WASEDA UNIVERSITY

GRADUATE SCHOOL OF ASIA-PACIFIC STUDIES

DOCTORAL THESIS

Corruption – its effects, causes, and anti-corruption strategies: a study for the Vietnamese case

腐敗ーその影響・原因と腐敗防止のための戦略：
ベトナムを事例とした研究

Full name:	TRUONG THI HOA
Student ID:	4017S003-1
Advisor:	Prof. KATO ATSUSHI
Deputy Advisor:	Assoc. Prof. NABESHIMA KAORU

06/2020

TOKYO, JAPAN

ACKNOWLEDGEMENTS

This dissertation could not be finished without the supports of many individuals and organizations.

I would like to express my deepest gratitude to my main supervisor, Professor Kato Atsushi, who has guided and supported me with great patience and kindness from the very first day of my journey. He has been a great mentor who has patiently read and commented on my academic papers and dissertation, encouraged me during my struggling time, and given me invaluable advice on my future career as a researcher. I profoundly appreciate all the time and efforts he spent to support me during my journey.

I am grateful to Professor Nabeshima Kaoru, my deputy advisor, for the precious guidance and suggestions he gave me during the writing process of this dissertation, my interim presentation, and my oral examination. My gratitude also goes to Professor Urata Shujiro and Professor Gemma Masahiko. Without the constructive comments and suggestions received from them during the interim and oral examinations, I could not improve my dissertation.

My special thank goes to Mr. Truong Thanh Vu, deputy director of South Vietnam Economic Studies Centre, the Vietnam Institute for Development Strategies, the Ministry of Planning and Investment of Vietnam for his generous provision of the data.

Chapter 5 could not be finished without the kind helps of Takano Keisuke, a current PhD student at the Department of Policy and Planning Science of the University of Tsukuba. I appreciate his useful comments, suggestions, and guidance regarding spatial econometric analysis in Chapter 5.

I also would like to thank the Vietnam International Cooperation Department (ICD), the Ministry of Education and Training of Vietnam and Waseda University for their financial supports. My appreciations also go to staffs of ICD and Graduate School of Asia-Pacific Studies, Waseda University for helping me to handle administrative procedures.

I appreciate all fruitful discussions with my fellow students and colleagues both in Waseda University and in academic events organized by several organizations, including Eurasia Business and Economics Society, the East Asian Economic Association, and Regional Studies Association.

My thanks also go to my dearest friends who have cheered me up when I had bad days and shared countless joyful moments with me.

My journey would have not started in the first place without the supports of my family who have always stood by my side with love and care. No words could express my gratitude to my parents, sisters, brothers, and my dearest grandma who had loved and cared for me till her last days.

ACCRONYMS AND ABBREVIATIONS

2SLS	Two-stage Least Squares
CECODES	The Centre for Community Support and Development Studies
CPI	Corruption Perception Index
CPV	The Communist Party of Vietnam
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalized Method of Moment
GSO	The General Statistics Office of Vietnam
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PAPI	The Vietnam Provincial Public Administration Performance Index
PCI	The Vietnam Provincial Competitiveness Index
PISA	Programme for International Student Assessment
SMEs	Small and Medium-sized Enterprises
SOEs	State Owned Enterprises
UNDP	United Nations Development Programme
USAID	United States Agency of International Development
USD	The United States Dollar
VCCI	The Vietnam Chamber of Commerce and Industry
VFF-CRT	Centre for Research and Training of the Viet Nam Fatherland Front
VND	Vietnam Dong

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENT

ABSTRACT

This thesis project aims to study several aspects of corruption for the case of Vietnam, including its effects, causes, as well as how anti-corruption strategies might work. This thesis includes four empirical articles as four key chapters.

Chapter 2 focuses on the effects of corruption on Vietnamese provinces/cities' economic growth, using a dynamic panel data analysis with a system generalized method of moments (GMM) approach. Although this study investigates both direct and indirect effects of corruption on Vietnamese provincial economic growth, it focuses more on the direct effect of corruption. The estimation results consistently support the assertion that, in general, corruption is detrimental to economic growth. Corruption directly impedes growth rates by reducing the efficiency of investments and this effect is more intense in provinces/cities with higher investment rates. However, the adverse direct impact of corruption may be alleviated by its positive impact on investment rates, which is an unexpected finding.

Chapter 3 analyzes the effects of corruption on human capital accumulation process in Vietnamese provinces/cities, using provincial data from 2010 to 2015. I employ labor quality assessments of firms as a proxy for human capital and divide human capital accumulation into two following processes: an educational process and a process through which educational outcomes and worker training transform into labor quality. The estimation results have some notable implications for the Vietnamese context. Corruption has both negative and positive effects on human capital. On the one hand, corruption reduces the positive effect of local government spending on educational achievements and worsens labor quality. On the other hand, the prevalence of corruption in provinces/cites increases the advantages of local schools in the competition to obtain funds from the central government; hence, corruption enhances educational achievements in those regions. The results indicate that corruption adversely affects human capital overall.

Chapter 4 approaches the causes of corruption from the perspective of firms and investigates how corrupt behavior of firms is influenced by the behavior of their peers, those that operate in the same sector of the same province. Regarding the behavior of firms, this work looks at both the decision to bribe and the size of bribe made by firms. Using firm survey data in 2012, the estimation results of logit and ordered logit models show the likelihood of a firm paying bribe is positively associated with the rate of the peers that pay bribe and higher average

bribe size of their peers raises the probability that firm pay higher bribe size. Besides, the characteristics of firms, provinces, and firm leaders also determine the bribery behavior of firms.

Chapter 5 investigates how three key strategies in the fight against corruption of Vietnamese local governments, namely, reducing regulation burden, enhancing transparency, and building a monitoring system, would work when the contagion of corruption is considered. For that purpose, this study includes spatial lag of corruption variable as one dependent variable that reflects the contagion of corruption. A dynamic GMM method is applied to run regressions for a panel dataset that covers all 63 Vietnamese provinces/cities from 2009 to 2015. The estimation results show that improving governance quality would lead to lower level of corruption of Vietnamese provinces/cities. Significant positive results of spatial lag of corruption variable also imply that local corruption is contagious across regions. Therefore, anti-corruption initiatives of local government of one province/city have considerable positive externalities on other provinces/cities.

CHAPTER 1: INTRODUCTION

1.1. Corruption

1.1.1. Definition

As stated by Svensson (2005), "no definition of corruption is completely clear-cut", the first challenge of any corruption study is how to define it. The difficulty arises because corruption could be seen very differently from different angles and at some points, the legal borderline between corrupt acts and non-corrupt acts could be ambiguous. For example, it is difficult to distinguish bribery and lobbying or campaign contribution (Svensson, 2005). Because of its complexity, most of attempts to study corruption often focus on one aspect and define it accordingly. One of the most common view is that corruption refers to actions in which "public power is used for personal gain in a manner that contravenes the rule of the game" (Jain, 2001). Aligning with this view, Transparency International defines corruption as "the abuse of entrusted power for private gain", or Svensson (2005) defines corruption "the misuse of power for private gain". In this sense, corruption is usually regarded as illegal acts, which are outcomes of a country's institutions.

1.1.2. Forms

Because there is no precise definition of corruption there is also no definite classification of types of corruption. Corruption could be divided as political corruption, economic corruption, and public administration corruption (Vargas-Hernández, 2013). Or, it could be categorized into a long list of specific acts, such as bribery, collusion, embezzlement and theft, fraud, nepotism, and so on. Transparency International divides corruption into three types: grand corruption, petty corruption, and political corruption. Grand corruption includes actions that take place in the top of government in the way they distort policies for personal benefits. Political corruption refers to behavior of political decision makers by which they manipulate policies and institutions to retain their power, status, and wealth. Finally, petty corruption consists corrupt acts of low and mid-level public officials in interactions with citizens. At the same time, Jain (2001) classifies three forms of corruption in democratic societies: grand corruption, legislative corruption, and bureaucratic corruption. Grand corruption refers to actions of political elites by which they take advantage of their positions in issuing or implementing national policies for their interest. Legislative corruption indicates the cases when voting behavior of legislators is altered. This type includes the cases in which some interest groups could bribe lawmakers to

pass the regulations that benefit them. Voting buying is also included in this type. Finally, bureaucratic corruption refers to corrupt behavior of bureaucrats in their dealing with their superiors or the publics. Petty corruption, including bribery, is the most common type of bureaucratic corruption.

1.1.3. Measuring corruption

Another challenge that any attempt to conduct empirical research on corruption has to face is the difficulties in measuring it. Most of corrupt acts are illegal and carried out behind closed doors and people who are involved in those acts are often intent on covering them (Jain, 2001; Lin & Yu, 2014). Furthermore, the struggle to bring a clear definition of corruption causes more difficulty in measuring it (Johnston, 2001). Consequently, a perfectly precise objective measure of corruption does not exist. In spite of that, numerous scholars and organizations have paid lots of efforts to provide corruption data, which has become important sources of information for both academic and policy making purposes. Those data could be grouped into two types, subjective perception-based data and objective reality-based data (Kaufmann, Kraay, & Mastruzzi, 2007).

Objective data is compiled based on criminal cases related to convicted corrupt acts, such as bribery, embezzlement, and fraud. However, this type of corruption data is frequently criticized by its incomparability and inaccuracy. One of the concerns is that the legal definition of each type of crime and the method used to collect and aggregate data varies among countries (Lambsdorff, 2006). Another concern is that the number of convicted cases might reflect the efficiency of the judiciary system rather than the extent of corruption (Lambsdorff, 2006). More than that, due to the unwillingness to report of people who are involved in corruption related cases, underreporting could be also a severe problem of crime-based data (Kato & Sato, 2014). As a result, rather than objective data, most of corruption studies depends more on subjective or perception-based data.

Of course, no matter how sophisticated the methods applied to collect and compute the indicators, the concern that subjective measures do not accurately reflect the real level of corruption remains. The perception of people depends on the limited information they get, and in most of corrupt cases, the participants use lots of tactics to cover up their illegal acts. Moreover, the response on questions about corruption are also biased by characteristics and believe of the respondents (Olken, 2009). Even for the cases of expert survey, there still remain

a doubt whether investigators spot the valid expert pool or not and a concern that the perception of the selected experts is also biased (Olken & Pande, 2012). Despite those concerns, as strongly defended by Kaufmann et al. (2007), subjective data is still one of the most reliable sources of information of corruption because it is derived from the real experiences of stakeholders, highly correlation with relevant data, and initiative on improving the applied methods. Moreover, corruption perception is also an important aspect in society because it might create distrust toward the institutions and increases the real level of corruption (Melgar, Rossi, & Smith, 2010; Sah, 2007).

1.2. Scope of this dissertation

Even though corrupt acts might exist in different forms, such as grand corruption, legislative corruption, and bureaucratic corruption, the extent of this dissertation is limited only to bureaucratic corruption, especially bribery, for the case of Vietnam. A main reason for the choice of bureaucratic corruption rather than two other forms is due to the availability of data. Bribery is the center of this study and bribery related indicators are used as proxies for bureaucratic corruption because it is the most widespread type of corruption (Vargas-Hernández, 2013).

There are several reasons that explain the choice of the Vietnamese case. Firstly, a within-country empirical work might bring more insightful findings and significant contributions to the literature of corruption studies. Most of empirical analyses on corruption issue have been conducted at a cross-country level, which suffers from some flaws due to the incomparability of institutional elements and corruption measures among nations (Glaeser & Saks, 2006; Lisciandra & Millemaci, 2017). Studies on regions within a country with more homogenous characteristics and similar corrupt practices could moderate this problem. However, a major drawback of a research that studies the case of one country is that its findings might not be applicable to other countries with distinctive circumstances. For instance, we could not generalize research outcomes from the case of the United States, a developed country with democratic system, to countries with completely different characteristics, such as China. Therefore, empirical works concentrating on the case of Vietnam, a developing country under authoritarian political system, would potentially give more insightful findings and implications, which could be more applicable to the case of other countries that share more comparable conditions, such as China or Laos.

Secondly, despite some disagreement in various aspects of society, when it comes to corruption there is a strong consensus among the Vietnamese government, the public, and business. Corrupt acts are pervasive in the Vietnamese society and that environment harms economic development and wellbeing of society. Hence, Vietnamese government led by the Communist Party of Vietnam (CPV) have claimed that a fight against corruption is one of their prioritized policies. This view receives full support from the public. However, in the academia, an extensive empirical work on the issue is absent. Empirical analyses on corruption in Vietnam mostly concentrates on the consequences of corruption and overlook other essential aspects, including the causes of corruption and anti-corruption policy. Therefore, a more comprehensive study that zooms in all three aspects of corruption for the case of Vietnam is needed.

1.3. Details of corruption data

This study utilizes corruption data source from The Vietnam Provincial Competitiveness Index (PCI), which is a product from the joint-effort of The Vietnam Chamber of Commerce and Industry (VCCI) and the United States Agency of International Development (USAID). The research team has reported PCI index annually since 2005 as a means to evaluate business environment of Vietnamese provinces/cities. Since its introduction, PCI index has become a popular source of data that supports the private business in their investment decision and prompts provincial leaders to act for a better business environment. The data has also become a crucial source of information for scholars who are interested in studying the economic circumstance in Vietnam. PCI data covers not only corruption data but various governance factors that determine the ease of doing business in provinces and cities of Vietnam. In total, PCI data measures ten group of factors, such as transparency of business environment, access to land, legal system, and, of course, corruption related indicators. Corruption data used in this thesis comes from a group of indicators related to informal charges that businesses pay when dealing with public officials.

PCI data is considered one of the most reliable source of data on the institutional quality of Vietnamese provinces/cities because of the sound methods applied in the process of collecting information and computing index (Tromme, 2016). In the first step, the PCI research team randomly selected a sample of thousands of firms across the country to mirror provincial population every year. Next, they rely on Unmatched Count Technique (UCT), a procedure meant to improve reliability in collecting sensitive information (Dalton, Wimbush, & Daily, 1994), to seek for response from firms on questions in the survey. After collecting responses,

they computed sub-indices and calculate PCI index as weighted mean of the sub-indices. PCI score and sub-indicators of all 63 provinces/cities is accessible on the website of the PCI team.

There are two types of data obtained from PCI team and used throughout this thesis. The first type is panel data at a provincial level for all 63 provinces/cities from 2009 to 2015. This form of data is utilized in chapter 2, chapter 3, and chapter 5, which aim to uncover the consequences of corruption on provincial economic development and anti-corruption initiative of provincial governments. The use of panel data gives several advantages in analyzing data (Hsiao, 2007). For instance, panel data includes both cross-sectional and time-series dimensions, hence gives more observations, increasing degree of freedom and allowing more sample variation for more efficient econometric estimates. Moreover, panel data econometric models are also more capable of controlling for unobservable invariant variables or capture the dynamic relationship. In each empirical work, the most appropriate indicator which belongs to the groups of indicators regarding informal charges is selected to measure corruption in accordance with the objectives of research. For example, empirical analyses in Chapter 3 necessitate to measure the prevalence of corruption, hence the indicator used in this chapter is the share of firms that agree or strongly agree with the statement "The rent-seeking phenomenon is popular for handling the administrative procedures required for businesses". Distinctively, to fulfill the goals of Chapter 2 and Chapter 5, I need to measure the extent of corruption, and thus the chosen indicator is the proportion of firms in provinces/cities that pay at least ten percent of their revenue for informal cost.

The second type of data used is firm level data, which is employed in Chapter 4, the one that focuses on corrupt behavior of Vietnamese firms, seeking for an answer on the causes of corruption in Vietnam. This dataset is constructed based on responses of more than 8000 Vietnamese domestic firms and is used to compute PCI index in 2012. The data is acquired from a set of data provided by Edmund Malesky as replication data for the article entitled "*Monopoly Money: Foreign Investment and Bribery in Vietnam, a Survey Experiment"* (E. J. Malesky, Gueorguiev, & Jensen, 2015). The answer of firms on the question *"What percentage of total income do firms in your line of business typically pay per year for informal charges to public officials?"* provides insights on corrupt behavior of firms. Based on this information, two variables are constructed to reflect the engagement of firms in bribery and the size of bribe they make.

1.4. Research objectives, questions, and hypotheses

With an attempt to address multiple facets of corruption for the Vietnamese case, this dissertation zooms in on the effects and causes of corruption as well as anti-corruption policy of Vietnamese government. In addition to the introduction and conclusion chapters, the main body of this thesis consists of four research articles as four key chapters. The first two examine the effects of corruption on Vietnamese provincial economic development, in term of both economic growth and human capital accumulation process. Findings of these first two parts suggest the detrimental impacts of bureaucratic corruption on Vietnamese economic development. If corruption is so harmful for economic development, an inevitable question that emerges is that what induces corruption in the first place. Seeking to respond to that question, the next chapter investigates the causes of bureaucratic corruption in Vietnam from the perspective of firms as bribe givers. Although chapter 4 examines various factors that might have influences on bribery practices of firms, it concentrates more on the behavior of firms' peers. Estimation results of this show that corrupt behavior is contagious among Vietnamese firms, and hence we cannot ignore the spillover effects of corruption when assessing anti-corruption strategies of Vietnamese government. As a result, the last paper examines anti-corruption initiatives of Vietnamese provincial governments when the contagious effect of corruption is considered.

Chapter 2 addresses the question on how corruption influences Vietnamese provincial economic growth. Regarding this research question, I hypothesize that, in total, corruption impedes Vietnam's provincial economic growth and it affects growth both directly and indirectly, mainly through the investment channel.

Hypothesis 1.1: Corruption indirectly harms economic growth by lowering investment rates because it worsens the local business environment and the credibility of local governments' policies, discourages investors to start their business in the regions.

Hypothesis 1.2: Corruption directly poses its adverse effect on growth through several channels, especially its harmful effect on the efficiency of investment.

Chapter 3 concentrates on another aspect of Vietnamese economic development, human capital, investigating how corruption distorts the accumulation process of human capital. The main hypothesis of this study is that corruption affects Vietnamese human capital via its effects on the two processes of human capital accumulation: the education process and the process by

which educational outcomes are transformed into labor quality in a productive sector. There are two sub-hypotheses on this issue.

Hypothesis 2.1: Corruption lowers educational outcomes because it potentially distorts the allocation and the use of the budgets intended for the education system, or it might act as an informal institution that shapes the incentives of stakeholders.

Hypothesis 2.2: Corruption has a detrimental effect on labor quality in the productive sector.

Chapter 4 tackles the question on how the corrupt behavior of Vietnamese domestic firms being affected by the behavior of their peers, firms in the same sector-province. I argue that Vietnamese enterprises have intention to learn from the bribery behavior of other firms in the same sector-province rather than all firms because they expect to deal with the same public department and the same bureaucratic procedures. Therefore, the main hypothesis of this paper is that bribery acts of Vietnamese firms and their peers are positively related. Two sub-hypotheses support the main hypothesis.

Hypothesis 3.1: Rates of a firm' peers that pay bribe is positively associated with the probability that the firm makes bribe.

Hypothesis 3.2: The average size of bribe made by peers is positively associated with the likelihood of a firm paying higher size of bribe.

The research question of chapter 5 is how anti-corruption initiative of Vietnamese provincial government works when the contagion effect of corruption is included. Regarding the question, there are three key hypotheses of this empirical work.

Hypothesis 4.1: Improving institutional quality would help to fight corruption.

Hypothesis 4.2: There exist spillover effects across geographical boundaries of corruption due to social interactions among individuals, firms, or government officials.

Hypothesis 4.3: Due to spillover effects of corruption, successful anti-corruption initiative of a provincial government would induce positive externalities to other provinces/cities.

Achieving the research objectives and answering the questions raised above will not only provide more empirical evidence for policy implementation purposes but also fulfill several research gaps in the existing literature.

1.5. Research gaps in the literature and research contributions

According to the arguments in several previous studies (Del Monte & Papagni, 2001; Glaeser & Saks, 2006; Lisciandra & Millemaci, 2017), cross-country studies face some bias issues due to the incomparability in terms of not only institutional systems but also corruption measurement between nations. A study for the case of regions or provinces within a country alleviates these problems, thus might carry more insightful outcomes. Nonetheless, research that studies the case of one country cannot be generalized to the case of other countries with distinctive attributes, hence results of some studies that have been carried out using data of developed countries cannot be applied to countries with lower level of development. However, there is a scarcity of empirical works that focus on the case of a developing country. Therefore, this empirical study, which concentrates on some unexplored aspects regarding corruption for the case of Vietnam, a developing country with authoritarian system and pervasive corrupt practices, might fulfill this research gap. The implications of this study would be more applicable to other countries with similar characteristics, such as China or Laos.

As pointed out in several survey articles, there are some aspects of corruption have been overlooked in empirical research. Among those are the effects of corruption on human capital, the link between corrupt actions of a firm and other firms, and the contagion effects of corruption (Dimant & Tosato, 2018). The most significant contributions of this thesis project is that it attempts to address these three aspects, uncover some issues that have been neglected in the literature and bring suggestions for future research development.

Lastly, although corruption is deemed to be a disastrous threat to the economic development of Vietnam, there is no extensive empirical work that has been undertaken to address the issue. This dissertation, despite its limitations, is the first one that unveils several aspects of corruption in Vietnam, from its consequences on economic development, its causes, and combating corruption strategy of Vietnamese government. Therefore, this thesis's outcomes would be useful for both academic purpose and policy building purpose of policy makers and scholars who are interested in circumstances in Vietnam.

Following is the details on how four empirical papers in this dissertation handles the research gaps and contribute to the existing literature.

1.5.1. Chapter 2: The effects of corruption on Vietnamese provincial economic growth

This paper is the first one that addresses the consequences of corruption on provincial economic growth in Vietnam. In addition, the research tackles two major problems that often arise in the empirical studies. First, it takes advantage of within-country data at a provincial level, thus moderate the bias due to omitted variables or measurement errors, which are discussed in the previous part. Second, this study employs system GMM method that help to tackle endogeneity problem due to reserve causality. The empirical work is designed, following the suggestions of Aron (2000), in order to not only reveal the total effects of corruption on growth but also its direct and indirect effects via the main transmission channel, investment. This study also added the interaction term of corruption and investment rates to test the hypothesis that the effectiveness of investment differs, depending on the level of corruption in the region.

1.5.2. Chapter 3: The effects of corruption on human capital accumulation process

The objective of this paper is to investigate the effect of corruption on the accumulation process of human capital, a topic that has not been paid enough attention in empirical studies. Rather than using educational indicators that are commonly employed as proxies for human capital, this study uses labor quality evaluation of firms to measure human capital. This innovative measure could be more precisely reflect human capital of Vietnamese provinces/cities. Education outcomes are criticized as imprecise measures of human capital because human capital is accumulated through not only education but also training process. Labor quality based on the assessment of firms on whether they are satisfied with the quality of local workers might overcome that limitation because it better reflects the knowledge and skills of workers that are accumulated through both education and training processes. Especially for the case of Vietnam, a country with impressive educational improvements but inadequate quality of workers, labor quality assessment index might be a more appropriate proxy for human capital.

This article also deals with another problem in the previous related studies. Although human capital, which refers to knowledge, skills, and competence of workers, is accumulated through the investment in both education and training, most of previous works focuses only on education process. This study divides human capital accumulation process into two processes,

education and a process in which educational outcome transforms into labor quality, and investigates the influences of corruption on both steps.

1.5.3. Chapter 4: Why do Vietnamese firms bribe? The influences of their peer

This part deals with the questions regarding the causes of corruption from perspective of firms by examining various factors that might affect the bribery decisions of Vietnamese firms, particularly focusing on the behavior of firms' peers. Corrupt behavior is believed to spread among individuals in a society, from citizens and enterprises to bureaucrats through social interactions. Particularly for the case of firms, via a learning process, they imitate the actions undertaken by other firms in handling with public officials, including bribery. If enterprises acknowledge the case in which their fellows pay informal money, and then overcome public rigidity or receive some favors from the government, they possibly follow the same strategy. As a consequence, firms that are surrounded by more corrupt fellows have higher propensity to act corruptly. However, empirical research has not paid enough attention on investing this aspect of firms' bribery. Therefore, this study intends to fill this research gap, uncovering the association between corrupt behavior of firms and that of their fellows.

1.5.4. Chapter 5: How would anti-corruption policy of Vietnamese government work?

During the last decade, a new trend in corruption research emerges and proves that corruption spread among individuals, firms, regions, and countries. Regardless of the research scope and approaches, those studies come up with two common conclusive points. First, they suggest that effective battles against corruption require the cooperation among governments. Then, they confirm the positive externalities of successful anti-corruption fights. However, there is no research that has been carried out to scale these positive externalities. This paper is unique because it follows this line of corruption study and would be the first to quantify positive externalities of anti-corruption policies.

This research takes advantages of the interesting case of provinces/cities in Vietnam, a country with strong central government alongside the decentralized implementation of polices and corruption phenomenon. The study concentrates only on several governance elements, including bureaucratic burden, transparency, and bottom-up corruption monitoring, because improving institutional quality is the key one in the combat against corruption led by the Communist Party of Vietnam (CPV). Additionally, although Vietnamese government

repeatedly presses that improving quality of governance is one of the key strategies to fight corruption, there is an absence of a sound quantitative analysis addressing how this strategy would work. This article intends to bring to light some implications on the matter. In order to fulfill these goals, the empirical analysis applies spatial econometric techniques to capture the spillovers of corruption among provinces/cities and employs Generalized Method of Moment (GMM) method to tackle the endogeneity problem.

CHAPTER 2: THE EFFECTS OF CORRUPTION ON ECONOMIC GROWTH

2.1. Introduction

When scholars and policymakers consider Vietnam's development, they often examine the country as a whole and generate comparisons with other countries. However, one aspect of understanding Vietnamese development that is usually overlooked is that there are immense disparities in terms of development among Vietnamese provinces/cities. While there are some more prosperous provinces/cities, such as Ho Chi Minh City with a real gross domestic product (GDP) per capita of more than 90 million VNDs[1], there are also many poor provinces, such as Lai Chau, where the GDP per capita is only 12 million VNDs in the same year. Being aware of these discrepancies raises questions about the cause of the vast differences among Vietnamese regions.

Answering this question is not an easy task. Economists have sought to solve it by proposing various models approaching the issue from different angles, yet these results are far from conclusive. One of the recent trends in the literature pioneered by North (1990) focuses on the role of institutional quality, which is considered to be a fundamental determinant of economic development. Among them, one institutional factor, corruption, has often been considered in this line of study. While cross-country studies have not concluded whether corruption is harmful to economic activities, corruption is widely perceived as an economic threat by the Vietnamese government and the public. Vietnamese academics, however, have not jumped to this conclusion yet. Recent empirical studies in the Vietnamese setting, most of which focus on the impacts of corruption on the economic performance of enterprises, have shown both positive and negative effects of corruption. Fewer studies have been conducted at the regional level. To my best knowledge, only one study (Dang, 2016) tackles this question at the provincial level and presents the harmful effects of corruption on private investments and income levels. In addition, a significantly negative correlation[2] between the corruption index and income presented in Figure 2.1 could be a hint of the negative link between corruption and Vietnamese provincial income level. Still, there is still no evidence about the consequences of corruption on the economic growth of Vietnamese provinces/citie.[3] Therefore, an appropriately conducted empirical analysis is needed to reveal any link if it exists between corruption and

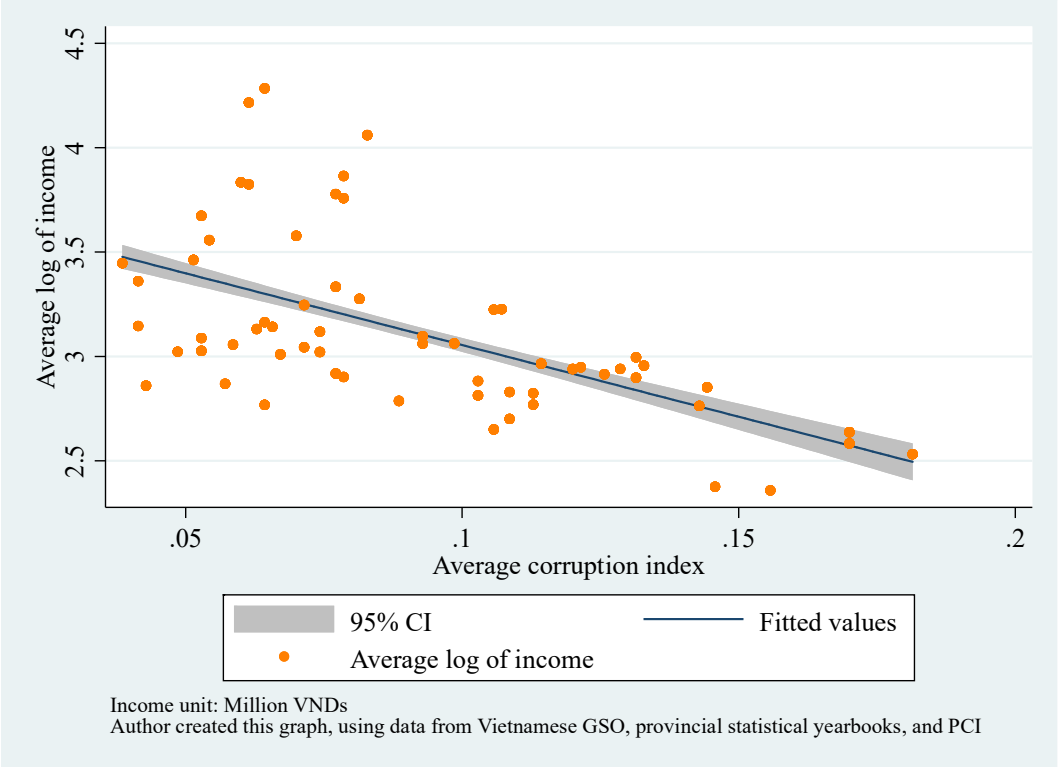
[1] VND is the Vietnamese currency with the exchange rates against USD stands around 1 USD = 22,800 VND (June 2018).

[2] Pairwise correlation stands around -0.4576.

[3] As shown in Figure 2.2, we do not see a clear relationship between corruption and economic growth rates of Vietnamese provinces/cities.

economic growth, and thus define a solution to the query about the causes of vast disparities in economic performance between Vietnamese provinces/cities.

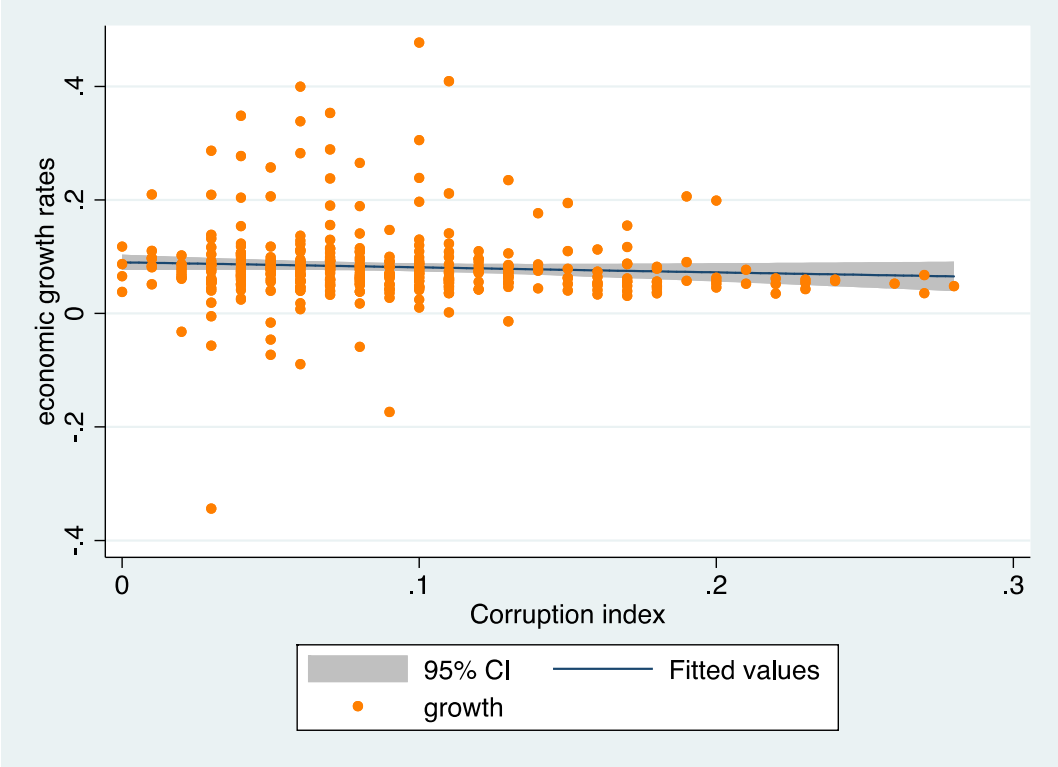
Figure 2.1: Correlation between corruption index and average income of Vietnamese cities/provinces[4]



Income unit: Million VNDs
Author created this graph, using data from Vietnamese GSO, provincial statistical yearbooks, and PCI

[4] Note: Ba Ria Vung Tau, the only oil-producing province in Vietnam, with GDP per capita being around 270 Million VNDs, three time higher than the number of Ho Chi Minh, the second region on the list, is a significant outlier. Therefore, this province is taken out of the analysis.

Figure 2.2: Correlation between corruption index and economic growth rates of Vietnamese provinces/cities



This article intends to fill this research gap, to become the first comprehensive analysis to provide empirical evidence about the consequences of corruption on Vietnamese provincial economic growth and contribute to an ongoing line of research about this topic. Most of the studies engaging in this topic have been conducted at a cross-country level and have been criticized for having several flaws due to the incomparability of various institutional characteristics (Del Monte & Papagni, 2001; Lisciandra & Millemaci, 2017) and corruption measures across countries (Glaeser & Saks, 2006); thus a cross-regional within-country study could provide more insights into the consequences of corruption. Indeed, there is novel within-country research using the examples of Italy and the United States (US) (Del Monte & Papagni, 2001; Glaeser & Saks, 2006; Lisciandra & Millemaci, 2017). However, those studies on regions of developed countries could not be generalized around the world where most countries are developing countries with rampant corrupt activities (Glaeser & Saks, 2006). This research, concentrating on the case of Vietnam, a rapidly developing country with a reputation of prevalent corruption, could be more applicable to the case of other countries with similar characteristics, such as China or Laos.

In this paper, although I test both direct and indirect effects of corruption on economic growth, I concentrate more on the direct effect[5]. In the main investigation, corruption variables and the interaction term between corruption and investment rates are added in growth regression models to test the hypothesis that corruption harms economic growth by reducing the efficiency of investment. Following other examples (Bond, Hoeffler, & Temple, 2001; Hoeffler, 2002), a system GMM method will be applied for the dynamic panel data analysis in this step. Then, I briefly run the regression of investment rates on corruption along with its determinants. Finally, I analyze the total effect of corruption on growth, using a reduced form of the Solow model.

This work presents several significant results. First, consistent with the dominant view of existing empirical studies, overall, corruption deters Vietnamese provincial economic growth. Discomposing this effect results in more noteworthy findings. Corruption affects growth both positively and negatively through several channels. The negative coefficients of the interaction term between corruption and investment rates suggest that corruption directly harms growth by lowering the efficiency of investments. Furthermore, it directly deters growth through other channels, possibly by causing talent misallocation or the distortion of public expenditures. One noteworthy point is that the direct effect of corruption depends on investment rates; provinces with lower investment rates suffer less from this channel. The estimation results also present weak evidence of a favorable effect of corruption on investment rates, contradicting most of the results in the previous empirical studies. Contrasting some influential cross-country works (Mauro, 1995; Pellegrini & Gerlagh, 2004), which supported the notion that the detrimental effect of corruption mainly come from its investment-reducing effect, in the case of Vietnam, corruption apparently plays an investment-enhancing role, alleviating its adverse direct impact.

Following is the structure of this paper. The second section presents a brief review of the existing literature about the effects of corruption on economic growth and my hypotheses. The third and fourth sections include the details about the empirical methodology and the sources of the utilized data and construction of variables. The following section details the estimation results. I shortly conclude the study in the last section.

[5] As explained in details in subsection 2.1.1, in this paper, I refer to the effects of corruption on the accumulation of physical/human capital as indirect effects, while to that on the performance of those factors as direct effects.

2.2. Literature review

2.2.1. Corruption and economic growth

Corruption, a complex social phenomenon that has existed for thousands of years since the very beginning of civilization, arguably affects various aspects of developing societies. Among those, its influences on economic growth have been a focus of discussions among economists for decades. In those discussions, two major questions have been frequently raised. The first question is whether corruption is detrimental or beneficial to economic growth. The second is how corruption impacts economic growth.

2.2.1.1. Detrimental or beneficial effects?

The first question sounds absurd because it is inconceivable to suggest that corruption is desirable for economic growth. However, several scholars, in fact, have supported this view, especially those who stand by the "grease the wheels" hypothesis. Generated by several scholars, (Huntington, 1968; Leys, 1965), the general idea of this hypothesis is that corruption might be beneficial in certain economies with malfunctioning institutions. In the economies with governmental ineffectiveness and bureaucratic rigidity, corruption might foster growth by speeding up administrative processes, improving public policy decisions, and enhancing both quantity and quality of overall investment (Méon & Sekkat, 2005; Méon & Weill, 2010). In contrast, many other economists oppose this suggestion, supporting the "sand in the wheels" hypothesis, arguing that corruption is rather more deleterious in countries with poor governance quality because officials there may intentionally cause delays to gain bribes or other advantages.

Some empirical studies have been conducted and manifested evidence that supports the "grease the wheels" hypothesis. Notably, Méon and Weill (2010) aim to establish a strategy to test both the "grease the wheels" and "sand in the wheels" hypotheses by observing how corruption, interacting with several governance dimensions, determines the efficiency of economies. The significantly positive results of the interaction term suggest that corruption possibly enhances efficiency in poorly governed economies, therefore supporting the "grease the wheels" hypothesis. Another study by Dreher and Gassebner (2013) also favors the "grease the wheels" hypothesis. This study reveals that regulatory procedures deter entrepreneurial activities, and corruption alleviates this negative impact. Investigating the impacts of corruption on the Indian manufacturing industry, Kato and Sato (2015) found strong evidence for the "grease the wheels" hypothesis as well. Their estimation results indicate that while the marginal

effects of corruption on gross value added per worker, capital-to-labor ratio, and total factor productivity are negative for the case of unregulated firms, they are positive for the case of regulated firms. Regarding the effects of corruption on growth, some studies have uncovered the favorable effect of corruption on growth for the case of some East Asian countries where improved growth rates are associated with high corruption rates. Rock and Bonnett (2004) conclude that corruption behaves as a growth-enhancing factor in East Asian newly industrializing economies where big businesses benefit from bribes, kickbacks, and close ties with the governments. Studying the impacts of corruption on the growth of 13 Asia-Pacific economies from 1997 to 2003, Huang (2016) found that corruption increased the growth rates in South Korea. However, those studies only make up a small slice of all of the existing studies; the notion that corruption impedes economic growth is still the dominant view in the literature. Méon and Sekkat (2005) attempted to test the "grease the wheels" concept regarding the growth enhancing role of corruption by adding an interaction term of corruption and several governance dimensions in regressions on growth and investment ratios. Their estimation results, in contrast, suggest that corruption is rather more damaging in countries with a poor quality of governance, favoring the "sand in the wheels" view. The negative influences of corruption on economic growth could also be found in numerous studies by Mauro (1995), Mo (2001), Pellegrini and Gerlagh (2004), Rock and Bonnett (2004) and many others.

