ellis et al., 2019) or national level (Anokhin & Schulze, 2009; Wen et al., 2020).

The studies that employ enterprise survey data measure innovation by the propensity to innovate (yes or no) and tend to focus on innovation outputs such a product or process innovation. An exception is Paunov (2016) who considers innovation inputs such as quality certificates and patents. Most of the firm-level studies measure corruption by using firms'

information about spending on gifts or informal payments to public officials to get better services regarding customs, taxes, licenses, etc.

The studies that utilize more aggregated data tend to define innovation as innovation inputs, e.g., quantity and quality of patents (Dincer, 2019) or resident patent applications and rates of realized innovation (Anokhin & Schulze, 2009). Corruption at provincial level is measured in terms of number of corruption convictions or number of corruption stories reported in the press (Dincer, 2019). At the national level, a popular measure of corruption is the control of corruption variable within the World Banks' World Governance Indicators.

Not surprisingly, empirical results concerning the broad effect of corruption on innovation are very heterogenous. Many studies have found that corruption has a negative impact on innovation (Anokhin & Schulze 2009; de Waldemar, 2012; Dincer, 2019; Habiyaremye & Raymond, 2018; Paunov, 2016). Nonetheless, other studies have concluded that corruption has a positive impact on innovation in the context of transition and developing economies (Ayyagari et al., 2014; Imran et al., 2020; Kabadurmuş, 2017; Krastanova, 2014; Nguyen et al., 2016, Xie et al., 2018).

The effects of corruption on innovation at a more detailed level are found to be dependent on various factors including types of innovation (corruption hinders product and organizational innovation but encourages marketing innovation; see Mahagaonkar (2010)), types of corruption (Krammer, 2019; Paunov, 2016), firm size (smaller firms are badly affected; see Paunov (2016)) or nature of the firm (state ownership and political connection matter; see Xu & Yano (2017)). Wen et al. (2020) further suggest that is a threshold level of corruption control. Above this threshold further control is beneficial to innovation but below which it is not.

There are a few studies that relate to taxation in emerging economies. For instance, Sharma and Mitra (2015) show that, in India, tax-evading firms are likely to pay larger amounts

of bribe to public officials than tax-compliant firms. Further, corruption is found to have a positive effect on product innovation but a negative effect on firms' efficiency. In the context of Chinese corporate tax reform and innovation, Cai et al. (2018: 2) argue that "lower taxes may reduce resources that firms spend on tax evasion, such as costs of bribing tax officers, which can be instead used on innovation activities."[17] The authors then find that lower corporate tax rate did stimulate innovation (R&D expenditure and number of patent applications) of medium and large enterprises as a result of the 2002 corporate tax cut in China.

The review of existing literature presented above reveals several research gaps. First, there is not yet a rigorous study that explicitly focuses on the direct effects of tax administration corruption on innovation in spite of the importance of the tax system in the reform and development of transition and developing countries (Hussain & Stern, 1993). Secondly, while IVs have been employed to deal with endogeneity, insufficient attention has been paid to the simultaneous presence of endogeneity, state dependence and initial condition problem. The present paper attempts to address these gaps by examining the impact of tax corruption on innovative activities of SMEs in Vietnam, utilizing an appropriate estimation strategy.

To summarize the above reasonings, my key hypothesis can be stated as follows:

Hypothesis 1: Other things being equal, tax corruption has a positive impact on SMEs' innovation outputs in Vietnam.

Hypothesis 2: Other things being equal, tax corruption has a positive impact on SMEs' innovation inputs in Vietnam.

[17] This seems to be a natural extension of a previously made argument that "firms under greater competition pressure are more motivated to avoid tax so as to have more investment money to compete in the market place" (Cai & Liu, 2009: 765).

2.3 Tax corruption and Vietnam's corporate taxation

2.3.1 What is tax corruption?

As a subset of general corruption, tax corruption refers to the unlawful exercise of public office by tax officials for their personal benefits (see, for example, June et al., 2008: 12). The benefits to corrupted tax officials consist of not only financial but also non-financial gains. In the context of developing countries, tax corruption can be defined more accurately as "behavior on part of tax officials to improperly and unlawfully enrich themselves, or those close to them, by the misuse of the public power entrusted to them" (J. Li, 1997: 475). This definition implies that in countries where the traditional culture encourages sharing, especially among members of an extended family including parents, spouses, children, and relatives or members of the same village (Vu et al., 2009), the well-being of people who are close to the corrupted tax officials is also of relevance.

Tax corruption, as defined above, could be classified in different ways depending on where the corruption happens in the operation of a tax system or its scale. In terms of the tax system operation, corruption could occur at the policy making, administration or dispute resolution stage. For example, corrupted tax policy makers could offer a tax incentive/exemption to a certain group of taxpayers that bribe them.[18] Similarly, a corrupted judge could biasedly and partially rule in favor of a taxpayer against the tax administrative agency (Riaz & Cantner, 2020). In terms of scale, tax corruption can be grand or petty. As stated in the previous section, the scope of this paper is confined to tax administration corruption which tends to be recurrent and petty.

[18] It is useful to draw a distinction between policy lobbying and policy corruption. Lobbying seeks to change the law, is transparent and does not involve direct benefits to politicians/public officials, whereas corruption tends to make an exception of the law, is secretive and involves direct benefits to the corrupted officials.

Tax corruption can take the form of bribery, embezzlement, theft, fraud, blackmail, extortion, collusion and abuse of discretion (e.g., hiring unqualified family members or friends in tax departments). Tax corruption can involve one tax official, several tax officials, or between one or more tax officials and a taxpayer. An example of tax corruption that involves a tax official and a taxpayer is the bribe that a taxpayer offers to a tax official in order to pass a tax audit or inspection. Tax corruption in this study is limited to the (illegal) interaction between taxpayers and tax officials.

As a result of tax corruption, the benefits to taxpayers typically involve less strict tax audits or lower tax liability. In some cases, taxpayers may also benefit from accessing privileged tax information that is beneficial to them. For tax officials, the benefits are ranging from cash, use or purchase of assets below market prices, payment for private expenses such as meals or traveling, recruitment/promotion of persons related to the tax officials in the taxpayer's business.

In terms of process, the interaction between tax officials and taxpayers can be collusive or extortive. In collusive corruption, taxpayers and tax officials are involved in negotiating tax payment and amount of the bribery, and the process of negotiation can be explicit or implicit. In extortive corruption, tax officials initiate request of bribery in dealing with taxpayers. From the tax official's perspective, there are widespread or loosely organized practices, i.e., a bribe sharing scheme between tax officials (Alm, Martinez-Vazquez, & McClellan, 2016). In the remainder of this paper, unless otherwise stated, tax corruption refers to petty, recurrent briberies by taxpayers to tax officials.

2.3.2 Corporate taxation and tax corruption in Vietnam

In Vietnam, an enterprise operates under one of the following five forms: (i) household enterprise, (ii) private enterprise, (iii) partnership, (iv) limited liability company, and (v) joint

stock company. These legal forms can be classified into two major categories of enterprises based on the tax payment method. The first category only includes household enterprises, which are not granted a tax code. The second one includes the remaining four forms of enterprises, which are registered with the local tax offices and granted a tax code.

The enterprises in the first category may pay a license tax, which is a lump-sum tax identified in the beginning of a fiscal year, value added tax (VAT), and/or personal income tax (PIT) depending on their sales revenue. They do not have to pay VAT and PIT if their annual turnover is less than 100 million VND, which is equivalent to about 4,300 USD (at the February 2020 exchange rate). The local government tax officials will decide how much tax including license tax, VAT, and/or PIT an enterprise should pay in the current year based on the sales revenue of the enterprise in the previous year. In this situation, owners and managers of enterprises may personally deal with the tax officials about how much they have to pay, leading to possible tax corruption.

The enterprises in the second category have to calculate and self-declare all types of taxes they have to pay, including VAT and corporate income tax (CIT), and submit their queries to the online system of the General Department of Taxation (GDT) under the Ministry of Finance of Vietnam. Their monthly or quarterly submission depends on the size of their annual sales revenue. The local tax administration department will verify and randomly post-audit the tax filings of some enterprises for tax compliance. In addition, the local tax administration department conducts tax audit of all enterprises every three to five years. Tax corruption is likely to happen during visits of the local government tax officials to the enterprises.

As a transition economy, Vietnam is known for its bureaucratic administration and burdensome regulation. For example, in the 2015 calendar year, paying taxes in Vietnam took 540 hours which was more than 2.5 times longer than the average of the East Asia and Pacific

countries (198 hours) (World Bank 2017).[19] Similarly, the number of tax payments in Vietnam in 2015 was 31 times which also far exceeded the average of the East Asia and Pacific Region (22.9 times). Facing this business/tax environment, there is an incentive for firms, especially innovating firms, to pay bribes/tax bribes to obtain better, faster and more certain government services and decisions (applications, licences, tax audits, etc.). In fact, many Vietnamese businesses perceive that corruption is a normal aspect of doing business and that they engage in corrupt activities to follow the 'rules of the game' (Nguyen et al., 2017: 305).

A 2012 survey sponsored by the World Bank and Government Inspectorate of Vietnam suggests that tax officials are identified by businesses as the public officials creating the most difficulties and the ones that have been given the most unofficial payments (i.e., briberies) and gifts (World Bank & Government Inspectorate of Vietnam, 2012: 44–45). Nevertheless, unofficial payments are actively suggested by businesses (almost 90 % of all cases) and only in about 10 % of cases are the unofficial payments demanded (World Bank and Government Inspectorate of Vietnam, 2012: 46). This has been confirmed by an independent survey based on a random sample of household businesses indicating that about 70 % of the respondents always or often collude with tax auditors for mutual benefits (Nguyen et al., 2017: 305). Only a small fraction of respondents (about 13 %) feel guilty about engaging in such an unlawful conduct.

[19] This refers to the number of hours that a medium-size company must spend to pay (or withhold) all taxes and mandatory contributions in a given year.

2.4 The model and estimation strategy

2.4.1 The model

This section seeks to provide a discussion on the channels by which tax corruption can impact on innovative activities of SMEs in Vietnam. My reasoning is similar but not identical to that of Cai et al. (2018), which has been discussed in Section 2.2.

Conceptually, the observed correlation between corruption and economic performance can result from a two-way causation, especially for transition and developing economies. A higher level of corruption may lower economic performance and, vice versa, a poorer economic performance may also encourage more corruption. For example, Ayyagari et al. (2014: 51) treat briberies as being dependent on innovation, and find that "innovators that pay bribes do not receive better services and do not have greater propensity to engage in other illegal activities such as tax evasion." Innovators are thus more likely to be victims than perpetrators of corruption.

The same kind of argument applies to tax administration corruption. The relationship between tax corruption and innovation can be intertwined and self-reinforcing, particularly in emerging economies. It is not implausible to argue that innovating firms tend to financially perform better than an average firm and can thus be targeted by corrupt tax officials who would demand larger amounts of tax bribery from them. This 'capacity to pay' argument may thus give rise to a reversed causality from innovation to tax corruption.

As mentioned in the previous section, while Vietnamese businesses often complain that tax officials use their prerogative and authority with a view to demanding more tax payments, bribes often result from a process of negotiation and collusion rather than extortion. This is because the accounting/tax rules and procedures in Vietnam are prescriptive with little room to manoeuvre. The tax officials have many discretionary powers and taxpayers have no recourse

to independent tax dispute resolution. The apparent conspiracy between business taxpayers and tax officials indicates businesses' desire to pass tax audits and also their darker motive of evading income taxation. As the most plausible result of negotiation, the amount of the bribe tends to be proportional to the amount of income tax that is in dispute, rather than to the business' profitability.

Tax corruption can assist firm-level innovation in Vietnam in two different ways. First, for SMEs, which often lack access to external funding, the tax 'savings' that results from tax corruption can represent an important source of funds. The tax savings, combined with funding from other sources, can be used to finance business expansion or improvement, including different types of innovation inputs such as R&D expenditure. Secondly, as 'tax-abiding' businesses, bribing firms would receive preferential treatments (relative to non-bribing firms) for any formal business applications including innovation.

Note that there are some subtle differences between our reasonings and those of Cai et al. (2018). Firstly, we argue that it is tax evasion that gives rise to tax savings that finance innovation whereas Cai et al. (2018:2) maintain that tax evasion takes resources away from innovative activities. Secondly, I focus on SMEs, which face constraints to raise funds externally, while Cai et al. (2018: 3) only consider medium and large enterprises. Thirdly and finally, in addition to the financial incentive, I also include the operational incentive for more certain and preferential treatments.

2.4.2 Estimation strategy

To examine the effect of tax corruption on innovation empirically, I augment the conventional, probit innovation model by incorporating tax bribery payment as an independent variable. I begin with discussing our estimation strategy to deal with state dependence and initial condition

problems by the use of a dynamic binary response model. I then discuss how to apply the control function method for the dynamic binary response panel models in dealing with the endogeneity problem.

A dynamic non-linear panel data model for state dependence

The RE probit model assumes zero correlation between unobserved individual effects and explanatory variables. Nevertheless, this assumption may be violated because, for example, current innovation of a firm may be a function of its past innovation, which is called the state dependence. Wooldridge (2005) proposes an approach to work with state dependence (unobserved heterogeneity) and initial conditions by using dynamic non-linear panel data models. The state dependence and initial conditions in dynamic non-linear panel data models may be derived from an underlying latent variable model as follows:

$$y_{1it}^{*} = \mathbf{z}_{1it}\beta_1 + \gamma y_{1it-1} + \alpha_{1i} + u_{1i} \ , \ y_{1it} = \mathbf{1}[y_{1i}^{*} \geq 0] \qquad (i = 1, \dots, N; t = 1, \dots, T) \quad (1)$$

$$y_{1i0} = \mathbf{1}[\mathbf{z}_{1io}\beta_0 + \alpha_{1i} + u_{1i0} \geq 0] \quad (2)$$

where y_{1i} is the observed dependent variable representing innovation of firm *i* at time *t*, y_{1i0} is firm *i*'s innovation at the initial period, $\mathbf{z}_{1it}$ is a vector of strictly exogenous variables, and the asymptotic properties assume that *T* is small and fixed, and *N* is infinite. The error terms of the model have the distribution u_{1it} ~ N(0, 1) whereas the time-invariant unobserved firm-effects (unobserved heterogeneity) are normally distributed, i.e., α_{1i} ~ N(0, $\sigma_{\alpha_1}^2$). The RE probit model assumes that unobserved heterogeneity is independent with explanatory variables ($\mathbf{z}_{1it}$).

Another problem that needs to be addressed is the existence of initial conditions in estimating dynamic non-linear panel data models. In other words, firm's innovation in initial period is correlated with α_{1i}. For example, characteristics of firms and owners determine the decision to innovate in the initial period. To do so, Heckman (1981) provides the reduced form equation to solve the initial conditions problem, which is as follows:

$$y_{1i0} = \mathbf{1}[\mathbf{x}_{1i0}\beta_0 + v_{1i0} \geq 0] \quad (3)$$

$$v_{1i0} = \theta\alpha_{1i} + u_{1i0} \quad (4)$$

where $\mathbf{x}_{1i0}$ is a vector, which can consist of the $\mathbf{z}_{1i0}$ and/or exogenous instruments and v_{1i0} is correlated with α_{1i}, written as in Equation (4). Note that v_{1i0} is uncorrelated with u_{1i} (t >= 1). The log-likelihood functions for Equations (1) and (2) can be examined by using the Gaussian–Hermite quadrature.

In empirical studies, estimating the Heckman's estimator is time consuming when the density of y_{1i0} given $(\mathbf{x}_{1i0}, \alpha_{1i})$ is computed. Wooldridge (2005) uses the conditional maximum likelihood estimator, which treats the distribution conditional on the initial period value. This approach is similar to the strategy of Mundlak (1978) and Chamberlain (1984b), which is called correlated RE approach. The form for α_{1i} suggested by Wooldridge (2005) is

$$\alpha_{1i} = a_1 y_{1i0} + \bar{\mathbf{z}}_{1i} a + c_{1i} \quad (5)$$

where $\bar{\mathbf{z}}_{1i} = \frac{1}{T}\sum_{t=1}^{T} \mathbf{z}_{1it}$ is a vector of time averages of $\mathbf{z}_{1i}$. Substituting it into Equation (1) gives

$$y_{1it} = \mathbf{1}[\mathbf{z}_{1it}\beta_1 + \gamma y_{1it-1} + a_1 y_{1i0} + \bar{\mathbf{z}}_{1i} a + c_{1i} + u_{1it} \geq 0] \quad (6)$$

Equation (6) can then be estimated by the RE probit model, which solves the unobserved heterogeneity and initial conditions problems.

A dynamic non-linear panel data model with endogenous explanatory variables

The approach by Wooldridge (2005) mentioned above only works if $\mathbf{z}_{1it}$ is strictly exogenous and it therefore cannot deal with unobserved heterogeneity and endogenous problems, which may exist simultaneously. Papke and Wooldridge (2008), and Giles and Murtazashvili (2013) suggest the application of the control function method in a setting of dynamic non-linear panel data model to control for endogeneity of explanatory variables.

The tax corruption variable included in $\mathbf{z}_{1it}$ in our study is, however, potentially endogenous as tax corruption decisions are correlated with the unobserved characteristics of firms and firm owners. Using the dynamic non-linear panel data models with endogenous explanatory variables to estimate the relationship between tax corruption and innovation of SMEs in Vietnam is, thus, appropriate. Specifically, I rewrite Equation (6) as

$$y_{1it} = \mathbf{1}[\mathbf{z}_{1i}\,\beta_1 + \gamma y_{1it-1} + \rho \mathrm{y}_{2it} + \alpha_{1i} + u_{1i} \geq 0] \quad (7)$$

where $\mathbf{z}_{1it}$ is a vector of strictly exogenous variables, α_{1i} is an unobserved heterogeneity, u_{1it} is a serially uncorrelated idiosyncratic error term with $Var(u_{1i}) = 1$, and y_{2it} is an endogenous variable.

First, we assume that the reduced form equation for the endogenous variable, y_{2it} is as follows:

$$y_{2i} = \mathbf{z}_{1it}\delta_1 + \mathbf{z}_{2it}\delta_2 + \alpha_{2i} + u_{2it} \quad (8)$$

where $\mathbf{z}_{2it}$ is a vector of IVs and u_{2it} are serially uncorrelated idiosyncratic error terms. Secondly, we assume that the unobserved heterogeneity in the first-stage equation, α_{2i}, is linear function of all exogenous variables, $\mathbf{z}_{it} = (\mathbf{z}_{1it}, \mathbf{z}_{2it})$ as

$$\alpha_{2i} = \bar{\mathbf{z}}_i\lambda + \eta_{2i} \quad (9)$$

where $\bar{\mathbf{z}}_i = \frac{1}{T}\sum_{t=1}^{T}\mathbf{z}_{it}$ is a vector of time averages of $\mathbf{z}_{it}$ and η_{2i} is error term. Equation (9) is consistent with the Mundlak (1978) device for unobserved heterogeneity, α_{2i}.

Following Papke and Wooldridge (2008), I substitute Equation (9) in Equation (8) and obtain:

$$y_{2i} = \mathbf{z}_{1it}\delta_1 + \mathbf{z}_{2it}\delta_2 + \bar{\mathbf{z}}_i\lambda + v_{2it} \quad (10)$$

where $v_{2it} = \eta_{2i} + u_{2it}$ is a new composite error term. We assume that (u_{1it}, u_{2it}) has zero mean bivariate normal distribution and is uncorrelated to $\mathbf{z}_i$. This assumption implies that the error term in Equation (7) is a function of the error term in Equation (10).

$$u_{1it} = \theta u_{2it} + \xi_{1it} = \theta(v_{2i} - \eta_{2i}) + \xi_{1it} \quad (11)$$

where $\theta = \frac{Cov(u_{1it}, u_{2it})}{Var(u_{2it})}$ with $Var(u_{1it}) = 1$ and ξ_{1it} is a serially uncorrelated idiosyncratic error term. According to Giles and Murtazashvili (2013), the assumption in Equation (11) is the contemporaneous endogeneity of y_{2it}. If the contemporaneous v_{2it} explains sufficiently change of u_{1it} in Equation (11), then y_{2it} become exogenous variable in Equation (7).

