



## Less than expected—The minor role of foreign firms in upgrading domestic suppliers—The case of Vietnam

Thi Xuan Thu Nguyen<sup>a,b</sup>, Javier Revilla Diez<sup>c,\*</sup>

<sup>a</sup> Diplomatic Academy of Vietnam, 69 Chua Lang, Hanoi, Viet Nam

<sup>b</sup> Thang Long University, Nghiem Xuan Yem, Hanoi, Viet Nam

<sup>c</sup> Geographisches Institut, Universität zu Köln, Albertus-Magnus-Platz, 50923 Köln, Germany

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### ABSTRACT

Vietnam is an important case for studying the impact of foreign firms' backward linkages on local firms' productivity. As an emerging economy Vietnam became the second most popular FDI destination after China in Pacific Asia since 2014. Our empirical analysis for Vietnam as a whole demonstrates a significant difference in the productivity growth between domestic suppliers who have a direct linkage with foreign firms and non-suppliers. This is also true for the Southeast Region (SE) with Ho-Chi-Minh City as economic center. However, in the Red River Delta (RRD), that difference is not statistically significant. Based on in-depth interviews with domestic suppliers, we reveal that in the RRD, effects of foreign firms on the productivity upgrading of domestic suppliers are indirect and limited while internal factors like absorptive capacity are more important for the productivity growth. These regional differences can be traced back to different regional specializations which still persist from the pre-reform era.

### 1. Introduction

Since the start of market-oriented economic reforms (Doi Moi) in 1986, the Vietnamese government has attempted to attract FDI through a series of laws, policies and instruments (UNIDO, 2011). As a consequence, the inward FDI into Vietnam has increased dramatically and by 2016 there had been 22594 FDI projects with a total investment volume of 12.600 million USD (gso.gov.vn). Remarkably, the capital inflow in 2015 was about 17 times higher than in 1995 (author's calculation based on Annual Report of General Statistic Office of Vietnam). The geographical distribution of FDI projects is highly concentrated in the Southeast region and the Red River Delta. In 2015, the Southeast (SE) and the RRD accounted for 45% and 27% respectively of FDI manufacturing employees in Vietnam (see more in Fig. 2). Undoubtedly, Vietnam became a very attractive location for FDI and thus the question arises about the impact of FDI on domestic firms' upgrading efforts.

Vietnam as many other developing and transition economies have given a high priority in their agenda to attract FDIs with the hope that inward FDIs directly or indirectly lead to economic growth and modernization of the economy. Particularly, FDIs could bring in new technology, new know-how and could help domestic firms to increase their productivity and competitiveness (Javorcik, 2004; Blömtrom and Kokko, 1998; Dunning and Lundan, 2008; Garcia et al., 2013). For

example, domestic manufacturers may imitate technology or recruit employees trained by foreign firms. Even competitive pressure caused by the presence of foreign firms could be seen as a motivation for domestic counterparts to introduce new technology and enhance their competences (Blomström and Kokko, 1998). However, in contrast to the belief on the positive spillover effect from FDIs, a range of empirical studies show a conflicting picture (Rodrik, 1999). Studies of Görg and Greenaway (2004) and Javorcik (2004) conclude that there is no strong evidence about a gross positive spillover effect from FDIs. Plausible reasons for the negative spillover effects from foreign firms could be the low absorptive capacity of domestic firms or the unwillingness of foreign firms to share know-how and technology.

Against this background, the aim of our paper is to examine to what extent the presence of foreign firms accelerates the productivity growth of domestic suppliers in Vietnam either driven by efficiency gains and/or technological progress. In line with most studies in the field, we take the total factor productivity (TFP) growth as a proxy for the process upgrading of firms. By applying the data envelopment analysis (DEA) methodology, we can decompose the TFP growth into efficiency change and technical progress. As such, it is possible to explore factors contributing to productivity changes (Färe et al., 1994). Additionally, different from most previous studies which rely on input-output matrices to measure interactions amongst sectors (Javorcik, 2004, Godart and Görg, 2013), the panel

\* Corresponding author at: Geographisches Institut, Universität zu Köln, Albertus-Magnus-Platz, 50923 Köln, Germany.