2.2.1.2. Transmission channels of corruption on growth

With regards to the second question, economists have proposed various channels through which corruption might impact economic growth. Corruption influences economic growth through various channels, such as investments, schooling, political instability, openness, or government spending (d'Agostino, Dunne, & Pieroni, 2016; Mo, 2001; Pellegrini & Gerlagh, 2004). Among those channels, the investment channel is undoubtedly the most prominent one that is repeatedly considered when scholars assess the effects of corruption on overall growth (Cieślik & Goczek, 2018; Mauro, 1995; Méon & Sekkat, 2005; Mo, 2001; Pellegrini & Gerlagh, 2004; Rock & Bonnett, 2004). Through its link with investment, corruption could affect growth both directly and indirectly. On one hand, it distorts incentives for investors, and hence could lower investment rates, which is a key determinant of growth rates; on the other hand, it lowers the efficiency of investment (Aron, 2000; Dimant & Tosato, 2018). Corruption reduces investment rates because it hurts countries' credibility towards policy stability and the investment environment. It is difficult for governments with a bad reputation for corruption to

convince investors to spend money in their country so both foreign and domestic investments deteriorate (Lambsdorff, 2007). Corruption causes inefficient public investment because politicians tend to allocate the public budget to the sectors where they might receive higher bribes rather than promote resources towards more productive sectors (Delavallade, 2006; Mauro, 1998) or cause the inefficiency in executing public contracts (Finocchiaro Castro, Guccio, & Rizzo, 2014). In addition, corruption might also raise the overall cost of doing business and lower the productivity of private investment (Aron, 2000).

One point that should be kept in mind here is that growth rates reflect the performance of economies, which can be determined by various factors, such as physical capital accumulation, growth in human capital, and so on. The effect of corruption on growth takes place because it influences the accumulation or the performance of those factors. In this sense, it is confusing to say corruption has a direct impact on growth. Therefore, I would like to raise the arguments made by Aron (2000), Mauro (1998), Pellegrini and Gerlagh (2004) to clear up the confusion that might emerge here. Based on their arguments, the indirect effect of corruption is its effect on the accumulation of certain growth determining factors, most significantly investment rates, the accumulation of physical capital. To test this channel, corruption should be treated as one of the explanatory variables in the regressions of those factors. Corruption influences growth directly when it affects the contribution of those factors to economic growth. Although Mauro (1995) and Aron (2010) emphasized the direct effect of corruption and other institutional elements on growth through their impacts on the efficiency of investment, we cannot exclude other channels, for instance, causing the misallocation of human capital. To test the direct channel, corruption is included in growth regression models alongside other determinants.

Various empirical studies consistently manifested indirect effects. Using average data from 1960 to 1985, Mauro (1995) managed several cross-country regressions, including both OLS and 2SLS, and found that corruption harms economic growth mainly by lowering total investment rates rather than causing inefficient investment choices. Pellegrini and Gerlagh (2004) studied the indirect effects of corruption through transmission channels, namely, investment ratios, schooling, trade openness, and political instability from 1960 to 1985 for 48 countries. Their estimation results confirm that the most damaging impact of corruption on growth is a reduction in investment rates, which accounted for almost 32 percent of the total effect. Rock and Bonnett (2004) employed four different corruption datasets, attempting to identify empirical evidence about the role of corruption on investment and growth. Their empirical results suggested that corruption reduces investment and growth in most developing

countries. Compared with the number of studies considering the indirect effect of corruption on growth through investment, fewer studies have been successful in proving a direct impact. In an influential study by Mauro (1995), the significance of the estimated coefficient of corruption index on growth rates did not survive when the investment ratio was added to the regression. His estimation results only provided weak evidence that corruption jeopardizes growth by causing inefficient investment choices. In contrast, some prominent studies, such as those by Mo (2001) and Méon and Sekkat (2005), presented significantly negative results for corruption even when investment rates are added to the growth regression, providing evidence about the direct impacts of corruption on growth. Regarding these studies, an issue that concerns me is the way these studies handled the coefficient of investment with different levels of corruption. If corruption directly worsens growth by causing inefficiency in investment, the contribution of investment on growth rates should depend on the level of corruption. Therefore, in this study, I aim to test that hypothesis by adding an interaction term of corruption and investment rates in the growth regression models.

2.2.1.3. Corruption on regional economic performance

Most of the studies on the consequences of corruption on economic growth have been undertaken at a cross-country level, which embodies many flaws. There exists a huge disparity between nations, not only in the extent of corruption but also other institutional elements, such as administrative control, government subsidies or the number of state-owned enterprises, for which cross-country data is incapable of controlling. Studies on regions with more homogeneous characteristics within a country could moderate any omitted variable bias that emerges from those differences (Del Monte & Papagni, 2001; Lisciandra & Millemaci, 2017). Additionally, cross-country studies often depend on survey-based corruption data, which raises two concerns that have been discussed by Glaeser and Saks (2006). First, corruption is a subjective concept and its definition might differ immensely across countries. Second, types of practiced corrupt behaviors also diverge among countries, thus it is difficult to compare corruption at a cross-country level. For all these reasons, a cross-regional analysis for one country could provide more insightful findings about the consequences of corruption on economic growth. Only a handful of studies address this issue using this approach. Rather than survey-based corruption data, most of these within-country studies employ corruption data that is based on reported crime data. Both Del Monte and Papagni (2001) and Lisciandra and Millemaci (2017) reviewed Italian regions and found that corruption deters economic growth

in those regions. Lisciandra and Millemaci (2017) proved that corruption deters Italian regional growth because it limits private investment and causes an inefficiency of public investment at the same time. Consistently, estimation results produced by Glaeser and Saks (2006) also suggest that there was an impediment of corruption on economic growth and income level of US states. Nevertheless, the results of these studies, which were conducted for two developed countries within a democratic political system, could not be generalized in the world where most of the countries are developing countries with pervasive corruption (Glaeser and Saks, 2006). For instance, Dong and Torgler (2013) recognized a positive association between corruption and the income level of Chinese provinces, which, they argued, developed as a result of the transitional nature of Chinese society. Although their study analyzes the causes of corruption and could not provide evidence for its consequences, it is a signal for how different it could be between countries with distinctive political and administrative systems and levels of development. In this study, I conduct a cross-regional within-country analysis about the consequences of corruption on economic growth in Vietnam, a rapidly developing country with a reputation of pervasive corruption. The results of this study could be more applicable to other developing countries with comparable characteristics, such as China or Laos.

2.2.2. Studies in the Vietnamese context

Although corruption has been widely perceived as a threat to economic performance in Vietnam, research, which investigates the economic consequences of corruption in the Vietnamese context, has not flourished until recently due to the unavailability of the appropriate data. Those studies that pay more attention to the consequences of corruption on firms' economic performance show several interesting and contrasting results. Using an enterprise survey data set provided by the World Bank in 2005, T. T. Nguyen and van Dijk (2012) found that although corruption deters Vietnamese firms' growth in total, its effects toward private firms and state-owned enterprises differ. While their estimation results consistently present a detrimental effect of corruption on firms' overall growth, corruption is less harmful to Vietnamese state-owned firms. Participating in corrupt activities generates more business opportunities and better administrative services for Vietnamese firms, but harms their technical efficiency and strategic capacity (T. V. Nguyen, Ho, Le, & Nguyen, 2016b). Contrasting results seen in those studies prove the complexity of the impacts of corruption on the Vietnamese economy; thus a conclusion about its effect on the provincial economic performance could not

be simply drawn. Even though there was quantitative evidence by Dang (2016) about the deterioration of provinces/cities' income level caused by the corruption, the need for more studies using different approaches remains.

2.2.3. Hypotheses

In this article, I hypothesize that, in total, corruption impedes Vietnam's provincial economic growth and it affects growth both directly and indirectly, mainly through the investment channel. Indirectly, corruption, worsening the local business environment and the credibility of local governments' policies, discourages investors, which lowers investment rates. In addition, corruption directly poses its adverse effect on growth through various channels. Among those direct channels, I expect that its harmful effect on the efficiency of investment is a key one.

2.3. Methodology

2.3.1. Dynamic panel data analysis

Bond et al. (2001) and Hoeffler (2002) are among the first to utilize a dynamic panel data analysis for a growth regression model in which initial income level is one critical explanatory variable. Dynamic panel data analysis, using the GMM method for regression, improves regression outcomes because it tackles two major bias problems that may emerge in cross-country growth analysis. In a cross-country regression, the country-specific effect that is included in the error term is assumed to be uncorrelated with other independent variables. This assumption is violated in a dynamic framework of growth regression, raising an omitted variable bias problem. Moreover, at least some explanatory variables, such as investment rates, of growth regression model are potentially endogenous, causing endogenous bias problem. Dynamic panel data analysis with the GMM approach could manage these two major problems and generate more reliable results for the growth regression model.

Following Bond et al. (2001) and Hoeffler (2002), I use a dynamic panel data analysis for an augmented Solow growth model, in which growth rates are explained by initial income level, investment rates, human capital, and the sum of population growth, technological progress and depreciation rates. Below is the econometric model.

$$\Delta y_{it} = \alpha + \beta y_{it-1} + \gamma x_{it} + \eta_i + \nu_{it} \quad (2.1)$$

where *i* and *t* refer to province *i* and year *t*, respectively. y_{it} is the natural logarithm of real GDP per capita or worker; Δy_{it}, growth rates, which is the change of the natural logarithm of real GDP per capita/worker, is the dependent variable. On the right-hand side, the natural logarithm of the initial GDP per capita/worker (y_{it-1}) is one of the main explanatory variables. In their estimation, Bond et al. (2001) and Hoeffler (2002) calculated growth rates as the average value for every five-year period and GDP per capita/worker is the beginning value of each period. In this study, I measure growth rates for every one-year period and the initial per capita GDP is the previous year's value. x_{it} denotes a vector of other independent variables: the logarithm of investment rates (total investment/GDP) (k_{it}); the sum of population growth (n_{it}), technological progress (g_{it}), and depreciation rates (δ_{it}); and the investment in human capital (h_{it}). Following the results from previous studies, the sum of technological progress and depreciation rates is assumed to be constant and equal to 0.05 (Bond et al., 2001; Hoeffler, 2002; Islam, 1995; Mankiw, Romer, & Weil, 1992). In addition, I include the corruption index *($Corrup_{it}$)* and the interaction term between corruption and the logarithm of investment rates *($Corrup_{it} \times lnk_{it}$)* in the regression to analyze the effects of corruption on growth rates. I add the interaction term because corruption is often argued to affect economic growth by reducing the efficiency of investments, hence the effect of investment rates on growth rates is expected to depend on the corruption level. η_i and ν_{it} are time invariant characteristics of provinces/cities and the error term, respectively. Following is the detailed empirical model.

$$\Delta y_{it} = \alpha + \beta_1 y_{it-1} + \beta_2 Corrup_{it} + \beta_3 lnk_{it} + \beta_4 Corrup_{it} \times lnk_{it} + \beta_5 lnh_{it} + \beta_6 \ln(n_{it} + g_{it} + \delta_{it}) + \eta_i + \nu_{it} \quad (2.2)$$

Regarding the estimation for this economic growth model, one issue that should be taken into consideration is whether to use per capita or per worker variables. Mankiw et al. (1992) and Ding and Knight (2009) use per worker variables for their estimation, while Bond et al. (2001), Islam 1995), and Caselli et al. (1996) use per capita variables and Hoeffler (2002) includes both types in her study. In this paper, I use both per capita variables and per worker variables in my estimations.

Regarding the use of dynamic panel data analysis for growth regression, Bond et al. (2001) confirmed the efficiency of the GMM approach for producing consistently estimated parameters in the presence of measurement error and endogenous independent variables. They also recommended using system GMM over first-difference GMM to avoid a large downward

finite-sample bias, especially when the number of time periods is small. Therefore, in this study, the system GMM method will be employed.

2.3.2. Estimation steps

In her discussion about how institutional factors enter the Solow growth model, Aron (2000) emphasized the link between institutional factors, investment, and growth. Because of the simultaneous relationship between those three variables, one strategy to estimate the total effects of institutions on growth is to replace investment rates by a set of its determinants. However, it is impossible to disentangle the direct and indirect effects of institutions on growth in this model. Therefore, a comprehensive study should run the regression of investment rates on its determinants, including institutions. Furthermore, when institutions enter the structural form of the Solow model, which includes investment rates as an explanatory variable, it is considered to have a direct effect on growth rates. Corruption is one of the key variables representing the institutional quality of economies, hence in this study, I follow the discussion by Aron (2000) to sketch a comprehensive picture about the effects of corruption on growth. My core estimation focuses on the direct effects of corruption is conducted by adding corruption and the interaction term in the augmented Solow model proposed by Mankiw et al. (1992). In addition, a brief analysis about the effect of corruption on investment rates will be undertaken to reveal the indirect effect of corruption. Finally, a growth regression without investment variables will be run to test the total effect of corruption on growth.

2.4. Data

For estimation purpose, I constructed a panel dataset for all 63 Vietnamese provinces/cities from 2009 to 2015. Three main sources for the data are the provinces/cities' statistical yearbooks, Vietnam's Population Change and Family Planning Survey and Population and Housing Survey published by the General Statistics Offices of Vietnam (GSO), and the provincial competitiveness index (PCI) that are compiled through the collaboration of the Vietnam Chamber of Commerce and Industry (VCCI) and the United States Agency for International Development (USAID).

Corruption index data is obtained from the PCI dataset, which is claimed to be one of the most reliable sources for corruption data in Vietnam because of the established methods used to gather and construct datasets (Tromme, 2016). For the corruption index, I use the percentage

of firms in provinces/cities that pay at least 10 percent of their revenue as an informal payment. This data is calculated by the PCI team based on the responses of firms' managers to the question "how much is the informal cost that businesses in their sectors have to pay to government officials?".

I calculated real GDP per capita (y), GDP per worker (y_1), and investment rates (k = total investment/GDP), using data from provinces/cities' statistical yearbooks and GSO[6]. The dependent variable, growth rates, has been calculated as the change of the natural logarithm of real GDP per capita ($dlny$) or GDP per worker ($dlny_1$) year over year, respectively. Enrollment rates are used as proxies for investment rates in human capital. High school enrollment rates (*HEnrol*) and tertiary enrollment rates (*TEnrol*) data are obtained from Vietnam's Population Change and Family Planning Survey and Population and Housing Survey. Population growth (*popgr*) and labor force growth (*Lgr*) are calculated based on the data reported by the GSO.

Descriptive statistics in *Table 2.1* show significant disparities between Vietnamese provinces/cities and reveal a significant outlier among provinces/cities; Ba Ria Vung Tau, the only oil-producing province in Vietnam. This province's GDP per capita stands at around 270 million VND, three times higher than Ho Chi Minh City, the city with the second highest GDP per capita[7]. In this study, I run regressions both with and without this outlier but only report those without this province as my main estimations because the main results remain the same. *Table 2.1* also reveals that there are some Vietnamese provinces with investment rates being higher than one in some years. These provinces are Ha Tinh (2013-2015), Thai Nguyen (2014-2015), Thanh Hoa (2014-2015), Dien Bien (2009), Lai Chau (2009, 2010, 2012), and Tra Vinh 2014. There are two main reasons to explain these unusually high investment rates, either the provinces received huge FDI inflows or enormous public investment for infrastructure projects in those years. The first case applies to explain investment rates of Ha Tinh with FDI for Formosa Steel project, Thai Nguyen with FDI from Samsung, and Thanh Hoa with FDI for Nghi Son Complex. Those years are the years of initial investments of those FDI projects, hence those provinces receive huge amount of foreign investment but have little value added to GDP. Other provinces, such as Lai Chau, Dien Bien, and Tra Vinh are poor Vietnamese provinces with big public investment in infrastructure projects. I also run regressions after excluding observations with unusual high rates of investment. Results of corruption variables remain significant and negative. Appendix A show outcomes of those estimations.

[6] 2010 is the base year.

[7] GDP per capita of Ho Chi Minh city is around 90 million VND at the same period.

Table 2.2 presents no high correlation coefficients among variables; hence multicollinearity should not be a problem.

Table 2.1: Descriptive statistics

VARIABLES	N	mean	sd	min	max
y	440	28.84	31.1	6.693	270.1
y_1	440	49.68	58.27	11.07	532.4
k	437	0.5	0.237	0.108	1.98
lnk	437	-0.789	0.437	-2.222	0.683
popgr	441	0.00971	0.00881	-0.00502	0.0783
Lgr	441	0.0179	0.0257	-0.0696	0.148
HEnrol	441	0.586	0.155	0.2	0.893
TEnrol	441	0.131	0.114	0.003	0.577
Corrup	441	0.0903	0.0518	0	0.28
Number of id	63	63	63	63	63

Table 2.2: Correlation matrix

	dlny	$dlny_1$	L.lny	$L.lny_1$	lnk	ln(popgr+0.05)	ln(Lgr+0.05)	lnHEnrol	lnTEnrol	Corrup
dlny	1									
$dlny_1$	0.9479	1								
L.lny	-0.0879	-0.0374	1							
$L.lny_1$	-0.0713	-0.0301	0.9947	1						
lnk	0.1338	0.1068	-0.4143	-0.411	1					
ln(popgr+0.05)	0.0056	-0.0116	0.2674	0.2674	0.1001	1				
ln(Lgr+0.05)	0.0145	-0.2618	-0.0005	0.023	0.073	0.3201	1			
lnHEnrol	0.0136	0.0414	0.3291	0.3188	0.0554	-0.1739	-0.0648	1		
lnTEnrol	-0.022	0.0359	0.5716	0.5878	-0.1725	-0.0117	-0.1304	0.5778	1	
Corrup	-0.0522	-0.064	-0.2193	-0.2436	0.2271	0.1085	0.0848	-0.1126	-0.3815	1

2.5. Estimations results

2.5.1. Direct effects of corruption on growth

Tables 2.3 and *2.4* report the estimation results of one-step system GMM regressions[8] with both per capita variables and per worker variables. Time dummy variables are included in all regressions. In all of the regressions, Arellano-Bond tests reject the zero autocorrelation of first-differenced errors at first-order but show no evidence of second-order autocorrelation, which validates the GMM estimation (Arellano & Bond, 1991). The results of Hansen tests fail to reject the hypothesis that all the instruments are exogenous as a group, and therefore fail to reject the validity of instruments.

As expected, coefficients of investment rates are consistently positive at one percent significant level. These results confirm the crucial role of investment rates on Vietnamese economic growth. The significantly negative coefficients of initial GDP per capita in all models, except in column (3)[9], are interpreted as evidence about conditional convergence. Coefficients of enrollment rates are positive but only significant in models (2) and (6). These results provide weak evidence about the role of human capital investment on growth rates. After all, enrollment rates are known to be noisy proxies that do not precisely measure human capital investment rates and these insignificant results are consistent with findings of many existing studies (Benhabib & Spiegel, 1994; Glewwe & Lambert, 2010a; Pritchett, 2001). One point that should be noted here is that considering the significance level, coefficients of tertiary enrollment rates are more significant than those of high school enrollment rates. This might be a sign that tertiary enrollment rates might be better proxies for human capital as a determinant of economic growth. Results for population growth are mostly insignificant but those for labor growth are consistently significantly negative as predicted by the Solow model.

In columns (1) – (4) of *Table 2.3*, corruption enters growth regression model as an explanatory variable, having a direct impact on growth[10]. Significantly negative coefficients of corruption are in accordance with some other studies that agree that corruption has a significantly adverse direct impact on growth rates. Specifically, model (1) shows that one

[8] Two-step system GMM regressions have been conducted as well; the results are robust with those produced by one-step system GMM.

[9] Although coefficient for initial income is not significant at 10 percent in model (5), the p-value of it stands at just around 0.14.

[10] The same strategy has been applied in many existing studies on the effects of corruption on economic growth (Mauro, 1995; Méon & Sekkat, 2005; Mo, 2001; Pellegrini & Gerlagh, 2004).

standard deviation increase in the corruption index (0.0518) leads to a 1.9 percent point lower growth rate. This adverse effect is often considered to be the evidence that corruption causes the inefficiency of investment, the misallocation of talent or that of public expenditures. Among those, the inefficiency of investment is often regarded as the most significant one.

Table 2.3: Direct effects of corruption on growth (estimations without interaction term)

	(1)	(2)		(3)	(4)
VARIABLES	dlny	dlny	VARIABLES	$dlny_1$	$dlny_1$
L.lny	-0.0560*	-0.0482**	$L.lny_1$	-0.0364	-0.0395*
	(0.0325)	(0.0213)		(0.0247)	(0.0209)
ln(popgr+0.05)	0.0931	0.0728	ln(Lgr+0.05)	-0.0470***	-0.0444***
	(0.0718)	(0.0474)		(0.0106)	(0.0108)
Corrup	-0.361***	-0.275**	Corrup	-0.303***	-0.251**
	(0.116)	(0.110)		(0.115)	(0.111)
lnk	0.0690***	0.0634***	lnk	0.0756***	0.0656***
	(0.0203)	(0.0203)		(0.0236)	(0.0219)
lnHEnrol	0.0404		lnHEnrol	0.0206	
	(0.0401)			(0.0301)	
lnTEnrol		0.0162**	lnTEnrol		0.0140
		(0.00822)			(0.00884)
Constant	0.631**	0.551***	Constant	0.203**	0.233**
	(0.313)	(0.193)		(0.0951)	(0.0932)
Year dummies	Yes	Yes	Year dummies	Yes	Yes
AR(1)	-2.49	-2.45	AR(1)	-2.56	-2.50
	(0.013)	(0.014)		(0.011)	(0.012)
AR(2)	0.35	0.36	AR(2)	0.34	0.36
	(0.724)	(0.716)		(0.732)	(0.720)
Hansen	40.83	34.53	Hansen	42.47	36.63
	(0.347)	(0.631)		(0.285)	(0.533)
Observations	369	369	Observations	369	369
Number of id	62	62	Number of id	62	62

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.4: Direct effects of corruption on growth (estimation with interaction term)

	(5)	(6)		(7)	(8)
VARIABLES	dlny	dlny	VARIABLES	$dlny_1$	$dlny_1$
L.lny	-0.0826**	-0.0748***	$L.lny_1$	-0.0478*	-0.0519**
	(0.0357)	(0.0280)		(0.0283)	(0.0250)
ln(popgr+0.05)	0.121	0.0900*	ln(Lgr+0.05)	-0.0487***	-0.0479***
	(0.0771)	(0.0532)		(0.00997)	(0.0113)
Corrup	-0.663***	-0.631**	Corrup	-0.679***	-0.696**
	(0.244)	(0.246)		(0.263)	(0.282)
lnk	0.101***	0.113***	lnk	0.128***	0.137***
	(0.0362)	(0.0355)		(0.0408)	(0.0452)
Corrup × lnk	-0.574*	-0.648**	Corrup × lnk	-0.729**	-0.810**
	(0.295)	(0.307)		(0.318)	(0.358)
lnHEnrol	0.0553		lnHEnrol	0.0195	
	(0.0385)			(0.0309)	
lnTEnrol		0.0179*	lnTEnrol		0.0119
		(0.00928)			(0.0108)
Constant	0.815**	0.714***	Constant	0.267**	0.306***
	(0.330)	(0.235)		(0.110)	(0.112)
Year dummies	Yes	Yes	Year dummies	Yes	Yes
AR(1)	-2.54	-2.50	AR(1)	-2.62	-2.58
	(0.011)	(0.012)		(0.009)	(0.010)
AR(2)	0.35	0.37	AR(2)	0.31	0.33
	(0.728)	(0.715)		(0.757)	(0.742)
Hansen	53.07	46.30	Hansen	50.16	46.16
	(0.285)	(0.543)		(0.388)	(0.549)
Observations	369	369	Observations	369	369
Number of id	62	62	Number of id	62	62

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The significant results for corruption and interaction term in *Table 2.4* imply that corruption directly affects provincial economic growth via two channels. First, the negative coefficients of the interaction term suggest that corruption reduces the positive effect of investment rates on economic growth rates. For example, on the results of regression (5), if the corruption index equals zero, one percent of the increase in investment rates raises growth rates by 0.101 percentage point. However, due to the presence of corruption, the effect of investment rates on growth rates is much lower. At the mean of corruption (0.0903), increasing investment rates by one percent induces only 0.049 ($0.101 - 0.574 \times 0.0903$) percent increase in growth rates. For some provinces/cities with severe corruption, in which 17.6 percent or higher proportion of firms pay at least one-tenth of their revenue towards bribery, the effects of investment on growth rates become negative. According to corruption data, in most provinces/cities, the corruption index stands lower than this threshold, except for some provinces in the far north of Vietnam, such as Cao Bang and Bac Kan[11]. In those most corrupt provinces, the contribution of investment on economic growth might be blown away because of corruption. This result confirms the notion made in several existing studies, which assert that corruption profoundly hurts economic growth because it jeopardizes the efficiency and quality of investment.

Corruption also influences growth rates through other channels. Analyzing those effects is quite complicated because corruption potentially affects so many different aspects of provinces/cities' economies, both positively and negatively. For some provinces/cities with a lower investment rate, around 0.315 or lower[12] corruption is, in fact, positively associated with growth rates[13]. This counterintuitive result is consistent with several studies that focus on the Vietnamese settings in which scholars concluded that corruption could be beneficial, speeding up transactions and improving the quality of public services. After all, firms bribe government officials, expecting to gain some benefits and they only make the informal payment if the potential benefits are higher than the costs. However, because corruption diminishes the efficiency of overall investment, and thus growth rate, the damage of corruption expands in provinces/cities with higher investment rates. In the regions with investment rates higher than 0.315, the adverse impacts of corruption trump its benefits. When *lnk* stands at its mean (-0.789),

[11] Some provinces of the Far North of Vietnam, including Cao Bang, Bac Kan, Ha Giang are among the most corrupt regions with average corruption index are around 0.18 or 0.17

[12] Marginal effects of corruption on growth, (-0.663-0.574*lnk*), is positive when k stands around 0.315 or lower.

[13] Mekong Delta Region' provinces, including An Giang, Dong Thap, Soc Trang, Bac Lieu are among the provinces with lowest investment rate, from around 0.2 to 0.3. Corruption might be favorable for economic growth.

higher corruption index results in worse economic performance; provinces with one standard deviation higher of corruption index (0.0518) has approximately one percentage point lower growth rate.

2.5.2. Effects of corruption on investment rates

However, because corruption also affects economic growth indirectly by its impact on investment rates, even when the results above show consistently negative direct effect of corruption on growth, we cannot draw a conclusion about the total effect of corruption on growth rates (Aron, 2000). Therefore, I ran a regression to test the impact of corruption on investment rates. Based on the dynamic model of investment used by Cieślik and Goczek (2018), investment rates can be explained by its lagged value, corruption, and a basic list of control variables that are often used in the literature, namely, initial GDP per capita, population growth, and enrollment rates. The results of fixed effects and system GMM estimations are presented in Table 2.5.

The estimated parameters of corruption are mostly insignificant and positive, in contrast with many previous studies that have found a decrease in investment rates due to corruption. In the case of Vietnamese provinces/cities, investment rates seem not to be deterred by corruption. Contrastingly, there is weak evidence that corruption raises total investment rates. Although these results contradict many influential works by Caselli et al. (1996) and Mauro (1998), they are not unexplainable. For instance, focusing on examples from post-communist economies in Eastern Europe and the former Soviet Union, Ruziev and Webber (2018) found that bribes and personal connections actually facilitated access to bank loans. Although their results do not explicitly offer evidence about the positive effect of corruption on investment, they could explain why in some less mature market-based economies, including Vietnam, corruption might help to stimulate private investment. I briefly run regressions to test the effects of corruption level on three different forms of investment, namely, private investment rates *(prk)*, public investment rates *(pk)*, and foreign investment rates *(fk)*. Table 2.6 shows results of these tests. Although the results of corruption are all insignificant, the sign of estimated coefficients differ. While estimated coefficients of corruption on private investment and public investment are positive, the number for foreign investment is negative. This result might suggest that foreign investment is more sensitive to corruption than domestic investment.

Table 2.5: Estimation results for the effects of corruption on investment rate

	(9)	(10)	(11)	(12)
VARIABLES	k	k	k	k
	GMM	FE	GMM	FE
L.k	0.907***	0.694***	0.909***	0.686***
	(0.0687)	(0.0614)	(0.0623)	(0.0565)
L.y	-0.000752	0.00218**	-0.000273	0.00189**
	(0.000991)	(0.00102)	(0.00122)	(0.000847)
Corrup	0.189	0.123	0.224*	0.146
	(0.153)	(0.0984)	(0.126)	(0.102)
HEnrol	0.275**	0.131		
	(0.117)	(0.142)		
TEnrol			0.274	0.289
			(0.210)	(0.179)
popgr	-0.760	0.794	-2.561**	0.757
	(1.082)	(4.767)	(1.096)	(4.524)
Constant	-0.110	-0.00329	0.0219	0.0450
	(0.0749)	(0.107)	(0.0408)	(0.0801)
Year dummies	Yes	Yes	Yes	Yes
AR(1)	-2.73		-2.55	
	(0.006)		(0.011)	
AR(2)	0.28		0.30	
	(0.778)		(0.766)	
Hansen	41.85		44.99	
	(0.307)		(0.203)	
R-squared		0.534		0.537
Observations	367	367	367	367
Number of id	62	62	62	62

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.6: Estimation results of the effects of corruption on private investment, public investment, and foreign investment

VARIABLES	(10) prk GMM	(11) pk GMM	(12) fk GMM
L.prk	0.562***		
	(0.0890)		
L.pk		0.721***	
		(0.0466)	
L.fk			1.162***
			(0.104)
L.y	-0.000681	-0.000815	-0.00309**
	(0.000475)	(0.000506)	(0.00131)
Corrup	0.110	0.109	-0.0399
	(0.0761)	(0.0898)	(0.120)
HEnrol	0.0406	0.0144	0.329*
	(0.0683)	(0.0763)	(0.173)
popgr	-0.540	0.912	2.509
	(0.755)	(0.659)	(1.718)
Constant	0.0967*	0.0359	-0.148
	(0.0502)	(0.0392)	(0.0947)
Year dummies	Yes	Yes	Yes
AR(1)	-3.65	-2.87	-1.97
	(0.000)	(0.004)	(0.049)
AR(2)	2.30	-0.87	0.24
	(0.022)	(0.382)	(0.809)
Hansen	33.79	39.20	33.37
	(0.665)	(0.416)	(0.683)
Observations	362	362	361
Number of id	62	62	62

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2.5.3. Total effects of corruption on growth

Results from the two steps above show that although corruption has a directly negative effect on growth rates, it is possibly beneficial for growth rates indirectly. The question of whether, in general, corruption is detrimental or favorable to Vietnamese growth, therefore,

remains unsolved. To tackle this question, I went a further step, conducting other regressions using the reduced form of the Solow model in which investment rates are replaced by its determinants[14]. Because investment rates also depend on initial income, enrollment rates, population growth and corruption, in these models, investment rates were simply dropped out of the list of independent variables. Table 6 presents the estimation outcomes of this step. The results provide evidence that, in total, corruption has a negative effect on growth rates. The extent of this effect is considerable. For instance, results seen in column (13) of Table 6 imply that if corruption index rises by one standard deviation (0.0518), economic growth rates decrease by approximately 1.5 percent. Compared with the result in column (1) of Table 3, which presents the direct effect of corruption on growth, the magnitude of corruption index is actually lower[15]. This indicates that the adverse direct impact of corruption is alleviated by its positive indirect effect on total investment rates.

[14] According to Aron (2000), this step is necessary to see total effects of corruption on growth.

[15] Estimated parameter of corruption index in model (1) is -0.361, implying that keeping other variables, including investment rate, corruption index increases by one standard deviation would reduce growth rates by about 1.9 percent.

Table 2.7: Estimation results using reduced form of growth regression model

	(13)	(14)		(15)	(16)
VARIABLES	dlny	dlny	VARIABLES	$dlny_1$	$dlny_1$
L.lny	-0.0523*	-0.0448*	L.lny1	-0.0404	-0.0430
	(0.0302)	(0.0238)		(0.0250)	(0.0270)
ln(popgr+0.05)	0.115*	0.0938*	ln(Lgr+0.05)	-0.0379***	-0.0361***
	(0.0595)	(0.0485)		(0.00977)	(0.00957)
Corrup	-0.288**	-0.190*	Corrup	-0.241**	-0.172
	(0.114)	(0.105)		(0.115)	(0.109)
lnHEnrol	0.0373		lnHEnrol	0.0213	
	(0.0349)			(0.0295)	
lnTEnrol		0.0181**	lnTEnrol		0.0183**
		(0.00895)			(0.00863)
Constant	0.648**	0.536**	Constant	0.155	0.180
	(0.264)	(0.209)		(0.114)	(0.129)
Year dummies	Yes	Yes	Year dummies	Yes	Yes
AR(1)	-2.46	-2.43	AR(1)	-2.52	-2.48
	(0.014)	(0.015)		(0.012)	(0.013)
AR(2)	0.29	0.31	AR(2)	0.30	0.33
	(0.774)	(0.759)		(0.762)	(0.740)
Hansen	26.91	27.68	Hansen	25.70	25.54
	(0.576)	(0.535)		(0.641)	(0.650)
Observations	370	370	Observations	370	370
Number of id	62	62	Number of id	62	62

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2.6. Conclusion

This study has two goals. The first is to contribute to the line of literature about the consequences of corruption on economic growth. The latter is to be the first study providing

empirical evidence about how corruption impacts Vietnamese regional economic growth. This comprehensive analysis presents several significant findings about the direct effect of corruption in the Vietnamese case. My estimation results show that being aligned with the dominant view in the literature, corruption has an adverse effect on Vietnamese provinces/cities' economic growth rates. Disentangling this impact manifests both robust and contrasting results with the previous empirical research. Directly, corruption deters growth rates by causing inefficiency in investment and other channels, possibly causing the misallocation of talent or public expenditures. However, the analysis also presents weak evidence that corruption raises investment rates, contradicting most of the previous evidence. Some influential cross-country works by Caselli et al. (1996), Mauro (1995), Mo (2001), Pellegrini and Gerlagh (2004) manifest that the adverse impact of corruption is mainly produced by its hindrance to investment rather than its direct impact. This study exhibits contrastive evidence for the case of Vietnam. Directly, corruption seriously harms growth rates; however, that harmful consequence may be alleviated by its positive impact on investment rates.

CHAPTER 3: THE EFFECTS OF CORRUPTION ON HUMAN CAPITAL ACCUMULATION PROCESS

3.1. Introduction

Since its economic reform in 1986, Vietnam has performed remarkably well according to human development indicators, including educational outcomes. The country stands out because of its significant achievements in education in terms of both quantity and quality. A report by the Vietnam Ministry of Education and Training shows that youth literacy rates have increased rapidly and reached 96.8 percent in 2012. Vietnam has also succeeded in making significant progress toward a commitment to universal primary education. In 2013, the net enrollment rates for primary education and lower secondary education were 98.31 percent and 88.04 percent, respectively.[16] Vietnam has shown improvement in terms of both access to education and the quality of education. When Vietnam joined the PISA[17] in 2012, Vietnamese students amazed experts around the world with their outstanding results, particularly considering that Vietnam is a lower middle-income nation. In 2012, Vietnam ranked in the top 20 economies with the highest scores, and its score was higher than the mean score of OECD countries/economies.[18] In 2015, the country maintained its stunning record and ranked 8th in science at 525 points, which is better than the average score of OECD countries/economies (OECD, 2016).

Despite all the achievements acknowledged by international organizations, the Vietnamese education system has two major problems that concern the public, the government, and scholars. The first is the criticism that educational outcomes do not meet social requirements (Trân, 2014). A report by the World Bank reveals that although the Vietnamese workforce is well educated with good literacy and numeracy, the productivity and quality of labor are inadequate (Bodewig & Badiani-Magnusson, 2014). The second is that the education system is subject to pervasive corruption. According to public officials, enterprises and citizens, corruption is one of the most severe problems in Vietnamese society (World Bank, 2013), and according to Vietnamese citizens, education is the fifth most corrupt sector (Transparency International, 2013). Widespread corruption inside the educational system threatens not only

[16] See the report *Vietnam Education for All 2015 National Review* (Vietnam Ministry of Education and Training, 2014)

[17] PISA stands for Programme for International Student Assessment, which is used to assess the key knowledge and skills of 15-year-old students, focusing on mathematics, reading, science and problem-solving. (OECD, 2014)

[18] In 2012, the scores for Vietnam were 511, 508, and 528 in mathematics, reading, and science, respectively, compared to the scores for OECD countries/economies, which were 494, 496, and 501. (OECD, 2014)

the quality of education but also the mentality and integrity of future generations (Transparency International, 2011).

Although the general view of the public and scholars in Vietnam is that corruption has detrimental influences on the accumulation of human capital, there is a lack of quantitative empirical evidence for that assertion. Furthermore, while corruption is a complex social phenomenon that can negatively affect the entire system, an empirical study has never been conducted to determine how corruption impacts Vietnamese educational achievements and human capital. This study aims to fill these research gaps by focusing on how corruption influences Vietnam human capital, based on provincial-level panel data. This study is unique because rather than using educational variables, such as enrollment rates or literacy rates, this study measures human capital using labor quality assessments of firms. Using educational factors to measure human capital might lead to flaws in research on a country with significant educational achievements but inadequate labor skills, such as in the Vietnam context. Second, I hypothesize that the process of human capital accumulation in Vietnam has two steps; the first is education, and the second is the transformation of educational outcomes and worker training into labor quality. I analyze the effects of corruption on both steps.