Given our assumption above and Equation (5),[20] I can rewrite Equation (7) as follows:

$$\begin{aligned} y_{1i} &= \mathbf{1}[\mathbf{x}_{it}\beta + a_1 y_{1i0} + \bar{\mathbf{z}}_i a + c_{1i} + \theta(v_{2it} - \eta_{2i}) + \xi_{1i} \geq 0] \\ &= \mathbf{1}[\mathbf{x}_{it}\beta + a_1 y_{1i0} + \bar{\mathbf{z}}_i a + \alpha_{0i} + \theta v_{2it} + \xi_{1it} \geq 0] \end{aligned} \quad (12)$$

where $\mathbf{x}_{it} = (\mathbf{z}_{1it}, y_{1it-1}, y_{2it})$, $\beta = (\beta_1, \gamma, \rho)'$ is a vector of coefficients to be estimated, and $\alpha_{0i} = c_{1i} - \theta\eta_{2i} = \alpha_{1i} - \theta(v_{2i} - u_{2i})$ is composite unobserved heterogeneity. According to Giles and Murtazashvili (2013), and Michler and Josephson (2017), we must control for the relationship between α_{0i} and v_{2it} in distinctive time periods because it affects consistent estimates of the parameters from Equation (12). Similar to my approach to the unobserved heterogeneity in the reduced form Equation (9) for y_{2it}, we also assume that α_{0i} is independent of the initial conditions, y_{1i0} and the exogenous variables $\mathbf{z}_i$, but not of v_{2i}.

$$\alpha_{0i} = \lambda_0 \bar{v}_{2i} + \eta_{1i} \quad (13)$$

where $\bar{v}_{2i} = \frac{1}{T}\sum_{t=1}^{T} v_{2i}$ and η_{1i} is an error term, which uncorrelated to $\mathbf{z}_i$, y_{1i0}, and v_{2i}.

I now plug Equation (13) into Equation (12) and obtain:

$$y_{1it} = \mathbf{1}[\mathbf{x}_{it}\beta + a_1 y_{1i0} + \bar{\mathbf{z}}_i a + \theta v_{2it} + \lambda_0 \bar{v}_{2i} + \eta_{1i} + \xi_{1it} \geq 0] \quad (14)$$

Equation (14) solves the unobserved heterogeneity and endogenous problems, which occur simultaneously and initial conditions problems in dynamic non-linear panel data models. In particularly, I follow the work of Giles and Murtazashvili (2013) with the two-step estimation procedure. First, we use a pooled OLS model to estimate Equation (10) and obtain

[20] We have controlled for the initial conditions problems following Wooldridge (2005).

the residuals $\hat{v}_{2it}$ from the reduced form equation and computed $\bar{\hat{v}}_{2i} = \frac{1}{T}\sum_{t=1}^{T}\hat{v}_{2it}$. Next, we employ the RE probit models to estimate Equation (14). The standard errors in second stage were corrected by a bootstrap procedure because it obtains asymptotic standard errors for the estimation (Giles & Murtazashvili, 2013; Papke & Wooldridge, 2008). In recent years, Giles and Murtazashvili (2013), and Michler and Josephson (2017) have utilized this methodology to estimate the poverty dynamics in China and Ethiopia, respectively.

Following Svensson (2003), I control for the potential endogeneity of tax corruption by using IVs. He argues that firms have to pay bribes when dealing with public officials. In the dataset, I have information about the time that owners/managers of the surveyed SMEs spent working with government officials in dealing with regulations, which include tax issues. In addition, there is information about whether the SMEs have been inspected by government officials for various reasons including tax inspection. The possibility of having to pay tax bribes and the amount of tax bribe is likely to be higher when an SME is inspected by the government officials and its owner/manager spends more time working with them. Moreover, the local government tax officials randomly select enterprises to visit and this process does not depend on firm performance that my IVs do not directly affect dependent variable. Therefore, I use two IVs to correct for the endogeneity of the tax corruption variable, which are (i) average % of owners/managers' working time spent each month dealing with government regulations and officials; and (ii) the status of having been inspected by government officials for various reasons including tax inspection.

With the two IVs, the reduced form Equation (10) becomes

$$TC_{it} = \mathbf{z}_{it}\delta_1 + \text{DealGov}_{it}\delta_{21} + \text{Inspect}_{it}\delta_{22} + \bar{\mathbf{z}}_i\lambda + v_{2i} \qquad (10')$$

where TC_{it} is tax corruption defined as the ratio of firm's tax bribery payment to its total value added; DealGov_{it} and Inspect_{it} are two IVs, which determine TC_{it} but do not directly affect

innovation of the SMEs; $\bar{\mathbf{z}}_i$ is a vector of time averages of the explanatory variables[21] in $\mathbf{z}_{it}$. I I use the pooled OLS model to estimate Equation (10′) and obtained the residuals $\hat{v}_{2it}$ from the reduced form equation and computed $\bar{\hat{v}}_{2i} = \frac{1}{T}\sum_{t=1}^{T} \hat{v}_{2it}$. I then plugged them into Equation (14′) derived below to control for the endogeneity problems.

To analyze the effects of tax corruption on various types of innovation of SMEs, I apply the control function method to estimate the dynamic RE panel data model with endogenous explanatory variables. Equation (14) is written explicitly as follows:

$$IN_{it} = \mathbf{1}[\mathbf{z}_{it}\beta + \gamma IN_{it-1} + a_1 IN_{i0} + \rho TC_{it} + \bar{\mathbf{z}}_i a + \theta v_{2i} \ + \lambda_0 \bar{v}_{2i} + \eta_{1i} + \xi_{1i} \ \geq 0] \qquad (14')$$

where IN_{it} is a dummy variable for innovation of firm *i* at time *t*. Innovation at time *t* is affected by innovation status at time *t*–1, which is indicated by IN_{it-1}, and innovation status in the initial period, which is indicated by IN_{i0}.[22] This approach is similar to what have been proposed by Giles and Murtazashvili (2013), Michler and Josephson (2017), Papke and Wooldridge (2008), and Wooldridge (2005). Incorporation of innovation status in the past in Equation (14′) allows me to address potential correlation between unobserved firm heterogeneity and the other covariates.

2.5 Data and variables

The panel data used for this study is drawn from the biennial surveys of SMEs, which were conducted in Vietnam from 2005 to 2015. The surveys have been jointly conducted by the United Nations University World Institute for Development Economic Research (UNU–WIDER) in collaboration with the Economic Development Research Group at the University of Copenhagen, and the Central Institute of Economic Management (CIEM) and

[21] As we mentioned in equation (9), they are used to control for unobserved heterogeneity (Mundlak, 1978).
[22] The initial period is defined as the first time that firms were observed in the dataset.

the Institute of Labor Science and Social Affairs (ILSSA) in Vietnam. In each round of survey, over 2,500 SMEs across 12 industries in 10 provinces were randomly sampled.

One advantage of using this panel of data is that it contains information about various business aspects of the surveyed SMEs including their characteristics, production activities, and different types of innovation achieved by the enterprises. A wide range of monetary information about the bribe payments (for getting connected to public services; obtaining licenses and permits; dealing with taxes and tax collection; gaining government contracts/public procurement; dealing with customs/imports/exports) is also included in the data. I only extract the tax-bribe payment and the non-tax-bribe payment. From the tax-bribe payment, I are able to compute the cost of tax corruption (TC) as the % of value added of the SMEs, which is defined as the difference between total sales revenue and intermediate costs. As a result of data extraction, the total number of SMEs in our analysis data during the period of 2005 - 2015 adds up to 10,888.

Table 2.1 presents definitions and descriptive statistics of the variables used in our estimation models. Major variables of interest include tax corruption and various indicators of innovation. The available data allows us to distinguish between incremental and more radical types of innovation outputs, which are assumed to be of different levels of technological difficulty. The former type is indicated by the improvement in existing products. The latter one is defined as either achievement of new products or new production processes. In terms of innovation inputs, we distinguish between machinery investments for innovation and R&D expenditure.[23] As a result, we have innovation inputs including machinery investments for innovation (MaInnovation) and R&D expenditure (R&D), and innovation outputs consisting of improved product (ImpProduct), new product or new production process (NewInnovation)

[23] This classification is based on the OECD's Oslo manual guidelines for collecting and interpreting innovation data (OECD, 2005).

and general innovation (Innovation), which is either improved product or new product or new production process.

[Insert Table 2.1 here]

Table 2.2 provides coefficients of the correlation matrix of the variables and their variance inflation factors (VIFs). As expected, the correlation coefficients are positive but there is no problem with multicollinearity because all VIF values are less than 5.

[Insert Table 2.2 here]

2.6 Results and discussion

2.6.1 Identification of tax corruption

I first perform the tests of validity of IVs in our model. The results of these statistical tests, summarized in Table 2.3, confirm the validity of the two IVs. In particular, the highly statistically significance of the Anderson's canonical correlation confirms the adequate explanatory power of our IVs for all categories of innovation. The Cragg–Donald–Wald F statistic and Stock–Wright LM statistic tests reject the null hypothesis of weak identification test and weak-instrument-robust inference for all types of innovation, respectively. The Sargan statistic tests do not reject the null hypothesis of over-identifying restrictions for all innovative activities. These results indicate that our instruments are statistically valid. Further, the endogeneity tests confirm the endogeneity of tax corruption for all innovative activities.

[Insert Table 2.3 here]

The reduced form regression is performed to estimate the determinants of tax bribery payment of the SMEs. The pooled-OLS estimation results in Table 2.4 suggest that among others our IVs, which are DealGov and Inspect, have significantly positive effects on the tax bribery payment of the SMEs. This finding indicates that my instruments are valid.

[Insert Table 2.4 here]

2.6.2 Findings

I determine the effects of tax corruption on innovation outputs and innovation inputs in Equation (14′) by applying the control function method for dynamic RE panel data models with endogenous explanatory variable. The second-stage regression results, reported in Tables 2.5 and 2.6, present average marginal effects of various factors on innovation outputs and innovation inputs, respectively.[24] Regression results in Table 2.5 for three types of innovation outputs including improvement of existing products (ImpProduct), introduction of new products or new processes (NewInnovation) and general innovation (Innovation). In the first three columns, I report the results of the naive RE panel data model with robust standard errors in parentheses. In the second set of three columns, I report the results of the dynamic RE panel data model without controlling for the endogeneity problem (with robust standard errors in parentheses). In the last three columns, I apply the control function method for the dynamic RE panel data model, controlling for the endogeneity problem and report the results with the bootstrapped-100-replication standard errors in parentheses. Regression results in Table 2.6 for two types of innovation inputs including machinery investments for innovation (MaInnovation) in the first three columns, and R&D expenditure (R&D) in the last three columns. The results from each group of three columns are the naive RE panel data model, the dynamic RE panel data model, and the control function method for the dynamic RE panel data model with endogeneity (dynamic RE with endogeneity), respectively. In these regressions, I include the time effects, industrial effects, provincial location effects and time averages of control variables.

[Insert Table 2.5 here]

[Insert Table 2.6 here]

[24] From the reduced form regression based on Equation (10'), we obtain the predicted values of the residuals $\hat{v}_{2it}$ and $\bar{\hat{v}}_{2i}$, which are then plugged into Equation (14′). This process is the control function method. We use the Stata xtprobit command to estimate Equation (14') in the structural form. Finally, the average marginal effects are obtained by using margins command in Stata.

I focus on three main points: (i) the effect of tax corruption on innovation inputs and outputs, (ii) the effect of past innovation on current innovation, and (iii) the influence of other control variables on innovation. Regarding (i), the key finding of our analysis is that tax corruption has positive and statistically significant effects on all three types of innovation outputs for SMEs in Vietnam. Specifically, in Table 2.5, one % point increase in the ratio of tax bribe payment to value added would increase the likelihood of improvement of existing products (Column 7), introduction of new products or new production processes (Column 8), and general innovation (Column 9) by about 0.29, 0.53, and 0.57 % points, respectively. My findings support Hypothesis 1. I provide robust analysis of innovation inputs by investigating whether or not tax corruption can represent an important source of funds as the tax 'saving.' It is shown that tax corruption has positive and statistically significant effects on all two types of innovation inputs for SMEs in Vietnam, which is similar to the case of innovation outputs. In particular, in Table 2.6, one % point increase in the ratio of tax bribe payment to value added would increase the likelihood of machinery investments for innovation (Column 3), and R&D expenditure (Column 6) by about 0.69, and 0.11 % points, respectively. My findings support Hypothesis 2. In contrast, Paunov (2016) finds corruption (informal payments for obtaining licenses and permits) have a negative impact on machinery investments for innovation. Finally, these results from applying control function method for the dynamic RE model with endogenous variable show that tax corruption has more ten-fold to thirty-fold size of effects on innovation than the naive RE and the dynamic RE models, depending on the type of innovative activities of the firm.

Concerning (ii), from Columns (4)–(9) in Table 2.5 and Column (2), and Column (3) of Table 2.6, I find consistent results that innovation outputs and only machinery investments of innovation inputs of an SME are positively determined by its innovation two years earlier

and innovation in the initial period. The magnitude of the average marginal effect is, however, small. On average, an SME having obtained innovation two years earlier has a higher possibility of achieving current innovation by no more than seven percentage points compared to others. The same finding holds for an SME with innovation in the initial period. However, I do not find similar results for R&D expenditure, as shown in columns (5)–(6) in Table 2.6.

Finally, regarding (iii), the results summarized in Tables 2.5 and 2.6 are economically plausible. More specifically, control variables such as firm size (FirmSize), exporting status (Export), employee training (Training), and proportion of professional employees (QWorkers) all have the expected positive impact on all types of SME innovation. This reassuring outcome provides a further evidence of the overall goodness of the estimated models.

2.6.3 Discussions

The key finding about the positive impact of tax corruption on innovation of SMEs in Vietnam confirms the grease-the-wheels hypothesis. Despite being conventionally coined considered as a factor which negatively affects development of firms (Fisman & Svensson, 2007; Paunov, 2016), previous empirical studies on corruption support two both the opposing: sand-the-wheels and grease-the-wheels, hypotheses. The empirical results obtained from this study lend credence to the second hypothesis, which has also been supported in previous studies on the impact of general corruption on innovation (see, for example, Krammer, 2019; Nguyen, Doan, Nguyen, & Tran-Nam, 2016; Sharma & Mitra, 2015; Xie et al., 2018). My finding is not implausible, particularly in the context of a transition economy in which the market mechanism, government regulation and tax administration are known to operate in an incomplete and inefficient manner. Given the discretionary power enjoyed by tax auditors over taxpayers, briberies to tax officials could generate the funds that finance innovation, and the short-term certainties that taxpayers seek to conduct and expand their businesses.

Since tax corruption is known to be widely practiced in Vietnam, it seems reasonable to assume that Vietnamese SMEs may consider paying tax bribes as a normal way of doing business. Thus, they are willing to engage in tax corruption so long as the benefits (more certainties to conduct business and to innovate) exceed the costs (amount of bribery). In this sense, tax bribe payment can be seen as a means to facilitate new business opportunities, including innovation. From an economic perspective, tax bribery payment may be viewed as an instrument that supplements the government regulations.

2.7 Conclusions

The present study attempts to shed light on tax corruption by empirically analyzing its effects on innovative activities of SMEs in Vietnam. While tax corruption can take many different forms, the focus of this study is on administration corruption that typically arises from the interaction between taxpayers and tax auditors during on-site tax inspection. To the best of the authors' knowledge, the study is the first that explicitly examines the influence of tax corruption on innovative activities of SMEs. A particular strength of the present study is that, unlike previous quantitative studies on tax corruption, the control function method for dynamic RE panel data models and IVs are employed to overcome problems associated with endogeneity of tax corruption, unobserved heterogeneity and initial condition problems of innovation simultaneously.

Using a panel of data from surveys of SMEs in Vietnam, the study suggests that paying tax bribery facilitates all types of SME innovative activities, which include both innovation inputs and innovation outputs. The estimation results are statistically valid and robust against a number of diagnostic tests. The results obtained are also plausible in the sense that the control variables (such as firm size, exporting status, employee training, and proportion of professional employees) all have the expected positive impact on innovative activities of SMEs.

This key finding of the study supports the grease-the-wheels hypothesis of tax corruption. It is also consistent with those results obtained from previous empirical studies on the effects of general corruption on firm development, especially in the context of transition economies (Krammer, 2019; Sharma & Mitra, 2015; Xie et al., 2018). My main interpretation of this unconventional finding is as follows. In many transition and developing countries, the market mechanism, government regulation and tax administration often do not operate completely or efficiently. In such cases, tax bribes could potentially produce short-term certainties and tax savings which may be beneficial to some business activities including innovation. Tax bribery payments can, in this sense, be said to facilitate innovation of SMEs, at least in the short term.

The findings of the present study have adverse implications to both businesses and tax authorities in Vietnam. First, I must unequivocally stress that my findings do not necessarily mean tax corruption is beneficial to firms in in the long run. In fact, I argue that the hidden (from official accounting statements) and ongoing costs of tax corruption can damage firms' development in the long term. Firms' myopic view of benefits from paying tax bribes can diminish their long-term integrity and strategic capability. In particular, continuous illegal payments of tax and other briberies would be detrimental to improving staff morale and work practice.

Secondly, in the presence of widespread business engagement in tax briberies, fighting tax corruption in transition economies such as Vietnam is problematic. Without visible and sustained pressure from the private sector, the government has little incentive to combat tax corruption despite its commitments to anti-corruption policies. This is particularly true in the case of Vietnam where the economy has experienced high growth rate, noticeable poverty reduction, and sufficiently high tax to GDP ratio.

Finally, the causes of tax administration corruption in Vietnam are various and many of which lie beyond the control of the tax authority (see Nguyen, Doan, & Tran-Nam, 2017). Nevertheless, the direct causes appear to be (i) high degree of discretionary power of tax auditors, and (ii) regular visits of tax auditors to large number of businesses, including SMEs. Thus, to reduce the incidence of tax briberies, the government could tackle those two issues. For example, to address (i) the government could consider simplifying tax laws and tax procedures. Similarly, the government could also use digital technology such as automation, e-filing, etc. to reduce the face-to-face interaction between business taxpayers and tax auditors.

