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Economic and Management issues of firms in Vietnam:
Productivity, multinational profit shifting, and ownership changes

a dissertation submitted to the Doctoral School of Social Sciences in partial fulfillment of the requirements for the Doctoral degree (Ph.D.) in Economics and Management

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Acknowledgement

Abstract

This thesis is comprised of three essays which explore economic and management issues of firms in Vietnam. The issues being addressed here are varied but connected to highlight (partly) how firms are doing business in the transition economy of Vietnam. The following are the summaries of each essays:

(i) The first essay (chapter 2) examines the role of ownership and market competition in Vietnamese firms' total factor productivity (TFP) from 2001 to 2011. Making use of a large panel dataset of manufacturing firms, we find that, on average, both foreign-owned enterprises (FOEs) and state-owned enterprises (SOEs) have performed better than private-owned enterprises (POEs) in terms of TFP levels. However, while FOEs ranked the highest in terms of TFP in the period 2001-2006, SOEs "closed the gap" with FOEs in the period 2007-2011. The good performance of SOEs may be the result of the state-led development policies undertaken during the 2000s. We also find that market competition has been effective in enhancing firms' TFP across industries and reducing the gaps in efficiency among ownership types. Based on these results, we put the transition path of Vietnam in comparative perspective with other transition models.

(ii) The second essay (chapter 3) investigates tax-avoidance profit-shifting activities of multinational firms out of Vietnam during the period from 2006 to 2012. Specifically, it examines how corporate income tax-rate differentials between the home country and Vietnam determine a foreign wholly-owned subsidiary's under-reporting of the profit obtained from an exogenous income shock. Departing from both the formal theory and most empirical studies on multinational profit shifting, we find a negative association between foreign subsidiaries' reported profit and tax rate difference. It means that the higher the corporate income tax rate of the home country compared to that of Vietnam, the less profits a wholly-owned subsidiary will report in Vietnam. Further analyses then reveal that this negative relationship between reported profit and tax-rate difference is mostly driven by the behavior of the firms from two neighboring tax havens, Hong Kong and Singapore. These firms from home countries with low corporate tax rates report more profits in response to the income shock in Vietnam than the remaining firms coming from other countries where corporate tax rates are higher. This study then contributes to

the literature a puzzling evidence of multinational profit shifting in Vietnam. Through the phenomenon of Hong Kong and Singaporean firms putting more money in Vietnam, it suggests that cross-border profit shifting by multinational firms is more complicated than what has been known given the role of tax havens and the weak institutions of a developing country such as Vietnam.

(iii) Using a sample of JVs from the Vietnam Enterprise Survey (VES) database, the third essay (chapter 4) is devoted to strategic implications of conversion of JVs to either WOSs (100% foreign ownership of MNEs) or fully domestic firms (DOMs– 100% domestic ownership) in Vietnam. For the case when JVs turning to WOSs, after matching the converted WOSs with selected comparable continuing JVs and analyzing the accumulated changes in their performance in a difference-in-differences framework, we do not find any persistent improvement in terms of financial profitability of the converted JV-to-WOSs compared to the matched continuing JVs. Here, no superiority attached to WOSs as an organization mode in compared to JVs has been found. The converted WOSs seems to experience a temporary negative shock in financial performance before conversion and then recover back to its normal trend which is not so different from that of the comparable continuing JVs. Besides, we also find some evidence of restructuring/adjustment in the converted WOSs in the first few years after conversion. Specifically, the converted WOSs have reduced their leverage levels and gradually improved fixed assets. Moreover, they have also slightly increased their employment scale and reduced the average wage bill per employee at the time of conversion. For the case of JVs turning to DOMs, our results suggested that the local owner has invested more on fixed assets after buying out a JV. However, the conversion of a JV to a DOM simply brings no effect in terms of financial profitability to the firm since, in compared to before conversion, both the converted JV-to-DOMs and the comparable continuing JVs have experienced a similar increasing trend in ROA.

Statement of Conjoint Work

The first essay of this thesis (chapter 2) is a joint work with Prof. Fabio Pieri and Prof. Enrico Zaninotto while the second essay (chapter 3) is a joint work with Prof. Marco Zamarian. The third essay (chapter 4) is a joint work with Prof. Zamarian and Prof. Roberto Gabriele. In all three essays, I perform the standard role of a PhD student by initiating the research projects, cleaning data, conducting empirical analyses, and writing a first draft of the working paper for each essay. Inputs from the Professors are acknowledged in terms of giving continuous comments and feedback, writing and improving subsequent versions of the working papers for each essay. All in all, it is a great opportunity and experience to work with them.

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Chapter 1 Introduction

1.1 Introduction and overview of the thesis

In their articles to welcome Vietnam's becoming a middle-income economy, the Economist shows many of the country's "strong" but "underappreciated" growth records (Economist, 2016a; Economist, 2016b). All in all, Vietnam is the 2nd fastest growing economy in the world in the period from 1990 to 2011, only after China. Its GDP has increased at an average pace of 7.3% annually from 1990 to 2011[1]. Once facing famine, the country now turns to be one of the world's main exporters of rice and other farm products. Millions of the country's people have escaped poverty and attained middle-income status (Economist, 2016a; Economist, 2016b). It is all thanks to the economic reform process started in 1986 which has essentially liberated the country from a central planning economy and transited it towards a market-based one.

This thesis, hence, aims to look at the micro dynamics underneath such transition using a database of Vietnamese enterprises that I am lucky enough to have access to: the Vietnamese Enterprise Surveys (VESs) from 2000 to 2012. It is comprised of three essays which explore economic and management issues of firms in Vietnam. The issues being addressed here are varied but connected to highlight (partly) how firms are doing business in the transition economy of Vietnam. The thesis is structured as follows:

(i) The first essay examines ownership differential (i.e. state-owned, private-owned, and foreign-owned) and competition effect on firm total factor productivity (TFP) as consequences of mixed economic reforms in Vietnam (Chapter 2). It describes the big picture: the whole transition process/institutional changes in Vietnam and how such changes are reflected in competition effect on firm TFP and comparative performance (in terms of TFP) of firms with different ownership types.

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[1] Calculated by Malesky and London (2014) from *World Bank's World Development Indicators*

(ii) The next two essays deal specifically with foreign firms' subsidiaries in Vietnam. One essence of the economic reform of Vietnam is its "open-door policy" to foreign direct investment (FDI) and international trade. While many benefits of FDI have been identified, in the second essay, an unwanted consequence of FDI is dealt with instead. Specifically, it examines whether foreign multinational firms undertake tax-avoidance profit shifting out the country (Chapter 3). Using a newly developed identification approach in the literature, the essay examines how corporate income tax-rate differentials between the home country and Vietnam determine a foreign wholly-owned subsidiary's under-reporting of the profit obtained from an exogenous income shock in Vietnam.

(iii) The third essay then investigates post-formation conversion of international joint ventures (JVs) to either wholly-owned subsidiaries (WOSs– 100% foreign ownership) or domestic firms (DOMs– 100% domestic ownership) in Vietnam. In this essay, both the drivers of such ownership transfers and their performance implications are investigated (Chapter 4).

The next section of this introduction chapter is a brief overview of the transition process of Vietnam economy since 1986. I then describe about FDI in Vietnam. These sections lay the background context for my empirical analyses of firm productivity, multinational profit shifting, and ownership changes of joint ventures in Vietnam in three subsequent chapters of the thesis. The last section concludes the chapter by providing a detailed summary of thesis.

1.2 A history of Vietnam's mixed economic reform since 1986

Before the country's economic renovation process (also known as "*Doi moi*" in Vietnamese term) started in 1986, Vietnam was facing famines and extreme shortages of basic consumer goods (Van Arkadie and Mallon, 2004, chapter 4)[2]. It was partly caused by the Trade Embargo imposed by the US after Vietnam War (1954-1975) and the fall in foreign aids from the Soviet bloc. However, the main reason lies internally on the "socialist" central planning economic system that the government eagerly adopted to recover the country's after-war economy. State-owned enterprises (SOEs) dominated the economy while private ownership was forbidden. There was no production autonomy inside SOEs as "the State assigned tasks to

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[2] My outline of Vietnam's economic situation before *Doi moi (1986)* in this paragraph is based on chapter 4 of Van Arkadie and Mallon's book. Interested readers are invited to cross-refer to this book for more details.

production units [i.e. SOEs], gave them the means [i.e. production inputs] and was handed over the finished goods"[3]. Industrial production soon collapsed in the economy once heavily dependent on external aids in the war time and now being plagued with distorted incentive structures and consequent inefficiency of SOEs. Such extreme economic conditions have led the Communist Party-led government to launch "*Doi moi*", the economic reform process, in 1986. This economic renovation process can be divided into two major periods: a gradual reform (1986-1999) and a substantial liberation period (2000-2012).

1.2.1 First phase (1986-1999): gradual reforms

In the first phase (1986-1999), learning from the transitional experience of its big socialist neighbor China, Vietnam adopted a gradual reform approach. It was featured by (i) the allowance but with cautious checking by the state for market entries of non-state enterprises, (ii) (i) the experimental reforms of SOEs, and (iii) a gradual relaxation of international trade barriers.

The *Doi moi* process began with the recognition by the Vietnamese Communist Party (VCP) that the heterogeneity in ownership of production assets was needed to solve the extreme shortages of necessity goods and to develop the economy (Pincus, 2016). Non-state enterprises were then allowed to enter selected industries and service sectors. It was in the Constitution 1992 that private property rights were officially stated and acknowledged for the first time. This change allowed the entry of thousands of small private-owned enterprises (POEs) into the market, which liberates underutilized factors of production such as land and labor to address market demand unfulfilled by SOEs and to export (Pincus, 2016)[4]. However, the population of private enterprises was still modest in terms of number in the 1990s as the government maintained "a cautious attitude" towards non-state sector (Tran et al. 2009). It was reflected in the laws with many strict and bureaucratic regulations as barriers to private business activities in Vietnam[5].

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[3] Communist Party of Vietnam 1986, p. 17 as quoted in Van Arkadie and Mallon, 2004, p. 41. The text in the square brackets are from the author of this thesis to make the sentence's meaning clearer.

[4] Parallel to this process is the entry of foreign-invested firms into Vietnam following the "open door" policy of the government to attract foreign direct investment (FDI). I will discuss in details about FDI in Vietnam in a separate section later.

[5] For example, two licenses were needed to establish a private company. The owners first must apply for *the establishment license* of a company. A high legal capital (i.e. required minimum capital) needed to be met and an

While still gradually freeing market entry, the government also conducted reforms on SOEs, its main economic vehicle. The SOE reform was first introduced through the "three-plan system" in 1980s. After fulfilling the production target set by the state, a SOE would be allowed to work on its own production plan where a large fraction of profits from such out-of-target plan could be retained inside the SOE and "allocated to employees as bonuses" (Van Arkadie and Mallon, 2004, p. 49). Privatization was also conducted but at case-based experimental scale on selected non-strategic SOEs in the late 1990s (CIEM-World Bank, 2002; CIEM-World Bank, 2005). However, the most important SOE reform in 1990s was the official legislation of regulations on business operations of SOEs. The Law on State-Owned Enterprises in 1995, the first of its kind, granted a legal status (as an independent legal person) to each SOEs, which enable them to legitimately do business with other business partners, in both state and non-state sectors (Nguyen, 2014, p. 38). Decision making was further decentralized to SOE managers in terms of employing and dismissing enterprise employees (Nguyen, 2014, p. 38).

Meanwhile, international trade barriers were gradually relaxed. Key reforms include (i) the switch from quotas or licensing towards the tariff regime following international custom to manage imports and exports and (ii) the accession to Association of Southeast Asian Nations (ASEAN) as a new member (Nguyen, 2014, p. 44-45; Van Arkadie and Mallon, 2004, p. 186). Trade also improved since the Trade Embargo by the US was lifted in 1994. However, Vietnam trade system was still considered as restrictive where tariff rates of selected goods could be as high as 60 percent (Nguyen, 2014, p. 44-45; Van Arkadie and Mallon, 2004, p. 186).

1.2.2 Second phase (2000-2012): more liberation and the rising of state capitalism

The slowdown of FDI inflows and the stagnation of economic growth shortly after the 1998 Asian financial crisis induced the government to start the second phase of the reform (Tran, 2009). This second phase was a more substantial liberalization the economy with its peak in 2007 as Vietnam joined World Trade Organization (WTO).

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initial business plan must be presented in the application file for *the establishment license.* Only after getting *the establishment license*, the company then could register and got *the business license* to start its business (Private Company Law, 1990). Moreover, a private company also need to go through both "*pre-inspection*" and "*post-inspection*" procedures during its establishment process (Nguyen, 2014, p. 41).

A first major reform was the adoption of the Law on Enterprises in 2000. This evolutionary Law has removed many administrative barriers and made it much easier to establish a new private enterprise in Vietnam (e.g. Nguyen, 2013; Nguyen, 2014, p.41). Since its coming into effect, the annual number of new-born private firms is booming (e.g. Tran, 2011).

Further reforms were also happened in the state-owned sector. Corporate governance of SOEs changed fundamentally in the early 2000s (2001-2004) as SOEs were converted into limited liabilities companies (LLCs) or joint stock companies (JSCs) (Nguyen, 2014, p.38) [6]. This change came officially into a legislation in the new Law on State-Owned Enterprises enacted in 2003. The law also abandoned most priorities and direct subsidiaries being received by SOEs and facilitated the privatization process of non-strategic SOEs (Nguyen, 2014, p. 38).

A legal framework for regulations on enterprises were "relatively complete" with the new Law on Enterprises 2005 which came into effect by July 2006 (Vu Thanh, 2014). This law applied equally to all enterprises irrespective of their ownership, viz. state-owned, private, and foreign-invested enterprises. This law promotes the "national treatment" principle where no forms of ownership discrimination can exist (Vu Thanh, 2014). Prior laws such as Law on State-Owned Enterprises, Law on Foreign Direct Investment, Law on Enterprises 2000 regulating specific types of enterprises based on their ownership, i.e. state ownership, private ownership, or foreign ownership, were abolished (see article 171 of the Law on Enterprises 2005). By the new Law, the state is merely an owner of equity in the SOEs who were being "reconstituted" as joint stock companies or limited liability companies (Nguyen, 2014, p.38)

Other crucial reforms in trade also happened (Nguyen, 2014, p. 46). The Bilateral Trade Agreement with the US was signed in 2000. Since 2002, export licenses were abolished and all

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[6] SOEs are organized as joint stock (or shareholding) companies (either listed or non-listed) when the state decides to maintain a majority of ownership. These companies are treated as cases under privatization when the state decides to hold just a minority of ownership. SOEs are converted to limited liability companies when the State would like to be the sole owner. About corporate governance structure, the joint stock companies have four governing bodies: shareholders' meeting, board of management (or board of directors) with a chairman, CEO, and an internal auditing committee. For limited liability companies, corporate governance structure still has three governing bodies: the member's council with a chairman (with similar role as the board of directors and the chair of the board), CEO, and an internal auditing member (or committee depending on company scale). Reader are cross-referred to Vietnam's Law on Enterprises 2000 or Law on Enterprises 2005 for more details on corporate governance of joint stock companies and limited liability companies.

business agents whatever their ownership types can freely undertake export activities. Tariffs were gradually reduced. Most important of all was the event of Vietnam's joining WTO in 2007.

While the liberation process of Vietnam economy reached a peak with its accession to WTO, it also should be noted about the rising state capitalism in the second half of 2000s. On a high of obtaining economic successes after two decades of economic renovation, the government consolidated smaller SOEs together into State Economic Groups (SEGs) with the hope of making these SEGs the "national champions" referencing to Korean chaebols and Chinese state-owned business groups (Malesky and London, 2014; Pincus, 2016). Vietnam came into a period of rising state capitalism when the government emphasized more the role of SOE sector as "leading engine" of economic growth (Malesky and London, 2014; Pincus, 2016). Such "state-led developmentalism" were in doubt as a gloomier picture shadowed the economy since then (Malesky and London, 2014; Pincus, 2016). Vietnam was hit by three consecutive macro and financial crises in late 2007, 2009, and 2011.

1.1.3 Key features of Vietnam's mixed economic reform

From the "*Doi moi*" economic reform process that we have experienced so far, it could be said that Vietnam is transiting into a mixed market economy (i.e. a combination of both planning and market systems) (e.g. Pincus, 2016). Two features have characterized such transition (i) liberalization of private property rights and (ii) state-led development policies with an emphasis on SOEs.

First, the state acknowledges private sector as a source of economic growth. Private property rights have been liberated with the increasing presence of non-state enterprises in the economy. Thousands of private-owned and foreign-owned enterprises (POEs and FOEs) operating in labor intensive and export-oriented sectors are "vent for surplus" of economic success (Pincus, 2016). See figure 1.1 for export performance of Vietnam which private and foreign-invested sectors are the main drivers.

[Figure 1.1 about here]

While still freeing private property rights and allowing for market entry of POEs and FOEs, the Communist-party led government never wants to abandon state ownership (Malesky and London, 2014; Pincus, 2016). It keeps confirming "the dominant role of the SOE sectors as

the leading engine of the economy"[7]. SOEs has been revitalized by privatization and changes in corporate governance. Small SOEs which are considered as non-strategic and not necessary to be hold by the state were privatized. Traditional SOEs were "reconstituted" into limited liabilities companies or joint stock companies (Nguyen, 2014, p. 38). The formation of SEGs with the hope of creating the "big fists" of the state in later 2000s has showed the stronger commitment to state-led developmentalism in Vietnam (Malesky and London, 2014; Vu Thanh, 2014; Pincus, 2016).

1.3 Foreign Direct Investment (FDI) in Vietnam

Foreign multinational enterprises (MNEs) began to enter Vietnam after the first Law on Foreign Investment in 1987. Figure 1.2 shows the annual inflows of FDI into Vietnam since then. In general, the number of new projects, registered capital and implemented capital have been increasing over the years. However, there are two brief downturn periods in terms of investment capital: 1997-1999 and 2009-2011. FDI declined from 1997 to 1999 as the Asian financial crisis hit Vietnam's neighbor and main-FDI-investing countries. The most recent global crisis in 2008 again caused a drop in FDI from 2009 to 2011. There is sign of recovery in FDI inflows by 2012.

[Figure 1.2 about here]

While there is never a formal written requirement that foreign investors must set up joint ventures with Vietnamese business partners in FDI laws, joint ventures (i.e. shared ownership between foreign and Vietnamese business parties) are the main form of FDI before 1996 (Truong and Gates, 1996). After the Law on FDI 1996, in practice, foreign investors are free to choose the investment forms (i.e. contracts, joint ventures (JVs), or wholly-owned subsidiaries (WOSs)) they like (Nguyen, 2014, p. 36). The number of WOSs (100% foreign ownership) started to increase and dominate the population of foreign-owned enterprises (FOEs). Figure 1.3 presents the new entries[8] by ownership calculated from the Vietnam Enterprises Surveys (VESs) for the

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[7] For example, the Communist Party of Vietnam has stated in its 10-Year Socio-Economic Development Plan for the period from 2010 to 2020: "The leading role of the State economic sector is to be enhanced, governing key domains of the economy; State enterprises are to be renewed and developed, ensuring production and business efficiency" (Communist Party of Vietnam 2010, p. 9, recited from Malesky and London (2014)).

[8] An entry is defined at the first appear in the VES database.

period 2001-2012. We can see that since 2002, WOSs always account for about 80 percentage of new entries. This fact is also reflected in the shares of WOSs and JVs in the annual numbers of current FOEs in Vietnam (figure 1.4). The number of JVs with local private partner(s) increases steadily from 129 firms in 2000 to 1018 firms in 2012 while the number of JVs with state partner(s) gradually decreases from its peak of 534 firms in 2001 to 366 firms in 2012. In the same time, the number of WOSs is booming from 823 firms in 2000 to 7329 firms in 2012.

[Figure 1.3 about here]

[Figure 1.4 about here]

The above patterns of FDI shows Vietnam's strong commitment to attract FDI and create a business-friendly environment towards foreign investors, for example, revisions of FDI regulations following practical requirements of the investors and establishment of export processing and industrial zones. On its side, FDI and FOEs have always been an important element of the country's economic reforms and economic success.

1.4 Summary of the thesis

Deeper economic and management issues relating to firms in Vietnam will be dealt with in later chapters of this thesis. Specifically, the next chapter addresses the role of ownership and competition in Vietnamese firms' total factor productivity in the transition period of 2001 to 2012. Chapter 3 then will investigate tax-avoidance profit shifting activities of MNEs out of Vietnam while chapter 4 examines post-formation ownership changes of foreign joint ventures. The following are detailed summaries of each chapters:

(i) The second chapter examines ownership differential (i.e. state-owned, private-owned, and foreign-owned) and competition effect on firm total factor productivity as consequences of mixed economic reforms in Vietnam. Understanding of the role ownership and competition in firm productivity throughout the transition path of Vietnam is very important. Vietnam has transited itself to a mixed market economy (i.e. a combination of both planning and market systems). In which, state-owned enterprises (SOEs), the legacy of the communist central planning economy, never disappear but being revitalized by the government to be "the leading engine of the economy" (Malesky and London, 2014; Pincus, 2016). However, in such an environment, the private sector including both private-owned enterprises (POEs) and foreign-owned enterprises (FOEs) still maintains a rapid growth. The business landscape in Vietnam has

been constantly altered with a lot of dynamics from the entry of newly private and foreign enterprises and the revitalization of the state-owned sector.

Using a panel dataset of Vietnamese manufacturing firms from 2001 to 2011, we find that state-owned enterprises (SOEs) and foreign-owned enterprises (FOEs) perform better than private-owned enterprises (POEs) in terms of TFP. More interestingly, while FOEs exhibit higher TFP level than SOEs in the 1st sub period (2001-2006), SOEs close the gap with FOEs in terms of TFP in the 2nd sub period (2007-2011) when the state capitalism is rising in Vietnam. We submit that the remarkable performance of SOEs may be the result of the effect of the restructuring process undertaken by the Vietnamese government to preserve and consolidate the internal competences of these firms. However, we cannot exclude, and indeed we discuss, the possibility that this result may also stem from the easier access to factors of production (capital and land) gauged by SOEs in the period 2007–2011. Second, we find that market competition has enhanced firm average productivity across industries and reduced gaps in productivity among firms of different ownership types (viz., FOEs, SOEs and POEs).

These findings are robust to a variety of robustness checks. We show that they are robust to Heckman's 2-stage procedure to control for the possible selection (non-randomness) of businesses kept in the hands of the state. Moreover, we control for simultaneity and unobserved heterogeneity and the main results of the analysis are confirmed. Results are also robust when we replace labor productivity (value-added over an employee) as the dependent variable or when we modify the definition of our main regressors of interest: ownership categories. Based on these findings, we discuss Vietnam's transition pattern specifically and in compared to other transition models.

(ii) Around the world, we are witnessing a raise in awareness about tax-dodging profit shifting activities by multinational corporations (MNCs) from high-tax to low-tax countries (Economist, 2013; Dharmapala, 2014). The study in the third chapter tackles those issues by investigating the profit-shifting behavior of MNCs operating in Vietnam, a late development country, during the period from 2006 to 2012. Vietnam serves as a good laboratory context since there is a lot of suspicion and indirect evidence raised in the media about MNCs' abuse of transfer pricing to siphon profits out of the country (e.g. Nguyen, 2011; Tuoi Tre News, 2015).

This study also uses a new identification strategy initiated by Chang and colleagues (Chang, 2013) to investigate the profit-shifting activities of multinational firms out of Vietnam. Specifically, it examines how corporate income tax-rate differential between the home country and Vietnam determines a foreign wholly-owned subsidiary's under-reporting of the profit obtained from an exogenous income shock in Vietnam. This identification approach then addresses the endogeneity issues raised about the traditional estimation approach developed by Hines and Rice (1994).

Based on a sample of MNCs' wholly-owned subsidiaries operating in Vietnam during the period from 2006 to 2012, our analysis suggests that a foreign subsidiary will report less profits in Vietnam the higher the corporate income tax rate of the home country compared to that of Vietnam. This contradicts the proposed hypothesis and previous results from the literature since the literature would suggest that a subsidiary will report more profits in response to the industry earnings shock, the higher the corporate income tax rate of the home country compared to that of Vietnam. Further analyses then reveal that this negative relationship between reported profit and tax-rate difference is mostly driven by the behavior of the firms from two neighboring tax havens, Hong Kong and Singapore. These firms from home countries with low corporate tax rates report more profits in response to the income shock in Vietnam than the remaining firms coming from other countries where corporate tax rates are higher.

Why do foreign firms from HS, the two tax havens and also neighboring countries, report more profits in Vietnam than the ones from the other countries? It is perhaps too soon to give any speculative explanation. We hope, through the study of this chapter, to contribute to the literature some puzzling evidence of multinational profit shifting in Vietnam. Through the phenomenon of firms from Hong Kong and Singapore putting money in Vietnam, it suggests that cross-border multinational profit shifting is more complicated than what has been known given the role of tax havens and the weak institutions of a developing countries such as Vietnam.

(iii) The fourth chapter investigates post-formation conversion of international joint ventures (JVs) to either wholly-owned subsidiaries (WOSs– 100% foreign ownership) of multinational enterprises or fully domestic firms (DOMs– 100% domestic ownership) in Vietnam. For the drivers of conversion of JVs to WOSs, we observe that a poor average ROA in three previous years significantly increases the likelihood of a JV's conversion to a WOS. The

converted JV-to-WOSs seem to experience a temporary negative shock in financial performance (an Ashenfelter's dip) before conversion. Moreover, in the presence of asset specificity proxied by high levels of fixed asset ratio, JVs are more likely to convert to WOSs. Meanwhile, foreign ownership share has a positive and significant relationship with the likelihood of JVs switching to be WOSs.

For the drivers of conversion of JVs to DOMs, we find that firm size has an inverted U-shaped relationship with the likelihood of conversion. It suggests that size might be a factor that constraints local owners from buying out the JV. After an "optimal point" in size, the likelihood of JVs switching to DOMs decreases. Among other results, foreign ownership share has a negative and significant effect on the likelihood of JVs switching to be DOMs. The larger the share of foreign ownership in a JV, the less likely that the JV will turn to be a DOM.

This chapter then contributes to the literature of joint venture evolution by examine subsequent performance implications of JV conversion. For the case when JVs turning to WOSs, after matching the converted WOSs with selected comparable continuing JVs and analyzing the accumulated changes in their performance in a difference-in-differences framework, we do not find any persistent improvement in terms of financial profitability of the converted JV-to-WOSs compared to the matched continuing JVs. Here, no superiority attached to WOSs as an organization mode in compared to JVs has been found. The converted WOSs seems to experience a temporary negative shock in financial performance before conversion and then recover back to its normal trend which is not so different from that of the comparable continuing JVs. Besides, we also find some evidence of restructuring/adjustment in the converted WOSs in the first few years after conversion. Specifically, the converted WOSs have reduced their leverage levels and gradually improved fixed assets. Moreover, they have also slightly increased their employment scale and reduced the average wage bill per employee at the time of conversion. For the case of JVs turning to DOMs, our results suggested that the local owner has invested more on fixed assets after buying out a JV. However, the conversion of a JV to a DOM simply brings no effect in terms of financial profitability to the firm since, in compared to before conversion, both the converted JV-to-DOMs and the comparable continuing JVs have experienced a similar increasing trend in ROA.

Tables and figures

Figure 1.1 Export as percentage of GDP (1986-2012)

Source: World Bank's World Development Indicator
(https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=VN)
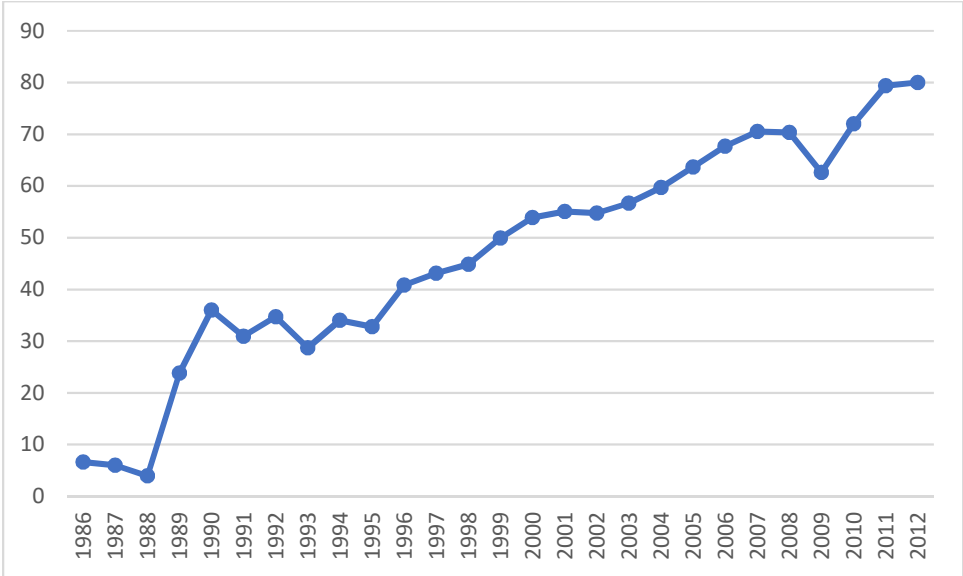
Figure 1.2 FDI in Vietnam (1986-2012)
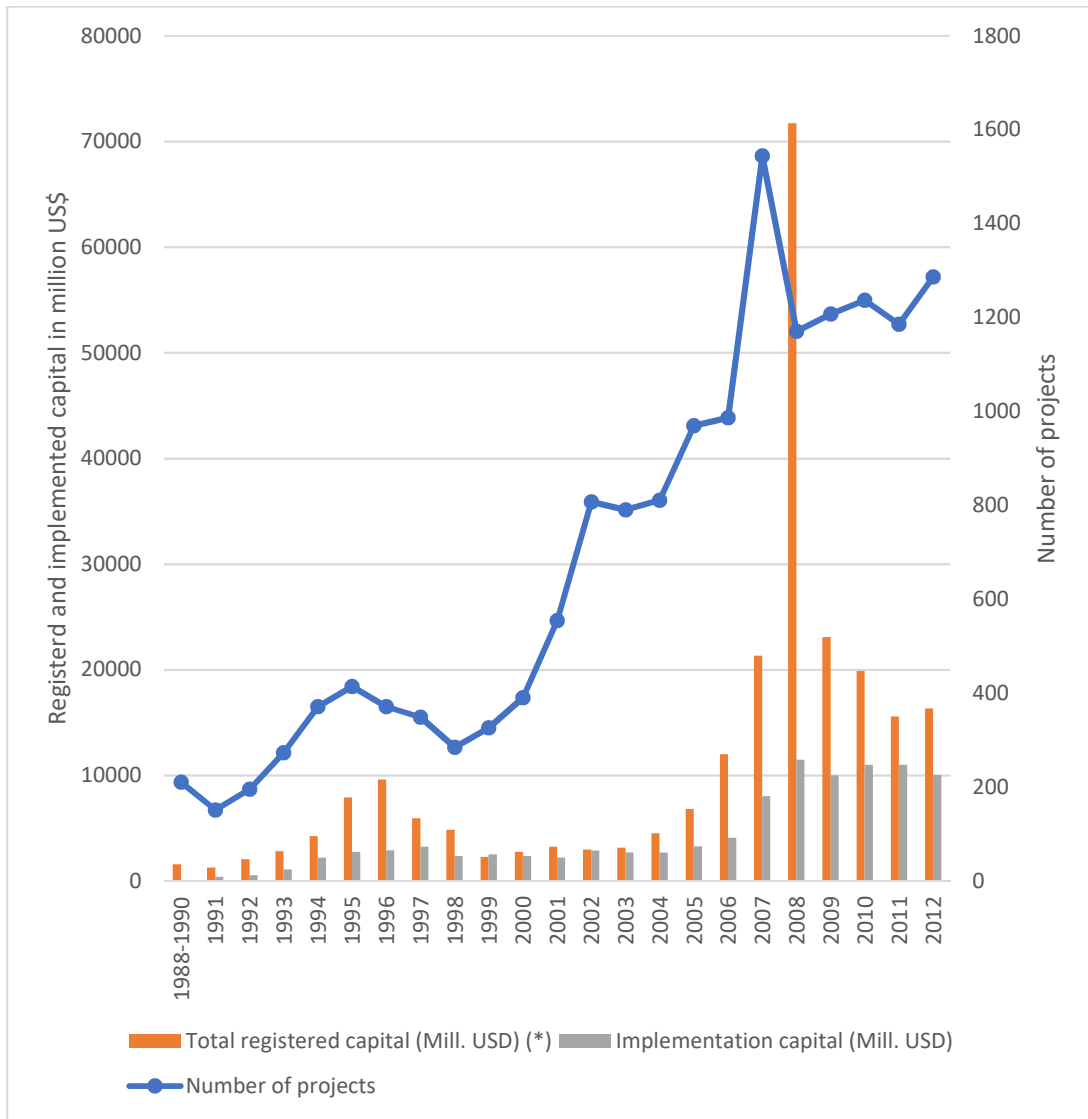
Source: Vietnam General Statistical Office (http://gso.gov.vn/default_en.aspx?tabid=776)

Figure 1.3 New entries by ownership (JVs vs. WOSs) in the VES surveys (2001-2012)
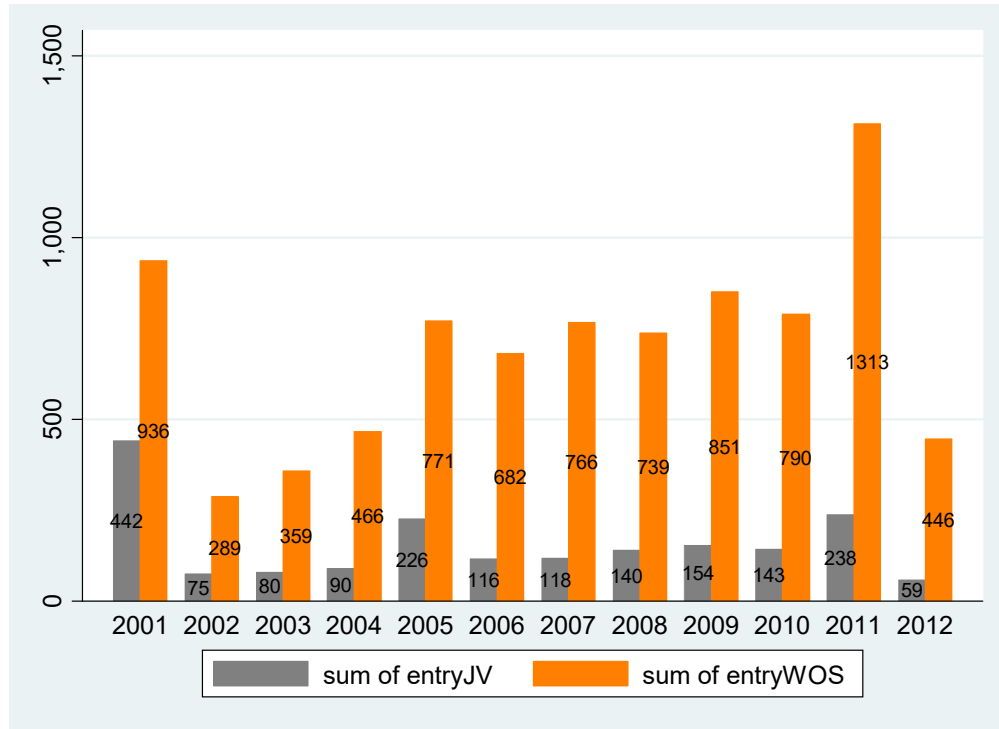
Source: author's calculation from the VES surveys

Figure 1.4 Number of foreign-owned enterprises in the VES surveys (2000-2012)
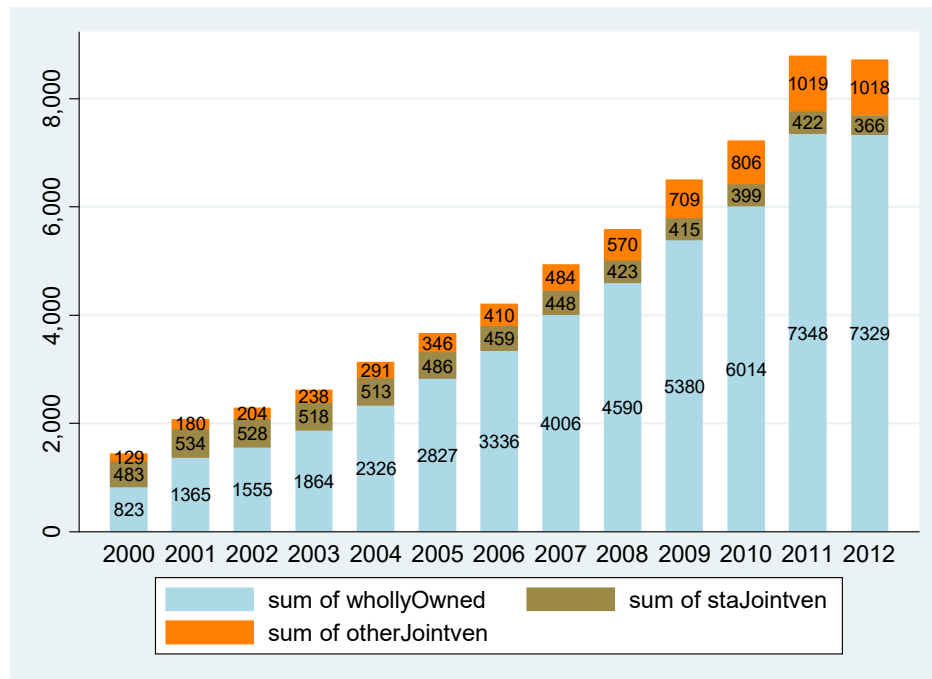
Source: author's calculation from the VES surveys

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Chapter 2 From central planning towards a market economy: the role of ownership and competition in Vietnamese firms' productivity

2.1. Introduction

Vietnam has achieved tremendous economic growth since the launch in 1986 of the *doi moi* ("renovation") program, which determined the gradual turning away of the country from central planning and its transition towards a market economy (Pincus, 2016; p. 380). Over this period, the Vietnamese GDP growth rate has been, on average, around 7% on a year-on-year basis (see Minh and Long, 2008; p. 106; World Bank, 2012; Malesky and London, 2014; p. 203).

The *doi moi* policy has been based on three main pillars (Pincus, 2016; pp. 380-382). First, mobilization of under-utilized land and labor in the production and export of goods: indeed, agriculture and labor-intensive manufacturing -- conducted by small firms and household enterprises-- have spurred Vietnamese growth during this period. Second, the greater space allowed for incoming foreign investments (whose number and value gained *momentum* mostly after the revision of the *Investment Law* in 2005). Third, from the mid-1980s the state began to retreat from an omnipresence across the economy while maintaining a strategic control of several industries (see Vu Thanh, 2014; p. 16) *via* state-owned enterprises (SOEs).[9]

Recent Vietnam's development has puzzled scholars for several reasons, leaving the explanation for the country success not clear-cut. As for institutions, the political system is a Communist single-party regime, where participation to political decisions is limited to few people (Malesky and London, 2014; p. 202); property rights protection and legal institutions are

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[9] Pincus (2016, p. 381) lists these sectors. By looking at the share of SOEs on total firms in our database (Appendix A2.4) we observe that SOEs were relevant in 2001 in the following manufacturing sectors: tobacco; machinery and equipment; chemicals and pharmaceuticals. The state kept lower but still significant shares in textiles, apparel, leather products and footwear and non-metallic mineral products. A quick look at the figures referring to 2011 shows that SOEs have been decreasing in number in most of these industries during the 2000s. Ngoc and Ramstetter (2004; p. 393) confirm these figures.

still not fully developed. As for the economy, the expansion of the private sector has gone hand in hand with the "state-led development" policy intended to consolidate several SOEs as the "leading engine of the economy" (Malesky and London, 2014; p. 2018).[10] Moreover, the growth model followed by Vietnam from the mid-1980s has been more based on the accumulation of resources rather than on productivity growth (around 80% of GDP growth during this period is explained by labor and capital accumulation).[11]

Even if the not so striking productivity figure together with low wages, widespread underemployment and the relevance of the agricultural sector[12] may suggest that the *doi moi* model has not been fully exploited yet (see Malesky and London, 2014; p. 207; Pincus, 2016 pp. 390-392), in the long-run, the Vietnamese growth path will be maintained only through sound productivity dynamics. Given this, it is timely to inquire into the determinants of productivity in Vietnam.

In particular, two features of the *doi moi* program may have had an effect on Vietnamese firms' productivity. First, the recognition and promotion of heterogeneity in ownership types. After 2000, several changes in the legal environment (see Section 2.2) incentivized the set-up of many private-owned enterprises (POEs) and the entry of foreign-owned enterprises (FOEs) and granted a single unified legal framework to all firms. During the same period, "state-led development" policies lead to changes in the governance and the equitization of several SOEs (Minh and Long, 2008; pp. 99-100). Second, the number of firms active in Vietnam and, thus, market competition has increased precisely because of these changes. The accession of Vietnam to the WTO has prompted market competition even further from 2007 onwards.

Despite the debate on Vietnamese firms' performance has gained *momentum* over the last fifteen years thanks to the increasing availability of firm-level data (see Ngoc and Ramstetter, 2004; Nguyen and Le, 2005; Ha and Kiyota, 2014; Nguyen, 2016; among others), general

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[10] In terms of GDP, the private sector has consistently represented 60% of the economy in 1995, 2005 and 2010.

[11] For example, Nguyen (2004) calculated the total factor productivity (TFP) growth rate to be around 1.5% (on average) in the period 1985-2004 (with respect to an average GDP growth rate of 6.7%); in line with this result, Minh and Long (2008) have found TFP growth to contribute about 19.7% to the country's GDP growth during the period 1985-2006.

[12] In 2012, almost 50% of the labor force was employed in the primary sector.

evidence on the role of ownership and market competition in productivity is still sparse and not conclusive (see Huang and Yang, 2016; Baccini et al. 2017; among others). This is unfortunate, because at this stage of Vietnam's development, it is key to deepen our knowledge into these two major determinants of firm productivity.

The study in this chapter take advantage of a large panel dataset of Vietnamese manufacturing firms observed over an entire decade (from 2001 to 2011) to empirically assess the role of ownership and competition in firm total factor productivity (TFP). The period analyzed is one of major changes in the firms' playing field, as the reforms promoting the private sector, the restructuring of the SOEs and the accession of the country to the WTO. The focus on manufacturing allows us to analyze the relative performance of different ownership types in sectors characterized by relatively low levels of regulation and exposed to international competition.