This study provides several noteworthy results. The estimation results reveal that corruption has both positive and negative effects on human capital; however, overall, it adversely affects human capital. On the one hand, during the education process, corruption reduces the favorable impacts of provincial spending on educational outcomes and worsens the quality of labor. On the other hand, surprisingly, it might help improve enrollment rates in certain provinces/cities. To provide a detailed explanation for this counterintuitive result, I construct a simple model based on the public fund procurement game for the Vietnamese context. This model shows that corruption increases the advantages of certain schools in the competition for the central government's funds; therefore, it enhances the inputs of local educational systems. These findings are important because they deepen our understanding of Vietnam and may shed light on the circumstances in other countries with similar phenomena, such as China and Laos.

This paper is structured as follows. Section 2 briefly reviews existing studies on human capital, the effects of corruption on human capital, and the phenomenon in Vietnam. Sections 3 and 4 discuss the hypotheses and the empirical methodology employed in this study. Section 5 describes the data sources and the construction of the variables. Section 6 analyzes the estimation results. Section 7 reviews the results of the robustness checks, and the final section

concludes the paper.

3.2. Literature review

3.2.1. Human capital

Although human capital is considered to be one of the critical determinants of economic development, it is an elusive concept. To proxy human capital, many previous studies use educational outcomes such as adult literacy rates (Barro, 1991), enrollment rates (Caselli et al., 1996), average years of schooling (Ding & Knight, 2009), and cognitive skills measured by test scores (Eric A Hanushek & Woessmann, 2008). Nonetheless, educational outcome may not be a good measure of human capital as a determinant of economic development. First, the accumulation of human capital depends not only on education but also training processes. Second, for many reasons, good learners may not transform into productive workers. Therefore, a significant gap exists between these educational variables and the knowledge and skills of workers. Some economists state that the imprecise measurement of human capital is one of the reasons that studies report inconsistent results on the impacts of human capital on development (de la Fuente & Doménech, 2006). To address this problem, in this study, I use labor quality assessments of firms as a proxy for human capital. This index more precisely reflects the knowledge, skills, and competence of workers that accumulate through both education and training. Therefore, labor quality assessments may be a better proxy for human capital.

To better explain the determinants of the human capital accumulation process, economists have attempted to identify the factors that determine educational outcomes. Some scholars employ the education production function, in which educational outcomes are explained by inputs, including school resources, family backgrounds, and the initial ability of students (Glewwe & Lambert, 2010b; E.A. Hanushek, 2010; Harris, 2010). This function is based on the principle that increasing inputs enhances achievement. However, this simple function is based on the unrealistic assumption that inputs are used efficiently (Harris, 2010); therefore, using this equation, numerous studies have found a weak or even negative link between inputs and output. These results imply that educational inputs are ineffectively used by educational systems (E.A. Hanushek, 2010).

Instead of using a simple education production function that explains educational outputs only by inputs, Bishop and WößMann (2004) consider the role of various actors (parents, teachers, students, the government, administration, and school managers) in the operation of

the education system. These actors respond to their respective incentives and influence the allocation of inputs and the effectiveness of their use; therefore, they affect the outcome. More details are provided in the following section, in which I discuss the channels through which corruption might affect educational outcomes and review existing studies evaluating these actors' actions and incentives. Some corrupt actors might steal a portion of public funds allocated for education or use it inefficiently for their personal gain. In addition, corruption influences educational outcomes by defining "the rules of the game", altering stakeholders' incentives and behaviors. In this study, I add corruption to a simple education production function to explicate its effects on educational outcome.

3.2.2. Effects of corruption on human capital

Corruption is generally considered to adversely influence human capital, as represented by indicators of education. Using cross-sectional and 2SLS estimations for 103 countries from 1980-2002, Dridi (2014) finds that their corruption index has a negative link with secondary school enrollment rates, but no significant connection with dropout rates. Gupta et al. (2002) show that corruption reduces primary net enrollment rates and increases dropout rates, repeater rates, and illiteracy rates. Studies have indicated that corruption has a negative link with human capital as measured by the average years of schooling (Mo, 2001). Many scholars discuss and stress the two key channels through which corruption affects human capital: its effects on the allocation and use of public budgets for education and its effects on the incentives of students and families to invest in human capital.

Previous studies show that corrupt officials tend to have smaller budgets for education, health, and social protection and larger budgets for fuel, defense, and infrastructure as these officials can embezzle more funds, and it is more difficult to detect embezzlement in projects involving both more money and secrecy (Delavallade, 2006; Mauro, 1998; Shleifer & Vishny, 1993). Bureaucrats also engage in corrupt activities for their personal benefit by stealing money devoted to the education system (Boikos, 2016) or using it ineffectively (Bishop & WößMann, 2004).

Corruption may also dictate "the rules of the game" and structure the incentives of all stakeholders in an education system, namely, parents, teachers, students, government officials, and school managers. Several scholars view corruption as a type of informal institution or an institutional problem rather than a rare illicit act. Based on the institutions concept proposed by

North (1990), Teorell (2007) argues that corruption is an institution because in most countries, corruption is not an exception to the rule but rather defines "the rules of the game". Corruption emerges as an informal institution that shapes the incentives of actors only when it is widespread and expectedly practiced among citizens and government officials (Helmke & Levitsky, 2004). It is considered an institutional problem that persists for long periods (Mo, 2001). When we view corruption as an institution or "the rules of the game" as defined by North (1990), its consequences are viewed from the following different perspective: corruption structures the incentives and interactions of individuals (North, 1990). The prevalence of corruption motivates people to engage in other corrupt acts because it lessens the probability they will be detected, the extent of punishment they will receive, or the moral cost they will pay (Blackburn, Bose, & Emranul Haque, 2010).

Rampant corruption in society also alters the incentives of individuals to invest in productive human capital (Ehrlich & Lui, 1999; Pecorino, 1992). Ehrlich and Lui (1999) develop two models with homogenous and heterogeneous agents who must choose to invest in either political capital or productive human capital and find that corruption reduces the incentive to invest in productive human capital. Corruption distorts individuals' incentives to allocate time and effort to productive activities, such as accumulating knowledge and skills (Mo, 2001; Tanzi, 1998); thus, rent-seeking activities reduce the incentives to invest in productive human capital, which hampers growth (Pecorino, 1992). Corruption also induces a misallocation of talent; corruption lowers the returns of productive activities, rendering rent-seeking or corrupt activities relatively more attractive, thereby causing resources, including talent, to flow from productive activities to corrupt activities (Murphy, Shleifer, & Vishny, 1993). Corruption affects occupational choices because talented young people might choose to work as bureaucrats with lower salaries since they could potentially earn extra income from corrupt activities (Blackburn et al., 2010). However, despite the importance of new research investigating the effects of corruption on human capital, empirical evidence regarding this issue is relatively limited (Dimant & Tosato, 2018; Dridi, 2014). Dimant and Tosato, (2018) conduct a comprehensive survey of the causes and effects of corruption by focusing on empirical studies and find that during the past decade, scholars have overlooked the effects of corruption on human capital.

Moreover, these studies, which are mainly conducted across countries, have two important limitations. The first is the incomparability of some variables between countries. It is inconceivable that one year of schooling is equivalent across countries, irrespective of the

difference in the quality of education (Wößmann, 2003). Furthermore, every country has unique characteristics, and cross-country studies are often unable to control for such characteristics. These issues highlight the need for conducting a cross-regional analysis within a single country, where many characteristics are common across regions. In this study, I focus on research at the provincial level; the data are more comparable and it is possible to delve deeply into Vietnam's distinctive phenomenon.

3.2.3. Corruption in Vietnam

Corruption is one of the most imminent threats to Vietnam's development. Vietnam is ranked 113 of 176 countries and has a score of 33/100 on the Corruption Perception Index 2016 (Transparency International, 2017). Corruption has grown alongside the rapid growth since the economic reform in 1986 because the process of economic transition creates more opportunities for corrupt behavior (Tromme, 2016). Previous studies show that corrupt behavior is pervasive in Vietnamese society (Rama & Võ, 2008), and most firms involved in these activities follow "the rules of the game" (T. V. Nguyen et al., 2016b).

Despite notable educational achievements, such as higher enrollment rates and literacy rates and obtaining a high rank in PISA test performance,[19] education is perceived as the fifth most corrupt sector of the 12 most important public sectors in Vietnam.[20] However, only a few studies investigate the consequences of corruption on the education process, and these studies can be divided into two lines of research. The first line of research focuses on corrupt behavior within the education system, and the second line of research, which attempts to provide quantitative evidence, measures corruption as a general term rather than specific acts within the system.

Studies belonging to the first line often provide insight into corrupt behavior within the Vietnamese education sector using qualitative approach. Transparency International (2011) details the forms, causes and effects of corrupt behavior within the Vietnamese education system. This study reveals that corrupt behavior in the education sector exists in many different forms as follows: embezzlement, bribes and kickbacks in public investment and procurement

[19] Vietnamese students impressed many experts with their high scores on the PISA test in 2015, and Vietnam ranks 8th based on the science scores (OECD, 2016).

[20] In the report *Global corruption barometer 2013*, the Vietnam education system received a score of 3.4 on a scale of 1-5; 1 implies that the country is not at all corrupt, and 5 implies that the country is extremely corrupt (Transparency International, 2013).

projects, misallocation of funds for students, the reporting of false achievements and awards, wrongdoing during the teacher selection process, bribery intended to benefit parents and students, misconduct during the process of publishing textbooks, informal charges and fees charged by teachers and administrators, and extra class requirements for some students. These practices adversely affect the Vietnamese education sector in three aspects. First, these practices raise the cost and inequality of accessing education because parents are expected to pay unauthorized charges or for extra classes. These practices also worsen the quality and outcomes of education because they cause a reduction in or the inefficient use of the educational budget or create a poor atmosphere that demotivates both teachers and students. Moreover, these activities are more harmful in the long run because they harm the mentality of generations of students who are directly involved in those actions and adversely affect social norms[21] (Chow & Dao Thi Nga, 2013; Transparency International, 2011). Despite such insight into corrupt behavior in the education sector, due to the unavailability of data at the nationwide level, the results of these studies focusing on corrupt behavior are limited and only capture several corruption-related cases.

The second line of research attempts to investigate and provide quantitative evidence of the effects of corruption on education and usually regards corruption as a general term rather than some specific practices within the education system. Anh et al. (2016) focus on Vietnam and study the effects of corruption on economic growth. These authors find a positive link between corruption and secondary education enrollment rates; however, the authors do not explain this link. Nguyen et al. (2017) finds that a negative relationship exists between corruption and the quality of Vietnamese primary education as assessed by the citizens at the district level. However, more empirical evidence based on different types of data and approaches is needed.

[21] According to Chow and Dao Thi Nga (2013), the practices of corruption in education 'perpetuate[s] a lifelong cycle of an unhealthy attitude'; 38 percent of Vietnamese youth claim they are willing to pay a bribe to be accepted by a good school or hired at a company.

3.3. The effects of corruption on the human capital accumulation process in the Vietnamese context

I hypothesize that corruption affects Vietnamese human capital via its effects on the two processes of human capital accumulation: the education process and the process by which educational outcomes are transformed into labor quality in a productive sector.

In the education process, educational achievements are generated from the use of educational inputs by actors. Corruption could influence this process and alter educational achievements because it potentially distorts the allocation or causes the inefficient use of the budgets intended for the education system. Corruption also acts as an informal institution that shapes the incentives of stakeholders. While corruption is expected to lower the positive effects of public spending on education, how corruption impacts educational outcomes when it is so prevalent as an informal institution is unclear. On the one hand, corruption might lower the return to productive human capital, which could reduce the incentive for students to study hard in their schooling. On the other hand, since the prevalence of corruption lowers the threat of corrupt agents being detected and punished, corruption encourages the stakeholders of the educational system to practice some forms of corruption, which may actually have some positive impacts. For instance, the prevalence of corruption in a region might stimulate a school manager to engage in bribery to obtain funding from the central government for a school facility project, an action that would increase school resources (Transparency International, 2011).

Corruption also influences the transformation process and worsens the labor quality in the productive sector via two possible reasons. First, corruption might distort individuals' incentive to accumulate knowledge and skills; therefore, lowering the quality of labor (Mo, 2001; Tanzi, 1998). Second, corruption might motivate talented young people to become government officials despite the low salaries because as officials, they can receive informal income by engaging in corrupt practices (Blackburn et al., 2010). Lastly, the prevalence of corruption reduces the return of education and push skilled workers to migrate (Dimant, Krieger, & Meierrieks, 2013). As a result, corruption lowers the quality of labor in private firms.

3.4. Empirical methodology

In this study, I analyze the influences of corruption on Vietnamese human capital in two steps.

In the first step, I examine how corruption affects educational achievements by adding corruption to a simple education production function at the provincial level, which is more popular in research investigating the individual level. In this simple function, I include both vital educational inputs, namely, public spending and family background, to explain educational achievements. Corruption might affect educational achievements through the incentives of stakeholders or the use of public spending. Because corruption potentially reduces the positive effects of spending on educational achievements, a non-linear relationship may exist between corruption and educational achievement (Boikos, 2016). I add an interaction term for public spending and corruption to the function to analyze the non-linear relationships among corruption, spending and educational achievements. The estimation equation is as follows.

$$y_{it} = \beta_0 + \beta_1 spend_{it} + \beta_2 corrupt_{it} + \beta_3 spend_{it} \times corrupt_{it} + \beta_4 \chi_{it} + \theta_i + \upsilon_{it} \qquad (3.1)$$

where y_{it}, $spend_{it}$, and $corrupt_{it}$ denote educational achievements measured by upper secondary enrollment rates, province/city spending per student, and the extent of corruption in province *i* in year *t*, respectively. Although public spending on education is distributed through the budgets of both provinces/cities and the central government,[22] I do not cover spending from the central government due to the unavailability of the data. In addition to public spending, the income and size of families also plays a key role in determining student educational performance (E.A. Hanushek, 2010). I employ real GDP capita and fertility rates as proxies for income and family size across regions and add them as control variables (χ_{it}). θ_i represents the unobserved invariant characteristics of provinces/cities, such as culture, and υ_{it} is the error term.

In the second step, I examine how corruption affects labor quality, as assessed by firm managers in specific provinces/cities, after controlling for educational achievement and the training expenses of firms in the regions. The labor quality depends on both education and training but could be affected by corruption because corruption might motivate talented students to work in the public sector rather than private firms or reduce the incentives to accumulate knowledge and skills among workers.

$$LQ_{it} = \gamma_0 + \gamma_1 y_{it} + \gamma_2 train_{it} + \gamma_3 corrupt_{it} + \varepsilon_{it} \qquad (3.2)$$

where LQ_{it} represents labor quality assessments of firms in province/city *i* in year *t,* and $train_{it}$ represents the worker training expenditures of firms.

Some scholars consider that corruption may be an endogenous variable due to reverse causality because a poor level of education might induce corruption (Gupta et al., 2002).

[22] In addition to the budgets of provinces/cities, education spending might be distributed from the state budget through several programs, such as the National Target Program on Education and Training (The Government of Vietnam, 2012).

However, in most countries, corruption is an institutional problem that persists over a long period (Mo, 2001; Pellegrini & Gerlagh, 2004); therefore, it is inconceivable that reverse causality occurs over a short period. In the context of this study, corruption is pervasively practiced in Vietnam. Corruption is also considered a type of institution or "the rules of the game"; therefore, it is implausible that the educational achievements attained over a period of six years would alter the corruption phenomenon. In addition, to address the problem regarding endogeneity, instrumental variables must be employed. There is no valid instrument for the study of corruption in Vietnam at the provincial level (Dang, 2016). Due to the reasons discussed above, I treat corruption as an exogenous variable.

I employed a fixed effects method for the estimation. In addition to public spending and family background, some invariant characteristics of provinces/cities, such as factors related to culture or ethnicity, might contribute to explaining educational outcomes. A fixed effects estimation rules out these constant variables and avoids omitted variable bias. Furthermore, the result of the Hausman test has a very small p-value, which suggests that the fixed effects model is more appropriate for this study[23] than random effects models.

3.5. Data sources and the construction of variables

I use panel data for all 63 provinces/cities in Vietnam from 2010 to 2015. I focus on data at the provincial level since the same system and policies apply to the whole nation; however, Vietnam's education and the phenomenon of corruption vary remarkably over time and across provinces/cities. Some provinces, such as Lai Chau, have upper secondary enrollment rates of approximately 33 percent, while others have higher rates; Hanoi had enrollment rates of approximately 87 percent in 2015. We may be able to enhance our understanding of Vietnam's circumstances by focusing on the reasons for the vast disparities among provinces/cities.

Panel data for the 63 provinces/cities of Vietnam is collected from three main sources: the General Statistics Office of Vietnam (GSO), provinces/cities' statistical yearbooks, and the provincial competitiveness index (PCI) published by the Vietnam Chamber of Commerce and Industry (VCCI) and the United States Agency for International Development (USAID).[24]

[23] The p-value of the Hausman test is 0.0004 for the first step and 0 for the second step.

[24] PCI indexes are reported annually based on the survey responses from thousands of firms that are randomly selected to mirror the populations of provinces/cities to accurately reveal the business environment of provinces/cities (E. Malesky, 2016)

In the first step, upper secondary enrollment rates are used as the dependent variable to capture educational achievements. Because of the universalization of education, there is little difference in the primary and lower secondary enrollment rates among provinces/cities. Upper secondary enrollment rates are a better indicator of educational achievements. I collect data for this variable from Vietnam's Population and Housing Survey, which is published by GSO.

In the second step, the dependent variable is labor quality based on firm's assessments, which is obtained from PCI dataset. This indicator shows the proportion of firms in the regions that agree that labor quality meets their demands. This index is a more precise measurement of human capital since it indicates the satisfaction of firms with the knowledge, skills, and competence of workers, which is attained through both education and training. Of course, there is no perfect measure of human capital and there is still a concern regarding the use of labor satisfaction of firms as a measure of labor quality because the satisfaction of firms depends on not only the actual level of labor quality but also on firms' expectation. There might be the cases that firms in richer provinces have higher expectation; hence they are less satisfied with quality of local labor. As a result, we might observe a negative relationship between labor quality and GDP per capita. However, the correlation graphs between labor quality and GDP per capita of Vietnamese provinces, which can be found in *Figure B.1*, Appendix B, reveal a slightly positive correlation between the two variables. Although this pattern cannot totally justify for the use of labor satisfaction as a measure of human capital, it partly clears the concern raised above.

To measure corruption, I use an indicator from the PCI dataset that is constructed through the cooperation between the VCCI and the USAID. These organizations constructed the dataset in three steps: collecting survey data from a random sample of thousands of firms; calculating sub-indices; calculating PCI, which is the weighted mean of all the sub-indices (E. Malesky, 2016). Since the first version, which was published in 2005, the PCI has become an important reliable tool for both academicians and the government to assess the ease of conducting business in provinces/cities. The indicator is calculated as the share of firms agreeing or strongly agreeing with the statement "the rent-seeking phenomenon is popular for handling the administrative procedures required for businesses". In this study, I evaluate the consequences of corruption and consider that corruption not only involves illegal acts but also acts as an informal institution. The selected indicator indicates the prevalence of corruption in provinces/cities, reflects corruption as an informal institution, and is relevant for this study. This indicator could also be considered a proxy of corrupt behavior in the education system for two reasons. First, corruption in Vietnam is highly centralized within a province/city, and provincial

leaders have the power to control corrupt activities in their regions by various means (Bai, Jayachandran, Malesky, & Olken, 2019). Therefore, a close correlation is expected to exist between corruption in the business sector and corruption in the educational system because both sectors depend on the incentives and activities of provincial leaders. Second, the prevalence of corruption could motivate more corrupt activities, including those in the educational system. Therefore, a potential positive correlation exists between the selected indicator and extent of corrupt behavior in the education system. In fact, Dang (2016) uses an indicator based on firm responses to the statement "Enterprises in my line of business usually have to pay for informal charges" to measure the prevalence of corruption. Because this indicator narrows the scale of corruption to specific industries rather than the whole region, I do not use this it for my main estimation but add it to the robustness check test.

I calculated provincial government spending per student and real GDP per capita using data from the statistical yearbooks of 63 provinces/cities using 2010 as the base year. Data regarding fertility rates, the number of children per mother, are also obtained from population and housing surveys. Data on training expenditures are obtained from the PCI dataset and is calculated as the share of firms' expenses that are spent on worker training.

Table 3.1 and *3.2* provide the descriptive statistics and correlation coefficients of the main variables, respectively. The descriptive statistics show that there are considerable differences among provinces/cites. *Table 3.1* also reveals some missing values of spending, per capita GDP, and fertility rates. Because the missing values are caused by incomplete data in certain statistical reports by the governments and are not related to the values of the variables, and the missing rate is very small, these observations with missing data could simply be deleted when performing the regressions.[25] The correlation coefficients are not very high between explanatory variables. Thus, multicollinearity should not be an issue.

[25] It is appropriate to remove observations with missing data if the missing data are not related to the value of variables and the proportion of missing values is small (Pigott, 2001)

Table 3.1: Descriptive statistics

Variable	Unit	Obs	Mean	SD	Min	Max	Source
Labor quality		378	0.86	0.11	0.43	1	PCI
Corruption		378	0.51	0.15	0.18	0.78	PCI
Spending	million VND(1)/student	373	7.58	4.96	1.19	19.5	Statistical yearbooks
GDP per capita	million VND(1)	377	30.16	32.6	7.53	270.06	Statistical yearbooks
Enrollment rates	%	378	59.45	15.33	24	89.3	Population and Housing
Fertility rates		377	2.18	0.37	1.3	3.46	Survey
Training expenditures	%	378	3.17	1.97	0	8.09	PCI

(1) VND is the currency of Vietnam, and the current exchange rate with USD is approximately 1 USD = 22,700 VND.

Table 3.2: Correlation coefficients among variables

	Labor quality	Training expenditures	Enrollment rates	Corruption	Spending	GDP per capita	Fertility rates
Labor quality	1						
Training expenditures	0.596	1					
Enrollment rates	0.2029	0.1996	1				
Corruption	0.1783	0.5055	0.2037	1			
Spending	0.1895	0.2312	-0.0554	0.2262	1		
GDP per capita	0.1079	0.0982	0.1773	0.0801	-0.0969	1	
Fertility rates	0.0232	0.1305	0.0097	0.2213	0.3059	-0.2591	1

3.6. Estimation results

3.6.1. First step: Effects of corruption on educational achievements

Table 3.3 shows the results for the fixed effects estimation results, which is the first step of the process. For model (1), public spending, corruption, and the interaction term are the independent variables, and they are the only variables included in the model. Models (2) and

(3) include both fertility rates and GDP per capita. All the variables are included in model (4). The findings of all four models show robust results for all the explanatory variables. The estimated coefficients of education spending per student, corruption and the interaction term are all statistically significant. I focus solely on the results of model (4), which has notable implications.

Table 3.3: Effects of corruption on upper secondary enrollment rates

Variable	(1)	(2)	(3)	(4)
Spending	1.346***	1.484***	0.813**	0.9274**
	(0.3807)	(0.3976)	(0.389)	(0.4006)
Corruption	20.1907***	21.5543***	9.04228*	10.4902**
	(5.156)	(5.1494)	(5.3197)	(5.2545)
Spending × Corruption	-1.9838***	-2.2366***	-1.2161*	-1.4163**
	(0.646)	(0.672)	(0.6423)	(0.6579)
Fertility rates		3.9318***		2.6257**
		(1.3984)		(1.2755)
GDP per capita			0.4053***	0.3868***
			(0.0954)	(0.0939)
Constant	47.0008***	37.6671***	41.3503***	35.3692***
	(2.667)	(4.131)	(3.2431)	(4.2719)
F statistics (p-value)	9.87(0)	11.13(0)	10.5(0)	9.41 (0)
Obs	372	372	372	372

**10% level of significance, **5% level of significance, ***1% level of significance*

Robust standard errors appear in parentheses

As expected, corruption has a negative effect on secondary school enrollment rates by reducing the positive impact of public education spending. The estimated coefficient of education spending is *0.9274*. This means that if the corruption index equals zero, and thus the interaction term is zero, school spending would enhance educational achievements, as predicted by the education production function. Increasing the educational budget by one million VND per student could increase the enrollment rates by *0.9274* percent. The coefficient estimated for the interaction term is equivalent to *-1.4163,* implying that corruption diminishes the positive effects of spending on educational achievement. For the study period, the corruption index for Vietnam ranged from *0.18* to *0.78,* with a mean of approximately *0.51*. At this mean, corruption reduces the positive impact of local spending, and the coefficient of spending decreases by 0.7223 ($\approx 1.4163 \times 0.51$). This means that, on average, spending has a positive influence on enrollment rates, but increasing the educational budget by one million VND per student increases enrollment rates by roughly *0.21* percent. For some provinces where corrupt behavior

is rampant (corruption index exceeds: $0.9274/1.4163 \approx 0.65$), the positive effect of spending is reversed.

The coefficient for the main effect of corruption is roughly *10.49*, which means that when spending is zero, and thus the interaction term is zero, corruption increases enrollment rates. This result contradicts other cross-country findings but is consistent with Anh et al. (2016), which also focuses on Vietnam. Using corruption data from Transparency International's Corruption Perceptions Index (CPI), the authors concluded that corruption has a favorable impact on secondary enrollment rates.

Because Vietnam has a unique context, in addition to the negative effects of corruption on education quality, which has been shown in several research and reports (T. V. Nguyen et al., 2017a; Transparency International, 2011), the prevalence of corruption could have positive effects on educational outcomes. This counterintuitive estimation result can be interpreted as follows. Three sources fund Vietnamese schools: the budgets of both local governments and central governments and households.[26] The funding from the central government has several distinctive characteristics. First, it is distributed through specific projects, such as those associated with the National Target Program, which prioritizes projects that aim to increase literacy rates, universalize education, or improve facilities for schools in poor mountainous areas.[27] These projects play an important role in increasing enrollment rates in poor areas. Second, obtaining approval for these facility projects is competitive due to the scarcity of funds, and the process is slow and laborious for local schools. These conditions foster an environment for bribery, and schools that are more willing to collude with government officials are more likely to be approved for infrastructure projects (Transparency International, 2011). As some previous studies have indicated, the pervasiveness of corruption stimulates additional corrupt behavior because it reduces the possibility of being caught or punished (Blackburn et al., 2010; Teorell, 2007). Therefore, the pervasiveness of corruption in provinces/cities motivates school managers to bribe central government officials to obtain approval for facility projects, which could have a positive impact on enrollment rates. For a more comprehensive explanation, I provide details about the rules for public fund procurement in Vietnam and build a simple model

[26] In 2013, local governments, the central government and households contributed 64%, 12%, and 24%, respectively (see *Education Financing in Viet Nam, 2009-2013, following the National Education Accounts methodology* by The Government of Viet Nam and UNESCO Institute for Statistics (2016).

[27] The central government allocated 12,300 billion VND for the 2012-2015 National Target Program in Education and Training; generally, half of the funds are allocated to school facility projects in poor mountainous areas, and one fifth of the funds is used to increase literacy rates or enhance the universalization of education (The Government of Vietnam, 2012).

that explains the link between the level of corruption and the allocation of funds from the central government.

3.6.1.1. The public fund procurement rules for the Vietnamese education system

In Vietnam, each local school project that is financed by the central government's budget must go through two main phases: fund procurement and fund disbursement. A typical procedure is illustrated below.

In phase one, there are two main players: school managers and officials of the central government. School managers prepare and propose project plans, and central government officials make the final fund allocation decisions. One problem here is that total government funding is limited; therefore, numerous schools compete for a fraction of the funding. This problem creates an environment that promotes bribery since school managers must offer some type of benefit to oblige the central government officials who hold the final decision-making power. Bribes are proposed in secrecy, and usually, the school managers who offer the largest bribe will obtain the approval. Often, the bribe is a specific share of the fund that is approved for the project.

There are three main stakeholders in phase two: the school manager, the central government officials, and the construction company. In this process, the fund disbursements for the construction and embezzlement occur at the same time. According to Vietnam's regulations, the funds for each project are strictly managed by the treasury system and cannot flow directly to the pocket of government officials or school managers. The government transfers money to the local school's account at the local treasury. School managers cannot withdraw this money for purposes other than making payments to the construction companies. Therefore, the embezzlement of funds can only occur when government officials, construction companies, and school managers collude. They steal money by setting the unit price of the project higher than its actual value and using the difference for bribes. After receiving the funds, construction companies fulfill their commitments and pay government officials and school managers. This kind of collusion in public investment projects are quite common in not only Vietnamese educational system but also other sectors (Transparency International, 2011).

Another important regulation is that there is an external monitor for the construction supervising company and auditing company for all projects funded by the central government. These players act on behalf of the government to ensure that the quality of facility meets a

certain standard and to prevent embezzlement. Their presence ensures that school managers and government officials do not steal all the money. However, due to their limited capabilities and information, these actors are unable to fully prevent the misappropriation of funds.

3.6.1.2. A simple model

The following describes a simple model that I constructed to illustrate the situation in Vietnam. There are a total of m provinces/cities, and there is one school in each province/city and one school can get approval for only one project. All these schools compete to receive funds from the central government. Because the central government budget is limited, only n schools will receive funds (n < m). The total funds for each project is T. All school managers are aware of the rules of the game and the level of corruption in all provinces/cities.

The first phase: fund procurement

The school manager of the school in province *i* secretly offers a share of the project funds as a bribe ($b_{i1} \times T$) to central government officials. The central government officials have full authority to make decisions; therefore, they will decide to approve funding requests based on the level of the bribe offered by the school managers. I assume that the bribe rate offered by the school managers is: $b_{11} < b_{21} < \cdots < b_{(m-n)1} < \cdots < b_{m1}$; n schools propose the highest bribe rate (with $b_{i1} > b_{(m-n)1}$) and will obtain the approval. Because embezzlement occurs in the second phase, which is no longer under the responsibility of these officials, and thus there is no evidence of their corrupt behavior, they do not face the risk of being detected.

Second phase: fund disbursement

All school managers know the percentage of money they can steal without being detected by the auditing company or the company that supervises the construction, which is represented by t (with: $t < 1$). If they steal a percentage higher than t, they will certainly be caught; therefore, all school managers ensure that the percentage of stolen money equals t, and the total amount of money left for improving the local school's facility is $T(1-t) > 0$. By predetermining t, the school managers do not face the risk of external detection but still face the risk of being caught, which could result from internal acts, such as denouncement by their staff or local government officials.

The school managers in province i must determine the percentage of money they will use to bribe central government officials (b_{i1}), the percentage they will keep for themselves

(b_{i2}), and the percentage they will pay their subordinates or local government officials for covering up the bribe (b_{i3}); $b_{i1} + b_{i2} + b_{i3} = t$ *with* $0 < b_{i1}, b_{i2}, b_{i3} < t$.

From the school managers' perspective

The actions of the school managers can only be detected internally, and the amount of risk depends on the percentage of funds they pay for covering up the bribe (b_{i3}) and the level of corruption in the province/city (c_i). The risk of being detected is: $p_{it} = e^{-\alpha(b_{i3}+c_i)}$, with $\alpha > 0$.

If their corrupt behavior is discovered, school managers will be penalized. The severity of the punishment depends on the total amount of money that has been stolen and the level of corruption in the respective province/city. The punishment is: $W_i = T \times t \times e^{-\beta c_i}$, with $\beta > 0$.

Objective function of school managers

If either the school managers offer a lower bribe rate than *n* other schools $(b_{i1} \leq b_{(m-n)1})$ or their school does not receive the funds, both the school managers and the schools obtain an amount equal to zero. If school managers obtain the funding ($b_{i1} > b_{(m-n)1}$), then the schools receive $T(1-t) > 0$; they receive both the monetary benefit ($T \times b_{i2} = T(t - b_{i1} - b_{i3})$) and other non-pecuniary benefits, such as promotion opportunities because they contributed to the school facility's improvement or their own satisfaction, which is denoted by a_0. For simplification, I assume that the other benefits (a_0) are equal among all school managers. The school managers also face the risk of being detected internally (p_{it}) and the punishment they must receive when they get exposed (W_i).

$$\begin{cases} F = 0 \ \ if \ b_{i1} \leq b_{(m-n)1} \\ F = (1-p_{it})[T(t - b_{i1} - b_{i3}) + a_0] + p_{it}[T(t - b_{i1} - b_{i3}) + a_0 - W_i] \ \ if \ b_{i1} > b_{(m-n)1} \end{cases}$$

(3.3)

School managers' decision-making process

First, b_{i3} is set to maximize F. The solution is $b_{i3} = \frac{\ln(\alpha t) - (\alpha+\beta)c_i}{\alpha}$ (3.4)

By inserting (3.4) into (3.3), I obtain: $F = T(t - b_{i1}) + a_0 - \frac{T}{\alpha}[\ln(\alpha t) - (\alpha + \beta)c_i + 1]$ (3.5)

Then, the school managers estimate their maximum b_{i1}, which is the solution for: $F = 0$. As such, the maximum b_{i1} that the school manager in each province/city could offer to central government officials is: $b_{i1}^* = t + \frac{a_0}{T} - \frac{1}{\alpha}[\ln(\alpha t) + 1] + \frac{\alpha+\beta}{\alpha}c_i$ (3.6). This solution reveals

that schools in provinces/cities with higher levels of corruption (c_i) have higher b_{i1}^*; therefore, they are more likely to receive funds. Because all school managers acknowledge the rules of the game and are aware of the level of corruption in the provinces/cities, they could calculate the highest bribe that could be offered by other schools. School managers do not necessarily offer the maximum level of bribe ($b_{i1}^* \times T$) to government officials.

3.6.1.3. Estimation results of other control variables

As expected, the estimated coefficients of GDP per capita are positive. These results align with a significant amount of evidence showing that higher income increases the amount of inputs that families have for education; therefore, it enhances educational outcomes (Blanden, 2004). In contrast, the positive results of fertility rates are rather surprising. Many existing studies have been conducted and the results generally indicate that larger family size decreases parents' resources and investment in their children's education; therefore, family size can adversely affect educational achievements (Jæger, 2009). Nonetheless, several scholars argue that this negative link is more consistent in studies on developed countries, while in developing countries, the effect of family size on educational outcomes depends on the specific context. In some developing countries, where either child labor is common or children bear the responsibility for housework, an increase in family size could increase the enrollment rates because children would have more siblings to help with household chores and labor (Maralani, 2008). This argument could also be applied to explain the positive correlation between fertility rates and enrollment rates in Vietnam, where more than half of the children engage in housework, and one tenth of the children are child laborers.[28]

3.6.2. Second step: Effects of corruption on labor quality

Table 3.4 shows the estimation results obtained during the second step, during which labor quality is the dependent variable. I focus on discussing the findings of model (3) because this model includes all the variables.

[28] There are roughly 18.35 million children aged 5–17 in Vietnam, and more than half (9.96 million) do 5–20 hours of housework per week; one sixth (2.83 million) are actively engaged in economic activities; and one tenth (1.75 million) are classified as child labors (International Labour Organization (ILO), Ministry of Labour, Invalids and Social Affairs (MOLISA) and General Statistics Office (GSO) of Viet Nam, 2014).

Table 3.4: The effects of corruption on labor quality

Variable	(1)	(2)	(3)
Corruption		-0.1223***	-0.1087**
		(0.0406)	(0.0416)
Enrollment rates	0.0077***		0.0076***
	(0.0012)		(0.0012)
Training	0.0298***	0.0424***	0.034***
expenditures	(0.0025)	(0.0023)	(0.0028)
Constant	0.3121***	0.7923***	0.3624***
	(0.0666)	(0.0187)	(0.0714)
F statistics (p-value)	170.88(0)	181.16(0)	126.14 (0)
Obs	378	378	378

**10% level of significance, **5% level of significance, ***1% level of significance.*

Robust standard errors appear in parentheses.

Corruption has a significant negative coefficient, possibly indicating that the prevalence of corruption directly harms the labor quality in private companies in provinces/cities. As discussed by several scholars, this adverse effect of corruption might be explained by its effect on not only the choice of occupation of young laborers (Blackburn et al., 2010; Murphy et al., 1993) and the incentive to invest in accumulating the knowledge and skills of current workers (Mo, 2001; Tanzi, 1998), but also the migration of skilled workers (Dimant et al., 2013). At least, in the case of Vietnam, the former effect appears to be a potential reason that have been observed and reported. Despite the low pay in the public sector,[29] 64.2 percent of young people in Vietnam prefer to work for the government.[30] Vietnamnet conducted a survey and found that most civil servants earn extra income through various means, including receiving informal payments,[31] and approximately one-third of the respondents agree that public servants stay in their jobs even though they receive low salaries because they have opportunities to earn extra

[29] Workers in the Vietnam public sector reportedly earn a low salary that does not meet the standard cost of living (Poon, Hung, & DO XUAN, 2009).

[30] See Vietnam School to Work Transition Survey by International Labor Office (ILO) (International Labour Office, 2017).

[31] In total, 34 percent agree that they would use their working time to perform extra work, 25 percent agree that they would use their position to perform extra work, 30 percent agree that they would receive gifts and informal payment from citizens and businesses (Jairo, 2012)

income (Jairo, 2012). It appears that corruption causes young people to join the public sector instead of private firms because it increases the expected income of government officials.

As several reports have noted, corruption in Vietnam is more damaging in the long run because it may harm the mentality of future generations, causing them to be more willing to engage in corrupt behaviors and work as corrupt bureaucrats rather than find employment in productive sectors. The Vietnam Youth Integrity Survey 2014 conducted by Transparency International indicates that, although they are aware that corruption is illegal, a high proportion of youths are still willing to break laws and compromise their integrity for personal gain. In addition, the survey reports that 42 percent of youth are willing to violate their principle of integrity to enroll in a good school; one fourth of these youths are willing to perform corrupt acts to attain a desirable job; and 18 percent believe that cheating leads to success in life.

Additionally, local education performance and training expenditures have significant and positive coefficients, implying that these factors are important for enhancing the knowledge, skills, and competence of workers in firms.

3.6.3. Total effects of corruption on labor quality

Based on two estimation results, corruption appears to affect labor quality both directly through talent allocation and indirectly through educational achievements. *Table 3.5* shows the total effect of corruption on labor quality.

Table 3.5: Total effects of corruption on labor quality

Direct effect	Indirect effect	Total effects
– 0.1087	(10.4902 – 1.4163 × Spending) × 0.0076	– 0.029 – 0.0108 × Spending

Corruption influences the accumulation of human capital at both steps: the education process and the process whereby educational outcomes and training transform into labor quality. Corruption directly harms the labor quality; as the corruption index increases from 0 (no corruption) to 1 (prolific corruption), the proportion of enterprises who are satisfied with their labor quality decreases by 10.87 percent. Indirectly, corruption affects labor quality through its effects on enrollment rates, which have a significantly positive impact on labor quality. Corruption affects enrollment rates in the following two aspects: corruption decreases the positive effects of local governments' spending on enrollment rates and simultaneously increases the chances that local education systems will receive funding from the central

government. Table 5 shows that, overall, corruption adversely affects labor quality, and its damaging effects increase as local spending also increases. However, we do not claim that less spending is better because spending also contributes to improving enrollment rates and labor quality.