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List of Tables

Table 2.1 Definitions and summary descriptive statistics of variables

Variable	Description	Mean	Standard deviation	Min	Max
Dependent variables					
Innovation outputs					
ImpProduct	Having improved an existing product = 1; otherwise = 0	0.33	0.47	0.00	1.00
NewInnovation	Having introduced a new product or new production process = 1; otherwise = 0	0.20	0.40	0.00	1.00
Innovation	Having improved existing product, introduced new product, or introduced new production process = 1; otherwise = 0	0.40	0.49	0.00	1.00
Innovation inputs					
MaInnovation	Having investments in machinery to replace old equipment, improve productivity, improve quality of output, or produce a new output = 1; otherwise =0	0.44	0.50	0.00	1.00
R&D	Having investments in R&D or purchasing patents = 1; otherwise = 0	0.01	0.09	0.00	1.00
Independent variable					
TC	Ratio of firm's tax bribery payment to its total value added	0.11	0.59	0.00	21.61
Control variables					
Formal	Belonging to the second legal form of SMEs, i.e., being either a private enterprise, partnership, limited liability company, or joint stock company = 1; Household business = 0	0.49	0.50	0.00	1.00
Export	Exporting products =1; otherwise = 0	0.04	0.20	0.00	1.00
FirmSize	Natural logarithm of the total number of permanent workers	1.65	1.06	0.00	6.99
Training	Having provided some trainings to more than 50% of all workers = 1; otherwise = 0	0.12	0.32	0.00	1.00
QWorkers	Ratio of the workers who hold university or college degrees to the total number of permanent workers	0.03	0.06	0.00	1.00
University	Owners/managers of the SMEs having attained undergraduate or	0.17	0.38	0.00	1.00

Variable	Description	Mean	Standard deviation	Min	Max
	graduate degree = 1; otherwise = 0				
Instrumental variables					
DealGov	SME owners/managers' time spent on dealing with government regulations (including tax regulations) and government officials (including tax officials) = 1; otherwise = 0	0.78	0.41	0.00	1.00
Inspect	Having been inspected by government officials for various reasons including tax inspection = 1; otherwise=0	0.32	0.47	0.00	1.00

Table 2.2 Correlation matrix

	VIF	1	2	3	4	5	6	7	8	9	10	11	12
1. ImpProduct		1.000											
2. NewInnovation		0.328***	1.000										
3. Innovation		0.858***	0.606***	1.000									
4. MaInnovation		0.171***	0.188***	0.203***	1.000								
5. R&D		0.062***	0.070***	0.070***	0.091***	1.000							
6. TC	1.02	0.075***	0.073***	0.072***	0.065***	0.030**	1.000						
7. Formal	1.50	0.150***	0.102***	0.141***	0.011	0.044***	0.089***	1.000					
8. Export	1.17	0.091***	0.097***	0.101***	0.064***	0.070***	0.012	0.096***	1.000				
9. FirmSize	1.90	0.248***	0.207***	0.241***	0.198***	0.117***	0.083***	0.367***	0.345***	1.000			
10. Training	1.17	0.109***	0.121***	0.112***	0.078***	0.084***	0.028**	0.158***	0.149***	0.317***	1.000		
11. Qwokers	1.34	0.113***	0.125***	0.115***	0.074***	0.099***	0.074***	0.192***	0.151***	0.400***	0.192***	1.000	
12. University	1.42	0.094***	0.105***	0.096***	0.058***	0.078***	0.070***	0.179***	0.199***	0.432***	0.219***	0.401***	1.000

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.3 Endogeneity tests of instrumental variables

	ImpProduct (1)	NewInnovation (2)	Innovation (3)	MaInnovation (4)	R&D (5)
Anderson canon. corr. (Under-identification test)	37.74***	37.74***	37.74***	37.74***	37.74***
Weak identification test (Cragg-Donald Wald F statistic)	18.87***	18.87***	18.87***	18.87***	18.87***
Stock-Wright LM statistic Chi-sq(2)[a]	10.74***	14.04***	13.14***	24.97***	9.64***
Sargan statistic (p-value)	0.011 (0.917)	1.135 (0.287)	0.019 (0.891)	1.099 (0.295)	2.694 (0.107)
Endogeneity test	9.077***	11.060***	11.553***	20.928***	6.036**

Notes: The results are derived from command ivreg2 in Stata; [a] Weak-instrument-robust inference; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.4 Reduced form estimation of tax corruption in the first stage

Dependent variable: Tax corruption (TC)	
DealGov	0.071***
	(0.010)
Inspect	0.047***
	(0.018)
Formal	0.025
	(0.022)
Export	-0.084
	(0.058)
FirmSize	-0.008
	(0.020)
Training	-0.009
	(0.031)
QWorkers	0.051
	(0.165)
University	0.037*
	(0.022)
_cons	0.066**
	(0.033)
Provincial location dummies	YES
Year dummies	YES
Industry dummies	YES
N	10888
R^2	0.026

Notes: Robust standard errors in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). The industry dummies are for industries including food product; beverages; textiles; apparel and leather products; wood products; paper products; printing and reproduction of recorded media; petroleum products, chemical, pharmaceutical and plastics; non-metallic mineral products; basic metal products; electronic products, equipment, machinery, transport equipment; and furniture and others. The provincial location dummies include Ha Noi; Phu Tho; Ha Tay; Hai Phong; Nghe An; Quang Nam; Khanh Hoa; Lam Dong; Ho Chi Minh City; and Long An. Regressions include time averages of explanatory variables.

Table 2.5 Average marginal effects of determinants of innovation outputs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	RE			Dynamic RE			Dynamic RE with endogeneity		
TC	0.037***	0.018***	0.036***	0.025***	0.024*	0.023**	0.286*	0.529***	0.567***
	(0.008)	(0.005)	(0.009)	(0.010)	(0.013)	(0.011)	(0.167)	(0.097)	(0.199)
Lag of ImpProduct				0.052***			0.054***		
				(0.014)			(0.014)		
The initial ImpProduct				0.065***			0.064***		
				(0.013)			(0.012)		
Lag of NewInnovation					0.035***			0.034***	
					(0.013)			(0.009)	
The initial NewInnovation					0.029***			0.027***	
					(0.010)			(0.007)	
Lag of Innovation						0.069***			0.069***
						(0.015)			(0.017)
The initial Innovation						0.071***			0.070***
						(0.014)			(0.016)
Formal	0.038***	0.049***	0.060***	0.028	0.049***	0.043**	0.019	0.031***	0.024
	(0.011)	(0.008)	(0.011)	(0.018)	(0.015)	(0.019)	(0.022)	(0.011)	(0.024)
Export	0.041*	0.044**	0.080***	0.105***	0.058*	0.158***	0.126***	0.099***	0.201***
	(0.023)	(0.018)	(0.027)	(0.036)	(0.030)	(0.043)	(0.040)	(0.022)	(0.059)
FirmSize	0.061***	0.052***	0.070***	0.059***	0.037***	0.061***	0.061***	0.040***	0.064***
	(0.006)	(0.004)	(0.006)	(0.013)	(0.011)	(0.014)	(0.013)	(0.008)	(0.019)
Training	0.049***	0.050***	0.049***	0.029	0.038***	0.023	0.030	0.040***	0.026
	(0.014)	(0.011)	(0.015)	(0.019)	(0.014)	(0.021)	(0.022)	(0.010)	(0.020)
QWorkers	0.198***	0.271***	0.268***	0.134	0.174*	0.160	0.119	0.141*	0.127
	(0.074)	(0.059)	(0.082)	(0.110)	(0.091)	(0.122)	(0.126)	(0.079)	(0.167)
University	0.014	0.003	0.004	-0.004	-0.004	-0.018	-0.013	-0.023**	-0.037

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	RE			Dynamic RE			Dynamic RE with endogeneity		
	(0.014)	(0.011)	(0.015)	(0.016)	(0.012)	(0.017)	(0.021)	(0.009)	(0.024)
v2							-0.260	-0.527***	-0.547***
							(0.167)	(0.097)	(0.196)
v2bar							-0.003	0.003	0.004
							(0.019)	(0.010)	(0.025)
Provincial location dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	10887	10888	10888	7449	7451	7451	7449	7451	7451

Notes: Columns (1)–(6) and Column (7)–(9) present robust standard errors and robust bootstrapped standard errors with 100 replications in parentheses, respectively; Columns (1), (4) and (7) present results of model with ImpProduct dependent variable; Columns (2), (5) and (8) present results of model with NewInnovation dependent variable; Columns (3), (6) and (9) present results of model with Innovation dependent variable * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Other notes about industry and location dummies in Table 4 apply. Regressions include time averages of explanatory variables. The v2 and v2bar are the contemporaneous endogeneity (first-stage residuals free of serial correlation) and mean of the contemporaneous endogeneity, respectively.

Table 2.6 Average marginal effects of determinants of innovation inputs

	(1) RE	(2) Dynamic RE	(3) Dynamic RE with endogeneity	(4) RE	(5) Dynamic RE	(6) Dynamic RE with endogeneity
	MaInnovation	MaInnovation	MaInnovation	R&D	R&D	R&D
TC	0.044***	0.039***	0.685***	0.001	0.003**	0.109**
	(0.010)	(0.013)	(0.205)	(0.001)	(0.001)	(0.047)
Lag of MaInnovation		0.054***	0.054***			
		(0.015)	(0.015)			
The initial MaInnovation		0.055***	0.055***			
		(0.014)	(0.015)			
Lag of R&D					0.001	0.001
					(0.006)	(0.006)
The initial R&D					0.005	0.004
					(0.006)	(0.006)
Formal	0.009	0.013	-0.009	0.002	0.002	-0.001
	(0.012)	(0.020)	(0.023)	(0.002)	(0.004)	(0.004)
Export	0.016	0.033	0.085	0.004	0.014**	0.022***
	(0.028)	(0.048)	(0.054)	(0.003)	(0.005)	(0.007)
FirmSize	0.125***	0.086***	0.089***	0.004***	0.006**	0.007**
	(0.006)	(0.015)	(0.017)	(0.001)	(0.003)	(0.003)
Training	0.071***	0.077***	0.081***	0.007***	0.004	0.005*
	(0.016)	(0.021)	(0.025)	(0.003)	(0.003)	(0.003)
QWorkers	0.173**	0.286**	0.248	0.033***	0.032**	0.027*
	(0.085)	(0.134)	(0.170)	(0.012)	(0.014)	(0.014)
University	-0.006	0.001	-0.022	0.002	0.001	-0.003
	(0.016)	(0.018)	(0.024)	(0.002)	(0.003)	(0.003)
v2			-0.649***			-0.106**

	(1) RE	(2) Dynamic RE	(3) Dynamic RE with endogeneity	(4) RE	(5) Dynamic RE	(6) Dynamic RE with endogeneity
	MaInnovation	MaInnovation	MaInnovation	R&D	R&D	R&D
			(0.204)			(0.047)
v2bar			0.004			-0.002
			(0.023)			(0.003)
Provincial location dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES
N	10888	7451	7451	10549	7030	7030

Notes: Columns (1), (2), (4), and (5), and Column (3), and (6) present robust standard errors and robust bootstrapped standard errors with 100 replications in parentheses, respectively; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Other notes about industry and location dummies in Table 4 apply. Regressions include time averages of explanatory variables. The v2 and v2bar are the contemporaneous endogeneity (first-stage residuals free of serial correlation) and mean of the contemporaneous endogeneity, respectively

Chapter 3 Intangible Assets, Global Value Chains and Innovation: Evidence from Vietnamese SMEs[25]

3.1 Introduction

The growing importance of global value chains (GVCs) in the international organization of production represents a major shift in international trade, and hence in the international competitiveness of firms (Grossman & Rossi-Hansberg, 2008; Montalbano, Nenci, & Pietrobelli, 2018; Reddy, Chundakkadan, & Sasidharan, 2020). Participation in GVCs provides SMEs with an opportunity of accessing new technologies, knowledge and information, and of forming trade networks (Gereffi, Humphrey, & Sturgeon, 2005; Montalbano et al., 2018; Reddy et al., 2020). Therefore, the globalization of production activities is no longer observed only through the lens of gross import and export flows, but also in value-added terms, with focus on high-value manufacturing and service activities (Timmer, Erumban, Los, Stehrer, & De Vries, 2014; World Bank, 2017b). As a result of the growing fragmentation of production, the export performance of firms along the value chain can be studied by distinguishing between upstream activities (i.e. the production of intermediate inputs) and downstream activities (e.g. the final assembly of products).

The smiling curve theory (Everatt, Tsai, & Cheng, 1999; Shih, 1996), or smile of value creation (Mudambi, 2007, 2008), posits that the gains in value added along GVCs depend on the position of the firms in the development stage of the global production network. This theory suggests that higher value is added both upstream and downstream, and that the lowest value-added is in the middle of the value chain (Dedrick, Kraemer, & Linden, 2010; Gereffi, 1999;

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Mudambi, 2007, 2008; Shin, Kraemer, & Dedrick, 2009, 2012). Subsequently, studies on firm GVC participation have increased considerably, with the aim of identifying various drivers of GVC participation and the implications on SME performance (Amador & Cabral, 2016; Criscuolo, Timmis, & Johnstone, 2016; Gereffi, 2014; Reddy et al., 2020). These studies show that firm productivity, foreign ownership and access to finance represent key drivers of firm GVC participation (Y. Lu, Shi, Luo, & Liu, 2018; Melitz, 2003). The GVCs literature has also emphasized recently the vital role of lead firms in the chain in terms of transferring technological knowledge to their suppliers (Gereffi, 1999; Humphrey & Schmitz, 2001, 2002; Pietrobelli & Rabellotti, 2011) and thus local supplier needs to build and deepen its own technological capabilities (TCs), suppliers can exploit opportunities for the learning and upgrading activities (Hansen, Fold, & Hansen, 2016; Morrison, Pietrobelli, & Rabellotti, 2008; Pietrobelli & Rabellotti, 2011; Whitfield et al., 2020). With respect to these main streams, consequently, we need to determine whether a firm's participation in GVCs is learning process, investment in intangible assets strengthen firm's capabilities and this in turn improves the learning skills that are necessary to benefit from GVC participation, or is value appropriation story, investment in intangible assets gains more upstream and downstream value that can be appropriated in GVC to improve their position in value chains. However, the role of the investments in intangible assets in driving the GVC participation and the governance form of GVCs of a firm have not received adequate attention. To fill this gap, this research aims to investigate the relationship between intangible assets and firms' GVC participation.

I posit that the governance form of GVCs and investments in intangible assets help firms to improve their gains in value-added through GVCs. I define this as the phenomenon of *upgrading,* which includes product upgrading, process upgrading, functional upgrading and inter-

sectoral upgrading (Gereffi et al., 2005; Humphrey & Schmitz, 2001, 2002). Most of the previous studies on the governance forms of firms participating in GVCs were conducted at an industry level (Gereffi, 1999; Giuliani, Pietrobelli, & Rabellotti, 2005; Navas-Alemán, 2011; Pavlínek & Ženka, 2010; Schmitz, 1999; Sturgeon, 2002; Sturgeon, Van Biesebroeck, & Gereffi, 2008), while only a few works used firm-level data (Pietrobelli and Saliola (2008). Among these studies, only the one by Brancati et al. (2017) focused on the impact of GVC participation on innovation. Moreover, this stream of literature focused on the role of the forms of governance and neglected the role of the investments of firms in intangible assets. Although the empirical evidence of the role played by intangible assets in GVCs at the micro level is limited (Montalbano et al., 2018; Reddy et al., 2020), there are numerous case studies that suggest their strategic role in value creation and value appropriation in GVCs. In the classical example of Apple's iPod, Apple, by investing in design, software development, product management, marketing and other high-wage functions, appropriated most of the value of the final product, while Chinese firms, mainly specialized in assembling and testing activities, have been left with about only 1% of the total value of the final product (Dedrick et al., 2010). Over time, some firms from emerging market economies have invested in developing competencies in high value-added activities ('catch-up'), and this requires investment in such assets as R&D, design, training and marketing, as well as in organizational capabilities.

My paper aims to contribute to this stream of literature by exploring the participation of small and medium enterprises (SMEs) in GVCs in an emerging economy (Vietnam) and by assessing whether the forms of governance and investment in intangible assets affect the relationship between firms' participation in GVCs (also distinguishing between different forms of governance) and firms' innovation. I empirically estimate a control function approach, to address

the problems of endogeneity and unobserved heterogeneity, using unique panel data on SMEs in Vietnam from 2005 to 2013. The dataset provides an appropriate setting to examine the relationship between GVC participation, the forms of GVC governance and the upgrading activities of firms moderated by intangible assets.

The case of Vietnam is particularly interesting since GVC participation in the country grew at above average rates from 2005 to 2015 (see Figure A3.1 in the Appendix). Vietnam's overall GVC participation index, backward participation and forward participation in 2015 were 55.6, 44.5 and 11.1, respectively (see Table A3.1 in the Appendix).[26]

My results contribute to the existing literature in several ways. First, I demonstrate that both participation in GVCs and different forms of GVC governance have a positive impact on the product upgrading of SMEs in Vietnam, but no impact on process upgrading; these findings support the simple learning-by-participating in the GVC model (Becker & Egger, 2013; Humphrey & Schmitz, 2002). Second, I show that firms' participation in GVCs, moderated by intangible assets, is positively associated with product upgrading, but has no impact on process upgrading. Furthermore, intangible assets moderated with different forms of GVC governance have different effects on upgrading. These findings are consistent with the literature, which points out that intangible assets play a crucial role in moderating the relationship between firms' participation on international markets (exports and GVCs) and product innovation (Aw & Batra, 1998; Aw,

[26] All these figures, except those of forward participation, are well above the average of developing countries (overall, Vietnam's participation in downstream activities is much more intensive than in upstream ones. The top industries that participate in downstream activities are textiles and clothing (25.7 percent), food and beverages (14.2 percent) as well as computer and electronic products (8.8 percent).The OECD-WTO Trade in value added (TiVA) report indicates the origin of value added embedded in gross exports by simultaneously using input–output data for the source and destination countries (OECD, 2019). The indicators include the GVC participation index, forward GVC participation and backward GVC participation, based on the Koopman, Powers, Wang, and Wei (2010) and Koopman, Wang, and Wei (2014) frameworks. They decomposed the domestic value added that is embedded in foreign inputs produced from domestic inputs and the indirect exports to third countries. In particular, backward GVC participation refers to the foreign value added content of exports, where a country imports intermediates to produce its exports. This is the sourcing side of GVCs, which is likely to be higher for countries involved in downstream activities (Jona-Lasinio, Manzocchi, & Meliciani, 2019). The participation of forward GVC refers to domestic value added embedded in foreign exports to third countries for further processing and export through value chains. This is the supply side of GVCs, which is likely to be higher for countries involved in upstream activities (Jona-Lasinio et al., 2019).

Roberts, & Winston, 2007; Baldwin & Gu, 2004; García, Avella, & Fernández, 2012; Meliciani & Tchorek, 2019).

3.2 Background literature and research questions

A large amount of literature is available on the impact of internationalization on innovation and several transmission mechanisms through which internationalized firms are more likely to introduce new products and processes have been identified. Among these, mention can be made to the availability of a potentially larger market for new products, exposure to international competition and the imitation of advanced technologies of foreign firms (learning by exporting) appear to be the main ones. However, the question remains: does participation in global value chains foster innovation in a similar way to other simpler forms of internationalization, such as imports and exports?

Alcacer and Oxley (2014) proposed a theory on learning by supplying and analyzed the main factors that foster the suppliers' ability to build new technological capabilities. In recent years, emerging economies have experienced a shift away from adaptive innovation strategies, i.e. innovation is undertaken by multinational companies and then transferred to their subsidiaries for adaptation and further use, to reverse innovation strategies, i.e. innovation is generated by subsidiaries of multinational companies located in an emerging economy, which drive their participation in global value chains (GVCs) (Lema, Quadros, & Schmitz, 2015). Furthermore, other studies have highlighted that the learning and capacity building of firms play crucial roles in favouring economic growth (Hausmann, Hwang, & Rodrik, 2007).

The GVCs literature has stressed recently the vital role of lead firms in the chain in terms of transferring technological knowledge to their suppliers (Gereffi, 1999; Humphrey & Schmitz, 2001, 2002; Pietrobelli & Rabellotti, 2011). To maximize gains from GVC participation, however,

local supplier needs to build and deepen its own TCs, suppliers can exploit opportunities for the learning and upgrading activities (Hansen et al., 2016; Morrison et al., 2008; Pietrobelli & Rabellotti, 2011; Whitfield et al., 2020). Morrison et al. (2008) suggests that research should focus on the endogenous process of TC development, including specific firm-level efforts, and of the mechanisms allowing knowledge to flow within and between different GVC governance, and foster processes of learning and upgrading in GVCs. For example, the bulk of technological capabilities in emerging economies are nurtured through the firms' ability to absorb the technology and reproduce it elsewhere (Morrison, Pietrobelli, & Rabellotti, 2008). As a result, local technological capabilities are crucial for shaping the production structure of a firm, thereby moulding its participation and position in GVCs (Taglioni & Winkler, 2016).

Although there are some similarities between the mechanisms that link export and innovation on the one hand and GVC participation and innovation on the other, there are also some differences which clearly emerge when a governance approach to the study of GVCs is adopted. Firms engaged in GVCs are part of an international division of the labor process, which is complex. Moreover, they can involve different types of governance with different degrees of power asymmetry between firms, and can result in different capabilities of appropriating value and benefitting from GVC participation.

The literature on GVCs emphasizes the concept of *upgrading* to cope with increasing competition on international markets and to improve a firm's position along the value chain (Gereffi et al., 2005; Humphrey & Schmitz, 2002). The concept of *upgrading* is quite broad; Humphrey and Schmitz (2002) defined it as a way of making better products, making more

efficient processes and organizations or engaging in higher value-added activities.[27] Morrison et al. (2008), and Brancati, Brancati, and Maresca (2017) argued that, at the firm level, the concept of upgrading should be intended as amplifying the capabilities within the same functions or in additional functions along the value chain.