E-mail addresses: [xuanthu@dav.edu.vn](mailto:xuanthu@dav.edu.vn) (T.X.T. Nguyen), [j.revilladiez@uni-koeln.de](mailto:j.revilladiez@uni-koeln.de) (J.R. Diez).

structure of the used dataset derived from the Vietnamese Company Census enables us to identify individual firms as a supplier of foreign firms and compare their performance with non-suppliers. As our results show strong regional differences, in a second step, we conducted in-depth face-to-face interviews with domestic suppliers and foreign firms in order to explore why the impact from foreign firms on suppliers in the RRD is so limited. Apparently, despite having a common national governance regime, differences in their development trajectories which even can be traced back before Doi Moi, still persists influencing the absorptive capacity of the existing industrial fabric. Therefore, Vietnam provides an exemplary case study for analyzing the impact of FDI in different contextual settings within one country and thus adding value to existing studies which often neglect a regional perspective. Methodologically, we follow Blömtrom and Kokko (1998) as well as Ivarsson and Alvstam (2005) suggesting that a study on the relationship between business performance development of local firms and the presence of foreign firms requires both detailed qualitative and quantitative micro data in order to detect the processes through which such spillover effects occur.

Focusing on domestic suppliers, our paper assesses the TFP growth as a result of their business interaction with foreign firms. We provide answers to two main research questions:

- i Are domestic suppliers of foreign firms better off in terms of TFP growth than non-supplying domestic firms? If so, is this result valid throughout Vietnam or are there regional differences?
- ii What characteristics of domestic suppliers are conducive to productivity enhancement?

This paper looks first at the literature about the impacts of foreign firms on the productivity and upgrading of domestic suppliers. The next section introduces the applied methodology. Then we examine the empirical evidence of the comparison of TFP growth between suppliers and non-suppliers of foreign firms and analyze the competence of domestic suppliers in productivity upgrading. Our final section provides the conclusion and draws some implications for policy.

## 2. Foreign firms and productivity upgrading of domestic suppliers

FDI has long been considered a major vehicle for technological and managerial knowledge transfer to firms in developing countries (Dunning, 1993; Lall et al., 2003; Fu and Gong, 2011). These spillovers from foreign firms can lead to productivity growth in local firms (Fu and Gong, 2011; Javorcik, 2004). Spillovers occur through different channels. For example, local firms imitate the technology and acquire knowledge from foreign firms by being in close proximity to foreign

firms or being their suppliers and/or customers, or by hiring former MNE employees. Even if foreign firms invest in labor intensive sectors, they are able to attract better qualified workers and/or train their workers internally so that the workers are better qualified than the average worker. By hiring employees who have worked for foreign firms, domestic firms have a chance to inherit knowledge carried by these laborers and therefore could improve the firm productivity (Görg and Greenaway, 2004). Similarly, Berger and Revilla Diez (2008) and Poole (2013) argue that labor mobility from foreign firms to domestic firms could make knowledge and skills spread through the host economy. Former employees of foreign firms may also use the practical knowledge acquired to start up their own business (Berger and Revilla Diez, 2008). Additionally, the increasing competition caused by the presence of foreign firms force local firms to use existing technology and resources more efficiently or introduce new technology (Blömtrom and Kokko, 1998; Newman, 2000). The increased performance of domestic firms caused by the presence of foreign firms in the same sector is referred to as a horizontal spillover. The transfer to the domestic firms in other sectors than that of foreign firms is a vertical spillover which includes forward spillovers to buyers of foreign firms and backward spillovers to their domestic suppliers (Dunning and Lundan, 2008).

Amongst spillover channels, the backward spillover is likely to be most significant because while foreign firms are motivated to prevent knowledge leakage to their competitors, foreign firms may benefit when their suppliers enhance their productivity, achieve better delivery response, save costs, and improve product quality (Javorcik, 2004; Blalock and Simon, 2009). In other words, the backward linkage is more likely to lead to spillovers of expertise and know-how from foreign firms to domestic suppliers (Blomström and Kokko, 2001; Pavlinek and Zizalova, 2016). Motohasi and Yuan (2010) find spillovers through backward linkages in automobile and electricity industries in China while horizontal spillover does not exist in both industries. Blalock and Gertler (2009) point out that domestic suppliers who have a strong relationship with foreign firms are likely to access crucial information about products, processes, and international standards. In line with this argument, McDermott and Corredoira (2010) as well as Simona and Axèle (2012) suggest that the strong linkages between domestic firms and their MNE customers is particularly beneficial for their upgrading. The productivity spillovers through backward linkages could be created in the following cases (Meyer, 2004; Javorcik, 2004):