3.7. Robustness check

For the robustness check, I conducted two estimation steps with different data measurements for corruption and educational achievements.

Table 3.6 presents the results of the estimation with Corruption 1, which is measured by the percentage of firms that agree or strongly agree with the statement "Enterprises in my line of business usually have to pay informal charges". Dang (2016) uses this index to measure the prevalence of corruption in provinces/cities. The main estimation results are robust, and the signs of the estimated coefficients for spending, corruption and the interaction term remain unchanged. The total effect of Corruption 1 on labor quality remains negative, which is consistent with the main estimation results.[32]

Table 3.7 provides the results of the regression with lower secondary enrollment rates being used as a proxy for educational achievements.[33] In the first step of regression, the estimated coefficients for educational spending and interaction term turns to be insignificant, but the signs remain the same. The results of the second step are robust with the main estimation. Overall, corruption has unfavorable effects on labor quality.[34]

[32] Total effects of corruption 1 on labor quality: - 0.0188 – 0.0196 × Spending

[33] Due to the efforts to fight illiteracy and universalize primary education, literacy rates and primary enrollment rates might not be good candidates reflecting disparity in terms of education achievements across regions. While upper secondary enrollment rates, which are employed in the main estimations, could be a better candidate, I select lower secondary enrollment rates for the robustness check test.

[34] Total effects of corruption according to the regression results: - 0.0949 – 0.0199 × Spending

Table 3.6: Estimation results with different corruption indicators

Dependent variable: Upper secondary enrollment rates	Variable	(1)	Dependent variable: Labor quality		(2)
	Spending	1.8712***		Corruption 1	-0.1494***
		(0.4189)			(0.0436)
	Corruption 1	17.4083***		Enrollment	0.0075***
		(5.7229)		rates	(0.0012)
	Spending ×	-2.6196***		Training	0.0327***
	Corruption 1	(0.6235)		expenditures	(0.0026)
	GDP per capita	0.3669***		Constant	0.3994***
		(0.0857)			(0.0707)
	Fertility rates	2.938**			
		(1.2822)			
	Constant	29.5588***			
		(4.3408)			
	F statistics	12.92		F statistics	115.38
	(p-value)	(0)		(p-value)	(0)
	Obs	372		Obs	378

**10% level of significance, **5% level of significance, ***1% level of significance.*

Robust standard errors appear in parentheses.

Table 3.7: Estimation results with educational achievement measured by lower secondary enrollment rates

Dependent variable: Lower secondary enrollment rates		(3)	Dependent variable: Labor quality		(4)
	Spending	0.2191		Corruption	-0.1881***
		(0.3834)			(0.0429)
	Corruption	12.2662**		Enrollment	0.0076***
		(5.233)		rates	(0.0012)
	Spending ×	-0.2039		Training	0.0354***
	Corruption	(0.6173)		expenditures	(0.0026)
	GDP per	0.2978***		Constant	0.2065**
	capita	(0.1069)			(0.0917)
	Fertility rates	0.8663			
		(1.1939)			
	Constant	66.1385***			
		(4.5106)			
	F statistics	17.02		F statistics	137.93
	(p-value)	(0)		(p-value)	(0)
	Obs	372		Obs	378

**10% level of significance, **5% level of significance, ***1% level of significance*

Robust standard errors appear in parentheses.

3.8. Conclusion

Using panel data on 63 provinces/cities in Vietnam, I conducted two estimation steps, aiming to identify the impacts of corruption on Vietnam's human capital. The estimation results for the first step show that corruption influences many aspects of human capital accumulation both positively and negatively. Corruption affects the education process and alters the outcomes of provinces/cities through two channels: local education spending and the ability to obtain central government funds. First, corruption weakens the positive impact of local spending on educational achievements because corrupt officials either embezzle funding devoted to the education system or use it inefficiently. In addition, the pervasiveness of corruption reduces the possibility that stakeholders who engage in corruption will be detected and affects the level of punishment that they will receive if their actions are discovered. For this reason, corruption at the provincial level enhances the advantages of school managers who seek to obtain funding

from the central government for school projects; thus, it may have a positive effect on enrollment rates. The results obtained during the second step are indicative of decreases in the local labor quality. The misallocation of talent caused by pervasive corruption could be a reason for this negative effect. Overall, corruption has a detrimental effect on human capital in Vietnam.[35]

[35] This Chapter has been reproduced with permission from *"The effects of corruption on human capital accumulation process: Evidence from Vietnam"* by *Truong Thi Hoa, Economics of Transition and Institutional Change, Vol. 28, Issue. 1, 68-99* by Wiley and Sons (Truong, 2020).

CHAPTER 4: WHY DO VIETNAMESE FIRMS BRIBE? THE INFLUENCES OF THEIR PEERS

4.1. Introduction

Vietnamese citizens and firms participate in various forms of corruption on a daily basis when dealing with public officials regarding public administrative services, from obtaining a certificate to receiving treatment in a public hospital. The visibility of corruption in the eyes of individuals has been reflected in the results of several surveys carried out over the last decade, including surveys used to compile the two most popular sources of data on corruption in Vietnam, namely, the Vietnam Provincial Public Administration Performance Index (PAPI) and the Vietnam Provincial Competitiveness Index (PCI). While the PAPI's surveys question Vietnamese citizens about their perception and experiences regarding public services, the surveys conducted by the PCI team focus on the perception and experiences of firms regarding the business environment. The survey responses reveal the widespread use of corrupt acts in Vietnamese society, where bribery is the norm when citizens and firms deal with administrative procurement. For instance, responding to a survey by the PAPI team in 2018, almost 70 percent of respondents stated that citizens pay bribes to obtain a certificate in Vietnam, and 40 percent believe that citizens pay bribes in a public district hospital (CECODES, VFF-CRT, RTA & UNDP, 2019). Similarly, bribery is quite common in doing business in Vietnam. Responding to a questionnaire by the PCI team in 2018, 55 percent of firms stated that firms in their lines of business make informal payments[36]. The daily corrupt acts by citizens and firms in Vietnam have drawn great attention from economists, and an increasing number of studies have focused on the effects of these petty corrupt acts on both firm performance and the quality of public services. A study by Nguyen, Bach, Le, and Le (2017) concentrates on the effects of petty corruption on the quality of public services. Their empirical analysis finds detrimental effects of corruption on the quality of both healthcare and primary education. Several investigations on the impact of corruption on Vietnamese firm performance have also been undertaken over the last decade. These empirical works produce mixed results, revealing both favorable and harmful effects of corruption. N. A. Nguyen, Doan, Nguyen, and Tran-Nam (2016) find that Vietnamese small and medium-sized enterprises (SMEs) benefit from informal payments because such payments help them overcome the bureaucratic burden and thus improve their

[36] This is the survey that has been used to construct the Vietnam Provincial Competitiveness Index (PCI), a joint project by the United States Agency for International Development (USAID) and the Vietnam Chamber of Commerce and Industry (VCCI) in 2018 (E. Malesky, Phan Tuan Ngoc, & Pham Ngoc Thach, 2019).

innovation. In contrast, several studies find harmful effects of bribery on firm performance, such as on firm productivity (Tran, Huong, Doan, & Tran, 2016), the growth of Vietnamese private firms (T. T. Nguyen & van Dijk, 2012b), and firms' long-term strategic capabilities (T. V. Nguyen, Ho, Le, & Nguyen, 2016a). Another aspect regarding bribery that has attracted less attention from economists is the identification of the determinants of the bribery behavior of Vietnamese firms and citizens. Notably, Rand and Tarp (2012) investigate the bribe-paying behavior of Vietnamese SMEs by focusing on firm characteristics, such as the ability to pay or relationships with government. Another study by Bai, Jayachandran, Malesky, and Olken (2019) that investigates the corruption of Vietnamese firms also focuses on the effects one attribute of firms, firm growth, on the corrupt behavior of firms. In this paper, I revisit the question concerning the determinants of the bribery behavior of Vietnamese firms from a different angle, which has not been addressed in the existing literature, focusing on the relationship between corrupt firm behavior and peer behavior. As pointed out in the existing literature, the corrupt behavior of individuals tends to spread in a society for several reasons, such as demonstration effects or learning effects (Dong, Dulleck, & Torgler, 2012; Goel & Nelson, 2007; Sah, 2007). For the case of Vietnamese firms who pay informal charges to follow "the rule of the game" in doing business (T. V. Nguyen et al., 2016a), although we expect to observe a clear connection between the bribery behavior of a firm and that of its peers, no study has been carried out to investigate the matter thus far. Therefore, this paper contributes to the literature by focusing on this relationship.

Based on survey data that have been used to compile the PCI index in 2012, the final sample of this study consists of 5,541 firms that operate in five different sectors in 63 provinces/cities. The empirical work examines two aspects of the bribe-making behavior of firms, namely, the participation of firms in bribery and their bribe size. In addition to the bribery behavior of peers, firms that belong to the same sector/province, the analysis also controls for other potential determinants, namely, the characteristics of firms and firm leaders and the corruption level of provinces/cities. The results of the logit and ordered logit models reveal a positive correlation between the corrupt behavior of firms and that of their peers. Although we cannot draw a direct causal relationship in this study, our results show a pattern in the Vietnamese context, where corrupt firms tend to be surrounded by corrupt peers. Therefore, when policy makers consider an effective anticorruption policy, the spread of corrupt behavior among Vietnamese firms should be taken into account.

The paper is structured as follows. In addition to the introduction and conclusion sections, there are four main sections in this paper. Section 4.2 reviews the related literature on the determinants of the bribe-making behavior of firms, followed by section 4.3, which presents the hypotheses and empirical analysis of this study. Section 4.4 details the data source, construction of the variables and some information about the informal charge payments of Vietnamese firms. Finally, I discuss the empirical results and conclude the paper in section 4.5 and section 4.6.

4.2. Related literature

4.2.1. Why do firms bribe?

There are several reasons that can explain why firms pay bribes, that is, informal payments to government officials. Sylwester (2019) classifies the roots of bribery into two groups: extortion and cost reduction. According to Sylwester (2019), extortion bribery arises because public officials threaten to punish enterprises if they do not make informal payments. In this case, the bribe is first demanded by bureaucrats, and firms decide to pay if they find the bribe to be less costly than the punishment they may face. Conversely, enterprises are on the side that initiates cost reduction bribery. Firms suggest bribe payments because they want government officials to tolerate their illegal acts to avoid costly regulatory penalties. However, as discussed by Sylwester (2019), the boundary between these two types of bribery is not always clear. Instead of explicit extortion, bureaucrats might intentionally delay the administrative process to force firms to pay bribes as a means of cost reduction. Therefore, when explaining the reasons that firms bribe government officials, empirical studies often reveal more specific motives for different cases. For instance, Sharma and Mitra (2015) examine the case of Indian enterprises, using data on 2287 enterprises from the World Bank Enterprises Survey in 2005-2006, and conclude that tax-evading firms are likely to pay higher bribes than other types of firms. Studying the case of Cambodian garment firms, Kasuga (2013) find that firms make informal payments in exchange for better administrative services and less bureaucratic delay.

Regardless of the different reasons for bribe payments, to finalize their decision concerning bribery, all firms first have to go through a decision-making process in which they evaluate the benefits and costs of bribery. There are many factors that potentially play a role in this process. Some aspects have been repeatedly examined in the existing literature, such as firms' characteristics and managers' ability to pay (Kasuga, 2013), firms' vulnerability and

exposure to corruption, which depend on firm characteristics and circumstances (S.-H. Lee, Oh, & Eden, 2010), or firms' ability to pay and refusal of power, which are also determined by firm characteristics (Svensson, 2003). More recently, another factor has emerged as a potential determinant of the evaluation of firms regarding bribery: the behavior of their peers.

4.2.2. Effects of the behavior of firms' peers

Corrupt behavior is expected to spread among individuals and firms in society because the willingness of individuals to participate in corruption depends on their perception about the behavior of their peers or others in the same organization or society (Dong & Torgler, 2012; Sah, 2007). First, the return and cost of the corrupt engagement of an individual depend on the number of corrupt actors in a society (Dong & Torgler, 2012). An increase in the number of corrupt actors in a society would reduce the possibility of these illegal actors being caught and the gravity of the punishment they receive when they get caught (Lui, 1986). In addition to the influences on direct benefits and costs, more corrupt practices in a society might also reduce the moral costs felt by people, and they might see this illegal behavior as more justifiable (Blackburn et al., 2010). The decision-making process of individuals is also a learning process. An individual who observes or perceives more corrupt acts in a society will expect a higher probability of encountering a corrupt bureaucrat and thus have more incentive to offer bribes (Sah, 2007). More specifically, for the case of enterprises, learning effects in doing business might play an important role in the spread of corrupt engagement (Goel & Nelson, 2007). If enterprises acknowledge the benefits from informal payments to bureaucrats of other firms, then they will likely follow the same strategies.

Several terms, such as social interactions, contagion effects, or peer influences, have been used to indicate the phenomenon described above, in which individuals condition their behavior based on the behavior of others in the same group (Manski, 1993). In corruption studies, scholars have also regarded this phenomenon using different terms, depending on the circumstance, such as conditional corruption (Dong et al., 2012), social interactions (Dong & Torgler, 2012), contagion effects (W.-S. Lee & Guven, 2013), or contagious corruption (Sui, Feng, & Chang, 2018). Although this phenomenon has been detected in many corruption studies at the country level (Becker, Egger, & Seidel, 2009a; Correa, Jetter, & Agudelo, 2016; Donfouet, Jeanty, & Malin, 2018; Sui et al., 2018) or local level (Dong & Torgler, 2012; Goel & Nelson, 2007), there is a scarcity of research at the micro level (Dong et al., 2012). At the country level,

Becker et al. (2009) detect contagion across the geographical border of perceived corruption among 123 nations using cross-sectional data. Taking advantage of panel data to address time and country fixed effects, Correa et al. (2016) and Donfouet et al. (2018) also find robust evidence of contagious corruption across geographical boundaries. In addition to geographical borders, more comparability in terms of economic level and political freedom are possible channels of contagious corruption (Sui et al., 2018). At the local level, the contagion effect of corruption has been observed for the case of Spanish municipalities (López-Valcárcel, Jiménez, & Perdiguero, 2017), the United States of America (Goel & Nelson, 2007), and Chinese provinces (Dong & Torgler, 2012).

Although these studies at the macro level prove the contagion of corruption that is considered a result of social interactions of individuals, firms, or bureaucrats within a country or between countries (Becker et al., 2009a; Correa et al., 2016; Goel & Nelson, 2007), they do not provide direct evidence of the effects of peer behavior on the corrupt behavior of individuals, which requires the use of micro data. There are only a limited number of empirical works that observe the role of social interactions in corruption using micro-level data. Notably, Dong et al. (2012) refer to the circumstance in which individuals' corrupt acts depend on the behavior of their surroundings as conditional corruption and provide empirical evidence at both the micro and macro levels to support their theory. To investigate conditional corruption at the micro level, Dong et al. (2012) utilize data from the European Value Survey and World Value Survey, datasets that detail sociocultural and political change from the perspective of citizens. In both analyses, they examine the relationship between the justifiability of the corruption of citizens and their perceptions regarding the corruption of others. The empirical analyses of both surveys show robust evidence of a positive correlation between perceived corruption and the justifiability of the corruption of citizens. This finding supports the existence of conditional corruption, in which the justifiability of corruption and hence the willingness to participate in corruption of individuals depends on their perception about the corrupt behavior of others in society.

Regarding the research on peer influences on the corrupt behavior of firms, to the best of my knowledge, only one study by You and Nie (2017) follows this direction, investigating how the bribery engagement of Chinese firms is influenced by their neighbors. Based on the data of 12,400 Chinese firms obtained from the World Bank Enterprises Survey, You and Nie (2017) divide the sample into three groups of three regions,—East, West, and Center—and attempt to reveal the determinant of firms' corrupt engagement. This empirical work supports

the significant effect of neighboring firms on a firm's corruption. The results also find that spillover takes place through geographical linkage, information, and marketization. Nonetheless, the use of the "time tax" variable as a proxy for enterprises' participation in corruption is questionable. We cannot rule out the case in which firms that participate less in corrupt acts face more bureaucratic delay and have to spend more time dealing with government departments. Therefore, a study that revisits this issue using different sources of data and a more precise proxy for the corrupt behavior of firms may obtain more fruitful findings.

4.2.3. Other determinants of the bribe decisions of firms

4.2.3.1. Firm characteristics

The characteristics of firms, which affect their ability to pay, bargaining power, or business experience, should play a role in determining the corrupt behavior of firms. Among all potential attributes that matter, firm size is one important factor that has been considered in almost all studies regarding the bribery behavior of firms. However, the effects of firm size on bribery are not yet conclusive. On the one hand, the size of the firm reflects its ability to pay; in this sense, a larger firm can offer more money than a smaller firm (Sylwester, 2019). On the other hand, larger firms may have more bargaining power or refusal power; therefore, they have less tendency to pay informal costs or pay less to government officials than smaller firms (Sylwester, 2019). Empirical studies produce mixed results on the link between firm size and bribery. Based on data of firms in 41 emerging countries, Webster and Piesse (2018) find that larger firms are less likely to make bribes than are smaller firms. In contrast, from the data of Vietnamese SMEs, Rand and Tarp (2012) conclude that larger firms have a greater propensity to bribe than smaller firms because they are more visible and thus more exposed to corrupt bureaucrats. At the same time, Sharma and Mitra (2015) report a nonsignificant connection between the size and corrupt acts of Indian firms.

Ties to the government is another aspect that might have impacts on bribery. Tests that include this factor, again, result in mixed findings. While Lee et al. (2010) support their hypothesis that state ownership is associated with less possibility of paying bribes and smaller bribe size because a firm with state ownership is less vulnerable to corruption, Soans and Abe (2016) present nonsignificant results for state ownership. In addition, Sharma and Mitra (2015) conclude that firms that sell to the government and hence interact more with government officials are more likely to bribe, while Svensson (2003) show a nonsignificant connection. The

cost of reallocating their business is also a potential determinant because firms with lower costs have more power to resist the bribe request from public officials (Rand & Tarp, 2012; Svensson, 2003).

4.2.3.2. Leader characteristics

Although leader characteristics have mostly been neglected in studies regarding the engagement of enterprises in corruption, they potentially play a crucial role in the decision-making process of firms. In the end, firm leaders are the direct decision makers within firms. Collins, Uhlenbruck, and Rodriguez (2009) demonstrate the role of firm managers, in which they manifest the positive association between managers' social connection with government officials and the likelihood of corrupt practices by firms. Examining the role of managers' social networks in the bribe payment of firms, Chavis (2013) concludes that having managers who are former state-owned enterprise (SOE) managers or members of trade associations reduces the bribe payments of Eastern European firms.

4.2.3.3. Circumstances faced by firms

The corrupt practices of firms also depend on the quality of the business environment in which they operate. A firm that operates in a corrupt region or sector with more pressure from officials may be more likely to offer bribes of greater scale than another firm that belongs to a relatively clean region or sector. For instance, Burmese firms that belong to the extractive natural resources sector face more pressure from bureaucrats for mining permits and therefore have a higher propensity to make bribes (Soans & Abe, 2016). Policy complications, which cause more difficulty for firms in dealing with administrative processes, are one of the causes of the corrupt engagement of firms (Sharma & Mitra, 2015).

4.3. Hypotheses and empirical analysis

The empirical analysis in this study focuses on the connection between the corrupt behavior of firms and the behavior of their peers, defined as firms that belong to the same sectors and the same provinces. I argue that Vietnamese firms have the intention to learn from the bribery behavior of other firms in the same sector/province rather than firms in other sectors and regions because they expect to deal with the same public departments and bureaucratic

procedures as those of the former. Because of this learning process, firms that are surrounded by more corrupt peers will have a propensity to act more corruptly. This study examines two aspects regarding the corrupt behavior of firms, namely, the decision of firms regarding whether to pay bribes and the size of the bribes made by these firms. The following are two subhypotheses regarding how the bribery behavior of a firm is related to the bribery behavior of its peers.

Hypothesis 3.1: The ratio of a firm's peers that pay bribes is positively associated with the probability that the firm makes bribes.

The econometric model for testing this hypothesis is as follows:

Pr(bribe) = F(peer's bribe ratio, firm characteristics, manager characteristics, corruption)

where *bribe* takes a value of either *1 (paying bribes)* or *0 (not paying bribes)*. The dependent variable, *Pr(bribe)*, is the probability of firms making bribes. The independent variable of interest here is *peer's bribe ratio*, which denotes the proportion of firms in the same sector/province that pay bribes. Other explanatory variables are firm characteristics, the attributes of firms' leaders, and the pervasiveness of corruption in the regions or industry with which firms have to deal. Because the choices of firms are either *1* or *0*, a logit model will be applied for regression purposes.

Hypothesis 3.2: The average size of bribes made by peers is positively associated with the likelihood of firms paying a larger bribe.

The econometric model to test hypothesis 2 is as follows.

Pr(bribesize) = F(peer's bribe size, firm characteristics, manager characteristics, corruption)

where *bribesize* takes eight different discrete levels, from *0* to *7*, with a higher level indicating a larger bribe. The dependent variable, *Pr(bribesize),* is the probability that a firm will pay a certain bribe size. The main independent variable is *peers' bribe size*, the average size of informal payments made by firms' peers. Other independent variables are similar to those in the first step, namely, firm characteristics and leader characteristics and the pervasiveness of corruption that firms have to face. Because the choice of firms is made at multiple levels, an ordered logit model will be used in this step.

4.4. Data and variable construction

I obtained the data in this study from the Harvard Dataverse website. The final data used in this chapter are part of the replication data for *"Monopoly money: Foreign Investment and Bribery in Vietnam: a Survey Experiment"*, supplied by Edmund Malesky in 2016. The provided data include survey data on Vietnamese firms in 2010, 2011, and 2012, which are utilized to compute the annual Vietnam Provincial Competitiveness Index (PCI). The full sample consists of 22,275 domestic firms and 4,821 foreign invested firms (E. J. Malesky et al., 2015). In this chapter, I employ data on domestic firms in 2012 to examine how the bribery behavior of Vietnamese firms is affected by the behavior of their peers. Even though PCI team did not explicitly reveal the classification of domestic firms, they selected sample of foreign firms and domestic firms based on a list of registered firms provided by the General Tax Authority of Vietnam (Gueorguiev & Malesky, 2012). This means a firm is considered a domestic one if their business in carried out in accordance with the regulation applicable to domestic firms. According to Vietnam's Law on Investment 2014, these firms are those with majority of capital share (51 percent or more) is under control of domestic investors. Therefore, domestic firms in this study might be partly owned by foreign investors but the capital share of foreign investors is less than 49 percent[37]. A total of 8,053 domestic firms responded to the PCI survey in 2012, of which 5,548 responded to the question on bribe size. After excluding firms with no information on sector and no peers, the final sample is composed of 5,541 domestic firms.

4.4.1. Informal payment of Vietnamese domestic firms

Figure 4.1 below presents the number of Vietnamese domestic firms grouped by the size of their informal payments as a percentage of their revenue based on the survey in 2012. Paying bribes is a norm in doing business in Vietnam, with the majority of firms reporting that they make informal payments to government officials. Among the 5,541 domestic firms in the final sample, approximately 73.5 percent pay bribes. The firms that claim that the size of such payments is under one percent of their sales make up the largest fraction, with 1,689 firms. Some firms pay extremely large bribes, over 30 percent of their total sales, though the number of those firms is very small, only 59 firms, making up approximately one percent of the final sample.

[37] According to Vietnam's Law on Investment 2014, these firms are foreign-invested firms but operated based on the regulation that apply for domestic investors, and hence treated as domestic firms in this study.

Figure 4.1: Number of firms by bribe size

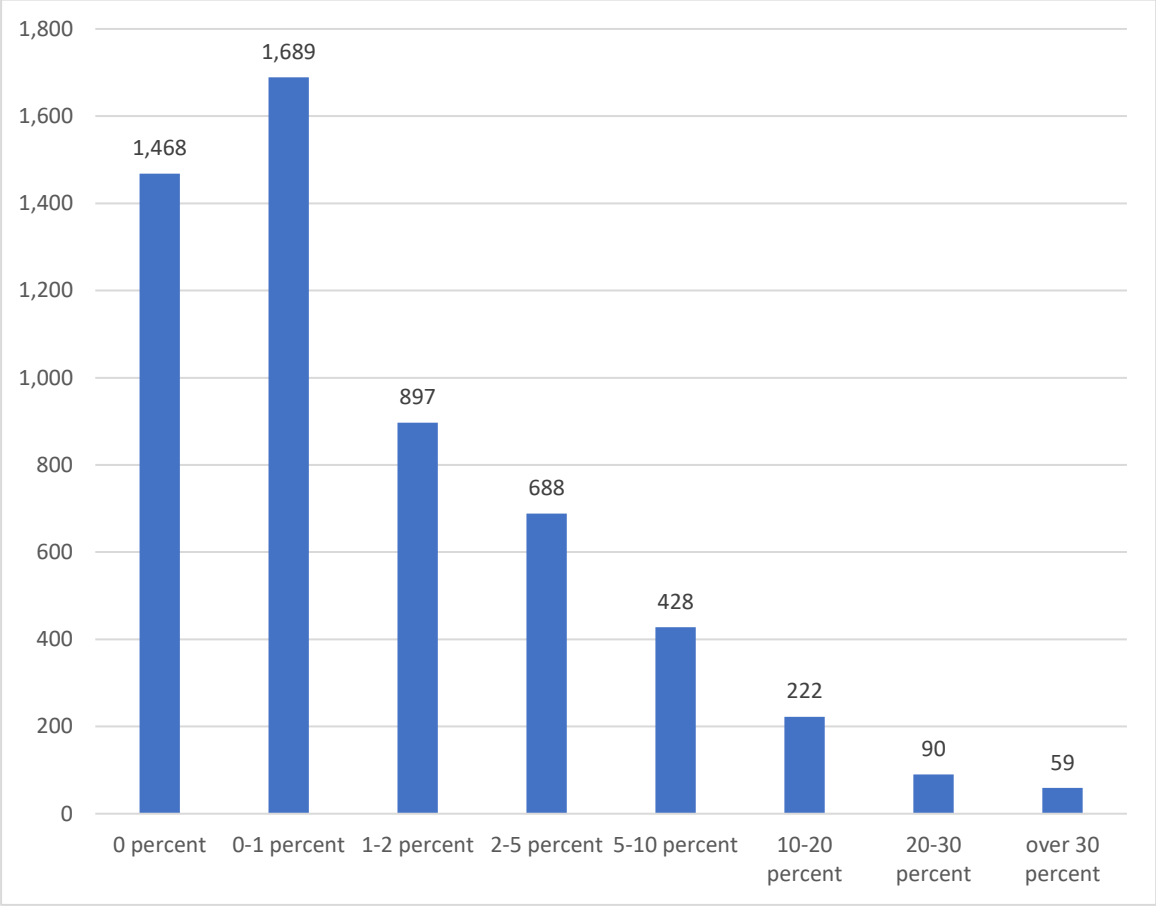


Figure 4.2 presents the percentage of firms that make informal payments by five different sectors, namely, manufacturing, service, agriculture, construction, and natural resources. The natural resource exploiting sector appears to be the most corrupt sector, with more than 90 percent of firms paying informal fees to officials, followed by the construction and agriculture sectors, in which approximately 77 percent of enterprises make informal payments. The manufacturing and service sectors observe the lowest proportion of businesses that report making bribes, with approximately 72 percent. *Figure 4.3* illustrates the details on the fractions of enterprises in the five sectors based on bribe size, measured as the percentage of revenue. The graph again suggests that firms that do business related to extractive natural resources are most corrupt, followed by firms in the construction sector. The proportions of firms that belong to the natural resource extraction and construction sectors and pay more than one percent of their sales as bribes are 66 and 56 percent, respectively. Manufacturing is the least corrupt industry, with only approximately 37 percent of firms paying more than one percent of their revenue in the form of bribes.

Figure 4.2: Bribe pay of firms, by sector

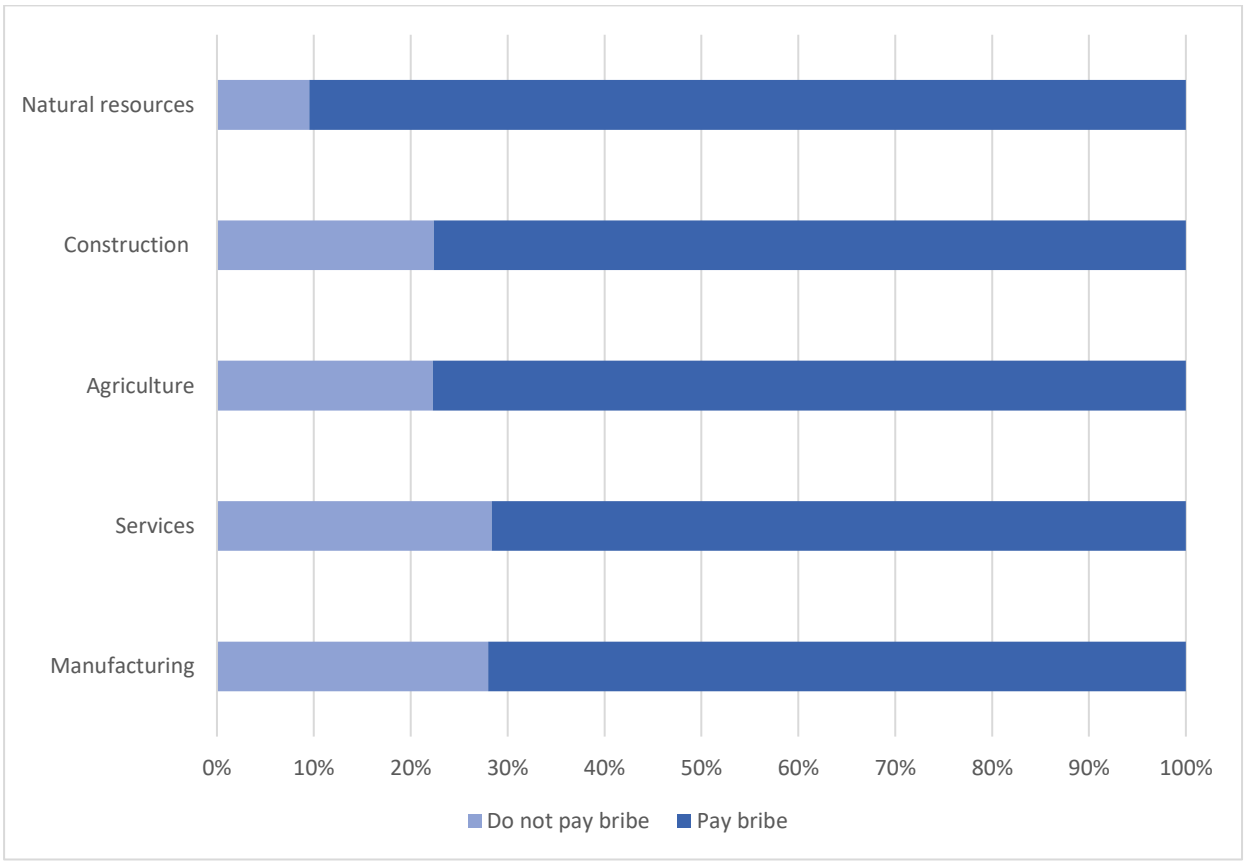
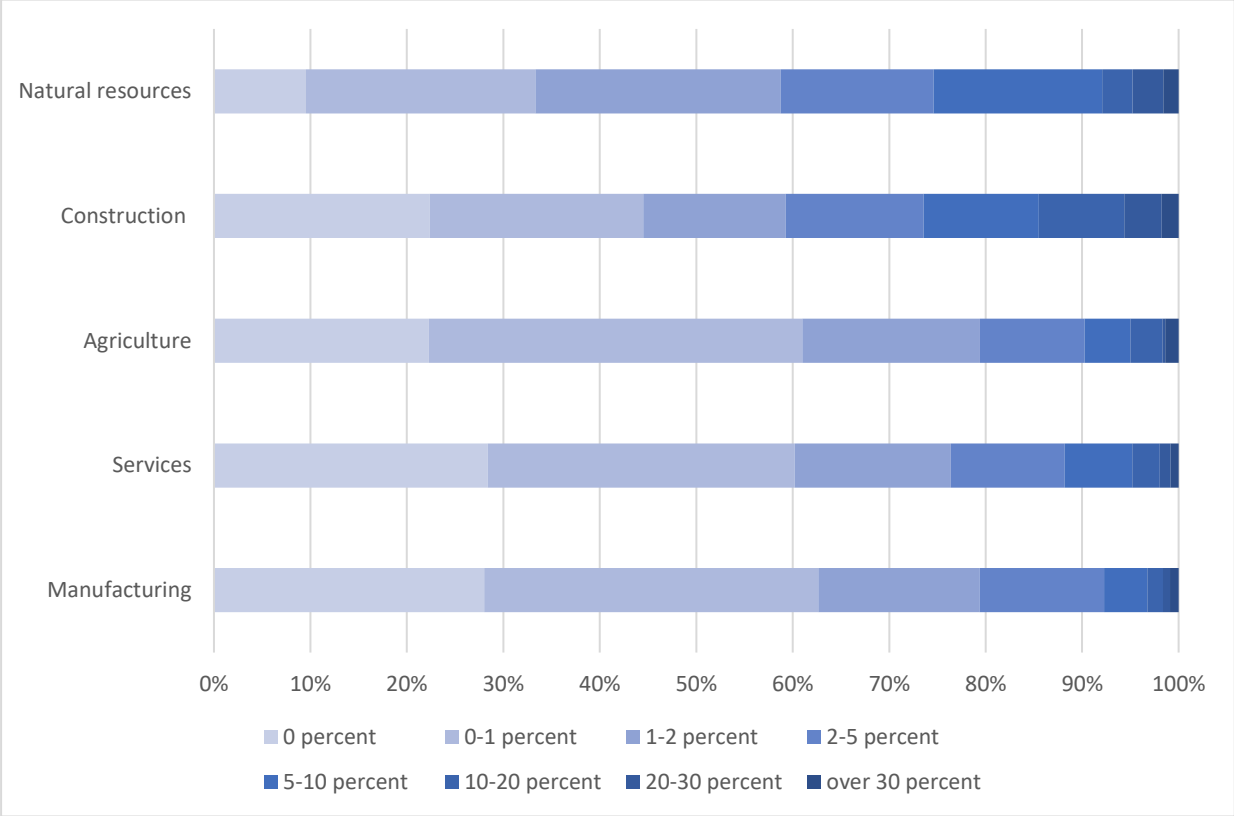


Figure 4.3: Bribe size as percentage of revenue of firms, by sector



4.4.2. Dependent variables

The data used to construct the dependent variables regarding the bribery decisions made by firms is the response of firms to the following question: *what percentage of total income do firms in your line of business typically pay per year for informal charges to public officials?* Firms answer this question in eight intervals, and the variable takes a value from 0 to 7 as follows: *0: 0 percent; 1: less than 1 percent; 2: from 1 percent to less than 2 percent; 3: from 2 percent to less than 5 percent; 4: from 5 percent to less than 10 percent; 5: from 10 percent to less than 20 percent; 6: from 20 percent to less than 30 percent; and 7: over 30 percent*. Note that even though the PCI team does not explicitly ask businesses about how much they pay in bribes, the response of this question is often employed to measure the size of the bribes made by enterprises. The reason for this is that if the interviewers ask directly about the size of firms' bribes, it is unlikely that they will obtain an honest answer because the respondents are aware that bribery is an illegal act (Sylwester, 2019). Therefore, first, survey organizers often use the term informal costs rather than bribes. Second, they often ask questions about the experiences of "firms such as yours" or "firms in the same industry", presuming that firms' answers will be highly correlated with their own experiences (Sylwester, 2019). The PCI team designed the

survey based on this idea to elicit evidence and protect respondents (Gueorguiev & Malesky, 2012).

This study investigates the factors that influence Vietnamese firms' bribery, concentrating on two approaches that firms have to take in regard to bribery. The first decision is to detect the factors that affect the decision of firms of whether to make bribes or not. The second is to examine the factors that influence the size of the bribes made by firms.

Firms' decision of whether to bribe

I construct data on the variable *bribepay*, which equals 0 if firms pay zero percent; in other words, they do not pay bribes. For all other cases, firms pay bribes, and *bribepay* is equal to 1. Data on this question are also used to test the second hypothesis regarding firms' decision on the size of bribes.

Size of bribes made by firms

The dependent variable of the second step, *bribesize*, takes eight different discrete levels (from 0 to 7) based on the responses of firms to the above question about the size of their informal payments.

4.4.3. Independent variables

4.4.3.1. Corrupt behavior of firms' peers

Firms are defined as peers of a firm if they operate in the same industries in the same provinces/cities as that firm. In the sample, firms are located in all 63 Vietnamese provinces/cities and are classified into five sectors*: 1: manufacturing/industry; 2: construction; 3: services/commerce; 4: agriculture/fishing/forestry; and 5: natural resources.* Two main explanatory variables in the empirical analysis regarding the behavior of a firm's peers are constructed as follows.

The main explanatory variable in the first analysis is *briberate*, which refers to the proportion of other firms making bribes that belong to the same sector of the same province. *wbribe,* the average bribe size of firms' peers, is the main dependent variable of the second step. An issue that arises in computing the average bribe size of firms' peers is that we do not know the exact size of the bribes made by firms because the data have been grouped into eight intervals. One solution to this problem is that we can assume that all observations fall in an interval taking the value of the midpoint of the interval and then calculate the mean of the grouped data (Hanneman, Kposowa, & Riddle, 2013; Healey, 2014). In this study, I follow the

suggested solution and use the midpoints of the grouped intervals to estimate the approximation of the average size of the bribes made by a firm's peer. One problem here is that there is no upper limit for interval *7 (over 30 percent)*; hence, we cannot compute the exact midpoint of this interval. I assume that firms cannot pay over 100 percent of their revenue in the form of informal payments, and the upper limit of this case is 100 percent; thus, the midpoint of the interval is 65 percent. *Table 4.1* details of the midpoints of the intervals of the bribe size made by firms.