Most of the studies that have used the GVC approach investigated the process of upgrading through case studies or a specific industry analysis. Some examples of this line of research are the works of Gereffi (1999) on the apparel commodity chain, Schmitz (1999) on the leather and footwear industry, Sturgeon (2002) on the electronics industry, Giuliani et al. (2005) on Latin American clusters, Sturgeon et al. (2008) on the global automotive industry, Pavlínek and Ženka (2010) on the upgrading of automotive firms in Central Europe, and Navas-Alemán (2011) on the upgrading of Brazilian furniture and footwear industries.

A much more limited number of studies has used firm-level data to establish the relationship between GVC participation and firms' performance. Pietrobelli and Saliola (2008), using firm-level data from Thailand, studied the impact of modes of governance on firms' total factor productivity and found that a more intense buyer involvement with local suppliers, not only in the definition of product characteristics, design and quality, but also in technology dissemination and R&D, is associated with higher productivity. However, this result only holds for domestic buyers, while the effect of buyer involvement on the TFP of suppliers is not significant for multinational enterprises or exporters. Using the same database, Saliola and Zanfei (2009)

[27] Humphrey and Schmitz (2002) identified four types of upgrading. The first, process upgrading, refers to introducing new methods to improve the production system, which can then transform intermediate inputs into final products more efficiently, particularly through innovations in the production process or in new technologies. The second, product upgrading, refers to introducing new products that lead to firms increasing their profits through the sales of higher value products. The third, functional upgrading, refers to acquiring new functions to increase the overall skill content of activities, which is normally related to higher labour productivity. Finally, inter-sectoral upgrading refers to gaining higher value by entering new product value chains; for example, Chinese Taipei firms have used knowledge previously acquired in producing televisions to make monitors and computers.

investigated the determinants of knowledge intensive value chain arrangements and found that they are positively associated with the presence of global buyers on the local market, with the efforts made by multinational enterprises to adapt technology to local contexts, and with the technical capabilities of domestic firms. Del Prete, Giovannetti, and Marvasi (2017), using a propensity score matching diff-in-diff method, found that North African firms that enter GVCs perform better ex ante and show additional productivity gains ex post.

Agostino, Brancati, Giunta, Scalera, and Trivieri (2019) and Giovannetti, Marvasi, and Sanfilippo (2015), focusing on small and medium size Italian firms, found that suppliers involved in GVCs experience gains in productivity, and have a higher probability of exporting and a higher intensive margin of trade, respectively.

Brancati et al. (2017), with reference to a sample of Italian firms observed after the 2008 financial crisis, directly tested the impact of GVC participation on firms' innovation and performance, distinguishing between different modes of governance. By referring to the contributions of Humphrey and Schmitz (2002) and those of Gereffi et al. (2005)[28], they identified four different forms of GVC governance (namely arm-length market, hierarchical, quasi-hierarchical and relational) on the basis of the suppliers' capabilities and degrees of subordination. They found that relational GVCs, comprising skilled firms with an active decisional role in the value chain, have a 4–6% higher probability of innovating and investing in R&D projects and of performing better, in terms of productivity and sales growth. On the other hand, they found that different forms of GVC participation do not lead to any significant premium, compared to domestic companies. Agostino et al. (2019), who also focused on Small and Medium Enterprises (SMEs) in

[28] Gereffi et al. (2005) identified five forms of GVC governance, that is, market, modular, relational, captive and hierarchy, which range from a low to high degree of power asymmetry and extent of explicit coordination with the partner's production activities, to explain the relevant heterogeneities in the learning-by-participating assumption in GVCs. Humphrey and Schmitz (2002) proposed a different classification with only four forms, that is, arm's length market relations, networks, quasi-hierarchy and hierarchy, and argued that local upgrading opportunities vary according to the way chains are governed.

Italy, studied the impact of participation in GVC and modes of governance on firms' technical efficiency. They found that firms that take part in GVCs obtain significant efficiency gains and that the benefits are larger for suppliers than for the final firms and larger for relational GVCs than for other forms of governance.

Using a sample of firms from 90 countries, Reddy et al. (2020) investigated whether innovation acts as a driver for firms to participate in GVCs. The results of the analysis show a positive impact of innovation on firm GVC participation, thereby reinforcing the notion that the innovative capacity of firms affects their behavior on international markets. Molodchik et al. (2020), relaying on a sample of Latin American and Caribbean countries, showed the presence of a positive relationship between participation in international activities and firm performance. They also found that both participation in GVCs and position within GVCs matter.

Overall, from the empirical studies reviewed above that focused on firms from both developing and developed countries, it emerges that participation in GVCs can be beneficial for firms' performance (productivity, innovation, efficiency, etc.) and that GVC modes of governance may play an important role in this process. This leads to my first testable hypothesis :

H1a: *The participation in GVCs has a positive impact on innovation.*

H1b: *The forms governance of GVCs have different impact on innovation.*

The studies that investigated the role of intangible assets in creating and appropriating value in GVCs are related to the literature on the governance of GVCs. Intangible assets are a vital driver of innovation, growth and international competitiveness at both the firm and country level, especially in advanced countries (D. Andrews & De Serres, 2012; Dosi, Grazzi, & Moschella, 2015; Dosi, Pavitt, & Soete, 1990; Fagerberg, 1994; Laursen & Meliciani, 2010). The definition

of intangible assets includes information technology knowledge, R&D knowledge, design, firm-specific training, marketing, advertising, brand management and organizational efficiency (Corrado, Haskel, & Jona-Lasinio, 2017; Corrado, Hulten, & Sichel, 2005, 2009). Investment in these assets is expanding more rapidly in OECD countries than investments in physical assets (machinery and equipment, buildings, land). These investments have a significant impact on productivity growth (Arrighetti, Landini, & Lasagni, 2014; Corrado, Haskel, Jona-Lasinio, & Iommi, 2013; Fukao, Miyagawa, Mukai, Shinoda, & Tonogi, 2009; Marrano, Haskel, & Wallis, 2009; Roth & Thum, 2013) as they enhance the innovativeness of firms (Kramer, Marinelli, Iammarino, & Diez, 2011) and GVC participation (Jona-Lasinio et al., 2019). However, the existing empirical evidence on emerging counties, at a firm-level, is still scarce. Yang, Zhou, and Song (2018) showed that intangible investment has a positive impact on the productivity of private manufacturing firms in China. Meliciani and Tchorek (2019) found that, although intangible assets were very important in preventing a drop in sales for internationalized firms in Europe immediately after the 2008 crisis, they amplified the probability of the failure of firms five years after the crisis in weaker European countries (Spain and Italy). I propose the second testable hypothesis:

H2: *Intangible assets (training, advertising and R&D) have a direct positive influence on innovation.*

The strategic role of intangible assets in GVCs at the micro level has emerged from numerous case studies, thus suggesting that much of the value added of a final product is created in the first (upstream) and last (downstream) stages of the production process by firms involved in R&D, design, marketing and advertising, while firms involved in intermediate stages (such as the production of components and assembly) only reap a small part of the final value of the goods or service produced (Dedrick et al., 2010; Mudambi, 2007, 2008; Shin et al., 2009, 2012).

Intangible assets can play different roles in value appropriation, depending on the innovative characteristics of each asset (product innovation or process innovation) and on the stage of GVC participation (upstream, downstream). R&D and design ideally lie upstream in the 'smiling of value creation', while marketing, advertising and brand management are located in a relatively downstream position. However, R&D and design can be strategic assets for the production of both final consumption goods and intermediate inputs. Jona-Lasinio et al. (2019) found, at a country level, that investments in R&D and design contribute positively to upstream participation in GVCs. On the other hand, because of the higher degree of information asymmetries between buyers and sellers, marketing and advertising are particularly vital for firms that sell their final products in GVCs (Jona-Lasinio et al., 2019). Finally, intangible assets are complementary with technological assets, such as ICT (see Corrado et al., 2017) and among themselves, as in the case of R&D and marketing: firms that innovate along the R&D margins are also likely to be innovative and/or effective in marketing (Corrado & Hao, 2014).

Despite the growing evidence from case studies on the role of intangible assets in GVCs, there is still a lack of statistical analyses at the firm level. This paper contributes to the literature by investigating whether intangible assets directly affect innovation and whether they moderate the impact of GVC participation on innovation. The issue is of particular interest for the case of Vietnam, an emerging country characterized by a prevalence of small and medium enterprises with a high degree of firm heterogeneity in their investments in intangible assets. In this context, I propose the third testable hypothesis:

H3: *A firm's participation in GVCs moderated by each intangible has a positively impact on innovation.*

Finally, it is possible to expect that investments in intangible assets and the modes of governance of GVCs are interrelated. Gereffi et al. (2005) identified different types of global value chain governance (hierarchy, captive, relational, modular and market), ranging from high to low levels of explicit coordination and power asymmetry. The key insight is that the coordination and control of global-scale production systems, despite their complexity, can be achieved without direct ownership. There is in fact a high degree of explicit coordination and a large measure of power asymmetry in captive value chains, with the lead firm (or top management) being the dominant party. In order to achieve a more balanced power between the firms in GVCs, suppliers need to develop specific capabilities, as happens in relational and modular value chains. Investment in intangible assets is crucial to enhance the dynamic capabilities of firms (Schiller & Perera, 2012). The role of intangible assets in allowing firms to benefit from GVC participation can therefore differ according to the mode of governance of the GVC. This leads to my last testable hypothesis:

H4: *Different forms of GVCs governance of firm moderated by each intangible asset has a positively impact on firm innovation.*

3.3 Empirical methodology

3.3.1 Data

The data used in this study were taken from unbalanced panel data from five rounds of biannual surveys of SMEs in Vietnam conducted between 2005 and 2013. The surveys were conducted by the Institute of Labour, Science and Social Affairs, the Central Institute for Economic Management (CIEM), the University of Copenhagen, and the United Nations University World Institute for

Development Economic Research (UNU - WIDER). The data cover manufacturing SMEs randomly selected from the population of non-state manufacturing firms in 10 cities and provinces in Vietnam, that is, Ha Noi city, Phu Tho, Hai Phong city, Ha Tay, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Ho Chi Minh city and Long An. The number of SMEs in the selected provinces covered about 60 percent of the population of non-state manufacturing firms in Vietnam (The General Statistics Office of Vietnam, 2016b). The sampled SMEs belong to different manufacturing sectors, including food products, beverages, textiles, apparel and leather products, wood products, paper products, printing and reproduction of recorded media, petroleum products, chemical, pharmaceutical, plastic products, non-metallic, mineral products, basic metal and metal products, electronic products, equipment, machinery, transport equipment, furniture, and others. The SMEs that exited the original sample during the sampling period were replaced by SMEs with similar attributes, drawn from the surveyed SMEs, and the total number of observations for the five rounds of surveys amounted to 13,106.

My dataset provides an appropriate setting to examine the relationship between GVC participation, forms of governance and the upgrading of firms, and it includes information on firms' investments in intangible assets. First, the data has allowed us to trace the participation of SMEs in GVCs and their upgrading decisions over a period of several years. Second, my data covers a dynamic period of the Vietnamese SMEs, which is characterised by their joining the WTO in 2007 and increasing their participation on the global market. According to the World Bank, the openness of Vietnamese trade (the sum of exports and imports of goods and services measured as a share of the gross domestic product) witnessed a continuous increase between 2005 and 2013 (except for 2009), with values of 130.7 percent, 154.6 percent, 134.7 percent, 162.9 percent and 165.1 percent in 2005, 2007, 2009, 2011 and 2013, respectively. Third, my sample does not cover

the multinational firms that operate in Vietnam, which helps to reduce the confounding effects of other internationalisation strategies (Cassiman & Golovko, 2011).

3.3.2 Participation in GVCs

It is particularly difficult to measure the participation of firms in GVCs on a large scale, since it would require a specific surveys repeated several times over a given period of time. Therefore, previous studies mostly relay on simple proxies to measure the firm's participation in GVCs. However, the use of simple proxies, such as export or import activities, may be biased in research on GVCs (Agostino et al., 2019; Brancati et al., 2017). In fact, the import and export activities of firms may occur without an concrete involvement of the firm in the value chain (Brancati et al., 2017; Johnson, 2018). Relaying on Brancati et al. (2017) and Agostino et al. (2019), I measure firms' participation in GVCs considering export and import activities of SMEs, the relationship between SMEs and their foreign customers, and the main type of production (final consumption and intermediate inputs).

Specifically, I used two alterative measures of SMEs' participation in GVCs. The first measure refers to firms' ability to export intermediate products, since this ability is generally required to be a part of a GVC (Amiti & Davis, 2012; Kasahara & Lapham, 2013; Melitz, 2003; Yi, 2003). The second measure refers to the firms' ability either to imports inputs or to exports a final product, thus indicating that it is involved to a great extent in international trade and expected to participate in global production (Brancati et al., 2017; Johnson, 2018).[29]

[29] See Table A3.2 and Table A3.3 in the Appendix for the definition of our full proxies.

3.3.3 The governance forms of GVC participation

Governance is a central element of any GVC analysis, and it is related to how global production and distribution systems are organized (Gereffi et al., 2005; Humphrey & Schmitz, 2001, 2002). Most papers refer to the governance forms as classified by Gereffi et al. (2005) and Humphrey and Schmitz (2002). Gereffi et al. (2005) identified five forms of global value chain governance, that is, market, modular, relational, captive and hierarchy, while Humphrey and Schmitz (2002) proposed a different classification, based only on four forms, that is, arm's length market relations, networks, quasi-hierarchy and hierarchy. Pertaining the *Arm's length market relations* form, buyers and suppliers do not develop close relationships. This implies that the supplier has the capacity to produce the product the buyer wants, and the supplier can satisfy the buyer's requirement (with reference to quality and reliability). The product should be of a standard type or easily customized, and any process requirements should satisfy specific non-transaction standards of the sort verified by means of independent certification. Concerning the *Networks* is concerned, firms co-operate in a more information- intensive relationship, frequently sharing essential value chain competences with each other. The relationship is characterized by reciprocal dependence. In this case, the buyer may specify certain product or process performance standards and is confident that the supplier can satisfy them. Regarding the *Quasi hierarchy* classification is concerned, one firm exercises a high degree of control over other firms in the chain, frequently provides detailed specifications about the product that has to be produced, and sometimes also about the production processes that have to be followed and the control mechanisms that have to be enforced. This level of control can arise not only from the lead firm's role in defining the product, but also from the buyer's perceived risk of losses as a result of any performance failure of the suppliers. In other words, there may be some doubts about the competence of the supply chain. Finally, the *Hierarchy*

form of GVC participation involves a high level of vertical integration and in-house production, where the lead firm takes direct ownership of some operations along the chain, such as a maximum degree of subordination in an offshore subsidiary. As a result of data limitations, I only refer to three out of the four forms of governance, that is, *Arm's length market relations, Networks, and Quasi hierarchy*. Our measure of *Arm's length market relations* form is proxied by considering the experience of a firm participating in GVCs, and foreign customers requesting a certification of the procedures and/or products (Brancati et al., 2017; Mangelsdorf, Portugal-Perez, & Wilson, 2012; Nadvi, 2008). My measure of *Networks* form is proxied by the experience of a firm participating in GVCs, and foreign partners providing technology or expertise to exchange knowledge and gain access to complementary competencies (Brancati et al., 2017). The *Quasi hierarchy* form is proxied by the experience of a firm participating in GVCs, and foreign customers providing product specifications and designs for production, because the foreign partners have a high degree of control over the other firms in the chain (Brancati et al., 2017). The proxies for these indicators are shown in Table A3.2 and Table A3.3 in the Appendix.

3.3.4 Econometric approach

My paper examines the effect of SME participation in GVCs and of the forms of governance on innovation activities moderated by investment in intangible assets in Vietnam. The following equation models were considered:

$$UPG_{it} = 1[\beta_{11} GVCs_{it-2} + \beta_{12} DaysTraining_{it-2} + \beta_{13} Advertising_{it-2} + \beta_{14} RD_{it-2} + x_{it}\boldsymbol{\theta}_1 + c_{1i} + \varepsilon_{1it} \geq 0] \quad (1)$$

$$UPG_{it} = 1[\beta_{21} GVCs_{it-2} + \beta_{22} DaysTraining_{it-2} + \beta_{23} Advertising_{it-2} + \beta_{24} RD_{it-2} + \beta_{25} GVCs_{it-2} * DaysTraining_{it-2} + \beta_{26} GVCs_{it-2} * Advertising_{it-2} + \beta_{27} GVCs_{it-2} * RD_{it-2} + x_{it}\boldsymbol{\theta}_2 + c_{2i} + \varepsilon_{2it} \geq 0] \quad (2)$$

where UPG_{it} is a dummy dependent variable that identifies investment decisions in innovation upgrading activities, such as the introduction of the product innovation (Product) and the process innovation (Process) of firm i at time t. $GVCs_{it-2}$ is a vector of the covariates that capture either the experience of participating in GVCs at time t-2 (GVC_{it-2}) or the experience of a specific form of GVC governance (Arm-length market, $amGVC_{it-2}$; Networks, $netGVC_{it-2}$; Quasi hierarchy, $qhGVC_{it-2}$). My intangible asset variables, INT_{it-2}, follow the definition of (Corrado et al. (2017) and Corrado et al. (2005, 2009) as information technology knowledge, R&D knowledge, design, firm-specific training, marketing, advertising, brand management and organizational efficiency. INT_{it-2} is a vector of the covariates that measure the types of intangible assets of firm i at time t-2, such as investment in R&D decisions; a logarithm of the average number of days of work training (Days of Training); and investment in advertising decisions (Advertising).

According to prior research, a set of control variables (x_{it}) was introduced into equations (1) and (2) to capture any relevant factors, such as firm *Size*, squared firm size *(Size^2)*, *Firm age*, *Labour quality* and *Formal Credit* that can affect the dependent variable. I also included time effects, provincial effects (*City*) and *Industrial effects* in equations (1) and (2). Finally, the distributions of the error terms are $\varepsilon_{1it} \sim N(0,1)$ and $\varepsilon_{2it} \sim N(0,1)$, while c_{1i} and c_{2i} are the unobserved heterogeneities (the unobserved-firm effects). The definitions of all the variables are given in Table A3.3 in the Appendix.

In addition, I control for endogeneity problems as time-invariant unobserved and unobserved heterogeneity, which can affect the relationship between the experience of participating in GVCs or the experience of a specific form of GVC governance and firm innovation in equations (1) and (2). To account for such problems, unobserved heterogeneity can first be accounted for by adding the time averages of the explanatory variables to equations (1) and (2) and then using a pooled probit or a traditional random effects (RE) probit model to estimate the models that are equivalent to a fixed effects model, as in a linear case (Wooldridge, 2010: Section 15.8). This approach is similar to the approach of Mundlak (1978) and Chamberlain (1984a), which is called the correlated-random effects approach. Their form of the unobserved heterogeneity, c_i, is assumed as follows:

$$c_i = \psi_0 + \bar{\mathrm{z}}_i\boldsymbol{\delta} + a_i$$

where $a_i \sim N(0, \sigma_a^2)$ and $\bar{\mathrm{z}}_i = \frac{1}{T}\sum_{t=1}^{T}\mathrm{z}_{it}$ are vectors of the time averages of z_{it}, which are all exogenous variables across all the time periods. Substituting this equation in equations (1) and (2) leads to equations (3) and (4), respectively:

$$UPG_{it} = 1[\beta_{31}GVCs_{it-2} + \beta_{32}DaysTraining_{it-2} + \beta_{33}Advertising_{it-2} + \beta_{34}RD_{it-2} + x_{it}\boldsymbol{\theta}_3 + \psi_0 + \bar{\mathrm{z}}_i\boldsymbol{\delta} + a_i + \varepsilon_{3it} \geq 0] \quad (3)$$

$$UPG_{it} = 1[\beta_{41}GVCs_{it-2} + \beta_{42}DaysTraining_{it-2} + \beta_{43}Advertising_{it-2} + \beta_{44}RD_{it-2} + \beta_{45}GVCs_{it-2} * DaysTraining_{it-2} + \beta_{46}GVCs_{it-2} * Advertising_{it-2} + \beta_{47}GVCs_{it-2} * RD_{it-2} + x_{it}\boldsymbol{\theta}_4 + \psi_0 + \bar{\mathrm{z}}_i\boldsymbol{\delta} + a_i + \varepsilon_{4it} \geq 0] \quad (4)$$

To take into account endogeneity issues, I apply the control function approach or the pooled instrumental variable (IV) probit approach considering relevant IV(s) to eliminate the endogeneity in equation (3), both of which lead to identical estimation results (Wooldridge, 2010). For example,

in the pooled IV probit approach, the fitted values of the endogenous explanatory variable that are obtained from pooled ordinary least squares (OLS) estimation of the reduced-form regression, are included into the structural-form regression. On the other hand, in the control function approach, the residuals obtained from the pooled OLS estimation of the reduced-form regression are added into the structural-form regression (Wooldridge, 2010). It should be noted that the two approaches lead to the same reduced-form regression. The control function approach allows a monotonic function of the endogenous explanatory variable to be obtained in a reduced form for both equations (3) and (4) as follows:

$$GVCs_{it-} = \beta_{51} TradePromotion_{it-2} + \beta_{52} DaysTraining_{it-2} + \beta_{53} Advertising_{it-2} + \beta_{54} RD_{it-2} + x_{it}\boldsymbol{\theta}_5 + \psi_1 + \bar{z}_i\boldsymbol{\delta} + v_{it} \quad (5)$$

where $TradePromotion_{it-2}$ is an instrument for the endogenous variable, $GVCs_{it-2}$. $TradePromotion_{it-2}$ is a dummy variable that is equal to 1 if a firm takes part in a national trade promotion programme where it is provided with assistances to study export opportunities and participate in international exhibitions and fairs organized in both Vietnam and overseas at time t-2. Such a program can help both trading firms and non-trading firms to overcome the trade barriers and to tackle asymmetric information problems of expanding and entering onto new international markets. The existing empirical evidence shows that national trade promotion has a significant and positive effect on export performance at both a country level (Lederman, Olarreaga, & Payton, 2010) and at a firm level in Chile (Martincus & Carballo, 2010) and in Peru (Malca, Peña-Vinces, & Acedo, 2020; Martincus & Carballo, 2008), while it increases the likelihood of Belgian firms exporting to new markets outside the single European Union market (Broocks & Van Biesebroeck, 2017).