- i Foreign firms provide assistance in technology, training of employees, finance, management and organization, or purchasing raw material (see more in Fig. 1);

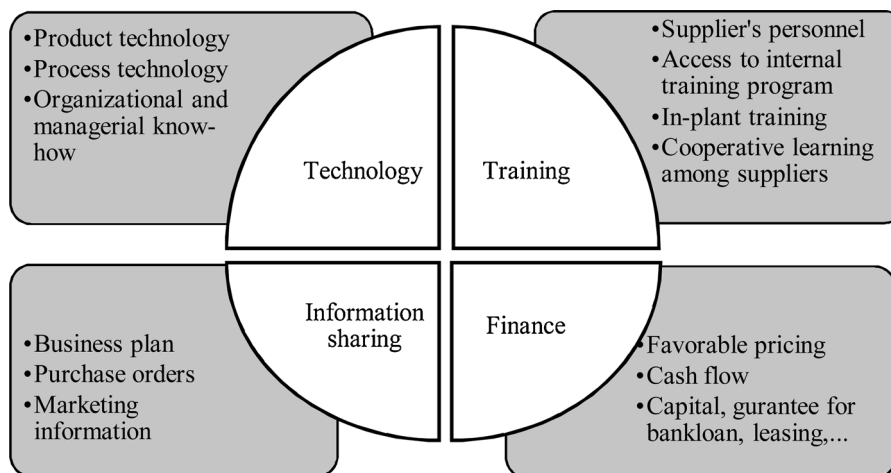


Fig. 1. Possible assistances provided by foreign firms to domestic suppliers. Source: UNCTAD, 2001: pp.142.

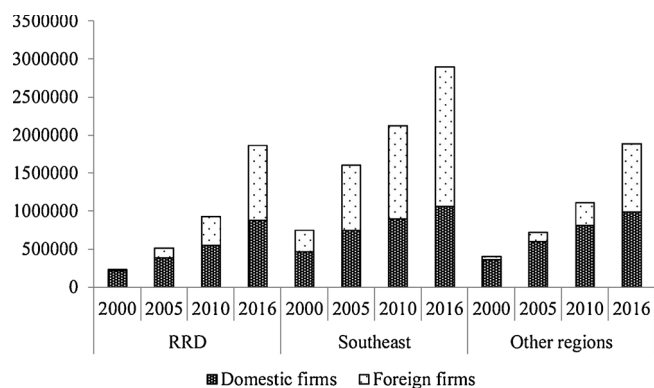


Fig. 2. Industrial employment development by regions in Vietnam 2000–2016. Source: Author's calculation based on VN-Census

- ii Foreign firms set demanding requirements on product quality and production processes which put pressure on local suppliers to improve the productivity;
- iii Higher demand on intermediate goods of foreign firms could lead supplier benefits from economies of scale.