Table 4.1: Midpoints of intervals of bribesize value

bribesize value	Interval	Midpoint
0	0 percent	0 percent
1	0–1 percent	0.5 percent
2	1–2 percent	1.5 percent
3	2–5 percent	2.5 percent
4	5–10 percent	7.5 percent
5	10–20 percent	15 percent
6	20 – 30 percent	25 percent
7	over 30 percent	65 percent

4.4.3.2. Control variables

Other control variables are classified into three groups of factors, namely, firm characteristics, leader characteristics, and the corruption phenomenon of provinces/cities.

Firm characteristics

Those characteristics that might influence the process of making decisions of firms and are included in the analysis are firm age *(age)*, firm size measured by current capital size *(size)*, the sectors to which firms belong *(sector)*, whether firms are listed in the stock market *(HOSE)*, whether firms own land use right certificates *(lurc)*, and whether part of the firms is owned by the state *(gov)*.

Firm leader characteristics

This group includes the gender of owners *(gender)* and the connection of firm managers with the government *(connect)*.

Corruption phenomenon of provinces/cities

This variable *(corrupt)* is measured by the overall informal cost index of provinces/cities. This index is a subindex of the PCI index, which reflects the performance of the provincial government in restricting corruption. A higher number in this index means that the province/city is doing better in terms of limiting corruption.

Table 4.2 shows detailed information on the variables in this study. *Tables 4.3* and *4.4* present the descriptive statistics and correlation matrix of the variables.

Table 4.2: Details of the variables

Variable	Details	Type of Variable
Dependent variables		
bribepay	Whether a firm bribes or not	Binary variable (1: pay bribes; 0: do not pay bribes)
bribesize	Bribe size as share of firm revenue	Interval variable (0: 0%, 1: <1%, 2:1%-2%; 3:2%-5%; 4: 5%-10%; 5: 10%-20%; 6:20%-30%; and 7: >30%)
Independent variables		
Variables of behavior of peers		
briberate	Ratio of firms that pay bribes in the same sector/province	Continuous variable
wbribe	Average bribe size of firms that belong to the same sector/province	Continuous variable
Variables of firm characteristics		
age	Age of firms, the number of years since registration	Continuous variable
size	Current capital size of firms	Interval variable (1: under 0.5 bill; 2: 0.5-1 bill; 3: 1-5 bill; 4: 5-10 bill; 5: 10-50 bill; 6: 50-200 bill; 7: 200-500 bill; and 8: over 500 bill)(1)
Sector	Firms' sector	Dummy variable (Five sectors: manufacturing/industry; construction; services/commerce;
Construction	Dummy for construction sector	
Services	Dummy for services/commerce sector	

Agriculture	Dummy for agriculuture/forestry/fishing sector	agriculture/forestry/fishing; natural resources) Manufacturing/industry sector is set as the base category.
Natural resources	Dummy for natural resources sector	
HOSE	Whether firms are listed in the stock market or not	Dummy variable (1: listed in the stock market; 0: not listed in the stock market)
lurc	Whether firms own land use right certificates or not	Dummy variable (1: possess land use right certificates; 0: do not possess land use right certificates)
gov	Part of firms owned by state or SOEs	Dummy variable (1: part of firms is owned by state or SOEs; 0: part of firms is not owned by state or SOEs)
Variables of firm leader characteristics		
Gender	Gender of firm owners	Dummy variable (Three groups: male; female; more than one owner) Male is set as the base category.
Female	Dummy for female owner	
More than one owner	Dummy for more than one owner	
connect	Connection with the government	Dummy variable (1: firm's manager is former government official; 0: firm's manager is not former government official)
Variable of corruption phenomenon in regions		
corrupt	Informal cost index of provinces/cities	Continuous variable

(1) bill: Billion Vietnam Dong

Table 4.3: Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
bribepay	5,541	0.7351	0.4413	0	1
bribesize	5,541	1.6824	1.6075	0	7
wbribe	5,541	3.1083	2.3911	0	19
briberate	5,541	0.7351	0.1303	0	1
age	5,290	6.1972	4.6509	0	22
size	4,834	3.0664	1.2291	1	8
sector	5,541	2.6809	0.7850	1	5
HOSE	5,541	0.0049	0.0696	0	1
lurc	5,149	0.5537	0.4972	0	1
gov	5,541	0.0189	0.1364	0	1
gender	5,382	1.2696	0.5064	1	3
connect	5,541	0.0206	0.1420	0	1
corrupt	5,541	6.4942	0.8198	4.5162	8.6113

Table 4.4: Correlation matrix

	bribepay	*bribesize*	*wbribe*	*briberate*	*age*	*size*	*sector*	*HOSE*	*lurc*	*gov*	*gender*	*connect*	*corrupt*
bribepay	1												
bribesize	0.6284	1											
wbribe	0.053	0.161	1										
briberate	0.1173	0.1136	0.3136	1									
age	0.0496	-0.0133	-0.0529	-0.017	1								
size	0.1	0.0962	0.0717	0.0993	0.1815	1							
sector	0.0034	-0.0424	-0.1258	0.0116	0.0148	-0.0663	1						
HOSE	0.0068	-0.0184	0.001	-0.0103	0.0453	0.1399	-0.031	1					
lurc	-0.0565	-0.1263	-0.0253	-0.0489	0.2195	0.1073	-0.0037	0.0381	1				
gov	0.0025	-0.0236	0.0214	0.0264	0.0364	0.1884	0.0261	0.1804	0.034	1			
gender	-0.0253	-0.0555	-0.0493	-0.0367	0.0624	0.0175	0.0525	-0.0378	0.0226	0.0021	1		
connect	0.0294	0.0508	0.0068	-0.0112	0.0195	0.0352	-0.0043	-0.0101	-0.0019	0.0172	0.0142	1	
corrupt	-0.1147	-0.1426	-0.2728	-0.3885	0.0143	-0.0699	-0.0089	0.0342	0.0278	-0.0169	0.005	-0.029	1

4.5. Empirical results and discussions

Table 4.4 shows the estimation results of logit models on the decision of Vietnamese domestic firms regarding whether to bribe or not. This table presents both the estimated coefficients and marginal effects of the independent variables. There are four groups of factors that are potential determinants of the bribery decisions of firms, namely, the behavior of firms' peers, firm characteristics, leader characteristics, and the pervasiveness of corruption in these regions. The last two columns show the estimated coefficients and marginal effects of the independent variables when all four groups of factors are included. The corrupt behavior of peers is the main independent variable and is included in all models. Columns (3) – (6) show the results when firm characteristics are included. The results of estimation with leader characteristics are added and presented in columns (7) and (8). *Table 4.5* shows the estimated coefficients of the independent variables, which are produced by ordered logit regression models. Column 5 of *Table 4.5* presents the results when all groups of determinants are controlled for.

4.5.1. Bribery behavior of Vietnamese firms and the behavior of their peers

This study examines the relationship between the bribery behavior of a firm and that of other firms that operate in the same sectors from two aspects: the decision on whether to pay bribes and the bribe size made by firms.

Table 4.5 details the results on firms' decision of whether to bribe. The coefficients and marginal effects of *briberate* are consistently positive and significant, with one percent confidence in all columns of *Table 4.4*. These results confirm *Hypothesis 3.1*, suggesting that firms that are surrounded by corrupt peers are more likely to make informal payments to government officials. After controlling for all other factors, the marginal effects of *briberate* stand at approximately 0.189, which implies that firms that are surrounded by totally corrupt peers (all their peers make bribes) are 18.9 percent more likely to make bribes than those who are surrounded by totally clean peers (none of their peers make bribes).

Table 4.5: Estimation results on the decision to bribe of Vietnamese firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	*bribepay*	*bribepay*	*bribepay*	*bribepay*	*bribepay*	*bribepay*	*bribepay*	*bribepay*	*bribepay*	*bribepay*
	coefficient	marginal effects	coefficient	marginal effects	coefficient	marginal effects	coefficient	marginal effects	coefficient	marginal effects
briberate	2.004***	0.385***	1.743***	0.338***	1.505***	0.288***	1.537***	0.291***	1.005***	0.189***
	(0.239)	(0.0450)	(0.270)	(0.0515)	(0.279)	(0.0528)	(0.283)	(0.0528)	(0.300)	(0.0561)
age			0.0247***	0.00479***	0.0291***	0.00558***	0.0294***	0.00556***	0.0303***	0.00570***
			(0.00772)	(0.00149)	(0.00823)	(0.00157)	(0.00837)	(0.00157)	(0.00837)	(0.00157)
size			0.144***	0.0279***	0.171***	0.0328***	0.148***	0.0280***	0.142***	0.0267***
			(0.0295)	(0.00568)	(0.0310)	(0.00588)	(0.0317)	(0.00594)	(0.0317)	(0.00592)
Sector										
Construction			0.333**	0.0645**	0.377***	0.0730***	0.384***	0.0740***	0.374***	0.0713***
			(0.131)	(0.0260)	(0.136)	(0.0269)	(0.139)	(0.0273)	(0.138)	(0.0269)
Services			0.107	0.0216	0.164	0.0333	0.198*	0.0398	0.173	0.0345
			(0.113)	(0.0233)	(0.117)	(0.0241)	(0.119)	(0.0244)	(0.119)	(0.0242)
Agriculture			0.222	0.0440	0.317*	0.0622*	0.350*	0.0680*	0.364**	0.0695**
			(0.178)	(0.0348)	(0.183)	(0.0351)	(0.186)	(0.0352)	(0.183)	(0.0343)
Natural resources			1.212**	0.187***	1.173**	0.186***	1.108**	0.179***	1.088**	0.174***
			(0.554)	(0.0598)	(0.549)	(0.0623)	(0.554)	(0.0656)	(0.552)	(0.0654)
HOSE					0.0616	0.0118	0.0757	0.0143	0.162	0.0305
					(0.517)	(0.0991)	(0.511)	(0.0965)	(0.511)	(0.0961)
lurc					-0.313***	-0.0600***	-0.287***	-0.0543***	-0.286***	-0.0538***
					(0.0739)	(0.0140)	(0.0753)	(0.0141)	(0.0755)	(0.0141)
gov					-0.366	-0.0702	-0.448	-0.0846	-0.473	-0.0889
					(0.281)	(0.0538)	(0.292)	(0.0552)	(0.293)	(0.0551)
Gender										
Female							-0.306***	-0.0606***	-0.305***	-0.0600***
							(0.0850)	(0.0174)	(0.0854)	(0.0174)
More than one owner							0.553**	0.0891**	0.524**	0.0848**
							(0.259)	(0.0357)	(0.257)	(0.0360)
connect							0.309	0.0584	0.266	0.0499
							(0.287)	(0.0542)	(0.285)	(0.0536)
corrupt									-0.215***	-0.0404***
									(0.0466)	(0.00870)
Constant	-0.437**		-1.031***		-0.818***		-0.743***		1.081**	
	(0.175)		(0.236)		(0.247)		(0.252)		(0.467)	
Pseudo R^2	0.0117		0.0228		0.0257		0.0293		0.0337	
Pro>chi2	0.000		0.000		0.000		0.000		0.000	
Observations	5,541	5,541	4,632	4,632	4,309	4,309	4,197	4,197	4,197	4,197

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The behavior of other firms that operate in the same sector of the same provinces/cities affects not only firms' choice of whether to bribe but also the size of the bribe they make. The significantly positive coefficients of *wbribe,* which are shown in *Table 4.6*, suggest that firms are more likely to pay larger bribes if the average bribe size made by their peers increases. *Table 4.7* details the average marginal effects of peer bribe size on the size of bribes made by firms. The probability that firms pay less than one percent of their revenue decreases, while the probability that they pay more than one percent of their revenue increases when the average bribe size of their peers increases.

Table 4.6: Estimation results on bribe size made by Vietnamese firms

	(1)	(2)	(3)	(4)	(5)
VARIABLES	bribesize	bribesize	bribesize	bribesize	bribesize
	coefficient	coefficient	coefficient	coefficient	coefficient
wbribe	0.111***	0.0742***	0.0705***	0.0712***	0.0467***
	(0.0116)	(0.0144)	(0.0147)	(0.0150)	(0.0148)
age		0.00627	0.0123**	0.0135**	0.0141**
		(0.00557)	(0.00585)	(0.00589)	(0.00586)
size		0.134***	0.166***	0.142***	0.132***
		(0.0222)	(0.0237)	(0.0241)	(0.0241)
Sector					
Construction		0.636***	0.656***	0.666***	0.687***
		(0.111)	(0.117)	(0.117)	(0.116)
Services		0.151*	0.183**	0.229**	0.205**
		(0.0862)	(0.0913)	(0.0924)	(0.0920)
Agriculture		0.0968	0.149	0.159	0.160
		(0.118)	(0.124)	(0.124)	(0.123)
Natural resources		0.859***	0.864***	0.815***	0.759***
		(0.229)	(0.239)	(0.243)	(0.243)
HOSE			-0.369	-0.343	-0.222
			(0.256)	(0.249)	(0.257)
lurc			-0.492***	-0.472***	-0.461***
			(0.0575)	(0.0584)	(0.0585)
gov			-0.541***	-0.635***	-0.670***
			(0.191)	(0.194)	(0.197)
Gender					
Female				-0.357***	-0.351***
				(0.0681)	(0.0682)
More than one owner				0.335**	0.314**
				(0.139)	(0.139)
connect				0.603***	0.564***
				(0.214)	(0.211)
corrupt					-0.247***
					(0.0352)
Pseudo R^2	0.006	0.0132	0.0191	0.0221	0.0255
Pro>chi2	0.000	0.000	0.000	0.000	0.000
Observations	5,541	4,632	4,309	4,197	4,197

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.7: Marginal effects of peers on bribe size made by Vietnamese firms

	(1)
VARIABLES	Marginal effects
0 (0 percent)	-0.00863***
	(0.00273)
1 (0 – 1 percent)	-0.00204***
	(0.000669)
2 (1 – 2 percent)	0.00212***
	(0.000677)
3 (2 – 5 percent)	0.00317***
	(0.00101)
4 (5 – 10 percent)	0.00266***
	(0.000850)
5 (10 – 20 percent)	0.00162***
	(0.000529)
6 (20 – 30 percent)	0.000637***
	(0.000219)
7 (over 30 percent)	0.000462***
	(0.000167)
Observations	4,197

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.5.2. Discussions of other factors

4.5.2.1. Firm characteristics

Firms' decisions to bribe also vary among firms with different attributes. Larger firms appear to be more likely to make informal payments and have a higher probability of paying larger bribes. These results are consistent with other studies that focus on the bribery behavior of

Vietnamese firms, in which they conclude that larger firms in Vietnam have a higher probability of paying bribes because they are more visible and hence targeted by government officials (Gueorguiev & Malesky, 2012; Rand & Tarp, 2012). In addition, older firms with more experience doing business in Vietnam are more likely to follow the norm, making informal payments and paying larger bribes. At the same time, whether firms are listed in the stock market does not affect their decision to bribe or the size of the bribe.

One of the important factors affecting the decision-making process of Vietnamese firms is the ownership condition of their land use right certificates. In Vietnam, not every firm owns a certificate for the right over the land they own. If they do not own a certificate, it might be impossible for them to sell the land and rebuild their business in other places. As discussed by Rand and Tarp (2012) and Svensson (2003), one important aspect that affects the interactions between firms and bureaucrats is the cost of reallocating their businesses, and firms with lower costs have stronger power to refuse to pay bribes. For the case of Vietnamese firms, owning a land use right certificate is an important determinant of the cost of relocating the business. Firms with certificate ownership have stronger bargaining power than those who do not because they can sell their land and build their business in other places with a more supportive business environment (Bai et al., 2019). The estimation results support that argument. The probability that firms with land certificate ownership pay informal charges is 5.38 percent less than that of firms who do not own a certificate. Moreover, the significant negative coefficients of *lurc* in *Table 4.4* suggest that the possession of a land use rights certificate reduces the chance firms pay larger bribes.

Although, whether a part of firms is owned by the state or not does affect the decision of whether to bribe of firms, firms partly owned by the state are more likely to pay smaller bribes. Therefore, this result assists the view that state ownership increases the bargaining power of firms and makes them less vulnerable to corruption (Lee et al., 2010).

4.5.2.2. Firm leader characteristics

Firm leaders make the final decisions, and the illegal behavior of firms deviates according to the characteristics of their leaders, including both firm owners and firm managers. Enterprises owned by females are less likely to make bribes, and their probability of making bribes is six percent lower than that of firms with male owners. In addition, those companies also have less propensities to offer a large bribe. The finding reinforces the view manifested by Fišar, Kubák,

Špalek, and Tremewan (2016): males are more sensible to social norms and more likely to make bribes than females if they believe the bribe will be accepted. Whether managers are formal government officials or not, a variable that captures their social connection with the government, is not a significant predictor of firm involvement in corruption. Nonetheless, the social connection of managers significantly determines the size of informal payments. Firms managed by formal public officials have more propensities to pay larger bribes.[38]

4.5.2.3. Circumstances faced by firms

The business environment, which varies according to the regions and industries in which firms operate, is also an important factor. Regarding the sector variable, *Table 4.5* shows the results when manufacturing is set as the base value. I also run other multiple regressions with other sectors set as base values. The results suggest that the natural resource exploitation business and construction sectors are the two most corrupt sectors in Vietnam, even after controlling for all other factors. The probability of paying bribes for natural resource exploitation firms is 17.4 percent higher than that of manufacturing firms, followed by construction firms and agriculture firms. *Table 4.8* details the likelihood that firms in construction, services, agriculture, and natural resources make different levels of bribes compared to manufacturing firms. While we observe no significant difference between agriculture firms and manufacturing firms, firms in the natural resources, construction and services sectors have a greater tendency to make larger informal payments than manufacturing firms. In comparison to firms in the manufacturing sector, firms that belong to those three industries have less propensity to pay less than one percent and more probability of paying more than one percent of their revenue in the form of bribes. Firms that operate in the manufacturing and service sectors are less likely to bribe. It is not surprising to observe that firms that belong to the natural resources or construction sectors behave more corruptly than firms in other sectors. Firms in the extractive sector are more likely to bribe because they need mining permits from the government and hence are more vulnerable to government officials (Soans & Abe, 2016). I run other regressions in which those firms belonging to these two sectors are excluded to check whether the results change. The results remain similar, suggesting that even in less corrupt businesses, the corrupt behavior of firms still highly depends on the behavior of their peers[39].

[38] Table C.1, Appendix C details information on marginal effects of lurc, gov, gender, and connect variables on bribesize.

[39] The results of these regressions are presented in Tables C.2-C.5 in Appendix C.

Table 4.8: Probability of making different bribe size of firms in construction, services, agriculture, and natural resources sectors, compared to manufacturing firms

	(1)	(2)	(3)	(4)
VARIABLES	construction	service	agriculture	natural resources
	Maginal effects	Maginal effects	Maginal effects	Maginal effects
0 (0 percent)	-0.124***	-0.0410**	-0.0323	-0.134***
	(0.0213)	(0.0189)	(0.0247)	(0.0373)
1 (0 – 1 percent)	-0.0364***	-0.00524***	-0.00365	-0.0430**
	(0.00712)	(0.00176)	(0.00317)	(0.0214)
2 (1 – 2 percent)	0.0301***	0.0115**	0.00911	0.0316***
	(0.00567)	(0.00540)	(0.00695)	(0.00676)
3 (2 – 5 percent)	0.0480***	0.0142**	0.0111	0.0528***
	(0.00816)	(0.00629)	(0.00849)	(0.0161)
4 (5 – 10 percent)	0.0407***	0.0106**	0.00821	0.0458***
	(0.00704)	(0.00461)	(0.00633)	(0.0169)
5 (10 – 20 percent)	0.0246***	0.00600**	0.00461	0.0281**
	(0.00457)	(0.00258)	(0.00358)	(0.0113)
6 (20 – 30 percent)	0.00966***	0.00227**	0.00174	0.0111**
	(0.00204)	(0.00100)	(0.00136)	(0.00484)
7 (over 30 percent)	0.00697***	0.00162**	0.00124	0.00801**
	(0.00155)	(0.000721)	(0.000981)	(0.00365)
Observations	4,197	4,197	4,197	4,197

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In addition, firms in less corrupt provinces/cities, which come with a higher overall index in terms of corruption restrictions, have a lower probability of making informal payments to government officials. According to Lee et al. (2010), the level of corruption of countries or regions matters because bureaucrats in regions with more pervasiveness of corruption have more incentive to demand bribes from businesses. The estimation results favor this argument.

In the case of Vietnam, firms that do business in provinces/cities, which perform better in terms of limiting corruption, face less harassment from officials; therefore, they have less tendency to make bribes and, as such, make smaller bribes.

4.6. Concluding remarks

This study attempts to identify bribe makers among Vietnamese domestic firms, focusing on the relationship between their bribery decisions and the behavior of their peers. The results of logit and ordered logit models show a significantly positive relationship between the bribery behavior of firms and that of their peers, in other words, firms in the same industries/provinces, offering evidence on the spillover effects among bribe makers. An enterprise that is encircled by a higher density of bribe makers is more likely to become a bribe maker. Moreover, the chance that firms pay more than one percent of their revenue as bribes also increases when the average bribe size made by their peers increases.

Additionally, this research offers other attributes of bribe makers, namely, firm characteristics, firm leader characteristics and the business environment in which firms operate. While larger and older firms appear to be more corrupt, land use rights certificate ownership decreases the chance of these firms to make bribes as well as the probability that they will make larger bribes. In addition, firms owned by males or managed by former government officials tend to engage more in bribery. Finally, firms that belong to more corrupt provinces or industries face more harassment from government officials and hence are more likely to pay bribes or make larger bribes.

Despite its contributions in terms of offering quantitative evidence for the contagious effect of corruption among enterprises and the features of bribe makers among Vietnamese firms, this study has two major limitations regarding the investigated sample. The sample includes only domestic firms and leaves out foreign firms due to missing data on many important independent variables. The results for foreign firms might differ from those that have been found here for the case of domestic firms. Future research that compares the two groups may be more beneficial. In addition, when we think about bribe acts, there are two sides, bribe makers and bribe receivers, and the sample in this study covers only information about bribe makers due to the unavailability of information from the perspective of bureaucrats, the bribe receivers. Future research offering analyses on both sides of bribes will contribute more to the understanding of bribery.

CHAPTER 5: HOW WOULD ANTI-CORRUPTION POLICY OF VIETNAMESE PROVINCIAL GOVERNMENT WORK?

5.1. Introduction

Corruption is generally seen as a threat not only to economic development and wellbeing of society, but also the accountability of governments around the world. There are numerous cases when a political party came to power with promises to fight against corruption and build a clean government. We could see those promises everywhere from democratic to authoritarian countries. On a global scale, in 2005, The United Nation enforced The United Nation Convention against Corruption that assist international cooperation among most of state members to tackle this global problem. On the academic side, it is inevitable to draw some implications on anti-corruption policies when studying corruption. The question that has frequently emerged is what policies government should take to reduce corruption successfully. There is another side of that question that has been neglected is how those policies would work. In conventional corruption studies, a country, a region, a city is treated as an isolated entity, a policy that works in one place will only affect corruption level of that place and has no effect whatsoever on other places. Nonetheless, that might not be the case anymore. The idea of social interactions that have long been studied in sociology, recently emerges in corruption literature lead to a different approach. In the end, corruption phenomenon in a country is a collective picture of corrupt acts practiced by all players in the society, from ordinary citizens, firms, bureaucrats, to politicians. The behavior of individuals are easily affected by others through social interactions, hence corrupt acts spread from citizen to citizen, firm to firm, and from country to country. Those studies that address corruption from this aspect mostly confirm the contagion of corruption. As a result, they suggest that effective anti-corruption policies have positive externalities across geographical borders and the cooperation between governments is necessary when it comes to combating corruption.

5.1.1. Contagious corruption

Corruption is contagious for several reasons. One of the reasons is due to the demonstration effects (Goel & Nelson, 2007; Sah, 2007). The decision of individuals to engaging in petty corruption depends on not only their past experiences but also others' behavior through social interactions; hence when individuals observe more corrupt acts of their surroundings they tend to act more corruptly (Sah, 2007). The contagion effects of corruption

might also be observed from both demand and supply sides (Goel & Nelson, 2007). The demand might increase because rent seekers would expect more rent seeking chances when they see more corrupt acts by their peers. On the supply side, with more and more civil servants engaging in corrupt acts, they tend to cause loose enforcement and less punishment. Learning process via business connections among individuals might be one of the causes of the spillover of corruption as well (Becker, Egger, & Seidel, 2009b). Not only limited to the cases of firms and citizens, corrupt acts also diffuse among bureaucrats. More corrupt government officials would lower the chance of public servant getting caught, the severity of the punishment they face, and the moral cost they feel. Hence, a bureaucrat tends to be more corrupt in the system with more corrupt fellows (Blackburn et al., 2010).

At a country level, corruption is contagious from a country to its neighbors because people in a certain country would enjoy more business deals and personal interactions with people who reside in the neighboring countries (Correa et al., 2016). Becker et al. (2009) is among the first empirical studies to investigate the spillovers of perceived corruption among countries, using cross-sectional data of 123 nations that cover around 95 percent of world population and 98 percent of world economy. By allowing the spread of corruption across neighbors in term of both adjacency and distance in a spatial econometric model, they prove that the change of corruption index in a country would affect its neighbors' index. Because of this spillover effects, a shock in terms of political regime in one country might, directly, lead to the change in corruption index of that country and, indirectly, of other countries. Also using data for 123 countries, rather than cross-sectional data, Correa et al. (2016) take advantage of panel data from 1995 to 2012 that allows them to tackle the time and country fixed effects. They, again, find the robust evidence on the contagion of corruption across border. Donfouet et al. (2018) bring both theoretical model and empirical evidence of spillovers effects of perceived corruption, applying spatial dynamic panel data model approach for the sample of 97 countries in the period 2000-2010. In this study, they tackle the endogeneity problem more seriously by using GMM method, which produce the consistent results in the presence of endogenous independence variables. Sui et al. (2018) also use the similar approach for their work and find that besides the traditional geographical factors, the similarity in terms of economic level and political freedom as potential channels of the spillovers. In contrast, despite the observed spatial interdependence of perceived corruption in the case of 171 countries, Márquez et al. (2011) deny the diffusion of corruption across countries. They conclude that corruption levels are

similar among neighboring countries because of their similar characteristics rather than the contagion of corruption itself.

Compared with cross-country studies, we expect to see more obvious contagion of corruption within a country. There are more barriers that might limit the spread of corruption among countries, such as different languages or incomparable institutional factors (Correa et al., 2016). For example, Correa et al. (2016) find that The European Union exhibits stronger contagion of corruption because political and economic institutions in this region are much more integrated, compared with other parts of the world. Goel and Nelson, (2007), López-Valcárcel et al. (2017), and Dong and Torgler (2012) are among notable works that provide evidence on the spillovers of corruption within a country. Instead of perception-based data, all these three studies utilize incident of corruption data measured by the number of reported legal cases related to corrupt acts. Analyzing the case of fifty states of the United States of America from 1995 to 2004, Goel and Nelson (2007) confirm the positive contagion of corruption. If corruption index of its neighboring states increase by 10 percent, corruption index of one state would increase somewhere between 4 percent and 11 percent. López-Valcárcel et al. (2017) also find evidence of strong contagion of corruption for the case of municipalities of Spain, another developed country. Dong and Torgler (2012) give both theoretical model and empirical evidence on the role of social interactions on corruption for the case of Chinese provinces. This study argues that social interactions exist in two forms, global one that is measured by the average corruption index of neighboring provinces and local one that is measured by previous year's corruption index. The empirical work produces the evidence of positive effects of both global and local social interactions on corruption rates of Chinese provinces.

At a firm level, You and Nie (2017) investigate Chinese firms' behavior based on World Bank's survey data in 2005. They find the evidence that the decision of Chinese firms on participating in corrupt acts highly depends on both their past action and the experience of their neighbors' behavior. Even though they attempt to use more objective corruption measurement, the use of the days that firms spend on administrative works as corruption variables is questionable. Although the correlation between "time tax" variable and corruption act might be carefully explained, the "time tax" variable does not precisely reflect corruption engagement of firms. There might be the case that the firms that spend less money on bribing government officials have to spend more time on handling with public servants.

Despite different circumstances, types of data, and approaches, all studies that prove the contagion of corruption across geographical borders draw similar policy implications as their

conclusive points. First, because corruption phenomenon in regions is impacted by the phenomenon of their neighbors, governments should cooperate and act together for the effectiveness of the fight against corruption. The second critical implication is that successful anti-corruption campaigns have positive externalities to other countries and regions. However, there are no study that has been undertaken to quantify and analyze these positive externalities. Therefore, the aim and key contribution of this study is to quantify the positive externalities of anti-corruption strategies, using the case of Vietnamese provinces/cities.

Vietnam is an interesting case for some reasons. First, Vietnam is a developing country with prevalent corruption and the fight against corruption is one of the priorities of the Vietnamese central government. Secondly, although the policies directed by the Communist Party of Vietnam (CPV) would, in principle, be presumed to be implemented in the whole country, the implementation of public policies varies considerably across provinces/cities, depending on the incentives of provincial leaders. As described by Bai et al. (2019) bureaucratic corruption is subnational and highly centralized within Vietnamese provinces/cities. Provincial top leaders have the power to control the extent of daily corrupt acts in their provinces by changing their behavior, punishing corrupt subordinates, or adjusting the policies that could reduce or promote corrupt practices. Therefore, the gravity of corruption and performance of anti-corruption tools varies substantially among Vietnamese provinces/cities. This phenomenon turns Vietnam into an interesting case to study the positive externalities of anti-corruption policies at provincial level.

5.1.2. Improving institutional quality as an anti-corruption strategy

In the last decades, Vietnamese government led by the Communist Party of Vietnam (CPV) has regconized the combat against corruption as one of their main policies. CPV built a stronger legal foundation to sustain this fight by issuing a new anti-corruption law in 2005. In 2009, Vietnamese government issued the National Strategy for Anti-corruption towards 2020 to implement this law. In addition, Vietnam signed The United Nation Convention against Corruption in 2003 and created an implementation plan of this convention in 2010. According to these legal documents, improving institutional quality appears to be the main tool in the fight against corruption of Vietnam. For example, in National Strategy for Anti-corruption, there are five key solutions and they are all about improving institutional quality.

(i) Enhancing the openness and transparency in policy making process and the development and implementation of law.

(ii) Improving the quality of public servants and public services.

(iii) Building a fair and transparent business environment.

(iv) Enhancing the efficiency and effectiveness of the detection and handling corrupt acts

(v) Promoting the role of society in combating corruption.

Moreover, institutional factors proved to be crucial determinants of corruption in the existing literature. Jetter and Parmeter (2018) study throughout 36 potential determining factors, including economic, cultural, educational, and institutional elements for the sample of 123 countries. They find that rather than cultural and economic characteristics, institutional factors, including the rule of law and government effectiveness, are the most persistent drivers for lower level of corruption.

Because of the reasons explained above, in this empirical work, I focus on institutional quality elements and seek to answer two main questions. First, does improving institutional element lead to lower level of corruption? Second, how would that anti-corruption strategy work? I study three means that have been considered meaningful factors in the fight against corruption, namely, reducing regulation burden, improving transparency, and providing bottom-up monitoring system. Heavy regulation burden could open opportunities for bribery and corruption (Levie & Autio, 2011), hence loosing regulation burden is one of crucial solutions to lowering corruption rates. Although countries often rely on top-down monitoring to detect and combat against corruption, this strategy fails in countries with systematic corruption. Using experimental approach, Serra (2012) proves that the bottom-up monitoring is effective in detecting corrupt behaviors of civil servants, thus the combination of both strategies are more effective in the fight against corruption. Transparency allows citizens to access to information about the actions of government and politician, enhancing monitoring by citizens and increase the possibility to detect corrupt acts (Bac, 2001; Olken and Pande, 2012).

The following section of this article explains the empirical analysis. Section 5.3 presents details of the data used in this study, including sources of data, descriptive statistics and correlation matrix of variables. Section 5.4 shows empirical results. The last section concludes and discusses the findings.

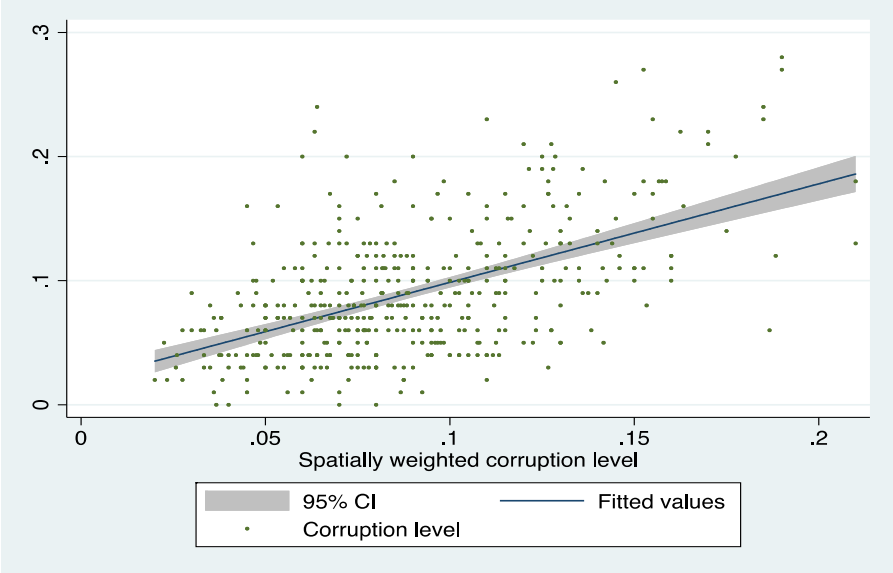
5.2. Empirical analysis

5.2.1. Spatial interdependence of corruption index

5.2.1.1. Correlation between corruption index and spatially weighted corruption index

First, I briefly check if there are spatial interdependences in terms of corruption index between neighboring provinces/cities[40] in Vietnam by looking at the correlation of corruption index between regions. *Figure 5.1* clearly suggest that there exists a positive correlation between corruption index of provinces/cities and the average index of their neighbors.

Figure 5.1: Correlation between corruption index and spatially weighted corruption index of Vietnamese provinces/cities



5.2.1.2. Global spatial autocorrelation tests

Secondly, I run some global spatial autocorrelation tests, which present the correlation between value similarity and locational similarity. Positive spatial autocorrelation indicates that the similar value tends to group in space; and the negative spatial autocorrelation exists when the regions tend to be surrounded by those with dissimilar value (Koch, 2008). Moran I test is the most common tool for testing the presence of spatial dependence between observations (Anselin, 2001). With the null hypothesis that the spatial pattern is random and there is no spatial autocorrelation between observations, Moran I index is calculated as follow: $I = \frac{N}{W} \frac{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{ij}(x_i-\bar{X})(x_j-\bar{X})}{\sum_{x=1}^{N}(x_i-\bar{X})^2}$ where N and W are the number of rows and the sum of all elements,

[40] Provinces/cities are considered neighbors if they share border.

w_{ij}, of the weight matrix, respectively. Because the weight matrix used would be in the row standardized form, $\frac{N}{W}$ equals 1. Moran I ranges from -1 to 1; with the positive and negative value suggests positive and negative spatial autocorrelation, respectively. Another popular index that measure spatial dependence is Geary's C, $C = \frac{(N-1)}{2W} \frac{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{ij}(x_i - x_j)^2}{\sum_{x=1}^{N}(x_i - \bar{X})^2}$. C takes value in the range [0,2]; if $C < 1$, there is positive spatial autocorrelation and if $C > 1$, there exists negative spatial autocorrelation. *Table 5.1* shows results of Moran's I and Geary' C indexes for corruption index from 2009 to 2015, using contiguity matrix in which provinces/cities are treated as neighbors if they share border. Significant results of both Moran's I and Geary's C suggest the positive spatial correlation for corruption variables, indicating that provinces with similar corruption index tend to cluster in space.

Table 5.1: Results of global spatial autocorrelation tests

Year	Moran's I			Geary's C		
	Moran's I	z score	p value	Geary's C	z score	p value
2009	0.366***	4.420	0.000	0.613***	-4.298	0.000
2010	0.193**	2.410	0.016	0.754***	-2.743	0.006
2011	0.209***	2.599	0.009	0.776**	-2.488	0.013
2012	0.379***	4.590	0.000	0.606***	-4.322	0.000
2013	0.273***	3.397	0.001	0.688***	-3.356	0.001
2014	0.261***	3.199	0.001	0.685***	0.685	0.000
2015	0.271***	3.308	0.001	0.700***	-3.365	0.001

5.2.1.3. Local spatial autocorrelation analysis

Besides global autocorrelation tests, which show an overall spatial pattern, I also conduct hot spot analyses to study the locally spatial pattern of corruption in Vietnam. The analyses detects clusters of high and low corruption level in Vietnam, based on Getis-Ord G_i^* local statistic (Ord & Getis, 1995). G_i^* statistic is a z-score, given by: $G_i^* = \frac{\sum_{i=1}^{N} w_{ij}x_i - \bar{X}\sum_{i=1}^{N} w_{ij}}{s\sqrt{\frac{\left[N\sum_{i=1}^{N} w_{ij}^2 - \left(\sum_{i=1}^{N} w_{ij}\right)^2\right]}{n-1}}}$

where $\bar{X} = \frac{\sum_{i=1}^{N} x_i}{N}$ and $S = \sqrt{\frac{\sum_{i=1}^{N} x_i^2}{n} - (\bar{X})^2}$. For a significantly positive G_i^* statistic (z-score), a larger z-score indicates a more intense cluster of high corruption level (hot spot). And for the

case of a significantly negative z-score, a smaller z-score reflects a more intense cluster of low corruption level (cold spot) (Jana & Sar, 2016). *Figure 5.2* shows the clusters of Vietnamese provinces with high corruption level and low corruption level from 2009 to 2015. G_i^* z-score is calculated using spatial matrix of five nearest neighbor. The maps reveal two hot spots where provinces with high corruption level cluster. The first spot is northern mountainous area where the cluster of high corruption level can be observed from 2009 to 2015. The second cluster, which can be seen in 2009-2012, is in the southern central region. Contrarily, the southern provinces around Ho Chi Minh City is a cold spot with cluster of low corruption level.