I use the pooled OLS to estimate equation (5) and to obtain the residuals, $\hat{v}_{it}$, which were inserted into equations (3) and (4) to control for the endogeneity of $GVCs_{it-2}$ and served as "the control function" in the second stage. I also computed $\hat{v}_{it} * GVCs_{it-2}$, and then added it into equation (4) to control for endogeneity of the interactions. As a result, I use the pooled probit model to estimate equations (6) and (7) to control for the unobserved heterogeneity and endogeneity of $GVCs_{it-2}$ (Wooldridge, 2010, 2015):

$$UPG_{it} = 1[\beta_{61}GVCs_{it-2} + \beta_{62}DaysTraining_{it-2} + \beta_{63}Advertising_{it-2} + \beta_{64}RD_{it-2} + \rho\hat{v}_{it} + x_{it}\boldsymbol{\theta}_6 + \psi_0 + \bar{z}_i\boldsymbol{\delta} + a_i + \varepsilon_{6it} \geq 0] \quad (6)$$

$$UPG_{it} = 1[\beta_{71}GVCs_{it-2} + \beta_{72}DaysTraining_{it-2} + \beta_{73}Advertising_{it-2} + \beta_{74}RD_{it-2} + \beta_{75}GVCs_{it-2} * DaysTraining_{it-2} + \beta_{76}GVCs_{it-2} * Advertising_{it-2} + \beta_{77}GVCs_{it-2} * RD_{it-2} + \lambda\hat{v}_{it} + \eta\hat{v}_{it} * GVCs_{it-2} + x_{it}\boldsymbol{\theta}_7 + \psi_0 + \bar{z}_i\boldsymbol{\delta} + a_i + \varepsilon_{7it} \geq 0] \quad (7)$$

3.4 Results

3.4.1 Descriptive statistics

Table 3.1 presents the descriptive statistics of the main variables in our model. The results show that the experience of participating in GVCs (GVC) is, on average, 0.3 years in our sample, while the arm-length market (amGVC), networks (netGVC) and quasi-hierarchical (qhGVC) relationships are about 0.12 years, 0.15 years and 0.17 years, respectively. In terms of innovation activities, 42.0 percent of the firms introduce product innovation, while only 16.0 percent introduces process innovation. Finally, the decisions of a firm to invest in R&D, in provisions for the training of workers as well as in advertising are 1.3 percent, 1.5 days and 10.1 percent, respectively.

Table 3.2 presents the correlations of our sample. The correlation coefficients among the innovation activities, participation in GVCs, the forms of governance and the investment in intangible assets of firms are positive and range from 5 percent to 20 percent.

[Insert Table 3.1 here]

[Insert Table 3.2 here]

3.4.2 Regression results

The first-stage results

The pooled OLS estimation results from equation (5) in Table 3.3 show that the participation of firm in a national trade promotion program has a significantly positive impact on GVC participation and the form of GVC governance. In addition, the results of two instrument validity tests, that is, the under-identification test (Anderson's canonical correlation) and the weak identification test (Cragg-Donald Wald test), are also reported to determine a valid instrument to predict the endogenous variable in the model (I. Andrews, Stock, & Sun, 2019; Stock & Yogo, 2005). The highly statistically significance of Anderson's canonical correlation tests confirm the adequate explanatory power of our IV for all the innovation categories. Moreover, all the Cragg-Donald Wald test values are greater than the critical values of the Stock-Yogo weak instrument test, that is, 16.38 for the 10% maximal IV size (Stock & Yogo, 2005), and reject the null hypothesis of weak-instrument inference for all types of innovation.

[Insert Table 3.3 here]

The second-stage results: the control function approach

I estimated equations (6) and (7), which refer to the control function approach, with the firm-fixed effects using the pooled probit model. The average marginal effects from equation (6),

pertaining to the regressor firms' participation in GVCs and different forms of governance of the GVCs, are reported in Table 3.4. Table 3.5 reports the average marginal effects of SME participation in GVCs and of the forms of governance on innovation activities moderated by investment in intangible assets. Estimates of product innovation and process innovation are reported in each table. The results of the modelling on participation in GVCs (GVC) are shown in the first two columns, the results of the modelling on the Arm-length market (amGVC) are shown in the second two columns, and the results of the modelling on Quasi-hierarchical (qhGVC) are shown in the last two columns. Next, the results of the test on the unobserved heterogeneity – firm effects ($\boldsymbol{\delta}$) in Table 3.4 and Table 3.5 are statistically significant, thus implying that the time averages of explanatory variables should be included to control for unobserved heterogeneity (Wooldridge (2010, 2015). The results of $\hat{v}_{it}(\rho)$ and of the Wald test for joint coefficients of $\hat{v}_{it}$ (λ) and $\hat{v}_{it} * GVCs_{it-2}$ (η) in Table 3.4 and Table 3.5 are both statistically significant for product innovation, but not for process innovation. Finally, I also estimated equation (6) using the fixed effects pooled IV probit model, and the results in Table A3.4 in the Appendix are identical to the results in Table 3.4, where the control function approach was used.

[Insert Table 3.4 here]

[Insert Table 3.5 here]

The marginal effects of the decisions of a firm to invest in R&D upstream in the smiling curve, and in marketing and advertising downstream, as well as providing the training of workers in a prior time (t-2) in Table 3.4, have different impacts on product innovation and process innovation. In fact, a ten percent increase in the number of worker training days would increase the likelihood of introducing production innovation by about 1.8 – 2.3 percent (Columns 1, 3, 5 and 7 in Table 3.4), while it would only rise by about one percent for process innovation (Columns

2, 4, 6 and 8 in Table 3.4). The firm's investment decisions on marketing and advertising, as well as on R&D have a higher likelihood of introducing product innovation, that is, about 5.4 – 9.9 percent and 10.4 – 26.8 percent, respectively (Columns 1, 3, 5 and 7 in Table 3.4), while they have no impact on process innovation (Columns 2, 4 and 6 in Table 3.4), except for a marginal effect of the Advertising variable (Column 8 in Table 3.4).These marginal effects remain unchanged when the intangible assets moderate the relationship between participation in GVCs, or the different forms of governance of GVCs, and innovation activities of a firm (Table 3.5). My results partly support hypothesis H2.

As far as the learning-by-participating notion in the GVC model is concerned, I find significant effects of firms' participation in GVCs and the form of GVC governance on product innovation, but no effects on process innovation (Table 3.4 and Table 3.5). My findings partly support hypotheses H1a and H1b.

Overall, it appears that simply participating in a GVC, regardless of the form of governance, helps Vietnamese firms to introduce product innovation but not process innovation. Hereafter, I test whether firms participating in GVCs should invest intensively in intangible assets to improve their position along value chains or as learning opportunities (Mudambi, 2007, 2008). Thus, I try to estimate the learning process model by moderating GVC participation and governance with firms' investments in intangible assets. The coefficients in equation (7) in Table 3.6 show that the interaction terms of firms' participation in GVCs and three forms of GVC governance with intangible assets differ according to the type of upgrading activities of the firm (product innovation or process innovation). It should be noted that I cannot estimate the marginal effects for interaction terms in a non-linear model such as equation (7) because they depend on all the covariates in the model, which would lead to different signs and statistical significance for

different values of the covariates (Ai & Norton, 2003; Williams, 2012) and even to significant or non-significant coefficients of the interactions. I have thus produced graphs to show the average marginal effects of all the types of intangible assets on innovation upgrading for various values of experience of GVC participation and experience in GVC governance.

[Insert Table 3.6 here]

The marginal effects of interactions in Figures 3.1a, 3.1b and 3.1c show that a firm investing in R&D, worker training and advertising, respectively, for different values of experience in participating in GVCs has different impacts on product innovation. I instead found no impact on process innovation.[30] For example, the likelihood of introducing product innovation does not increase for a firm participating in GVCs (for any value) and investing in R&D (Figure 3.1a). The likelihood of introducing product innovation increases by 2.0, 2.3 and 2.6 percent for a ten percent increase in investing in worker training for 1-year, 2-years and 3-years of experience in GVC participation, respectively (Figure 3.1b). The likelihood of introducing product innovation increases by 9.7, 11.3 and 12.0 percent for a firm investing in advertising for 1-year, 2-years and 3-years of experience in GVC participation, respectively (Figure 3.1c). My results partly support hypothesis H3.

Figures 3.2a, 3.2b and 3.2c; 3.3a, 3.3b and 3.3c; and 3.4a, 3.4b and 3.4c, regarding the interaction terms of intangible assets with the forms of governance of GVCs, show the results of three forms of GVC governance, *Arm's length market relations, Networks* and *Quasi hierarchy*, respectively, with three types of intangible assets. Overall, the results are similar to those reported in Figures 3.1a, 3.1b and 3.1c, and show the presence of learning curves which impact on the

[30]The graphs show non-significant effects of three intangible assets for different values of experience of participating in GVCs on process innovation. These graphs are available upon request from the authors.

probability of introducing product innovation but not process innovation.[31] In particular, the effects on product innovation for 1-year of experience in an *Arm's length market* relationship disappear for a firm that has invested in R&D (Figure 3.2a),while a firm with 1-year, 2-years, 3-years or 4-years of experience in an *Arm's length market* relationship and which invests in training has an increased likelihood of introducing a product innovation of 2.6, 3.2, 3.6 and 3.7 percent, respectively (Figure 3.2b). A firm with 1-year, 2-years or 3-years of experience in an *Arm's length market* relationship and which invests in advertising has an increased likelihood of introducing product innovation of 9.7 percent, 11.3 and 12.0 percent, respectively (Figure 3.2c). I found week marginal effects of three intangible assets on the relationship between *Networks* relationships and production innovation (Figures 3.3a, 3.3b and 3.3c). Finally, a firm that has invested in R&D, whose effects on product innovation for 1-year of experience in a *Quasi hierarchy* relationship disappears (Figure 3.4a), is similar to those in an *Arm's length market* relationship. On the other hand, a firm with 1-year and 2-years of experience in a *Quasi hierarchy* relationship and which invests in training has an increased likelihood of introducing product innovation of 2.4 percent and 2.1 percent, respectively (Figure 3.4b). A firm with 1-year and 2-years of experience in a *Quasi hierarchy* relationship and which invests in advertising has an increased likelihood of introducing product innovation of 10.2 percent and 9.0 percent, respectively (Figure 3.4c). My results partly support hypothesis H4.

[Insert Figures 3.1a, 3.1b, 3.1c and 3.1d here]

[Insert Figures 3.2a, 3.2b, 3.2c and 3.2d here]

[Insert Figures 3.3a, 3.3b, 3.3c and 3.3d here]

[31] The graphs show non-significant effects of three intangible assets for different values of experience of three forms of GVC governance on process innovation. These graphs are available upon request from the authors.

3.4.3 Robustness checks

I are well aware of the limitation of our measure of intangible assets, that is, firm's investment decisions in advertising and R&D (dummy variables), due to the lack of information about their size. I thus attempt to exploit the heterogeneity of intangible assets to enrich our results by testing for firms that invest in one, two or three types of intangible assets at the same time. If learning skills is what matters, it is plausible that such skills are stronger in firms with a more diversified intangible asset base. To do so, I create a diversified-intangible-asset variable (DIA) with values of 0, 1, 2 or 3 to determine the number of intangible assets that a firm invests in. I then replace all the types of intangible asset variables (Days of training, Advertising and R&D) in equation (7) with the diversified-intangible-asset variable (DIA), and I use the control function approach to estimate this model. Based on the estimated results, I produced the predictive margin graphs of interaction coefficients between DIA and experience in GVC participation (Figure 3.5a), amGVC (Figure 3.5b), netGVC (Figure 3.5c) and qhGVC (Figure 3.5d). All the Figures confirm my expectation that a firm investing in a more diversified intangible asset base increases the likelihood of introducing product innovation with more experience in GVC participation and in governance. Moreover, the trends are different from those of the different forms of governance. These results are consistent with my main findings.

[Insert Figures 3.5a, 3.5b, 3.5c and 3.5d here]

3.4.4 Discussions

This paper studies the role of firms' investments in intangible assets on the relationship between participation in global value chains (GVCs) and innovation in Vietnamese small and medium enterprises (SMEs). First, in recent years, emerging economies have experienced a shift away from

adaptive innovation strategies, i.e. innovation is undertaken by multinational companies and then transferred to their subsidiaries for adaptation and further use, to reverse innovation strategies, i.e. innovation is generated by subsidiaries of multinational companies located in an emerging economy, which drive their participation in global value chains (GVCs) (Lema, Quadros, & Schmitz, 2015). I found evidence of the learning-by-participating in the GVC hypothesis, that is, both experience of GVC participation and the forms of GVC governance have impact on the likelihood of firms introducing product innovation but have no impact on process innovation of SMEs in Viet Nam. My results are consistent with the study of Monreal-Pérez, Aragón-Sánchez, and Sánchez-Marín (2012), who did not find any learning-by-exporting effects on process innovation in Spain. While Brancati et al.(2017) found that Italian firms participate in GVCs and governance are more likely to introduce both product and process innovations.

Second, the role of intangible assets in creating and appropriating value in GVCs are related to the literature on the governance of GVCs. Intangible assets are a vital driver of innovation, growth and international competitiveness at both the firm and country level, especially in advanced countries (D. Andrews & De Serres, 2012; Dosi, Grazzi, & Moschella, 2015; Dosi, Pavitt, & Soete, 1990; Fagerberg, 1994; Laursen & Meliciani, 2010). My findings confirmed that investment in intangible assets of SMEs in Vietnam have positive impact on innovation. However, each type of intangible assets has different impacts on product innovation and process innovation, in which gains depend on investments of firm in each type of intangible assets. My findings are consistent with those of Mudambi (2008) and suggest that a firm that invests intensively in intangible assets is able to gain higher returns.

Finally, intangible assets can play different roles in value appropriation, depending on the innovative characteristics of each asset (product innovation or process innovation) and on the stage

of GVC participation (upstream, downstream). R&D and design ideally lie upstream in the 'smiling of value creation', while marketing, advertising and brand management are located in a relatively downstream position (Jona-Lasinio et al., 2019; Corrado et al., 2017; Corrado & Hao, 2014). My findings showed that intangible assets interacting with experience of the forms of GVC governance and GVC participation, help firms to enhance the likelihood of introducing product innovation, but there is no evidence of this for process innovation. However, their relationships depend on moderation of each type of intangible assets. These findings qualify the learning process in GVCs by showing that the benefits from GVC participation are not mechanical and instead require firms to invest in building absorptive capacities. My findings are consistent with the literature findings pertaining to the fact that intangible assets plays a crucial role in moderating the relationship between firm's performance and firm's participation on an international market (exports, GVCs) (Aw & Batra, 1998; Aw et al., 2007; Baldwin & Gu, 2004; García et al., 2012; Meliciani & Tchorek, 2019).

3.5 Concluding remarks

A recent literature stream about the globalization of value chains has emphasized the importance of gains in value-added along the value chain, related to firm or country positions in global production networks. My paper attempts to explore whether and how intangible assets moderate the impact of firms' participation in GVCs and the GVC forms of governance on the phenomenon of *upgrading,* as proxied by product innovation and process innovation. I have used SME data on Vietnam to estimate a control function approach to control for endogeneity and unobserved heterogeneity problems based on learning-by-participating in the GVC hypothesis. I have found evidence of the learning-by-participating in the GVC hypothesis, that is, participation in GVCs and the forms of GVC governance both have an impact on the likelihood of firms introducing

product innovation, but have no impact on process innovation. My findings are consistent with evidence from Becker and Egger (2013), although Brancati et al. (2017) found evidence of impacts of only GVC participation and *Network* relationships on innovation (product and process) in Italian SMEs.

Interestingly, I have found that intangible assets, including firms' investments in training, and firms' investments in marketing and advertising, are positively and significantly related to the innovation activities of a firm, while firms' investments in R&D only have an impact on product innovation, but not on process innovation. I have also found that the learning curves of intangible assets moderate the relationship between participation in GVCs, or forms of GVC governance, and product innovation, but not process innovation. Moreover, those Vietnamese SMEs that select the *Arm's length market* form and *Quasi-hierarchy* form with their investment in worker training and advertising have more benefits than others. These findings are consistent with the literature finding that intangible assets play a crucial role in moderating the relationship between firm's performance and firm's participation on an international market (exports, GVCs) (Aw & Batra, 1998; Aw et al., 2007; Baldwin & Gu, 2004; García et al., 2012; Meliciani & Tchorek, 2019).

My paper contributes to the existing literature on GVCs at a firm level in several ways. First, I have investigated the effects of heterogeneity across various forms of GVC governance and of participating in GVCs on upgrading activities using rich information from panel-data on manufacturing SMEs in Vietnam. Second, I have assessed whether and to what extent GVC participation can have an impact on different upgrading activities. Third, I have investigated the role of intangible assets in learning opportunities in GVCs as Morrison et al. (2008) suggests that research should focus on the process of technological capacity developments, including specific firm-level efforts, and of the mechanisms allowing knowledge to flow within and between

different GVC governance, and foster processes of learning and upgrading in GVCs. Fourth, I have explored whether a firm's investment in intangible assets and the forms of governance of GVCs are interrelated. Overall, the main result that emerges from the empirical analysis is that intangible assets play different roles in interacting with the different forms of GVC governance and GVC participation and they have different impacts on the types of innovation activities.

This paper has important policy implications. The policy makers, entrepreneurs, and managers of SMEs in transition economies should be aware of the fact that, although international trade is an important vehicle for learning and upgrading, it is not an automatic process. Therefore, for a country to move towards a more sophisticated internationalization process and to be able to capture value from GVC participation, it is important to favor investments in a series of knowledge-based assets, including not only R&D, but also training, marketing and advertising. In addition, understanding the importance of intangibles and governance forms in supply chains could help managers and entrepreneurs of small businesses to capitalize on their participation in GVCs.. Hence, it may be important for small firms to invest in job training for their employees to foster innovative abilities within the firms.

This study suffers from some limitations. First, my analysis focuses on a single transition economy. Future research could analyze other countries to obtain a better understanding of the relationship between the participation in GVCs, intangible assets and forms of governance. Future work could involve examining such relationships by comparing developed and transition countries. In addition, the research was carried out using a sample of SMEs across different sectors. Concentrating the study on specific sectors would allow the degree by which intangible assets affect participation in GVCs to be captured for each type of business and to explore possible industry variations.