We get two main results. First, we find that -- once controlled for a large set of firm, industry and province characteristics -- both FOEs and SOEs show, on average, higher TFP levels than POEs during the period 2001-2011. Actually, while FOEs ranked the highest in terms of TFP in the period 2001-2006, SOEs "closed the gap" with FOEs in the period 2007-2011. That remarkable performance of SOEs may be the result of the effect of the restructuring process undertaken by the Vietnamese government in order to preserve and consolidate the internal competences of these corporations. We cannot exclude and indeed we discuss the possibility that this result may also stem from the easier access to factors of production (capital and land) gauged by SOEs in the period 2007-2011[13]. Second, we find that market competition has enhanced firm average productivity across industries and reduced gaps in productivity among firms of different ownership types (viz. FOEs, SOEs and POEs), providing some evidence on the role that competition has played in the recent Vietnam's transition path (Pincus, 2016; Nguyen, 2016).

These findings are robust to a variety of robustness checks. We show that they are robust to Heckman's 2-stage procedure to control for the possible selection (non-randomness) of

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[13] We also discuss the possibility that this result may also stem from the fact that we may over-estimate the TFP of SOEs due to omitted price bias. We conduct an indirect test to confirm this is the result of the effective restructuring policies undertaken by the Vietnamese government rather than just a consequence of omitted price-bias (see section 2.5.1).

businesses kept in the hands of the state. Moreover, we control for simultaneity and unobserved heterogeneity and the main results of the analysis are confirmed. Results are also robust when we replace labor productivity (value-added over an employee) as the dependent variable or when we modify the definition of our main regressors of interest: ownership categories.

This study contributes to the literature on the Vietnam growth path and its determinants (see Minh and Long, 2008; Malesky and London, 2014; Pincus, 2016; among others), by providing a comprehensive overview of TFP in Vietnamese manufacturing during the period 2001-2011 when relevant institutional and economic changes have taken place. In addition, this work contributes to the empirical literature on the joint role of private ownership and market competition in firms' productivity. Indeed, the two have been considered by both scholars and policy makers as the major forces for an effective transition from central planning to market economies (see Zhang et al., 2001, for an assessment of these two factors on Chinese firms' efficiency; Bartel and Harrison, 2005, for an analysis of manufacturing establishment in Indonesia; Asaftei et al., 2008, for an inquiry into Romanian firms; Driffield et al. 2013, for some evidence regarding Central and Eastern European countries; among others).[14] Finally, by discussing our results in the light of the literature on the models of transition and by comparing the evidence we get with other countries' experiences in a comparative perspective, our study makes a contribution to the literature on the role and the evolution of state ownership in transition countries (e.g. see, Grosman et al., 2016; Musacchio et al., 2015; among others).

The rest of this chapter is organized as follows. Section 2.2 describes some major institutional reforms occurred in Vietnam in the last three decades. Section 2.3 defines the framework of analysis and the research hypotheses. Section 2.4 describes the data. Section 2.5 presents econometric results while Section 2.6 discusses them. Section 2.7 concludes the chapter.

2.2 Reforms in the 1990s and 2000s: the rise of private firms and state-led development policies

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[14] As underlined by Estrin et al. (2009; p. 5), "The so-called Washington Consensus emphasized […] that private ownership together with market forces would ensure efficient economic performance".

Since the launch of the "renovation" program in 1986, Vietnam followed the footsteps of its big socialist neighbor, China, to transit into a mixed market economy (Pincus, 2016; p. 380).

The first main ingredient of the economic reforms promoted through the *doi moi* plan (which has successfully lasted for three decades until the crisis that has affected the Vietnamese economy in 2011) was the liberalization of property rights, which have been strengthened after the Vietnamese Constitution of 1992[15]. This institutional change set under-utilized factors of production free and allowed the entry of small POEs into the market. In parallel with this entry process, the government started to adopt an "open door" policy to attract foreign direct investments (FDIs). However, the relevance of both POEs and FOEs has been increasing in the second wave of the reforms started since 2000. Indeed, after 2000, the new versions of the *Enterprise* and *Investment* laws granted a single unified legal framework to all firms (either domestic or foreign, private or state-owned) (e.g. Nguyen, 2014; Vu Thanh, 2014). These laws removed many administrative barriers and made it easier to establish new private enterprises in the country. Since their coming into effect, the number of POEs and FOEs in Vietnam has sharply raised, as Figure 2.2 shows. Accession to the WTO in 2007 has further prompted market liberalization.[16]

The second ingredient of the transition process has been the role assigned by the government to both SOEs and the sectors in which they are more relevant as tools to keep dominating "the commanding heights of the economy" (Malesky and London, 2014; Pincus, 2016). Before 1986, under a central planned economy, SOEs were the dominant organizations in the economy when private ownership was still considered as illegitimate at that time. However, these SOEs were characterized as inefficiency since they have no production autonomy and, hence, incentives to improve themselves (Van Arkadie and Mallon, 2004-chapter 4). Since the "*doi moi*" program, the government has been conducting series of reforms on SOEs, its main

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[15] Private ownership is officially stated and acknowledged in the Constitution 1992. The reader is cross-referred to Malesky and London (2014) and Pincus (2016) for an in-depth description of the reforms undertaken by the country in the three last decades.

[16] Indeed, Vietnam had to adjust its legal framework to the underlying values of the WTO such as free trade (i.e. via reduction of tariff and non-tariff barriers), fair competition (i.e. via a promise of elimination of prohibited subsidies to SOEs and fostering competition in domestic financial markets) and non-discrimination (through the "national treatment" principle). An in-depth discussion on the reforms that Vietnam had to start to deal with in order to join the WTO is presented in Vu Thanh (2014; pp. 5-11).

economic vehicle throughout 1990s and 2000s. The Law on State-Owned Enterprises in 1995, the first of its kind, granted a legal status (as an independent legal person) to each SOEs, which enable them to legitimately do business with other business partners, in both state and non-state sectors (Nguyen, 2014, p. 38). Decision making was also decentralized to SOE managers in terms of employing and dismissing enterprise employees (Nguyen, 2014, p. 38).

The government has boosted up its scheme to further "revitalize" SOEs in 2000s. In the first years (2000-2006), SOEs were corporatized (i.e. converted into limited liability companies or joint stock (shareholding) companies) to have a more "modern" governance structure. This corporatization process happens in parallel and pave the way for the privatization of small and non-strategic SOEs (CIEM-Worldbank, 2002; CIEM-Worldbank, 2005). Under the unified Law on Enterprises 2005, the state is merely an owner of equity in the SOEs who were being "reconstituted" as joint stock companies or limited liability companies (Nguyen, 2014, p.38)[17]. These reforms aimed at strengthening SOEs' efficiency since managers and workers inside SOEs are now more motivated to improve efficiency, thanks to the advantages of corporatization with the separation of state ownership and management (e.g. Zhang et al., 2001; Aivazian et al., 2005). State-led development policies have geared up in the second half of 2000s (2007-2011). In front of three consecutive macro and financial crises (respectively in 2007, 2009, 2011) and the exposure to tougher international competition imposed by the accession to WTO, the government has promoted consolidations of several SOEs into State Business Groups (SBGs) or State Economic Groups (SEGs) with the aim of reaching economies of scale and scope and consolidating their main managerial and technological competences (Vu Thanh, 2014; Pincus, 2016).

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[17] SOEs are organized as joint stock (or shareholding) companies (either listed or non-listed) when the state decides to maintain a majority of ownership. These companies are treated as cases under privatization when the state decides to hold just a minority of ownership. SOEs are converted to limited liability companies when the State would like to be the sole owner. About corporate governance structure, the joint stock companies have four governing bodies: shareholders' meeting, board of management (or board of directors) with a chairman, CEO, and an internal auditing committee. For limited liability companies, corporate governance structure still has three governing bodies: the member's council with a chairman (with similar role as the board of directors and the chair of the board), CEO, and an internal auditing member (or committee depending on company scale). Reader are cross-referred to Vietnam's Law on Enterprises 2000 or Law on Enterprises 2005 for more details on corporate governance of joint stock companies and limited liability companies.

2.3 Framework of analysis and hypotheses

The framework of analysis draws from Park et al. (2006) and it is based on the two main forces that have re-shaped the economic landscape in Vietnam across 2000s, i.e. the liberalization of private property rights and the state-led development policies.

[Figure 2.1 about here]

The liberalization of private property rights may have had a direct impact on firm productivity via an ownership (*per se*) effect. Megginson and Netter (2001) and Estrin et al. (2009; p.7) review the advantages that private ownership ensures to firms. Indeed, it reduces managerial discretion via better incentives (Morck et al., 1989) and clear monitoring chains (Driffield et al. 2013) and by exposing firms to the market for corporate control. Furthermore, the state, as the firm's owner, may impose targets other than profit-maximization (Shleifer and Vishny, 1997; Hanousek, Kočenda and Svenjar, 2009). Finally, poorly performing SOEs may be granted easier access ("soft budget constraint") to external financial resources than their private counterparts (Brandt and Li, 2003). All these factors may positively affect private-owned firms' efficiency with respect to that of their state-owned counterparts.

However, these advantages of private ownership are more truly hold in a *perfect* market system (Shleifer, 1998 or Peng et al., 2016). In their seminal article, Musacchio et al. (2015) propose that national-level institutions serve as a contingent factor that determines the relative performance between SOEs and POEs. In the context of transition economies (as Vietnam), non-private ownership may be advantageous (e.g. Li, 1996; Che and Qian, 1998). Specifically, due to poorly functioning of supporting institutions and market governance, POEs suffer higher costs to conduct market transactions (Park et al., 2006) [18]. Moreover, state-led development policies in the 2000s with aim of revitalizing SOEs seems to work along two main lines. First is the privatization of small, non-strategic SOEs and the modernization of governance of SOEs, where enterprises' managers and workers are now more motivated to improve efficiency (e.g. Zhang et

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[18] Some authors have suggested that non-private ownership may be advantageous in the context of transition economies (such as China and Vietnam), where market transactions can be blocked due to government regulations (Li, 1996) and property rights are insecure (Che and Qian, 1998).

al., 2001; Aivazian et al., 2005)[19]. Second is the consolidation of medium and large SOEs into state conglomerates where economies of scale and scope may have been better exploited (Pincus, 2016).

Overall, in the period 2001-2011, the co-occurrence of property rights' liberalization and state-led development policies may have had uneven effects on the efficiency of firms characterized by different ownership types. On the one hand, a strengthened recognition and protection of private ownership may have granted an advantage to POEs; on the other hand, SOEs may have improved their efficiency thanks to the government action. Thus, we propose a pair of contradicting hypotheses, letting the empirical analysis telling us which one is supported.

H1a. *POEs outperform SOEs in terms of TFP levels*

H1b. *SOEs outperform POEs in terms of TFP levels*

Theoretical works have established the advantage of foreign firms over domestic ones (Markusen, 1991; Dunning, 1993; Caves, 1996). This is linked to firm-specific knowledge-based and intangible assets that ensure to FOEs superior management practices and technological know-how. Indeed, several empirical papers have proved FOEs to be more productive than domestic firms (Griffith, 1999; Harris and Robinson, 2002; Takii, 2004; Benfratello and Sembenelli, 2006). Given that, we expect FOEs to be more productive than both POEs and SOEs:

H2. *FOEs outperform domestic enterprises (POEs and SOEs) in terms of TFP levels*

Apart from the ownership effect, the liberalization of private property rights during the 2000s has implied a rise in the number of POEs and FOEs across industries. This, together with Vietnam's accession to the WTO, may have pushed up managements' effort to enhance firms' efficiency due to a fiercer market competition. Backus (2014) suggests two channels through which this may work. First, more competitors allow the owner of the firm to better compare the performance of own managers with that of other managers in the same industry (Holmström, 1982). Second, the generation of a business-stealing effect raises the necessity to invest in cost

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[19] Since SOEs were being "reconstituted" as limited liability companies or joint stock companies (Nguyen, 2014, p.38), the state as an owner of equity exerts control through appointment of state representatives in the board and firm CEOs. In practice, state representatives and top management team inside SOEs also held Communist party membership and are treated as tenured state officials.

reduction (Raith, 2003). As a result of the rise in the number of firms, we expect firms active in more competitive industries to be more efficient.

H3. *In industries characterized by a higher degree of market competition, the productivity of the "average" firm is higher*

By being exposed to a fiercer competition, less efficient firms –regardless of their ownership types-- will be forced to exit the market. Thus, another consequence of the rise in the number of firms is the expected convergence in productivity toward "sufficient" levels by all firms belonging to the same industry (Hopenhayn, 1992). We expect market competition to reduce gaps in productivity across ownership types within industries.

H4. *In industries characterized by a higher degree of market competition, the gaps in productivity across different ownership types is lower*

2.4 Data and descriptive analysis

2.4.1 Data

Since 2000, the General Statistics Office (GSO) conducts an annual Survey on Vietnamese Enterprises (VES), which essentially covers all Vietnamese firms operating in all economic sectors (*census*) in the period 2000-2012.[20] The VES survey is rich in terms of demographic and balance sheet information regarding firms and these data have been used in a number of scientific papers (e.g., Ha and Kiyota, 2014; Newman et al., 2015; Kyburz and Nguyen, 2016; Nguyen, 2016; Baccini et al. 2017).

Each firm in the VES is classified as belonging to an industry following the Vietnamese Standard Industrial Classification (VSIC). In order to build our analysis upon the longest feasible time-series, we had to develop a probabilistic routine to adjust the industrial classification before

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[20] The VESs survey all SOEs and FOEs no matter what size they are. For POEs, because the population of enterprises has grown, since 2003 GSO has surveyed fully all firms with more than 10 employees (this number is 20 employees from 2008 onwards) but surveyed only a selected representative sample of firms with less than 10 employees (or 20 employees from 2008 onwards). However, GSO still includes the micro private enterprises which are not surveyed in the database as observations with only variables on their identity (name and tax code) and their basic demographic information to generalize and calculate annual summary statistical figures for administrative and regulative purposes.

2006 (VSIC 93) to the new industrial classification (VSIC 07).[21] This has allowed us to exploit a longer panel of data than those employed in previous studies using the same survey. A time-invariant (modal) industry code is assigned to each firm.

In order to clean the data and get the final sample, we take the following steps. We select manufacturing firms; we drop duplications (a unique ID -- which is derived from the tax code -- is assigned to each firm over time), inactive enterprises, and enterprises with no tax code or missing values on key information; we drop observations with illogical figures such as negative values on sales, total assets, total wages, and material input costs; only observations with *leverage ratio* (total debts over total assets) from 0 to 100 are maintained in the database. Thus, our final sample is an unbalanced panel of Vietnamese manufacturing firms, which comprises of 282,764 firm-year observations from 2001 to 2011.[22] It essentially covers about 88.23% of the total population of manufacturing firms in Vietnam.[23]

As for the information regarding ownership, all Vietnamese enterprises are classified (each year) into 14 ownership types. We regroup these 14 types into three mutually exclusive categories: state-owned enterprises (SOEs), private-owned enterprises (POEs), and foreign-owned enterprises (FOEs). SOEs are the firms with state participation in equity greater than 50%. POEs are the firms with entirely private ownership or the ones with a mix of both private and state ownership where state ownership is less than or equal 50%. FOEs comprise both fully owned foreign subsidiaries and joint ventures established between foreign and local partners in Vietnam.[24] Firms can shift from one category to another on a year-on-year basis.

As discussed in Section 2.2, there has been a remarkable growth in the population of POEs in 2000s (Figure 2.2). Meanwhile, the number of FOEs has increased fourfold from 1096

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[21] Appendix A2.1 furnishes additional details about the procedure.

[22] As we use the entry- and exit-rate as regressors in the econometric model, the first (2000) and the last year (2012) of the panel are not usable.

[23] The reader is cross-referred to Appendix A2.2 for a comparison of our sample with the official figures of manufacturing firms reported annually by GSO.

[24] Our classification is in line with those employed by Asafei et al. (2008) and Huang and Yang (2016). See Appendix A2.3 for further details about the adopted classification. We also check if our findings are robust to an alternative way of defining ownership dummies (see section 2.5.2.2 and Appendix A2.13 and A2.14).

firms in 2001 to 4595 firms in 2011, while the number of SOEs halved from 1231 firms in 2001 to 622 firms in 2011[25].

[Figure 2.2 about here]

2.4.2 Variables and descriptive analysis

Productivity

We employ firm TFP (in log) as the dependent variable in the econometric model, by measuring it with the IV-GMM modified Levinsohn-Petrin estimator (Levinsohn and Petrin, 2003) developed by Wooldridge (2009)[26]. Output in the production function is proxied by real value-added, which is calculated using the addition method: specifically, it equals sum of total wage, depreciation,[27] operating profit before tax, and indirect taxes. Capital input is proxied by the value of fixed assets in real terms while labor is measured by the number of total employees, both at the end of the year. Material input is calculated by subtracting value-added from output (deflated sales).[28]

Ownership and market competition

Two out of three mutually exclusive dummies for firm ownership (the baseline/omitted category is the dummy referring to POEs) are included in the empirical model to capture the differences in productivity levels across ownership types.

We use two variables to measure the toughness of market competition in the 4-digit industry a firm belongs to. First, the Herfindahl-Hirschman Index (HHI) is included, which equals the sum of squares of market shares (in terms of sales) of all firms in the 4-digit industry:

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[25] A breakdown of firms by ownership type and industry is reported in Appendix A2.4.

[26] The estimation of firms' TFP is discussed at length in Appendix A2.5. A table which presents production function input coefficients estimated for each 2-digit sector is also put in this appendix.

[27] As the VES does not have information about depreciation, by following Ha and Kiyota (2014), we approximate depreciation by the difference in accumulated depreciation between the end of year and the beginning of the year.

[28] We use different deflators to convert nominal values into real values (base year: 2010). Value-added is deflated by using the Producer Price Indexes (PPI) of each 2-digit industry (source: www.gso.gov.vn) while capital is deflated by using the gross fixed capital formation deflators (source: World Bank's World Development Indicator). Finally, annual GDP deflators taken from World Bank's World Development Indicator are used to deflate material inputs. Real values in Vietnam Dong (VND) are then converted into US dollars (USD) using the official annual exchange rate in 2010 at 18612.92 VND/USD.

the higher the HHI the more concentrated and therefore, the less competitive an industry is. Second, we use the annual entry rate at the 4-digit level, which captures the threat by potential entrants.

In order to test for the effect of competition in reducing the gaps in productivity across firms with different ownership, we also include the interactions between ownership and competition by multiplying each dummy (SOEs and FOEs) with each proxy for market competition.

Control variables

In order to minimize the risk of getting biased coefficients referring to ownership and market competition due to omitted variables, we extend the empirical model and include a vector of controls at the firm, industry and province level. Table 2.1 shows the definitions of all variables employed.

[Table 2.1 about here]

Relying on the previous literature on the determinants of productivity at the firm-level, we include, as controls, measures of: firm age (see Jovanovic 1982; Ericson and Pakes 1995, among others), firm size (Garicano, et al. 2016) and firm export status[29] (see Bernard and Jensen, 1999; Roberts and Tybout, 1997; Melitz, 2003, among others). Firm leverage ratio (debt over total assets) is also included as a first attempt to control for the fact that SOEs might have benefited from "softer budget constraints" than their private counterparts in the period 2001-2011 (Kornai et al., 2003; Asaftei et al., 2008).

Industry and province heterogeneity have been also controlled for. Specifically, we include the exit rate of the 4-digit industry the firm belongs to: indeed, together with the entry rate, this variable captures the overall dynamism characterizing the industry in which the firm is active (Geroski, 1995; Bartelsman et al. 2005). The import penetration ratio (as the ratio of imports to the sum of total domestic production and imports in the same 4-digit industry) is also

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[29] Firm export status is an indicator of whether a firm undertakes export activities in a specific year or not. For a few years that the VES does not survey this information, we impute the information using the procedure suggested by Newman et al. (2017) in their article investigating the export-productivity nexus of VES firms. Specifically, a firm is identified as an exporting firm if either (i) the firm pays export tax or (ii) if the firm exports in both the previous year and the subsequent year.

included to control for competition incoming from abroad.[30] Moreover, the provincial annual GDP growth rate is inserted into our empirical model in order to control for demand shocks and phases of the economic cycle that may have affected Vietnamese provinces (in which the firms are located) in asymmetric ways. We have further included a vector industry and province dummies to account for unobserved and time-invariant factors affecting all firms belonging to the same industry and province in the same way.

Finally, a vector of year dummies has been included to control for common shocks to productivity that may have affected all firms in each specific year.

Descriptive analysis

Table 2.2 shows the basic characteristics of firms in our sample by ownership type[31]. In general, SOEs are about four times older than both POEs and FOEs. SOEs and FOEs are more comparable in terms of employment and they are typically large firms, while POEs are more often small firms.

From 2001 to 2011, the mean of capital-labor ratio (expressed in terms of thousands USD over 1 employee) of SOEs increased about 3 times (from 5.0 to 17.2); POEs has only marginally increased their capital-labor ratio, while FOEs have even decreased it. This evidence is in line with the process of capital accumulation undertaken by SOEs since 2005 (see Vu Thanh, 2014; p. 17), possibly boosted by the credit *stimulus* and easier access to capital granted by the government especially to this group of firms as a reaction to the 2008-2009 US mortgage's loan crisis (Pincus, 2016; p. 387).

Keeping in mind that from Table 2.2 we can only appreciate the unconditional (to other factors) differences in productivity across ownership types, some interesting preliminary results emerge. During the period 2001-2011, the productivity level of SOEs is rather comparable to that of FOEs while, the productivity of POEs is far below the other two groups (in line with Nguyen and Le, 2005; Huang and Yang, 2016). Moreover, all three groups of firms have improved their productivity over the years, which is coherent with the growing path followed by the country in 2000s. However, firms have improved productivity at different paces, depending

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[30] Details about the calculation of the import penetration measure are provided in Appendix A2.6.

[31] We put a table of summary statistics and correlation matrix of variables in our sample in Appendix A2.7.

on ownership type: while SOEs increased (on average) their TFP by around 8%, POEs' growth has been around 5% and the FOEs have grown their TFP by 4% on a year-on-year basis. These figures on TFP growth rates at the firm-level are comparable to those shown by Ha and Kyiota (2014; p. 208).

Overall, this first descriptive evidence is in line with both (i) the dynamism of the economy found in other works and caused by the entry of many new private firms and (ii) a restructuring process of SOEs. In particular, the increase in the capital-labor ratio by SOEs seems to go hand in hand with a noticeable TFP growth, thus pointing out that some technological advancement and not simply capital deepening has characterized the evolution of state enterprises in the period 2001-2011. Given that firms with different ownership types may also be alike in other dimensions, we conduct a multivariate analysis in the next section, estimating regressions of firm TFP (in log) on ownership and market competition, controlling for a large vector of firm, industry and province characteristics.

[Table 2.2 about here]

2.5 Econometric analysis

2.5.1 Baseline results

We estimate variants of the following model, by OLS:

$$tfp_{ijpt} = \alpha + \beta' OWNERSHIP_{ijpt} + \gamma' COMPETITION_{jt} + \delta'\left(OWNERSHIP_{ijpt} * COMPETITION_{jt}\right) + \varphi' X_{ijpt}$$
$$+ \theta' V_{jt} + \vartheta' Z_{pt} + \mu_j + \rho_p + \tau_t + \varepsilon_{ijpt}, \tag{1}$$

where tfp_{ijpt} is the (log of the) TFP of the ith firm, belonging to the jth industry and located in the pth province in year t; $OWNERSHIP_{ijpt}$ stands for the types of ownership that characterizes the ith firm in year t ($OWNERSHIP ={POE, SOE, FOE}$); $COMPETITION_{jt}$ stands for the degree of market competition characterizing the jth (4-digit) industry in year t and proxied by both the the Herfindahl-Hirschman Index and the entry rate ($COMPETITION ={HHI, Entry Rate}$); coefficients δ' capture the interaction effects. We extend our baseline model by including a vector of firm-level (X_{ijpt}), industry-level (V_{jt}) and province-level (Z_{pt}) time-variant characteristics and vectors of industry-, province- and year- fixed effects. Thus, the empirical model gives us information regarding the statistical relationships between the firm productivity

level and ownership (coefficients β'), the degree of competition of the industry (coefficients γ') and their interplay (coefficients δ'), conditional on a large vector of firm-, industry- and province- characteristics.

Table 2.3 shows our first set of results. The specification in col. (1) includes only ownership dummies, year, industry and province fixed effects. We then extend the empirical model by including proxies for market competition (HHI and Entry Rate) and the vector of controls, respectively, in cols. (2) and (3). Results in col. (3) show that, on average, after controlling for a large set of firm, industry and province characteristics, both FOEs and SOEs exhibit significant higher productivity levels than POEs (the omitted category) during the period 2001-2011 and that FOEs are the most productive firms. As for market competition, the coefficient of HHI is negative (-0.2) and significant while the coefficient of entry rate is negative (-0.05) and not statistically significant. This suggests that, *ceteris paribus*, while firms are more productive in less concentrated (more competitive) industries, no statistical relationship is found between productivity and the indicator capturing the threat of potential competitors. Overall, results in col. (3) support hypotheses 1b, 2 and 3, while hypothesis 1a is rejected.

As for the control variables, results shown in col. (3) suggest that firms that are older, bigger, and undertaking export activities are more productive[32]. Meanwhile, a higher leverage ratio is associated with higher productivity. This could be explained by the fact that, in order to perform better, firms need to make productive investments that are financed through debt. Coefficients on exit rate and provincial GDP growth rate both show the expected positive sign even though they are not significant. Finally, in industries characterized by a higher import penetration, firms are - on average - less productive. Doan et al. (2016), in their recent study about import competition and productivity in Vietnam from 2001 to 2009, got a similar result.[33]

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[32] Surveys of firm productivity in developed countries tend to show a slightly different pattern, in which firms which are bigger but younger and undertaking export exhibit higher productivity performance (e.g., Baily et al., 1996; Bartelsman and Doms, 2000; Haltiwanger et al., 2017).

[33] This result is in line with both theoretical predictions in Aghion et al. (2005) and the empirical evidence in Ding et al. (2015) and Ben Yahmed and Dougherty (2017). In their seminal article, Aghion et al. (2005) propose that import competition only encourage innovations and improve productivity in sectors or firms which are close to the world technology frontier but even hurt productivity in sectors or firms which are lagging behind. It means that import penetration may discourage productivity growth in less advanced countries whose industries and firms are below the world frontier.

Given that the period from 2001 to 2011 has been characterized by institutional reforms aimed at improving the competitive environment of Vietnam, it is key to study the role of market competition in reducing gaps in productivity across firms with different ownership. Thus, in cols. (4) and (5), we separately add the interactions between ownership dummies and HHI and between ownership dummies and entry rate. Results support hypothesis 4, as the gap in TFP between POEs and SOEs and that between POEs and FOEs are smaller in industries characterized by a lower concentration (HHI) and a higher entry rate[34].

[Table 2.3 about here]

In Section 2.2, we have sketched the main institutional and economic changes witnessed by Vietnam in 2000s. The first half of the decade has been characterized by the rapid private sector growth (2001-2006), thanks to relevant changes in the legal framework for businesses, while in the second half of 2000s both the accession to WTO and state-led development policies have taken place. Given that, it is relevant to check how those changes had been mapped into different performance by SOEs, POEs, and FOEs and we repeat our regression analysis for the two sub-periods, i.e. 2001-2006 and 2007-2011. The results -- shown in Table 2.4-- are in line with those shown in Table 2.3, but some differences between the two periods are worthy to point out.

[Table 2.4 about here]

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[34] There is a concern that including four time-variant industry-level variables, viz. HHI, entry rate, exit rate, and import penetration together in one regression may cause a multicollinearity issue since these variables are likely to be highly correlated to each other. By simply looking at the correlations of these variables (Appendix A2.7), we can mitigate this concern. The highest correlation coefficients found are the one between import penetration and HHI (0.24) and the one between entry rate and exit rate (0.2). They are in expected scales and not so alarming. For a more robustness check, we also rerun the regressions in table 2.3 in an alternative way (we would like to thank Marco Sanfilippo to suggest this). We first run a regression with ownership dummies, firm-level controls, and adding industry-year and province-year fixed effects. For this practice, we get results reported in columns (1) and (2) of Appendix A2.8. We go on dropping industry-year fixed effects and replace them by industry fixed effects only and start to include one by one among the four industry-level variables above and then the interactions with ownership. Results reported in columns from (3) to (7) of Appendix A2.8 shows that the estimated coefficients of these four industry-level variables when we include them one by one are the same as those when we include them altogether. Hence, basically it does not matter whether we including them one by one or altogether in the same regression and the likely multicollinearity issue is not a real concern. The estimation results here in column (7) are also almost similar to the ones in column (3) of table 2.3. We do the same robustness check by running alternative regressions for those in table 2.4 and 2.5 for the two sub-periods, viz. 2001-2006 and 2007-2011 and put results in Appendix A2.9 and Appendix A2.10.

The advantage in productivity of SOEs with respect to POEs in the period 2007-2011 is much bigger (33% higher as in col. (4)) compared to one shown in the period 2001-2006 (only 9% higher as in col. (1)). Furthermore, results also show that while FOEs still exhibit higher productivity levels than SOEs in the first sub-period, SOEs "closed the gap" with FOEs in the second sub-period. Interestingly, results in col. (4) even show that SOEs even outperform FOEs in the second sub-period by about 10%.

These results, which are in line with some previous works (Ngoc and Ramstetter, 2004; Nguyen and Le, 2005; Huang and Yang, 2016), suggest a good productivity performance of the Vietnamese state-owned sector with respect to POEs, especially in the period 2007-2011 and deserve a more in-depth discussion. First, this may be the result of the state-led development policies undertaken by the Vietnamese government during the 2000s with the aim of consolidating several SOEs in to State Business Groups or State Economic Groups. The promotion of large groups of SOEs may have granted them the economies of scale to improve their productivity, which results even more relevant after the WTO accession in 2007 (Vu Thanh, 2014; p. 12). Concurrently the transformation of governance in SOEs to limited liability companies or joint stock companies may have improved their internal incentive systems, with positive consequences on their productivity. Of course, there could be a "selection" issue: the government may have non-randomly kept in "its hands" the companies with better characteristics in terms of management practices, technology and human capital: if these characteristics are not independent from firm productivity, our results would be biased. We will explicitly deal with the "selection" issue in the Section 2.5.1.

Second, the lagging behind of POEs may be explained by a lack in commercial experience and entrepreneurialism in Vietnam (Pincus, 2016; p. 382). We may put this in perspective with the evidence provided in Bloom and Van Reenen (2010; p. 211) regarding China (which has followed a similar path of development to Vietnam) and hypothesizing an issue of youth of Vietnamese POEs and the corresponding inferior managerial practices.

Third, it is possible that our measure of productivity --which cannot be corrected to account for prices of output and input at the firm-level-- may (partially) reflect market power of the firm both in the product and the input markets (Van Beveren, 2012). The possibility that SOEs systematically charge higher prices in the product market should be rather low in this

work. Indeed, given the analysis restricted to manufacturing firms –that sell tradable goods--, it is not obvious that these may act as "natural monopolist" in their industries; moreover, if that would be the case, we should have not found a negative relationship between the degree of market concentration and firm "average" performance. Conversely, there is evidence (see the discussion in Nguyen and Le, 2005; pp. 306-309) that SOEs in Vietnam have had access to land and capital at more favorable conditions than private firms for a long period of time, for example via subsidies (Vu Thanh, 2014; p. 7). In particular, after the WTO accession in 2007 and, even more, the 2008 mortgage crisis in the US, the state provided additional loans to help SOEs through the state-owned banks (Pincus, 2016; p. 387). This third possibility may affect our main results in two ways. On the one hand, we may have simply over-estimated the TFP of SOEs due to price-bias. On the other hand, a preferential credit allocation to SOEs could imply a "true" higher productivity with respect to POEs, if the "cheaper" capital borrowed by SOEs is invested in more advanced technology (Nguyen and Le, 2005; p. 306).

Obviously, the first possibility is the one we worry more about. Unfortunately, we cannot properly test if the results in terms of ranking in productivity by ownership type are robust to the price-bias correction. We can instead rely on an indirect test, by taking advantage of firm age variability in our sample. Similar to the idea put forward by Li (2008, p. 221) for the case of Chinese SOEs, the younger the SOE the lower should be the probability of having benefited from "soft budget constraints" for a long period of time. We thus re-run the regressions in the sub-sample of firms established by less than 10 years.[35] Interestingly, as shown in Table 2.5, the good performance of SOEs is confirmed and even strengthened in the sub-sample of younger firms (especially for the period 2007-2011), thus being in favor of the idea that this is the result of the effective restructuring policies undertaken by the Vietnamese government rather than just a consequence of the price-bias.

[Table 2.5 about here]

Overall, the three explanations suggested above are not mutually exclusive and, at the same time, we cannot leave out the possibility that (part of) our results are affected by the price-bias in the input markets. Thus, we submit the good performance in productivity by SOEs in

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[35] We have also performed the analysis in the sub-samples of, respectively, (i) firms younger than 15 years and (ii) firms younger than 5 years. Main results are confirmed and available to the authors upon request.

relative terms to be the result of state-led development policies plus a lack in experience and entrepreneurialism in POEs, "gross of" the price bias.

2.5.2 Further results and robustness checks

2.5.2.1 Controlling for the selection of SOEs

Based on the literature on ownership in transition economies, (Estrin et al., 2009; pp. 9-10) and the literature on the development of Vietnam (see Malesky and London, 2014; Pincus, 2016; among others) it is reasonable to think that firms are not maintained as SOEs at random. Thus, the impressive productivity of SOEs observed in the period from 2007 to 2011 might reflect a selection of SOEs, rather than an outcome of a modernization process undertaken by the government during 2000s.

The government may have retained the firms with better management, technology and human capital. Thus, our results so far might be biased and we need to properly control for the selection of SOEs. In order to do that, we conduct several checks. First, we compare the average *tfp* of privatized SOEs (i.e. those SOEs that became POEs or FOEs during the period under analysis) both before and after privatization with that of those remaining SOEs over the entire period. Table 2.6 shows that privatized firms have improved their average productivity level after privatization. However, the average productivity of privatized firms both before and after privatization (1.73 and 1.98) is still lower than that of those remaining SOEs (2.01). This first evidence is coherent with the idea that a selection of SOEs based on productivity may have been taken place.

[Table 2.6 about here]

Second, we compare the average *tfp* of those firms that remained SOEs over the period 2001-2011 with that of privatized firms but before privatization and controlling for a vector of firm, industry, and province characteristics in a regression framework (Table 2.7).[36] Interestingly, the difference in *tfp* between firms always remaining SOEs and privatized SOEs (before privatization) disappears when industry fixed effects are included in the regression (col. 2 of Table 2.7). This result suggests that the selection by the government, if at work, was more

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[36] In Table 2.7, neither FOEs nor privatized SOEs after privatization are included.

based on "strategic industries" rather than on strategic "SOEs". Thus, this evidence partially reassures us about the higher productivity of SOEs over POEs (observed especially in the period from 2007 to 2011) not entirely due to "selection" but also to the restructuring policies of the government.

[Table 2.7 about here]

Third, as the probability of being maintained as SOEs is not a random event, we use a Heckman 2-stage procedure (Heckman, 1979) to correct for the selection of SOEs. The first stage is a probit model to predict the probability that a firm will be retained as SOEs in year t (Table 2.8)[37]. In the second stage, we include the inverse Mills' ratio retrieved from the first stage in the main empirical model. Results are shown in Tables 2.9 and 2.10 and they are in line with those shown in Tables 2.3 and 2.4. After having taken selection into account, SOEs still exhibit a higher productivity than POEs (column (1) – table 2.9). Moreover, they also have statistically significant higher performance in terms of productivity than FOEs in the period from 2007 onwards (see column (4) of table 2.10).

[Tables 2.8, 2.9 and 2.10 about here]

2.5.2.2 Further checks

We run a battery of robustness checks and present the results in the Appendix. First, we extend the empirical model and include the first lag of firm *tfp* as a further control (Appendix A2.11). Indeed, we may have captured a spurious correlation if (i) a higher productivity level the previous year is the reason for either being retained by the government or being acquired by a foreign investor, and (ii) there is a persistence in firm TFP over time. Second, in order to reduce

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[37] The dependent variable of the probit model is a dummy being one if a firm is a SOE and zero otherwise. The explanatory variables include (1-year lagged) firm-, sector- and province-characteristics. Firm-level characteristics include a dummy for whether the firm is managed by central government, export status, *tfp*, number of employees, firm age, the leverage ratio and their squared terms. As suggested by Bai et al. (2009), we also include year, industry and province fixed effects plus employment shares of SOEs in each 3-digit industry sector and province, and the 1-year changes in these shares. As discussed in section 2.4.1, our main data sample covers the period from 2001 to 2011. Meanwhile, in this Heckman 2-stage procedure, our data sample is only restricted to the period from 2002 to 2011 since we lose the year 2001 (the first year in the main sample) when lagging explanatory variables one year in the first-stage selection model.

the simultaneity issue, we estimate the model with all independent variables included as 1-year lagged (Appendix A2.12). The main results are robust to both checks.

Third, we check if our results are also robust to an alternative way of defining ownership dummies. In our definition so far, SOEs are the firms with state participation in equity greater than 50% and POEs could be firms with 100% private ownership or having a mix of both private and state ownerships where the state account for less than 50% of ownership. However, when dealing with state ownership, even a small share of state ownership may influence firm performance and productivity[38]. For example, Inoue et al. (2013) find that minority state shareholding facilitates firm performance and investments on building firm capabilities in Brazil. So, we divide the group of POEs as defined above into two groups: *POEs* - now defined as firms with 100% private ownership and *MIXED enterprises* – enterprises with a mix of both private and state ownership where state ownership ranges from greater than 0 to 50 percent. Meanwhile the definitions of FOEs and SOEs remain the same.

Regression results with MIXED enterprises as additional ownership group are presented in Appendix A2.13. We use model specifications in column (1), (4), and (7) – the models without interaction terms - to explain the comparative performance of firms with different ownership categories. In whole research period from 2001 to 2011, POEs (now being entirely private owned) exhibit lower productivity than both FOEs and the enterprises with state ownership, viz. MIXED enterprises (state ownership varying from greater than 0 to 50 percent) and SOEs (the state ownership greater than 50%). Moreover, while FOEs are the best performer in terms of *tfp*, among enterprises with state ownership, MIXED enterprises perform better than SOEs (see column (1) in Appendix A2.13). It is also interesting to look into the performance rankings of these types of firm in the two sub-periods: 2001-2006 and 2007-2011. While POEs always perform the worst compared to enterprises in the other ownership types, the rankings in terms of productivity among SOEs, MIXED enterprises, and FOEs in the sub-period from 2007-2011 have a reverse order compared to those in the sub-period from 2001-2006. In the sub-period from 2001-2006, FOEs are in the top of the rankings, MIXED enterprises are in the second, SOEs are in the third (column (4) – Appendix A2.13). In the second sub-period, the

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[38] We thank Marco Sanfilippo for pointing this out.

rankings go with SOEs as the top and then MIXED enterprises and FOEs as the second and third, respectively (column (7) – Appendix A2.13).

These results confirm again our general findings that FOEs and firms with state ownership (both greater or less than 50%) show, on average, higher TFP levels than POEs. Moreover, while in the sub-period 2001-2006 FOEs have the highest *tfp* level, in this second sub-period 2007-2011, firms with state ownership has close the gap in productivity with FOEs. Importantly, we observe that the productivity of SOEs is the highest and even more than both MIXED and FOEs in the second sub-period 2007-2011 (column (7) – Appendix A2.13). This is in line our finding of the remarkable improvement in terms of productivity of SOEs in the sub-period when the state-led government policies have geared up. Our findings are also robust to the results of the 2nd stage in the Heckman 2-stage procedure to account for the selection of SOEs when adding the dummy for MIXED enterprises[39].

Finally, we go on to check if our findings are robust to a different measure of productivity by using labor productivity (log of value-added over an employee) as the dependent variable and adding the capital-labor ratio to the list of control variables. We run parallel analyses to the ones in tables 2.3, 2.4, 2.7, 2.8, 2.9, 2.10 but now using labor productivity as the dependent variable. Results (reported in Appendixes from A2.15 to A2.18) are indeed consistent with the findings when we use *tfp* as the dependent variable.

2.6 Discussion: the Vietnamese transition in a comparative perspective

The results open the way to a reconsideration of the role of SOEs in the process of transition, both with respect to the Vietnamese case and to other countries' historical experiences.

As for the case of Vietnam, our results do not support the view that the maintenance by the state of a long-lasting control of part of the business sector impairs the effects of competition on firm productivity. Vu Thanh (2014) is critical about the policies undertaken to modernize

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[39] Results of the first stage is actually the results in table 2.9 (since we do not change the definition of SOEs here, the dependent variable of the first stage is unchanged). Results of the 2nd stage are presented in Appendix A2.14.

SOEs, as for example, the creation of State Economic Groups (SEG): the author puts forward the idea that big SEGs were used to disable WTO accession's effects and to disguise national protection over wide sectors of the economy. This was done by ensuring to SOEs favorable access to both land and capital (Nguyen and Le, 2005) [40]. Along the same lines, Baccini et al. (2017) claim that inefficient SOEs hindered resources' re-allocation and reduced productivity gains that the opening to international trade (WTO accession) could have ensured to the country economy. In a counterfactual exercise, they find that the aggregate productivity growth had been roughly 50 percent higher, were SOEs be private in Vietnam. They also estimate a gap in productivity growth of SOEs' dominated industries with respect to POEs' dominated ones.

Actually, our results on firm performance (both pre- and post-accession into WTO) do not support Vu Thanh's criticism about the reforms of SOEs. Moreover, while the role of competition in fostering productivity is confirmed by our empirical analysis, lower productivity growth in SOEs' dominated industries found by Baccini et al. (2017) is fully compatible with the fact that the productivity level of SOEs is higher that of POEs in those industries.