Figure 5.2: Clusters of provinces with high corruption level and low corruption level

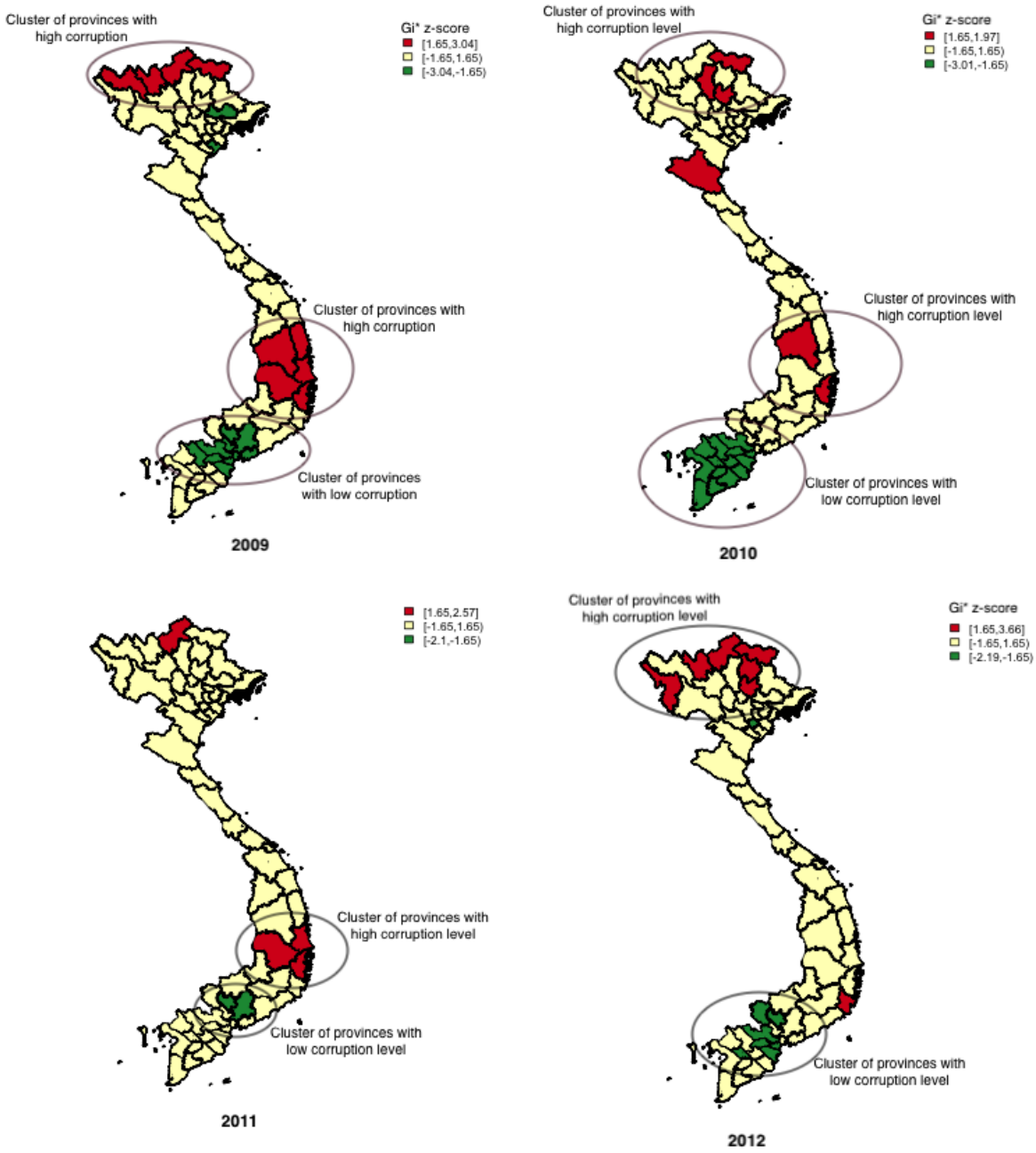
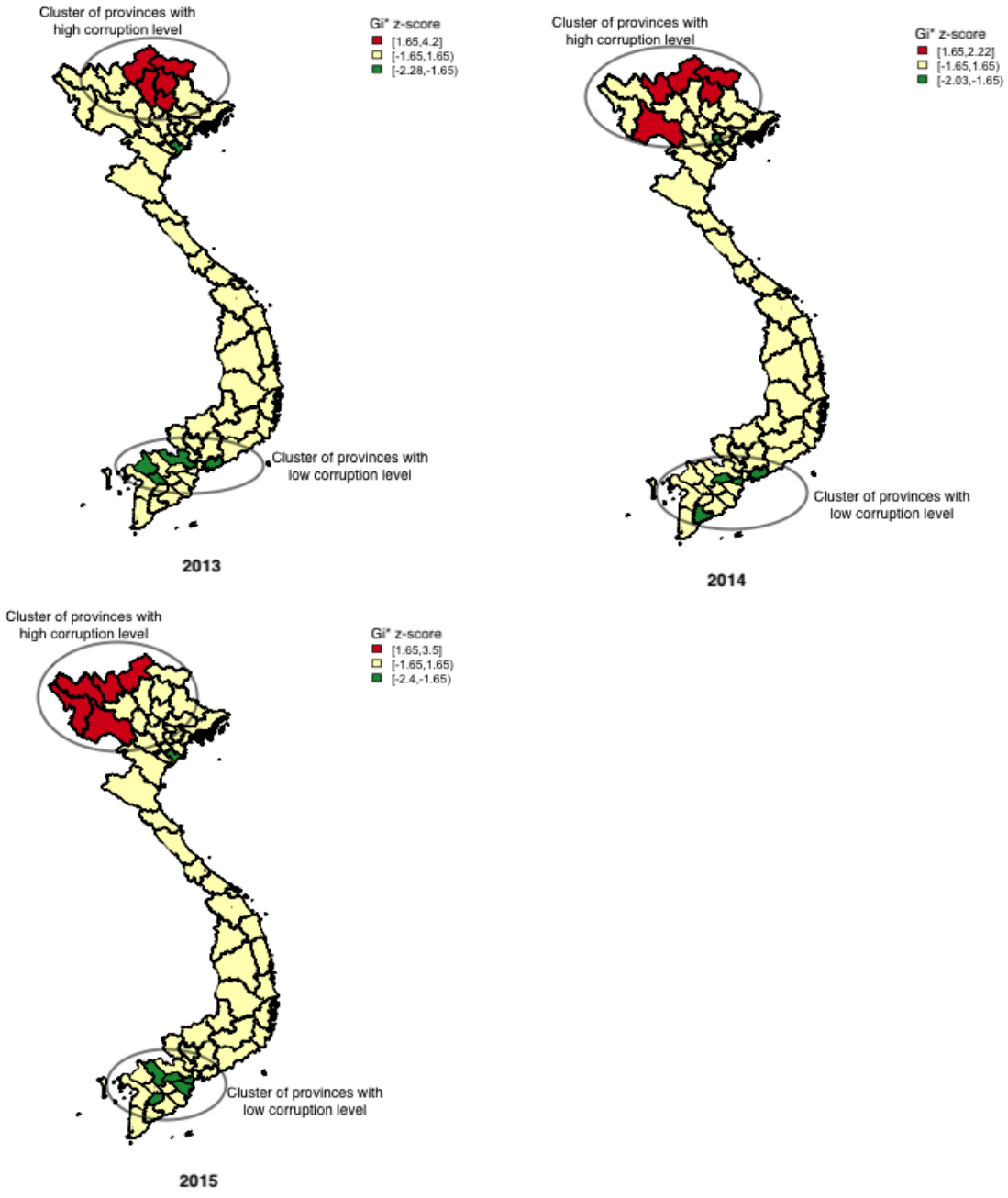


Figure 5.2 continued



Both *Figure 5.1* and results of spatial autocorrelation tests in *Table 5.1* suggest the positive interdependences of corruption index among neighboring Vietnamese provinces/cities. Additionally, local spatial autocorrelation analysis presents the clustering of high corruption level in the North and low corruption level in the South. Of course, those results cannot prove the spread of corruption among regions in Vietnam. As suggested by Márquez et al. (2011), the similar phenomenon between neighbors might be caused by the similarity of their

characteristics rather than the spillover of corruption. Nonetheless, we cannot ignore the spatial interdependence and rule out the potential existence of the contagion of corruption, either. Ignoring the spatial dependence of corruption in estimating the effects of various factors on corruption might lead to biased estimation results and inaccurate interpretation of how determinants of corruption deliver their impacts on corruption level of provinces/cities. Therefore, it is necessary to add the spatial lag corruption variables in the main estimation model.

5.2.2. Empirical model

I employ a dynamic spatial autoregressive model (SAR), in which both the spatial lag and time lag of dependent variable are included. This model have been used by López-Valcárcel et al. (2017) and Donfouet et al. (2018).

$$C_{it} = \tau C_{it-1} + \delta W_{ij} C_{it} + \eta W_{ij} C_{it-1} + \sum_{i=1}^{N} \beta_i X_{it} + \alpha_i + \epsilon_t + \varepsilon_{it} \qquad (5.1)$$

The dependent variable is C_{it}, which refers to corruption level of province *i* at the year *t*. Corruption is a phenomenon that persists in the society over time, the current level of corruption highly depends on the phenomenon in the past. According to Sah (2007), the past reality of corruption that individuals face would alter their current perception, hence their choice of engaging in corrupt acts. Corrupt acts of individuals in turn affect to current reality of corruption. As a result, the past corruption influences the present one and corruption persists in society. Therefore, one important explanatory variable is the corruption level of the last period, C_{it-1}. X_{it} expresses anti-corruption initiative variables by local government and control variables. This study focuses on the endeavors to improve institutional quality as anti-corruption policies of Vietnamese provincial government. The governance quality variables, which are considered, are regulation burden, bottom-up corruption monitoring, and transparency. Control variables are two significant determinants that appear repeatedly in the previous studies, namely, real per capita GDP and educational level. In addition, results of chapter 5 suggest that construction and natural resources exploitation sectors are two most corrupt industries in Vietnam; hence the contribution of these two sectors is also added as a control variable to check the robustness of main estimation results.

In their empirical work, Donfouet et al. (2018) only include the spatial lag of corruption, $W_{ij} C_{it}$, to capture the spillovers of corruption across geographical boundaries. However, as Sah (2007) pointed out, the current phenomenon of corruption highly depends on the phenomenon

of the past, in this study, I argue that the last period' corruption level of its neighbors also plays a role in determining the present corruption level of a province/city. Hence, the space-time lag of corruption level, $W_{ij}C_{it-1}$, is included in the empirical model. W_{ij} is the spatial weighted matrix.

The variables in equation (1) could be explained in matrix forms as follows.

$$C_{it} = \begin{bmatrix} C_{1t} \\ C_{2t} \\ \vdots \\ C_{nt} \end{bmatrix}_{n\times 1} \qquad C_{it-1} = \begin{bmatrix} C_{1t-1} \\ C_{2t-1} \\ \vdots \\ C_{nt-1} \end{bmatrix}_{n\times 1}$$

$$W_{ij} = \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1n} \\ w_{21} & w_{22} & \cdots & w_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ w_{n1} & w_{n2} & \cdots & w_{nn} \end{bmatrix}_{n\times n} \qquad X_{it} = \begin{bmatrix} x_{11t} & x_{12t} & \cdots & x_{1mt} \\ x_{21t} & x_{22t} & \cdots & x_{2mt} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1t} & x_{n2t} & \cdots & x_{nmt} \end{bmatrix}_{n\times m}$$

where: $w_{ii} = 0$; if $i \neq j$: $\begin{cases} w_{ij} = 1 \; if \; province \; i \; and \; j \; are \; neighbor \\ w_{ij} = 0 \; if \; province \; i \; and \; j \; are \; not \; neighbor \end{cases}$

and *n* is the number of regions, m is the number of control variables, X_{it}.

In this study, all the weighted matrices are in row standardized form, which means the sum of the value of row elements add up to one. In the main estimations, I analyze the contagious corruption using contiguity matrix in which provinces are considered neighbors if they are contiguous. For robustness check tests, I run the regressions using spatial weighted matrices based on other geographical characteristics. The first one is the matrix of the five nearest neighbors. In this matrix, if province *j* is one of the five nearest neighbors of province *i* based on the distance between their capitals, they will be considered neighbors and $w_{ij} = 1$. In the second one, provinces are considered neighbors if the distance between their capital is less than 105 kilometers[41]. In the last one, provinces in the same regions would be treated as neighbors[42].

Baltagi et al. (2014) point out that dynamic spatial panel data model suffers serious problem of endogeneity of spatial lag and time-lagged dependent variables problem and the estimation that fail to address this problem would lead to biased and inconsistent estimated coefficient. Furthermore, as pointed out by Jetter and Parmeter (2018), one of severe problems in studying the determinants of corruption is the endogeneity problem that arises by reverse causality. Income, education, and governance quality are significant determinant of corruption

[41] With 105 kilometers, every province/city has at least one neighbor.

[42] Based on socioeconomic characteristics, Vietnam is divided into 6 regions: Northwest and Northeast, Red River Delta, Central Coast, Central Highland, Southeast, and Mekong Delta.

but corruption have influences on these factors as well. Because of the endogeneity problem, Baltagi et al. (2014), Bouayad-Agha and Védrine (2010), and Kukenova et al. (2009) recommend using GMM estimator for dynamic spatial panel data models. In this study, I will apply GMM method for estimation purpose.

5.2.3. Short-term and long-term marginal effects for a spatial dynamic panel model

In a dynamic spatial panel data model, the effects of explanatory variables on a dependent variable differs in the short run and long run. Following Elhorst (2014), the effects in the short-term and long-term of a certain independent variable, x_k, on corruption take the following forms.

Short-term effects

$$\begin{bmatrix} \frac{\partial E_{(C1)}}{\partial x_{1k}} & \frac{\partial E_{(C1)}}{\partial x_{2k}} & \cdots & \frac{\partial E_{(C1)}}{\partial x_{nk}} \\ \frac{\partial E_{(C2)}}{\partial x_{1k}} & \frac{\partial E_{(C2)}}{\partial x_{2k}} & \cdots & \frac{\partial E_{(C2)}}{\partial x_{nk}} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{\partial E_{(Cn)}}{\partial x_{1k}} & \frac{\partial E_{(Cn)}}{\partial x_{2k}} & \cdots & \frac{\partial E_{(Cn)}}{\partial x_{nk}} \end{bmatrix}_{n \times n} = (I_n - \delta W)^{-1}(\beta_k I_n)$$

(5.2)

Long-term effects

$$\begin{bmatrix} \frac{\partial E_{(C1)}}{\partial x_{1k}} & \frac{\partial E_{(C1)}}{\partial x_{2k}} & \cdots & \frac{\partial E_{(C1)}}{\partial x_{nk}} \\ \frac{\partial E_{(C2)}}{\partial x_{1k}} & \frac{\partial E_{(C2)}}{\partial x_{2k}} & \cdots & \frac{\partial E_{(C2)}}{\partial x_{nk}} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{\partial E_{(Cn)}}{\partial x_{1k}} & \frac{\partial E_{(Cn)}}{\partial x_{2k}} & \cdots & \frac{\partial E_{(Cn)}}{\partial x_{nk}} \end{bmatrix}_{n \times n} = [(1 - \tau)I_n - (\delta + \eta)W]^{-1}(\beta_k I_n)$$

(5.3)

where W is the spatial weighted matrices, I_n is the identity matrix of order n.

Each element of the matrices above presents the effects of the change in x_k in one region on corruption level of that region (direct effect) or other region (indirect effect). The diagonal elements, $\frac{\partial C_i}{\partial x_{ik}}$, present the direct effects, and the off-diagonal elements, $\frac{\partial C_i}{\partial x_{jk}}$, present the indirect effects. Elements of row *i* exhibit the marginal effects of factor x_k in all regions on corruption level of region *i*, and those of column *i* show the marginal effects of factor x_k in region *i* on corruption level of all regions. The direct effect ($\frac{\partial C_i}{\partial x_{ik}}$), which indicates how a change in x_k in region *i* impacts corruption level of that region, includes not only the immediate impact of x_k

on C_i (β_k) but also the feedback loops that occurs due to global spillovers. For instance, corruption of region *i* affects corruption of its neighboring region *j*, and corruption of region *j* would impact those of its neighbors *k* and *h,* and back to *i*. Because of this process, the direct effects of one factor (x_k) would be slightly different with the estimated coefficient (β_k) and differ between regions because of the feedback effect (LeSage & Dominguez, 2012). The similar process takes place for the case of the indirect impacts; hence a change of x_k causes not only changes of corruption of its neighbors but all other regions. When we take the spatial spillovers of corruption into account, the analyses might results in strikingly different with those produced by analyses that do not consider the spatial spillovers (LeSage & Dominguez, 2012). In the latter case, the interdependence between regions is assumed to be non-existing; there is no spatial spillover, hence all off-diagonal elements equal zero and the direct effect of x_k equals β_k for all regions. In the case of a spatial model, estimating the marginal effect and interpreting the coefficients would be much more complex because the factor in one region would influence in all regions differently. For example, this study covers 63 Vietnamese provinces/cities, we have to compute (63 x 63) elements to report the detailed effects of one explanatory variable on corruption level. Therefore, Golgher and Voss (2016), Lesage and Pace (2009), and LeSage and Dominguez (2012) suggest to estimate the average direct, indirect and total impacts of x_k on the dependent variable.

5.3. Data

Data used for this work is a panel data set that covers all 63 Vietnamese provinces/cities in the period of 7 years, from 2009 to 2015. I obtained the data from three sources, namely, Vietnamese provinces/cities' statistical yearbooks, Vietnam Population Change and Family Planning and Population and Housing Survey published by Vietnamese General Statistics Office (GSO), and The Vietnam Provincial Competitiveness Index (PCI) that compiled by the Vietnam Chamber of Commerce and Industry (VCCI) and the United States Agency for International Development (USAID). I computed deflated GDP per capita *(y)*, using GDP and population data from Provincial Statistical Yearbook 2010, 2013, and 2015[43]. Contribution of construction and natural resource exploitation sectors, the proportion of value added of two sectors to provincial GDP, are computed based on data from Provincial Statistical Yearbooks as well. GSO's Vietnam Population Change and Family Planning and Family and Housing Survey

[43] The statistical yearbooks of provinces/cities usually contain the statistics of the current year and two previous years.

provides me the data on enrollment rates. After decades of anti-illiteracy and primary educational universalization campaign by Vietnamese government, although there still exists the vast disparity of educational achievements, the literacy rates and primary enrollment rates are quite equal among provinces/cities. For that reason, I choose to use local high school enrollment rates as a proxy for educational level of local citizens.

The data on corruption and governance factors is available from PCI dataset that is compiled annually by PCI team under the collaboration of VCCI and USAID. This dataset is constructed by PCI team based on the responses of thousands of domestic firms that are chosen randomly on a comprehensive questionnaire about the ease of doing business in Vietnamese provinces/cities. Since the first version in 2005, PCI dataset has become one of the most trustable sources of information that assist scholars and provincial leaders to assess provincial institutional elements that are vital for firms. Petty corruption category that is measured based on enterprises' perception and experiences is one of key factors of PCI dataset. Corruption index used in this study is the proportion of firms in provinces/cities that pay more than one tenth of their revenue for informal expense. This index is calculated by PCI team based on responses of firm managers with how much informal cost firms have to pay to government officials, as a share of revenue. I adopt this index because it is the most objective one among all the indexes regarding informal charge paid by firms.

The data of the following institutional quality elements are also collected from PCI. Following is the details of these factors.

Regulation burden	Proportion of firms that spend over 10 percent of their time on understanding and complying with regulations.
Monitoring	Proportion of firms that answered that provincial legal system always or usually provides mechanism for firms to appeal officials' corrupt behavior.
Lack of Transparency	Proportion of firms that consider relationship is important or very important to access to provincial documents. In principle, firms are free to gain access to provincial documents regardless of their relationship with government officials. Therefore, a higher number on this index means less transparency.

The spatial lag and space-time lag of corruption variables depend on the choice of the weight matrix. I compute these two variables, using four different weighted matrices, as following functions.

$$\text{Spatial lag of corruption: } W_{ij} \times C_{it} = \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1n} \\ w_{21} & w_{22} & \cdots & w_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ w_{n1} & w_{n2} & \cdots & w_{nn} \end{bmatrix}_{n\times n} \times \begin{bmatrix} C_{1t} \\ C_{2t} \\ \vdots \\ C_{nt} \end{bmatrix}_{n\times 1}$$

$$\text{Space-time lag of corruption: } W_{ij} \times C_{it-1} = \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1n} \\ w_{21} & w_{22} & \cdots & w_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ w_{n1} & w_{n2} & \cdots & w_{nn} \end{bmatrix}_{n\times n} \times \begin{bmatrix} C_{1t-1} \\ C_{2t-1} \\ \vdots \\ C_{nt-1} \end{bmatrix}_{n\times 1}$$

Beside the row standardized contiguity matrix (W_c) used in the main analysis, I use three additional spatial matrices, namely matrix of five nearest neighbors (W_{5n}), matrix of within distance neighbors (W_d), and in the same region neighbors matrix (W_{reg}), in robustness check tests.

Table 5.2 and *Table 5.3* show descriptive statistics and correlation matrix of the data used, respectively. Details of the data indicate the vast disparity in term of not only corruption level but also other factors among provinces/cities within Vietnam. Correlation between provincial income level and total contribution of construction and natural resources sectors is quite high (around 0.6096). The positively linear relationship between two variables raises the concern about multicollinearity problems between variables, both of which presents the economic performance of Vietnamese provinces/cities. Therefore, most of regression models in this study only include income level *(y)* as a control variable that present economic performance. The contribution of construction and natural resources sectors will be included to check the robustness results of the main estimation.

Table 5.2: Descriptive statistics

Variable	Details	Obs	Mean	Std. Dev.	Min	Max
C	Corruption index	441	0.090	0.052	0.000	0.280
y	Real GDP per capita (base year: 2010) (unit: million VND)	441	28.816	31.074	6.693	270.064
HEnrol	Net high School enrollment rates	441	0.586	0.155	0.200	0.893
Regu	Regulation burden	441	0.216	0.109	0.030	0.510
Monitor	Monitoring	441	0.300	0.097	0.090	0.700
LTrans	Lack of Transparency	441	0.676	0.126	0.300	0.960
ConRe	Share of value added of construction and natural resources sectors in provincial GDP	430	0.105	0.095	0.02	0.72
WcC	Spatial lag of corruption, using contiguity matrix	441	0.090	0.035	0.020	0.210
W5nC	Spatial lag of corruption, using 5 nearest neighbors matrix	441	0.088	0.032	0.020	0.192
WdC	Spatial lag of corruption, using neighbor within distance matrix	441	0.089	0.038	0.020	0.270
WregC	Spatial lag of corruption, using neighbor in the same region matrix	441	0.090	0.034	0.028	0.176

Table 5.3: Correlation matrix

	C	L.C	y	HEnrol	Regu	Monitor	LTrans	WcC	W5nC	WdC	WregC	ConRe
C	1											
L.C	0.4904	1										
y	-0.1066	-0.1642	1									
HEnrol	-0.0818	-0.1152	0.1799	1								
Regu	0.4554	0.2347	0.0902	0.0616	1							
Monitor	-0.1373	-0.1077	-0.0222	-0.0841	0.0439	1						
LTrans	0.2704	0.2454	-0.1044	-0.0209	0.1916	-0.0554	1					
WcC	0.5385	0.4215	-0.1614	-0.0009	0.4807	-0.1684	0.2323	1				
W5nC	0.5295	0.4282	-0.1413	0.0108	0.5396	-0.1364	0.2347	0.907	1			
WdC	0.5559	0.4241	-0.152	-0.0801	0.4766	-0.1624	0.2188	0.8687	0.8348	1		
WregC	0.5688	0.4464	-0.1569	-0.0054	0.5561	-0.0963	0.2595	0.7766	0.8149	0.7099	1	
ConRe	0.2071	0.2033	0.6096	0.0944	0.081	0.1169	-0.1024	0.1548	0.1451	0.1265	0.1461	1

5.4. Results

5.4.1. Main estimation results

Table 5.4 presents results of the main estimations in which I apply system GMM method for dynamic spatial panel data models that are expressed by formula (5.1). In all regressions, I add three control variables that have been regarded as key determinants of corruption, namely, 1-year lagged corruption index, GDP per capita, and education that is presented by net high school enrollment rates. I also include spatial lag or space-time lag of corruption or both to control for the contagion of corruption. Additionally, I run a regression without the spatial lag variable in order to reveal how the results might change if we ignore the contagion of corruption. Column (5) presents result of this regression. Model (1) leave out anti-corruption initiative variables and model (2) to (4) only comprise one of them. In this section, I will pay more attention to discussing the results that are shown in column (7), which presents estimation results when all variables of interest are included. Results of Arellano-Bond tests and Hansen tests validate the GMM tests outcomes. The significantly negative value of $\tau + \delta + \eta - 1$ indicates that the estimations satisfy the restriction on the stationarity of the spatial dynamic panel data model shown in equation *(5.1)* (Ciccarelli & Elhorst, 2018).

The results show consistent estimated coefficients for all explanatory variables. The significantly positive sign of time-lagged corruption confirms the persistence of corruption in society. It indicates that the extent of corruption in the past that had been experienced by players would last in their mind, affecting their behavior in the present, and thus impacts the current level of corruption. Furthermore, this implies that corrupt acts in societies cannot be abolished instantly, and anti-corruption campaigns by governments only work if the governments could retain them for a long time.

Education plays a significant role in reducing petty corruption, while income appears to have no effects. Regarding the anti-corruption initiative variables, all three elements got significant results with expected sign. More complex regulation and less transparency come with higher proportion of firms that have to pay at least ten percent of their revenue for informal cost. Meanwhile, bottom-up monitoring that allows firms to denounce corrupt behaviors of public official comes with lower level of petty corruption. These results confirm what have been suggested by scholars and policy advisors. Improving institutional quality would help to reduce corruption. Particularly, in this work, I focus on petty corruption behavior in Vietnam, a

country where firms bribe civil servants on the daily basis for various reasons, from avoiding taxes, obtaining certificate, to gaining access to official documents.

Although the fact that improving governance quality results in less level of daily corruption is not something that has been discovered only recently, the presence of spatial spillovers leads to different interpretation of how governance quality factors influence corruption. If we do not take the spread of corruption across geographical boundaries into account, such as the case of model (5) in Table 4, we assume that there is no interdependence of corruption level among provinces/cities. In this case, improving governance quality of a province/city, for instance, Hanoi, reduces bureaucratic corruption in that city only, there is no effect on other provinces/cities. However, the robust significant results of spatial lag of corruption *(WcC)* prove the spatial spillovers of daily corrupt behavior, hence the mechanism would be much more complex.

Table 5.4: Main estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	C	C	C	C	C	C	C	C
L.C	0.276***	0.268***	0.269***	0.267***	0.316***	0.291***	0.262***	0.235***
	(0.0855)	(0.0796)	(0.0799)	(0.0868)	(0.0717)	(0.0700)	(0.0746)	(0.0725)
WcC	0.234**	0.277**	0.236**	0.200*		0.357***	0.238**	0.201*
	(0.116)	(0.114)	(0.108)	(0.116)		(0.115)	(0.109)	(0.111)
L.WcC	0.160	0.171	0.159	0.158			0.166	0.130
	(0.109)	(0.108)	(0.113)	(0.105)			(0.107)	(0.110)
y	2.91e-05	8.27e-06	4.98e-05	1.45e-05	-6.06e-05	-1.02e-05	7.76e-06	-0.000169
	(5.64e-05)	(5.29e-05)	(4.44e-05)	(5.99e-05)	(5.37e-05)	(5.01e-05)	(4.83e-05)	(0.000132)
HEnrol	-0.0981***	-0.0709**	-0.0841***	-0.100***	-0.0591*	-0.0523**	-0.0624**	-0.0581**
	(0.0342)	(0.0284)	(0.0292)	(0.0336)	(0.0314)	(0.0259)	(0.0252)	(0.0246)
Regu		0.148***			0.153***	0.149***	0.141***	0.131***
		(0.0460)			(0.0486)	(0.0469)	(0.0462)	(0.0474)
LTrans			0.0912***		0.0848***	0.0815***	0.0814***	0.0768***
			(0.0271)		(0.0253)	(0.0250)	(0.0255)	(0.0250)
Monitor				-0.0449**	-0.0697***	-0.0476**	-0.0508**	-0.0537**
				(0.0225)	(0.0245)	(0.0232)	(0.0230)	(0.0250)
ConRe								0.0826*
								(0.0493)
Constant	0.112***	0.0396	0.0369	0.0977***	0.0397	-0.00721	-0.00122	0.0105
	(0.0237)	(0.0260)	(0.0265)	(0.0221)	(0.0282)	(0.0290)	(0.0279)	(0.0305)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	-4.56	-4.48	-4.53	-4.56	-4.22	-4.32	-4.46	-4.40
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
AR(2)	0.11	0.36	-0.17	-0.04	0.00	-0.10	-0.07	-0.04
	(0.909)	(0.719)	(0.863)	(0.965)	(0.997)	(0.917)	(0.944)	(0.965)
Hansen	46.67	55.35	56.48	50.37	55.37	54.72	54.27	52.77
	(0.324)	(0.386)	(0.346)	(0.577)	(0.610)	(0.895)	(0.951)	(0.999)
$\tau + \delta + \eta - 1$	-0.330**	-0.284**	-0.336**	-0.375***	-0.684***	-0.351***	-0.334***	-0.434***
	(0.137)	(0.129)	(0.129)	(0.141)	(0.072)	(0.126)	(0.126)	(0.133)
Obs	378	378	378	378	378	378	378	372
Number of id	63	63	63	63	63	63	63	63

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Column (5) of *Table 5.4* shows results without the spatial lag. Obviously, the coefficients of independent variables are not identical with those outcomes in column (6) and (7). The dissimilarity exists not only in terms of the magnitude of the impacts but also the transmission channels from improving education and governance quality to diminishing corrupt behaviors. For instance, in model (5), the coefficient of regulation burden variable equals 0.153; if regulation burden of one province or city increases by one standard deviation (0.109) would increase the corruption level of that province/city by 1.67 percent. The impact of regulation burden on corruption is assumed to stop there; its effect does not expand to other provinces/cities in this model. However, as discussed above, corruption is a contagious social phenomenon, and because the interactions between individuals take place every day, the process would not end as such case.

5.4.2. Contagion effects and positive externalities of anti-corruption policies

Column (6) and (7) of *Table 5.4* show results when the contagion of corruption is included in the analysis. Enhancing institutional quality of one province, first, leads to a reduction in corruption index of that province. Then, the spillovers take place, resulting in the decrease of corruption level of first-level neighbors those share border with the original province, second-level neighbors those are contiguous with the first-level neighbors, and so on; these changes in other provinces, in turn, cause a feedback loop on the original province.

Table 5.5 shows the direct effects of institutional quality variables on corruption index in both short-term and long-term. First, I will take the case of Hanoi as an instance to illustrate how anti-corruption policies would work. In the short term, direct effect of regulation burden on corruption index of Hanoi stands at around 0.14272, slightly different from the estimated coefficient of regulation burden shown in column (7), *Table 5.4* (0.141). The small difference (0.00172) demonstrates the effects regulation burden of Hanoi on its level of corruption caused by a feedback loop rather than the immediate effect. The direct effects of regulation burden variable differ among provinces because even though we assume similar immediate effect, the feedback effects are dissimilar among regions. The same mechanism applies to other institutional quality factors and education variables as well. *Table 5.5* details the direct effect of each element for all 63 provinces/cities. One point should be noted here is that because of the positive spatial interdependence of corruption level between regions, the magnitude of the direct effects of determinants are slightly bigger than the immediate effects shown in *Table 5.4*.

On the other side, reducing regulation burden of Hanoi would influence corruption level of other provinces as well. Although the contagion leads to not only Hanoi's neighbors but also other provinces, the effects on its neighbors are more extended. For example, Bac Ninh is a first-level neighbor of Hanoi, they share border. In the short run, the marginal effect of Hanoi's regulation burden on corruption level of Bac Ninh stands around 0.00938, while those of Hai Duong, the second-level neighbor[44], is lower, approximately 0.000983. Theoretically, the change would head to far distant provinces, such as some provinces in southern Vietnam, but, in fact, the marginal effects are very small, almost equal to zero. Moreover, the corruption phenomenon in Hanoi is altered by regulation burden of other regions. Again, regulation burden of closer neighbors would matter more, compared to those of distant ones. The marginal effect of Bac Ninh's regulation burden on corruption level of Hanoi is around 0.00469, while the number for Hai Duong's regulation burden is about 0.000737 and those of distant regions are almost zero. Similar interpretation applies to the cases of other provinces/cities and factors.

If Hanoi's local government could maintain their anti-corruption policy by reducing regulation burden in the long time, the extent of both direct and indirect effects would be much higher than the short-term effects. In the long-run, the marginal direct effects stands around 0.20708, compared to only 0.14272 in the short-run. Moreover, the magnitude of indirect effects on other provinces also bigger. For instance, the long-term indirect impacts on corruption level of Bac Ninh is approximately 0.0378, compared to 0.00938 in the short-term.

Table 5.5: Direct effects

Provinces/cities	Short-term			Long-term		
	Regulation Burden	Lack of Transparency	Monitoring	Regulation Burden	Lack of Transparency	Monitoring
Ha Noi	0.14272	0.08239	-0.05142	0.20708	0.11955	-0.07461
Hai Phong	0.14278	0.08243	-0.05144	0.20662	0.11928	-0.07444
Vinh Phuc	0.14232	0.08216	-0.05128	0.20261	0.11697	-0.073
Bac Ninh	0.14246	0.08224	-0.05132	0.20411	0.11783	-0.07354
Hai Duong	0.14314	0.08263	-0.05157	0.2115	0.1221	-0.0762
Hung Yen	0.14262	0.08234	-0.05138	0.20603	0.11894	-0.07423
Ha Nam	0.14293	0.08252	-0.0515	0.20926	0.12081	-0.07539
Nam Dinh	0.14278	0.08243	-0.05144	0.20657	0.11925	-0.07442

[44] Though Hai Duong and Hanoi are not contiguous, they both share border with Bac Ninh, hence they are considered as second-level neighbors.

Thai Binh	0.14312	0.08262	-0.05156	0.21029	0.1214	-0.07577
Ninh Binh	0.14301	0.08256	-0.05152	0.20883	0.12056	-0.07524
Ha Giang	0.14295	0.08252	-0.0515	0.20834	0.12028	-0.07506
Cao Bang	0.14285	0.08247	-0.05147	0.20756	0.11982	-0.07478
Lao Cai	0.14294	0.08252	-0.0515	0.20812	0.12015	-0.07498
Bac Kan	0.1427	0.08238	-0.05141	0.20657	0.11926	-0.07443
Lang Son	0.14292	0.08251	-0.05149	0.2084	0.12031	-0.07508
Tuyen Quang	0.14295	0.08253	-0.0515	0.20962	0.12101	-0.07552
Yen Bai	0.143	0.08255	-0.05152	0.21028	0.1214	-0.07576
Thai Nguyen	0.14269	0.08238	-0.05141	0.20675	0.11936	-0.07449
Phu Tho	0.1425	0.08227	-0.05134	0.20473	0.11819	-0.07376
Bac Giang	0.14274	0.0824	-0.05143	0.20722	0.11963	-0.07466
Quang Ninh	0.14289	0.08249	-0.05148	0.20784	0.11999	-0.07488
Lai Chau	0.14356	0.08288	-0.05172	0.21413	0.12362	-0.07715
Dien Bien	0.14279	0.08243	-0.05144	0.20628	0.11909	-0.07432
Son La	0.14324	0.08269	-0.05161	0.21174	0.12224	-0.07629
Hoa Binh	0.14269	0.08237	-0.05141	0.20666	0.11931	-0.07446
Thanh Hoa	0.1433	0.08273	-0.05163	0.21081	0.1217	-0.07595
Nghe An	0.1441	0.08319	-0.05192	0.21702	0.12529	-0.07819
Ha Tinh	0.14516	0.0838	-0.0523	0.22685	0.13096	-0.08173
Quang Binh	0.14516	0.0838	-0.0523	0.22716	0.13114	-0.08184
Quang Tri	0.14446	0.0834	-0.05205	0.22091	0.12753	-0.07959
Thua Thien Hue	0.14462	0.08349	-0.0521	0.22408	0.12936	-0.08073
Da Nang	0.14357	0.08288	-0.05173	0.21451	0.12384	-0.07728
Quang Nam	0.14418	0.08324	-0.05195	0.22129	0.12775	-0.07973
Quang Ngai	0.14352	0.08286	-0.05171	0.21512	0.12419	-0.07751
Binh Dinh	0.14306	0.08259	-0.05154	0.20987	0.12116	-0.07561
Phu Yen	0.14318	0.08266	-0.05159	0.21113	0.12188	-0.07607
Khanh Hoa	0.14303	0.08257	-0.05153	0.20941	0.12089	-0.07545
Kon Tum	0.14308	0.0826	-0.05155	0.21034	0.12143	-0.07578
Gia Lai	0.1435	0.08285	-0.0517	0.21536	0.12433	-0.07759
Dak Lak	0.1431	0.08261	-0.05156	0.21053	0.12154	-0.07585
Dak Nong	0.14256	0.0823	-0.05136	0.20453	0.11808	-0.07369
Lam Dong	0.14329	0.08272	-0.05163	0.21351	0.12326	-0.07693
Ho Chi Minh	0.14318	0.08266	-0.05158	0.21152	0.12211	-0.07621

Ninh Thuan	0.14285	0.08247	-0.05147	0.20724	0.11964	-0.07467
Binh Phuoc	0.14302	0.08257	-0.05153	0.20953	0.12096	-0.07549
Tay Ninh	0.14291	0.08251	-0.05149	0.20836	0.12029	-0.07507
Binh Duong	0.14276	0.08242	-0.05144	0.20747	0.11977	-0.07475
Dong Nai	0.14305	0.08258	-0.05154	0.21082	0.12171	-0.07595
Binh Thuan	0.14313	0.08263	-0.05157	0.21006	0.12127	-0.07568
Ba Ria Vung Tau	0.14269	0.08237	-0.05141	0.20578	0.1188	-0.07414
Long An	0.14279	0.08243	-0.05144	0.20695	0.11948	-0.07456
Dong Thap	0.14299	0.08255	-0.05152	0.20921	0.12078	-0.07538
An Giang	0.14275	0.08241	-0.05143	0.20655	0.11924	-0.07442
Tien Giang	0.14293	0.08252	-0.0515	0.20865	0.12045	-0.07517
Vinh Long	0.14328	0.08271	-0.05162	0.21363	0.12333	-0.07697
Ben Tre	0.14295	0.08253	-0.0515	0.20811	0.12015	-0.07498
Kien Giang	0.14368	0.08294	-0.05176	0.21645	0.12496	-0.07798
Can Tho	0.14296	0.08253	-0.05151	0.20977	0.1211	-0.07558
Hau Giang	0.1429	0.0825	-0.05149	0.20963	0.12102	-0.07553
Tra Vinh	0.1431	0.08261	-0.05156	0.20947	0.12093	-0.07547
Soc Trang	0.14303	0.08257	-0.05153	0.20962	0.12102	-0.07552
Bac Lieu	0.14356	0.08288	-0.05172	0.21469	0.12394	-0.07735
Ca Mau	0.14295	0.08252	-0.0515	0.20803	0.1201	-0.07495

Table 5.6: Average direct, indirect, and total effects

	Short-run effects			Long-run effects		
	Direct	Indirect	Total	Direct	Indirect	Total
Regulation Burden	0.1431	0.0419	0.1850	0.2105	0.2104	0.4209
Lack of Transparency	0.0826	0.0242	0.1068	0.1215	0.1215	0.2430
Monitoring	-0.0516	-0.0151	-0.0667	-0.0758	-0.0758	-0.1516

The illustrated details above show that improving institutional quality is an effective strategy to reduce corruption level of Vietnamese provinces/cities. Moreover, due to the contagion effect of corruption, successful anti-corruption initiatives have positive externalities that occur across both geographical border and time with considerable magnitudes. Regarding the externalities that arise beyond geographical border, the indirect effects, which show the

extent of a reduction in corruption level caused by improving institutional quality of other provinces, are obvious demonstration. The extent of these positive externalities is considerable and differs, depending on the distance between provinces/cities. Institutional quality improvement in one province would deliver more significant positive effects on corruption level of its neighboring provinces/cities than those faraway. In addition, the feedback loops suggest another channel of externalities, which affect the original provinces. The magnitude of this sort of positive externalities are quite small. *Table 5.6* shows the average marginal effects of institutional factors on corruption. The indirect effects in both short-run and long-run indicate the size of positive externalities on other provinces/cities. The slight difference between the direct effects in *Table 5.6* and estimated coefficients in column (7), *Table 5.4* presents the extent of positive externalities of improving institutional quality in one province on corruption level of that province itself. In the long-run, the magnitude of both average direct and indirect effects of reducing regulation burden on corruption are much higher. Because the phenomenon of corruption in the past persist and affect its future phenomenon, if provincial government could maintain the improvement in a long-term, the effects would take place with greater extent. This suggests the substantial magnitude of positive externalities of successful anti-corruption policy across time.