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List of Figures

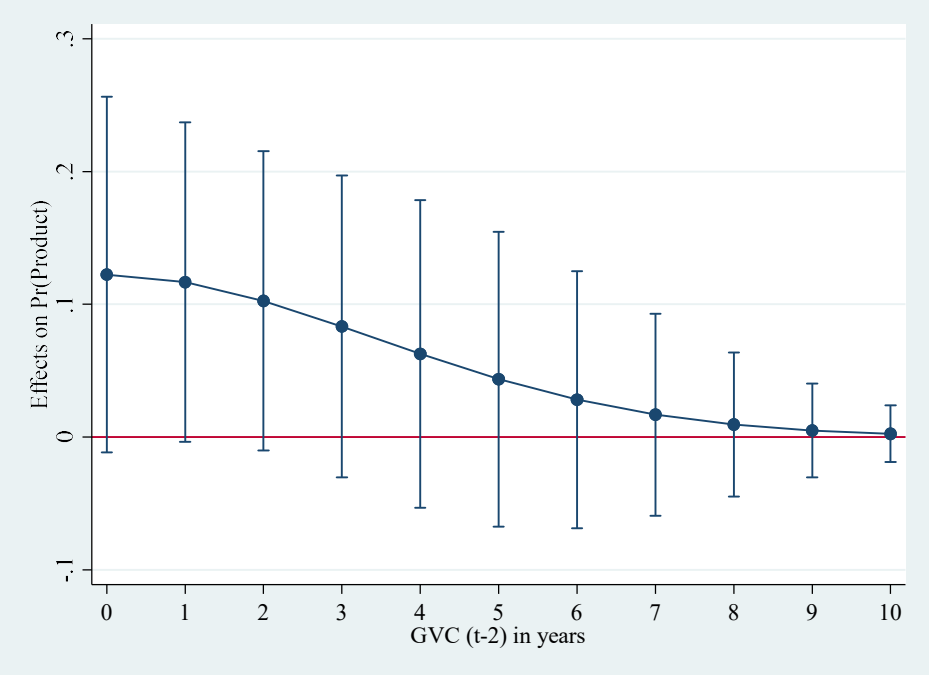


Figure 3.1a Average marginal effects of R&D (t-2) on the likelihood of product innovation at different values of GVC (t-2)

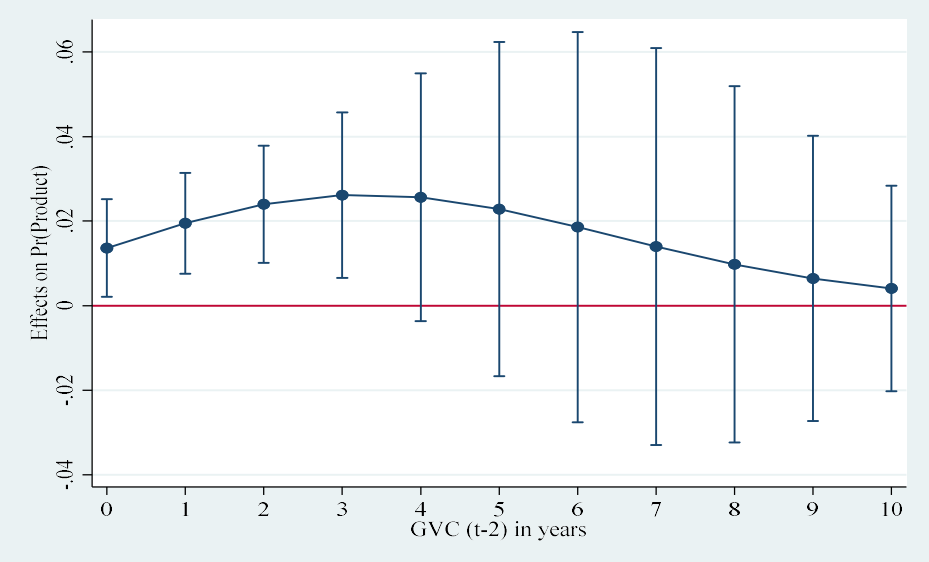


Figure 3.1b Average marginal effects of DaysTraining (t-2) on the likelihood of product innovation at different values of GVC (t-2)

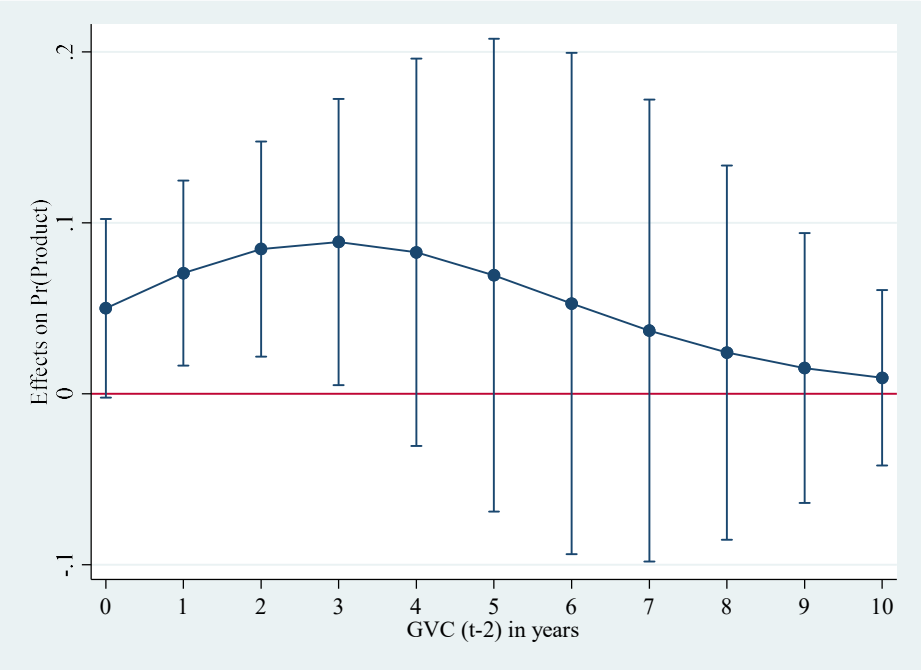


Figure 3.1c Average marginal effects of advertising (t-2) on the likelihood of product innovation at different values of GVC (t-2)

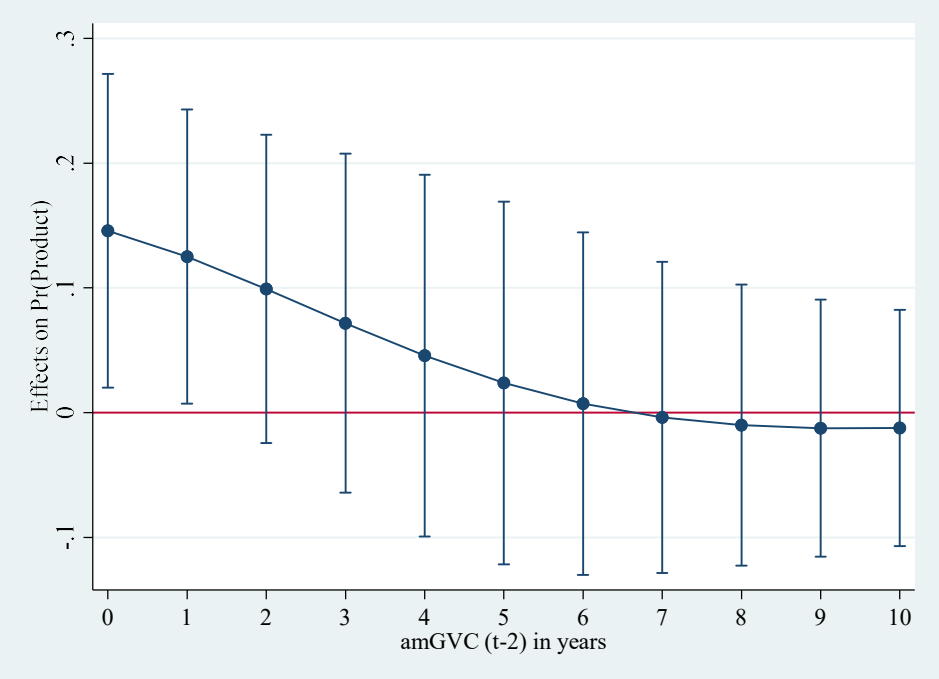


Figure 3.2a Average marginal effects of R&D (t-2) on the likelihood of product innovation at different values of amGVC (t-2)

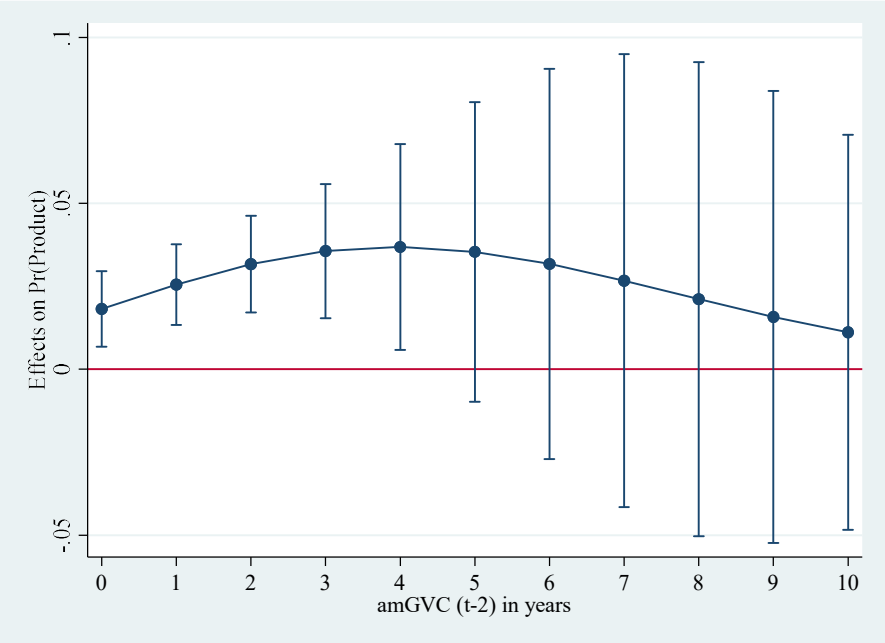


Figure 3.2b Average marginal effects of DaysTraining (t-2) on the likelihood of product innovation at different values of amGVC (t-2)

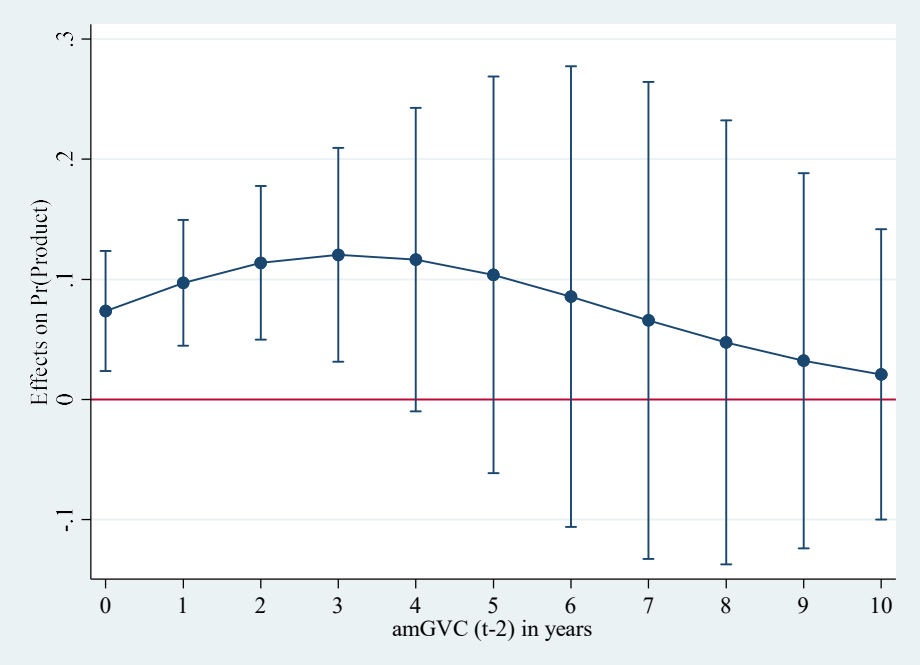


Figure 3.2c Average marginal effects of advertising (t-2) on the likelihood of product innovation at different values of amGVC (t-2)

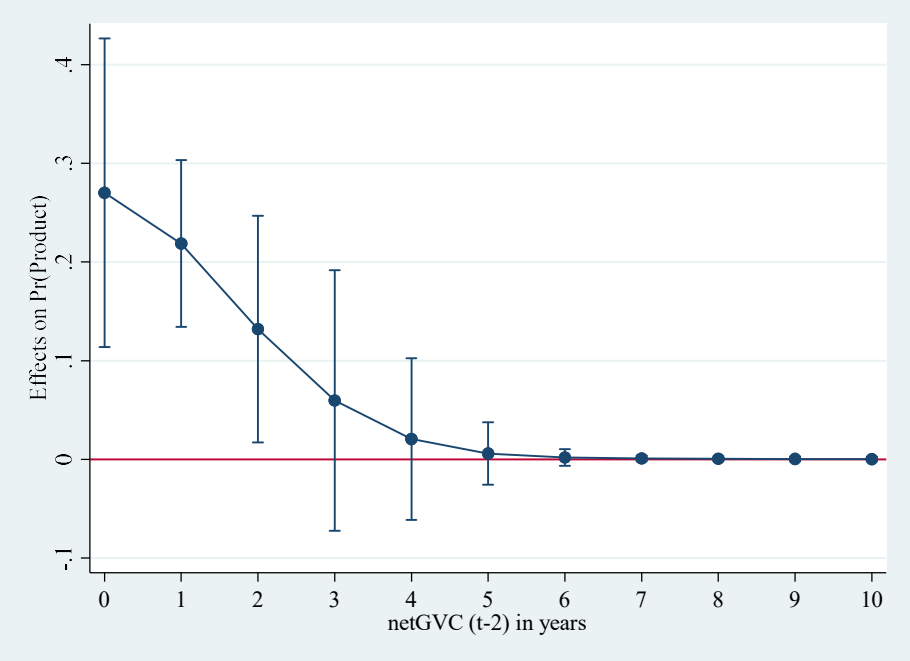


Figure 3.3a Average marginal effects of R&D (t-2) on the likelihood of product innovation at different values of netGVC (t-2)

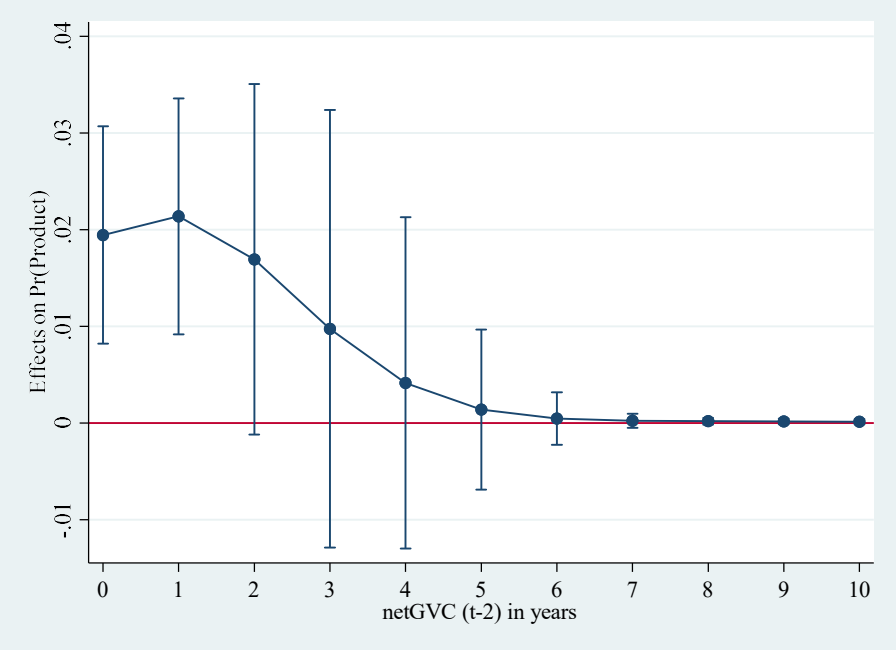


Figure 3.3b Average marginal effects of DaysTraining (t-2) on the likelihood of product innovation at different values of netGVC (t-2)

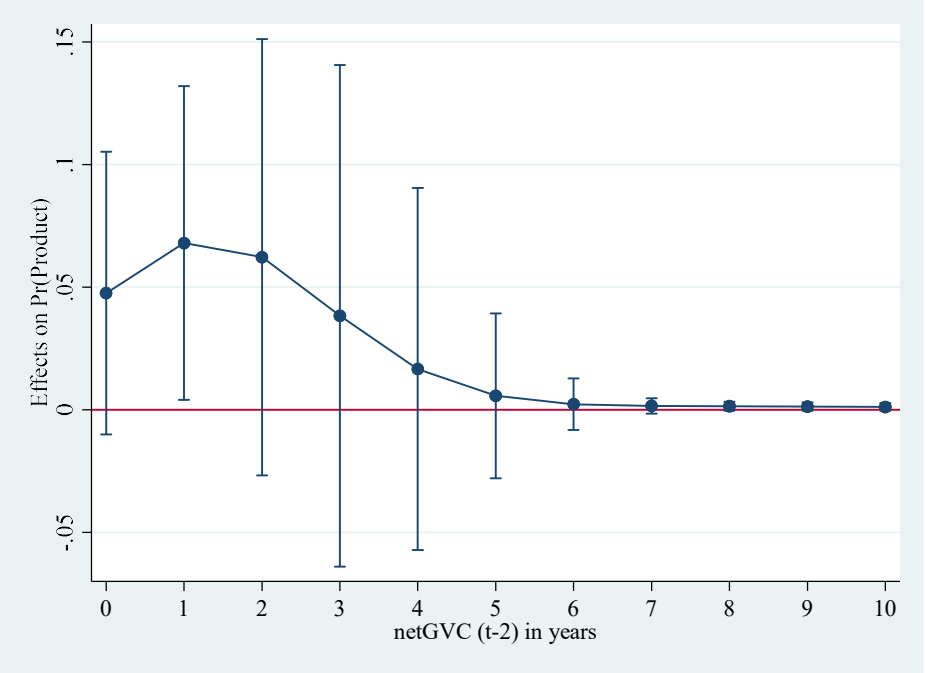


Figure 3.3c Average marginal effects of advertising (t-2) on the likelihood of product innovation at different values of netGVC (t-2)

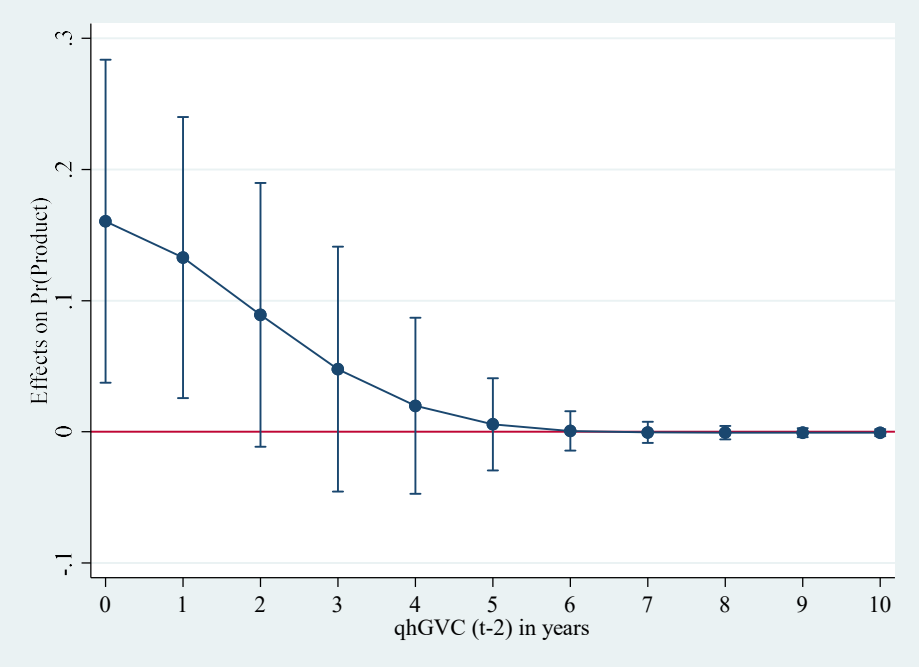


Figure 3.4a Average marginal effects of R&D (t-2) on the likelihood of product innovation at different values of qhGVC (t-2)