Even though studies on impacts of foreign firms on host countries are plentiful, there is no consensus on the benefits and drawbacks that foreign firms bring to domestic firms' productivity (for reviews, Blomström and Kokko, 2003; Javorcik, 2004; Almfraji and Almsafir, 2014). Explanation on the apparent contradictions between empirical results also varies. According to Blomström and Kokko (2003) and Görg and Greenaway (2004), the technical development level as well as locational characteristics of the host region or country may matter for the occurrence of spillovers. Consequently, differences on the spillover effects of foreign firms among countries and regions should be expected (Blomström and Kokko, 2003). Concerning firm level, Pavlinek and Zizalova (2016) argue that whether linkages have positive or negative impacts on domestic firms depends on what Cohen and Levinthal (1989) called a firm's 'learning' or 'absorptive' capacity. Absorptive capacity is conceptualized by Cohen and Levinthal (1989, pp.569) as the ability of firms to 'identify, assimilate and exploit knowledge from the environment'. Blomström and Kokko (2003) conclude from the mixed finding of earlier studies that the motivation and capacity of domestic firms to absorb knowledge and skills are crucial to realize whether domestic firms are able to learn from foreign firms or not. Similarly, Fu and Gong (2010) discuss that spillovers do not take place automatically as they require an effective customer-supplier linkage, absorptive capacity and human capital in local firms. As such, absorptive capacity is considered to be crucial for effective technological learning and benefiting from foreign firms (Kim, 1999; Meyer, 2004; Berger and Revilla Diez, 2008). The study of the manufacturing sectors in Venezuela by Aitken and Harrison (1999) finds no evidence of positive spillovers from foreign firms due to the limitation on absorptive capacity of domestic firms. Liang (2017) explores the industrial linkages and firm capabilities in China. He reveals that knowledge transfers from foreign firms to local suppliers are more likely to increase the efficiency of firms with high absorptive capacity. Similarly, Zhang et al. (2010) prove that the extent to which domestic firms can utilize spillover effects from foreign firms depends on their absorptive capacity. According to Cohen and Levinthal (1989) absorptive capacity is strongly related to R&D capabilities of firms which are strengthened by R&D investment. For instance, Kathuria (2000) explores that spillovers in India depend largely on the investment level of firms on R&D activities and learning. Absorptive capacity is a multi-dimensional concept (Schmidt, 2008) in which its development is determined by various firms' characteristics such as the level of prior related knowledge, organizational factors, intensity of effort, and human capital (Kim, 1999; Cohen and Levinthal, 1990; van den Bosch et al., 2003; Berger

2007). Concerning the intensity of the effort, the capabilities of managers play a crucial role for devoting resources to R&D activities and absorptive capacity improvement (UNIDO, 2013).

### 3. Data and methodology

#### 3.1. Data

In order to address the formulated research questions, we apply a mixed method approach, combining quantitative and qualitative analysis. Firstly, this paper utilizes the Viet Nam Enterprise Census Surveys (VN-Census) from 2009 to 2016 which were conducted compulsorily and nationwide by GSO. This data covers detailed information at the micro level like type of ownership, business sector, location, level of employment, and business performance. Additionally, we also deploy the sub-survey of the VN-Census 2013 focusing on production technology. This sub-survey is conducted randomly for manufacturing firms. It provides information on whether firms supply to foreign firms. Therefore, we merge this data source to the panel VN-Census data to observe the business performance of domestic suppliers and non-suppliers of foreign firms over the studied period. After merging, we drop observations in the sub-survey which started or ended in the period from 2009 to 2016 because the estimation of the Malmquist Index using data envelopment analysis (DEA) requires a balanced dataset. The final dataset consists of 3416 firms of which 2790 are non-suppliers and 626 suppliers of foreign firms.

Even though VN-Census allows us to observe the business performance of firms and identify an individual firm as a supplier to foreign firms, it lacks detailed information about the collaboration between foreign firms and domestic suppliers as well as necessary characteristics of domestic suppliers in order to understand their absorptive capacity. Then after conducting our quantitative analysis, we recognized that while the presence of foreign firms accelerates the TFP growth of domestic suppliers in Vietnam as a whole and the Southeast, it is not the case in the RRD. Therefore, the RRD was chosen as an in-depth case study to understand the unexpected result. In addition to the quantitative analysis the paper draws on face-to-face interviews with 15 domestic suppliers of foreign firms, 3 foreign firms, and 1 training center in the RRD. We select domestic firms out of the sub-survey of VN-Census 2013 who are identified as suppliers of foreign firms. Interviews were held with business manager or owners of firms and lasted between one to two hours. The interviews cover the following issues: business performance, collaboration with foreign firms, technological capabilities, R&D investment, and training.

#### 3.2. Methodology

Our analysis is conducted through the following steps:

- i Firstly, we estimate the TFP growth using DEA which is a linear programming method and decompose it into technical progress and efficiency change;
- ii Then, we apply the propensity score matching method to compare the TFP growth and its decomposed components between domestic suppliers and non-suppliers of foreign firms;
- iii Finally, the in-depth interviews will be used to explore the extent of backward linkages and absorptive capacity of domestic suppliers in more detail (see chapter 5.2).