Moreover, our results on the pre-2007 period, which show a productivity advantage of FOEs over SOEs and POEs, are in line with those obtained by Huang and Yang (2016). Even if their analysis covers a shorter period of time (2000-2008), they show that WTO accession is positively related to SOEs' productivity in a stronger manner than to POEs' and FOEs' productivity. Consistently, our study highlights remarkable productivity levels of SOEs after 2007 (Table 2.2). Given the simultaneity of WTO accession and the state-led development policies, we cannot disentangle which phenomenon has contributed the most to the observed effect. However, we provide some general empirical evidence in favor of the joint effect of

[40] While policies of the Vietnamese government aimed at improving the state sector, there is also a concern that SOEs may have constrained the development of the private sector. For example, Thang and Freeman (2009) showed that, in the period 2000-2003, the greater the presence of SOEs in a province, the lower was the proportion of bank lending to POEs and the longer it took for these firms to have access to land. We check if SOEs are constraining the development of POEs by regressing the 1-year TFP growth rate of POEs on the employment share of SOEs that belong to the same 3-digit industry and are located in the same province (Appendix A2.19). We control for firm size, firm age, export status, tfp, the presence of FOEs in terms of employment share in the same 3-digit industry and province and we include the vectors of industry, province and year fixed effects. All independent variables are included as 1-year lagged in order to limit simultaneity bias. Overall, we find no evidence of SOEs to constrain the development of POEs. Conversely, results show that, ceteris paribus, the employment share of SOEs in the same industry exhibits a positive correlation with the productivity growth of POEs during the whole period (2001-2011) and even more in the sub-period from 2007 to 2011.

ownership and market competition in a period of increasing openness of the Vietnamese economy and governmental reforms undertaken to improve the governance of SOEs.

As for the general debate on the role of SOEs during a transition from central planning to market economies, it is worth to note that, after 2000, a critical view on the early approaches to privatization has taken foot (e.g. Peng et al., 2016). First, a poor institutional environment and a weak market for corporate control, does not prevent appropriation in big firms enjoying monopolistic power. A comparison of ex-communist EU and CIS countries offers a clear evidence of the role that institutional environment has played in determining privatization outcomes (Estrin et al. 2009). Second, how privatization is carried out also matters: fast privatization without efficient financial infrastructures faces the risk to put big firms on hands of crooks and enables the creation of a kleptocracy that spoils big firms and adverse selects competent technicians and managers (Black et al., 2000). The impressive rent appropriation and tax evasion by new owners convinced Russian governments to launch a re-nationalization program (Chernykh, 2011). The major critique on state ownership is based on the relative advantage of private property rights in aligning managerial incentives with efficiency goals (e.g. Shleifer, 1998). However, this relative advantage depends on the functioning of a market for corporate governance and also, on the institutions that regulate the state control over business. The balance, in terms of cost and time, is not clear.[41]

We put forward that the role of state ownership in transition countries is an open question: SOEs have once predicted to be extinct, but they evolved even in western countries to be hybrid and account for ten percent of global GDP in recent years (Peng et al. 2016). We submit that the high level of productivity shown by Vietnamese SOEs in the period 2007-2011 may have been an outcome of the state-led development policies undertaken by the government. A gradual reform of SOEs buffers them from an abrupt exposition to market selection when institutions are still weak (Estrin et al., 2009). Not in contrast with that, we find that market competition has been a major driver for reducing productivity gaps across ownership types within industries and that privatization's episodes have positively contributed to firm productivity in Vietnam during the period 2001-2011.

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[41] A similar tradeoff has been faced in western countries dealing with the problem of re-nationalization after the financial crisis (Clò et al. 2017)

As pointed out in Section 2.5.1, given the evidence on the more favorable conditions at which SOEs had access to land and capital for a long period of time (Nguyen and Le, 2005; pp. 306-309) and the unavailability in the VES database of the information regarding prices at the firm-level, we interpret our results as "gross of" the price bias.

2.7 Concluding remarks

In this chapter, we empirically examine the role of ownership and market competition in Vietnamese firms' TFP in the period 2001-2011. We get two main results. First, both FOEs and SOEs have performed better than POEs in terms of TFP levels. While FOEs exhibited the highest TFP level in the period 2001-2006, SOEs "closed the gap" with FOEs in the period 2007-2011. We posit that the remarkable performance of SOEs from 2007 onwards is the result of the policies undertaken by the Vietnamese government to restructure them, "gross of" any potential omitted price bias in our measure of *tfp*. Second, competition improves firm average productivity across industries and reduces the gaps in productivity among firms of different ownership types. These findings are consistent to a series of robustness checks.

The first result suggests that the state-led development policies have been effective in Vietnam. Inside each SOE, there are firm-specific valuable resources that cannot be easily re-allocated *via* the market (e.g. Uhlenbruck et al., 2003; Peng et al., 2016). A gradual restructuring of SOEs buffers them from an abrupt exposure to market selection when institutions are still weak (Estrin et al., 2009). During transition towards a market economy, government intervention can work well in preserving firm-specific resources in SOEs. However, SOEs -- either privatized or not-- should be fully exposed to market competition when supporting institutions fully emerge.

The second result points out that, in Vietnam during the period 2001-2011, market competition has been effective for improving firm "average" productivity and reducing the gaps in productivity between POEs and SOEs (or FOEs). Moreover, it has played a complementary role to both a restructuring of SOEs and "privatization" episodes. Consequently, we may expect further improvements in market competition and the business environment to boost the catching-up of POEs in terms of productivity levels towards the performance of both FOEs and SOEs.

This study is not without limitations and future studies in these areas are called for. First, since we do not have information on prices of output and input at the firm level, our measure of TFP cannot take account of omitted price bias and may (partially) reflect market power of the firm (Van Beveren, 2012). We have conducted an indirect test to confirm the remarkable performance of SOEs is the result of the effective restructuring policies undertaken by the Vietnamese government rather than just a consequence of the price-bias. To advance the literature on Vietnam economic growth and development, future studies should consider a better measurement of *tfp* which corrects for omitted price bias whenever data on firm-level prices are available. Second, we point out (in section 2.3) but do not directly test some mechanisms that enable the remarkable productivity performance of SOEs such as the modernization of their governance and incentives or institutional effects. They are out of the scope of this study given the limitation of the data at hands. Studies in China (e.g., Xu, 2000) have confirmed that SOEs have improved performance following a series of changes in their internal incentives. Aivazian et al. (2005) even shows that even without the need to privatization when the state may still be the sole owner, corporatization of SOEs alone can bring significant improvement in SOE efficiency in China. Future research in this direction for Vietnam, hence, is warranted.

Tables and figures

Figure 2.1

Framework of analysis: institutional reforms and productivity (adapted from Park et al., 2006)

Reforms during the 1990s and 2000s

Liberalization of private property rights and the rise of private firms

State-led development policies

Tougher market competition (enhanced by WTO accession in 2007)

Consequences on firm productivity:

(i) private ownership is associated to better governance due to a reduction in managerial discretion thanks to more effective incentives and monitoring;

(ii) state-led development policies enhance SOEs' governance, maintain their competences and make them exploit economies of scale and scope;

(iii) fiercer market competition reduces X-inefficiency and pushes managerial effort to boost firm efficiency across industries and to reduce gaps in productivity across ownership types.

Figure 2.2 Number of firms by ownership type; Vietnamese manufacturing; 2001-2011

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SOEs	1231	1227	1137	1051	909	738	677	662	666	617	622
POEs	7787	9925	11669	13651	15703	19593	22690	30311	34178	41600	36205
FOEs	1096	1462	1778	2017	2242	2558	2953	3355	3758	4101	4595

■ SOEs ■ POEs ■ FOEs
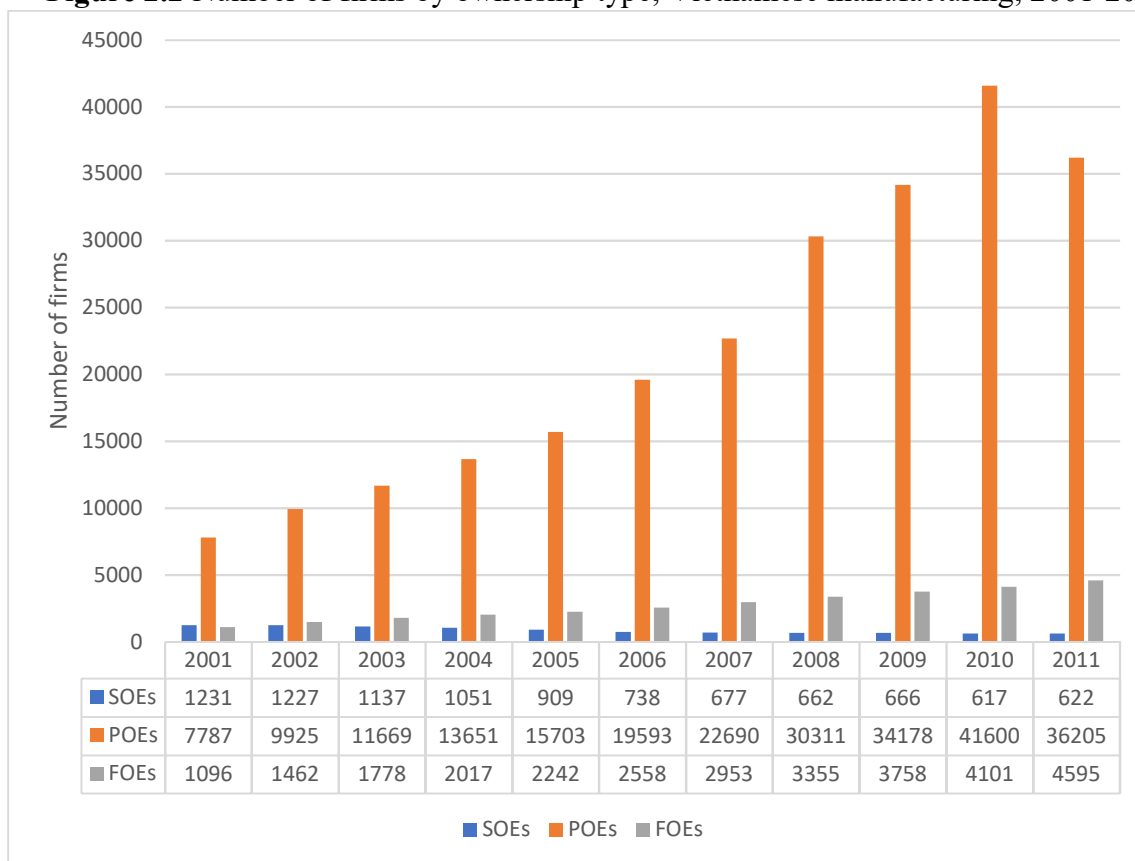
Table 2.1 List and definition of variables

Variables	Definition
Productivity	
tfp	Log of firm's TFP, estimated by using the IV-GMM modified Levinsohn-Petrin estimator (Levinsohn and Petrin, 2003) developed in Wooldridge (2009). See Appendix A2.5.
Ownership and market competition	
SOE	Dummy variable equal to 1 for state-owned firms (and 0 otherwise)
FOE	Dummy variable equal to 1 for foreign-owned firms (and 0 otherwise)
HHI	Sum of squares of market shares of all firms in the 4-digit industry the firm belongs to
Entry Rate	Entry rate of the 4-digit industry the firm belongs to
SOE*HHI	Interaction term
FOE*HHI	Interaction term
SOE*Entry Rate	Interaction term
FOE*Entry Rate	Interaction term
Control variables	
Import penetration	Ratio of imports to the sum of total domestic production and imports in the same 4-digit industry the firm belongs to. See Appendix A2.6.
Exit Rate	Exit rate of the 4-digit industry the firm belongs to
Leverage Ratio	Debt over total assets of the firm
Firm size	No. of employees at the end of the year (in log)
Firm age	No. of years since the firm establishment (in log, +1)
Export status	A dummy equal to 1 if the firm exports
Province GDP growth	1-year growth rate of the provincial GDP
Year FE	Year fixed effects
Industry FE	Industry fixed effects
Province FE	Province fixed effects

Table 2.2 Descriptive statistics

Firm-characteristics	2001					
	SOEs		POEs		FOEs	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Firm age	21.4	13.4	6.5	8.4	5.0	3.7
Value added	2156.1	8729.0	154.8	668.0	2597.6	10918.1
No. of employees	510.9	807.2	79.1	282.8	367.3	1140.1
Capital-labor ratio	5.0	9.0	5.2	73.3	34.0	134.3
tfp	1.6	1.1	0.7	1.0	1.8	1.5
	2006					
	SOEs		POEs		FOEs	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Firm age	23.9	15.4	5.7	7.6	5.7	4.4
Value added	4249.0	15097.0	183.0	885.8	2311.1	9080.9
No. of employees	630.8	956.5	72.4	262.3	493.4	1656.1
Capital-labor ratio	9.0	21.4	4.8	23.3	14.6	29.5
tfp	2.0	1.1	0.9	0.9	1.8	1.3
	2011					
	SOEs		POEs		FOEs	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Firm age	23.5	17.0	6.2	7.1	7.1	5.1
Value added	7089.9	35378.9	303.7	2657.0	3515.5	21823.2
No. of employees	488.9	794.6	58.1	229.4	487.3	1843.2
Capital-labor ratio	17.2	67.4	6.1	23.0	14.9	32.5
tfp	2.4	1.1	1.2	1.1	2.2	1.2

Notes

Value-added in real terms is calculated as the sum of total wage, depreciation, operating profit before tax, and indirect taxes. Capital input is measured as real fixed assets while labor is measured as the number of firm employees, both at the end of the year. All monetary variables are expressed in the constant 2010 value in units of 1000 USD.

Table 2.3 Ownership, competition and firm productivity; 2001-2011

	Dependent variable: *tfp*				
	1	2	3	4	5
Ownership					
SOE	0.99***	0.99***	0.21***	0.16***	0.30***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
FOE	0.79***	0.79***	0.31***	0.22***	0.36***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Market competition					
HHI		-0.13***	-0.20***	-0.43***	-0.20***
		(0.04)	(0.04)	(0.04)	(0.04)
Entry Rate		-0.05	-0.05	-0.05	0.02
		(0.04)	(0.04)	(0.04)	(0.04)
Interactions					
SOE*HHI				0.76***	
				(0.10)	
SOE*Entry Rate					-0.31***
					(0.05)
FOE*HHI				1.52***	
				(0.06)	
FOE*Entry Rate					-0.21***
					(0.04)
Controls					
Exit Rate			0.02	0.04	0.01
			(0.05)	(0.05)	(0.05)
Import Penetration			-0.34***	-0.30***	-0.33***
			(0.04)	(0.04)	(0.04)
Leverage Ratio			0.15***	0.15***	0.15***
			(0.00)	(0.00)	(0.00)
Firm size			0.23***	0.23***	0.23***
			(0.00)	(0.00)	(0.00)
Firm age			0.13***	0.13***	0.13***
			(0.00)	(0.00)	(0.00)
Export status			0.16***	0.16***	0.16***
			(0.01)	(0.01)	(0.01)
Province GDP growth			0.06	0.05	0.06
			(0.05)	(0.05)	(0.05)
Constant	0.81***	0.89***	0.16***	0.19***	0.15***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Observations	282,764	282,764	282,764	282,764	282,764
Adjusted R-squared	0.27	0.27	0.38	0.38	0.38
Year FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes

Notes:
Omitted ownership category: POE
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.4 Ownership, competition and firm productivity; 2001-2006 and 2007-2011

	Dependent variable: *tfp* 2001-2006			Dependent variable: *tfp* 2007-2011		
	1	2	3	4	5	6
Ownership						
SOE	0.09***	0.05***	0.15***	0.33***	0.27***	0.56***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
FOE	0.43***	0.32***	0.50***	0.23***	0.15***	0.68***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Market competition						
HHI	-0.33***	-0.61***	-0.33***	-0.03	-0.16***	-0.02
	(0.11)	(0.11)	(0.11)	(0.06)	(0.06)	(0.06)
Entry Rate	-0.02	-0.03	0.04	-0.36***	-0.35***	-0.07
	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
Interactions						
SOE*HHI		0.57***			0.94***	
		(0.14)			(0.15)	
SOE*Entry Rate			-0.19***			-1.16***
			(0.06)			(0.21)
FOE*HHI		1.52***			1.44***	
		(0.10)			(0.07)	
FOE*Entry Rate			-0.20***			-2.25***
			(0.06)			(0.11)
Controls						
Exit Rate	0.11*	0.13*	0.09	0.12	0.14	0.19*
	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Import Penetration	-0.22***	-0.20**	-0.21***	-0.19***	-0.11	-0.16**
	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)
Leverage Ratio	0.13***	0.13***	0.13***	0.15***	0.15***	0.16***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size	0.24***	0.24***	0.24***	0.22***	0.22***	0.22***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.17***	0.17***	0.17***	0.10***	0.10***	0.10***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Export status	0.11***	0.11***	0.11***	0.22***	0.22***	0.20***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.14**	0.14**	0.14**	0.01	-0.01	0.06
	(0.06)	(0.06)	(0.06)	(0.09)	(0.09)	(0.09)
Constant	0.02	0.09	0.00	0.61***	0.60***	0.51***
	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)	(0.05)
Observations	95,774	95,774	95,774	186,990	186,990	186,990
Adjusted R-squared	0.38	0.38	0.38	0.37	0.37	0.37
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes:

Omitted ownership category: POE

Standard errors in parentheses

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

Table 2.5 Ownership, competition and firm productivity; firms <= 10 y.o.; 2001-2011 and sub-periods

	Dependent variable: *tfp*			Dependent variable: *tfp*			Dependent variable: *tfp*		
	2001-2011			**2001-2006**			**2007-2011**		
	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.43***	0.34***	0.61***	0.31***	0.22***	0.48***	0.55***	0.47***	0.92***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.09)
FOE	0.27***	0.20***	0.31***	0.38***	0.27***	0.42***	0.19***	0.14***	0.65***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)
Market competition									
HHI	-0.15***	-0.32***	-0.15***	-0.33***	-0.58***	-0.34***	0.02	-0.06	0.03
	(0.04)	(0.05)	(0.04)	(0.12)	(0.12)	(0.12)	(0.06)	(0.06)	(0.06)
Entry Rate	0.01	0.01	0.06	0.08	0.07	0.13**	-0.33***	-0.32***	-0.08
	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
Interactions									
SOE*HHI		1.43***			1.51***			1.18***	
		(0.22)			(0.38)			(0.28)	
SOE*Entry Rate			-0.64***			-0.49***			-1.85***
			(0.10)			(0.12)			(0.40)
FOE*HHI		1.28***			1.40***			1.09***	
		(0.07)			(0.11)			(0.09)	
FOE*Entry Rate			-0.16***			-0.15**			-2.27***
			(0.05)			(0.06)			(0.12)
Controls									
Exit Rate	0.05	0.07	0.04	-0.03	-0.02	-0.05	0.14	0.16	0.21*
	(0.05)	(0.05)	(0.05)	(0.08)	(0.08)	(0.08)	(0.12)	(0.12)	(0.12)
Import Penetration	-0.30***	-0.26***	-0.29***	-0.22**	-0.19**	-0.21**	-0.22***	-0.16**	-0.19**
	(0.04)	(0.04)	(0.04)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)
Leverage Ratio	0.21***	0.21***	0.21***	0.17***	0.17***	0.17***	0.21***	0.21***	0.22***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size	0.19***	0.19***	0.19***	0.20***	0.20***	0.20***	0.20***	0.20***	0.20***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.18***	0.18***	0.18***	0.31***	0.30***	0.31***	0.12***	0.12***	0.12***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Export status	0.16***	0.15***	0.15***	0.10***	0.09***	0.10***	0.22***	0.22***	0.20***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.08	0.07	0.08	0.12*	0.12*	0.12*	0.01	-0.00	0.06
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.10)	(0.10)	(0.10)
Constant	0.10**	0.12***	0.09**	-0.08	-0.02	-0.10	0.42***	0.40***	0.33***
	(0.04)	(0.04)	(0.04)	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)
Observations	229,390	229,390	229,390	74,986	74,986	74,986	154,404	154,404	154,404
Adjusted R-squared	0.33	0.33	0.33	0.35	0.35	0.35	0.32	0.32	0.33
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE

Standard errors in parentheses

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

Table 2.6 Average *tfp* of privatized SOEs *versus* always remaining SOEs

Privatized SOEs		Always remaining SOEs
Before privatization	After privatization	
1.73	1.98	2.01

Note: We identify a firm as privatized SOEs when its ownership status changes from being an SOE to either a POE or an FOE.

Table 2.7 Difference in *tfp* between always remaining SOEs and privatized SOEs (before privatization)

Dependent variable: *tfp*		
	1	2
Dummy (=1) for those firms always remaining SOEs	0.12***	0.02
	(0.02)	(0.02)
Leverage Ratio	-0.36***	-0.31***
	(0.02)	(0.02)
Export status	0.02	0.11***
	(0.03)	(0.02)
Firm size	0.27***	0.38***
	(0.01)	(0.01)
Firm age	0.02*	-0.06***
	(0.01)	(0.01)
Constant	0.20***	0.23***
	(0.07)	(0.07)
Observations	10,867	10,867
Adjusted R-squared	0.27	0.49
Year FE	Yes	Yes
Province FE	Yes	Yes
Industry FE	No	Yes

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

Table 2.8 Heckman selection model: first stage (probit); the probability for firms to be maintained as SOEs; 2002-2011

Dependent variable: dummy =1 for SOEs	
Firm managed by central Gov. $_{(t-1)}$	2.48***
	(0.05)
tfp $_{(t-1)}$	0.15***
	(0.02)
$(tfp)^{2}$ $_{(t-1)}$	-0.01***
	(0.00)
Firm size $_{(t-1)}$	1.38***
	(0.04)
(Firm size)^{2} $_{(t-1)}$	-0.09***
	(0.00)
Firm age $_{(t-1)}$	-0.43***
	(0.04)
(Firm age)^{2} $_{(t-1)}$	0.21***
	(0.01)
Leverage Ratio $_{(t-1)}$	0.42***
	(0.03)
(Leverage Ratio)^{2} $_{(t-1)}$	-0.04***
	(0.01)
Export status $_{(t-1)}$	-0.18***
	(0.02)
Employment share by industry $_{(t-1)}$	1.42***
	(0.08)
Employment share by province $_{(t-1)}$	1.81***
	(0.12)
ΔEmployment share by industry $_{(t-1\ to\ t)}$	1.10***
	(0.23)
ΔEmployment share by province $_{(t-1\ to\ t)}$	1.08***
	(0.20)
Constant	-7.76***
	(0.15)
Observations	194,503
Year FE	Yes
Province FE	Yes
Industry FE	Yes

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

Note: In this Heckman 2-stage procedure, our data sample is only restricted to the period from 2002 to 2011 since we lose the year 2001 (the first year in the main sample) when lagging all explanatory variables one year in the first-stage selection model.

Table 2.9 Heckman selection model: second stage; ownership, competition and firm productivity; 2002-2011

	Dependent variable: *tfp*		
	1	2	3
Ownership			
SOE	0.43***	0.38***	0.59***
	(0.02)	(0.02)	(0.02)
FOE	0.37***	0.27***	0.45***
	(0.01)	(0.01)	(0.02)
Market competition			
HHI	-0.17***	-0.42***	-0.17***
	(0.05)	(0.05)	(0.05)
Entry Rate	0.11***	0.10**	0.25***
	(0.04)	(0.04)	(0.05)
Interactions			
SOE*HHI		0.68***	
		(0.11)	
SOE*Entry Rate			-0.59***
			(0.07)
FOE*HHI		1.67***	
		(0.07)	
FOE*Entry Rate			-0.36***
			(0.06)
Inverse Mills' ratio	-0.18***	-0.18***	-0.19***
	(0.01)	(0.01)	(0.01)
Controls			
Exit Rate	-0.14**	-0.12**	-0.16***
	(0.06)	(0.06)	(0.06)
Import Penetration	-0.25***	-0.21***	-0.23***
	(0.05)	(0.05)	(0.05)
Leverage Ratio	0.09***	0.09***	0.09***
	(0.00)	(0.00)	(0.00)
Firm size	0.25***	0.25***	0.25***
	(0.00)	(0.00)	(0.00)
Firm age	0.04***	0.04***	0.04***
	(0.00)	(0.00)	(0.00)
Export status	0.14***	0.14***	0.14***
	(0.01)	(0.01)	(0.01)
Province GDP growth	0.08	0.07	0.08
	(0.05)	(0.05)	(0.05)
Constant	0.18***	0.22***	0.15***
	(0.05)	(0.05)	(0.05)
Observations	194,503	194,503	194,503
R-squared	0.41	0.41	0.41
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; In this Heckman 2-stage procedure, our data sample is only restricted to the period from 2002 to 2011 since we lose the year 2001 (the first year in the main sample) when lagging all explanatory variables one year in the first-stage selection model.

Table 2.10 Heckman selection model: second stage; ownership, competition and firm productivity; 2002-2006 and 2007-2011

	Dependent variable: *tfp*					
	2002-2006			**2007-2011**		
	1	2	3	4	5	6
Ownership						
SOE	0.44***	0.41***	0.52***	0.66***	0.59***	0.89***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)
FOE	0.52***	0.40***	0.61***	0.29***	0.21***	0.70***
	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.03)
Market competition						
HHI	-0.00	-0.34**	0.00	-0.06	-0.21***	-0.06
	(0.14)	(0.14)	(0.14)	(0.06)	(0.07)	(0.06)
Entry Rate	0.11	0.08	0.24***	-0.34***	-0.34***	-0.01
	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)
Interactions						
SOE*HHI		0.47***			0.91***	
		(0.15)			(0.16)	
SOE*Entry Rate			-0.31***			-1.21***
			(0.08)			(0.23)
FOE*HHI		1.69***			1.58***	
		(0.12)			(0.08)	
FOE*Entry Rate			-0.31***			-2.05***
			(0.08)			(0.12)
Inverse Mills' ratio	-0.26***	-0.25***	-0.26***	-0.22***	-0.21***	-0.22***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Controls						
Exit Rate	0.07	0.09	0.03	0.00	0.00	0.07
	(0.08)	(0.08)	(0.08)	(0.13)	(0.13)	(0.13)
Import Penetration	-0.13	-0.10	-0.12	-0.15*	-0.07	-0.13
	(0.11)	(0.11)	(0.11)	(0.09)	(0.09)	(0.09)
Leverage Ratio	0.06***	0.06***	0.06***	0.10***	0.10***	0.11***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size	0.25***	0.25***	0.25***	0.24***	0.24***	0.24***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.01**	0.01**	0.01**	0.04***	0.04***	0.05***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Export status	0.08***	0.07***	0.08***	0.19***	0.19***	0.17***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.09	0.08	0.09	0.14	0.13	0.19*
	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Constant	0.18**	0.27***	0.13	0.51***	0.51***	0.41***
	(0.08)	(0.08)	(0.09)	(0.06)	(0.06)	(0.06)
Observations	60,471	60,471	60,471	134,032	134,032	134,032
R-squared	0.43	0.43	0.43	0.40	0.40	0.40
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; In this Heckman 2-stage procedure, our data sample is only restricted to the period from 2002 to 2011 since we lose the year 2001 (the first year in the main sample) when lagging all explanatory variables one year in the first-stage selection model.

Appendixes

A2.1 Procedure to convert the old Vietnamese Standard Industrial Classification system (VSIC 93) into the most recent one (VSIC 07)

We develop a probabilistic routine to adjust the old industrial classification (VSIC 93), not used anymore after 2010, into the new industrial classification (VSIC 07). Any research that wants to combine VES's data before and after 2010 need to overcome this issue to have a panel of firms classified with a consistent industrial classification.

Each firm in the VES database (with a unique ID, derived from the firm's tax code) is classified as belonging to an industry following the VSIC. There are two versions of the VSIC: VSIC 93 (ver. 1993) and VSIC 07 (ver. 2007), which were respectively built based on United Nation's ISIC 3 and ISIC 4. The old version (VSIC 93) was applied to enterprises surveyed from 2000 to 2005, while the new version (VSIC 07) has been applied since 2006 onwards. A conversion of the VSIC 93 into VSIC07 is thus needed for the cohorts prior to 2006. The procedure we follow for the conversion is based on two steps.

First, we create a concordance table at 4-digit level between VSIC93 and VSIC07. We make use of the fact that, GSO still keeps assigning both the old VSIC 93 code and the new VSIC 07 code for each enterprise surveyed between 2006 to 2010. From this co-assignment, we build the concordance table which captures every possible correspondence between VSIC 93 and VSIC 07 codes. There are both one-to-one and one-to-many correspondences. In case of one-to-many correspondence, an empirical probability distribution is built based on the frequencies at which each industry in the old system is associated with the corresponding industries in the new system. For example, if an industry X in VSIC 93 is associated with three industries Y_1, Y_2, Y_3 of VSIC 07, the empirical probability distribution will tell us the probabilities that X will be associated with Y_1, Y_2, and Y_3.

Second, if an enterprise belongs to an industry X in VSIC 93, which is associated with three industries Y_1, Y_2, Y_3 in VSIC 07, it will be randomly assigned to either Y_1, Y_2, or Y_3 by using the empirical probability distribution of X being associated with Y_1, Y_2, and Y_3 described above.

There are cases (about than 0.5%) where a firm in the VES from 2000 to 2005 does not show the information about the VSIC03, giving us no clues to assign the corresponding code in the VSIC07. We fill the missing information by using the same VSIC07 code that assigned those enterprises in the next available year from 2005 onwards. In particular, information in 2006 will be used to fill the missing information in 2005 and that for 2005 in turn will be used to fill the missing in 2004, and so on and so forth.

By doing this, we assume enterprises not to change their industry over time. Indeed, a time-invariant (modal) industry code is assigned to each firm. As a robustness check, we also calculate TFP and repeat the analysis for the case in which firms are allowed to switch industry over time. The main results are confirmed.

The STATA code for this procedure is available from the authors upon request.

A2.2 Comparison of our sample with total population

Year	Our sample	Total population	Coverage ratio
2001	10114	12353	81.9%
2002	12614	14794	85.3%
2003	14584	16916	86.2%
2004	16719	20531	81.4%
2005	18854	24017	78.5%
2006	22889	25086	91.2%
2007	26320	29182	90.2%
2008	34328	36459	94.2%
2009	38602	42894	90.0%
2010	46318	45472	101.9%
2011	41422	52587	78.8%
Total	282764	320291	88.3%

Note: Information about total population of manufacturing are taken from the official number reported by GSO in their website (www.gso.gov.vn)

A2.3 Ownership classification

There are 14 ownership types defined by the GSO and we re-classify them into 3 mutually exclusive groups. SOEs are the firms with state participation of at least 50% ownership. POEs are the firms with entirely private ownership and the ones where state ownership is less than or equal 50%. Cooperatives enter into the POEs category because they are essentially private business in Vietnam. These should be distinguished from collectives/cooperatives in China, which are enterprises collectively owned by employees and local governments (e.g. Xu et al., 2014). FOEs comprise both fully owned foreign subsidiaries and joint ventures established between foreign and local partners in Vietnam.

Code	Ownership types as defined by GSO	Our classification[a]
01	Central SOEs (supervised by central government)	
02	Local SOEs (supervised by province-level government)	
03	Central state-owned limited liability companies	SOEs
04	Central state-owned limited liability companies	
05	Joint stock companies with state ownership of more than 50%	
06	Cooperatives	
07	Private enterprises (sole proprietorship)	
08	Partnership companies	
09	Private limited companies	POEs
10	Joint stock companies without state ownership	
11	Joint stock companies with state ownership of less than or equal 50%	
12	Wholly-owned foreign subsidiaries	
13	Joint ventures (between SOE and foreign partners)	FOEs
14	Joint ventures (between non-state company and foreign partners)	

Notes:
[a] Our classification scheme is very close to the one adopted by Huang and Yang (2016).

A2.4 Breakdown of firms by ownership and industry in 2001 and 2011

Each cell has three rows. First row shows the frequency, the second is "row" percentage while the third one shows "column" percentage.

VSIC 07 (2-digit industry)	2001				2011			
	SOEs	POEs	FOEs	Total	SOEs	POEs	FOEs	Total
10 Food	176	2,137	110	2,423	60	4,204	308	4,572
	7.26	88.2	4.54	100	1.31	91.95	6.74	100
	14.3	27.44	10.04	23.96	9.65	11.61	6.7	11.04
11 Beverages	75	452	21	548	27	1,408	35	1,470
	13.69	82.48	3.83	100	1.84	95.78	2.38	100
	6.09	5.8	1.92	5.42	4.34	3.89	0.76	3.55
12 Tobacco	18	5	1	24	16	3	2	21
	75	20.83	4.17	100	76.19	14.29	9.52	100
	1.46	0.06	0.09	0.24	2.57	0.01	0.04	0.05
13 Textiles	55	257	69	381	27	1,370	289	1,686
	14.44	67.45	18.11	100	1.6	81.26	17.14	100
	4.47	3.3	6.3	3.77	4.34	3.78	6.29	4.07
14 Wearing apparel	88	382	118	588	35	2,789	605	3,429
	14.97	64.97	20.07	100	1.02	81.34	17.64	100
	7.15	4.91	10.77	5.81	5.63	7.7	13.17	8.28
15 Leather processing	35	151	65	251	15	695	244	954
	13.94	60.16	25.9	100	1.57	72.85	25.58	100
	2.84	1.94	5.93	2.48	2.41	1.92	5.31	2.3
16 Wood Processing	48	633	34	715	17	3,120	117	3,254
	6.71	88.53	4.76	100	0.52	95.88	3.6	100
	3.9	8.13	3.1	7.07	2.73	8.62	2.55	7.86
17 Paper product	41	372	25	438	17	1,487	126	1,630
	9.36	84.93	5.71	100	1.04	91.23	7.73	100
	3.33	4.78	2.28	4.33	2.73	4.11	2.74	3.94
18 Printing	119	190	6	315	65	2,526	66	2,657
	37.78	60.32	1.9	100	2.45	95.07	2.48	100
	9.67	2.44	0.55	3.11	10.45	6.98	1.44	6.41
19 Refined Petroleum	2	9	2	13	2	57	5	64
	15.38	69.23	15.38	100	3.13	89.06	7.81	100
	0.16	0.12	0.18	0.13	0.32	0.16	0.11	0.15
20 Chemicals	47	206	82	335	37	1,212	280	1,529
	14.03	61.49	24.48	100	2.42	79.27	18.31	100
	3.82	2.65	7.48	3.31	5.95	3.35	6.09	3.69
21 Pharmaceutical	31	68	12	111	12	253	32	297
	27.93	61.26	10.81	100	4.04	85.19	10.77	100
	2.52	0.87	1.09	1.1	1.93	0.7	0.7	0.72
22 Rubber and plastics	30	408	86	524	23	2,350	473	2,846
	5.73	77.86	16.41	100	0.81	82.57	16.62	100
	2.44	5.24	7.85	5.18	3.7	6.49	10.29	6.87
23 Non-metallic mineral	182	840	50	1,072	81	2,912	132	3,125
	16.98	78.36	4.66	100	2.59	93.18	4.22	100
	14.78	10.79	4.56	10.6	13.02	8.04	2.87	7.54
24 Basic metals	19	105	20	144	20	768	85	873
	13.19	72.92	13.89	100	2.29	87.97	9.74	100
	1.54	1.35	1.82	1.42	3.22	2.12	1.85	2.11
25 Fabricated metal products	74	618	101	793	45	5,640	524	6,209
	9.33	77.93	12.74	100	0.72	90.84	8.44	100
	6.01	7.94	9.22	7.84	7.23	15.58	11.4	14.99
26 Computer and electronics	15	45	42	102	13	300	226	539
	14.71	44.12	41.18	100	2.41	55.66	41.93	100
	1.22	0.58	3.83	1.01	2.09	0.83	4.92	1.3
27 Electrical equipment	27	110	52	189	17	611	187	815
	14.29	58.2	27.51	100	2.09	74.97	22.94	100
	2.19	1.41	4.74	1.87	2.73	1.69	4.07	1.97
28 Other	44	136	19	199	14	765	113	892

VSIC 07 (2-digit industry)	2001				2011			
	SOEs	POEs	FOEs	Total	SOEs	POEs	FOEs	Total
machinery	22.11	68.34	9.55	100	1.57	85.76	12.67	100
	3.57	1.75	1.73	1.97	2.25	2.11	2.46	2.15
29 Motor vehicles	14	41	31	86	14	159	135	308
	16.28	47.67	36.05	100	4.55	51.62	43.83	100
	1.14	0.53	2.83	0.85	2.25	0.44	2.94	0.74
30 Other trans- port equipment	58	139	38	235	44	395	122	561
	24.68	59.15	16.17	100	7.84	70.41	21.75	100
	4.71	1.79	3.47	2.32	7.07	1.09	2.66	1.35
31 Furniture	18	350	45	413	5	2,106	225	2,336
	4.36	84.75	10.9	100	0.21	90.15	9.63	100
	1.46	4.49	4.11	4.08	0.8	5.82	4.9	5.64
32 Other manufacturing	4	89	62	155	4	535	236	775
	2.58	57.42	40	100	0.52	69.03	30.45	100
	0.32	1.14	5.66	1.53	0.64	1.48	5.14	1.87
33 Repair of machinery	11	44	5	60	12	540	28	580
	18.33	73.33	8.33	100	2.07	93.1	4.83	100
	0.89	0.57	0.46	0.59	1.93	1.49	0.61	1.4
Total	1231	7,787	1096	10,114	622	36,205	4595	41,422
	12.17	76.99	10.84	100	1.5	87.41	11.09	100
	100	100	100	100	100	100	100	100

A2.5 The modified Levinsohn and Petrin (2003) estimator developed by Wooldridge (2009)

We start with a Cobb-Douglas production function:

$$y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 m_{it} + \omega_{it} + e_{it} \qquad (1)$$

where lower-case letters refer to natural logarithms of y_{it} (deflated-sales), k_{it} (capital), l_{it} (labor), and m_{it} (material). Among the inputs for production function, k_{it} (capital) is the quasi-fixed state variable accumulated from past investments while l_{it} or m_{it} (log of labor or material) are free-adjustment inputs which can be correlated with ω_{it} (i.e. the firm know its implicit productivity when taking decisions on labor and material). While Levinsohn and Petrin (2003) assume that m_{it} is the only free-adjustment input, we follow Ackerberg, Caves, Frazier (2006) by assuming that both l_{it} or m_{it} are free-adjustment inputs. It means that firms also determine l_{it} based on k_i, ω_{it} or $l_{it}=l(k_i, \omega_{it})$.

It is assumed that e_{it} is independent of all current and past inputs, k_{it}, l_{it}, m_{it} (t=1,2, …,T): $E(e_{it}| k_{it}, l_{it}, m_{it}, k_{it-1}, l_{it-1}, m_{it-1}, …) = 0$ with t=1,2, …,T. We also assume that productivity (ω_{it}) is (i) a monotonic function of m_{it}, k_{it}: $\omega_{it}=g(m_{it}, k_{it})$ and (ii) follow an autoregressive process of order 1 (AR(1)): $\omega_{it} =E(\omega_{it}|\omega_{it-1}) + a_{it}$. The innovation in productivity AR(1) process, a_{it}, is not only independent of $\omega_{it-1}=g(k_{it-1}, m_{it-1})$ but also independent of k_{it} as k_{it} is quasi-fixed and being determined from past periods.

Hence, we can write: $\omega_{it} =E(\omega_{it}|\omega_{it-1}) + a_{it}= f[g(k_{it-1}, m_{it-1})] + a_{it} = h(k_{it-1}, m_{it-1}) + a_{it}$ where $h()=f[g()]$ is assumed to be monotonic function of k_{it-1} and m_{it-1}. Then (1) becomes:

$$y_{it} = \beta_0 + \beta_1 k_{it} + h(k_{it-1}, m_{it-1}) + \beta_2 l_{it} + \beta_3 m_{it} + \varepsilon_{it} \qquad (2)$$

where $\varepsilon_{it}= a_{it} + e_{it}$ is independent of k_{it}, k_{it-1}, m_{it-1} but can be correlated with l_{it} and m_{it} (i.e. l_{it} and m_{it} are endogenous).

If we approximate $h()$ by sum of polynomials order 2 of k_{it-1} and m_{it-1}, we can estimate (2) using GMM method in STATA:

ivreg2 y_{it} k_{it} k_{it-1} m_{it-1} $k_{it-1}*m_{it-1}$ k^2_{it-1} m^2_{it-1} (l_{it} m_{it} = l_{it-1} m_{it-2}), gmm2s cluster(firm_id)

We can approximate $h()$ by polynomials of k_{it-1} and m_{it-1} up to order 3 (Wooldridge, 2009).

The function $h()$ is represented by k_{it-1} m_{it-1} $k_{it-1}*m_{it-1}$ k^2_{it-1} m^2_{it-1} in the command line. l_{it} and m_{it} are endogenous (i.e. can be correlated with ε_{it}) and being instrumented by their own

lags l_{it-1} and m_{it-2}: while the other variables are exogenous and being instrumented by themselves. Then the vector of instrument is $\mathbf{z}_{it} = [1 \quad k_{it} \quad k_{it-1} \quad m_{it-1} \quad k_{it-1}*m_{it-1} \quad k^2_{it-1} \quad m^2_{it-1} \quad l_{it-1} \quad m_{it-2}]$. The moment equations used to identify parameters in (2) in the Stata's command line are $E(\mathbf{z'}_{it}* \varepsilon_{it}) = 0$

In this study, we specially use the production function with value-added on the left-hand side. The equivalence of (2) when value-added is on the left-hand side is:

$$v_{it} = \beta_0 + \beta_1 k_{it} + h(k_{it-1}, m_{it-1}) + \beta_2 l_{it} + \varepsilon_{it} \qquad (2')$$

In this case, we only have one endogenous variable l_{it} which will be instrumented by its own lag l_{it-1}. The vector of instrument $\mathbf{z'}_{it} = [1 \quad k_{it} \quad k_{it-1} \quad m_{it-1} \quad k_{it-1}*m_{it-1} \quad k^2_{it-1} \quad m^2_{it-1} \quad l_{it-1}]$ then is used to identify parameters in (2') from the following moment equations $E(\mathbf{z'}_{it}* \varepsilon_{it}) = 0$. The command line in STATA is:

ivreg2 v_{it} k_{it} k_{it-1} m_{it-1} $k_{it-1}*m_{it-1}$ k^2_{it-1} m^2_{it-1} ($l_{it} = l_{it-1}$), *gmm2s cluster(firm_id)*

We estimate the coefficient $\widehat{\beta_1}, \widehat{\beta_2}$ separately for each 2-digit manufacturing sectors, and the firm's TFP (in log) is calculated as $\widehat{\omega}_{it} = v_{it} - \hat{\beta}_1 k_{it} - \hat{\beta}_2 l_{it}$. It should be noted that we also include dummies for year in the ivreg2 command to control for the difference in technologies across years. The estimated $\widehat{\beta_1}$ and $\widehat{\beta_2}$ are reported in the table below.