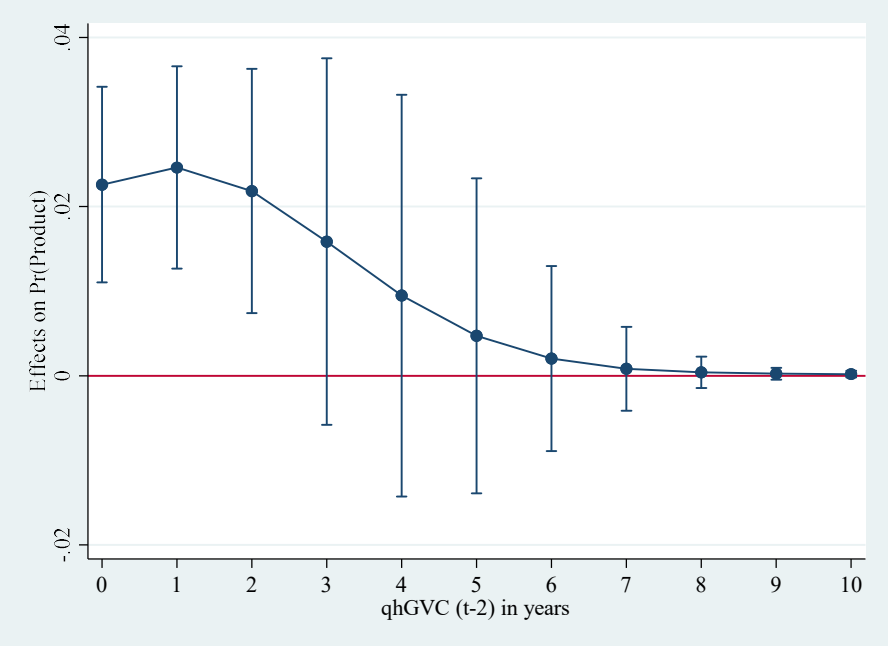


Figure 3.4b Average marginal effects of DaysTraining (t-2) on the likelihood of product innovation at different values of qhGVC (t-2)

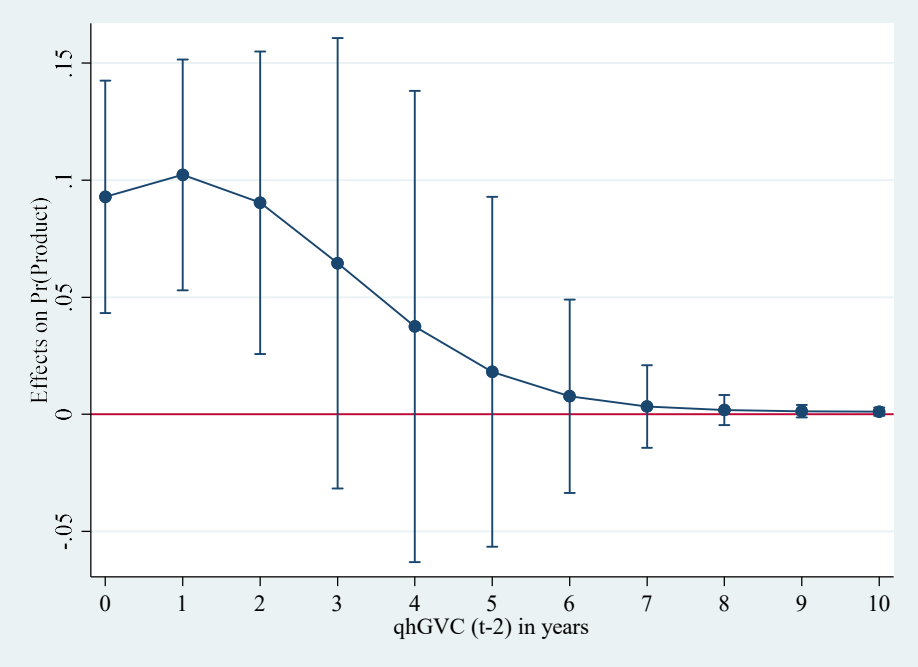


Figure 3.4c Average marginal effects of advertising (t-2) on the likelihood of product innovation at different values of qhGVC (t-2)

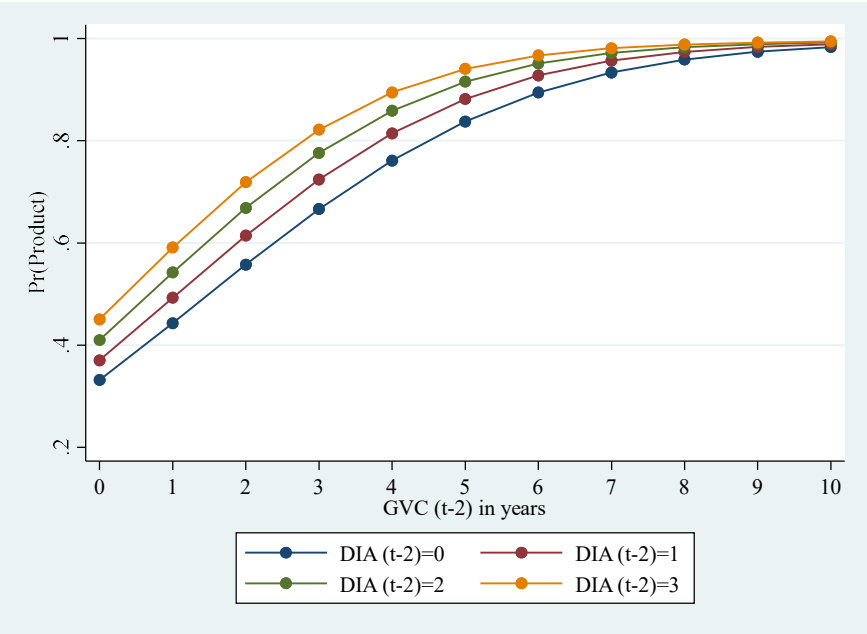


Figure 3.5a Predictive margins of diversified intangible assets on product innovation at different values of GVC (t-2)

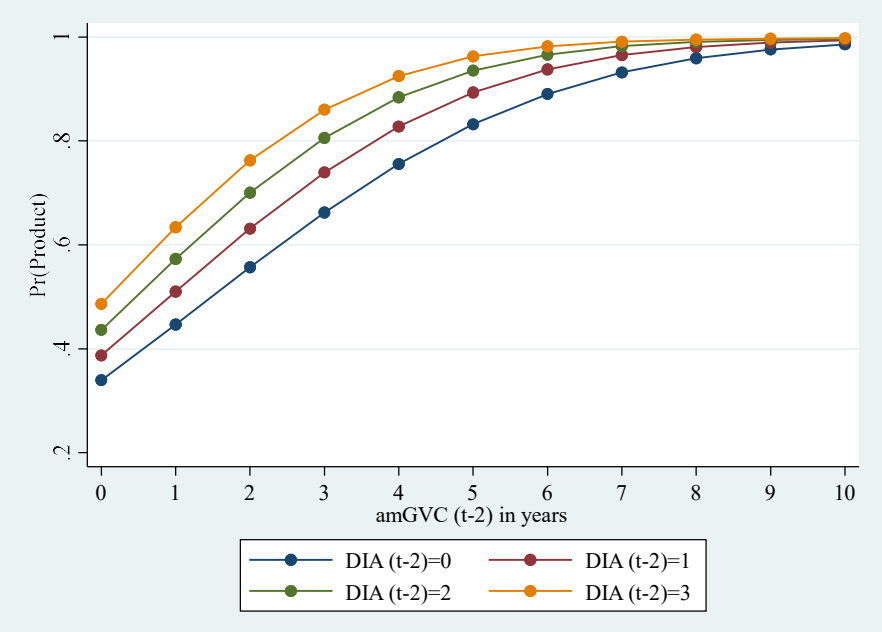


Figure 3.5b Predictive margins of diversified intangible assets on product innovation at different values of amGVC (t-2)

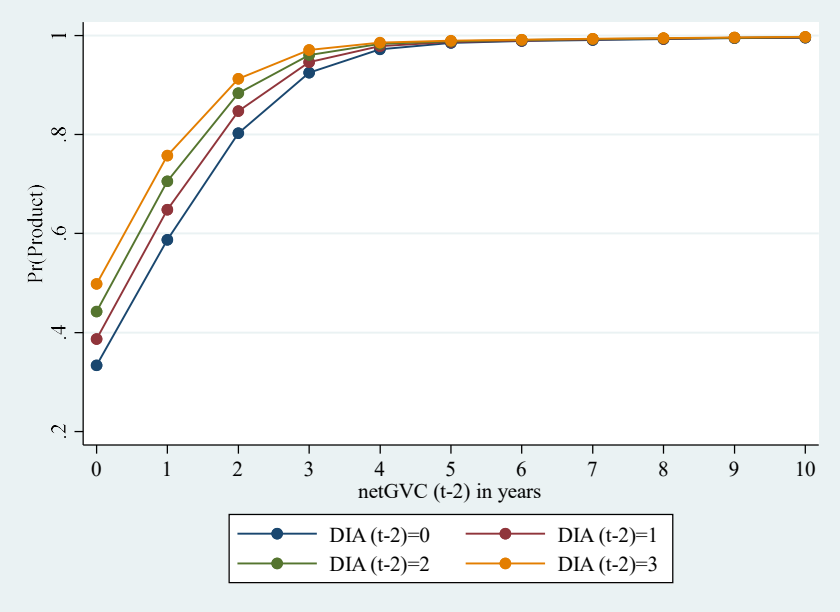


Figure 3.5c Predictive margins of diversified intangible assets on product innovation at different values of netGVC (t-2)

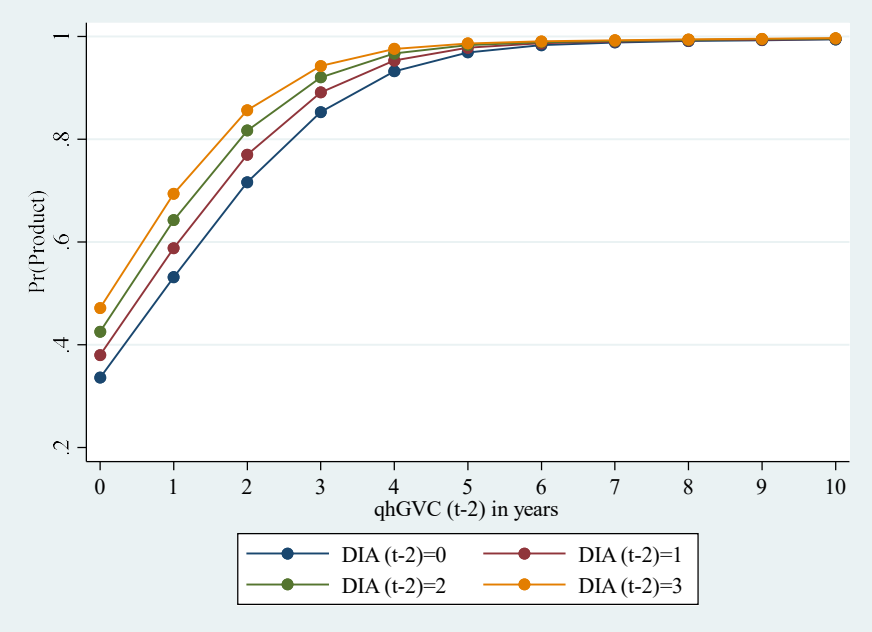


Figure 3.5d Predictive margins of diversified intangible assets on product innovation at different values of qhGVC (t-2)

List of Tables

Table 3.1 Descriptive statistics

	Mean	**Standard deviation**	**Min**	**Max**
Dependent variables				
Product	0.420	0.494	0	1
Process	0.160	0.366	0	1
Experience of GVC participation and their form of governance				
GVC	0.297	1.589	0	30
amGVC	0.120	1.034	0	20
netGVC	0.149	1.121	0	20
qhGVC	0.165	1.211	0	20
Investments in intangible assets				
R&D	0.013	0.111	0	1.00
Days of Training	0.395	1.079	0	5.06
Advertising	0.101	0.302	0	1.00
Control variables				
Size	1.884	1.168	0	7.56
FirmAge	2.368	0.718	0.69	4.34
FormalCredit	0.340	0.474	0	1
Labour quality	0.036	0.076	0	1
City	0.436	0.496	0	1
Instrumental variable				
TradePromotion	0.019	0.135	0	1
N	13106			

Table 3.2 Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Product	1.00													
2. Process	0.35***	1.00												
3. GVC	0.07***	0.08***	1.00											
4. amGVC	0.05***	0.08***	0.64***	1.00										
5. netGVC	0.07***	0.09***	0.69***	0.66***	1.00									
6. qhGVC	0.06***	0.07***	0.75***	0.71***	0.75***	1.00								
7. Days of Training	0.10***	0.11***	0.15***	0.12***	0.12***	0.11***	1.00							
8. Advertising	0.11***	0.13***	0.19***	0.14***	0.13***	0.12***	0.25***	1.00						
9. R&D	0.08***	0.10***	0.09***	0.09***	0.04***	0.06***	0.07***	0.11***	1.00					
10. Size	0.26***	0.28***	0.31***	0.23***	0.25***	0.26***	0.29***	0.35***	0.12***	1.00				
11. Firm Age	-0.11***	-0.10***	0.01	0.01	-0.00	0.00	-0.07***	-0.07***	-0.03***	-0.17***	1.00			
12. Formal Credit	0.14***	0.16***	0.09***	0.08***	0.09***	0.08***	0.10***	0.11***	0.07***	0.29***	-0.08***	1.00		
13. Labour quality	0.11***	0.17***	0.12***	0.09***	0.08***	0.08***	0.13***	0.24***	0.10***	0.39***	-0.17***	0.12***	1.00	
14. City	0.10***	0.09***	0.08***	0.06***	0.07***	0.08***	0.11***	0.13***	0.04***	0.33***	-0.17***	-0.12***	0.26***	1.00

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.3 The pooled OLS estimation results from equation (5) – The first stage

	(1) GVC (t-2)	(2) amGVC (t-2)	(3) netGVC (t-2)	(4) qhGVC (t-2)
TradePromotion (t-2)	0.593***	0.673***	0.333***	0.418***
	(0.108)	(0.075)	(0.081)	(0.086)
R&D (t-2)	0.171**	0.076	0.158***	-0.037
	(0.079)	(0.055)	(0.059)	(0.063)
Days of Training (t-2)	0.277	0.218*	-0.530***	0.026
	(0.174)	(0.122)	(0.130)	(0.140)
Advertising (t-2)	0.019	-0.003	0.000	-0.017
	(0.018)	(0.013)	(0.014)	(0.015)
Size (t)	-0.047	0.021	-0.011	-0.069**
	(0.040)	(0.028)	(0.030)	(0.032)
Firm Age (t)	0.085*	0.073**	0.074**	0.066*
	(0.044)	(0.031)	(0.033)	(0.036)
Labour quality (t)	0.518	-0.433*	-0.007	-0.162
	(0.355)	(0.248)	(0.265)	(0.284)
Formal Credit (t)	-0.024	-0.036	-0.016	-0.005
	(0.047)	(0.033)	(0.035)	(0.037)
City (t)	0.015	0.001	-0.011	0.013
	(0.038)	(0.027)	(0.028)	(0.031)
_cons	-0.985***	-0.464**	-0.504**	-0.449*
	(0.306)	(0.214)	(0.229)	(0.245)
Underidentification test (Anderson's canonical correlation)	30.242***	79.434***	17.115***	23.400***
Weak identification test (Cragg-Donald Wald test)[a]	30.199	79.795	17.064	23.347
Year fixed effects	Yes	Yes	Yes	Yes
Industrial fixed effects	Yes	Yes	Yes	Yes
N	8306	8306	8306	8306
R^2	0.176	0.110	0.115	0.112

Notes: [a]Stock-Yogo weak idenfition test critical value is 16.38 for 10% maximal IV size (Stock and Yogo, 2005); Regressions include time averages of explanatory variables; Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.4 The average marginal effects of experience of GVC participation and governance on innovation-led upgrading activities from equation (6)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GVCs = GVC		GVCs = amGVC		GVCs = netGVC		GVCs = qhGVC	
	Product	Process	Product	Process	Product	Process	Product	Process
main								
GVCs (t-2)	0.128**	0.031	0.112**	0.028	0.226**	0.056	0.180**	0.045
	(0.058)	(0.033)	(0.051)	(0.029)	(0.103)	(0.058)	(0.082)	(0.046)
R&D (t-2)	0.104*	0.036	0.118**	0.038	0.268***	0.086	0.137**	0.045
	(0.061)	(0.036)	(0.060)	(0.035)	(0.080)	(0.055)	(0.059)	(0.034)
Days of Training (t-2)	0.018***	0.009***	0.021***	0.010***	0.020***	0.010***	0.023***	0.011***
	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)
Advertising (t-2)	0.068**	0.025	0.083***	0.029*	0.054*	0.022	0.099***	0.034**
	(0.027)	(0.017)	(0.025)	(0.016)	(0.030)	(0.019)	(0.026)	(0.017)
Size (t)	0.061***	0.040***	0.053***	0.038***	0.058***	0.039***	0.067***	0.041***
	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)	(0.013)	(0.010)
Firm Age (t)	-0.046***	-0.023**	-0.044***	-0.022**	-0.052***	-0.024**	-0.047***	-0.023**
	(0.014)	(0.010)	(0.014)	(0.010)	(0.016)	(0.010)	(0.015)	(0.010)
Labour quality (t)	0.218*	0.186**	0.331***	0.216***	0.286**	0.204***	0.313***	0.210***
	(0.118)	(0.072)	(0.115)	(0.071)	(0.114)	(0.070)	(0.114)	(0.071)
Formal Credit (t)	0.052***	0.033***	0.053***	0.033***	0.052***	0.033***	0.050***	0.033***
	(0.014)	(0.010)	(0.014)	(0.010)	(0.014)	(0.010)	(0.014)	(0.010)
City (t)	0.037***	0.009	0.038***	0.009	0.041***	0.010	0.036***	0.009
	(0.013)	(0.009)	(0.013)	(0.009)	(0.013)	(0.009)	(0.013)	(0.009)
$\hat{v}_{it}(\rho)$	-0.138**	-0.040	-0.130**	-0.037	-0.240**	-0.065	-0.190**	-0.052
	(0.058)	(0.033)	(0.051)	(0.029)	(0.103)	(0.058)	(0.083)	(0.046)
Testing for the unobserved heterogeneity ($\boldsymbol{\delta}$) - chi2(18)	62.69***	28.07*	61.80***	26.39*	61.76***	26.63*	61.64***	27.15*
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industrial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8306	8306	8306	8306	8306	8306	8306	8306
pseudo R^2	0.152	0.133	0.153	0.132	0.152	0.132	0.152	0.131