5.4.3. Robustness check test results

I employ three different spatial matrices, based on different geographical factors to run robustness check tests. The first one is the matrix of the five nearest neighbors. In the second one, provinces are considered neighbors if the distance between their capital is less than 105 kilometers. In the last one, provinces/cities in the same regions would be treated as neighbors. *Table 5.7* presents results of these tests. Estimation results remain similar to those obtained in the main analysis. The estimated coefficients of time-lagged and spatial-lagged corruption are significantly positive in all regressions, confirming the persistence of corruption across time and the spillover of corruption beyond geographical boundaries. Additionally, estimation results suggest that reducing regulation burden, improving transparency, and providing a bottom-up monitoring system would reduce corruption at provincial level. These findings of robustness check tests reinforce what have been found in the main analysis.

Table 5.7: Estimation results using different spatial matrices

	(1)	(2)	(3)
VARIABLES	C	C	C
L.C	0.266***	0.254***	0.147**
	(0.0768)	(0.0800)	(0.0733)
W5nC	0.271*		
	(0.145)		
L.W5nC	0.205**		
	(0.103)		
WdC		0.298***	
		(0.0933)	
L.WdC		0.159*	
		(0.0954)	
WregC			0.393***
			(0.139)
L.WregC			0.190
			(0.127)
y	3.66e-06	1.04e-05	7.73e-06
	(4.79e-05)	(3.97e-05)	(4.20e-05)
HEnrol	-0.0478**	-0.0376*	-0.0459*
	(0.0231)	(0.0210)	(0.0251)
Regu	0.151***	0.148***	0.160***
	(0.0445)	(0.0447)	(0.0441)
LTrans	0.0818***	0.0796***	0.0653***
	(0.0260)	(0.0249)	(0.0252)
Monitor	-0.0572**	-0.0585***	-0.0615***
	(0.0243)	(0.0216)	(0.0228)
Constant	-0.0127	-0.0143	-0.0135
	(0.0259)	(0.0238)	(0.0275)
Year dummies	Yes	Yes	Yes
AR(1)	-4.42	-4.55	-4.63
	(0.000)	(0.000)	(0.000)
AR(2)	-0.08	-0.23	-0.50
	(0.933)	(0.820)	(0.616)
Hansen	55.81	58.21	51.29
	(0.933)	(0.897)	(0.975)
$\tau + \delta + \eta - 1$	-0.258*	-0.289***	-0.270*
	(0.143)	(0.087)	(0.140)
Observations	378	378	378
Number of _ID	63	63	63

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.5. Conclusions and discussions

This study addresses the old quest about the effectiveness and mechanism of the fight against corruption with a new approach. Several recent studies confirm the role of social interactions on corrupt behavior and the spread of corruption among citizens, firms, bureaucrats, regions, and countries and draw critical implications about the positive externalities of successful anti-corruption campaigns. What have been missed in the existing literature is that no studies have quantified and detailed these positive externalities in their empirical analysis. This article fills this gap and give more detailed discussion on the channels and extent of positive externalities that could emerged from effective anti-corruption policy for the case of provinces/cities within Vietnam.

The empirical findings suggest that improving institutional quality is an effective tool to reduce bureaucratic corruption in Vietnam. If provincial governments could manage to reduce regulation burden, enhance transparency, and provide better mechanism, through which firms are able to denounce the corrupt behavior of government officials, their endeavor could be paid off in lower corruption level in their provinces/cities. Furthermore, corruption tends to spread across geographical border. More severe corruption in the neighboring provinces/cities would cause adverse impacts on their provinces/cities and the anti-corruption effort of the provincial governments might be wasted; hence provinces and cities, especially who are neighbors, should come together in a joint-effort for more effective strategy. Enhancement of institutional quality in one province/city have positive externalities not only to other provinces, on itself, but also across time. The scale of the externalities are quite significant and differ depend on the distance of provinces/cities. Successful endeavor of one province/city would bring more favorable effects on its neighbors than those faraway.

Furthermore, the local spatial autocorrelation analysis reveals the clustering of high corruption level in northern mountainous area and southern central are of Vietnam. This finding is meaningful in term of policy implication for the Vietnamese central government. Considering the constrained resources intended for this campaign, it would be more effective if the government focuses on reducing corruption in these two areas, compared to the case the government put equal efforts on the campaign in all regions of the country.

This study has some limitations. Regarding the contagion of corruption, it treats the spreads as the same for all neighbors, regardless of their economic and demographic characteristics. That might not be a case. For instance, Ho Chi Minh is the biggest city in terms of both population and economy, the marginal effects of a change of its corruption level on its

neighbors should be more substantial than those small provinces, such as Tay Ninh. However, this work is incapable of controlling for such consideration. Moreover, the recent boom of communication technology and social media allows individuals to enjoy more interactions people in other regions, not only limited to those in geographical neighbors. Those communicating tool are potential channel of social interactions that facilitate the spread of corruption. This study is unable to cover those potential channels. Future research might address these limitations as the potential directions.

CHAPTER 6: CONCLUSION

6.1. Main findings

Aiming to address corruption phenomenon in Vietnam from various aspects, from consequences of corruption on both economic growth and human capital, determinants of corrupt behavior of firms, to anti-corruption strategies of government, this thesis is finalized in some conclusive remarks. First, overall corruption is harmful for two crucial facets of economic development, economic growth rates and human capital accumulation process. Nonetheless, the influences of corruption is complex, transmitting through various channels. Besides several negative ones, corruption might generate some favorable impacts on economic performance or human capital accumulation process. Second, various factors could play a role in determining corrupt behavior of Vietnamese firms. In addition to some factors that have been proved to be significant, namely, characteristics of firms, characteristics of firm executives, and the business environment that firms confront, the way other fellow firms behave is also proved to be an important determinant. This outcome suggests the contagion of corrupt acts in the society. Lastly, improving governance quality appear to be a valid strategy in the fight against corruption of Vietnamese government. Nonetheless, the implementing of this policy diverges among Vietnamese provinces/cities, depending on the incentive and devotion of local government leaders. The presence of spillover effects of corruption implies that a successful anti-corruption campaign requires the cooperation between provincial governments. Above that, successful effort of one province or city would generate considerable positive externalities to others and vice versa. The following part give more details on the key findings.

6.1.1. The effects of corruption on provincial economic growth

Chapter 2 investigates the consequences of corruption on economic growth by not only looking at a simple linkage between two variables but also zooming in on the transmission channels through which corruption delivers its impacts. The transmission channels include direct effects through the use of investment and other factors and an indirect one through the accumulation of investment. Outcomes of multiple tests confirm the hindrance of corruption to growth, aligning with the influential view in the literature. Disintegrating the transmission channels between the two results in more notable findings. Directly, corruption worsens economic growth by reducing the effectiveness of investment and total factor productivity. The surprising finding is that indirectly corruption might generate positive impact through

investment rates. There is a weak evidence that higher corruption level might, in fact, go with higher total investment rates, contradicting the findings of many influential studies. Regressions on three types of investment find a negative estimate effect of corruption on foreign investment but positive ones on domestic private and public investment. This finding implies interesting case of Vietnam, where foreign investors seem to be more sensitive to business environment than domestic investors.

6.1.2. The effects of corruption on human capital accumulation process of Vietnamese provinces/cities

Chapter 3 revisits the debate on what effects corruption might have on human capital by tracking the human capital accumulation process. I presume that human capital is accumulated through two processes, education and a process via which education outcomes is transformed into labor quality, a proxy for human capital. This chapter confirms an overall unfavorable impact of corruption on Vietnamese provinces/cities' human capital. A noteworthy point here is that besides negative impacts, corruption might also have its positive side. Corruption worsens human capital because it causes the ineffectiveness of public expenditure intended for education, lowering educational outcomes. In addition, after controlling for educational outcomes and training expenditure, findings of the second step imply a detrimental effect of corruption on labor quality. The possible explanation for the negative link is that corruption might cause the misappropriation of talent or motivate talented students migrate from highly corrupted region to less corrupted region. The positive effect of corruption might be observed in the educational process, which is a surprising finding. In order to explain that counterintuitive result, I examined the fund procurement and disbursement processes in Vietnam and constructed a model on the competition to acquire central government's funds among Vietnamese schools. The model suggests that schools belonging to an area with more prevalent corruption have more advantages in the competition because they could offer bigger amount of money for public officials who have full authorities on the allocation of the central government funds on education. As a result, provinces/cities with higher level of corruption are more likely to get funds from the central government, and respectively corruption helps to improve educational outcomes in those regions.

6.1.3. The determinants of Vietnamese firms' corrupt behavior: the role of corrupt behavior of their peers

Rather than a provincial level data, chapter 3 employs firm level data based on responses of around 8000 Vietnamese domestic businesses on a survey conducted by The Vietnam Provincial Competitiveness Index (PCI) team in 2012, attempting to identify the corrupt behavior of Vietnamese enterprises. This empirical work draws some interesting findings. Characteristics of firms, firm leaders, and the circumstances that firms face do matter in defining bribery behavior of firms, in term of both their participation in bribery and the size of bribe they make. Bigger and older firms appear to be more corrupt, while firms that own land use right certificate or partly owned by government, which are essential in defining their bargaining power, tend to be pay less informal cost. Characteristics of firm leaders, the people who make final decisions, are significant factors as well. Firms with female owners appear to engage less in bribery, at the same time, firms managed by former government officials tend to pay higher bribe. In addition, behavior of firms' peers, which are defined as firms in the same sector-province, is also important when it comes to bribery decisions of firms. Specifically, firms are more likely to pay informal charge when the ratio of their peer paying bribe increases. The probability a firm that is surrounded by all corrupt firms (all its peer make bribe) making bribe is 18.9 percent higher than that of another firm that is surrounded by all clean firms (none of its peer pay bribe). Furthermore, the propensity of paying bigger bribe size of firms and average size of that is paid by their fellows are also positively associated. These results give evidence on the spillovers of corruption among businesses as predicted in the literature. The outcome of this chapter implies the spread of corrupt practices in Vietnam, hence when it comes to analyzing anti-corruption policies we cannot ignore the contagion effect of corruption.

6.1.4. The effectiveness and positive externalities of anti-corruption initiative of Vietnamese provincial governments

Chapter 5 analyzes anti-corruption strategies of Vietnamese government. The most significant contribution of this chapter is that it addresses the issue with a new approach, allowing the econometric model to control for the spread of corruption across regions, a phenomenon that has been implied in the chapter 4. This paper results in three main conclusive points. The strategy that treats the improvement of institutional quality as a mean to reduce bureaucratic corruption of Vietnamese government appears to be a valid one. If Vietnamese

provincial governments could successfully improve transparency, reduce administrative burden, or provide a mechanism through which firms could expose corrupt acts of public servants, corruption level in the provinces/cities would decrease. Moreover, the significantly positive coefficients of both spatial lag and time lag of corruption suggest the existence of the spillovers of corruption across geographical border and time. A decrease in corruption level in one province/city would cause a reduction in corruption in its neighbors and vice versa. Tracking the spillovers of corruption shows that a successful improvement of institutional quality in one province generates positive externalities on its own, other provinces, and across time. The magnitude of positive externalities across geographical boundaries are significant, depending on the distance among entities. The magnitude is even getting more substantial if the successful campaigns could be maintained in the long term. Additionally, because highly corrupt Vietnamese provinces cluster in either northern mountainous area or southern central area, it would be much more effective if the Vietnamese government put more resources and efforts in the fight against corruption in these two regions.

6.2. Limitations and potential directions for future research

This study suffers from several drawbacks caused by many reasons, including the constraint on the available data, the scope of research, and the applied methodology.

The first limitation is the one regarding the used data in this thesis. Measuring corruption has long been a challenging task to any attempts of studying corruption because in most cases, these illegal acts are carried out behind the curtain and people who are involved in those acts tend to keep them in secrecy (Jain, 2001; Joshnston, 2001). This study relies on subjective perception of business, which raises the concerns whether it reflect the real phenomena of corruption.

Furthermore, among four main chapters, three of them take advantages of panel data on all 63 Vietnamese provinces and cities. Applying panel data is profitable in handling data in this study because it allows more efficient econometric models or more capable of controlling for omitted variables (Hsiao, 2007). However, the used panel data covers annual data quite a short period, only seven years from 2009 to 2015. The results of empirical work would be more convincing if it covers longer period and employs 5-year data rather than yearly data because we could observe more visible change of variables.

This empirical work in Chapter 4 also embodies some drawbacks due to the unavailability of data, which could be addressed in future works. Regarding bribery, there are always two sides, bribe givers (firms) and bribe receivers (public officials), and a comprehensive study on the causes of corruption should address the issue from both sides. However, due to the unavailability of data the empirical work is unable to investigate the causes of corruption from the bureaucratic side. Furthermore, this research is restricted only to the case of Vietnamese domestic firms. The corrupt practices of firms with foreign origin in Vietnam might differ with those of domestic firms. A study that includes the case of two groups might results in more insightful details.

The second drawback is due to the constraint of time and research scope. The research outcomes of Chapter 2 suggest the positive connections between corruption level and total investment rates. In addition, brief regression has been carried out and give weak evidence that corruption might have negative impact on foreign investment but positive impacts on domestic investment. A more sophisticated empirical works that concentrates on effects of corruption on investment decisions of domestic and foreign investors might results in more interesting findings for the case of Vietnam. Due to the constraint of time and research scope, the current study is unable to dig more deeply in the issue. Future investigations that focuses more on explaining these links could produce more insights into the case of Vietnam.

The last drawback is the one related to methodology issues. Chapter 5 embodies two major related limitations. First, this study assumes the spillovers of corruption to be equal among neighbors, regardless of the size of provinces/cities, which might not be the case. For instance, both Tay Ninh and Ho Chi Minh City are neighbors of Binh Duong, hence if these two regions succeed in limiting corruption at the same level, those improvements, would first reduce corruption in Binh Duong at the same scale. That might not be the case because Ho Chi Minh is much bigger than Tay Ninh in terms of both population and economy, hence its effect should be more significant than that of Tay Ninh. However, this paper cannot control for the size of provinces/cities in its empirical analysis. The second drawback is that it only considers the spread of corruption via geographical borders based on the reason that individuals in two neighboring regions get more chance for social interactions. Nonetheless, the recent technological progress, associating with more communicational tools, facilitates more social interactions among individuals regardless of the geographical proximity. As a result, the spread of corruption occurs through those modern tools as well. This paper is unable to control for the contagion of corruption via those tools. Future studies that could tackle two drawbacks above

would contribute more to the existing literature of the ongoing line of research about the contagion of corruption and positive externalities of successful anti-corruption policies.

REFERENCES

Anh, N. N., Minh, N. N., & Tran-Nam, B. (2016). Corruption and economic growth, with a focus on Vietnam. *Crime, Law and Social Change*, *65*(4–5), 307–324. doi: 10.1007/s10611-016-9603-0

Anselin, L. (2001). Spatial econometrics. In B. H. Baltagi (Ed.), *A companion to theoretical econometrics* (Vol. 310330). Blackwell Publishers.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297.

Aron, J. (2000). Growth and institutions: A review of the evidence. *The World Bank Research Observer*, *15*(1), 99–135.

Bac, M. (2001). Corruption, connections and transparency: Does a better screen imply a better scene? *Public Choice*, *107*(1–2), 87–96.

Bai, J., Jayachandran, S., Malesky, E. J., & Olken, B. A. (2019). Firm Growth and Corruption: Empirical Evidence from Vietnam. *The Economic Journal*, *129*(618), 651–677. doi: 10.1111/ecoj.12560

Baltagi, B. H., Fingleton, B., & Pirotte, A. (2014). Estimating and Forecasting with a Dynamic Spatial Panel Data Model*: *Dynamic spatial Panels*. *Oxford Bulletin of Economics and Statistics*, *76*(1), 112–138. doi: 10.1111/obes.12011

Barro, R. J. (1991). Economic growth in a cross section of countries. *The Quarterly Journal of Economics*, *106*(2), 407–443.

Becker, S. O., Egger, P. H., & Seidel, T. (2009a). Common political culture: Evidence on regional corruption contagion. *European Journal of Political Economy*, *25*(3), 300–310. doi: 10.1016/j.ejpoleco.2008.12.002

Becker, S. O., Egger, P. H., & Seidel, T. (2009b). Common political culture: Evidence on regional corruption contagion. *European Journal of Political Economy*, *25*(3), 300–310. doi: 10.1016/j.ejpoleco.2008.12.002

Benhabib, J., & Spiegel, M. M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics*, *34*(2), 143–173.

Bishop, J. H., & WößMann, L. (2004). Institutional Effects in a Simple Model of Educational Production. *Education Economics*, *12*(1), 17–38. doi: 10.1080/0964529042000193934

Blackburn, K., Bose, N., & Emranul Haque, M. (2010). Endogenous corruption in economic

development. *Journal of Economic Studies*, *37*(1), 4–25. doi: 10.1108/01443581011012234

Blanden, J. (2004). Family Income and Educational Attainment: A Review of Approaches and Evidence for Britain. *Oxford Review of Economic Policy*, *20*(2), 245–263. doi: 10.1093/oxrep/grh014

Bodewig, C., & Badiani-Magnusson, R. (2014). *Skilling up Vietnam: Preparing the workforce for a modern market economy*. World Bank Publications.

Boikos, S. (2016). Corruption, Public Expenditure and Human Capital Accumulation. *Review of Economic Analysis*, *8*(1), 17–45.

Bond, S., Hoeffler, A., & Temple, J. (2001). GMM estimation of empirical growth models. *CEPR Discussion Paper*, *No. 3048*.

Bouayad-Agha, S., & Védrine, L. (2010). Estimation Strategies for a Spatial Dynamic Panel using GMM. A New Approach to the Convergence Issue of European Regions. *Spatial Economic Analysis*, *5*(2), 205–227. doi: 10.1080/17421771003730711

Caselli, F., Esquivel, G., & Lefort, F. (1996). Reopening the convergence debate: A new look at cross-country growth empirics. *Journal of Economic Growth*, *1*(3), 363–389. doi: 10.1007/BF00141044

CECODES, VFF-CRT, RTA & UNDP. (2019). *The 2018 Viet Nam Governance and Public Administration Performance Index (PAPI): Measuring Citizens' Experiences. A Joint Policy Research Paper by the Centre for Community Support and Development Studies (CECODES), Centre for Research and Training of the Viet Nam Fatherland Front (VFF-CRT), Real-Time Analytics, and United Nations Development Programme (UNDP)*. Hanoi, Vietnam.

Chavis, L. (2013). Social networks and bribery: The case of entrepreneurs in Eastern Europe. *Journal of Comparative Economics*, *41*(1), 279–293. doi: 10.1016/j.jce.2012.11.002

Chow, S., & Dao Thi Nga. (2013). Bribes for enrollment in desired schools in Vietnam. In Transparency International (Ed.), *Global corruption report: Education* (pp. 60–67; By Transparency International). Retrieved from https://books.google.co.jp/books?id=BfdEAQAAQBAJ

Ciccarelli, C., & Elhorst, J. P. (2018). A dynamic spatial econometric diffusion model with common factors: The rise and spread of cigarette consumption in Italy. *Regional Science and Urban Economics*, *72*, 131–142. doi: 10.1016/j.regsciurbeco.2017.07.003

Cieślik, A., & Goczek, Ł. (2018). Control of corruption, international investment, and economic

growth – Evidence from panel data. *World Development*, *103*, 323–335. doi: 10.1016/j.worlddev.2017.10.028

Collins, J. D., Uhlenbruck, K., & Rodriguez, P. (2009). Why Firms Engage in Corruption: A Top Management Perspective. *Journal of Business Ethics*, *87*(1), 89–108. doi: 10.1007/s10551-008-9872-3

Correa, E. A., Jetter, M., & Agudelo, A. M. (2016). Corruption: Transcending Borders: Corruption: Transcending borders. *Kyklos*, *69*(2), 183–207. doi: 10.1111/kykl.12108

d'Agostino, G., Dunne, J. P., & Pieroni, L. (2016). Corruption and growth in Africa. *European Journal of Political Economy*, *43*, 71–88. doi: 10.1016/j.ejpoleco.2016.03.002

Dalton, D. R., Wimbush, J. C., & Daily, C. M. (1994). Using the unmatched count technique (UCT) to estimate base rates for sensitive behavior. *Personnel Psychology*, *47*(4), 817–829.

Dang, Q. V. (2016). The impact of corruption on provincial development performance in Vietnam. *Crime, Law and Social Change*, *65*(4–5), 325–350. doi: 10.1007/s10611-016-9608-8

de la Fuente, A., & Doménech, R. (2006). Human Capital in Growth Regressions: How Much Difference Does Data Quality Make? *Journal of the European Economic Association*, *4*(1), 1–36. doi: 10.1162/jeea.2006.4.1.1

Del Monte, A., & Papagni, E. (2001). Public expenditure, corruption, and economic growth: The case of Italy. *European Journal of Political Economy*, *17*(1), 1–16. doi: 10.1016/S0176-2680(00)00025-2

Delavallade, C. (2006). Corruption and distribution of public spending in developing countries. *Journal of Economics and Finance*, *30*(2), 222–239. doi: 10.1007/BF02761488

Dimant, E., Krieger, T., & Meierrieks, D. (2013). The effect of corruption on migration,1985–2000. *Applied Economics Letters*, *20*(13), 1270–1274. doi: 10.1080/13504851.2013.806776

Dimant, E., & Tosato, G. (2018). Causes and effects of corruption: What has past decades' empirical research taught us? A survey: Causes and effects of corruption. *Journal of Economic Surveys*, *32*(2), 335–356. doi: 10.1111/joes.12198

Ding, S., & Knight, J. (2009). Can the augmented Solow model explain China's remarkable economic growth? A cross-country panel data analysis. *Journal of Comparative Economics*, *37*(3), 432–452. doi: 10.1016/j.jce.2009.04.006

Donfouet, H. P. P., Jeanty, P. W., & Malin, E. (2018). Analysing spatial spillovers in corruption:

A dynamic spatial panel data approach: A dynamic spatial panel analysis of corruption. *Papers in Regional Science*, *97*, S63–S78. doi: 10.1111/pirs.12231

Dong, B., Dulleck, U., & Torgler, B. (2012). Conditional corruption. *Journal of Economic Psychology*, *33*(3), 609–627. doi: 10.1016/j.joep.2011.12.001

Dong, B., & Torgler, B. (2012). Corruption and social interaction: Evidence from China. *Journal of Policy Modeling*, *34*(6), 932–947. doi: 10.1016/j.jpolmod.2012.04.005

Dong, B., & Torgler, B. (2013). Causes of corruption: Evidence from China. *China Economic Review*, *26*, 152–169. doi: 10.1016/j.chieco.2012.09.005

Dreher, A., & Gassebner, M. (2013). Greasing the wheels? The impact of regulations and corruption on firm entry. *Public Choice*, *155*(3–4), 413–432.

Dridi, M. (2014). Corruption and education: Empirical evidence. *International Journal of Economics and Financial Issues*, *4*(3), 476.

Ehrlich, I., & Lui, F. T. (1999). Bureaucratic Corruption and Endogenous Economic Growth. *Journal of Political Economy*, *107*(S6), S270–S293. doi: 10.1086/250111

Elhorst, J. P. (2014). Dynamic Spatial Panels: Models, Methods and Inferences. In J. P. Elhorst, *Spatial Econometrics* (pp. 95–119). doi: 10.1007/978-3-642-40340-8_4

Finocchiaro Castro, M., Guccio, C., & Rizzo, I. (2014). An assessment of the waste effects of corruption on infrastructure provision. *International Tax and Public Finance*, *21*(4), 813–843. doi: 10.1007/s10797-014-9312-5

Fišar, M., Kubák, M., Špalek, J., & Tremewan, J. (2016). Gender differences in beliefs and actions in a framed corruption experiment. *Journal of Behavioral and Experimental Economics*, *63*, 69–82. doi: 10.1016/j.socec.2016.05.004

Glaeser, E. L., & Saks, R. E. (2006). Corruption in America. *Journal of Public Economics*, *90*(6–7), 1053–1072. doi: 10.1016/j.jpubeco.2005.08.007

Glewwe, P., & Lambert, S. (2010a). Education Production Functions: Evidence from Developing Countries. In *International Encyclopedia of Education* (pp. 412–422). doi: 10.1016/B978-0-08-044894-7.01232-X

Glewwe, P., & Lambert, S. (2010b). Education Production Functions: Evidence from Developing Countries. In D. J. Brewer & P. J. McEwan (Eds.), *Economics of education* (pp. 137–147). Amsterdam: Elsevier.

Goel, R. K., & Nelson, M. A. (2007). Are corrupt acts contagious? *Journal of Policy Modeling*, *29*(6), 839–850. doi: 10.1016/j.jpolmod.2007.09.002

Golgher, A. B., & Voss, P. R. (2016). How to Interpret the Coefficients of Spatial Models:

Spillovers, Direct and Indirect Effects. *Spatial Demography*, *4*(3), 175–205. doi: 10.1007/s40980-015-0016-y

Gueorguiev, D., & Malesky, E. (2012). Foreign investment and bribery: A firm-level analysis of corruption in Vietnam. *Journal of Asian Economics*, *23*(2), 111–129. doi: 10.1016/j.asieco.2011.11.006

Gupta, S., Davoodi, H. R., & Tiongson, E. (2002). Corruption and the provision of health care and education services. In A. K. Jain (Ed.), *The political economy of corruption* (pp. 111–141). London: Routledge.

Hanneman, R. A., Kposowa, A. J., & Riddle, M. (2013). *Basic statistics for social research* (1. ed). San Francisco, CA: Jossey-Bass.

Hanushek, E.A. (2010). Education Production Functions: Developed Country Evidence. In D. J. Brewer & P. J. McEwan (Eds.), *Economics of education* (pp. 132–136). Amsterdam: Elsevier.

Hanushek, Eric A, & Woessmann, L. (2008). The Role of Cognitive Skills in Economic Development. *Journal of Economic Literature*, *46*(3), 607–668. doi: 10.1257/jel.46.3.607

Harris, D. N. (2010). Education Production Functions: Concepts. In D. J. Brewer & P. J. McEwan (Eds.), *Economics of education* (pp. 127–131). Amsterdam: Elsevier.

Healey, J. F. (2014). *Statistics: A tool for social research*. Cengage Learning.

Helmke, G., & Levitsky, S. (2004). Informal Institutions and Comparative Politics: A Research Agenda. *Perspectives on Politics*, *2*(04), 725–740. doi: 10.1017/S1537592704040472

Hoeffler, A. E. (2002). The augmented Solow model and the African growth debate. *Oxford Bulletin of Economics and Statistics*, *64*(2), 135–158. doi: 10.1111/1468-0084.00016

Hsiao, C. (2007). Panel data analysis—Advantages and challenges. *TEST*, *16*(1), 1–22. doi: 10.1007/s11749-007-0046-x

Huang, C.-J. (2016). Is corruption bad for economic growth? Evidence from Asia-Pacific countries. *The North American Journal of Economics and Finance*, *35*, 247–256. doi: 10.1016/j.najef.2015.10.013

Huntington, S. P. (1968). *Political order in changing societies*. Yale University Press.

International Labour Office. (2017). *Viet Nam school-to-work transition survey country summary*. Retrieved from http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-hanoi/documents/publication/wcms_541516.pdf

International Labour Organization (ILO), Ministry of Labour, Invalids and Social Affairs

(MOLISA) and General Statistics Office (GSO) of Viet Nam. (2014). *Vietnam National Child Labour Survey 2012—Main Findings*. Hanoi: ILO.

Islam, N. (1995). Growth empirics: A panel data approach. *The Quarterly Journal of Economics*, *110*(4), 1127–1170.

Jæger, M. M. (2009). Sibship size and educational attainment. A joint test of the Confluence Model and the Resource Dilution Hypothesis. *Research in Social Stratification and Mobility*, *27*(1), 1–12. doi: 10.1016/j.rssm.2009.01.002

Jain, A. K. (2001). Corruption: A Review. *Journal of Economic Surveys*, *15*(1), 71–121. doi: 10.1111/1467-6419.00133

Jairo, A.-A. (2012, February 21). Incentives and salaries in Vietnam's public. Retrieved September 12, 2017, from Vietnam Law & Legal Forum website: http://vietnamlawmagazine.vn/incentives-and-salaries-in-vietnams-public-3479.html

Jana, M., & Sar, N. (2016). Modeling of hotspot detection using cluster outlier analysis and Getis-Ord Gi* statistic of educational development in upper-primary level, India. *Modeling Earth Systems and Environment*, *2*(2), 60. doi: 10.1007/s40808-016-0122-x

Jetter, M., & Parmeter, C. F. (2018). Sorting through global corruption determinants: Institutions and education matter – Not culture. *World Development*, *109*, 279–294. doi: 10.1016/j.worlddev.2018.05.013

Johnston, M. (2001). Measuring corruption: Numbers versus knowledge versus understanding. In *The political economy of corruption* (pp. 169–191). Routledge.

Kasuga, H. (2013). WHY DO FIRMS PAY BRIBES? FIRM-LEVEL EVIDENCE FROM THE CAMBODIAN GARMENT INDUSTRY: Why Do Firms Pay Bribes? *Journal of International Development*, *25*(2), 276–292. doi: 10.1002/jid.1787

Kato, A., & Sato, T. (2014). The effect of corruption on the manufacturing sector in India. *Economics of Governance*, *15*(2), 155–178. doi: 10.1007/s10101-014-0140-y

Kato, A., & Sato, T. (2015). Greasing the wheels? The effect of corruption in regulated manufacturing sectors of India. *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement*, *36*(4), 459–483. doi: 10.1080/02255189.2015.1026312

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2007). *Measuring corruption: Myths and realities* (No. 273). Washington, D.C: World Bank.

Koch, W. (2008). Development Accounting with Spatial Effects. *Spatial Economic Analysis*, *3*(3), 321–342. doi: 10.1080/17421770802353733

Kukenova, M., Monteiro, J.-A., Monte, A., & Monteiroy, J. (2009). *Spatial dynamic panel model and system GMM: a Monte Carlo investigation*.

Lambsdorff, J. G. (2006). Measuring corruption–the validity and precision of subjective indicators (CPI). *Measuring Corruption*, *81*, 81.

Lambsdorff, J. G. (2007). Causes and consequences of corruption: What do we know from a cross-section of countries? *International Handbook on the Economics of Corruption*, 1.

Lee, S.-H., Oh, K., & Eden, L. (2010). Why Do Firms Bribe?: Insights from Residual Control Theory into Firms' Exposure and Vulnerability to Corruption. *Management International Review*, *50*(6), 775–796. doi: 10.1007/s11575-010-0057-9

Lee, W.-S., & Guven, C. (2013). Engaging in corruption: The influence of cultural values and contagion effects at the microlevel. *Journal of Economic Psychology*, *39*, 287–300. doi: 10.1016/j.joep.2013.09.006

LeSage, J. P., & Dominguez, M. (2012). The importance of modeling spatial spillovers in public choice analysis. *Public Choice*, *150*(3–4), 525–545. doi: 10.1007/s11127-010-9714-6

Lesage, J. P., & Pace, R. K. (2009). *Introduction to spatial econometrics*. Boca Raton, FL: CRC Press.

Levie, J., & Autio, E. (2011). Regulatory Burden, Rule of Law, and Entry of Strategic Entrepreneurs: An International Panel Study: Regulation, Rule of Law, and Entrepreneurial Entry. *Journal of Management Studies*, *48*(6), 1392–1419. doi: 10.1111/j.1467-6486.2010.01006.x

Lin, M.-W., & Yu, C. (2014). Can Corruption Be Measured? Comparing Global Versus Local Perceptions of Corruption in East and Southeast Asia. *Journal of Comparative Policy Analysis: Research and Practice*, *16*(2), 140–157. doi: 10.1080/13876988.2013.870115

Lisciandra, M., & Millemaci, E. (2017). The economic effect of corruption in Italy: A regional panel analysis. *Regional Studies*, *51*(9), 1387–1398. doi: 10.1080/00343404.2016.1184244

López-Valcárcel, B. G., Jiménez, J. L., & Perdiguero, J. (2017). Danger: Local corruption is contagious! *Journal of Policy Modeling*, *39*(5), 790–808. doi: 10.1016/j.jpolmod.2017.08.002

Lui, F. T. (1986). A dynamic model of corruption deterrence. *Journal of Public Economics*, *31*(2), 215–236. doi: 10.1016/0047-2727(86)90019-8

Malesky, E. (2016). *The Vietnam Provincial Competitiveness Index: Measuring Economic Governance for Private Sector Development, 2015 Final Report*. Hanoi, Vietnam:

Vietnam Chamber of Commerce and Industry and United States Agency for International Development.

Malesky, E. J., Gueorguiev, D. D., & Jensen, N. M. (2015). Monopoly Money: Foreign Investment and Bribery in Vietnam, a Survey Experiment. *American Journal of Political Science*, *59*(2), 419–439. doi: 10.1111/ajps.12126

Malesky, E., Phan Tuan Ngoc, & Pham Ngoc Thach. (2019). *The Vietnam Provincial Competitiveness Index: Measuring Economic Governance for Private Sector Development, 2018 Final Report*. Vietnam Chamber of Commerce and Industry and United States Agency for International Development: Hanoi, Vietnam.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, *107*(2), 407–437. doi: 10.2307/2118477

Manski, C. F. (1993). Identification of Endogenous Social Effects: The Reflection Problem. *The Review of Economic Studies*, *60*(3), 531. doi: 10.2307/2298123

Maralani, V. (2008). The changing relationship between family size and educational attainment over the course of socioeconomic development: Evidence from Indonesia. *Demography*, *45*(3), 693–717. doi: 10.1353/dem.0.0013

Márquez, M. A., Salinas-Jiménez, J., & Salinas-Jiménez, Ma. del M. (2011). Exploring differences in corruption: The role of neighboring countries. *Journal of Economic Policy Reform*, *14*(1), 11–19. doi: 10.1080/17487870.2011.534287

Mauro, P. (1995). Corruption and growth. *The Quarterly Journal of Economics*, *110*(3), 681–712.

Mauro, P. (1998). Corruption and the composition of government expenditure. *Journal of Public Economics*, *69*(2), 263–279. doi: 10.1016/S0047-2727(98)00025-5

Melgar, N., Rossi, M., & Smith, T. W. (2010). The Perception of Corruption. *International Journal of Public Opinion Research*, *22*(1), 120–131. doi: 10.1093/ijpor/edp058

Méon, P.-G., & Sekkat, K. (2005). Does corruption grease or sand the wheels of growth? *Public Choice*, *122*(1–2), 69–97.

Méon, P.-G., & Weill, L. (2010). Is corruption an efficient grease? *World Development*, *38*(3), 244–259.

Mo, P. H. (2001). Corruption and Economic Growth. *Journal of Comparative Economics*, *29*(1), 66–79. doi: 10.1006/jcec.2000.1703

Murphy, K. M., Shleifer, A., & Vishny, R. W. (1993). Why is rent-seeking so costly to growth? *The American Economic Review*, *83*(2), 409–414.

Nguyen, N. A., Doan, Q. H., Nguyen, N. M., & Tran-Nam, B. (2016). The impact of petty corruption on firm innovation in Vietnam. *Crime, Law and Social Change*, *65*(4–5), 377–394. doi: 10.1007/s10611-016-9610-1

Nguyen, T. T., & van Dijk, M. A. (2012a). Corruption, growth, and governance: Private vs. state-owned firms in Vietnam. *Journal of Banking & Finance*, *36*(11), 2935–2948. doi: 10.1016/j.jbankfin.2012.03.027

Nguyen, T. T., & van Dijk, M. A. (2012b). Corruption, growth, and governance: Private vs. state-owned firms in Vietnam. *Journal of Banking & Finance*, *36*(11), 2935–2948. doi: 10.1016/j.jbankfin.2012.03.027

Nguyen, T. V., Bach, T. N., Le, T. Q., & Le, C. Q. (2017a). Local governance, corruption, and public service quality: Evidence from a national survey in Vietnam. *International Journal of Public Sector Management*, *30*(2), 137–153. doi: 10.1108/IJPSM-08-2016-0128

Nguyen, T. V., Bach, T. N., Le, T. Q., & Le, C. Q. (2017b). Local governance, corruption, and public service quality: Evidence from a national survey in Vietnam. *International Journal of Public Sector Management*, *30*(2), 137–153. doi: 10.1108/IJPSM-08-2016-0128

Nguyen, T. V., Ho, B. D., Le, C. Q., & Nguyen, H. V. (2016a). Erratum to: Strategic and transactional costs of corruption: perspectives from Vietnamese firms. *Crime, Law and Social Change*, *65*(4–5), 375–375. doi: 10.1007/s10611-016-9623-9

Nguyen, T. V., Ho, B. D., Le, C. Q., & Nguyen, H. V. (2016b). Strategic and transactional costs of corruption: Perspectives from Vietnamese firms. *Crime, Law and Social Change*, *65*(4), 351–374. doi: 10.1007/s10611-016-9609-7

North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Retrieved from https://books.google.co.jp/books?id=BVC6AAAAIAAJ

OECD (Ed.). (2014). *What students know and can do: Student performance in mathematics, reading and science* (Rev. ed., Febr. 2014). Paris: OECD.