Input coefficients estimated for each 2-digit manufacturing sector

Sector code (VSIC07)	Sector name	$\widehat{\beta_1}$	$\widehat{\beta_2}$
10	Food	0.25	0.45
11	Beverages	0.16	0.74
12	Tobacco	0.31	0.74
13	Textiles	0.20	0.61
14	Wearing Apparel	0.08	0.81
15	Leather products	0.09	0.77
16	Wood and product of woods	0.14	0.68
17	Paper	0.15	0.63
18	Printing	0.16	0.73
19	Refine petroleum products	0.26	0.84
20	Chemicals	0.22	0.51
21	Pharmaceuticals	0.20	0.48
22	Rubber and Plastics	0.18	0.62
23	Non-metalic mineral	0.16	0.70
24	Basic metals	0.25	0.50

Sector code (VSIC07)	Sector name	$\widehat{\beta_1}$	$\widehat{\beta_2}$
25	Fabricated metal	0.17	0.68
26	Electronics, computer, And optical equipment	0.12	0.62
27	Electrical equipment	0.20	0.50
28	Machinery and equipment	0.13	0.67
29	Motor vehicles	0.25	0.42
30	Other transport equipment	0.18	0.62
31	Furniture	0.12	0.72
32	Other manufacturing	0.15	0.67
33	Repair and installation of machinery	0.12	0.68

A2.6 The measure of import penetration

Import penetration is the ratio of imports to the sum of sales and imports by 4-digit VSIC 07 industry. Data on imports have been extracted from UN Comtrade database and classified by the HS classification system of traded products (HS1 to HS 4). We use the following procedure to convert import data at HS's 6-digit product level into 4-digit VSIC 07's industrial sectors.

First, we obtain the concordance tables from HS systems to ISIC Rev.3 from World Integrated Trade Solution's website (http://wits.worldbank.org/product_concordance.html). Vietnam reports trade data in different versions of HS (HS1 to HS4) from years to years. As World Integrated Trade Solution only provides the concordance from HS 1, HS2, and HS3 to ISIC Rev.3, we will convert import values by HS4 to HS3 using the conversion table between HS4 and HS3 provided by World Customs Organization (http://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/hs_nomenclature_2012/correlations-tables.aspx). When a HS4 category is associated with more than one HS3 categories, we split the import value by the HS4 category equally between all associated HS3 categories. Moreover, as VSIC 93 is developed on the basis of ISIC Rev.3; specifically, it is a mirror of ISIC Rev.3 with only minor difference. Therefore, we have got concordance tables from HS systems (1 to 3) to VSIC 93, in fact.

Second, we map import data classified by HS products to VSIC 07's 4-digit sectors, using the HS to VSIC 93 concordance above and the concordance from VSIC 93 to VSIC 07 provided by GSO. We manually input the associated VSIC 07 codes for 5 specific VSIC 93 codes, viz. 1911, 2330, 2412, 3313, 3720, which are missing in the concordance from GSO. When a VSIC 93 categories maps into two or more VSIC 07 categories, we split the import value equally between all VSIC 07 categories linked to the VSIC 93 category.

A2.7 Summary statistics and correlation matrix of variables in the dataset

	Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1	tfp (in log)	1.19	1.06	1.00											
2	SOE	0.03	0.18	0.13	1.00										
3	FOE	0.11	0.31	0.25	-0.06	1.00									
4	HHI	0.06	0.08	0.03	0.04	0.04	1.00								
5	Import penetration	0.19	0.23	0.11	0.01	0.10	0.24	1.00							
6	Entry Rate	0.23	0.11	-0.12	0.06	0.01	0.10	0.05	1.00						
7	Exit Rate	0.10	0.06	-0.05	-0.02	-0.04	0.03	-0.09	0.20	1.00					
8	Leverage ratio	0.45	0.39	0.21	0.11	0.10	-0.02	0.03	-0.04	0.00	1.00				
9	Firm size	3.23	1.55	0.36	0.29	0.38	-0.01	0.03	0.05	-0.04	0.23	1.00			
10	Firm age	1.55	0.93	0.25	0.27	0.06	0.00	-0.01	-0.12	-0.01	0.11	0.35	1.00		
11	Export status	0.10	0.30	0.21	0.07	0.35	0.00	0.03	-0.04	-0.08	0.11	0.39	0.13	1.00	
12	Province GDP growth	0.12	0.04	0.00	0.00	0.06	0.01	0.03	0.06	0.17	-0.01	0.05	-0.01	0.01	1.00

N=282,764 obs.

In this robustness check, we rerun the regressions in table 2.3 in an alternative way. This alternative strategy is to mitigate the concern that including four time-variant industry-level variables, viz. HHI, entry rate, exit rate, and import penetration together in one regression may cause a multicollinearity issue since these variables are likely to be highly correlated to each other. We first run a regression with ownership dummies, firm-level controls, and adding industry-year and province-year fixed effects. For this practice, we get results reported in column 1 and 2 of the table below. We go on dropping industry-year fixed effects and replace them by industry fixed effects only and start to include one by one among the four industry-level variables above and their interactions with ownership. Results in columns from 2 to 7 shows that the estimated coefficients of these four industry-level variables when we include them one by one are the same as those when we include them altogether. Hence, basically it does not matter whether we include them one by one or altogether in the same regression and the likely multicollinearity issue is not a real concern. The estimation results we obtain here in column (7) are also almost similar to the ones in column (3) of table 2.3. We do the same robustness check for regressions in table 2.4 and 2.5 for the two sub-periods, viz. 2001-2006 and 2007-2011 and put results in Appendix A2.9 and Appendix A2.10.

	1	2	3	4	5	6	7	8	9
	Dependent variable: *tfp; period 2001-2011*								
Ownership									
SOE	1.00***	0.21***	0.22***	0.22***	0.22***	0.22***	0.21***	0.16***	0.29***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
FOE	0.78***	0.30***	0.31***	0.31***	0.31***	0.31***	0.31***	0.21***	0.36***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Industry-level determinants									
HHI			-0.15***				-0.21***	-0.45***	-0.21***
			(0.04)				(0.04)	(0.04)	(0.04)
Entry Rate				-0.07*			-0.02	-0.02	0.04
				(0.04)			(0.04)	(0.04)	(0.04)
Exit Rate					-0.09*		-0.10**	-0.09*	-0.12**
					(0.05)		(0.05)	(0.05)	(0.05)
Import Penetration						-0.26***	-0.31***	-0.27***	-0.30***
						(0.04)	(0.04)	(0.04)	(0.04)
Interactions									
SOE*HHI								0.81***	
								(0.10)	
FOE*HHI								1.53***	
								(0.06)	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SOE*Entry Rate									-0.29***
									(0.05)
FOE*Entry Rate									-0.23***
									(0.05)
Firm-level controls									
Leverage Ratio		0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm size		0.23***	0.23***	0.23***	0.23***	0.23***	0.23***	0.23***	0.23***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age		0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Export status		0.18***	0.16***	0.16***	0.16***	0.16***	0.16***	0.16***	0.16***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.87***	0.02	-0.07*	-0.08*	-0.12***	-0.04	0.07	0.09*	0.05
	(0.13)	(0.12)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
Observations	282,764	282,764	282,764	282,764	282,764	282,764	282,764	282,764	282,764
Adjusted R^2	0.28	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	No	No	No	No	No	No	No
Year FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A2.9 Robustness check: running regressions in table 2.4 in an alternative way

				Dependent variable: *tfp; period 2001-2006*					
	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.96***	0.09***	0.09***	0.09***	0.09***	0.09***	0.09***	0.05***	0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
FOE	0.84***	0.43***	0.43***	0.43***	0.43***	0.43***	0.43***	0.32***	0.48***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Industry-level determinants									
HHI			-0.28***				-0.35***	-0.64***	-0.35***
			(0.10)				(0.11)	(0.11)	(0.11)
Entry Rate				-0.10*			-0.10	-0.10*	-0.05
				(0.05)			(0.06)	(0.06)	(0.06)
Exit Rate					0.01		0.05	0.07	0.04
					(0.06)		(0.07)	(0.07)	(0.07)
Import Penetration						-0.24***	-0.26***	-0.24***	-0.25***
						(0.08)	(0.08)	(0.08)	(0.08)
Interactions									
SOE*HHI								0.58***	
								(0.14)	
FOE*HHI								1.53***	
								(0.10)	
SOE*Entry Rate									-0.16**
									(0.06)
FOE*Entry Rate									-0.16***
									(0.06)
Firm-level controls									
Leverage Ratio		0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size		0.24***	0.24***	0.24***	0.24***	0.24***	0.24***	0.24***	0.24***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age		0.17***	0.17***	0.17***	0.17***	0.17***	0.17***	0.17***	0.17***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Export status		0.13***	0.11***	0.11***	0.11***	0.11***	0.12***	0.11***	0.11***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.88***	-0.06	-0.08	-0.12*	-0.18***	-0.15***	0.04	0.11	0.02
	(0.13)	(0.12)	(0.06)	(0.06)	(0.05)	(0.05)	(0.08)	(0.08)	(0.08)
Observations	95,774	95,774	95,774	95,774	95,774	95,774	95,774	95,774	95,774
Adjusted R^2	0.28	0.39	0.38	0.38	0.38	0.38	0.38	0.39	0.38
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	No	No	No	No	No	No	No
Year FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A2.10 Robustness check: running regressions in table 2.5 in an alternative way

	Dependent variable: *tfp; period 2007-2011*								
	1	2	3	4	5	6	7	8	9
Ownership									
SOE	1.08***	0.32***	0.33***	0.33***	0.33***	0.33***	0.33***	0.26***	0.55***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
FOE	0.74***	0.23***	0.23***	0.23***	0.23***	0.23***	0.23***	0.15***	0.68***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Industry-level determinants									
HHI			-0.04				-0.07	-0.22***	-0.06
			(0.05)				(0.06)	(0.06)	(0.06)
Entry Rate				-0.27***			-0.27***	-0.26***	0.03
				(0.07)			(0.07)	(0.07)	(0.07)
Exit Rate					-0.10		-0.13	-0.11	-0.07
					(0.11)		(0.11)	(0.11)	(0.11)
Import Penetration						-0.12*	-0.15*	-0.07	-0.12*
						(0.07)	(0.08)	(0.08)	(0.07)
Interactions									
SOE*HHI								0.96***	
								(0.15)	
FOE*HHI								1.45***	
								(0.07)	
SOE*Entry Rate									-1.16***
									(0.21)
FOE*Entry Rate									-2.31***
									(0.11)
Firm-level controls									
Leverage Ratio		0.15***	0.15***	0.15***	0.15***	0.15***	0.15***	0.15***	0.15***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size		0.22***	0.22***	0.22***	0.22***	0.22***	0.22***	0.22***	0.23***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age		0.10***	0.10***	0.10***	0.10***	0.10***	0.10***	0.10***	0.11***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Export status		0.22***	0.22***	0.22***	0.22***	0.22***	0.22***	0.22***	0.21***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.02***	0.22***	0.18***	0.25***	0.19***	0.22***	0.33***	0.32***	0.24***
	(0.08)	(0.07)	(0.04)	(0.04)	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)
Observations	186,990	186,990	186,990	186,990	186,990	186,990	186,990	186,990	186,990
Adjusted R^2	0.26	0.38	0.37	0.37	0.37	0.37	0.37	0.38	0.38
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	No	No	No	No	No	No	No
Year FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0

A2.11 Ownership, competition and firm productivity; adding the first lag of tfp in the vector of controls

	Dependent variable: *tfp*								
	2001-2011			**2001-2006**			**2007-2011**		
	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.12***	0.08***	0.18***	0.14***	0.11***	0.17***	0.18***	0.14***	0.31***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.04)
FOE	0.21***	0.16***	0.26***	0.28***	0.22***	0.32***	0.17***	0.12***	0.40***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Market competition									
HHI	-0.04	-0.19***	-0.04	0.10	-0.10	0.10	-0.00	-0.09	0.00
	(0.04)	(0.04)	(0.04)	(0.12)	(0.12)	(0.12)	(0.06)	(0.06)	(0.06)
Entry Rate	0.16***	0.15***	0.23***	0.17***	0.16***	0.23***	-0.05	-0.06	0.14*
	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
Interactions									
SOE*HHI		0.51***			0.48***			0.62***	
		(0.09)			(0.13)			(0.14)	
FOE*HHI		0.91***			0.89***			0.93***	
		(0.06)			(0.10)			(0.08)	
SOE*EntryRate			-0.26***			-0.11			-0.68***
			(0.06)			(0.07)			(0.20)
FOE*EntryRate			-0.25***			-0.14**			-1.20***
			(0.05)			(0.07)			(0.11)
Lagged productivity									
tfp$_{t-1}$	0.46***	0.46***	0.46***	0.47***	0.47***	0.47***	0.45***	0.45***	0.45***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls									
Exit Rate	-0.09*	-0.08	-0.10*	-0.04	-0.03	-0.06	0.16	0.16	0.20*
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Import Penetration	-0.19***	-0.16***	-0.18***	-0.05	-0.03	-0.04	-0.20***	-0.16**	-0.19**
	(0.04)	(0.04)	(0.04)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)
Leverage Ratio	0.08***	0.08***	0.08***	0.05***	0.05***	0.05***	0.10***	0.10***	0.10***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Firm size	0.14***	0.14***	0.14***	0.13***	0.14***	0.13***	0.15***	0.15***	0.15***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	-0.03***	-0.03***	-0.03***	-0.07***	-0.07***	-0.07***	-0.01***	-0.01***	-0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Export status	0.10***	0.10***	0.10***	0.06***	0.06***	0.06***	0.13***	0.13***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.02	0.01	0.02	0.06	0.06	0.06	-0.09	-0.10	-0.06
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.10)	(0.10)	(0.10)
Constant	0.15***	0.17***	0.13***	0.22***	0.27***	0.20***	0.41***	0.41***	0.35***
	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
Observations	194,503	194,503	194,503	60,471	60,471	60,471	134,032	134,032	134,032
Adjusted R-squared	0.54	0.54	0.54	0.58	0.58	0.58	0.52	0.52	0.52
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: omitted ownership category: POE; standard errors in parentheses

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

A2.12 Ownership, competition and firm productivity; regressors as 1-year lagged variables

	Dependent variable: *tfp*								
	2001-2011			**2001-2006**			**2007-2011**		
	1	2	3	4	5	6	7	8	9
Ownership									
SOE(t-1)	0.21***	0.15***	0.28***	0.13***	0.08***	0.16***	0.32***	0.24***	0.60***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)
FOE(t-1)	0.34***	0.24***	0.32***	0.49***	0.37***	0.47***	0.26***	0.18***	0.73***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)
Market competition									
HHI(t-1)	-0.14***	-0.39***	-0.14***	0.00	-0.32***	0.00	-0.05	-0.20***	-0.04
	(0.05)	(0.05)	(0.05)	(0.11)	(0.11)	(0.11)	(0.06)	(0.06)	(0.06)
Entry Rate(t-1)	0.12***	0.12***	0.12***	0.09*	0.09*	0.09*	-0.10	-0.08	0.24***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)
Interactions									
SOE*HHI(t-1)		0.82***			0.70***			1.11***	
		(0.10)			(0.13)			(0.16)	
FOE*HHI(t-1)		1.57***			1.49***			1.54***	
		(0.06)			(0.10)			(0.08)	
SOE*EntryRate(t-1)			-0.23***			-0.07*			-1.41***
			(0.04)			(0.04)			(0.22)
FOE*EntryRate(t-1)			0.08**			0.04			-2.27***
			(0.04)			(0.04)			(0.12)
Controls									
Exit Rate(t-1)	-0.21***	-0.22***	-0.20***	-0.03	-0.03	-0.03	-0.44***	-0.46***	-0.34***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.12)	(0.12)	(0.12)
Import Penetration (t-1)	-0.27***	-0.25***	-0.27***	0.04	0.03	0.03	0.11	0.16*	0.13
	(0.04)	(0.04)	(0.04)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Leverage ratio(t-1)	0.08***	0.08***	0.08***	0.12***	0.12***	0.12***	0.07***	0.07***	0.07***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size (t-1)	0.26***	0.26***	0.26***	0.27***	0.27***	0.27***	0.25***	0.25***	0.25***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age (t-1)	0.03***	0.03***	0.03***	0.02***	0.01***	0.02***	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Export status(t-1)	0.15***	0.14***	0.15***	0.05***	0.04***	0.05***	0.25***	0.25***	0.23***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth (t-1)	-0.01	-0.01	-0.01	0.05	0.04	0.05	0.06	0.05	0.11
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.13)	(0.13)	(0.13)
Constant	0.23***	0.25***	0.24***	0.11	0.18**	0.11	0.46***	0.47***	0.35***
	(0.05)	(0.05)	(0.05)	(0.09)	(0.09)	(0.09)	(0.06)	(0.06)	(0.06)
Observations	209,614	209,614	209,614	66,598	66,598	66,598	143,016	143,016	143,016
Adjusted R-squared	0.39	0.39	0.39	0.41	0.41	0.41	0.38	0.38	0.38
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes:

Omitted ownership category: POE

Standard errors in parentheses

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

A2.13 Ownership, competition and firm productivity; adding Mixed ownership group (enterprises in which the state possesses more than 0 but less than or equal 50% of ownership)

	Dependent variable: *tfp*								
	2001-2011			*2001-2006*			*2007-2011*		
	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.25***	0.20***	0.34***	0.12***	0.08***	0.19***	0.36***	0.30***	0.62***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
FOE	0.33***	0.23***	0.39***	0.45***	0.34***	0.52***	0.25***	0.17***	0.71***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
MIXED	0.32***	0.28***	0.43***	0.30***	0.26***	0.36***	0.31***	0.27***	0.78***
	(0.01)	(0.01)	(0.03)	(0.02)	(0.03)	(0.04)	(0.02)	(0.02)	(0.05)
Market competition									
HHI	-0.20***	-0.45***	-0.20***	-0.33***	-0.63***	-0.33***	-0.02	-0.18***	-0.01
	(0.04)	(0.04)	(0.04)	(0.11)	(0.11)	(0.11)	(0.06)	(0.06)	(0.06)
entryRate	-0.05	-0.05	0.03	-0.03	-0.03	0.05	-0.36***	-0.36***	-0.02
	(0.04)	(0.03)	(0.04)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
Interactions									
SOE*HHI		0.80***			0.59***			0.98***	
		(0.10)			(0.14)			(0.15)	
FOE*HHI		1.56***			1.56***			1.49***	
		(0.06)			(0.10)			(0.07)	
MIXED*HHI		0.71***			0.59***			0.77***	
		(0.13)			(0.22)			(0.16)	
SOE*Entry Rate			-0.34***			-0.21***			-1.28***
			(0.05)			(0.06)			(0.21)
FOE*Entry Rate			-0.23***			-0.22***			-2.32***
			(0.04)			(0.06)			(0.11)
MIXED*Entry Rate			-0.46***			-0.20			-2.38***
			(0.10)			(0.13)			(0.24)
Controls									
Exit Rate	0.03	0.04	0.01	0.11*	0.12*	0.09	0.12	0.13	0.19*
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Import Penetration	-0.34***	-0.29***	-0.33***	-0.22***	-0.20**	-0.21***	-0.18**	-0.09	-0.16**
	(0.04)	(0.04)	(0.04)	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)
Leverage Ratio	0.15***	0.15***	0.15***	0.13***	0.13***	0.13***	0.16***	0.15***	0.16***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size	0.22***	0.22***	0.22***	0.24***	0.24***	0.24***	0.22***	0.22***	0.22***

	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.12***	0.12***	0.12***	0.17***	0.17***	0.17***	0.10***	0.10***	0.10***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Export	0.16***	0.16***	0.15***	0.11***	0.11***	0.11***	0.21***	0.21***	0.19***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.07	0.06	0.07	0.14**	0.14**	0.14**	0.00	-0.01	0.05
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.09)	(0.09)	(0.09)
Constant	0.18***	0.21***	0.16***	0.04	0.11	0.02	0.62***	0.60***	0.50***
	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)	(0.05)
Observations	282,764	282,764	282,764	95,774	95,774	95,774	186,990	186,990	186,990
Adjusted R-squared	0.38	0.38	0.38	0.38	0.38	0.38	0.37	0.37	0.37
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POEs (now being firms with 100% private ownership); Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A2.14 Heckman selection model: second stage; ownership (adding MIXED OWNERSHIP), competition and firm productivity; 2002-2011, 2002-2006, and 2007-2011

				Dependent variable: *tfp*					
	2002-2011			2002-2006			2007-2011		
VARIABLES	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.44***	0.38***	0.60***	0.45***	0.41***	0.55***	0.64***	0.56***	0.91***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)
FOE	0.39***	0.29***	0.48***	0.54***	0.42***	0.64***	0.31***	0.23***	0.73***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.03)
MIXED	0.34***	0.30***	0.55***	0.36***	0.32***	0.48***	0.31***	0.27***	0.75***
	(0.01)	(0.02)	(0.03)	(0.03)	(0.03)	(0.05)	(0.02)	(0.02)	(0.05)
Market competition									
HHI	-0.18***	-0.46***	-0.17***	-0.02	-0.40***	-0.01	-0.06	-0.23***	-0.05
	(0.05)	(0.05)	(0.05)	(0.14)	(0.14)	(0.14)	(0.06)	(0.07)	(0.06)
entryRate	0.11***	0.10**	0.28***	0.11	0.09	0.27***	-0.33***	-0.34***	0.06
	(0.04)	(0.04)	(0.05)	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)
Interactions									
SOE*HHI		0.77***			0.53***			1.03***	
		(0.11)			(0.15)			(0.16)	
FOE*HHI		1.73***			1.75***			1.65***	
		(0.07)			(0.12)			(0.08)	
MIXED*HHI		0.71***			0.67***			0.81***	
		(0.13)			(0.25)			(0.16)	
SOE*Entry Rate			-0.62***			-0.33***			-1.33***
			(0.07)			(0.08)			(0.22)
FOE*Entry Rate			-0.40***			-0.34***			-2.13***
			(0.06)			(0.08)			(0.12)
MIXED*Entry Rate			-0.99***			-0.49**			-2.29***
			(0.15)			(0.19)			(0.25)
Inverse Mills' ratio	-0.15***	-0.14***	-0.16***	-0.23***	-0.22***	-0.23***	-0.18***	-0.17***	-0.19***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Controls									
Exit Rate	-0.14**	-0.12**	-0.16***	0.05	0.07	0.01	-0.00	-0.00	0.08
	(0.06)	(0.06)	(0.06)	(0.08)	(0.08)	(0.08)	(0.13)	(0.13)	(0.13)
Import Penetration	-0.25***	-0.20***	-0.24***	-0.15	-0.12	-0.13	-0.14*	-0.04	-0.12
	(0.05)	(0.05)	(0.05)	(0.11)	(0.11)	(0.11)	(0.09)	(0.09)	(0.09)
Leverage Ratio	0.09***	0.09***	0.09***	0.06***	0.06***	0.05***	0.11***	0.11***	0.11***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm size	0.24***	0.24***	0.24***	0.24***	0.24***	0.24***	0.23***	0.23***	0.24***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.03***	0.03***	0.03***	0.00	0.00	0.00	0.04***	0.04***	0.04***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)

Export	0.14***	0.14***	0.14***	0.07***	0.07***	0.07***	0.19***	0.19***	0.17***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.09*	0.08	0.09*	0.09	0.08	0.09	0.14	0.12	0.18*
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Constant	0.21***	0.24***	0.16***	0.21**	0.30***	0.15*	0.52***	0.51***	0.40***
	(0.05)	(0.05)	(0.05)	(0.08)	(0.08)	(0.09)	(0.06)	(0.06)	(0.06)
Observations	194,503	194,503	194,503	60,471	60,471	60,471	134,032	134,032	134,032
R-squared	0.41	0.41	0.41	0.43	0.44	0.44	0.40	0.40	0.40
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POEs (now being firms with 100% private ownership); Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

A2.15 Robustness to labor productivity - Ownership, competition and firm labor productivity (ln(VA/employee))

	Dependent variable: *labor productivity*								
	2001-2011			2001-2006			2007-2011		
VARIABLES	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.17***	0.14***	0.23***	0.05***	0.04**	0.08***	0.29***	0.24***	0.45***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
FOE	0.27***	0.21***	0.33***	0.37***	0.28***	0.44***	0.21***	0.16***	0.55***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Market competition									
HHI	-0.25***	-0.40***	-0.25***	-0.35***	-0.56***	-0.35***	-0.04	-0.13**	-0.03
	(0.04)	(0.04)	(0.04)	(0.10)	(0.11)	(0.10)	(0.05)	(0.06)	(0.05)
Entry Rate	-0.07**	-0.07**	-0.01	-0.04	-0.04	0.02	-0.38***	-0.37***	-0.15**
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.06)	(0.07)	(0.07)	(0.07)
Interactions									
SOE*HHI		0.43***			0.21			0.76***	
		(0.10)			(0.14)			(0.15)	
SOE*Entry Rate			-0.21***			-0.10*			-0.79***
			(0.05)			(0.06)			(0.21)
FOE*HHI		1.05***			1.19***			0.89***	
		(0.06)			(0.10)			(0.07)	
FOE*Entry Rate			-0.23***			-0.24***			-1.75***
			(0.04)			(0.06)			(0.11)
Firm-level controls									
Ln (K/L)	0.22***	0.22***	0.22***	0.23***	0.23***	0.23***	0.21***	0.21***	0.21***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exit Rate	0.03	0.04	0.02	0.12*	0.13**	0.10	0.11	0.12	0.16
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Import Penetration	-0.24***	-0.21***	-0.24***	-0.19**	-0.18**	-0.18**	-0.19**	-0.14*	-0.16**
	(0.04)	(0.04)	(0.04)	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)
Leverage Ratio	0.14***	0.14***	0.14***	0.13***	0.13***	0.13***	0.15***	0.15***	0.15***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Firm size	0.05***	0.05***	0.05***	0.06***	0.06***	0.06***	0.05***	0.05***	0.05***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.12***	0.12***	0.12***	0.17***	0.17***	0.17***	0.10***	0.10***	0.10***

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Export status	0.14***	0.14***	0.14***	0.10***	0.10***	0.10***	0.18***	0.18***	0.17***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.08*	0.07	0.08*	0.15**	0.14**	0.15**	0.07	0.06	0.11
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.09)	(0.09)	(0.09)
Constant	-0.13***	-0.11***	-0.15***	-0.28***	-0.23***	-0.31***	0.17***	0.16***	0.09*
	(0.04)	(0.04)	(0.04)	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)	(0.05)
Observations	282,764	282,764	282,764	95,774	95,774	95,774	186,990	186,990	186,990
Adjusted R-squared	0.35	0.35	0.35	0.34	0.34	0.34	0.33	0.33	0.33
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A2.16 Robustness to labor productivity - Difference in labor productivity (ln(VA/employee)) between always remaining SOEs and privatized SOEs (before privatization)

Dependent variable: labor productivity	1	2
Dummy(=1) for those firms who always remaining SOEs	0.13***	0.00
	(0.02)	(0.02)
Ln(K/L)	0.36***	0.29***
	0.01	0.01
Leverage Ratio	-0.48***	-0.34***
	(0.02)	(0.02)
Export status	-0.07***	0.09***
	(0.02)	(0.02)
Firm size	0.11***	0.19***
	(0.01)	(0.01)
Firm age	0.02	-0.05***
	(0.01)	(0.01)
Constant	-0.08	-0.42***
	(0.07)	(0.07)
Observations	10,867	10,867
Adjusted R-squared	0.36	0.50
Year FE	Yes	Yes
Province FE	Yes	Yes
Industry FE	No	Yes

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

A2.17 Robustness to labor productivity - Heckman selection model: first stage (probit); the probability for firms to be maintained as SOEs; 2002-2011

Dependen variable: dummy=1 for SOEs	
Firm managed by central Gov. (t-1)	2.47***
	(0.05)
Labor productivity (t-1)	0.16***
	(0.01)
Labor productivity ^2 (t-1)	-0.02***
	(0.00)
Firm size (t-1)	1.41***
	(0.04)
(Firm size)^2 (t-1)	-0.09***
	(0.00)
Firm age (t-1)	-0.45***
	(0.04)
(Firm age)^2 (t-1)	0.21***
	(0.01)
Leverage Ratio (t-1)	0.41***
	(0.03)
(Leverage Ratio)^2 (t-1)	-0.04***
	(0.01)
Export status (t-1)	-0.19***
	(0.02)
Employment share by industry (t-1)	1.42***
	(0.08)
Employment share by province (t-1)	1.84***
	(0.12)
ΔEmployment share by industry (t-1 to t)	1.09***
	(0.23)
ΔEmployment share by province (t-1 to t)	1.08***
	(0.20)
Constant	-7.72***
	(0.15)
Observations	194,503
Year FE	Yes
Province FE	Yes
Industry FE	Yes

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

A2.18 Robustness to labor productivity - Heckman selection model: second stage; ownership, competition and firm labor productivity; 2002-2011, 2002-2006, and 2007-2011

	Dependent variable: *labor productivity (ln(VA/Employee))*								
	2002-2011			2002-2006			2007-2011		
VARIABLES	1	2	3	4	5	6	7	8	9
Ownership									
SOE	0.38***	0.35***	0.50***	0.40***	0.39***	0.46***	0.61***	0.55***	0.77***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)
FOE	0.33***	0.26***	0.41***	0.44***	0.35***	0.53***	0.27***	0.21***	0.58***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.02)
Market competition									
HHI	-0.20***	-0.37***	-0.20***	0.01	-0.24*	0.01	-0.09	-0.18***	-0.08
	(0.05)	(0.05)	(0.05)	(0.14)	(0.14)	(0.14)	(0.06)	(0.06)	(0.06)
Entry Rate	0.09**	0.08*	0.21***	0.08	0.06	0.19***	-0.34***	-0.35***	-0.10
	(0.04)	(0.04)	(0.05)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)
Interactions									
SOE*HHI		0.36***			0.14			0.72***	
		(0.11)			(0.15)			(0.16)	
SOE*Entry Rate			-0.47***			-0.21***			-0.85***
			(0.07)			(0.08)			(0.22)
FOE*HHI		1.18***			1.34***			1.05***	
		(0.07)			(0.11)			(0.08)	
FOE*Entry Rate			-0.34***			-0.31***			-1.57***
			(0.06)			(0.08)			(0.12)
Inverse Mills' Ratio	-0.17***	-0.17***	-0.18***	-0.26***	-0.26***	-0.26***	-0.21***	-0.20***	-0.21***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)
Controls									
ln_kol	0.23***	0.23***	0.23***	0.25***	0.25***	0.25***	0.22***	0.22***	0.22***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exit Rate	-0.13**	-0.12*	-0.15**	0.07	0.09	0.04	-0.03	-0.02	0.03
	(0.06)	(0.06)	(0.06)	(0.08)	(0.08)	(0.08)	(0.12)	(0.12)	(0.12)
Import Penetration	-0.19***	-0.16***	-0.18***	-0.13	-0.12	-0.13	-0.17**	-0.11	-0.15*
	(0.05)	(0.05)	(0.05)	(0.10)	(0.10)	(0.10)	(0.08)	(0.08)	(0.08)
Leverage Ratio	0.09***	0.09***	0.09***	0.06***	0.06***	0.06***	0.10***	0.10***	0.10***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

Firm size	0.06***	0.06***	0.06***	0.06***	0.06***	0.06***	0.06***	0.06***	0.07***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm age	0.03***	0.03***	0.03***	0.01**	0.01**	0.01**	0.04***	0.04***	0.04***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Export status	0.12***	0.12***	0.11***	0.06***	0.05***	0.06***	0.16***	0.16***	0.15***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Province GDP growth	0.09*	0.09*	0.10*	0.08	0.08	0.08	0.22**	0.21**	0.26**
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
Constant	-0.13***	-0.11**	-0.16***	-0.14*	-0.07	-0.18**	0.20***	0.19***	0.12*
	(0.05)	(0.05)	(0.05)	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)
Observations	194,503	194,503	194,503	60,471	60,471	60,471	134,032	134,032	134,032
R-squared	0.37	0.37	0.37	0.39	0.39	0.39	0.35	0.35	0.35
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Omitted ownership category: POE; Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A2.19 Are SOEs constraining the productivity growth of POEs?

	Dependent variable: 1-year TFP growth rate of POEs		
	2001-2011	**2001-2006**	**2007-2011**
Presence of SOEs			
Emp. share by SOEs	0.11***	0.02	0.20***
same 3-digit ind. (t-1)	(0.03)	(0.07)	(0.07)
Emp. share by SOEs	0.03	0.09	0.23***
same province (t-1)	(0.02)	(0.06)	(0.06)
Controls			
Emp. share by FOEs	0.46***	0.17*	0.47***
same 3-digit ind. (t-1)	(0.04)	(0.09)	(0.10)
Emp. share by FOEs	0.10***	-0.22**	0.34***
same province (t-1)	(0.03)	(0.09)	(0.06)
Firm size $_{t-1}$	0.17***	0.18***	0.17***
	(0.00)	(0.00)	(0.00)
Firm age $_{t-1}$	-0.04***	-0.08***	-0.02***
	(0.00)	(0.00)	(0.00)
Export status $_{t-1}$	0.12***	0.05***	0.20***
	(0.01)	(0.01)	(0.01)
tfp $_{t-1}$	-0.52***	-0.51***	-0.53***
	(0.00)	(0.00)	(0.00)
Constant	0.04	0.21***	0.01
	(0.04)	(0.08)	(0.05)
Observations	196,429	61,442	134,987
Adjusted R-squared	0.29	0.32	0.28
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Notes:

Only POEs are considered in these regressions

Standard errors in parentheses

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

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Chapter 3 Tax-avoidance profit shifting by multinational firms: evidence from Vietnam

3.1 Introduction

We are witnessing a raise in awareness about tax-dodging profit shifting activities by multinational corporations (MNCs) from high-tax to low-tax countries (Economist, 2013; Dharmapala, 2014). Specifically, these MNCs try to minimize their global income tax burden by internally relocating profits generated by subsidiaries located in high-tax countries to the ones located in low-tax states. In 2013, the OECD initiated a project (the OECD/G20 BEPS, still ongoing) characterized by an action plan of fifteen items to prevent cross-border profit shifting by MNCs. According to the OECD's conservative estimate, between $100 and $240 billion of global corporate income tax has been lost annually due to profit shifting by MNCs from 2013 to 2015 (OECD, 2015).

Given the importance of the issue, there has been a growing number of empirical studies investigating the evidence and magnitude of multinational profit shifting[42]. The prevailing results stemming from this literature have outlined at least two powerful facts. First, MNCs do, in indeed, shift profits from high taxes countries to low taxes ones (e.g. Heckemeyer and Overesch, 2013; Dharmapala, 2014). Second, they tend to use two means to this end (e.g. Chang, 2013, p. 134; Dharmapala, 2014, p. 14). The first is through internal transfer pricing in which an MNC channels profits generated in high-tax countries to low-tax jurisdictions by manipulating prices of imports and exports in intra-group transactions between group-affiliated subsidiaries. Specifically, imports undertaken by the MNC's focal subsidiary located in a high-tax country

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[42] Throughout this chapter, we use the words "profit shifting" to refer to the activities of an MNC to internally relocate profits among its affiliates across national borders, specifically from high to low tax countries, to minimize its global income tax responsibility.

will be overpriced while its exports are underpriced. The second mechanism is through strategic inter-subsidiary debts in which the multinational firm issues debts to subsidiaries in high-tax countries because the interest paid back to the parent company is exempted from income tax in the host countries.

Despite these significant findings, the extant literature has two main limitations. First, these studies mostly focus on profit shifting in OECD countries while evidence from developing countries is still under-explored (Fuest and Riedel, 2010; Johannesen et al., 2016). Second, in terms of methodology, there are some serious endogeneity issues in the estimation approach used in most studies (Dharmapala, 2014).

This chapter is a study that tackles those issues by investigating the profit-shifting behavior of multinationals operating in Vietnam, a late development country, during the period from 2006 to 2012. Vietnam serves as a good laboratory context since there is a lot of suspicion and indirect evidence raised in the media about MNCs' abuse of transfer pricing to siphon profits out of the country (e.g. Nguyen, 2011; Tuoi Tre News, 2015). We also use a new identification strategy initiated by Chang and colleagues (Chang, 2013) to investigate the profit-shifting activities of multinational firms out of Vietnam. Specifically, it examines how corporate income tax-rate differential between the home country and Vietnam determines a foreign wholly-owned subsidiary's under-reporting of the profit obtained from an exogenous income shock in Vietnam. This identification approach then addresses the endogeneity issues raised about the traditional estimation approach developed by Hines and Rice (1994).

The rest of this chapter is organized as follows. The next section introduces a simple formal model about cross-border profit shifting activities by MNCs. It is followed by a description of corporate income tax legislation and evidence in the media news about tax-avoidance multinational profit shifting in Vietnam. We then introduce our data source, sample, and methodology. In the last sections, we present econometric results, discuss them, and conclude the chapter.

3.2 A simple formal model of tax-avoidance profit shifting by MNCs

In this section, we first introduce a simple version of formal models[43] that have been used so far to explain the logic behind tax-motivated profit shifting activities of MNCs. Consider a representative MNC coming from a home country H and having a subsidiary in a specific host country D (e.g. Vietnam). This subsidiary makes an amount of "true" pre-tax profit, which is normalized to 1. The corporate income tax rate in home country H is t_H while its counterpart in host country D is t_D. We assume that host country D has a higher tax rate than that of the home country ($t_D > t_H$). Hence, the MNC will get a benefit of t_D-t_H from tax saving for any 1 dollar of profits being shifted from D to H[44]. We call the amount of shifted profits is s (since "true" profit is normalized to 1, s is essentially the fraction of "true" profits being shifted: s varies from greater than 0 to less than 1). Basically, the MNC has relocated an amount of profits s generated in D to its home H and pay income tax for the shifted profits (s) now appearing in the MNC's balance sheet and income statement in H. The MNC also incurs costs when shifting profits, for example consulting services for tax planning, potential costs for legal services, reputation hurt when news about its profit shifting are disseminated (Dharmapala and Riedel, 2013). Following custom in the literature (e.g. Huizinga and Laeven, 2008), we assume that the total cost of shifting (c) is a positive, increasing and convex function of s, specifically, $c = \frac{1}{2}\gamma s^2$. Here, γ is a cost coefficient which implies that the marginal cost of shifting c' is proportional to s: $c' = \gamma s$.

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[43] These formal models of profit shifting by MNCs are essentially similar to each other and have appeared, for example, in Hines and Rice (1994), Huizinga and Laeven (2008), Weichenrieder (2009), Dharmapala and Riedel (2013), or Sugathan and George (2015). The model that we present here is based on Sugathan and George's (2015) which explains profit shifting of MNCs' foreign subsidiaries out of a specific host country.

[44] We need to make a clear distinction between "*profit shifting*" and "*profit repatriation*". "*Profit shifting*" is the activity of multinational firms to siphon profits from high-tax to low-tax countries without paying any taxes for the shifted profit at the country where it is generated. Meanwhile, "*profit repatriation*" is the legal withdrawal of profits by multinational firms back to their home country (the location of the parent firm), after paying corporate income taxes to the host country (the location of the subsidiary).

Then, to the MNC coming from H, the value (V_{sub}) of its subsidiary in D is composed of three components: (i) after-tax profits in D: $(1 - s)(1 - t_D)$, (ii) shifted profits from D into H net of the tax paying in H: $s(1 - t_H)$, and (iii) profit shifting costs: $-\frac{1}{2}\gamma s^2$. Or, we have:

$$V_{sub} = (1 - s)(1 - t_D) + s(1 - t_H) - \frac{1}{2}\gamma s^2 \quad (1)$$

The MNC determines the optimal amount of shifted profits out of a subsidiary in D to maximize V_{sub}. Using equation (1), the first order condition with respect to s is

$$\frac{\partial V_{sub}}{\partial s} = t_D - t_H - \gamma s = 0 \quad (2)$$

Solving (2), we get the optimal amount of shifted profits is $s^* = \frac{t_D - t_H}{\gamma}$. It equals the benefit the MNC gets from shifting 1 dollar of profits (t_D-t_H) divided by the cost coefficient of profit shifting (γ). We normalize the subsidiary's profits at 1. If we call the unnormalized real profits is π, the optimal amount of shifted profits will be $\pi s^* = \pi(t_D$-$t_H)/\gamma$. Remember that so far, we have assumed that $t_D > t_H$. If, conversely, t_D is less than t_H, we will have $s^* < 0$. In this case, profits will be shifted from H into D instead and the amount shifted also equals s^* in a similar logic[45].

Taking the derivative of the shifted profits with respect to tax-rate difference between the host country and the home country, we have $\frac{\partial s^*}{\partial(t_D - t_H)} = \frac{1}{\gamma} > 0$. It could be stated verbally that the optimal amount of shifted profits s^* is strictly increasing with respect to tax rate differentials between host and home countries (t_D-t_H). Intuitively, the larger the tax-rate difference, the bigger the marginal benefit from shifting one dollar of profits, which encourages the MNC to engage more in profit shifting and report less profits in the host country (D). Therefore, a proposition derived from this simple model and also being supported so far by empirical studies in the literature is:

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[45] The assumption here is that the costs of shifting are similar in both countries.

Proposition: Given a specific host country, for example Vietnam, an MNC will engage less (more) in profit shifting and reporting more (less) profits in Vietnam, the higher (smaller) the corporate income tax rate of the home country compared to that of Vietnam.

3.3 Corporate income tax law and some evidence raised by the media about tax-avoidance profit shifting by MNCs in Vietnam

Vietnam is a late development economy. Only since 1986, when Vietnam Communist Party launched *Doi moi* reform (somehow equivalent to *perestroika* in Russia), Vietnamese economy has opened to foreign investors and local private entrepreneurs. As the economy is in a transition phase toward being operated by a market-based mechanism, its new pro-market legal institutions are under construction and gradually being improved overtime.

Before 2004, to attract Foreign Direct Investment (FDI), the country kept maintaining a dual corporate income tax system applied separately for local and foreign-invested firms. The foreign-invested firms were treated more favorably than local firms in terms of corporate income tax. The statutory income tax rate for foreign-invested firms was 25% while it was 32% for local companies. Moreover, foreign-invested firms could even enjoy further tax reductions or tax holidays if they invested in strategic locations like special industrial zones or in specific industries.

On its schedule to join WTO, to create a fair competition environment for all enterprises, the Vietnamese government enforced a new Corporate Income Tax Law in 2003, which took effect in 2004. According to the new law, the discrimination between private and state-owned sectors or between domestic and foreign-invested firms was abandoned. The statutory income tax rate was 28% and applied equally to all enterprises. Since then, statutory income tax rates of Vietnam kept declining from 28% (in the period 2004-2008) to 25% (from 2009 to 2012 – the end of our sample data).