Notes: Regressions include time averages of explanatory variables; Robust standard errors in parentheses clustered by firms; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.5 The average marginal effects of experience of GVC participation and governance on innovation-led upgrading activities moderated by intangible assets from equation (7) – No marginal effects for interaction terms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GVCs = GVC		GVCs = amGVC		GVCs = netGVC		GVCs = qhGVC	
	Product	Process	Product	Process	Product	Process	Product	Process
main								
GVCs (t-2)	0.109*	0.028	0.093*	0.020	0.216**	0.044	0.170**	0.035
	(0.059)	(0.033)	(0.053)	(0.030)	(0.104)	(0.058)	(0.083)	(0.047)
R&D (t-2)	0.123*	0.030	0.145**	0.035	0.271***	0.085	0.159**	0.043
	(0.068)	(0.036)	(0.064)	(0.035)	(0.081)	(0.055)	(0.063)	(0.035)
Days of Training (t-2)	0.015**	0.009**	0.019***	0.010***	0.020***	0.010***	0.023***	0.010***
	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)
Advertising (t-2)	0.056**	0.024	0.076***	0.028*	0.051*	0.020	0.096***	0.033**
	(0.027)	(0.017)	(0.026)	(0.016)	(0.030)	(0.018)	(0.026)	(0.017)
Size (t)	0.061***	0.040***	0.053***	0.038***	0.057***	0.039***	0.067***	0.041***
	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)	(0.013)	(0.010)
Firm Age (t)	-0.045***	-0.022**	-0.043***	-0.022**	-0.052***	-0.024**	-0.047***	-0.022**
	(0.014)	(0.010)	(0.014)	(0.010)	(0.016)	(0.011)	(0.015)	(0.010)
Labour quality (t)	0.215*	0.184**	0.327***	0.216***	0.286**	0.203***	0.309***	0.209***
	(0.119)	(0.072)	(0.115)	(0.071)	(0.114)	(0.071)	(0.115)	(0.071)
Formal Credit (t)	0.052***	0.033***	0.053***	0.033***	0.052***	0.033***	0.050***	0.033***
	(0.014)	(0.010)	(0.014)	(0.010)	(0.014)	(0.010)	(0.014)	(0.010)
City (t)	0.037***	0.009	0.039***	0.010	0.041***	0.010	0.036***	0.009
	(0.013)	(0.009)	(0.013)	(0.009)	(0.013)	(0.009)	(0.013)	(0.009)
$\hat{v}_{it}$ (λ)	-0.139**	-0.043	-0.127**	-0.038	-0.231**	-0.064	-0.184**	-0.051
	(0.059)	(0.033)	(0.052)	(0.029)	(0.104)	(0.058)	(0.082)	(0.046)
$\hat{v}_{it} * GVCs_{it-2}$ (η)	0.001	0.001	0.001	0.001	-0.001	0.001	0.001	0.001
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Testing for the unobserved heterogeneity ($\boldsymbol{\delta}$) - chi2(18)	61.42***	28.53*	61.50***	26.82*	61.22***	27.16*	61.45***	27.40*
Testing jointly for $\lambda = 0$ and $\eta = 0$ – chi2(2)	7.52**	3.93	6.02**	2.46	5.56*	2.34	5.04*	3.20
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industrial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8306	8306	8306	8306	8306	8306	8306	8306
pseudo R^2	0.154	0.133	0.154	0.132	0.153	0.132	0.152	0.131

Notes: Regressions include time averages of explanatory variables; Robust standard errors in parentheses clustered by firms; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

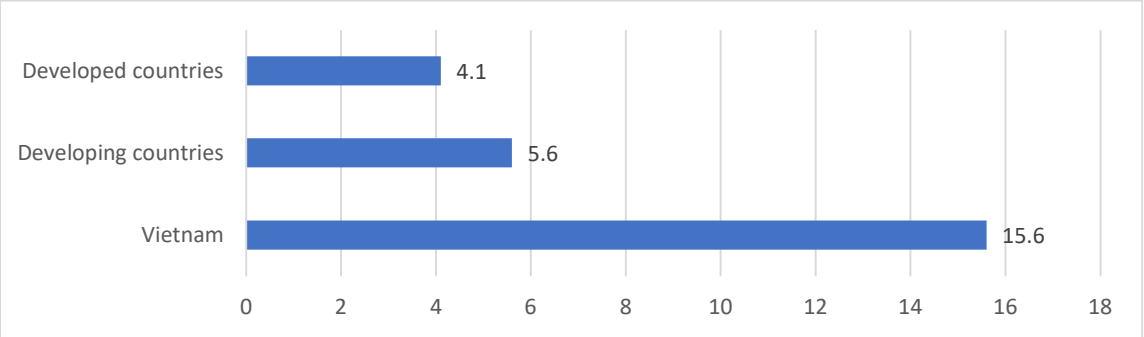
Table 3.6 The estimation coefficients of experience of GVC participation and governance on innovation-led upgrading activities moderated by intangible assets from equation (7)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GVCs = GVC		GVCs = amGVC		GVCs = netGVC		GVCs = qhGVC	
	Product	Process	Product	Process	Product	Process	Product	Process
main								
GVCs (t-2)	0.334*	0.154	0.281*	0.105	0.679**	0.242	0.538**	0.197
	(0.188)	(0.189)	(0.170)	(0.171)	(0.332)	(0.333)	(0.264)	(0.269)
R&D (t-2)	0.381*	0.151	0.446**	0.177	0.831***	0.403*	0.494***	0.216
	(0.206)	(0.181)	(0.192)	(0.172)	(0.255)	(0.224)	(0.190)	(0.165)
Days of Training (t-2)	0.044**	0.050**	0.058***	0.056***	0.063***	0.056***	0.073***	0.059***
	(0.019)	(0.022)	(0.019)	(0.021)	(0.019)	(0.021)	(0.019)	(0.021)
Advertising (t-2)	0.159*	0.130	0.229***	0.148*	0.151*	0.103	0.289***	0.173**
	(0.083)	(0.091)	(0.077)	(0.084)	(0.091)	(0.098)	(0.077)	(0.084)
GVCs* R&D (t-2)	**-0.025**	**0.024**	**-0.068**	**0.024**	**-0.063**	**-0.002**	**-0.077**	**0.019**
	(0.048)	**(0.041)**	**(0.067)**	**(0.045)**	**(0.084)**	**(0.078)**	**(0.054)**	**(0.044)**
GVCs*Days of Training (t-2)	**0.015****	**0.006**	**0.019****	**0.002**	**0.003**	**0.002**	**0.002**	**0.004**
	(0.007)	**(0.006)**	**(0.009)**	**(0.009)**	**(0.008)**	**(0.008)**	**(0.007)**	**(0.008)**
GVCs*Advertising (t-2)	**0.054***	**0.005**	**0.062***	**0.030**	**0.063***	**0.046**	**0.024**	**0.010**
	(0.028)	**(0.028)**	**(0.036)**	**(0.039)**	**(0.035)**	**(0.038)**	**(0.031)**	**(0.031)**
Size (t)	0.195***	0.228***	0.169***	0.216***	0.183***	0.223***	0.214***	0.236***
	(0.040)	(0.052)	(0.039)	(0.052)	(0.039)	(0.052)	(0.043)	(0.055)
Firm Age (t)	-0.145***	-0.129**	-0.137***	-0.125**	-0.164***	-0.135**	-0.148***	-0.128**
	(0.046)	(0.057)	(0.045)	(0.056)	(0.050)	(0.061)	(0.047)	(0.058)
Labour quality (t)	0.684*	1.058**	1.041***	1.241***	0.911**	1.168***	0.982***	1.200***
	(0.378)	(0.416)	(0.367)	(0.411)	(0.362)	(0.405)	(0.365)	(0.407)
Formal Credit (t)	0.165***	0.190***	0.168***	0.191***	0.167***	0.191***	0.159***	0.188***
	(0.046)	(0.060)	(0.046)	(0.060)	(0.046)	(0.060)	(0.046)	(0.059)
City (t)	0.117***	0.053	0.123***	0.055	0.131***	0.058	0.114***	0.052
	(0.041)	(0.049)	(0.041)	(0.049)	(0.041)	(0.050)	(0.041)	(0.049)
$\hat{v}_{it}$ (λ)	-0.444**	-0.246	-0.406**	-0.216	-0.735**	-0.368	-0.586**	-0.293
	(0.188)	(0.188)	(0.165)	(0.164)	(0.330)	(0.332)	(0.262)	(0.265)
$\hat{v}_{it} * GVCs_{it-2}$ (η)	0.003	0.002	0.001	0.003	-0.003	0.004	0.001	0.004
	(0.002)	(0.002)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
_cons	0.238	-1.488***	0.001	-1.597***	0.183	-1.511***	0.087	-1.551***
	(0.348)	(0.432)	(0.306)	(0.395)	(0.339)	(0.424)	(0.319)	(0.408)
Testing for interaction terms (Days of Training, Advertising) – chi2(1)	1.72	0.01	1.24	0.44	2.34	1.12	0.42	0.03
Testing for interaction terms (Days of Training, R&D) – chi2(1)	0.69	0.21	1.63	0.26	0.62	0.01	1.98	0.12
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industrial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8306	8306	8306	8306	8306	8306	8306	8306
pseudo R^2	0.154	0.133	0.154	0.132	0.153	0.132	0.152	0.131

Notes: Regressions include time averages of explanatory variables; Robust standard errors in parentheses clustered by firms; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Figure A3.1 Evolution of Vietnam's GVC participation index, 2005-2015 (annual percentage change)



Source: OECD-WTO Trade in value added (TiVA) database

Table A3.1 The GVC participation index (percent), 2015

	Vietnam	**Developing countries**	**Developed countries**
GVC participation	55.6	41.4	41.4
Backward participation [a]	44.5	21.4	20.6
Forward participation	11.1	20.0	20.8

Source: OECD-WTO Trade in value added (TiVA) database; [a] The top backward participation of industries are textiles and clothing (25.7 percent), food and beverages (14.2 percent) and computer and electronic products (8.8 percent).

Table A3.2 The questions in the SME Questionnaire administered in Vietnam to identify participation in GVCs and forms of GVC governance

Code	Question	Range
EX	Does your enterprise export?	0/1
EY	What year did your firm start producing for export? From this question, we computed the number of years the firm has been participating in international trade.	0 – 30 (years)
IM	From whom does the enterprise procure its raw materials? Give a percentage distribution in terms of value. (Which should add up to 100%)	
IM1	From households	0-100
IM2	Other non-state enterprises	0-100
IM3	State enterprises	0-100
IM4	Other state agencies	0-100
IM5	Imported (directly)	0-100
IM6	Other	0-100
CE	Have foreign customers ever requested certification of your procedures and/or products?	0/1
CO	Did the cooperation with foreign partners provide you with technology or expertise that you otherwise would not have had access to? (if EX=1)	0/1
PR	Does your enterprise receive product specifications and/or designs for production? (if EX=1)	0/1
II	How much of your production is used for: (in percent of total sales, and should add up to 100%) (if EX=1)	
II1	Final consumption	0-100
II2	Intermediate inputs/capital equipment (manufacturing, agriculture and services	0-100
FI	Sales structure of the most important product. (Calculated as percentages, and should add up to 100%).	
FI1	Individual people/households (non-tourists)	0-100
FI2	Tourists	0-100
FI3	Non-commercial government authorities	0-100
FI4	Domestic, non-state enterprises	0-100
FI5	State enterprises	0-100
FI6	Foreign investing companies	0-100
FI7	Export	0-100

Table A3.3 Definitions of the variables

Variable	Definition
GVC	Experience of GVC participation, which is equal to EY if (EX=1 & IM5>0) or [EX=1 & (II2 > II1)], 0 otherwise (Agostino et al., 2019; Brancati et al., 2017).
amGVC	Experience of the Arm-length market relationship, which is equal to EY if ((EX=1 & IM5>0) or [EX>=1 & (II2 > II1)]) & CE=1, 0 otherwise
netGVC	Network relationship GVC dummy, which is equal to EY if ((EX=1 & IM5>0) or [EX>=1 & (II2 > II1)]) & CO=1, 0 otherwise.
qhGVC	Experience of the Quasi-hierarchical relationship, which is equal to EY if ((EX=1 & IM5>0) or [EX>=1 & (II2 > II1)]) & PR=1, 0 otherwise.
Innovation	
Product	Product innovation dummy, which is equal to 1 if the firm introduced new products or improved old products, 0 otherwise.
Process	Process innovation dummy, which is equal to 1 if the firm introduced new processes or new technology, 0 otherwise.
Intangible assets	
R&D	RD dummy, which is equal to 1 if the firm decided to invest in R&D, 0 otherwise.
Days of Training	Logarithm of the number of days a firm provided worker training.
Advertising	Advertisement dummy, which is equal to 1 if the firm advertised (TV, Internet, trade fair…) its products, 0 otherwise.
Firm characteristics	
Size	Logarithm of the number of employees.
Labour quality	Ratio of the employees who hold university or college degrees to the total number of employees.
Firm Age	Logarithm of firm age measured as the years of operation of the firm.
Formal Credit	Formal credit dummy, which is equal to 1 if the firm received bank loans or formal creditors, 0 otherwise.
City	City dummy, which is equal to 1 if the firm is located in Ha Noi City, Hai Phong City or Ho Chi Minh City, 0 in other provinces.

Table A3.4 The average marginal effects of independent variables on innovation activities using the fixed effects pooled IV probit model to estimate equation (6) – The second stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GVCs = GVC		GVCs = amGVC		GVCs = netGVC		GVCs = qhGVC	
	Product	Process	Product	Process	Product	Process	Product	Process
main								
Predicted GVCs (t-2)	0.129**	0.032	0.113**	0.028	0.229**	0.056	0.183**	0.045
	(0.058)	(0.033)	(0.051)	(0.029)	(0.103)	(0.058)	(0.082)	(0.046)
R&D (t-2)	0.104*	0.035	0.115*	0.039	0.270***	0.086	0.137**	0.045
	(0.061)	(0.036)	(0.060)	(0.035)	(0.080)	(0.056)	(0.059)	(0.034)
Days of Training (t-2)	0.018***	0.009**	0.021***	0.010***	0.020***	0.010***	0.023***	0.011***
	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)
Advertising (t-2)	0.068**	0.025	0.082***	0.029*	0.053*	0.022	0.099***	0.033**
	(0.027)	(0.017)	(0.025)	(0.016)	(0.030)	(0.019)	(0.026)	(0.017)
Size (t)	0.061***	0.040***	0.053***	0.038***	0.058***	0.039***	0.068***	0.041***
	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)	(0.013)	(0.010)
Firm Age (t)	-0.046***	-0.022**	-0.043***	-0.022**	-0.052***	-0.024**	-0.047***	-0.023**
	(0.014)	(0.010)	(0.014)	(0.010)	(0.016)	(0.010)	(0.015)	(0.010)
Labour quality (t)	0.217*	0.188***	0.333***	0.216***	0.285**	0.204***	0.313***	0.211***
	(0.118)	(0.073)	(0.115)	(0.071)	(0.113)	(0.070)	(0.114)	(0.071)
Formal Credit (t)	0.052***	0.033***	0.053***	0.033***	0.052***	0.033***	0.049***	0.033***
	(0.014)	(0.010)	(0.014)	(0.010)	(0.014)	(0.010)	(0.014)	(0.010)
City (t)	0.036***	0.009	0.038***	0.009	0.041***	0.010	0.036***	0.009
	(0.013)	(0.009)	(0.013)	(0.009)	(0.013)	(0.009)	(0.013)	(0.009)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industrial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8306	8306	8306	8306	8306	8306	8306	8306
pseudo R^2	0.151	0.130	0.151	0.130	0.151	0.130	0.151	0.130

Notes: Regressions include time averages of the explanatory variables; The robust standard errors in parentheses are clustered by firm; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Conclusions

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The thesis has been empirical work and has combined three papers about impacts of local, global business environment as well as intangible assets on firm innovation by using Vietnamese SMEs data from 2005 to 2015. In particular, firstly, chapter 1 makes several important contributions. First, it adds to the social capital literature by analyzing the role of social capital in a small business context (Hernández-Carrión et al., 2017) and testing the inverted U-shaped effects of social capital and the moderating effects of innovation on the performance of SMEs. Chapter 1 adds to both social capital theory and resource-based theory of competitive advantage (Batjargal, 2010; Peteraf, 1993) by revealing the effects on SMEs' performance of both political and financial social capital. It highlights different impacts of different types social ties on SMEs' performance and, thus, is in line with other studies (Hernández-Carrión et al., 2017). Chapter 1 further provides insights into the boundary conditions of social capital by analyzing the moderating role of innovation. Innovation provides SMEs with the prior knowledge and absorptive capacity required to evaluate, filter out, accept and understand the value of external resources acquired through social capital (Cohen & Levinthal, 1990; Hughes et al., 2014; Lane & Lubatkin, 1998). Overall, we tests the theories developed in Western social environments on a sample of SMEs from a transition economy and, thus, contributing to the management research literature (Peng, 2003).

This chapter has some important practical implications. In transition economies, owners/managers of SMEs should consider both political and financial social capital as valuable contextual resources for increasing their performance. They should be, however, aware that a too high level of social capital could have negative effects as maintaining it will become too costly. Our results confirm that innovation moderates the relationship between social capital and SMEs' performance, depending on types of social capital. Therefore,

investing more in innovation is warranted for the SMEs to achieve better performance. As Hernández-Carrión et al. (2017) point out, public authorities are important for facilitating entrepreneurs' access to or contact with external actors. Organizing programs in which entrepreneurs, credit providers, and policy makers jointly participate, or creating formal associations to promote relational links among actors would enhance SMEs' performance. Moreover, these policies should be aimed at the SMEs that are active in conducting innovation. Relational links among actors and innovation policies should be complemented to assure better performance of the SMEs in transition economies.

Secondly, Chapter 2 attempts to shed light on tax corruption by empirically analyzing its effects on innovative activities of SMEs in Vietnam. This key finding of the study supports the grease-the-wheels hypothesis of tax corruption. It is also consistent with those results obtained from previous empirical studies on the effects of general corruption on firm development, especially in the context of transition economies. Our main interpretation of this unconventional finding is as follows. In many transition and developing countries, the market mechanism, government regulation and tax administration often do not operate completely or efficiently. In such cases, tax bribes could potentially produce short-term certainties and tax savings which may be beneficial to some business activities including innovation. Tax bribery payments can, in this sense, be said to facilitate innovation of SMEs, at least in the short term. This chapter has important policy implications. The causes of tax administration corruption in Vietnam are various and many of which lie beyond the control of the tax authority (see Nguyen et al. 2017). Nevertheless, the direct causes appear to be (1) high degree of discretionary power of tax auditors, and (2) regular visits of tax auditors to large number of businesses, including SMEs. Thus, to reduce the incidence of tax briberies, the government could tackle those two issues. For example, to address (1) the government could consider simplifying tax laws and tax

procedures. Similarly, the government could also use digital technology such as automation, e-filing, etc., to reduce the face-to-face interaction between business taxpayers and tax auditors.

Finally, chapter 3 attempts to explore whether and how intangible assets moderate the impact of firms' participation in GVCs and the GVC forms of governance on the phenomenon of upgrading, as proxied by product innovation and process innovation. We have found evidence of the learning-by-participating in the GVC hypothesis, that is, participation in GVCs and the forms of GVC governance both have an impact on the likelihood of firms introducing product innovation, but have no impact on process innovation. Additionally, we have found that intangible assets, including firms' investments in training, and firms' investments in marketing and advertising, are positively and significantly related to the innovation activities of a firm, while firms' investments in R&D only have an impact on product innovation, but not on process innovation. We have also found that the learning curves of intangible assets moderate the relationship between participation in GVCs, or forms of GVC governance, and product innovation, but not process innovation.

Our findings contributes to the existing literature on GVCs at a firm level in several ways. First, we have investigated the effects of heterogeneity across various forms of GVC governance and of participating in GVCs on upgrading activities using rich information from panel-data on manufacturing SMEs in Vietnam. Second, we have assessed whether and to what extent GVC participation can have an impact on different upgrading activities. Third, we have investigated the role of intangible assets in learning opportunities in GVCs. Fourth, we have explored whether a firm's investment in intangible assets and the forms of governance of GVCs are interrelated. Overall, the main result that emerges from the empirical analysis is that intangible assets play different roles in interacting with the different forms of GVC governance and GVC participation and they have different impacts on the types of innovation activities.

This chapter has important policy implications. The policy makers, entrepreneurs, and managers of SMEs in transition economies should be aware of the fact that, although international trade is an important vehicle for learning and upgrading, it is not an automatic process. Therefore, for a country to move towards a more sophisticated internationalization process and to be able to capture value from GVC participation, it is important to favor investments in a series of knowledge-based assets, including not only R&D, but also training, marketing and advertising. In addition, understanding the importance of intangibles and governance forms in supply chains could help managers and entrepreneurs of small businesses to capitalize on their participation in GVCs. Hence, it may be important for small firms to invest in job training for their employees to foster innovative abilities within the firms.