OECD. (2016). *PISA 2015 Results in Focus* (PISA in Focus No. 67). doi: 10.1787/aa9237e6-en

Olken, B. A. (2009). Corruption perceptions vs. Corruption reality. *Journal of Public Economics*, *93*(7–8), 950–964. doi: 10.1016/j.jpubeco.2009.03.001

Olken, B. A., & Pande, R. (2012). Corruption in Developing Countries. *Annual Review of Economics*, *4*(1), 479–509. doi: 10.1146/annurev-economics-080511-110917

Ord, J. K., & Getis, A. (1995). Local spatial autocorrelation statistics: Distributional issues and an application. *Geographical Analysis*, *27*(4), 286–306.

Pecorino, P. (1992). Rent Seeking and Growth: The Case of Growth through Human Capital Accumulation. *Canadian Journal of Economics*, *25*(4), 944–956.

Pellegrini, L., & Gerlagh, R. (2004). Corruption's Effect on Growth and its Transmission Channels. *Kyklos*, *57*(3), 429–456. doi: 10.1111/j.0023-5962.2004.00261.x

Pigott, T. D. (2001). A Review of Methods for Missing Data. *Educational Research and Evaluation*, *7*(4), 353–383. doi: 10.1076/edre.7.4.353.8937

Poon, Y., Hung, N. K., & DO XUAN, T. (2009). The Reform of the Civil Service System as Viet Nam moves into the Middle-Income Country Category. *Reforming Public Administration in Viet Nam*, 199.

Pritchett, L. (2001). Where Has All the Education Gone? *The World Bank Economic Review*, *15*(3), 367–391. doi: 10.1093/wber/15.3.367

Rama, M., & Võ, V. K. (2008). *Making Difficult Choices, Vietnam in Transition*. International Bank for Reconstruction and Development/The World bank.

Rand, J., & Tarp, F. (2012). Firm-Level Corruption in Vietnam. *Economic Development and Cultural Change*, *60*(3), 571–595. doi: 10.1086/664022

Rock, M. T., & Bonnett, H. (2004). The Comparative Politics of Corruption: Accounting for the East Asian Paradox in Empirical Studies of Corruption, Growth and Investment. *World Development*, *32*(6), 999–1017. doi: 10.1016/j.worlddev.2003.12.002

Ruziev, K., & Webber, D. J. (2018). Does connectedness improve SMEs' access to formal finance? Evidence from post-communist economies. *Post-Communist Economies*, 1–21. doi: 10.1080/14631377.2018.1470855

Sah, R. (2007). Corruption across countries and regions: Some consequences of local osmosis. *Journal of Economic Dynamics and Control*, *31*(8), 2573–2598. doi: 10.1016/j.jedc.2006.09.002

Serra, D. (2012). Combining Top-Down and Bottom-Up Accountability: Evidence from a Bribery Experiment. *Journal of Law, Economics, and Organization*, *28*(3), 569–587. doi: 10.1093/jleo/ewr010

Sharma, C., & Mitra, A. (2015). Corruption, governance and firm performance: Evidence from Indian enterprises. *Journal of Policy Modeling*, *37*(5), 835–851. doi: 10.1016/j.jpolmod.2015.05.001

Shleifer, A., & Vishny, R. W. (1993). Corruption. *The Quarterly Journal of Economics*, *108*(3),

599–617. doi: 10.2307/2118402

Soans, A., & Abe, M. (2016). Bribery, corruption and bureaucratic hassle: Evidence from Myanmar. *Journal of Asian Economics*, *44*, 41–56. doi: 10.1016/j.asieco.2016.04.003

Sui, B., Feng, G.-F., & Chang, C.-P. (2018). The pioneer evidence of contagious corruption. *Quality & Quantity*, *52*(2), 945–968. doi: 10.1007/s11135-017-0497-4

Svensson, J. (2003). Who must pay bribes and how much? Evidence from a cross section of firms. *Quarterly Journal of Economics*, *118*(1).

Svensson, J. (2005). Eight questions about corruption. *Journal of Economic Perspectives*, *19*(3), 19–42.

Sylwester, K. (2019). Extortion or cost-reduction: Why do firms pay bribes? *Journal of Applied Economics*, *22*(1), 85–101. doi: 10.1080/15140326.2018.1526876

Tanzi, V. (1998). Corruption around the world: Causes, consequences, scope, and cures. *Staff Papers*, *45*(4), 559–594.

Teorell, J. (2007). Corruption as an institution: Rethinking the nature and origins of the grabbing hand. *QoG Working Paper Series*, *5*.

The Government of Viet Nam and UNESCO Institute for Statistics. (2016). *Education Financing in Viet Nam, 2009-2013, following the national education accounts methodology*. Hanoi.

The Government of Vietnam. (2012, September). Decision on the approval of national target program for education and training for period 2012—2015. Retrieved from Social Republic of Vietnam Government Portal website: http://vanban.chinhphu.vn/portal/page/portal/chinhphu/hethongvanban?class_id=2&mode=detail&document_id=163488

Truong, T. H. (2020). The effects of corruption on the human capital accumulation process: Evidence from Vietnam. *Economics of Transition and Institutional Change*, *28*(1), 69–88. doi: 10.1111/ecot.12229

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

Trân, T. T. H. (2014). Education financing in Vietnam. *Revue Internationale d'éducation de Sèvres*. Retrieved from http://journals.openedition.org/ries/3895

Transparency International. (2011). *Forms and effects of corruption on the education sector in Vietnam*.

Transparency International. (2013). *Global corruption barometer 2013*.

Transparency International. (2017, January 25). Corruption Perception Index 2016. Retrieved September 5, 2017, from Transparency International website: https://www.transparency.org/news/feature/corruption_perceptions_index_2016

Tromme, M. (2016). Corruption and corruption research in Vietnam—An overview. *Crime, Law and Social Change*, *65*(4–5), 287–306. doi: 10.1007/s10611-016-9605-y

Vargas-Hernández, J. G. (2013). The multiple faces of corruption: Typology, forms and levels. In *Organizational immunity to corruption: Building theoretical and research foundations* (pp. 111–117).

Vietnam Ministry of Education and Training. (2014). *Vietnam Education for All 2015 National Review*. Hanoi.

Webster, A., & Piesse, J. (2018). Are Foreign-Owned Firms More Likely to Pay Bribes than Domestic Ones? Evidence from Emerging Markets. *World Development*, *101*, 142–161. doi: 10.1016/j.worlddev.2017.08.007

World Bank. (2013). *Corruption from the perspective of citizens, firms, and public officials: Results of sociological surveys*. Washington D.C: The World Bank.

Wößmann, L. (2003). Specifying human capital. *Journal of Economic Surveys*, *17*(3), 239–270.

You, J., & Nie, H. (2017). Who determines Chinese firms' engagement in corruption: Themselves or neighbors? *China Economic Review*, *43*, 29–46. doi: 10.1016/j.chieco.2017.01.002

APPENDIX

APENDIX A: Additional estimation results for Chapter 2

Estimation results on the effects of corruptions on Vietnamese provincial economic growth, excluding observations with unusually high investment rates.

Table A.1: Direct effects of corruption on growth (estimations without interaction term)

	(1)	(2)		(3)	(4)
VARIABLES	dlny	dlny	VARIABLES	dlny1	dlny1
L.lny	-0.0798**	-0.0869***	$L.lny_1$	-0.0480	-0.0705**
	(0.0351)	(0.0313)		(0.0293)	(0.0319)
lnk	0.0290	0.0262	lnk	0.0449	0.0321
	(0.0336)	(0.0365)		(0.0351)	(0.0380)
ln(popgr+0.05)	0.154**	0.149***	ln(Lgr+0.05)	-0.0423***	-0.0390***
	(0.0707)	(0.0543)		(0.0118)	(0.0127)
Corrup	-0.394***	-0.325**	Corrup	-0.316**	-0.285**
	(0.134)	(0.130)		(0.134)	(0.130)
lnHEnrol	0.0344		lnHEnrol	0.00234	
	(0.0358)			(0.0258)	
lnTEnrol		0.0149*	lnTEnrol		0.0103
		(0.00875)			(0.00866)
Constant	0.820***	0.866***	Constant	0.205*	0.307**
	(0.303)	(0.241)		(0.122)	(0.142)
Year dummies	Yes	Yes	Year dummies	Yes	Yes
AR(1)	-2.27	-2.23	AR(1)	-2.33	-2.29
	(0.023)	(0.026)		(0.20)	(0.022)
AR(2)	0.30	0.33	AR(2)	0.36	0.38
	(0.763)	(0.744)		(0.719)	(0.703)
Hansen	41.77	29.55	Hansen	41.46	34.67
	(0.31)	(0.835)		(0.322)	(0.624)
Observations	351	351	Observations	351	351
Number of id	62	62	Number of id	62	62

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.2: Direct effects of corruption on growth (estimation with interaction term)

	(1)	(2)		(3)	(4)
VARIABLES	dlny	dlny		dlny1	dlny1
L.lny	-0.109***	-0.110***	$L.lny_1$	-0.0674**	-0.0829***
	(0.0351)	(0.0317)		(0.0300)	(0.0312)
lnk	0.0705**	0.0761**	lnk	0.110***	0.106**
	(0.0358)	(0.0376)		(0.0372)	(0.0437)
ln(popgr+0.05)	0.190**	0.172***	ln(Lgr+0.05)	-0.0443***	-0.0422***
	(0.0752)	(0.0542)		(0.0105)	(0.0118)
Corrup	-0.923***	-0.866***	Corrup	-0.953***	-0.906***
	(0.241)	(0.244)		(0.253)	(0.258)
Corrup × lnk	-0.873***	-0.906***	Corrup × lnk	-1.077***	-1.062***
	(0.268)	(0.290)		(0.285)	(0.325)
lnHEnrol	0.0459		lnHEnrol	0.00415	
	(0.0371)			(0.0294)	
lnTEnrol		0.0175	lnTEnrol		0.0115
		(0.0114)			(0.0114)
Constant	1.068***	1.034***	Constant	0.301**	0.383***
	(0.328)	(0.258)		(0.133)	(0.144)
Year dummies	Yes	Yes	Year dummies	Yes	Yes
AR(1)	-2.30	-2.27	AR(1)	-2.38	-2.36
	(0.022)	(0.023)		(0.017)	(0.018)
AR(2)	0.28	0.31	AR(2)	0.32	0.35
	(0.782)	(0.753)		(0.752)	(0.727)
Hansen	46.50	46.46	Hansen	50.27	48.04
	(0.534)	(0.536)		(0.384)	(0.471)
Observations	351	351	Observations	351	351
Number of id	62	62	Number of id	62	62

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.3: Estimation results for the effects corruption on investment rates

	(1)	(2)	(3)	(4)
VARIABLES	k	k	k	k
L.k	0.594***	0.457***	0.553***	0.462***
	(0.0935)	(0.0746)	(0.0892)	(0.0747)
L.y	-0.000564	-3.75e-05	-0.000494	-6.58e-05
	(0.000787)	(0.00101)	(0.000881)	(0.00104)
Corrup	0.219*	-0.0248	0.331**	0.00103
	(0.121)	(0.0791)	(0.152)	(0.0788)
HEnrol	0.0660	0.196		
	(0.100)	(0.139)		
popgr	0.193	-0.285	-0.200	0.134
	(1.342)	(3.636)	(1.119)	(3.550)
TEnrol			0.111	0.0813
			(0.161)	(0.0986)
Constant	0.139*	0.140	0.179***	0.244***
	(0.0760)	(0.0985)	(0.0469)	(0.0718)
Year dummies	Yes	Yes	Yes	Yes
AR(1)	-3.13		-3.08	
	(0.002)		(0.002)	
AR(2)	0.43		0.14	
	(0.670)		(0.890)	
Hansen	42.09		42.37	
	(0.298)		(0.288)	
Observations	351	351	351	351
R-squared		0.295		0.288
Number of id	62	62	62	62

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.4: Estimation results using reduced form of growth regression model

VARIABLES	(1) dlny	(2) dlny	VARIABLES	(3) dlny1	(4) dlny1
L.lny	-0.0891**	-0.0841**	$L.lny_1$	-0.0654**	-0.0787**
	(0.0361)	(0.0328)		(0.0272)	(0.0326)
ln(popgr+0.05)	0.179***	0.153***	ln(Lgr+0.05)	-0.0370***	-0.0347***
	(0.0682)	(0.0535)		(0.0104)	(0.0104)
Corrup	-0.346***	-0.258**	Corrup	-0.276**	-0.231*
	(0.133)	(0.131)		(0.136)	(0.134)
lnHEnrol	0.0520		lnHEnrol	0.0238	
	(0.0388)			(0.0300)	
lnTEnrol		0.0195**	lnTEnrol		0.0184**
		(0.00882)			(0.00791)
Constant	0.929***	0.873***	Constant	0.255**	0.337**
	(0.318)	(0.245)		(0.127)	(0.159)
Year dummies	Yes	Yes	Year dummies	Yes	Yes
AR(1)	-2.28	-2.23	AR(1)	-2.33	-2.29
	(0.023)	(0.025)		(0.020)	(0.022)
AR(2)	0.29	0.32	AR(2)	0.35	0.39
	(0.775)	(0.752)		(0.724)	(0.698)
Hansen	32.36	27.02	Hansen	27.13	26.71
	(0.304)	(0.571)		(0.565)	(0.587)
Observations	351	351	Observations	351	351
Number of id	62	62	Number of id	62	62

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX B: Correlation between labor quality index and GDP per capita

Figure B.1: Correlation between labor quality index and GDP per capita of Vietnamese provinces

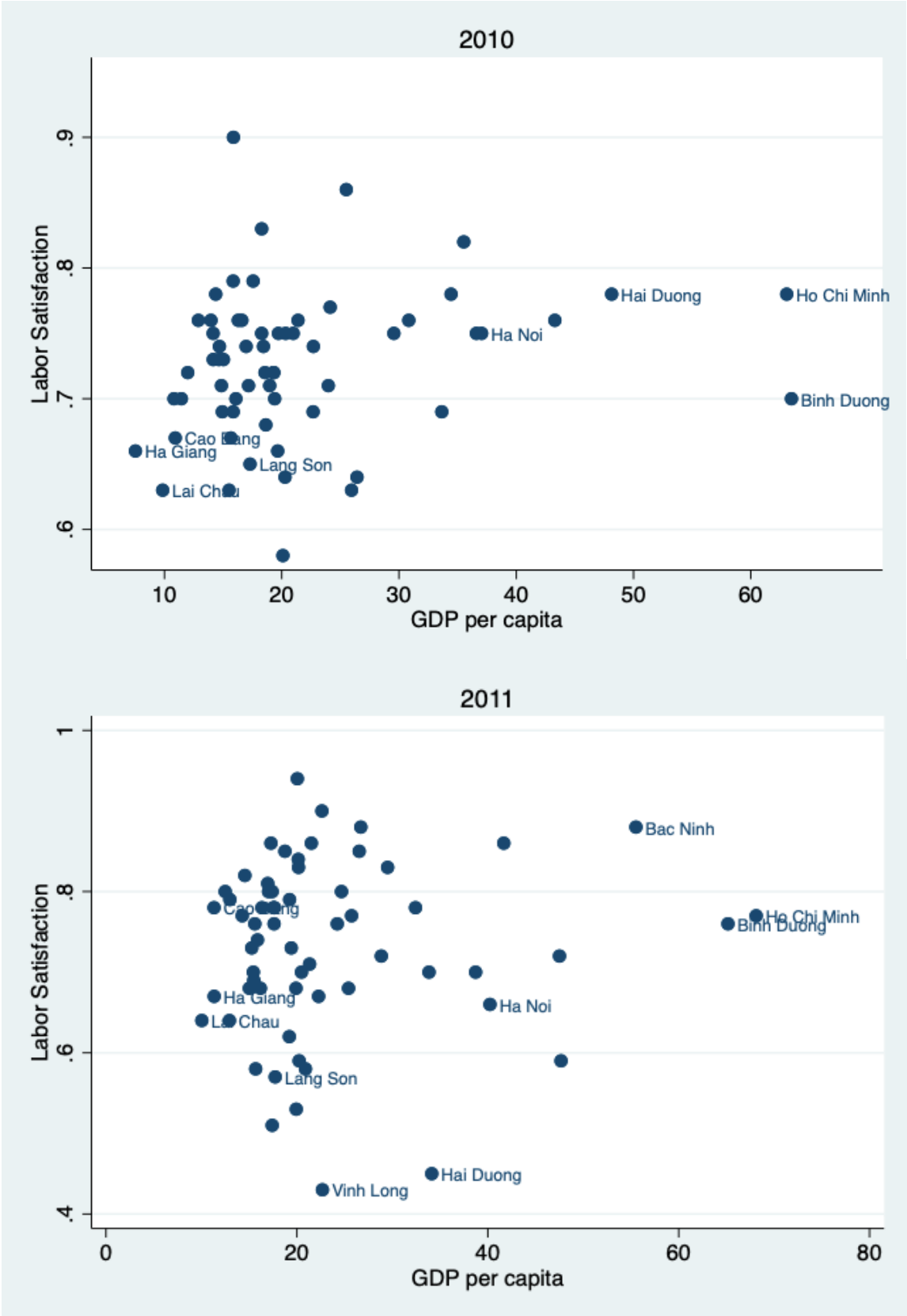


Figure B.1 continued

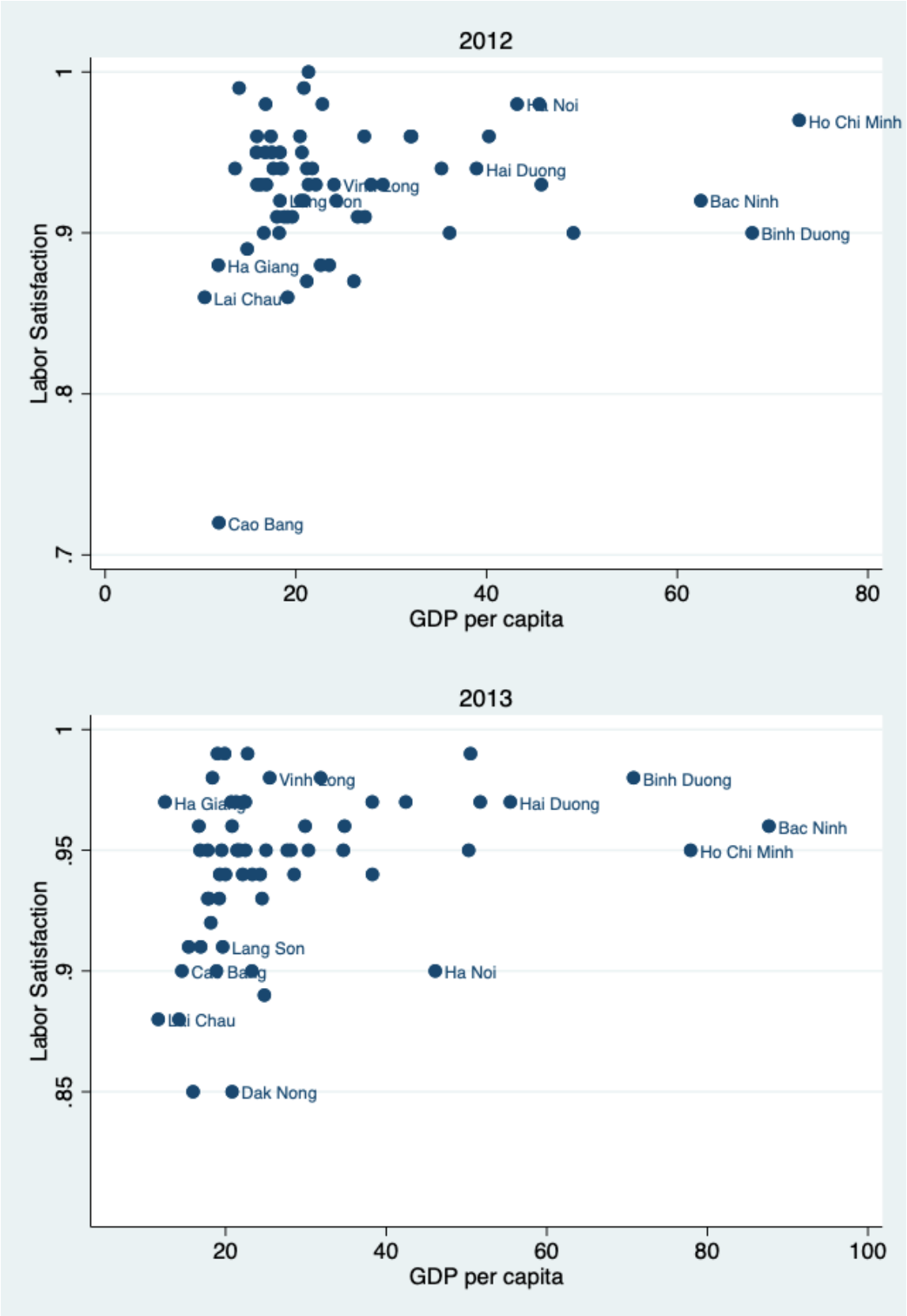
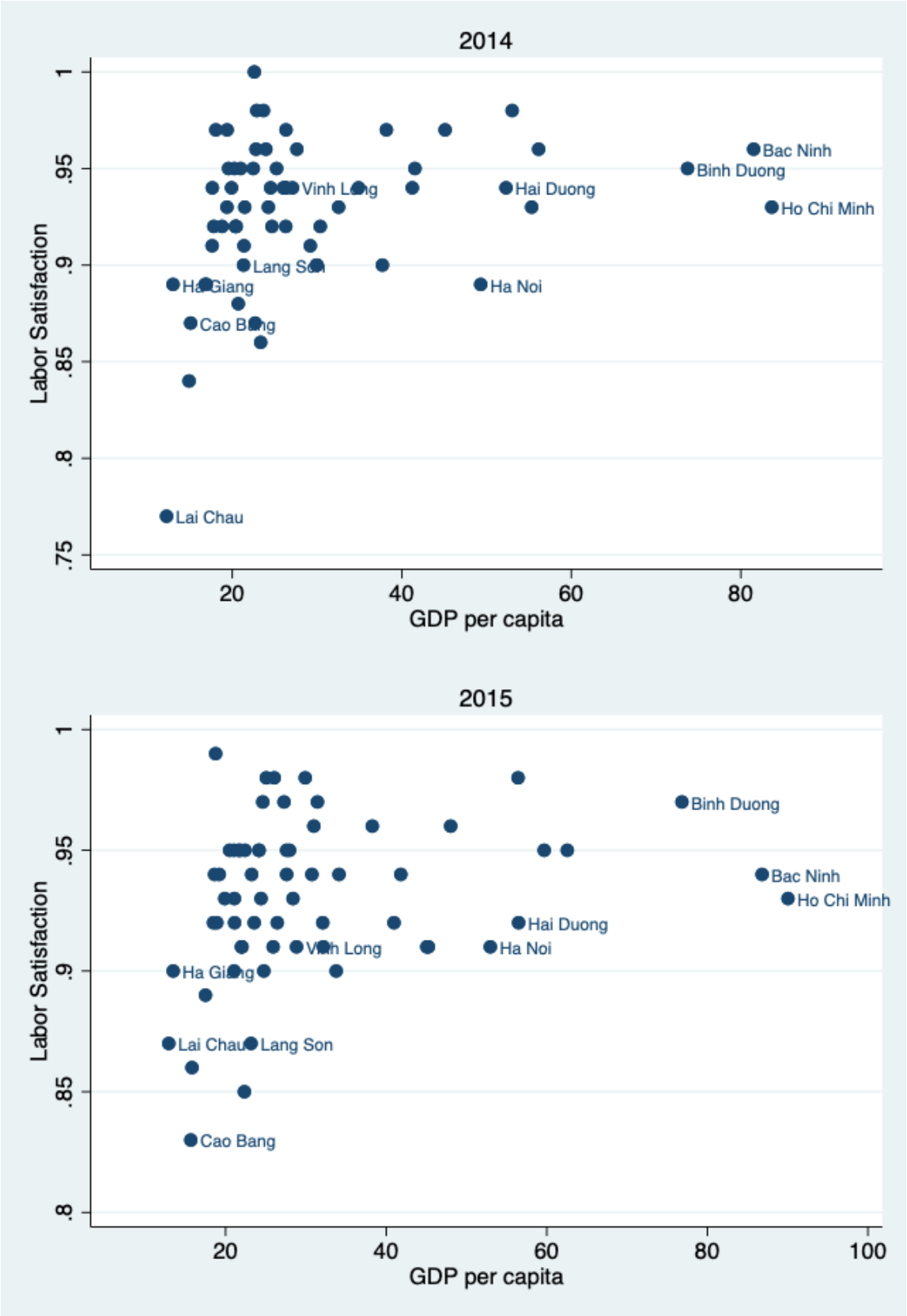


Figure B.1 continued



APENDIX C: Additional estimation results in Chapter 4

Table C.1: Marginal effects of several firm characteristics and leader characteristics on bribe size made by firms

VARIABLES	(1) lurc Marginal effects	(2) gov Marginal effects	(4) female Marginal effects	(6) connect Marginal effects
0 (0 percent)	0.0851***	0.124***	0.0682***	-0.104***
	(0.0106)	(0.0363)	(0.0137)	(0.0390)
1 (0 – 1 percent)	0.0201***	0.0293***	0.0112***	-0.0246***
	(0.00304)	(0.00888)	(0.00193)	(0.00938)
2 (1 – 2 percent)	-0.0210***	-0.0305***	-0.0181***	0.0257***
	(0.00270)	(0.00905)	(0.00387)	(0.00966)
3 (2 – 5 percent)	-0.0313***	-0.0455***	-0.0240***	0.0383***
	(0.00406)	(0.0134)	(0.00472)	(0.0144)
4 (5 – 10 percent)	-0.0262***	-0.0382***	-0.0189***	0.0321***
	(0.00360)	(0.0114)	(0.00361)	(0.0121)
5 (10 – 20 percent)	-0.0160***	-0.0232***	-0.0111***	0.0195***
	(0.00234)	(0.00702)	(0.00213)	(0.00747)
6 (20 – 30 percent)	-0.00629***	-0.00915***	-0.00428***	0.00770**
	(0.00112)	(0.00294)	(0.000931)	(0.00303)
7 (over 30 percent)	-0.00456***	-0.00663***	-0.00307***	0.00558**
	(0.000920)	(0.00220)	(0.000706)	(0.00222)
Observations	4,197	4,197	4,197	4,197

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.2: Estimation results on the decision to bribe of Vietnamese firms (without natural resources firms)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect
briberate	1.997***	0.386***	1.783***	0.348***	1.537***	0.296***	1.575***	0.299***	1.028***	0.194***
	(0.245)	(0.0463)	(0.274)	(0.0527)	(0.284)	(0.0540)	(0.287)	(0.0540)	(0.306)	(0.0575)
age			0.0251***	0.00490***	0.0297***	0.00572***	0.0299***	0.00568***	0.0308***	0.00583***
			(0.00773)	(0.00151)	(0.00825)	(0.00158)	(0.00839)	(0.00159)	(0.00839)	(0.00158)
size			0.143***	0.0278***	0.170***	0.0327***	0.146***	0.0277***	0.139***	0.0263***
			(0.0296)	(0.00573)	(0.0311)	(0.00593)	(0.0318)	(0.00600)	(0.0318)	(0.00597)
construction			0.331**	0.0642**	0.374***	0.0726***	0.384***	0.0741***	0.375***	0.0715***
			(0.132)	(0.0261)	(0.136)	(0.0270)	(0.139)	(0.0273)	(0.138)	(0.0269)
service			0.106	0.0215	0.163	0.0329	0.199*	0.0398	0.173	0.0345
			(0.113)	(0.0233)	(0.117)	(0.0242)	(0.119)	(0.0245)	(0.119)	(0.0242)
agriculture			0.220	0.0437	0.315*	0.0618*	0.349*	0.0679*	0.363**	0.0695**
			(0.178)	(0.0349)	(0.183)	(0.0352)	(0.186)	(0.0353)	(0.184)	(0.0344)
HOSE					0.0283	0.00546	0.0460	0.00875	0.131	0.0248
					(0.522)	(0.101)	(0.515)	(0.0980)	(0.516)	(0.0975)
lurc					-0.318***	-0.0614***	-0.291***	-0.0554***	-0.291***	-0.0549***
					(0.0741)	(0.0142)	(0.0755)	(0.0143)	(0.0757)	(0.0142)
gov					-0.314	-0.0606	-0.396	-0.0752	-0.420	-0.0794
					(0.283)	(0.0546)	(0.295)	(0.0561)	(0.296)	(0.0560)
Gender										
Female							-0.299***	-0.0596***	-0.299***	-0.0591***
							(0.0852)	(0.0175)	(0.0855)	(0.0175)
More than one owner							0.671**	0.105***	0.643**	0.101***
							(0.268)	(0.0346)	(0.266)	(0.0348)
connect							0.307	0.0583	0.263	0.0498
							(0.287)	(0.0545)	(0.286)	(0.0540)
corrupt									-0.217***	-0.0411***
									(0.0468)	(0.00880)
Constant	-0.439**		-1.059***		-0.836***		-0.768***		1.081**	
	(0.179)		(0.239)		(0.250)		(0.255)		(0.473)	
Observations	5,478	5,478	4,583	4,583	4,262	4,262	4,152	4,152	4,152	4,152

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.3: Estimation results on bribe size made by Vietnamese firms (without natural resources firms)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	bribesize coefficient	bribesize coefficient	bribesize coefficient	bribesize coefficient	bribesize coefficient
wbribe	0.116***	0.0798***	0.0764***	0.0765***	0.0502***
	(0.0121)	(0.0150)	(0.0153)	(0.0156)	(0.0155)
age		0.00680	0.0131**	0.0140**	0.0145**
		(0.00559)	(0.00587)	(0.00591)	(0.00588)
size		0.133***	0.163***	0.140***	0.130***
		(0.0223)	(0.0238)	(0.0242)	(0.0242)
construction		0.619***	0.638***	0.651***	0.677***
		(0.112)	(0.117)	(0.118)	(0.116)
services		0.149*	0.180**	0.227**	0.204**
		(0.0862)	(0.0913)	(0.0924)	(0.0920)
agriculture		0.0955	0.147	0.158	0.159
		(0.118)	(0.124)	(0.124)	(0.123)
HOSE			-0.341	-0.319	-0.198
			(0.266)	(0.259)	(0.267)
lurc			-0.498***	-0.477***	-0.466***
			(0.0579)	(0.0587)	(0.0588)
gov			-0.515***	-0.609***	-0.641***
			(0.195)	(0.198)	(0.202)
female				-0.351***	-0.345***
				(0.0682)	(0.0683)
More than one owner				0.381***	0.365***
				(0.138)	(0.138)
connect				0.598***	0.559***
				(0.214)	(0.211)
corrupt					-0.248***
					(0.0354)
Observations	5,478	4,583	4,262	4,152	4,152

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.4: Estimation results on the decision to bribe of Vietnamese firms (without natural resources and construction firms)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect	bribepay coefficient	bribepay Marginal effect
briberate1	1.880***	0.373***	1.775***	0.358***	1.631***	0.325***	1.695***	0.333***	1.309***	0.256***
	(0.276)	(0.0540)	(0.302)	(0.0600)	(0.312)	(0.0613)	(0.315)	(0.0611)	(0.331)	(0.0642)
age			0.0187**	0.00376**	0.0225**	0.00448***	0.0231***	0.00454***	0.0241***	0.00472***
			(0.00823)	(0.00166)	(0.00876)	(0.00174)	(0.00893)	(0.00175)	(0.00892)	(0.00174)
size			0.145***	0.0293***	0.174***	0.0346***	0.152***	0.0298***	0.147***	0.0288***
			(0.0320)	(0.00640)	(0.0340)	(0.00668)	(0.0347)	(0.00675)	(0.0348)	(0.00675)
services			0.107	0.0220	0.164	0.0337	0.202*	0.0411*	0.183	0.0370
			(0.113)	(0.0236)	(0.117)	(0.0245)	(0.120)	(0.0250)	(0.120)	(0.0247)
agriculture			0.220	0.0443	0.310*	0.0617*	0.342*	0.0676*	0.351*	0.0685*
			(0.178)	(0.0353)	(0.183)	(0.0357)	(0.186)	(0.0360)	(0.184)	(0.0353)
HOSE					-0.0411	-0.00818	-0.0424	-0.00832	0.00589	0.00115
					(0.581)	(0.116)	(0.574)	(0.113)	(0.575)	(0.113)
lurc					-0.314***	-0.0625***	-0.301***	-0.0592***	-0.299***	-0.0586***
					(0.0822)	(0.0162)	(0.0839)	(0.0163)	(0.0840)	(0.0163)
gov					-0.254	-0.0505	-0.289	-0.0567	-0.318	-0.0622
					(0.316)	(0.0630)	(0.331)	(0.0650)	(0.333)	(0.0652)
Gender										
Female							-0.311***	-0.0637***	-0.312***	-0.0636***
							(0.0902)	(0.0190)	(0.0905)	(0.0190)
More than one owner							0.662**	0.108***	0.629**	0.103**
							(0.296)	(0.0400)	(0.293)	(0.0404)
connect							0.480	0.0943	0.443	0.0866
							(0.340)	(0.0668)	(0.337)	(0.0659)
corrupt									-0.167***	-0.0327***
									(0.0510)	(0.00994)
Constant	-0.392**		-1.022***		-0.873***		-0.824***		0.571	
	(0.200)		(0.257)		(0.270)		(0.275)		(0.505)	
Observations	4,339	4,339	3,644	3,644	3,392	3,392	3,304	3,304	3,304	3,304

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.5: Estimation results on bribe size made by Vietnamese firms (without natural resources and construction firms)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	bribesize coefficient	bribesize coefficient	bribesize coefficient	bribesize coefficient	bribesize coefficient
wbribe	0.0781***	0.0892***	0.0840***	0.0813***	0.0588***
	(0.0168)	(0.0190)	(0.0196)	(0.0198)	(0.0195)
age		0.00146	0.00735	0.00840	0.00944
		(0.00627)	(0.00661)	(0.00664)	(0.00661)
size		0.147***	0.184***	0.161***	0.153***
		(0.0254)	(0.0274)	(0.0279)	(0.0278)
services		0.158*	0.194**	0.244**	0.222**
		(0.0904)	(0.0958)	(0.0972)	(0.0966)
agriculture		0.0974	0.150	0.160	0.162
		(0.123)	(0.129)	(0.129)	(0.128)
HOSE			-0.424	-0.424	-0.361
			(0.309)	(0.303)	(0.312)
lurc			-0.487***	-0.479***	-0.466***
			(0.0653)	(0.0663)	(0.0663)
gov			-0.563***	-0.601***	-0.645***
			(0.203)	(0.208)	(0.212)
Gender					
Female				-0.368***	-0.366***
				(0.0734)	(0.0736)
More than one owner				0.363**	0.334**
				(0.161)	(0.160)
connect				0.714***	0.657***
				(0.237)	(0.235)
corrupt					-0.220***
					(0.0396)
Observations	4,339	3,644	3,392	3,304	3,304

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX D: Short-term and long-term effects in dynamic spatial models

$$C_{it} = \tau C_{it-1} + \delta W_{ij} C_{it} + \eta W_{ij} C_{it-1} + \sum_{i=1}^{N} \beta_i X_{it} + \alpha_i + \epsilon_t + \varepsilon_{it}$$

$$(I_n - \delta W_{ij}) C_{it} = \tau C_{it-1} + \eta W_{ij} C_{it-1} + \sum_{i=1}^{N} \beta_i X_{it} + \alpha_i + \epsilon_t + \varepsilon_{it}$$

$$C_{it} = (I_n - \delta W_{ij})^{-1} (\tau C_{it-1} + \eta W_{ij} C_{it-1} + \sum_{i=1}^{N} \beta_i X_{it} + \alpha_i + \epsilon_t + \varepsilon_{it})$$

where: $C_{it} = \begin{bmatrix} C_{1t} \\ C_{2t} \\ \vdots \\ C_{nt} \end{bmatrix}_{n \times 1}$; $I_n$is the identity matrix; $I_n = \begin{bmatrix} 1 & \cdots & 0 \\ \cdots & \cdots & \cdots \\ 0 & \cdots & 1 \end{bmatrix}$

$X_{it} = [x_{1t} \quad \cdots \quad x_{mt}]$; the k[th] independent variable: $x_{kt} = \begin{bmatrix} x_{k1t} \\ x_{k2t} \\ \vdots \\ x_{knt} \end{bmatrix}_{n \times 1}$

According to Elhorst (2014):

The matrix of partial derivatives of expected value of corruption in the year t (C_{it}) with respect to k[th] explanatory variable in the year *t* (x_{kt}) is:

$$\left[\frac{\partial E(C_{it})}{\partial x_{k1t}} \cdots \frac{\partial E(C_{it})}{\partial x_{knt}}\right] = \begin{bmatrix} \frac{dE(C_{1t})}{dx_{k1t}} & \cdots & \frac{dE(C_{1t})}{dx_{nkt}} \\ \cdots & \cdots & \cdots \\ \frac{dE(C_{nt})}{dx_{knt}} & \cdots & \frac{dE(C_{nt})}{dx_{knt}} \end{bmatrix} = (I_n - \delta W_{ij})^{-1} (\beta_k I_n)$$

The matrix above present short-run effects of independent variable (x_k) on corruption level (C_i) in the year *t*

Similarly, the long-run effects is expressed as follows:

$$\left[\frac{dE(C_i)}{dX_{k1}} \cdots \frac{dE(C_i)}{dX_{kn}}\right] = [(1-\tau) I_n - (\delta + \eta) W]^{-1} (\beta_k I_n)$$