Meanwhile, Vietnam has still a very limited legislation on multinational profit shifting (World Bank, 2014)[46]. Specifically, there was no regulation on anti-tax avoidance from profit shifting or transfer pricing until 2010 when the Ministry of Finance introduced a Circular (a kind of sub-law document) regarding the requirement of documentation of transactions between related parties and how to evaluate these transactions based on arm's length criteria. These regulations were only officially legislated two years later in the amendment of the Law on Tax Management approved by the parliament in July 2013. However, the Law is still incomplete and ineffective to prevent tax-avoidance profit shifting as it has still no regulation on thin capitalization[47] and specific penalties related to transfer pricing. Even though Vietnam charges the interest paid out of the country a tax of 5 percent, foreign-invested firms still get a tax deduction of 20 percent given the top statutory tax rate of 25 percent in the period from 2009 to 2013.

Given such tax regime, there is a lot of suspicion and indirect evidence raised by the country's media about tax-avoidance profit shifting by foreign multinational firms. A typical example is the story of Metro Cash and Carry Vietnam. More than doubling its scale from 8 to 19 wholesale centers and seeing its revenues increases 25 times, the giant German wholesaler has had only a single year of positive profit and incurred continuous losses over its first 12 years of operation in the country. Since its entry in 2001, "Metro has never paid a single penny of corporate tax" (Tuoi Tre News, 2015). The People Daily - the largest daily newspaper in sales volume in Vietnam - reports that while continuing to expand their operations, about 50% of FDI enterprises report losses continuously in the period from 2000 to 2010 and, hence, do not pay income tax. However, no case came to trial because of lacking explicit evidence (Nguyen, 2011).

In an attempt to empirically verify these stylized facts, we run a series of OLS regressions comparing performance of foreign firms versus local firms in Vietnam from 2006-2012

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[46] Interested readers are invited to cross-refer to the report by World Bank (2014) for more detailed discussion about issues concerning corporate income tax in Vietnam.

[47] The issue that the share of equity in total assets is too thin as firms borrow a large amount of debt and enjoy interest deductibility from tax

controlling for firm size, age, 2-digit industry, region, and year fixed effects[48]. Results reported in Appendix A3.1 confirm the main storyline above that foreign-invested firms are much more efficient in terms of asset utilization but have much lower profitability compared to domestic firms. Specifically, results in regression models 1-3 using ROA (i.e. operating profits on total assets) as the dependent variable show that wholly-owned subsidiaries have the lowest profitability among all the ownership-based types of firms in Vietnam, worse not only than state-owned firms but also than foreign joint ventures (i.e. joint ventures between foreign and local parties) and private-owned firms. This raises a suspect that wholly-owned subsidiaries, 100% controlled by foreigners with better known brands and superior technology, are hiding profits and shifting them out of the country. We also decompose ROA into ROS (i.e. operating profit on net sales) and AT (asset turnover)[49] and, in turn, replace ROA with either ROS or AT as the dependent variable in the regression models 4-9. Results reveal further that wholly-owned subsidiaries are really efficient at asset utilization (only behind state join ventures) but have the worst profit margins or ROS, which further implies our profit-hiding anecdotal story.

3.4 Data and methodology

3.4.1 Data

Our main source of data is the database of the Vietnamese Enterprise Surveys (VESs) from 2006 to 2012 compiled by the General Statistical Office of Vietnam (GSO)[50]. Besides state-

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[48] These regressions employ all firms in the database of the Vietnam Enterprise Surveys (VESs) compiled by the General Statistical Office of Vietnam. As our main source of data, this database will be described in more details right later in data and methodology section.

[49] ROA = ROS×AT (DuPont Identity). ROS is defined as operating profits on net sales while AT equals net sales over total assets.

[50] GSO has conducted these annual surveys since 2000. We start our investigation period by 2006 for two main technical reasons. First, data on financial expenses and revenues to detect profit shifting through debt instruments are only available since 2006. Second, more importantly, GSO started applying a new industrial classification (VSIC 07) for the VES survey in 2006. The old industrial classification version (VSIC 93) was applied for the VES surveys from 2000 to 2005. Because we use industry level profitability at 4-digit sectors as the source of exogenous income shock to identify profit shifting, it is necessary that we have a consistent industrial classification system through years. In another research project, we have overcome this obstacle by developing a probabilistic routine to convert the industrial classification before 2006 (VSIC 93) into the new industrial classification (VSIC

owned and domestic private-owned firms, these annual surveys also cover all foreign-invested firms in Vietnam, our target group[51]. According to the Vietnamese law, foreign-invested firms are comprised of wholly-owned subsidiaries (100% foreign ownership) and joint ventures between foreign investors and local partners (from either state or private sectors). Following Chang (2013, p. 216), we choose to investigate profit shifting only in wholly-owned subsidiaries because the controlling parent firms encounter no management obstacles to involve in profit shifting in these subsidiaries. In contrast, in joint ventures, they might be constrained from shifting profits by other local equity owners.

Hence, a population of all wholly-owned subsidiaries operating in Vietnam from 2006 to 2012 is extracted from the database of the VESs. It includes 39,123 firm-year observations. We use the nationality of the foreign owners to define the home country of a focal wholly-owned subsidiary. If there are more than one foreign owners, the home country of origin of the focal subsidiary will be the nationality of the foreign owner with the highest equity stake. To deal with outliers, we drop observations with return on assets (ROA) in the upper and lower 0.01% of the distribution. We also have to delete observations missing one or more key variables. Our final sample then is an un-balanced panel with 36,209 observations (92.34% of the population) of 8,732 wholly-owned subsidiaries coming from 79 countries (each subsidiary has an average of 4.1 observations). A table of distribution of home countries of these subsidiaries is presented in table 3.1.

[Table 3.1 about here]

We obtain most of the key variables for our analysis using information on firm age, industry sector, and financial information from VESs database. We append information on

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07). However, as this is a probability-based conversion, we choose to be conservative in this study to start our research period by 2006 onwards to have a consistent industrial classification based on VSIC 07.

[51] These annual surveys essentially cover all enterprises of all ownership types (i.e. state-owned, foreign-owned, and private-owned) and employment scales and operating in all industries. Because the population of enterprises has grown, since 2003, GSO has only surveyed a selected sample of the micro enterprise group (i.e. private enterprises with less than 10 employees or 20 employees from 2008 onwards) while still keeping track of all state-owned and foreign invested enterprises. However, for all micro enterprises which are not surveyed, GSO also documents a list of their names and basic demographic information, which can be used to generalize survey information for this group. A general description of the surveys in English is available from the author upon request.

country statutory corporate income tax rates from the world corporate tax database of the Tax Foundation, a US-based independent tax policy research organization. The tax database covers 244 countries and data reach back to 1983 when available (Source: https://github.com/TaxFoundation/data/tree/master/world-corporate-tax-rates-and-gdp).

3.4.2 Econometric strategy and variables

The relocation of profits generating in one country to another country involves a deliberate manipulation of reported accounting profits. The traditional econometric approach (or the "Hines and Rices" approach[52]) identifies profit shifting by estimating the percentage change in a focal subsidiary's reported profits due to one percentage point change in tax-rate difference between the parent and the focal subsidiary. It assumes that tax-rate changes are exogenous and use exogenous variations in tax-rate difference between the home and host countries as the source of identification (Dharmapala and Riedel, 2013; Dharmapala, 2014).

However, the extant literature has shown some endogeneity issues in the "Hines and Rices" approach. First, tax-rate changes may influence firm profitability through other mechanisms besides profit shifting. For example, an increase in the host country's tax rate may discourage efforts of firm managers and, hence, lead to a reduction in firm profitability (e.g. Feldstein, 1999; Dharmapala and Riedel, 2013; Johannesen et al., 2016). Moreover, tax-rate changes are infrequent and tend to happen at the same time as social, economic, and political changes in the macro-level environment of the home and host countries (Dharmapala and Riedel, 2013). Hence, it is difficult to tell whether changes in a subsidiary's reported profit following changes in tax rates in either home or host countries are due to tax-motivated profit shifting or the impacts of macro-level changes in socio-economic environment or even due to reduction in managerial efforts.

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[52] The term "Hines and Rice" was named by Dharmapala (2014). It represents an empirical strategy to identify profit shifting developed in the pioneer works of Grubert and Mutti (1991) and Hines and Rice (1994). See appendix A.3.2 for our results using the "Hines and Rice" approach.

In this study, we use a new identification approach developed by Chang and colleagues (Chang, 2013, p. 215-222)[53]. This approach has been originally used to trace profit tunneling of Indian business groups in Bertrand et al. (2002). Bertrand et al. (2002) find that Indian business groups tend to manipulate non-operating profits of member firms and tunnel profits from affiliate firms which the group owner(s) has low cash flow rights to affiliate firms which the owner(s) has high cash flow rights. Other authors, specifically Dharmapala and Riedel (2013) and Sugathan and George (2015), also apply this approach to identify profit shifting by foreign multinationals in Europe and India, respectively.

This approach can be illustrated as follows. Suppose that an exogenous industry-level shock raises the earnings of an MNC's subsidiary in Vietnam by $1. Given the propensity and channels of profit shifting that are already in place, the multinational firm will shift part of the $1 additional income out of the Vietnamese subsidiary. We then examine how corporate income tax-rate differential between the home country and Vietnam determines a foreign wholly-owned subsidiary's under-reporting of the profit obtained from the exogenous income shock and consider this as indirect evidence of profit shifting.

The following is the econometric model of this approach used in our study:

$$profit_{it} = \alpha + \beta \; predicted \; profit_{it} + \delta \; (predicted \; profit_{it} * tax \; difference_{it}) + \theta \; subsidiary \; size_{it} + subsidiary_i + year_t + home \; country\_year_{it} + \varepsilon_{it} \quad ()$$

In this model, the dependent variable, $profit_{it}$ is reported pre-tax profit of a subsidiary i in period t[54]. We use two types of profits: *operating profit* and *financial profit* to detect different

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[53] This approach is developed by Chang, Chung, and Moon (2012) in the working paper "Do multinational firms shift profits out of China?" We do not have a copy of this working paper and our entire reference relies on the description of its methodology and excerpt of its results being put in Appendix 10 (p. 215-222) of the book by Chang (2013), the leading author.

[54] Previous studies such as Huizinga and Laeven (2008) or Dharmapala and Riedel (2013) have restricted their sample to only subsidiaries having positive pre-tax profits. This is because their sample is comprised of subsidiaries operating in different host countries and if a host country's jurisdiction does not allow firms to carry losses forward, only subsidiaries having positive profits have incentives to shift profits. As Vietnamese Accounting Standards allow loss offsetting into subsequent years, we included in our sample subsidiaries with both positive and negative profits.

mechanisms use by multinational firms to shift profits out of Vietnam. Operating profit is defined as profits before taxes and financial expenses. Financial profit is calculated by subtracting financial expenses from financial income.

Predicted profit is the profit that the subsidiary is predicted to obtain from an industry-level income shock. Asset-weighted average return on assets of all firms in the same industry (industry-level ROA) is identified as the source of earnings shocks to a subsidiary's income. This shock influences every individual firm in the industry. Moreover, it is considered as exogenous since it is out of control of any single individual firm's intervention or decision (Bertrand et al., 2002). Industries are classified at 4-digit level according to the 2007 version of Vietnamese Standard Industrial Classification (VSIC 2007). As advised by Bertrand et al. (2002), to reduce potential mechanical correlation, the subsidiary i itself is excluded when calculating industry-level ROA for sector s which it belongs: $\overline{ROA}_s^i = \sum_{j \neq i \in s} ROA_j \frac{Asset_j}{\sum_{j \neq i \in s} Asset_j}$. In this formula, the subscript j represents all the other firms in the same sector s except i and $Asset_j$ is total assets of firm j[55]. Multiplying industry-level ROA with the subsidiary i's total assets: $\overline{ROA}_s^i \times Asset_i$, we obtain *predicted profit* as the "*earnings shocks*" experienced by the focal subsidiary i in the absence of profit shifting.

Tax difference is the corporate income tax-rate difference between the home country and Vietnam (i.e. the tax rate of the home country minus the tax rate of Vietnam).

Controlling variables include *subsidiary size*$_{it}$ (log of total assets), *subsidiary*$_i$ (subsidiary fixed effects), *year*$_t$ (year fixed effects), and, *home country_year*$_{it}$ (home country-year fixed effects).

Here, we use the same empirical model in Chang (2013) with a minor modification. The only modification is that we add home country-year fixed effects. With the subsidiary fixed effects, this model is a firm-level panel fixed effects model (FE model). Yearly fixed effects (i.e.

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[55] ROA is defined here as operating profit over total assets. All firms in each 4-digit industry sector in the database are employed to calculate industry-lever ROA, including not only foreign subsidiaries but also domestic firms.

year dummies) control for any common effect on all foreign subsidiaries in Vietnam due to the macro-level changes in Vietnam in a given year. Meanwhile, home country-year fixed effects account for any common effect on all subsidiaries coming from the same home country due to the macro-level changes in both the home country and Vietnam in a given year.

Therefore, in this model, a specific subsidiary's average performance is represented by θ $subsidiary\ size_{it}$ + $subsidiary_i$ + $year_t$ + $home\ country\_year_{it}$. The coefficient β attached to *predicted profit* will tell us the expected money a focal subsidiary will obtain from a one-dollar "earnings shock" from industry level, given the subsidiary's average performance. The coefficient δ of the interaction term, δ ($predicted\ profit_{it}$ * $tax\ difference_{it}$), then shows the variation in response of subsidiaries' reported profits to the industry-level "earnings shock" depends on different levels of tax difference between home countries and Vietnam, out of average subsidiary performance. This provides us indirect evidence of profit shifting.

We test this model for all wholly-owned subsidiaries in Vietnam. From the proposition in section 3.2, we would expect that δ>0. It means that a foreign subsidiary will report more profits in response to an industry-level earnings shock, the higher the corporate income tax rate of the home country compared to that of Vietnam.

Table 3.2 provide summary statistics of the key variables. The mean of tax rate difference is 0.821% while the highest and lowest levels observed is 15.69% and -28%. A graph of corporate income tax rates and tax-rate differences between home country and Vietnam of the top 21 investing countries in Vietnam is presented in figure 3.1. We present the correlation matrix of the key variables in table 3.3.

[Table 3.2 and 3.3 about here]
[Figure 3.1 about here]

3.5 Results

3.5.1. Baseline results

Table 3.4 shows estimation results of our main identification model investigating the influence of an industry-level exogenous earnings shock on wholly-owned subsidiaries' reported operating profit. Model 1 is the base line model, while in model 2, we add the interaction between earnings shock (*predicted profit*) and tax-rate difference to track how tax-rate difference induces foreign firms to report more or less profits from the earnings shock. Model 1 shows that a one-dollar ($1) earnings shock in the local market in average brings additional 96.3 cents in operating profit for a typical wholly-owned subsidiary. In model 2, we have an estimation of δ less than 0 (δ=-0.0608). It means that for each 1 percentage point corporate income tax rate of the home country higher than that of Vietnam, wholly-owned subsidiaries under-report 6.08 cents more from a $1 earnings shock in the local market. Using estimated coefficients in model 2, we plot estimated reported operating profits in response to a $1 income shock of foreign subsidiaries at varying levels of corporate income tax rate difference in figure 3.2. Other thing being equal, a foreign subsidiary from Singapore with a corporate income tax rate of 20% in 2006 (i.e. tax rate difference equals -8%) will report about $1.27 increase in operating profit given a $1 income shock. Meanwhile, a foreign subsidiary from Canada with a corporate income tax rate of 36.1% in 2006 (i.e. tax rate difference equals 8.1%) will report just about $0.29 increase in operating profit when being faced with the same $1 income shock.

[Table 3.4 about here]
[Figure 3.2 about here]

Our results, hence, suggest that a foreign subsidiary will report less profits in Vietnam the higher the corporate income tax rate of the home country compared to that of Vietnam. This contradicts the proposed hypothesis and previous results from the literature since the literature would suggest that a subsidiary will report more profits in response to the industry earnings shock, the higher the corporate income tax rate of the home country compared to that of Vietnam. We also run the traditional Hines and Rice's approach to see if results from this approach are different from the ones we just obtained from our new identification approach. Estimation results from the Hines and Rices's approach (Appendix A3.2) are indeed similar in

terms of sign even though smaller in terms of magnitude to those from our identification models[56].

3.5.2. Do home countries' institutions matter? Emerging countries vs. developed countries

One possible explanation for the negative association between tax-rate difference and reported operating profit responding to the income shock (see figure 3.2) is that there is a structural difference in shifting behaviors between two main types of MNCs investing in Vietnam. Vietnam has two typical types of foreign MNCs: the MNCs from neighboring, emerging countries in Asia (emerging-market MNCs) and the MNCs from developed OECD economies (developed-market MNCs). The emerging-market MNCs share one common property: they come from countries with relatively weaker institutions (e.g. Rottig, 2016). Tax evasion hence is pervasive in those countries due to weak governance and a large informal sector (Cai and Liu, 2009; Johannesen et al., 2016; Gokalp et al., 2017). While developed-market MNCs need to pay taxes for any amount of profits "shifted" home and appeared in their home balance sheets and income statements, the emerging-market MNCs could even evade/dodge taxes in their home countries. Therefore, the negative association between tax-rate difference and reported operating profit may be mainly driven by emerging-market MNCs' profit-shifting behavior. These emerging-market MNCs may rely on their ability to cope with these institutions at home and will shift profits home and report less profits in the host country even when tax rates of their home countries are higher than that of the host country (i.e. Vietnam).

We test this explanation by running our identification model for two subsamples of subsidiaries of developed-market MNCs (the ones from OECD countries) and subsidiaries of emerging-market MNCs (the ones from Asia excluding Japan and Korea as they are OECD

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[56] One reason that the Hines and Rice's approach yields a smaller magnitude in terms of profit shifting could be because it only considers subsidiaries reporting *positive* profit. This practice relies on the assumption that profit-shifting incentives are only relevant in subsidiaries with *positive* profit. However, recent evidence both anecdotal and empirical shows that MNCs are very aggressively involving in tax-avoidance profit-shifting in developing countries where those firms report *zero* and *negative* profits consistently through years (see our section 3.3, Chang (2013, p.132), and Johannesen et al. (2016)).

members) in Vietnam[57]. Results are presented in model 1 and 3 (table 3.5) respectively. We find that δ_{Asia} equals -0.0222, which suggests a foreign subsidiary coming from Asian countries will report less profits in response to an industry-level earnings shock, the higher the corporate income tax rate of the home country compared to that of Vietnam. Meanwhile, a foreign subsidiary coming from OECD countries will behave as the norms by reporting more profits in response to an industry-level earnings shock, the higher the corporate income tax rate of the home country compared to that of Vietnam (δ_{OECD}=0.0137). These results seem to be supportive of our explanation about the structural difference in shifting behaviors between Asian emerging-market MNCs and OECD developed-market MNCs.

[Table 3.5 about here]

As there is no clear cut between emerging countries and developed countries, we follow here an often-used approach in the literature by defining the OECD countries as developed countries while considering the ones who do not belong to the OECD group as emerging (Rottig, 2016). However, some of the countries are categorized as emerging countries in this way are pretty developed themselves compared to the rest of the group. We, therefore, check if the results above are robust to an alternative way of dividing between emerging and developed countries when we further exclude Hong Kong and Singapore (here after HS), two high-income and fairly advanced countries, from the group of Asian emerging countries and put them in group of developed countries alongside with other OECD countries. Results in model 2 and 4 of table 3.5 suggest that δ_{Asia} estimated turns from negative to positive when we exclude firms from HS while $\delta_{OECD,}$ turns, in contrast, from positive to negative when we include HS into the group of developed countries. While our explanation about the structural difference in profit-shifting behaviors between emerging-market MNCs and developed-market MNCs does fail this robustness test[58], it also suggests another fact that the negative association between tax rate

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[57] Wholly-owned subsidiaries from OECD and Asia accounts for about 99% of all wholly-owned subsidiaries in Vietnam.

[58] We would like to thank Marco Sanfilippo for pointing out the weakness in the way we operationalize emerging countries and developed countries, which leads to this robustness check.

difference and reported operating profit seems to be strongly driven by the presence of firms from HS.

3.5.3. The role of tax havens

We have seen in the robustness check above that the estimated coefficient δ always turn negative with the presence of firms from HS. This leads us to another explanation that the overall negative relationship between reported operating profit and tax-rate difference is driven by the behavior of the firms from tax havens, of whom HS are among. These foreign firms from tax havens, where corporate tax rates are usually very low or even zero, report more profits in response to the income shock in Vietnam than the remaining firms coming from other non-tax-haven countries where corporate tax raters are higher. Hence, we get a negative δ in our regression model, which suggests that a foreign subsidiary will report less profits in Vietnam the higher the corporate income tax rate of the home country compared to that of Vietnam

To compare the response to the earnings shock by foreign subsidiaries from tax havens to that by the ones from non-tax havens, we run the following model specification in which we add the interaction between predicted profit and a dummy for foreign subsidiaries from tax havens[59]:

$$profit_{it} = \alpha + \beta \, predicted \, profit_{it} + \gamma \, (predicted \, profit_{it} * dummy \, for \, tax \, haven_{it}) + \theta \, subsidiary \, size_{it} + subsidiary_i + year_t + home \, country\_year_{it} + \varepsilon_{it}$$

Results are shown in table 3.7 from which we have the estimated coefficient γ equals 1.235. It means that, given a one-dollar industry-level income shock, firms from tax haven report $1.235 (roughly about 3.93 times)[60] more than those from non-tax havens. We also list the distribution of wholly-owned subsidiaries from tax havens by year in table 3.6. As majority of tax-haven firms are the ones coming from Singapore, Hong Kong, and Switzerland, we compare how these Hong Kong, Singaporean, and Swiss firms react to the income shock in comparison to the rest by adding the interaction between predicted profit and a dummy for firms from HS (or HS and

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[59] The list of tax havens is from Dharmapala and Hines (2009)

[60] 3.93=1.235/0.314

Switzerland). Results reported in model 3 and 4 (table 3.7) suggest that overall negative relationship between reported operating profit and tax-rate difference is mostly driven by the behavior of the firms from HS (and Switzerland) alone.

[Table 3.6 and 3.7 about here]

Let us further illustrate this fact by plotting estimated reported operating profits by firms from tax havens in response to a $1 income shock in figure 3.3 using estimated coefficients in model 2 of table 3.4. It is even clearer if we look at figure 3.4 where we plot estimated reported operating profits at varying levels of tax rate difference by foreign subsidiaries from top 21 investing countries in Vietnam. Here, the size of the bubble is proportional to the share of firms from a specific country in total population of wholly-owned subsidiaries in a year. Hong Kong, Singapore, and Switzerland, the three tax havens among the top investors, locate at the far left in the variation spectrum of tax-rate difference. It is the fact that these firms from HS (and Switzerland) who reporting more profits than the rest determines the negative association between reported operating profit and tax rate difference.

[Figure 3.3 and 3.4 about here]

3.5.4. Profit shifting through debt instrument

Because tax-motivated changes in reported operating profit only capture the evidence of profit shifting through *transfer pricing*, we next run our identification model using financial profit as dependent variable to identify profit shifting through the channel of *inter-subsidiary debts* (table 3.8). Estimated δ (model 2) is negative and equals -0.016. For each 1 percentage point corporate income tax rate of the home country higher than that of Vietnam, a wholly-owned subsidiary hence under-reports additionally 1.6 cents in financial profit. This negative association between reported financial profit and tax-rate difference is driven by the behavior of the firms from tax havens too. We observe that given a $1 industry-level income shock, firms from tax haven report 43.6 cents more in terms of financial profit than those from non-tax havens. We also plot estimated reported financial profits in Vietnam at varying levels of tax rate difference by foreign subsidiaries from tax havens and the top 21 investing countries in figure 3.5 and 3.6.

[Table 3.8 about here]

[Figure 3.5 and 3.6 about here]

3.5.5. Comparison of tax-avoidance profit shifting in Vietnam to other contexts

Using the estimate of δ in model 2 of table 3.4 we can calculate the "semi-elasticity" of operating income to tax rate difference. This "semi-elasticity" is usually being used to compare the magnitude of profit shifting in different contexts. It tells us the extent of profit shifting by the percentage change in the focal subsidiary's reported operating profits due to 1 percentage point change in tax-rate difference between the parent and the focal subsidiary. As discussed above, given a $1 earnings shock in the local market, wholly-owned subsidiaries under-report 6.08 cents cents more for each 1 percentage point corporate income tax rate of the home country higher than that of Vietnam. This corresponds to a semi-elasticity of -6.08 (%)[61]. A summary of estimates of semi-elasticity for different geographical contexts and Vietnam is presented in table 3.9. Estimate of semi-elasticity for Vietnam is much larger to those of China (1.7), the US (2.25), and EU countries (ranging from 0.28 to 2.92), which suggests a more aggressive tax-avoidance profit shifting behavior by MNCs in Vietnam compared to that in the other context.

[Table 3.9 about here]

3.6 Discussion and Conclusion

So far, we have examined how corporate income tax-rate differentials between the home country and Vietnam determine a wholly-owned subsidiary's under-reporting of the profit obtained from an exogenous income shock. We find that how much profit (both operating and financial ones) that a foreign subsidiary would report is significantly sensitive to these tax incentives, which gives us indirect evidence of multinational profit shifting activities. However, departing from the proposition by formal theories and evidence from most other empirical studies on multinational profit shifting, we find a negative association between subsidiaries' reported profit and tax rate difference. It means that the higher the corporate income tax rates of the home country, the less profits a wholly-owned subsidiary will report in Vietnam given a $1

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[61] The assumption is that a foreign firm will shift the same amount from every additional dollar it makes.

income shock. Further analyses then reveal that this negative relationship between reported profit and tax-rate difference is driven by the behavior of the firms from tax havens, mostly the ones from HS. These firms coming from home countries where corporate tax rates are very low report more profits in response to the income shock in Vietnam than the remaining firms coming from other countries where corporate tax rates are higher.

Why do foreign firms from HS, the two tax havens and also neighboring countries, report more profits in Vietnam than the ones from the other countries? It is perhaps too soon to give any speculative explanation. We hope, through the study of this chapter, to contribute to the literature some puzzling evidence of multinational profit shifting in Vietnam. Through the phenomenon of HS firms putting money in Vietnam, it suggests that cross-border multinational profit shifting is more complicated than what has been known given the role of tax havens and the weak institutions of Vietnam. Future research digging deeper this phenomenon is warranted and similar studies in other developing countries like Vietnam are needed to corroborate our findings. Moreover, more clinical studies on the phenomenon of multinational profit shifting are called for as our study and most other empirical research in the literature only provide indirect evidence of multinational profit shifting. Such case-based studies with in-depth and direct evidence will be supplemental to empirical studies to fully portrait how multinationals involving in tax-avoidance profit shifting across borders.

This study is not without limitations. First, we examine multinational profit shifting from a single country perspective (i.e. Vietnam) by observing how tax incentives induce a Vietnam-based wholly owned subsidiary's under-reporting of the profit obtained from an exogenous income shock. However, this identification strategy cannot tell us where the profit is actually shifted to. It would be better if we employ a multi-country perspective and have data on operation and profitability of all affiliates in the same multinational group in different host countries. The core idea is that if a multinational group is shifting an amount of profit out of a subsidiary in a specific host country, parts of this profit must be re-appeared somewhere in the balance sheets and income statements of other affiliates/subsidiaries of the same group in other countries. If there is suddenly "an exogenous earnings shock" to a group affiliated firm, we can

empirically trace the propagation of the earnings shock across other group affiliated firms given the shifting channels are readily available, like the propagation of fluid in communicating vessels. Second, the income shock that a subsidiary absorbs from industry-level average performance may have characteristics of "the perils of peer effects" (Angrist, 2014)[62]. When we regress an individual firm's reported performance on industry (group) average performance, the peer effects identified here by group average are confounded with intragroup correlation. We have no way to disentangle peer effects from purely mechanic intragroup correlation in group average performance. However, as our reference groups are composed of firms from different provinces and different ownership types (state-owned, domestic private-owned firms, as well as foreign-invested firms), we believe that our reference groups are heterogeneous enough that the issue of intragroup correlation is mitigated.

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[62] We would like to thank Antonio Accetturo for pointing this out.

Tables and figures

Table 3.1 Distribution of countries of origin of wholly-owned subsidiaries in Vietnam[a]

Country	2006	2007	2008	2009	2010	2011	2012	Total
Taiwan	1,092	1,242	1,350	1,446	1,481	1,560	1,552	9,723
Korea, Rep.	610	796	925	1,155	1,251	1,494	1,546	7,777
Japan	449	569	638	770	805	977	1,059	5,267
China	134	200	263	336	370	497	474	2,274
Singapore	172	187	232	267	324	424	431	2,037
USA	136	176	183	217	252	310	281	1,555
Hong Kong	109	109	124	133	171	184	216	1,046
Malaysia	84	103	122	150	151	180	179	969
France	82	91	108	127	130	157	150	845
UK	63	67	75	100	109	132	135	681
Thailand	62	73	81	98	104	119	117	654
Australia	58	73	82	95	89	104	100	601
Germany	36	42	50	67	75	80	91	441
Switzeland	26	22	25	31	30	36	32	202
Canada	11	19	22	32	39	42	33	198
Belgium	15	20	21	23	28	23	24	154
Philppines	7	15	17	29	29	23	22	142
Denmark	8	10	12	23	23	32	33	141
India	5	10	11	20	18	25	22	111
Russia	12	14	15	15	12	16	16	100
Indonesia	4	9	11	12	18	23	22	99
Other countries	81	97	129	175	204	250	256	1,192
Total	3,256	3,944	4,496	5,321	5,713	6,688	6,791	36,209

[a] There are in total 79 countries having wholly-owned subsidiaries in Vietnam from 2006-2012. We order the countries by the number of wholly-owned subsidiaries and group 58 countries with a small number of foreign investment in Vietnam into a category of other countries.

Table 3.2 Descriptive statistics of key variables

Variable	Mean	SD	Min	Max
Operating profit	541.1243	6632.485	-124908	757679
Financial profit	-65.7162	2059.802	-54245.5	262988
Earnings shock (*Predicted profit*)	547.1276	3226.965	-105724	330955
Log of Assets	7.313626	1.955638	-3.11663	14.957
Tax rate difference (%)	.8218655	7.577718	-28	15.69

Note: N=36,209; All monetary variables are expressed in the constant 2010 value in units of 1000 USD. We convert the VND nominal values into VND real values in the base year of 2010 using Vietnamese GDP deflators (The World Bank's World Development Indicators Database). VND real values are then converted into USD using the official annual exchange rate in 2010 at 18612.92 VND/USD.

Table 3.3 Correlation matrix of key variables

		1	2	3	4	5
1	Operating profit	1				
2	Financial profit	0.114	1			
3	Earnings shock (*Predicted profit*)	0.636	-0.155	1		
4	Log(Asset)	0.175	-0.037	0.314	1	
5	Tax rate difference	0.008	0.002	0.024	-0.018	1

N=36,209 and All correlation coefficients greater than 0.02 are significant at 1% level

Table 3.4 Response from wholly-owned subsidiaries with different home country corporate income tax rates to earnings shock: Operating profits

	Dependent variable: *Reported operating profit*	
Model:	1	2
Independent variables:		
Earnings shock (*Predicted profit*)	0.963***	0.786***
	(0.0103)	(0.0105)
Earnings shock ×		-0.0608***
tax rate difference		(0.00124)
Log of Assets	-70.12	-11.44
	(49.12)	(47.07)
Observations	36,209	36,209
Adjusted R-squared	0.636	0.666
Year FE	Yes	Yes
Year*Home-Country FE	Yes	Yes
Firm FE	Yes	Yes

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

Table 3.5 Do home countries' institutions matter? Response in operating profit by MNCs from Asian Emerging countries vs. MNCs from OECD countries

	Dependent variable: *Reported operating profit*			
Model:	1	2	3	4
	Asia firms[a]	Asia firms[a] without Hong Kong and Singapore	OCED firms	OECD firms with Hong Kong and Singapore
Independent variables:				
Earnings shock (*Predicted profit*)	1.321***	0.786***	-0.188***	0.778***
	(0.0262)	(0.0169)	(0.0137)	(0.0131)
Earnings shock ×	-0.0222***	0.0443***	0.0137***	-0.0795***
tax rate difference	(0.00334)	(0.00236)	(0.00165)	(0.00153)
Log of Assets	-331.3***	9.493	165.0***	60.14
	(86.95)	(57.90)	(40.90)	(65.49)
Observations	17,245	14,162	18,806	21,889
Adjusted R-squared	0.713	0.513	0.687	0.702
Year FE	Yes	Yes	Yes	Yes
Year*Home-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1 and Standard errors in parentheses
[a] Excluding Japan and Korea

Table 3.6 Distribution of wholly-owned subsidiaries by tax havens in Vietnam

Country	2006	2007	2008	2009	2010	2011	2012	**Total**
Bahrain	0	0	0	0	0	0	1	1
Bermuda	0	0	0	0	0	1	0	1
Cayman Islands	0	0	1	0	2	2	1	6
Cyprus	1	0	0	0	1	1	1	4
Gibraltar	1	0	0	1	0	0	0	2
Hong Kong	109	109	124	133	171	184	216	1,046
Ireland	1	1	2	3	5	10	10	32
Jordan	0	0	1	1	1	1	2	6
Lebanon	0	0	0	0	1	1	0	2
Liechtenstein	0	0	0	0	1	1	3	5
Luxembourg	4	4	5	6	6	4	4	33
Macao	2	1	1	0	0	1	2	7
Malta	1	1	1	1	0	0	1	5
Mauritius	0	0	1	1	3	3	5	13
Panama	1	0	1	1	1	1	0	5
Singapore	172	187	232	267	324	424	431	2,037
Switzerland	26	22	25	31	30	36	32	202
Total	318	325	394	445	546	670	709	3,407

Note: The list of tax havens is from Dharmapala and Hines (2009).

Table 3.7 Response in operating profit to earnings shock by firms from tax havens vs. non-tax havens

Dependent variable: ***Reported operating profit***				
Model:	1	2	3	4
Independent variables:				
Earnings shock (*Predicted profit*)	0.963***	0.314***	0.314***	0.314***
	(0.0103)	(0.0132)	(0.0131)	(0.0132)
Earnings shock × dummy		1.235***		
for tax havens		(0.0175)		
Earnings shock × dummy			1.240***	
for Hong Kong and Singapore			(0.0175)	
Earnings shock × dummy for				1.236***
Hong Kong, Singapore, and Switzerland				(0.0175)
Log of Assets	-70.12	107.4**	113.3**	108.3**
	(49.12)	(45.23)	(45.20)	(45.23)
Observations	36,209	36,209	36,209	36,209
Adjusted R-squared	0.636	0.692	0.693	0.692
Year FE	Yes	Yes	Yes	Yes
Year*Home-Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

Table 3.8 Response from wholly-owned subsidiaries with different home country corporate income tax rates to earnings shock: Financial profits

	Financial profit				
	Dependent variable: ***Reported financial profit***				
Model:	1	2	3	5	6
Independent variables:					
Earnings shock (*Predicted profit*)	-0.185***	-0.231***	-0.414***	-0.413***	-0.414***
	(0.00325)	(0.00336)	(0.00408)	(0.00408)	(0.00408)
Earnings shock × tax rate difference		-0.0160***			
		(0.000397)			
Earnings shock × dummy for tax havens			0.436***		
			(0.00543)		
Earnings shock × dummy for Hong Kong and Singapore				0.436***	
				(0.00543)	
Earnings shock × dummy for Hong Kong, Singapore, and Switzerland					0.437***
					(0.00543)
Log of Assets	28.12*	43.57***	90.82***	92.65***	91.17***
	(15.56)	(15.12)	(14.01)	(14.01)	(14.00)
Observations	36,209	36,209	36,209	36,209	36,209
Adjusted R-squared	0.621	0.642	0.694	0.694	0.694
Year FE	Yes	Yes	Yes	Yes	Yes
Year*Home-Country FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes

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

Table 3.9 Comparison of magnitude of profit shifting activity in Vietnam and other contexts[a]

Study	Context	Period	Semi-Elasticity	**Interpretation**: a 1% point corporate income tax rate of the home country higher than that of the host country is associated with a change in reported income from $100,000 to
Hines and Rice (1994)	US	1982	2.25	$102,500
Huizinga and Laeven (2008)	EU	1999	From 0.28 to 2.92	$103,000
Dischinger (2010)	EU	1995-2005	0.7	$100,700
Chang (2013)	China	2001-2007	1.7	$101,700
Heckemeyer and Overesch (2013)	Meta-analysis	Various	0.8	$10,800
Lohse and Riedel (2013)	EU	1999-2009	0.4	$100,400
Sugathan and George (2015)	India	2001-2010	0.53	$100,530
Our research	Vietnam	2006-2012	-6.08	$93,920

[a] This table is based on the summary table of Dharmapala (2014), We only append results from recent research by Chang (2013), Sugathan and George (2015).

Figure 3.1 Corporate income tax rates and tax-rate differentials between home country and Vietnam of 21 leading countries having wholly-owned subsidiaries in Vietnam (2006-2012)

Corporate tax rates by home country

Tax-rate differentials between home country and Vietnam
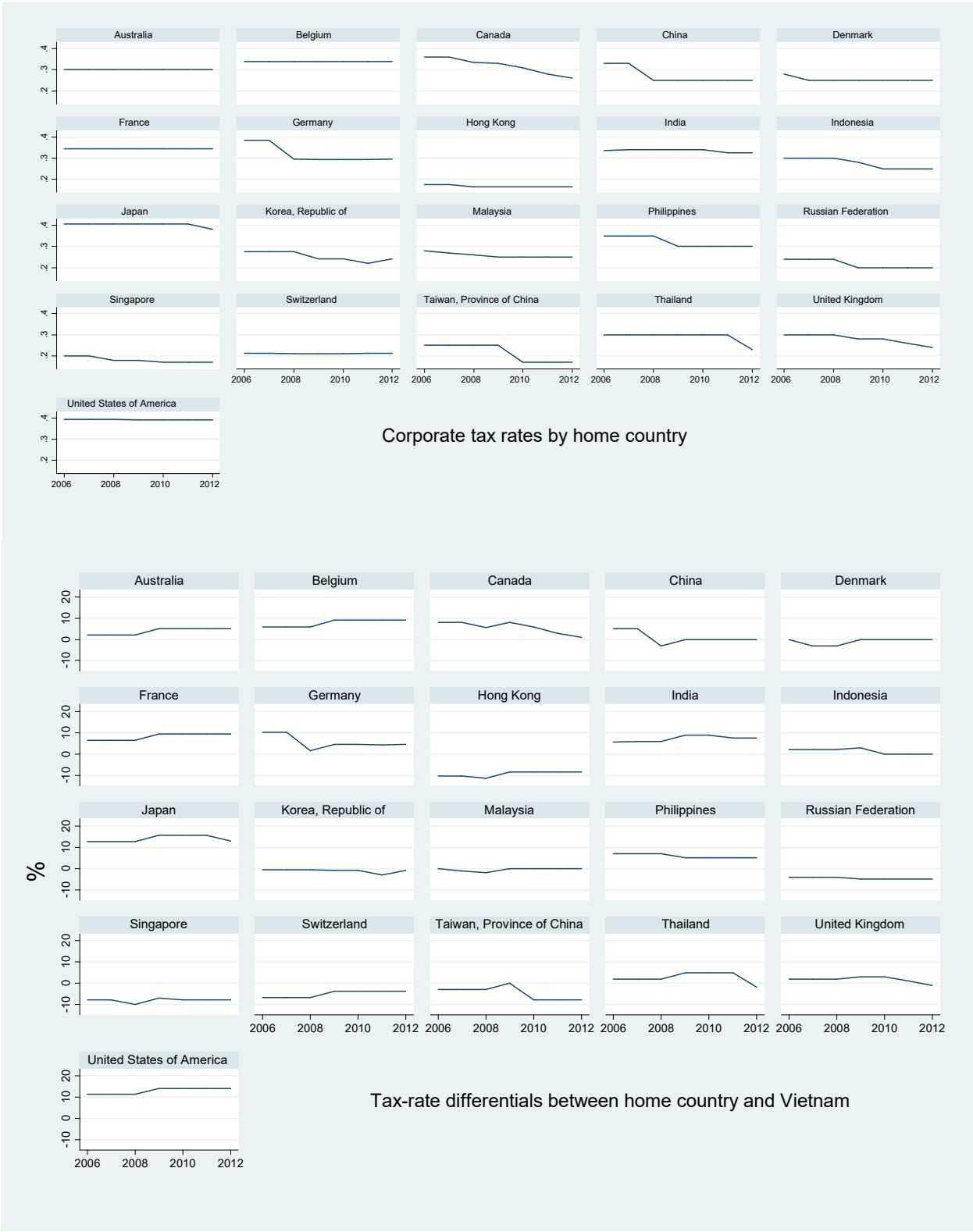
Figure 3.2 Estimated response to a $1 earnings shock: Operating Profit
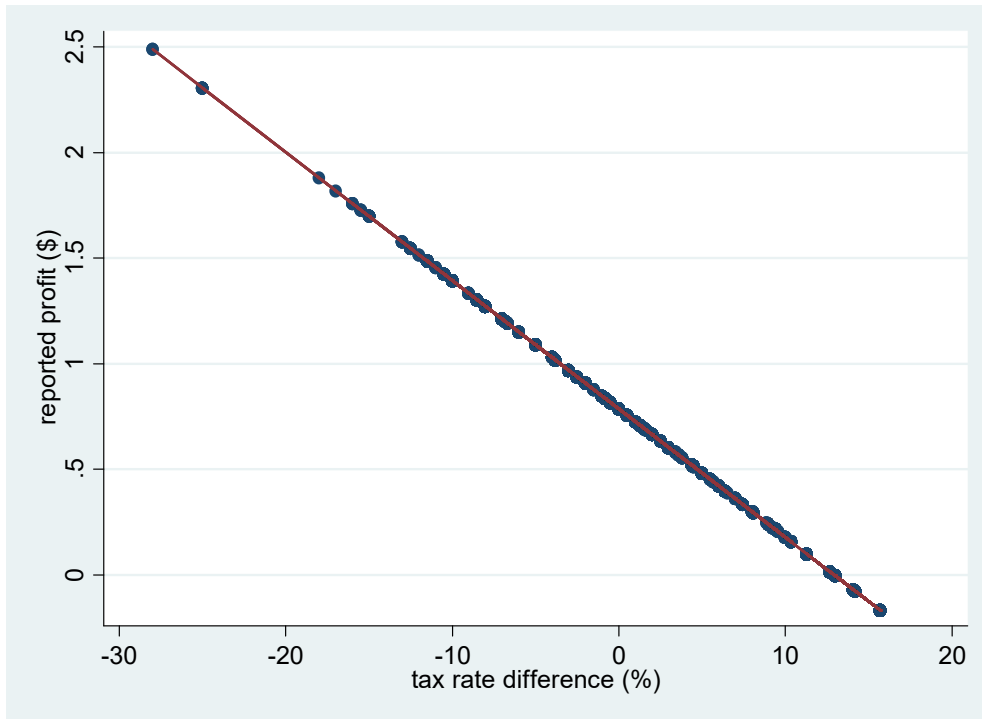
Note: Estimated reported operating profit in response to a $1 income shock is
calculated from estimated coefficients in model 2 table 3.4: reported operating profit
= 0.786 – 0.0608×tax rate difference, given that income shock equals $1.

Figure 3.3 Estimated response to a $1 earnings shock: Operating Profit
(by WOSs from tax havens)
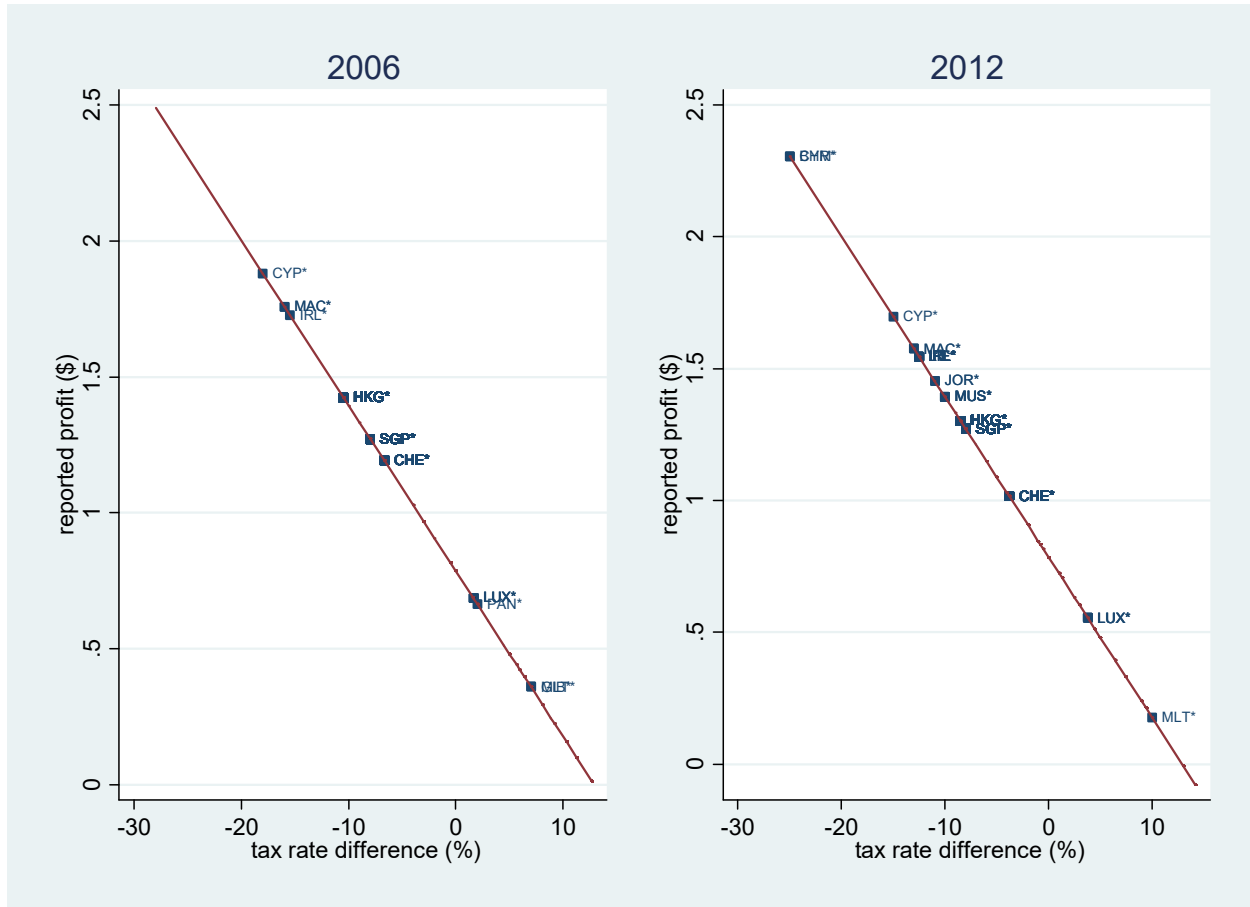
Note: Asterisk (*) is the mark for tax havens. Country names are in ISO 3166-1 alpha-3 three-letter country codes. The list of tax havens having WOSs in Vietnam includes Bahrain (BHR), Bermuda (BMU), Cayman Islands (CYM), Cyprus (CYP), Gibraltar (GIB), Hong Kong (HKG), Ireland (IRL), Jordan (JOR), Lebanon (LBN), Liechtenstein (LIE), Luxembourg (LUX), Macao (MAC), Malta (MLT), Mauritius (MUS), Panama (PAN), Singapore (SGP), Switzerland (CHE).

Figure 3.4 Estimated response to a $1 earnings shock: Operating Profit
(by WOSs from top 21 investing home countries)

Note: Asterisk (*) is the mark for tax havens. The size of the bubble is proportional to the share of firms from a specific country in total population of WOSs in a year (2006 and 2012). Top 21 investing home countries include Australia (AUS), Belgium (BEL), Canada (CAN), China (CHN), Denmark (DNK), France (FRA), Germany (DEU), Hong Kong (HKG), India (IND), Indonesia (IDN), Japan (JPN), Korea, Republic of (KOR), Malaysia (MYS), Philippines (PHL), Russian Federation (RUS), Singapore (SGP), Switzerland (CHE), Taiwan, Province of China (TWN), Thailand (THA), United Kingdom (GBR), United States of America (USA).

Figure 3.5 Estimated response to a $1 earnings shock: Financial Profit
(by WOSs from tax havens)
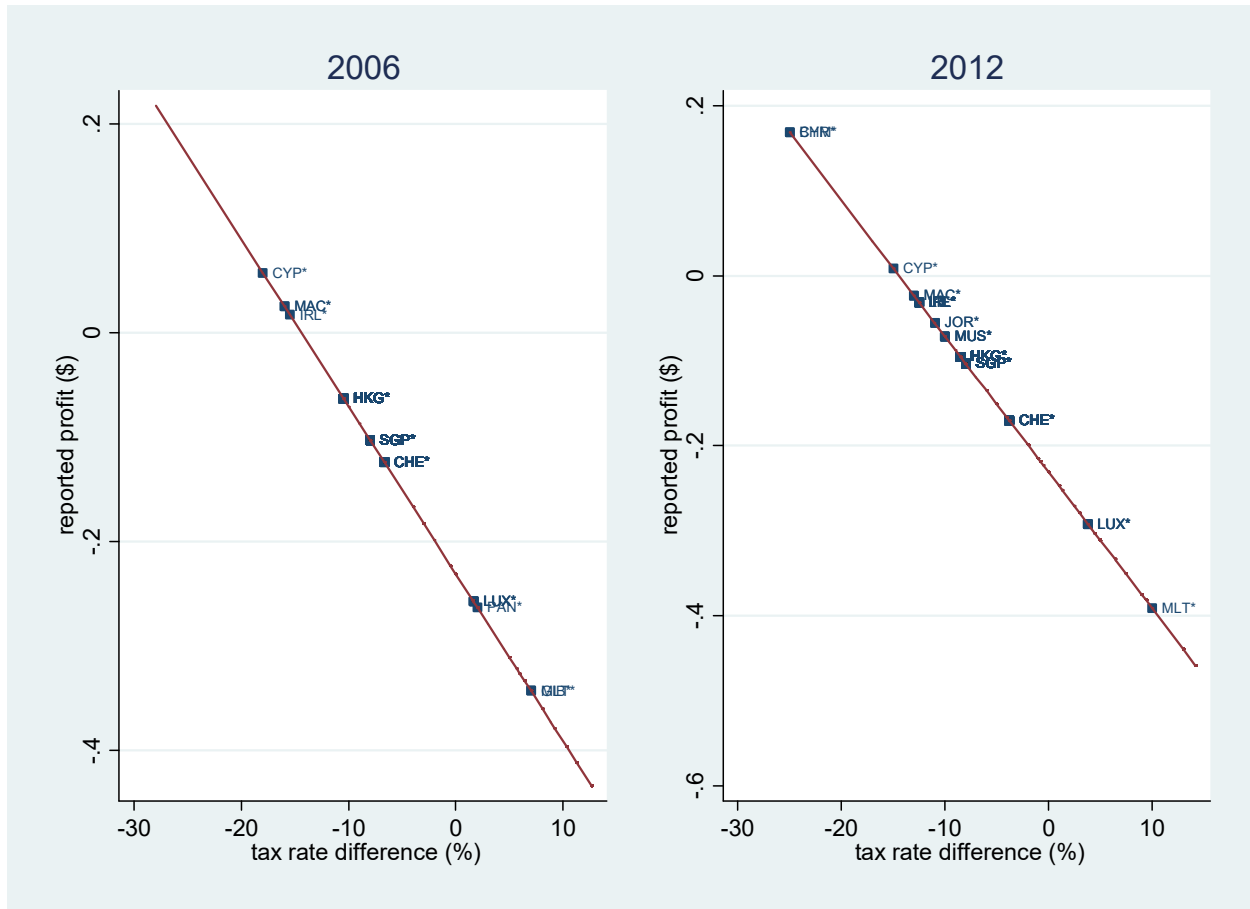
Note: Asterisk (*) is the mark for tax havens. Country names are in ISO 3166-1 alpha-3 three-letter country codes. The list of tax havens having WOSs in Vietnam includes Bahrain (BHR), Bermuda (BMU), Cayman Islands (CYM), Cyprus (CYP), Gibraltar (GIB), Hong Kong (HKG), Ireland (IRL), Jordan (JOR), Lebanon (LBN), Liechtenstein (LIE), Luxembourg (LUX), Macao (MAC), Malta (MLT), Mauritius (MUS), Panama (PAN), Singapore (SGP), Switzerland (CHE).

Figure 3.6 Estimated response to a $1 earnings shock: Financial Profit
(by WOSs from top 21 investing home countries)

Note: Asterisk (*) is the mark for tax havens. The size of the bubble is proportional to the share of firms from a specific country in total population of WOSs in a year (2006 and 2012). Top 21 investing home countries include Australia (AUS), Belgium (BEL), Canada (CAN), China (CHN), Denmark (DNK), France (FRA), Germany (DEU), Hong Kong (HKG), India (IND), Indonesia (IDN), Japan (JPN), Korea, Republic of (KOR), Malaysia (MYS), Philippines (PHL), Russian Federation (RUS), Singapore (SGP), Switzerland (CHE), Taiwan, Province of China (TWN), Thailand (THA), United Kingdom (GBR), United States of America (USA).

Appendix

A3.1 Ownership and profitability of Vietnamese firms (2006-2012)

DEPENDENT VARIABLES	ROA (Return on Assets)[a]			ROS (Return on Sales)[a]			AT (Asset Turnover)[a]		
	1	2	3	4	5	6	7	8	9
Log of Assets	0.0154***	0.0175***	0.0175***	0.0470***	0.0621***	0.0617***	-0.428***	-0.455***	-0.456***
	(0.000119)	(0.000124)	(0.000124)	(0.00153)	(0.00161)	(0.00161)	(0.00980)	(0.0103)	(0.0103)
Age	0.00154***	0.00167***	0.00164***	0.0101***	0.0104***	0.0102***	0.0847***	0.0837***	0.0837***
	(3.10e-05)	(3.19e-05)	(3.19e-05)	(0.000400)	(0.000413)	(0.000414)	(0.00256)	(0.00264)	(0.00264)
Private-owned firms		0.0377***	0.0368***		0.159***	0.155***		-0.363***	-0.365***
		(0.00151)	(0.00151)		(0.0196)	(0.0196)		(0.125)	(0.125)
Foreign invested firms[b]		-0.0223***			-0.332***			0.499***	
		(0.00177)			(0.0229)			(0.147)	
Wholly-owned subsidaries[b]			-0.0321***			-0.362***			0.494***
			(0.00184)			(0.0238)			(0.152)
State Joint ventures[b]			0.0525***			0.0302			0.706**
			(0.00405)			(0.0524)			(0.335)
Other Joint ventures[b]			-0.00128			-0.356***			0.395
			(0.00329)			(0.0426)			(0.272)
Constant	-0.0388	-0.0851*	-0.0841*	-0.297	-0.517	-0.511	4.207	4.682	4.686
	(0.0471)	(0.0470)	(0.0470)	(0.609)	(0.609)	(0.609)	(3.888)	(3.890)	(3.890)
Observations	1,489,871	1,489,871	1,489,871	1,489,871	1,489,871	1,489,871	1,489,871	1,489,871	1,489,871
Adjusted R-squared	0.038	0.040	0.040	0.014	0.014	0.015	0.005	0.005	0.005
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

[a] ROA and ROS are cut off at 0.1% and 99.9% percentile to remove outliers. ROA is defined as operating profit (i.e. profits before taxes and financial expenses) over total assets while ROS equals operating profit over net sales. AT (asset turnover ratio) is net sales over total assets. We have: ROA = ROS×AT

(Dupont Identity). All monetary variables are expressed in the constant 2010 value in units of 1000 USD. We convert the VND nominal values into VND real values in the base year of 2010 using Vietnamese GDP deflators (The World Bank's World Development Indicators Database). VND real values are then converted into USD using the official annual exchange rate in 2010 at 18612.92 VN.

[b] Foreign-invested firms include three disjoint groups: wholly-owned subsidiaries, state joint ventures (i.e. the joint ventures with state-owned firms), and other joint ventures (i.e. the joint venture with local private partner(s)).

A3.2 Results from *the Hines and Rice's approach*

Dependent variable: Ln(reported operating profit)		
	All foreign subsidiaries[b]	WOSs[a] only
Independent variables:		
Tax rate difference (τ)	-0.00450*	-0.00623**
	(0.00257)	(0.00298)
WOS[a]=1	-0.0625	
	(0.0773)	
Ln(K)	0.125***	0.156***
	(0.0129)	(0.0167)
Ln(L)	0.434***	0.415***
	(0.0239)	(0.0274)
Constant	3.838***	3.534***
	(0.809)	(0.826)
Observations	23,991	19,189
Adjusted R-squared	0.782	0.759
Year FE	Yes	Yes
Industry-year FE	Yes	Yes
Firm FE	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[a] WOSs is short for wholly-owned subsidiaries
[b] Model 1 includes all foreign subsidiaries (both joint ventures and wholly-owned subsidiaries) while mode 2 includes wholly-owned subsidiaries only.

The above table shows the results when we run the econometric model of the Hines and Rice approach:

$$\ln(operating\ profit_{it}) = \beta_1 \tau_{it} + \beta_2 \ln K_{it} + \beta_3 \ln L_{it} + \gamma_{jt} + \mu_i + \delta_t + \epsilon_{it} \qquad (1)$$

in which, *operating profit*$_{it}$ is the reported pretax operating profit of a focal subsidiary i of a multinational group in year t in Vietnam. K_{it} and L_{it} represent the subsidiary's tangible fixed assets and labor (in terms of total employment), while γ_{jt}, μ_i, δ_t are industry(j)-year(t), firm(i), and year(t) fixed effects, respectively. The regressor of interest, τ_{it}, is the corporate income tax-rate difference between the home country and Vietnam (i.e. the tax rate of the home country minus the tax rate of Vietnam). Given a level of input employment (K_{it}, L_{it}), the coefficient β_1, then tells us the extent of profit shifting by the percentage change in the focal subsidiary's reported profits due to 1 percentage point change in the tax-rate difference between the parent and the focal subsidiary.

We run the data from 2006 to 2012 for all foreign subsidiaries (i.e. both joint ventures and WOSs) and for WOSs only. It should be noted that the number of observations in the Hines and Rice's model is different from that of our main identification model because the Hines and Rice's model only considers foreign subsidiaries with *positive* pretax profit. For a comparison with the results in our main identification model, let us consider the estimate of β_1 in the model including WOSs only. It equals -0.00623, which suggests that an 1-percentage point increase in the tax-rate difference (for example, because the tax rate of the foreign subsidiary's home country increases 1 percent while the tax rate of Vietnam remains unchanged) would be associated with a 0.623-cent *reduction* in the reported operating profit of a subsidiary i from \$1 to 99.377 cents (=100 cents - 0.623 cents). Meanwhile, a comparable result in our main identification model (model 2, table 3.4) suggests that an 1-percentage point increase in the tax-rate difference would be associated with a 6.08-cent *reduction* in the reported operating profit of a subsidiary i from \$1 to 93.92 cents (=100 cents – 6.08 cents). Our result reveals much more aggressive profit-shifting behaviors by MNCs in Vietnam.

One reason that the Hines and Rice's approach yields a smaller magnitude in terms of profit shifting could be because it only considers subsidiaries reporting positive profit. This practice relies on the assumption that profit-shifting incentives are only relevant in subsidiaries with positive profit. However, recent evidence both from media news and empirical studies shows that MNCs are very aggressively involving in tax-avoidance profit-shifting in developing countries where those firms report zero and negative profits consistently through years (see our section 3.3, Chang (2013, p.132), and Johannesen et al. (2016)).

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Chapter 4 Roads to Damascus: Entry modes and ownership changes in Multinational Enterprises

4.1 Introduction

Multinational enterprises (MNEs) performance after entry into a foreign country is an important but under-studied question in international business (e.g. Chang et al., 2013; Chung and Beamish, 2010). Prior studies have focused on either MNEs' entry mode choice or termination of subsidiaries while little is known about strategic changes and adaption/evolution of MNEs' subsidiaries in the middle stages (Chung and Beamish, 2010). The literature on *post-entry relative performance of entry modes* tries to find out which mode of entry, as wholly-owned subsidiaries (WOSs) or as joint ventures (JVs), implies better subsequent performance. The tenet in this literature is that entry misfit (i.e. any mode chosen which is deviating from the one theoretically predicted) will lead to poor post-entry performance (Brouthers, 2002). This thesis, however, does not pay attention to any post-entry strategic change by MNEs to adapt and correct for earlier entry choice misfit; for example, JVs might convert to WOSs and vice versa (Puck et al., 2009; Chang et al., 2013).

Methodologically, research in this literature also encounters the endogeneity of entry mode choice. Specifically, firms depending on their own characteristics are self-driven to choose a specific entry mode (i.e. either WOSs or JVs) (Shaver, 1998; Brouthers, 2002). Addressing this "self-selection of entry mode" is an obstacle for researchers who want to compare post-entry performance of WOSs vs. JVs (e.g. Shaver, 1998; Martin, 2013). A recent study by Chang et al. (2013) overcomes the endogeneity issue when comparing performance of WOSs and JVs by using Difference in Differences (DiD) combined with propensity score matching (PSM) technique. The authors take advantage of the fact that some JVs in China gradually convert into WOSs after this country started allowing for the presence of WOSs following its admission into WTO in 2001. They compare the performance change before and after conversion of the

converted WOSs (JVs converting to WOSs is defined as the Treatment) with that of their matched continuing JVs (that constitutes the Control group). The treatment and control firms are comparable in most observable characteristics, which allows the authors to attribute to the treatment the causal effect observed on performance change (in this case the treatment is WOS operating mode). Chang et al. (2013) find that, after conversion, the converted WOSs perform better than comparable firms continuing as JVs.

In this chapter, we first replicate the investigation of Chang et al. (2013) in Vietnam to see if their findings are context-free. In contrast to China, Vietnam FDI laws do not require the formation of a JV as the only allowed foreign entry mode. Nonetheless, even if MNEs are "free" (not bound by laws) to choose their preferred mode of entry, many companies decide to enter by establishing a JV and later convert to a WOS. In a sense, then, Vietnam serves as an ideal laboratory to test if Chang and colleagues' findings are generalizable.

We then extend Chang et al.'s study by exploring the conversion of JVs in the other direction to fully domestic firms (i.e. a firm with 100% of domestic ownership when JVs are fully acquired by local owner(s)). Specifically, we look at the drivers of the local owner's acquisition of a JV and what are performance and strategic changes in the JV after being converted to a fully domestic firm (or a DOM – here after). By this line of analysis, we also contribute to the literature on *joint venture evolution*. The evolution and transformation of JVs towards either WOSs or DOMs when the MNEs or the local owners may buy out the firm is an interesting phenomenon. This is, strangely enough, a rather under-explored phenomenon.

The chapter is organized as follows. In section 4.2, we provide a review of two related streams of literature, the first dealing with relative performance of entry mode choices by MNEs, the second exploring the evolution of Joint Ventures. The next section (section 4.3) introduces the methodology of this study and our data source – the Vietnam Enterprise Surveys (VES) database. We present our results in section 4.4. Section 4.5 discusses and concludes this chapter.

4.2 Literature review

Choosing an entry mode (i.e. WOSs vs. JVs) is a critical decision that an MNE has to face when making a foreign direct investment (FDI) (e.g. Brouthers, 2002; Hennart and

Brouthers, 2007)[63]. Specifically, the MNE needs to decide whether it should find a local partner to set up a joint venture or establish a wholly-owned subsidiary. Compared to a JV, a WOS requires more resource commitment but brings more control to the MNE (Anderson and Gatignon, 1986). Therefore, entry mode choice yields long-term implications on subsequence performance of the FDI in the host country (e.g. Brouthers, 2002; Gaur and Lu, 2007).

The dominant theory that explains an MNE's entry mode choice between WOSs and JVs is transaction cost economics (TCE). Specifically, a WOS is preferable to a JV as it brings full control to the MNE when it is essential to protect the firm's specific assets (e.g. brands, technologies, management practices) from opportunistic behaviors of the potential local partner in the host country (Anderson and Gatignon, 1986). In contrast, a JV is preferable to a WOS when the MNE needs access to complementary assets of the local partner which are not easily transactable in the market (Hennart, 1991a; Hennart, 1991b). Various empirical studies have employed the TCE framework and confirmed its proposition that asset specificity from the MNE side and local complementary assets are two key determinants of entry mode choice (e.g. Zhao et al., 2004; Hennart and Brouthers, 2007[64])

The literature on *post-entry relative performance of entry mode choices* naturally follows the literature of entry mode choice. It tries to find out which operating mode (i.e. WOSs vs. JVs), chosen by a foreign MNE when entering a host market, implies better subsequent performance. Earlier works simply compare post-entry performance of different modes and yield inconsistent results (e.g. Brouthers and Hennart, 2007; Chang et al., 2013). Specifically, some find that WOSs perform better than JVs (e.g. Makino and Beamish, 1998; Pan and Chi, 1999; Kim and Gray, 2008) while others find the opposite (e.g. Woodcock et al., 1994; Gaur and Lu, 2007). All these results, however, are biased because of the self-selection issue[65]. Specifically, firms

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[63] Besides making FDI or equity-based entry modes (WOSs and JVs), an MNE can choose other contractual-based modes (e.g. exporting, licensing, franchising, or distribution contracts, etc.). See Hennart and Brouthers (2007) for a full list of 16 entry modes identified in the literature. However, in this study we focus mainly on equity-based entry modes, viz. WOSs and JVs, given that the MNE has decided to make equity investment.

[64] See Zhao et al. (2004) for a meta-analysis of transaction cost determinants of entry modes.

[65] Interested readers may want to look at Brouthers and Hennart (2007, p. 412-413) or Otto (2010, p.18-23) for a detailed review. The literature on *post-entry relative performance of entry modes* is also criticized for using mostly cross-sectional research designs which fail to capture an MNE subsidiary's evolution (Benito, Petersen, & Welch, 2009) and for using measures of post-entry performance in terms of either subjective evaluation of MNE managers or subsidiary termination (exit) (e.g. Brouthers, 2002; Brouthers and Hennart, 2007; Gaur and Lu, 2007).

depending on their own characteristics are self-driven to choose a specific entry mode (i.e. either WOSs or JVs) (Shaver, 1998; Brouthers, 2002). This self-selection of entry modes makes the job of comparing performance of WOSs vs. JVs like that of comparing apples with oranges.

Taking into account the endogeneity of entry mode choice in his seminal article, Brouthers (2002) develops the concept of entry "fit" and "misfit". Accordingly, an entry misfit happens when the entry mode chosen by an MNE deviates from the theoretically predicted mode and such entry misfit will lead to poor subsequent performance. In his seminal article, Brouthers (2002) estimates a logistic model which explains the choice between WOSs and JVs using TCE's variables such as general transaction costs and asset specificity among others. He then codes a dummy for entry fit (1) and misfit (0) for the two groups of firms whose actual entry modes are (or are not) predicted by the logistic model. Using the fit dummy to explain managers' subjective evaluation of the subsidiary performance, Brouthers (2002) finds support for his thesis that entry fit (or misfit) positively (or negatively) influences subsequent entry mode performance. In the case of entry misfit, the established subsidiary (either WOSs or JVs) is performing poorly after its formation because the MNE has chosen a "wrong" entry mode but not the mode prescribed by theories such as TCE.

This thesis by Brouthers, however, seems to apply a static view and assume away any potential post-entry strategic move to adapt or correct for earlier entry choice misfits. For example, as illustrated in figure 4.1, JVs might convert to WOSs later and vice versa (Puck et al., 2009; Chang et al., 2013). Moreover, in some cases, a foreign firm simply choose a mode of entry that gives it flexibility to change later and, compared to WOSs, JVs are considered as more flexible (e.g. Song, 2014). Hence, instead of being considered as a strategic error, the entry mode which was misaligned with predictions might be simply just a cautious choice when making an important investment. In a similar vein, according to the real option theory, JVs can be seen as real options that provide the MNE parents both the put option (divest) or call option (acquire) later (Kogut, 1991). Facing uncertainty in a new country market, cautious MNEs might choose to enter by establishing JVs. MNEs will act behaviorally and trigger the option later by either divesting or acquiring fully JVs after gaining experience and getting feedback about their decision in terms of JV performance.

[Figure 4.1 about here]

Methodologically, in a recent article, Chang and colleagues (2013) overcome the endogeneity issue when comparing performance of WOSs and JVs by employing a new econometric technique. The authors take advantage of the fact that some joint ventures (JVs) in China gradually convert into WOSs after 2001 when China accesses into WTO. They compare ex-post performance of the converted WOSs (Treatment) with their matched continuing JVs (Control) using Difference in Differences (DiD) combined with propensity score matching (PSM)[66]. Matched firms are comparable in most observable characteristics, which allows the authors to attribute to the treatment the causal effect observed on performance (in this case the treatment is WOS operating mode). Chang et al. (2013) found that, after conversion, the converted WOSs perform better than comparable firms continuing as JVs controlling for the initial performance differences between the two groups before conversion[67].

One main limitation of Chang et al. (2013) is that this research can be context-specific (i.e. it only holds true in China). Most of MNEs entered China before 2001 are strictly required to establish joint ventures with local Chinese firms. Only after 2001 when China joined WTO, this requirement was relaxed and there has been a wave of conversion of JVs into WOSs in China (Chang et al., 2013, p. 322). This phenomenon is taken advantaged of in the research design of Chang et al. (2013), which makes it prone to context-specific. Vietnam, however, does not have any restriction on entry mode choice or any joint venture requirement in its laws on FDI[68]. Majority of FDI projects starting from 2000, the starting year of our dataset, are indeed in the form of WOSs. We therefore first initiate our study as an attempt to replicate Chang et al.

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[66] This is a fairly new econometric technique that has been only recently applied in strategic management and international business (Reeb, Sakakibara, & Mahmood, 2012; Bettis, Gambardella, Helfat, & Mitchell, 2014). See section 4.3.1 for a discussion on this methodology.

[67] It should be noted that, in her unpublished thesis, Petkova (2009), who also applied difference-in-differences analysis combined with propensity score matching, has found that the conversion of JVs to WOSs has no effect on firm performance in China. However, Petkova's research is limited by its smaller sample size (1246 observations, in which there are 86 treated cases, when assessing changes in ROA) and specific location (only firms from Wuxi Economic Development Zone of Jiangsu province). Chang et al. (2013) instead uses the sample of joint ventures from the Chinese National Bureau of Statistics firm-level data which arguably contains the population of all foreign invested firms in China.

[68] While there is never a formal written requirement that foreign investors must set up joint ventures with Vietnamese business partners in FDI laws, joint ventures (i.e. shared ownership between foreign and Vietnamese business parties) are the main form of FDI before 1996 (Truong and Gates, 1996). After the Law on FDI 1996, by laws and in practice, foreign investors are free to choose the investment forms (i.e. contracts, joint ventures (JVs), or wholly-owned subsidiaries (WOSs)) they like (Nguyen, 2014, p. 36). Our research period starts in 2001 five years after the 1996 FDI law.

(2013) to investigate the performance implications of JVs converting to WOSs in the country context of Vietnam where FDIs by laws are free to enter in both forms of JVs and WOSs. This will help us to test whether Chang et al.'s findings on performance superiority of WOSs compared to JVs are generalizable.

At the same time, our study also contributes to the literature on *joint venture evolution.* Since post-entry subsidiary-level data are still pretty difficult to obtain (e.g. Chang et al., 2013), most studies still focus on JV's termination events while neglecting the interesting post-entry strategic changes of JVs (Chung and Beamish, 2010). Specifically, the evolution of JVs and their transformation towards either WOSs or DOMs when the MNE or the local owners may buy out the firm is an interesting phenomenon. This is, strangely enough, a rather under-explored phenomenon. Indeed, to the best of our knowledge only two studies investigate the conditions that lead to such post-formation ownership transformation in JVs (Steensma et al., 2008; Iriyama and Madhavan, 2014). However, these studies do not explore the performance and strategic effects after ownership changes, especially when ownership of the JV is handed over to the local owner. This is why we believe that our study, examining the drivers of JVs conversion to either WOSs and DOMs, and performance and strategic implications of such conversion, is a valuable contribution.

4.3 Econometric strategy and Data

4.3.1 Econometric strategy: Difference-in-differences (DiD) combined with matching approach

The analysis of performance and strategic implications of joint ventures (JVs) converting to either wholly-owned subsidiaries (WOSs) or domestic firms (DOMs) has to take into account that very likely firms are selected not randomly in the two groups. Such condition lets arise a selection bias problem. To address it we should ensure that ex ante the MNEs in the groups we would compare are similar. In order to do so, we propose to use a difference-in-differences (DiD) combined with matching approach (e.g. Arnold & Javorcik, 2009; Chari et al., 2012; Chang et al., 2013; or Wang and Wang, 2015) by first match the converted JVs (treatment) with a group of comparable continuing JVs (control). Then in the next step, a DiD will be performed by taking the difference between the treatment and control groups in terms of within-firm performance difference before and after conversion. We apply this DiD combining with

matching approach for the two cases that (i) JVs turns to be WOSs and (ii) JVs turns to be DOMs separately. In both cases the reference category (the potential control group) is represented by continuing JVs.

Different matching methods, each with its own pros and cons, have been proposed to be employed under this common DiD combined with matching framework. The pioneer paper in the literature by Arnold & Javorcik, (2009) [69] stresses that the treatment should be matched with the control from the same industry sector and year. The first class of matching methods, hence, is exact matching by industry sector and year, which could be done based on propensity score (Arnold & Javorcik, 2009; Chang et al. 2013), Mahalanobis (or Euclidean) distance metric, or by applying the coarsened exact matching (CEM – Iacus et al. (2011))[70]. However, in practice, except Arnold & Javorcik (2009) or a later paper by Chang et al. (2013) that apply this approach using propensity score, almost no following papers choose to do exact matching by sector and year. The reason may simply lie in the fact that this class of matching methods requires a dataset with a very rich pool of potential controls[71], otherwise, many treated cases will be left unmatched. Hence, while theoretically sound, it is hard to apply in many micro (firm or individual level) datasets of smaller sample size (e.g. Chari et al., 2012) [72]. Besides, according to Abadie and Imbens (2008), the naïve bootstrapped standard errors in the exact matching by

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[69] Arnold & Javorcik (2009) investigate whether there is superior premium relating to foreign ownership by comparing productivity of foreign acquired manufacturing plants with that of comparable domestic plants in Indonesia.

[70] To do exact matching using propensity score, ones can use propensity score as a balancing score complementary to an exact matching on sector and year. This is done by first estimating a propensity score model predicting treatment based on a vector of pre-treatment characteristics X and then using the estimated propensity score to match between treatments and controls in the same sector and year (this approach has been applied by Arnold & Javocik (2009) and Chang et al. (2013)). Similar procedure applies to exact matching on Mahalanobis (or Euclidean) distance by simply replacing the Mahalanobis distance to propensity score as the balancing score to do an exact matching on sector and year. CEM instead do an exact matching not only on sector and year but also on user-defined coarsened values of all other pre-treatment characteristics X.

[71] We need to have many potential controls in each cell of a combination of year and sector which possesses a treated. Arnold & Javocik (2009), for example, have about 100,000 potential control observations to match with only 297 treated cases or Chang et al. (2013) have about 18,000 control observations in compared to about 799 cases.

[72] In CEM, one need to subjectively coarsen (in other words, tolerate) a lot on each covariate in the vector of pre-treatment characteristics X, except sector and year, to fully match all the treated cases in smaller datasets. A simple trial of CEM with automatic coarsening using my dataset to match JVs switching to be WOSs and comparable continuing JVs on a selected set of pre-treatment covariates X including 2-digit sector and year lead to only 4 out of 67 treated cases being matched.

sector and year using propensity score as in Arnold & Javorcik (2009) are inconsistent (Wang and Wang, 2015).

Recent applications tend to use propensity score matching (PSM) and simply control for sector and year fixed effects in the model predicting treatment (Chari et al., 2012[73]; Wang and Wang, 2015). Based on the same estimated propensity scores, Wang and Wang (2015) choose to use the single nearest neighbor matching estimator while Chari et al. (2012) choose to apply the propensity score reweighting estimator. By controlling for sector and year fixed effects in the model predicting treatment and derive these estimators of the average treatment effect on the treated (ATT) in a DiD framework, any remaining temporally *invariant* differences between treatment and control groups can be tolerable (Smith and Todd, 2005). Both the single nearest neighbor matching (or pair matching) estimator (Wang and Wang, 2015) or propensity score reweighting estimator (Chari et al., 2012) have the same root of the same propensity score function. In choosing each of the two, one encounters a trade-off in terms of bias and variance (i.e. pair matching has lowest bias but more variable).

In this chapter, we choose to use a Conditional Difference in Differences Estimator (CDiD) method that combines the PSM with the difference-in-differences method (DiD) as proposed by Smith & Todd (2005). Specifically, we use DiD combining with PSM one-to-one matching following the practice in Wang and Wang (2015):

(i) First step: we run a Probit regression to predict the treatment (a conversion of JV). This enable us to calculate the propensity score which is the predicted probability of treatment according to the probit model. Then we perform a PSM one-to-one match with replacement and with common support restriction. An observation of converted JVs in treatment group will be matched with an observation of continuing JVs in control group with the closest propensity score. By matching with replacement, one control can be used as a match to multiple treated firms as long as it is closest in terms of propensity score to these treated. We impose common support restriction which requires that the treated observations are matched only if they have propensity scores lying inside the region of minimum and maximum propensity scores of the control observations.

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[73] We would like to thank Marco Sanfilippo for suggesting this paper.

(ii) Second step: for each MNE in both the treatment and control groups, we calculate changes in the outcome variable for firm $i=1,...,I$ as: $\Delta Yi=Y_{i,t+k}- Y_{i,t-1}$. We compare the level of the outcome k years ($k=0, 1, 2$) after the switch ($Y_{i,t+k}$) with its level one year prior to switch ($Y_{i,t-1}$). Finally, the average treatment effect on the treated (ATT) under the DiD framework is calculated as followed:

$$ATT_k = \frac{1}{n}\sum_{i\in Treated}\left[\left(Y_{i,t+k}^1 - Y_{i,t-1}^0\right) - \sum_{j\in Control}\left(Y_{j,t+k}^0 - Y_{j,t-1}^0\right) w(i,j)\right] (1)$$

where: k refers to the length of years lag at which we would evaluate the effect; n is the total number of switching MNEs; Y is the outcome variable considered and the superscripts 1 and 0 indicate, respectively, the switching event of JV or the fact that JV continues in the period under analysis; $w(.)$ is a weight of the controls to compared to each treated MNE and depends on the matching estimator chosen (e.g. PSM pair matching or propensity score reweighting estimators). For PSM pair matching if we call $m(i)$ as the index of the matched control to a specific treated firm i, our specific ATT_k will be

$$ATT_k = \frac{1}{n}\sum_{i\in Treated}\left(Y_{i,t+k}^{treated} - Y_{i,t-1}^{treated}\right) - \frac{1}{n}\sum_{m(i)\in control}\left(Y_{m(i),t+k}^{control} - Y_{m(i),t-1}^{control}\right) (2)$$

For testing the significance of ATT in PSM pair matching, for long researchers use a bootstrapped standard error (Caliendo and Kopeinig, 2008). However, Abadie and Imbens (2008) has proved that this standard bootstrapped standard error is inconsistent for pair matching estimators. In this chapter, we follow the current practice in the literature to report Abadie and Imbens' robust standard errors (Abadie and Imbens, 2016) for our estimated ATT_k.

4.3.2 Data and identification of joint venture switching

Our raw source of data is the annual Vietnamese Enterprise Survey (VES) from 2000 to 2012 compiled by the General Statistics Office of Vietnam (GSO). Besides state-owned and private owned firms, VES includes all foreign-invested firms operating in Vietnam.

Every firm in the VES has a registration type which indicates its main ownership. We then regroup these registration types into 3 disjoint categories: domestic firms (DOMs), joint ventures (JVs) and wholly-owned enterprises (WOSs). DOMs are firms with 100% domestic ownership, which includes both domestic state-owned and private owned firms. WOSs are firms

with 100% foreign ownership, meanwhile JVs are firms with shared ownership between foreign investors and local partners from either state or private sectors.

This recoded registration system is used to identify JVs' conversion. We identify the conversion of a JV when its registration type changes from JVs to either WOSs or DOMs[74]. As the dataset also includes information on ownership shares of Vietnamese and foreign parties in a joint venture. We use the foreign share of ownership (i.e. the percentage share of ownership by the foreign parents) to cross check on the conversion of a JV. We do not consider the cases in which foreign ownership share in a JV changes from any level of above 90% to 100% as a JV-to-WOS switch. In these cases, the JV with foreign ownership share of more than 90% could also be considered as a WOS in a loose sense[75].

4.3.3 Propensity score estimation and matching

In this section, we explain the detail of propensity score estimation and matching in our econometric strategy. A very crucial assumption in PSM is the unconfoundedness assumption. It requires that treatment assignment (i.e. a conversion of JV) is independent of potential outcomes (e.g. firm performance) given the set X of observable covariates included in the probit model. Here, we first introduce the covariates in our probit model and give justification for our choice of these covariates. We next introduce the outcomes being assessed and details on the implementation of the matching.

Choice of covariates in propensity score estimation

The dataset includes demographic and financial information of each firm from which we build the variables in our propensity score models. All monetary terms are converted to real values at the constant price of 2010. It is important that we choose a set X of observable covariates that influence both the decision to convert of JVs and their performance. We use the following variables to predict the conversion of JVs in the Probit models: *firm size*, *age*, *ROA*, *leverage ratio*, *export status*, *fixed assets ratio*, *foreign ownership*, *state joint venture*, and *year, 2-digit industry, region fixed effects*. *Firm size* is the natural logarithm of total assets. *Age* is the

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[74] Wang and Wang (2015) have used the same approach to distinguish between foreign acquired firms versus domestic acquired firms in China.

[75] A customary definition in international business literature uses 95% of ownership held by foreign parents as the cut-off point to define a WOS (Gomes-Casseres, 1990).

number of years since a firm's establishment. *ROA* is defined as pretax profits divided by total assets while *leverage ratio* equals total debt divided by total assets. *Export status* is coded 1 if the firm undertakes export activities and 0 otherwise[76]. *Fixed assets ratio* is defined as fixed assets divided by total assets. *Foreign ownership* is ownership share of the foreign parents. *State joint venture* is a dummy to indicate joint ventures whose local parents are Vietnamese state-owned enterprises. Common shocks to all firms in the same year, same industry, and same region are controlled by *year, 2-digit industry, region fixed effects.*

These above variables include almost all the covariates suggested by Chang et al. (2013). Different theories and literatures on foreign entry mode choice and joint venture performance such as transaction cost economics, learning, real option theory of joint venture, and the literature on joint venture instability have guided their chosen (Chang et al., 2013). We summarize in figure 4.2 a theoretical framework on the observable confounding factors that influence both switching decision of JVs and their performance.

[Figure 4.2 about here]

Specifically, transaction cost economics suggest that a high level of asset specificity from the MNE and the need to protect those specific assets from the local partner's potential opportunistic behaviors in a joint venture will enable the MNE to buy out the local partner's stake and convert the JV to a WOS (Puck et al., 2009). *Fixed assets ratio* then serves as an indicator of asset specificity, that is specific investments in terms of "sophisticated machinery", reflecting in the JV's amount of fixed assets- Chang et al. (2013). *Firm age* is related to the time length of learning from each other by both the MNE and the local partner (Hennart, 1991). Steensma et al. (2008) find that "the acquisition of knowledge" from the MNE partner increases the likelihood that the local partner takes over the whole JV from its MNE partner at a later stage. Joint ventures could also be seen as real options that provide the parents both the put option (divest) or call option (acquire) later (Kogut, 1991). *ROA, leverage ratio*, and "*export platform*", therefore, act as a proxy for the values of these "real options" in later periods when

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[76] For a few years that the VES does not survey on firm export, we impute the information using whether the firm pays export tax as suggested by Newman, Rand, Tarp, and Nguyen (2017) in their article investigating the export-productivity nexus of VES firms. As export firms being recovered from using the information on export tax are still underrepresented in our sample of foreign JVs, we further impute export status by identifying an export firm if the firm exports in either the previous year or the subsequent year.

uncertainty resolves (Kogut, 1991; Kogut and Chang, 1996; Chang et al., 2013). Facing uncertainties from a new country market, an MNE might simply choose a mode of entry that gives it flexibility to change later (JVs are more flexible than WOSs - Song, 2014). MNEs will act behaviorally and trigger the option after gaining experience and getting feedback about its decision in terms of JV performance. The same line of logic applies equally to the local partners. *Firm size* is included to account for size-related factors of conversion (Chang et al., 2013). The other two covariates, f*oreign ownership* and *state joint venture* reflect the effects of bargaining power and control due to (uneven) ownership share and local parent type on JV stability (e.g. Ren et al., 2009).

Outcomes

We assess the implications of conversion of international joint ventures in Vietnam through the main outcome: financial performance represented by ROA. Besides, we also explore changes in strategic indicators including leverage ratio, sales, fixed assets, employment, average wage per employee (except leverage ratio, all the others in the log form).

Implementation of the propensity score matching

We perform two separate matching practices between JVs switching to WOSs and comparable continuing JVs and between JVs switching to DOMs and comparable continuing JVs. Hence, we will run two separate probit models to predict JVs switching to WOSs and JVs switching to DOMs separately. The control group in both matching practices is continuing JVs defined as the ones who are joint ventures at the time they first appear in our dataset and continue to be a joint venture at time t when we perform matching. We use two slightly variant data cleaning procedures for the two matching samples. The details of these procedures are described in Appendix A4.1 and a description of switching cases is put in Appendix A4.2.

To estimate propensity scores, we run probit models predicting the conversion of JV at time t based on its characteristics in the prior period. There is a concern that we do not capture an Ashenfelter's dip by lagging just one period all covariates in the set X described above to predict the treatment at a time *t*. An Ashenfelter's dip happens if the treated experience a temporary negative shock in performance the recent periods before treatment[77]. We screen all the covariates

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[77] We would like to thank Marco Sanfilippo to point this out.

and find the evidence of an Ashenfelter's dip in terms of financial performance (ROA) for both the cases when JVs turning to WOSs and JVs turning to DOMs. Figure 4.3 presents this evidence by plotting the means of ROA of all treated cases in periods before and after switching. Hence, we use a three-year average of lags of ROA from t-1 to t-3 to control for this Ashenfelter's dip in financial profitability when running the probit model explaining the conversion of JVs to WOSs at a time t, meanwhile all the other covariates are lagged one year as it is customary. For the case when we predict JVs switching to DOMs, we just lag all covariates, including ROA, one period. Even though there is evidence of the Ashenfelter's dip in firm profitability, taking the three-year average of lags of ROA before conversion will leave us the number of treated cases being matched too small (only 30 cases). Our matching analysis for the case when JVs turning to WOSs, hence, applies to the period from 2003 to 2010 since we require three years of lag time in the probit model and study changes in performance two years after conversion. For the case of JVs turning to DOMs, our matching covers the period from 2001 to 2010.

[Figure 4.3 about here]

The most tiresome and important step in PSM, given the plausibility of the confoundedness condition, is to derive a good specification of the probit model which enable us to balance the treatment and control groups after matching in terms of all covariates in the set X. I use Dehejia and Wahba's (2002) algorithm to derive the specific specifications for the probit models predicting treatment. This simple procedure requires us to add interactions or high-ordered terms of covariates and rerun/reevaluate the models until we get a satisfying configuration.

I follow the guidance by Garrido et al. (2014) to perform PSM one-to-one match with replacement and with common support restriction in Stata 14 MP. The common support is the area bound by the minimum and maximum propensity scores of the control groups. Up to date, even though Stata has provided its own command, *teffects psmatch*, for PSM, the best commands for one-to-one PSM and balancing analysis are still the user-written *psmatch2* and its companion *pstest* (Leuven & Sianesi, 2003 – the most updated versions at 30 of Jan 2016). However, as Leuven & Sianesi (2003) do not include the Abadie and Imbens' robust standard errors (AI's S.E.) in their commands, practitioners need to overcome this limitation by first using *psmatch2* and *pstest* to perform PSM and balancing check, and then using *teffects psmatch* to get the AI's

S.E. (Garrido et al., 2014)[78]. To get precisely equivalent results in ATTs between *psmatch2* and *teffects psmatch*, we need to make sure that the two commands run on the same sample. We get through this inconvenience procedure fairly well when we perform matching for the case of JVs turning to WOSs (we have better overlap). For the case of matching for JVs turning to DOMs (when the outcomes being assessed are ROA, leverage ratio, employment, and average wage per employee), we encounter one treated case being off-support. As *teffects psmatch* does not allow us to impose common support and hence there is no way to make results from *teffects psmatch* and *psmatch2* equivalent if we insist on imposing common support restriction, we choose to use the results from using *psmatch2* for PSM one-to-one match with common support restriction. In this case, we accept that *psmatch2*'s default standard errors do not take into account that propensity scores are estimated. For a comparison, we also report results from running *teffects psmatch* when we drop the treated being off-support from analysis to prevent *teffects* from performing a bad match (see Appendix 4.8).

4.4 Results

4.4.1. JVs switching to WOSs

Propensity score estimates and matching

Results of the Probit model in the first step of PSM to predict the conversion of JVs to WOSs are presented in table 4.1[79]. We observe that a poor average ROA in three previous years significantly increases the likelihood of a JV's conversion to a WOS. A poor financial performance of the JV may trigger the parent MNE to fully internalize it to centralize management and better coordinate parent-subsidiary relations (e.g. Baliga and Jaeger, 1984; O'Donnell, 2000). We also find that the coefficient of fixed asset ratio is positive and significant. In the presence of asset specificity proxied by fixed asset ratio, JVs are more likely to convert to

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[78] In an email correspondent, Barbara Sianesi, the author of *psmatch2,* also suggests that it is the practice that she would advise to her students and herself would do. We would like to thank Barbara for her prompt response and advice.

[79] We have tried various configurations when we add higher ordered terms or interaction of covariates. The configuration with all covariates in linear terms that we presented in table 4.1 seems to be better than the others in balancing the matched pairs.

WOSs (Chang et al., 2013). Meanwhile, foreign ownership share has a positive and significant relationship with the likelihood of JVs switching to be WOSs.

[Table 4.1 about here]

It would be better if we were able to include intangible assets ratio in the probit model explaining the conversion of JVs to WOSs to take account of specific assets such as technology or brands which are intangible and being licensed/transferred to the joint ventures by the MNE parents. However, the VES database only includes information on intangible assets since 2006, which leaves us with too few treated cases if we choose to include intangible assets ratio among the other pre-treatment characteristics to perform matching. For a robust check, we attempt to run Probit models adding intangible assets ratio among the other covariates to predict the conversion of JVs to WOSs from 2007 to 2012 (when we have information on firm intangible assets). Nevertheless, we do not find its coefficient to be significant in both scenarios when we also include or drop fixed assets ratio among the other covariates (results are put in Appendix A4.3).

Results of balancing tests are put in table 4.2. The means of treatment and control in columns three and four tells us about the characteristics of the sample before (unmatched) and after matching (matched). Before matching, the treatments are essentially different from the control group in age, average ROA, leverage ratio, fixed assets ratio, state joint venture dummy, and foreign ownership share. Specifically, the treatment group tend to be younger, perform financially poorer (low/negative ROA and highly leveraged), have higher fixed assets ratio and foreign ownership share. They also contain a smaller percentage of state joint ventures (the ones who local parents are state-owned domestic firms). After matching, the treated and matched controls are not different from each other in all of these characteristics. The standardized differences (or standardized biases) on each covariate between treatment and control groups after matching are all bellow 20 (the mean (median) standardized difference is 7.5 (4.7)). We put the distributions of continuous covariates for treated and control groups after matching in Appendix A4.4 for a further careful diagnosis of after-matching balance between treated and control groups (we also put a distribution of treated cases being matched by region and sector in Appendix A4.5). The distributions of propensity scores for treated and control groups are plotted in figure 4.4. We can see that these distributions of propensity scores for treated and control groups are almost overlapped after matching (the mean distance in propensity scores of matched pairs is

.0006914[80]). All of these observations give us a well assurance about the quality of our propensity score matching.

[Table 4.2 and Figure 4.4 about here]

DiD combined with PSM estimators for changes in financial performance and other strategic indicators after conversion

Our main outcome of interest is firm financial performance measured by ROA. As can be seen in part A of table 4.3, mean ROA of the treated group drops from t-1 to t and then improves in the next two period t+1 and t+2 after JVs switching to WOSs. The average treatment effect on the treated (ATT) in terms of ROA at year t+1 is 0.045 and it is statistically significant. It means that one year after conversion, ROA of the converted WOSs is 4.5 percentage points greater than that of the continuing JVs net of the initial difference in ROA between the two groups before conversion. However, the improvement in ROA seems to be just an "one-shot" rather than a persistent effect. By extending our analysis one year further up to t+3 in part B of table 4.3, we observe that mean ROA of treated cases reaches its peak at t+1 then drops again in t+2 and t+3. The ATT at t+3 is even negative (-0.08) and statistically significant (see figure 4.5 for a comparison of the means of ROA of matched treated and control groups from t-1 to t+3)[81].

[Table 4.3 about here]

Theoretically, if WOSs were superior to JVs we would expect to observe a persistent improvement in ROA of the converted JV-to-WOSs compared to the controlled continuing JVs, like what is observed in Chang et al. (2013). It reflects the difference in long-term performance trend between the two organization modes emerging over time (i.e. WOSs would persistently perform better than JVs in long term). Here, after carefully controlling for the Ashenfelter's dip in financial performance before conversion, we do not find any persistent improvement in terms of financial performance of the converted JV-to-WOSs in Vietnam, hence also any superiority of WOSs as an organization mode in compared to JVs. The converted WOSs seems to temporarily

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[80] Propensity scores are theoretically bound between 0 and 1.

[81] To estimate propensity scores and perform matching in the sample with non-missing observations up to t+3, we use the following configuration: size, age, average ROA, leverage ratio, leverage ratio^2, leverage ratio*average ROA, export status, fixed assets ratio, state joint venture dummy, foreign ownership share, and year, sectors, region fixed effects. The standardized differences of each covariates after matching are all bellow 20 (the mean (median) standardized difference is 12.5 (12.2)). The mean distance in propensity scores of matched pairs is .0015338.

experience negative financial performance before conversion and then recover back to its normal trend which is not so different from that of the comparable continuing JVs (see figure 4.5).

[Figure 4.5 about here]

We continue to check the changes in other strategic indicators of the converted WOSs after conversion (table 4.4. and 4.5). There is some evidence of restructuring/adjustment in the converted WOSs in the first few years after conversion which has accompanied the improvement in ROA, albeit not persistent, that we observed. First, after switching the converted WOSs have reduced its amount of debt in relative to its total assets. The ATT in terms of leverage ratio is statistically significant at t+1 and equals -0,141, which suggests that in one year after conversion the level of leverage in the converted WOSs is 14.1 percent less than that of continuing JVs net of the initial difference in leverage ratios between the two groups before conversion. There are also increases in sales of the converted WOSs after switching but the ATTs are not significant. When evaluating changes in fixed assets, it should be noted that in general we should observe that the value of a firm's fixed assets reduces over time. This reflects asset depreciation and the well-known fact that new capital investments are lumpy (i.e. firms make new investments in fixed assets in an intermittent manner). We observe decreases in fixed assets in both treatment and control groups. The ATT in terms of fixed assets is marginally significant at t+2 and equal 0.215, which suggests a slight improvement in fixed assets in converted WOSs after their conversion. The converted WOSs also slightly increase their employment scale and reduce the average wage bill per employee at time t: ATT in terms of employment equals 0.058 and statistically significant while that of average wage equals -0.127 and also significant. Employment scale has grown by 5.8 percent faster in the converted WOSs at the time of conversion. At the same time, their average wage bill per employee has reduced by 12.7 percent relatively when compared to the comparable JVs.

[Table 4.4 and 4.5 about here]

4.4.2. JVs switching to DOMs

Propensity score estimates and matching

We put the results of the Probit model predicting the conversion of JVs to DOMs in table 4.6. We find that firm size has an inverted U-shaped relationship with the likelihood of conversion. It suggests that size might be a factor that constraints local owners from buying out

the JV. After an "optimal point" in size, the likelihood of JVs switching to DOMs decreases. Credit constraints and limited financial resources might be the reason that explain why the local owner cannot buy out fully equity in big JVs. By contrast, foreign MNEs do not feel this constraint in their decision to acquire the local partner's stake, even in very big JVs. Among other results, foreign ownership share has a negative and significant effect on the likelihood of JVs switching to be DOMs. The larger the share of foreign ownership in a JV, the less likely that the JV will turn to be a DOM. Note that we found above an opposite positive effect of foreign ownership share on the likelihood that JVs switching to WOSs.

[Table 4.6 about here]

Results of the associated balancing tests are put in table 4.7. Before matching, the treatments are essentially different from the control group in size, foreign ownership share, and state joint venture dummy. Specifically, the treatment group (JV-to-DOMs) tend to be smaller in terms of size and have lower levels of foreign ownership share. They also contain a smaller percentage of state joint ventures. After matching, the treated and matched controls are not different from each other in all of these characteristics. The standardized differences (or standardized biases) between treatment and control groups on each covariate after matching are all bellow 20 (the mean (median) standardized difference is 7.3 (6.7))[82]. We put the distributions of continuous covariates for treated and control groups after matching in Appendix A4.6 for a further careful diagnosis of after-matching balance between treated and control groups (we also put a distribution of JV-turning-to-DOMs being matched by region and sector in Appendix A4.7). In figure 4.6, we can see that the distributions of propensity scores of treated and control groups are almost overlapped after matching (the mean distance in propensity scores of matched pairs is .0001354). Hence, all of these observations give us a well assurance about the quality of our propensity score matching for the cases when JVs turning to DOMs.

[Table 4.7 and Figure 4.6 about here]

DiD combined with PSM estimators for changes in financial performance and other strategic indicators after conversion

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[82] We have tried various configurations when we add higher ordered terms or interaction of covariates. The configuration with all covariates in linear terms that we presented in table 4.6 seems to be better than the others in balancing the matched pairs.

As mentioned above, since there is one treated case being off-support in our matching[83] (when the outcomes being assessed are *ROA*, *leverage ratio*, *employment*, and *average wage per employee*), we choose to use the results from using *psmatch2* for PSM one-to-one match with replacement and with common support restriction. In these cases, we accept that the default standard errors in *psmatch2* do not take into account that propensity scores are estimated and we simply perform t-tests to test whether the difference in accumulated changes in an outcome between the treatment and control groups (i.e. the ATT) is significant[84]. Since the naïve bootstrapped standard errors are no longer used, Chang et al. (2013) also rely on the same practice when comparing performance of converted WOSs and comparable continuing JVs in China. For a comparison, we also report in Appendix A4.8 the ATTs and their associated AI's S.Es. obtained when we drop the treated being off-support from the sample and run *teffects psmatch* (as there is no common support restriction in *teffects,* this command will still perform a bad match for the treated being off-support if we do not drop it[85]).

As can be seen in table 4.8, mean ROA of the treated group increases from t-1 to t+1 then slightly drops at t+2 after JVs switching to DOMs. However, compared to the matched continuing JVs, there is no significant improvement in profitability of the converted JV-to-DOMs after conversion since the control group also experiences the same trend in ROA (see figure 4.7). Hence, none of ATTs in terms of ROA are statistically significant. Similarly, we also observe no significant changes in leverage ratio, sales, employment, average wage (table 4.9 and 4.10) in the converted JV-to-DOMs after conversion compared to the matched continuing JVs. However, there is some evidence that the converted JVs has invested more on fixed assets after conversion. The mean of ln(fixed assets) in these JVs-turning-DOMs has changed from 6.365 at year t-1 to 6.607 at year t (which equivalent to 28 percent increase in the value of firm fixed assets). The ATT in terms of ln(fixed assets) is strongly significant at t+2 and equals 0.494, which suggests that fixed assets have grown by 49.4 percent faster in JVs switching to DOMs

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[83] This treated case has a propensity score much higher than the maximum propensity score of the controls.

[84] The default standard errors in *psmatch2* are basically the sample standard errors and these t-tests are simply the t-test of equal mean of two independent samples using sample standard errors.

[85] It should be noted that the results in *teffects psmatch* will, therefore, be slightly different from those of *psmatch2*. It is due to the fact that *teffects* runs the first-step probit model predicting treatment on a sample without the treated case being off-support (we simply drop it before running *teffects*) while *psmatch2* runs the first-step probit model on the full sample.

relative to continuing JVs by two year after conversion (t+2). In general, it is suggested that the local owner has invested more on fixed assets after buying out a JV. However, the conversion of a JV to a DOM simply brings no effect in terms of financial profitability for the firm.

[Figure 4.7 about here]

[Table 4.8, 4.9, and 4.0 about here]

4.5 Conclusion

This study uses a difference-in-differences (DiD) combined with propensity score matching to explore performance and strategic implications of the conversion of JVs to either WOSs or DOMs in Vietnam. For the case when JVs turning to WOSs, there is evidence that these JVs experience a temporary negative shock in ROA in periods right before conversion. After carefully controlling for this Ashenfelter's dip in financial performance before conversion and matching the converted WOSs with selected comparable continuing JVs, we do not find any persistent improvement in terms of financial profitability of the converted JV-to-WOSs compared to the matched continuing JVs in Vietnam. Besides, we also find some evidence of restructuring/adjustment in the converted WOSs in the first few years after conversion. Specifically, the converted WOSs have reduced their leverage levels and gradually improved fixed assets. Moreover, they have also slightly increased their employment scale and reduced the average wage bill per employee at the time of conversion.

For the case of JVs turning to DOMs, results suggested that the local owner has invested more on fixed assets after buying out a JV. There is an increasing trend in ROA of the converted DOMs from before to after conversion. However, there is no significant improvement in profitability of the converted JV-to-DOMs after conversion since the comparable continuing JVs also experience the same trend in ROA. Among other results, we also observe no significant changes in leverage ratio, sales, employment, average wage of the converted domestic firms.

Our study, hence, makes a contribution to the literatures on relative performance of foreign entry modes and joint venture evolution. It first implies that Chang et al. (2013)'s finding about the persistent improvement of converted WOSs compared to continuing JVs are only specific to the context of China. There used to be prior restricting requirement that foreign entry was only allowed through the form of JVs in China. After this country started permitting the presence of WOSs in 2001, some of these JVs now can convert into WOSs and enjoy persistent

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improvement with this preferred entry mode – the one that they would have been chosen had they been free to choose when entering China (Chang et al., 2013). In the case of Vietnam where freedom in entry mode choice is afforded by Vietnamese legislation, most foreign companies already entered the market with their preferred ownership structure and partnership type (i.e. WOSs or JVs). Indeed, evidence shows that the converted JVs in Vietnam tend to be the ones having temporary negative shock in financial profitability (ROA). Hence, after controlling for this Ashenfelter's dip in ROA, there is no evidence of persistent difference in performance observed between converted JV-to-WOSs and comparable continuing JVs and no superiority of WOSs as an organization mode in compared to JVs has been confirmed. Our study also contributes to the literature of joint venture evolution by exploring the consequences of the conversion of JVs to fully domestic firms (DOMs), a rather under-explored phenomenon. We find that the conversion of a JV to a DOM simply brings no effect in terms of financial profitability for the firm in Vietnam.

This study is not without limitations. In this study, we treat the conversions of JVs to either WOSs or DOMs separately as if they are independent, which is a crucial assumption in our analysis. One potential issue of concern is that the choice of switching from JVs to WOSs could not be independent from that of switching from JVs to DOMs[86]. It means that we may need to consider two treatments: JVs to WOSs and JVs to DOMs together. To address this issue, a bivariate probit model or a multinominal logit model could be employed to predict propensity scores. Besides matching converted JVs (to either WOSs or DOMs) with continuing JVs, we then can also match converted JV-to-WOSs against converted JV-to-DOMs, which is also really interesting. We leave this practice of matching with multiple treatments as a future research direction.

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[86] We would like to thank Marco Sanfillippo for pointing this out

Tables and figures

Table 4.1 Probit model: *JVs to WOSs*

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Size	-0.01	0.05	-0.22	0.82	-0.12	0.09
Age	-0.01	0.02	-0.48	0.63	-0.04	0.03
Average ROA	-1.19**	0.55	-2.16	0.03	-2.26	-0.11
Leverage Ratio	0.03	0.12	0.24	0.81	-0.21	0.27
Export status	-0.15	0.16	-0.98	0.33	-0.46	0.15
Fixed assets Ratio	1.13***	0.34	3.36	0.00	0.47	1.80
State Joint venture	-0.16	0.17	-0.91	0.36	-0.49	0.18
Foreign Ownership	1.39**	0.57	2.44	0.02	0.27	2.51
Pseudo-R2	0.17					
Chi-squared	95.75***					
N	1,702					

*Note: *** p<0.01, ** p<0.05, * p<0.1. Fixed effects for year, industry (2-digit), region are omitted to save space. All independent variables except Average ROA are lagged one period. Average ROA is the three-year average of lags of ROA from t-1 to t-3.*

Table 4.2 Balancing test: *JVs to WOSs*

		Mean			t-test	
	Sample	Treated	Control	%bias	t	p>|t|
Size	Unmatched	8.448	8.676	-14.1	-1.12	0.264
	Matched	8.448	8.710	-16.2	-0.84	0.401
Age	Unmatched	8.448	9.568	-25	-1.88	0.06
	Matched	8.448	8.493	-1	-0.06	0.95
Average ROA	Unmatched	-0.018	0.081	-56.3	-4.26	0
	Matched	-0.018	-0.018	0.1	0	0.996
Leverage Ratio	Unmatched	0.684	0.504	31.9	2.94	0.003
	Matched	0.684	0.704	-3.6	-0.18	0.86
Export status	Unmatched	0.463	0.470	-1.4	-0.11	0.91
	Matched	0.463	0.373	17.9	1.05	0.297
Fixed assets Ratio	Unmatched	0.429	0.362	23.9	1.97	0.049
	Matched	0.429	0.445	-5.8	-0.34	0.734
State Joint venture	Unmatched	0.522	0.646	-25.3	-2.08	0.038
	Matched	0.522	0.582	-12.2	-0.69	0.491
Foreign Ownership	Unmatched	0.686	0.618	49.1	3.88	0
	Matched	0.686	0.681	3.5	0.21	0.832

Note: All independent variables except Average ROA are lagged one period. Average ROA is the three-year average of lags of ROA from t-1 to t-3. %bias is the standardized difference (or standardized bias) calculated following the formula from Rosenbaum and Rubin (1985).

Table 4.3 Changes in performance (ROA) by conditional DiD of *JVs switching to WOSs*

A. Up to t+2

Year	t-1	t	t+1	t+2
		Outcome: ROA		
Mean outcome of Treatment group	-0.001	-0.032	0.057	0.050
Mean outcome of Control group	-0.020	0.001	-0.006	0.031
ATT[a]		*-0.052*	*0.045***	*0.001*
AI's S.E.[a]		*0.085*	*0.019*	*0.026*
# of match pairs: 67		Unmatched (off support): 0		

B. Up to t+3

Year	t-1	t	t+1	t+2	t+3
		Outcome: ROA			
Mean outcome of Treatment group	-0.006	-0.051	0.060	0.059	0.00
Mean outcome of Control group	-0.033	-0.030	-0.012	-0.035	0.05
ATT[a]		*-0.049***	*0.044*	*0.067*	*-0.08**
AI's S.E.[a]		*0.023*	*0.028*	*0.059*	*0.046*
# of match pairs: 52		Unmatched (off support): 0			

*Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the means of outcome by treatment group and control group observed at the given time.*
[a] ATT and its corresponding Abadie-Imbens' robust standard error (S.E.) are in italics. ATTs in terms of conditional DiD are calculated following formula (2). Given matched treatment and control groups, ATT_k will be: $ATT_k = \frac{1}{n}\sum \left(ROA_{t+k}^{treated} - ROA_{t-1}^{treated}\right) - \frac{1}{n}\sum \left(ROA_{t+k}^{control} - ROA_{t-1}^{control}\right)$ for k years after conversion (k=0, 1, 2, or 3).

Table 4.4 Changes in other strategic indicators of *JVs switching to WOSs*: Leverage Ratio, Sales, Fixed Assets

A. Leverage Ratio

Year	t-1	t	t+1	t+2
	Outcome: Leverage Ratio			
Mean outcome of Treatment group	0.684	0.766	0.687	0.647
Mean outcome of Control group	0.704	0.768	0.849	0.835
ATT[a]		*0.019*	*-0.141****	*-0.168*
AI's S.E.[a]		*0.026*	*0.051*	*0.115*
# of match pairs: 67	Unmatched (off support): 0			

B. Sales

Year	t-1	t	t+1	t+2
	Outcome: ln(Sales)			
Mean outcome of Treatment group	8.129	8.102	8.263	8.297
Mean outcome of Control group	8.134	8.145	8.167	8.063
ATT[a]		*-0.038*	*0.101*	*0.238*
AI's S.E.[a]		*0.118*	*0.097*	*0.146*
# of match pairs: 67	Unmatched (off support): 0			

C. Fixed assets

Year	t-1	t	t+1	t+2
	Outcome: ln(Fixed Assets)			
Mean outcome of Treatment group	7.195	7.112	7.063	7.033
Mean outcome of Control group	7.591	7.539	7.267	7.214
ATT[a]		*-0.030*	*0.193*	*0.215**
AI's S.E.[a]		*0.103*	*0.142*	*0.115*
# of match pairs: 65	Unmatched (off support): 0			

Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.
[a]*ATT and its corresponding Abadie-Imbens' robust standard error (S.E.) are in italics.*

Table 4.5 Changes in other strategic indicators of *JVs to WOSs* (cont'): Employment, Average Wage per employee

A. Employment

Year	t-1	t	t+1	t+2
		Outcome: ln(Employment)		
Mean outcome of Treatment group	4.833	4.916	4.949	4.938
Mean outcome of Control group	4.745	4.769	4.781	4.770
ATT[a]		*0.058****	*0.080*	*0.080*
AI's S.E.[a]		*0.013*	*0.052*	*0.096*
# of match pairs: 67		Unmatched (off support): 0		

B. Average wage per employee

Year	t-1	t	t+1	t+2
		Outcome: ln(Average wage per employee)		
Mean outcome of Treatment group	1.127	1.078	1.157	1.217
Mean outcome of Control group	1.324	1.403	1.397	1.350
ATT[a]		*-0.127****	*-0.043*	*0.064*
AI's S.E.[a]		*0.047*	*0.082*	*0.089*
# of match pairs: 67		Unmatched (off support): 0		

Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.
[a]*ATT and its corresponding Abadie-Imbens' robust standard error(S.E.) are in italics.*

Table 4.6 Probit model: *JVs to DOMs*

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Size	0.76**	0.38	1.98	0.05	0.01	1.51
Size^2	-0.05**	0.02	-2.15	0.03	-0.10	0.00
Age	0.01	0.02	0.54	0.59	-0.02	0.04
ROA	-0.22	0.26	-0.86	0.39	-0.74	0.29
Leverage Ratio	-0.25	0.21	-1.18	0.24	-0.67	0.17
Export status	0.00	0.17	0.00	1.00	-0.32	0.32
Fixed assets Ratio	0.06	0.30	0.19	0.85	-0.53	0.65
State Joint venture	-0.10	0.17	-0.58	0.57	-0.43	0.23
Foreign Ownership	-0.87**	0.40	-2.20	0.03	-1.65	-0.09
Pseudo-R2	0.15					
Chi-squared	75.47**					
N	2,846					

Note: *** p<0.01, ** p<0.05, * p<0.1. Fixed effects for year, industry (2-digit), region are omitted to save space. All independent variables are lagged one period.

Table 4.7 Balancing test: *JVs to DOMs*

		Mean			t-test	
	Sample	Treated	Control	%bias	t	p>|t|
Size	Unmatched	7.915	8.495	-34.9	-2.26	0.024
	Matched	7.915	8.113	-11.9	-0.65	0.516
Age	Unmatched	7.865	8.408	-10.3	-0.76	0.449
	Matched	7.843	7.000	16	0.84	0.402
ROA	Unmatched	0.026	0.053	-12.9	-0.72	0.472
	Matched	0.025	0.023	1.1	0.09	0.926
Leverage Ratio	Unmatched	0.411	0.484	-20.9	-1.31	0.192
	Matched	0.409	0.391	5.1	0.3	0.768
Export status	Unmatched	0.365	0.320	9.5	0.69	0.491
	Matched	0.373	0.412	-8.2	-0.4	0.689
Fixed assets Ratio	Unmatched	0.369	0.398	-9.6	-0.68	0.495
	Matched	0.375	0.376	-0.3	-0.02	0.986
State Joint venture	Unmatched	0.481	0.602	-24.5	-1.77	0.076
	Matched	0.490	0.471	3.9	0.2	0.845
Foreign Ownership	Unmatched	0.544	0.605	-34.4	-2.73	0.006
	Matched	0.546	0.567	-11.9	-0.61	0.541

Note: All independent variables are lagged one period. %bias is the standardized difference (or standardized bias) calculated following the formula from Rosenbaum and Rubin (1985).

Table 4.8 Changes in performance (ROA) by conditional DiD of *JVs switching to DOMs*

Year	t-1	t	t+1	t+2
	Outcome: ROA			
Mean outcome of Treatment group	0.025	0.051	0.100	0.081
Mean outcome of Control group	0.023	0.073	0.062	0.067
ATT[a]		*-0.025*	*0.036*	*0.012*
S.E.[a]		*0.036*	*0.041*	*0.033*
# of match pairs: 51	Unmatched (off support): 1			

Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.
 [a]ATT and its standard error (S.E.) are in italics. S.E. does not take into account that the propensity score is estimated. They are obtained by running psmatch2 to perform one-to-one PSM with replacement and with common support restriction.

Table 4.9 Changes in other strategic indicators of *JVs switching to DOMs*: Leverage Ratio, Sales, Fixed Assets

A. Leverage Ratio

Year	t-1	t	t+1	t+2
		Outcome: Leverage Ratio		
Mean outcome of Treatment group	0.409	0.419	0.411	0.447
Mean outcome of Control group	0.391	0.426	0.402	0.397
ATT		*-0.024*	*-0.009*	*0.033*
S.E.		*0.049*	*0.054*	*0.061*
# of match pairs: 51		Unmatched (off support): 1		

*Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.*
ªATT and its standard error (S.E.) are in italics. S.E. does not take into account that the propensity score is estimated. They are obtained by running psmatch2 to perform one-to-one PSM with replacement and with common support restriction.

B. Sales

Year	t-1	t	t+1	t+2
		Outcome: ln(Sales)		
Mean outcome of Treatment group	7.605	7.594	7.819	7.712
Mean outcome of Control group	7.394	7.538	7.619	7.657
ATT[b]		*-0.155*	*-0.012*	*-0.156*
AI's S.E[b]		*0.220*	*0.213*	*0.280*
# of match pairs: 45		Unmatched (off support): 0		

*Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.*
ᵇATT and its corresponding Abadie-Imbens' robust standard error (S.E.) are in italics.

C. Fixed assets

Year	t-1	t	t+1	t+2
		Outcome: ln(Fixed Assets)		
Mean outcome of Treatment group	6.365	6.607	6.396	6.425
Mean outcome of Control group	6.400	6.317	6.250	5.967
ATT[b]		*0.325*	*0.180*	*0.494******
AI's S.E[b]		*0.264*	*0.182*	*0.083*
# of match pairs: 50		Unmatched (off support): 0		

*Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.*
ᵇATT and its corresponding Abadie-Imbens' robust standard error (S.E.) are in italics.

Table 4.10 Changes in other strategic indicators of *JVs switching to DOMs* (cont'):
Employment, Average Wage per employee

A. Employment

Year	t-1	t	t+1	t+2
		Outcome: ln(Employment)		
Mean outcome of Treatment group	4.399	4.518	4.608	4.567
Mean outcome of Control group	4.232	4.437	4.447	4.446
ATT[a]		*-0.087*	*-0.006*	*-0.046*
S.E[a]		*0.118*	*0.137*	*0.151*
# of match pairs: 51		Unmatched (off support): 1		

B. Average wage per employee

Year	t-1	t	t+1	t+2
	Outcome: ln(Average wage per employee)			
Mean outcome of Treatment group	0.942	0.900	0.894	0.947
Mean outcome of Control group	1.204	1.244	1.185	1.278
ATT[a]		*-0.082*	*-0.029*	*-0.069*
S.E[a]		*0.121*	*0.137*	*0.121*
# of match pairs: 51		Unmatched (off support): 1		

*Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time.*
[a]*ATT and its standard error (S.E.) are in italics. S.E. does not take into account that the propensity score is estimated. They are obtained by running psmatch2 to perform one-to-one PSM with replacement and with common support restriction.*

Figure 4.1 Matrix of post-formation transformation of entry modes

Transformation matrix		Transformation after entry	
		WOSs	**JVs**
Entry Mode	**WOSs**	Continuing WOSs	WOSs convert to JVs
	JVs	JVs convert to WOSs	Continuing JVs

Figure 4.2 Theoretical framework on the confounding factors that influence both switching decision of JVs and their performance
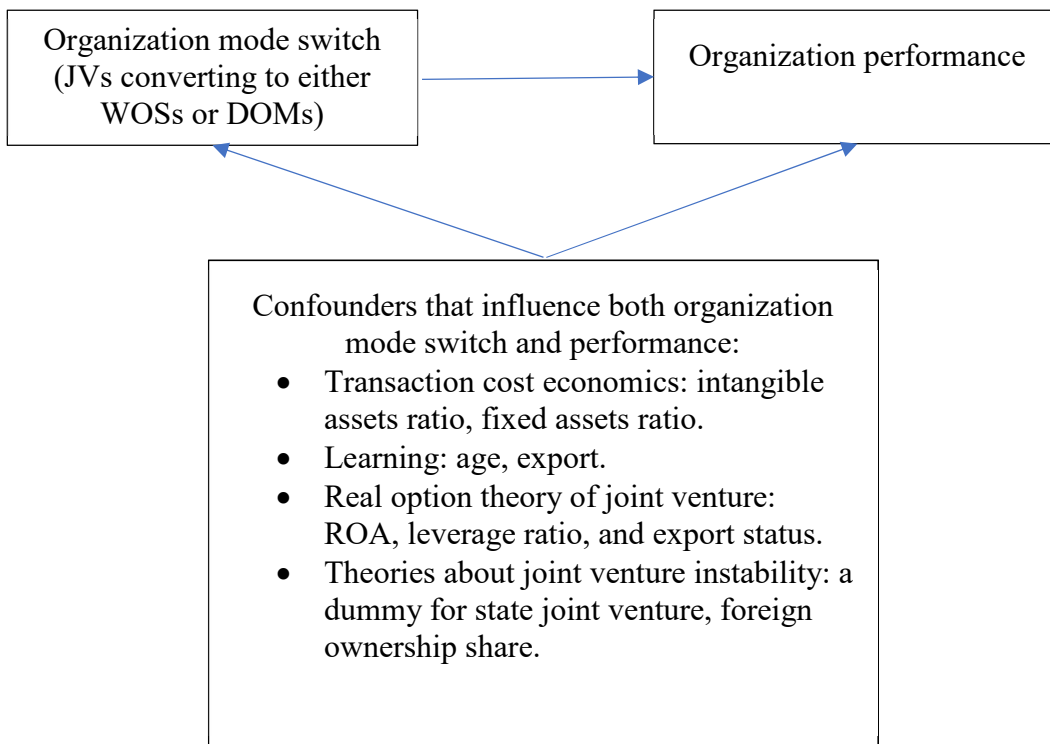
Figure 4.3 Evidence of Ashenfelter's dip (i.e. shocks in performance before switching) in treated group
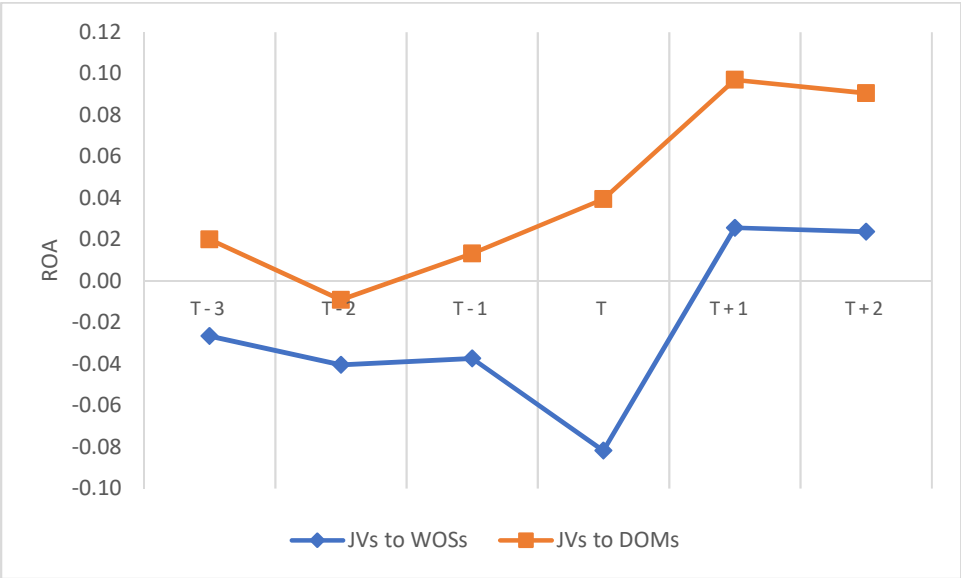
Figure 4.4 Propensity scores for treated and controls before and after match: *JVs to WOSs*

psmatch2: Propensity Score

Unmatched

Matched
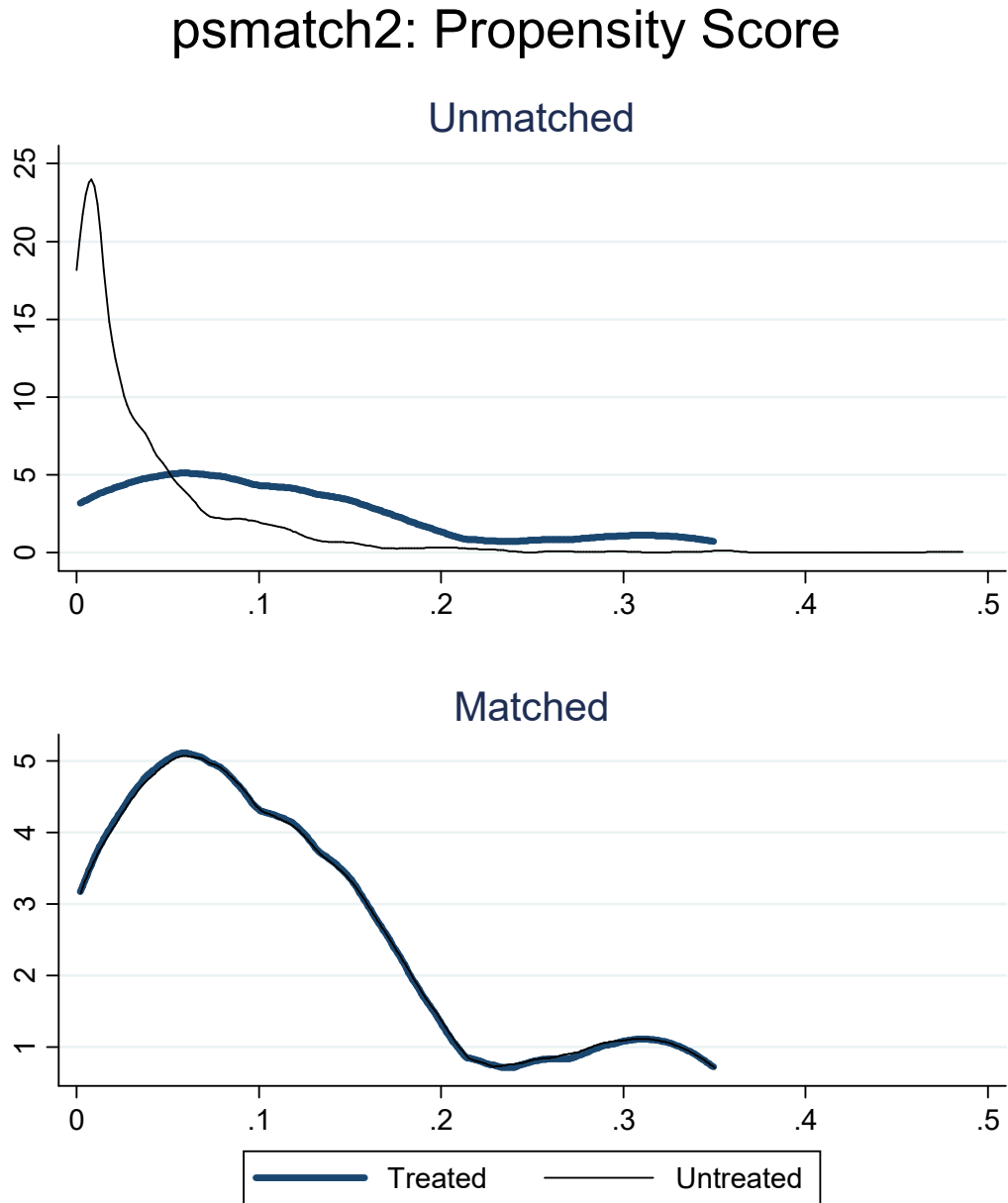
Treated   Untreated

Figure 4.5 Comparison of means of ROA by matched treated (JVs to WOSs) and control groups up to t+3
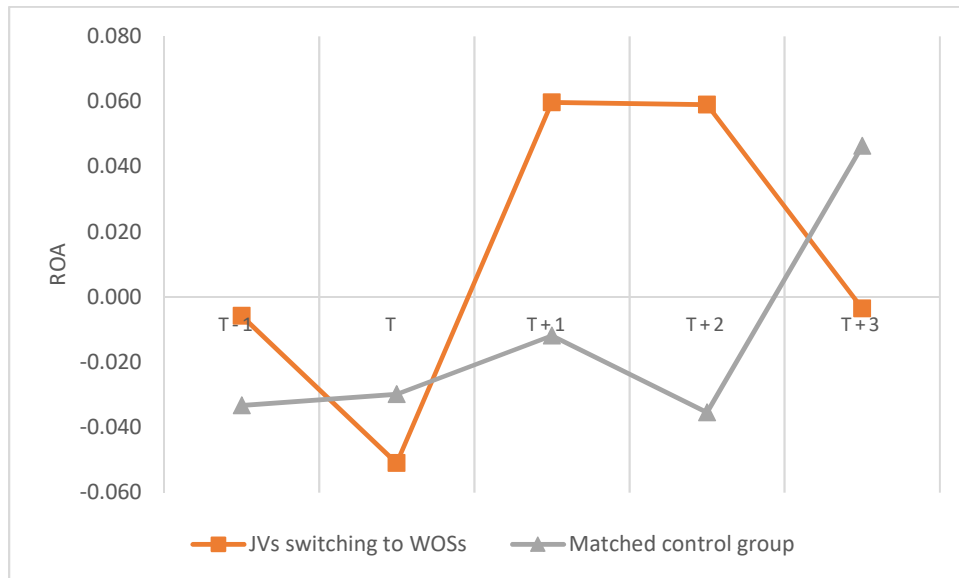
Figure 4.6 Propensity scores for treated and controls before and after match: *JVs to DOMs*
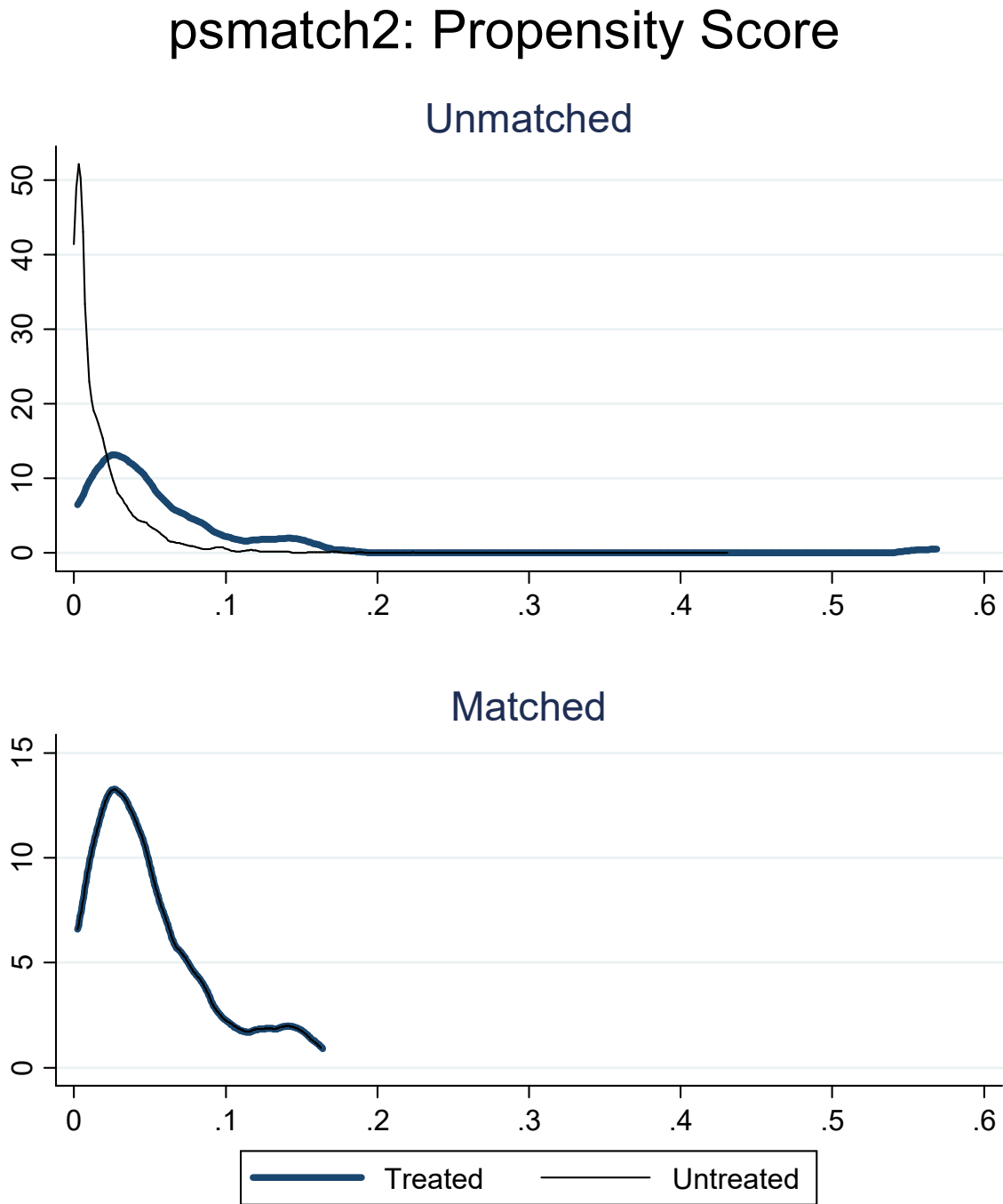
Figure 4.7 Comparison of means of ROA by JV-to-DOMs and matched control groups up to t+2
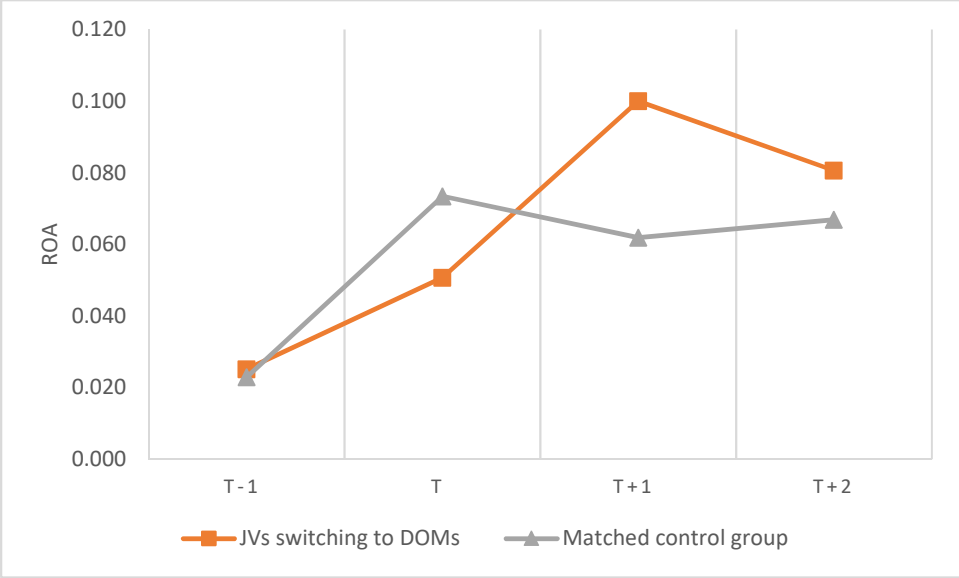
Appendixes

A4.1 Data cleaning procedures

We consider only foreign firms who are joint ventures at the time they first appear in our dataset. They include both the firms who are continuing joint ventures to their last appearance in the dataset and the ones who later convert. Like Arnold and Javorcik (2009) and Chang et al. (2013), we also restrict our sample to firms with at least five consecutive years of observations. Firms need to remain in the dataset sufficiently long as we need compare changes in firm performance and other strategic indicators at least two years after conversion (t+1 and t+2) to the year before conversion (t-1). We identify the conversion of a JV when its registration type changes from JVs to either WOSs or DOMs (Please cross-reference to section 4.3.2). The registration system includes three types: domestic firms (DOMs), foreign joint ventures (JVs) and wholly-owned subsidiaries(WOSs), which reflects ownership classification of firms. We also drop JVs who change their registration type more than two times as they potentially involve errors in coding.

To increase the precision of our matching practice, we further apply two slight different data cleaning procedures to derive two matching samples (i) between JVs switching to WOSs and continuing JVs and (ii) between JVs switching to DOMs and continuing JVs.

For the matching sample between JVs switching to WOSs and continuing JVs, we drop:

- Observations with illogical data and extreme outliers. They are
    - the ones with negative total assets or fixed assets and the ones which fixed assets are greater than total assets,
    - the ones with return on assets (ROA) above 20 or less than -20,
    - the ones with leverage ratio (total debt over total assets) greater than 20 or less than 0.
- Any JVs with foreign ownership share which are equal or greater than 90% (as these JVs lie near the borderline of classification between JVs and WOSs; hence, loosely speaking they could be considered as WOSs). A subset of these JVs which are the ones whose foreign ownership share in the JV changes from any level of above 90% to 100% also not being considered as a JV-to-WOS switch and being dropped.

- Any observations of JVs in any two-digit VSIC sectors in which there is no conversion of JVs to WOSs occurring during the study period

- Observations of JVs who later convert to DOMs since here we only consider the conversion from JVs to WOSs.

- Observations of converted JVs *after their switching to WOSs* to prevent these observations of the now-being-WOSs from being used as controls.

For the matching sample between JVs switching to DOMs and continuing JVs, we drop:

- Observations with illogical data and extreme outliers. They are
    - the ones with negative total assets or fixed assets and the ones which fixed assets are greater than total assets,
    - the ones with return on assets (ROA) above 10 or less than -10.
    - the ones with leverage ratio (total debt over total assets) greater than 10 or less than 0.

- Any observations of JVs in any two-digit VSIC sectors in which there is no conversion of JVs to DOMs occurring during the study period.

- Observations of JVs who later convert to WOSs as here we only consider the conversion from JVs to DOMs.

- Observations of converted JVs *after their switching to DOMs* to prevent these observations of the now-being-DOMs from being used as controls. Indeed, these observations are automatically dropped out of the sample since they have no information on foreign ownership share to perform matching. Only when a firm is a foreign invested firm (i.e. WOSs or JVs) that we have information on foreign ownership share; for fully domestic firms, this information is missing.

A4.2 Description of switching cases

	Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Of all years
JVs to WOSs	*Total*	10	2	9	11	8	17	17	11	13	14	16	23	151
	Matched	-	-	4	9	5	12	10	8	9	10	-	-	67
	UnMatched (Off-support)	-	-	0	0	0	0	0	0	0	0	-	-	0
	UnMatched (missing covariates/ not enough observations)	-	-	5	2	3	5	7	3	4	4	-	-	45
JVs to DOMs	*Total*	6	3	1	1	4	5	13	15	14	14	14	13	103
	Matched	3	0	1	0	3	1	11	9	12	11	-	-	51
	UnMatched (Off-support)	0	0	0	0	0	0	1	0	0	0	-	-	1
	UnMatched (missing covariates/ not enough observations)	3	3	0	1	1	4	1	6	2	3	-	-	24

***A4.3 Probit models predicting JVs switching to WOSs with intangible assets ratio among predictors (2007-2012)***

| VARIABLES	Model		
	1	2	3
Size	0.39*	0.38*	0.40*
	(0.21)	(0.21)	(0.21)
Size^2	-0.02*	-0.02*	-0.02*
	(0.01)	(0.01)	(0.01)
Age	-0.06***	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)
ROA	-0.03	0.03	0.02
	(0.20)	(0.20)	(0.21)
Leverage ratio	0.15***	0.15***	0.14***
	(0.05)	(0.05)	(0.05)
Export status	-0.08	-0.06	-0.06
	(0.12)	(0.12)	(0.12)
Intangible assets ratio	-0.16		-0.78
	(0.81)		(0.92)
Fixed assets ratio		0.47**	0.53**
		(0.23)	(0.24)
State joint venture	0.15	0.12	0.14
	(0.14)	(0.14)	(0.14)
Foreign ownership	4.86***	4.97***	5.02***
	(1.58)	(1.60)	(1.61)
Foreign ownership^2	-3.76***	-3.88***	-3.91***
	(1.17)	(1.18)	(1.19)
Constant	-4.98***	-5.10***	-5.18***
	(1.21)	(1.22)	(1.23)
Observations	3,409	3,409	3,409
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1. Fixed effects for year, industry (2-digit), region are omitted to save space. All independent variables are lagged one period.

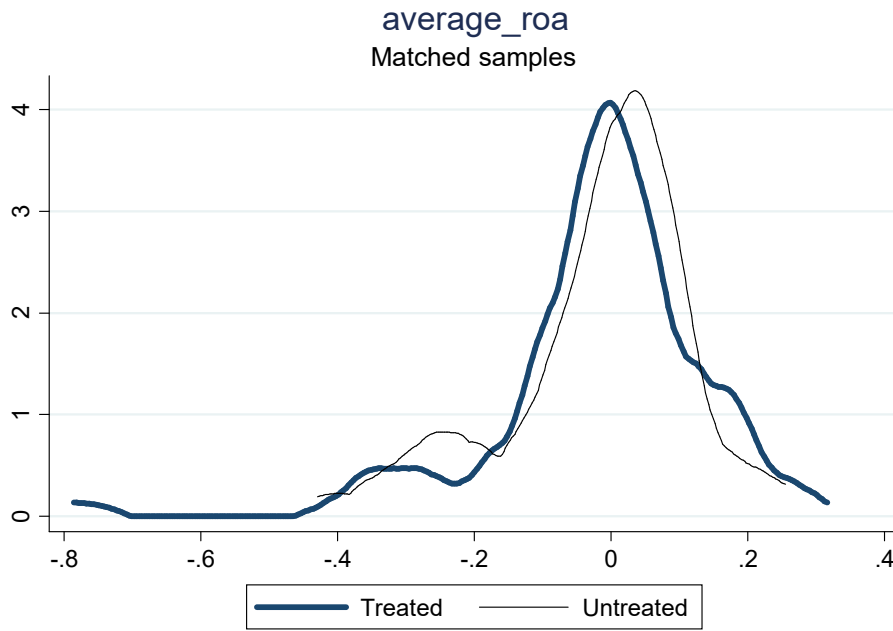## A4.4 Diagnosis of the balance after matching: JVs switching to WOSs

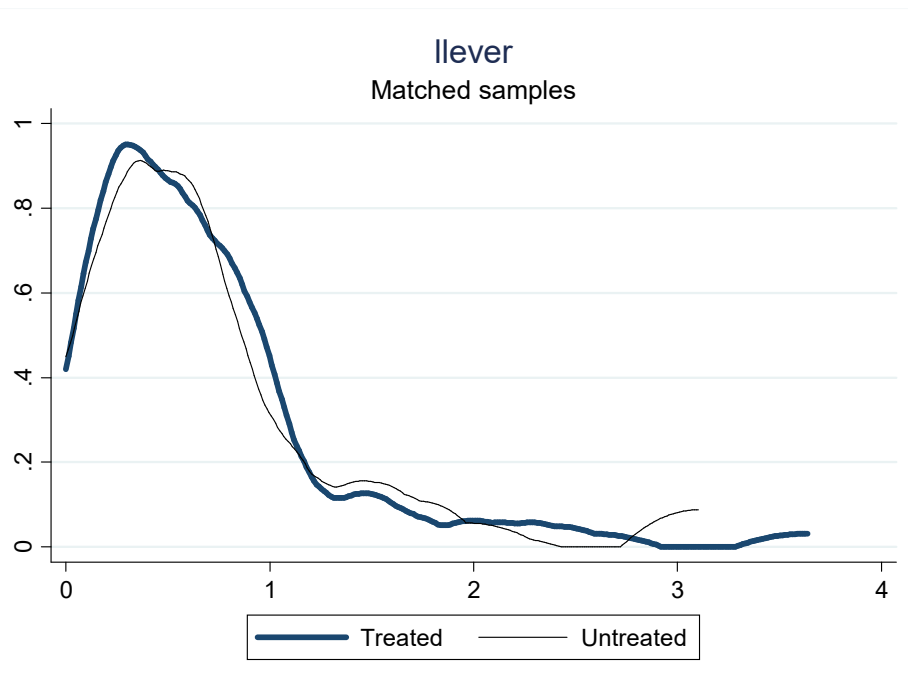**Figure 1** Kernel density distribution of *size* (ln(total assets)) at *t-1*
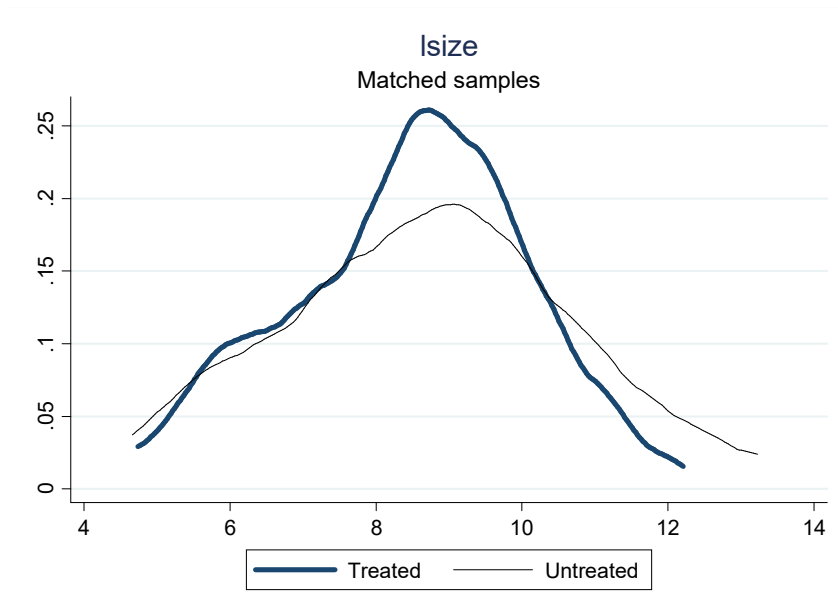
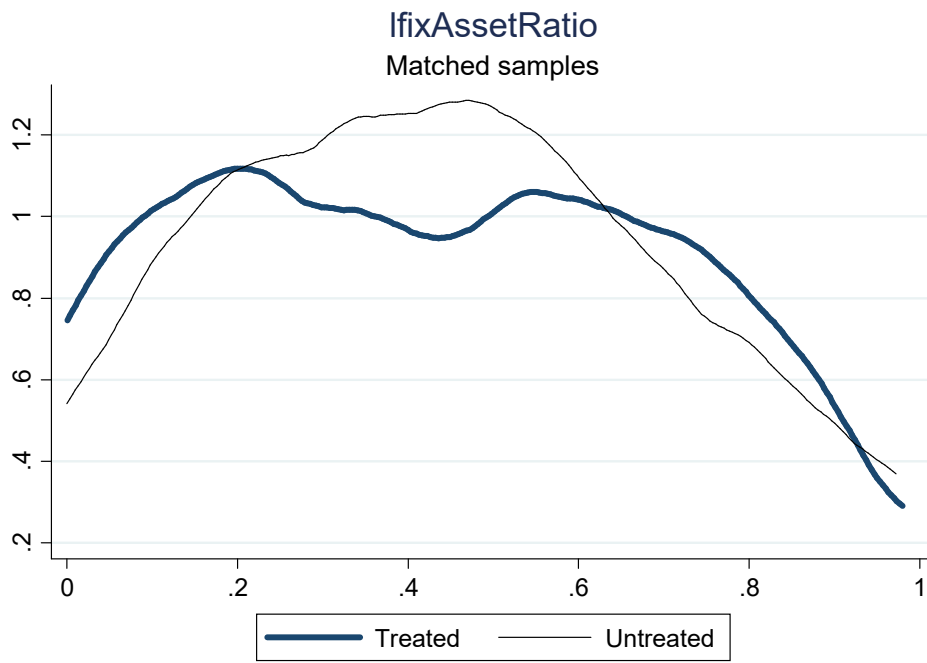

Figure 2 Kernel density distribution of *age* at *t-1*
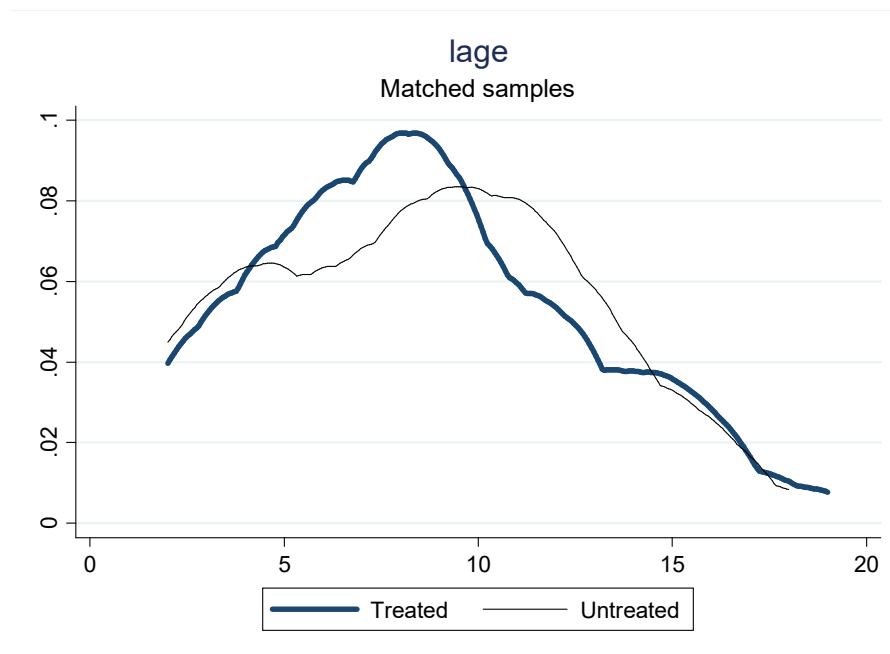
**Figure 3** Kernel density distribution of *average ROA* from *t-3* to *t-1*

average_roa
Matched samples

Figure 4 Kernel density distribution of *leverage ratio* at *t-1*

llever
Matched samples

Figure 5 Kernel density distribution of *fixed assets ratio* at *t-1*

IfixAssetRatio
Matched samples

Figure 6 Kernel density distribution of *foreign ownership share* at *t-1*
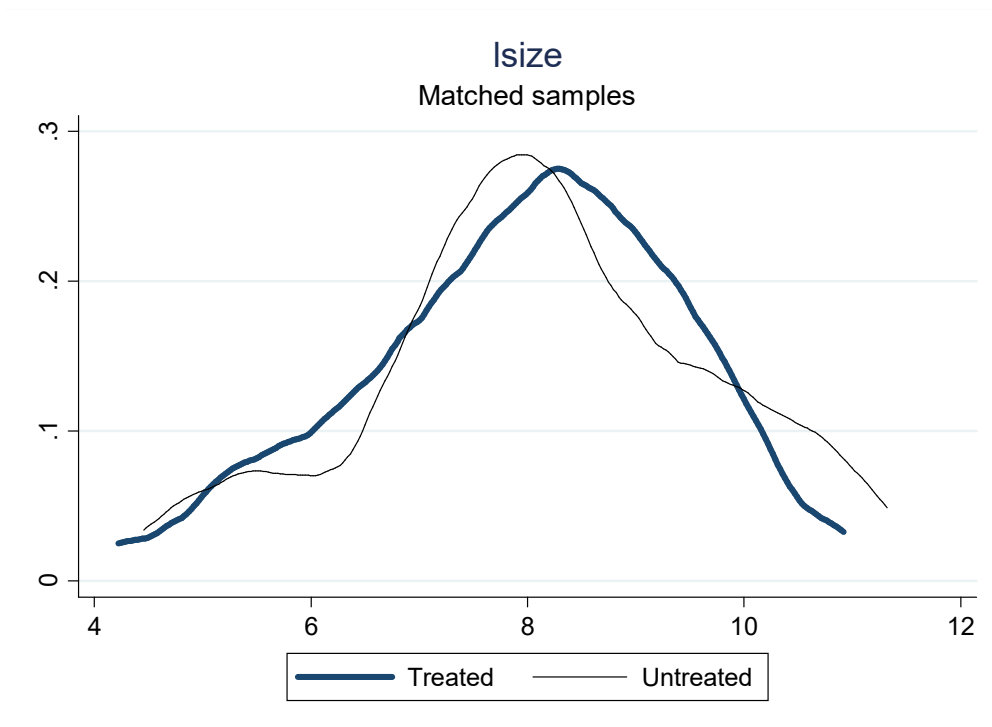

IforOwnershipImp
Matched samples
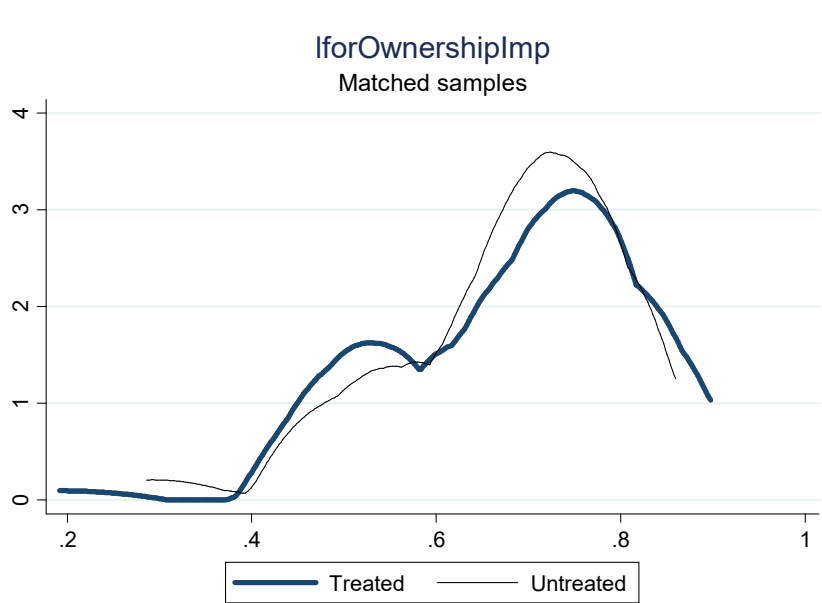
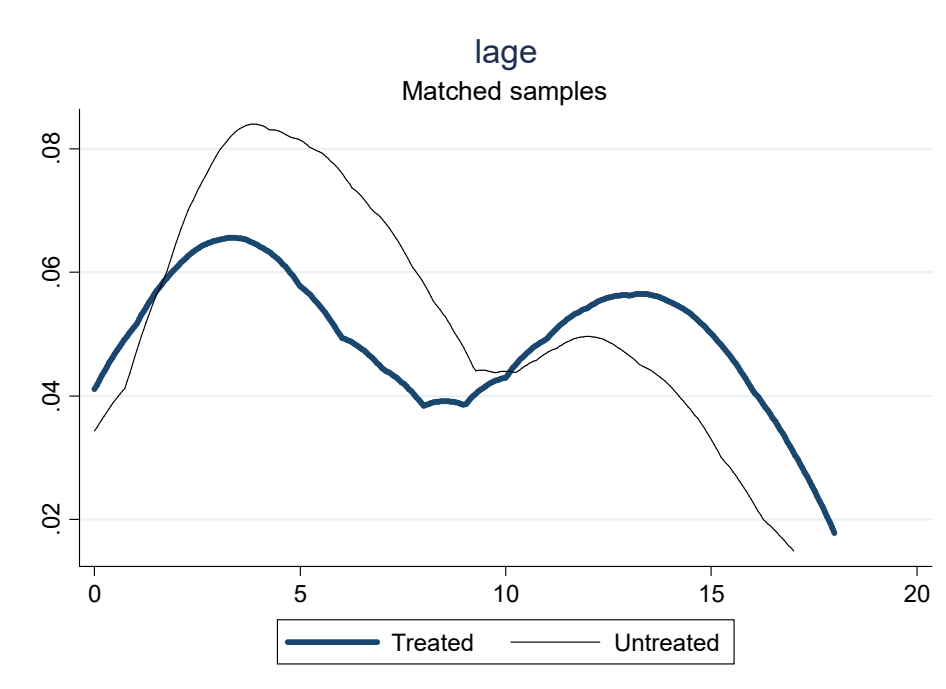*A4.5 Distribution of matched treated cases by region and sector: JVs switching to WOSs*

Sector (2-digit VSIC)	Sector Name	Greater Hanoi	North-ern Coast	Central High-land	South Central Coast	Greater HCM city	Mekong Delta	Total
10	Manufacture of food products	0	0	1	2	1	1	5
13	Manufacture of textiles	0	0	0	1	1	0	2
14	Manufacture of wearing apparel	2	0	0	0	1	0	3
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0	0	0	0	1	0	1
20	Manufacture of chemicals and chemical products	2	0	0	0	7	0	9
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	1	0	0	0	0	0	1
22	Manufacture of rubber and plastics products	3	0	0	0	4	0	7
23	Manufacture of other non metallic mineral products	3	0	0	0	3	0	6
25	Manufacture of fabricated metal products, except machinery and equipment	2	2	0	0	5	0	9
26	Manufacture of computer, electronic and optical products	0	0	0	0	1	0	1
27	Manufacture of electrical equipment	0	0	0	0	1	0	1
30	Manufacture of other transport equipment	1	0	0	0	1	0	2
31	Manufacture of furniture	0	1	0	0	0	0	1
32	Other manufacturing	1	0	0	0	0	1	2
35	Electricity, gas, steam and air conditioning supply	2	0	0	0	0	0	2
42	Civil engineering	0	0	0	0	1	0	1
43	Specialized construction activities	2	0	0	0	1	0	3
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	1	0	0	0	0	0	1
46	Wholesale trade, except of motor vehicles and motorcycles	1	0	0	0	0	0	1
52	Warehousing and support activities for transportation	0	0	0	0	2	0	2
55	Accommodation	1	0	1	1	1	1	5
65	Insurance, reinsurance and pension funding, except compulsory social security	1	0	0	0	1	0	2
	Total	23	3	2	4	32	3	67

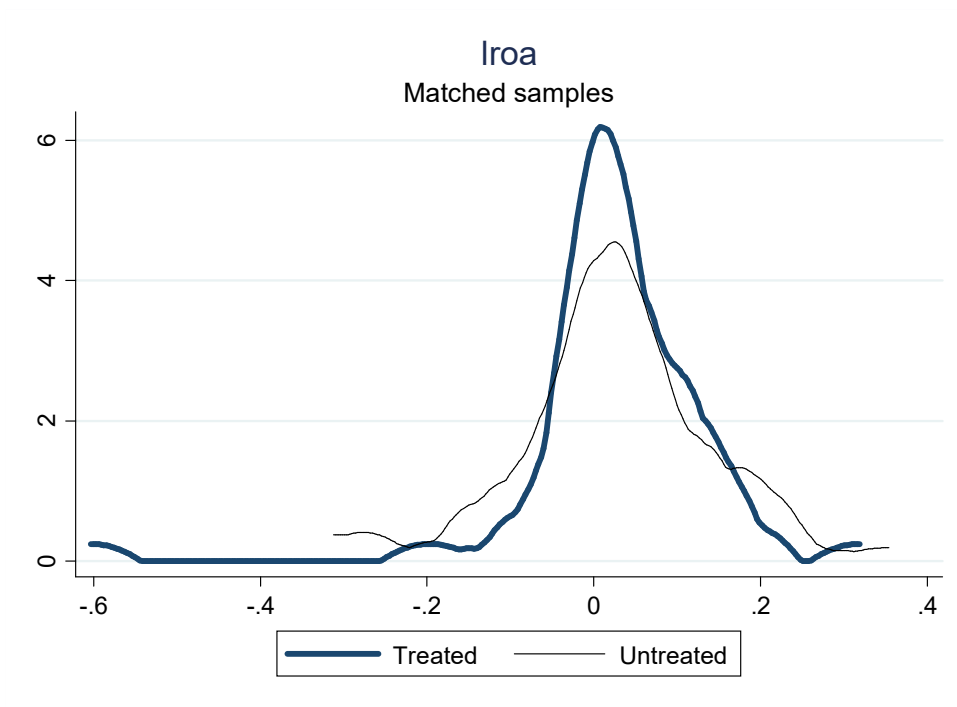### A4.6 Diagnosis of the balance after matching: JVs switching to DOMs

Figure 1 Kernel density distribution of *size* (ln(total assets)) at *t-1*
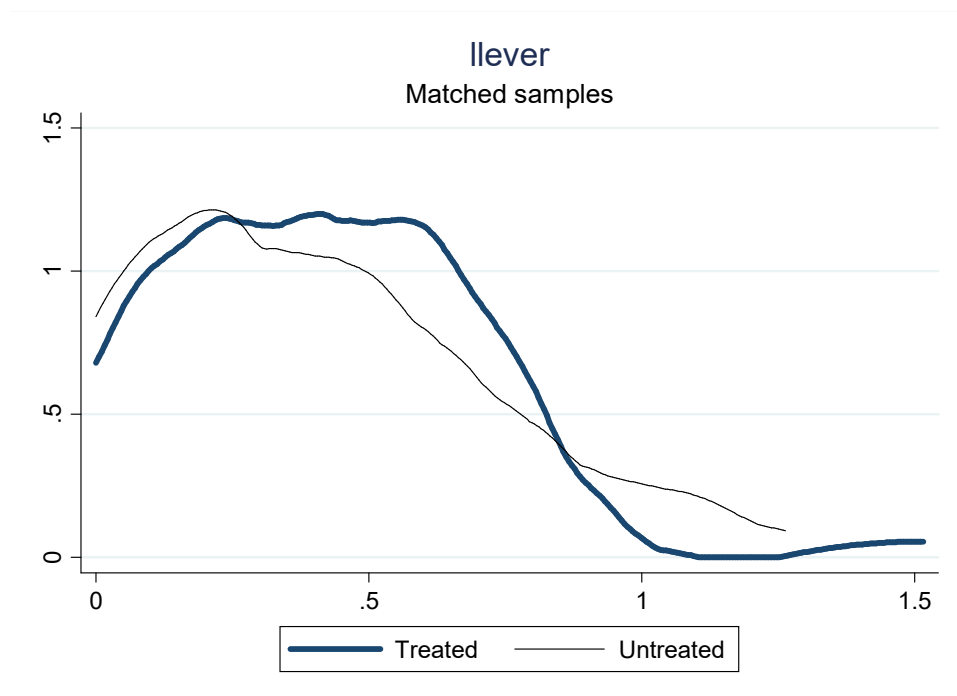

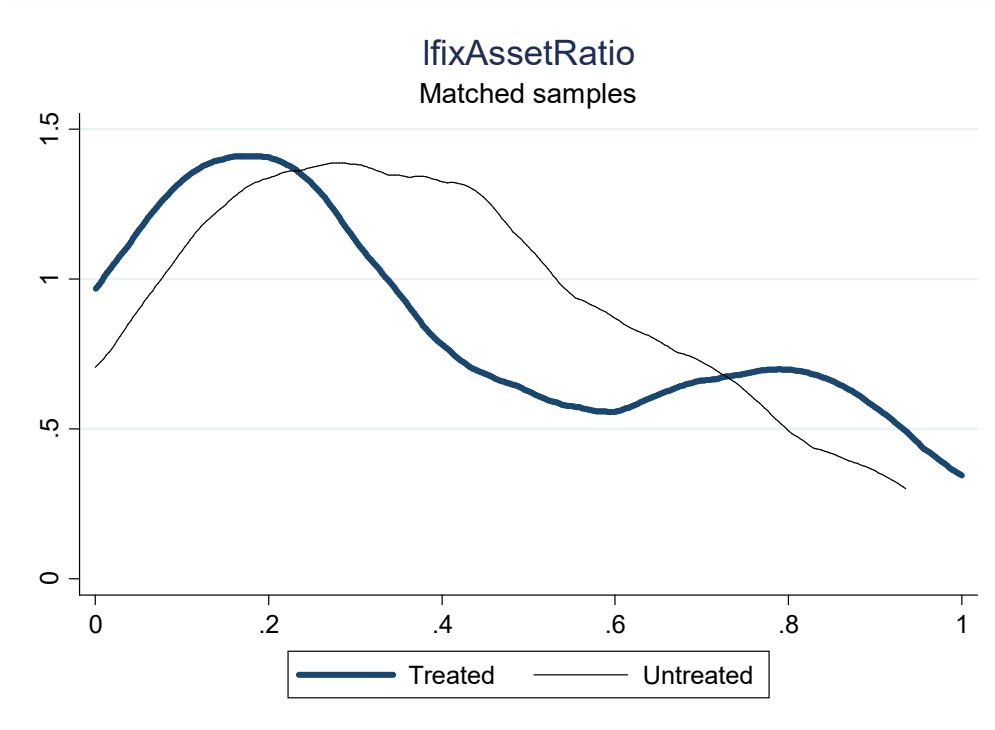**Figure 2** Kernel density distribution of *age* at *t-1*

Figure 3 Kernel density distribution of *ROA* at *t-1*

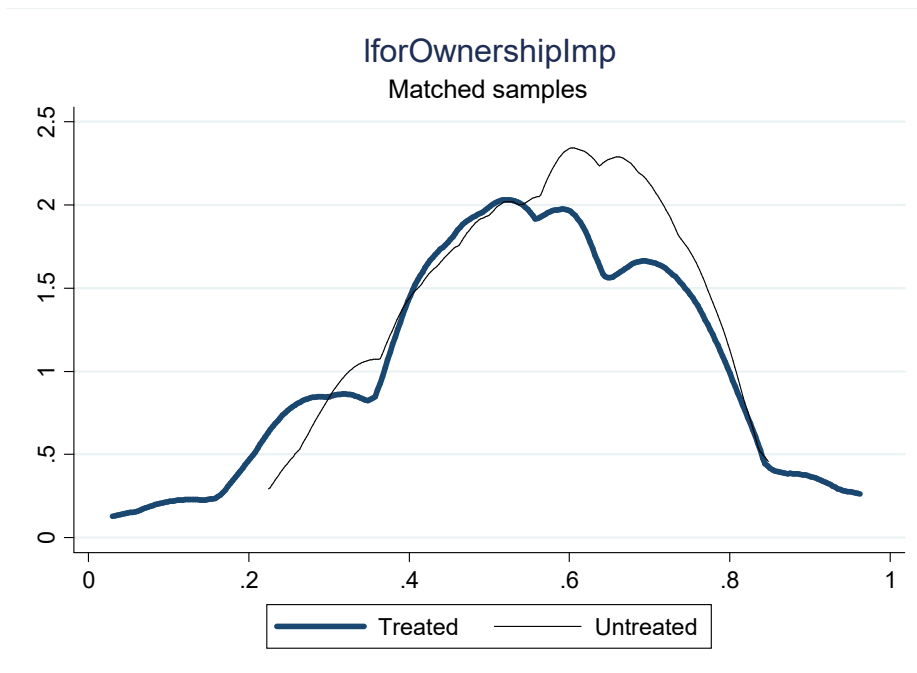

Figure 4 Kernel density distribution of leverage ratio at t-1

Figure 5 Kernel density distribution of *fixed assets ratio* at *t-1*

Figure 6 Kernel density distribution of *foreign ownership share* at *t-1*

A4.7 Distribution of matched treated cases by region and sector: JVs switching to DOMs

Sector (2-digit VSIC)	Sector Name	Greater Hanoi	North-ern Coast	North Central Coast	South Central Coast	Greater HCM	Mekong Delta	Total
10	Manufacture of food products	0	0	0	1	2	1	4
11	Manufacture of beverages	0	0	0	0	1	0	1
13	Manufacture of textiles	1	0	0	0	0	0	1
14	Manufacture of wearing apparel	1	0	0	0	2	0	3
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0	0	1	0	0	1	2
17	Manufacture of paper and paper products	1	0	0	0	0	0	1
18	Printing and reproduction of recorded media	0	1	0	0	0	0	1
20	Manufacture of chemicals and chemical products	0	0	0	0	1	0	1
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0	0	0	0	1	0	1
22	Manufacture of rubber and plastics products	0	0	0	0	3	0	3
23	Manufacture of other non metallic mineral products	2	0	0	0	2	0	4
25	Manufacture of fabricated metal products, except machinery and equipment	1	0	0	0	2	0	3
26	Manufacture of computer, electronic and optical products	1	0	0	0	0	0	1
27	Manufacture of electrical equipment	1	0	0	0	1	0	2
28	Manufacture of machinery and equipment n.e.c.	1	0	0	0	0	0	1
29	Manufacture of motor vehicles, trailers and semitrailers	1	0	0	0	0	0	1
31	Manufacture of furniture	1	0	0	0	1	0	2
32	Other manufacturing	0	1	0	0	0	0	1
41	Construction of buildings	0	0	0	0	1	0	1
42	Civil engineering	1	0	1	0	0	0	2
49	Land transport and transport via pipelines	0	0	0	0	0	1	1
52	Warehousing and support activities for transportation	0	0	0	0	1	0	1

Sector (2-digit VSIC)	Sector Name	Greater Hanoi	North-ern Coast	North Central Coast	South Central Coast	Greater HCM	Mekong Delta	Total
55	Accommodation	1	1	0	1	1	0	4
62	Computer programming, consultancy and related activities	1	0	0	0	0	0	1
65	Insurance, reinsurance and pension funding, except compulsory social security	2	0	0	0	0	0	2
68	Real estate activities	1	0	0	0	2	0	3
71	Architectural and engineering activities	0	0	0	0	1	0	1
93	Sports activities and amusement and recreation activities	1	0	0	0	1	0	2
Total		18	3	2	2	23	3	51

Appendix 4.8 Changes in performance and other strategic indicators by conditional DiD of JVs switching to DOMs (obtained by running *teffects psmatch* on a sample without the treated being off-support)

Year	t-1	t	t+1	t+2
		Outcome: ROA		
Mean outcome of Treatment group	0.025	0.051	0.100	0.081
Mean outcome of Control group	0.001	0.042	0.050	0.052
ATT[a]		*-0.015*	*0.026*	*0.004*
AI's S.E[a]		*0.040*	*0.041*	*0.042*
# of match pairs: 51		Unmatched (off support): 0		

Year	t-1	t	t+1	t+2
		Outcome: Leverage Ratio		
Mean outcome of Treatment group	0.409	0.419	0.411	0.447
Mean outcome of Control group	0.371	0.413	0.422	0.420
ATT[a]		*-0.031*	*-0.049***	*-0.010*
AI's S.E.[a]		*0.045*	*0.023*	*0.025*
# of match pairs: 51		Unmatched (off support): 0		

Year	t-1	t	t+1	t+2
		Outcome: ln(Employment)		
Mean outcome of Treatment group	4.399	4.518	4.608	4.567
Mean outcome of Control group	4.588	4.611	4.597	4.568
ATT[a]		*0.095*	*0.199**	*0.186*
AI's S.E.[a]		*0.092*	*0.112*	*0.133*
# of match pairs: 51		Unmatched (off support): 0		

Year	t-1	t	t+1	t+2
		Outcome: ln(Average wage per employee)		
Mean outcome of Treatment group	0.942	0.900	0.894	0.947
Mean outcome of Control group	0.993	1.126	1.166	1.184
ATT[a]		*-0.175*	*-0.221***	*-0.186**
AI's S.E.[a]		*0.121*	*0.080*	*0.101*
# of match pairs: 51		Unmatched (off support): 0		

*Note: *** p<0.01, ** p<0.05, * p<0.1. The first two lines present the mean of outcomes by treatment group and control group at the given time. [a]ATT and its corresponding Abadie-Imbens' robust standard error (S.E.) are in italics.*

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