#### 3.3. Total factor productivity growth estimation using the Malmquist productivity Index

The Malmquist productivity index (MI) is one of the important indices for estimating the relative productivity change of observations over time. Following the methodology of Färe et al. (1994), we combine input and output information of observations for both time  $t$  and  $t + 1$

to specify whether the TFP change is driven by technical progress (Techch) or efficiency change (Effch). Apparently, an advantage of this TFP growth estimation compared to other TFP estimation method is that TFP growth could be decomposed into technical progress and efficiency change. Technical progress is caused by technological innovation, technology diffusion, and the introduction of new machines whilst the better management of production processes, resource allocation, and scale efficiency lead to efficiency change (UNIDO, 2013).

TFP growth is given by a geometric mean of two Malmquist productivity indices and estimated based on the ratios of distance functions of observation at time  $t$  and  $t + 1$ . Färe et al. (1994) specify the Malmquist TFP growth index as follow:

$$M_0(x^{t+1}, y^{t+1}, x^t, y^t) = \left[ \left( \frac{D_0^t(x_0^{t+1}, y_0^{t+1})}{D_0^t(x_0^t, y_0^t)} \right) \left( \frac{D_0^{t+1}(x_0^{t+1}, y_0^{t+1})}{D_0^{t+1}(x_0^t, y_0^t)} \right) \right]^{\frac{1}{2}} \tag{1}$$

When  $M_0$  equals to 1 that means no change in productivity from  $t$  to  $t + 1$ .  $M_0 > 1$  indicate productivity growth and  $M_0 < 1$  shows the opposite trend.

The Malmquist index could be decomposed into technical progress and efficiency change. In particular, the change in the distance that the observed production is far from the maximum potential production is efficiency change. Technical change is measured by shifts in the technological frontier. As such, an equivalent way of showing  $M_0$  is:

$$M_0(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} * \left[ \left( \frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right) \left( \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right) \right]^{\frac{1}{2}} \tag{2}$$

$$\text{Where efficiency change} = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \tag{3}$$

$$\text{And technical change} = \left[ \left( \frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right) \left( \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right) \right]^{\frac{1}{2}} \tag{4}$$

Similar to  $M_0$ , the value of efficiency change or technical change larger than 1 means improvement, while the value less than 1 shows deterioration in performance. It should be noted that these components of Malmquist indices may move in opposite directions. For instance, a Malmquist index greater than 1 may have a technical change less than 1 and an efficiency change greater than 1.

Like Färe et al. (1994) we measure Malmquist indices using a non-parametric programming method named DEA. The input for our model includes the number of employees, capital (net fixed assets), and intermediate cost. The output is the total firm output.

### 3.4. Propensity score matching

The analysis on TFP growth based on DEA method provides a picture on the development of firms in general. Through the simple comparison on the TFP growth between suppliers and non-suppliers we just know the mean level on TFP growth from which group is higher. It is not sufficient to reveal the statistical significance of this difference as well as the role of being a supplier in productivity gains. Therefore, in order to figure out whether being a supplier of foreign firms does matter for the productivity growth of firms we apply propensity score matching (PSM) method. The average treatment effect on being a supplier of foreign firms follows the model of Heckman and Navarro-Lozano (2004):

$$ATT = E(Y_{1i} - Y_{0i} | D = 1) = E(Y_{1i} | D = 1) - E(Y_{0i} | D = 1)$$

in which ATT denotes the average treatment effect on the treated, which measures the impact of being a supplier of foreign firms on the TFP growth of domestic firms.  $D$  is a binary dummy variable which is equal to 1 if a firm is a supplier of foreign firms and 0 if otherwise.  $Y_{1i}$  and  $Y_{0i}$  are outcomes of firm  $i$  in the case of being a supplier and not

being a supplier respectively. Nonetheless, we are not able to measure the outcome of a supplier in case it was not a supplier ( $Y_{0i} | D = 1$ ). Our solution is to apply propensity score matching (PSM) which is introduced by Rosenbaum and Rubin (1983). Due to the assumption of conditional independence, this method pairs the set of observable characteristics of suppliers to some group of “comparable” non-suppliers by creating propensity scores (Greenland et al., 1999). Following, the effect of being a supplier of foreign firms on outcomes (hereafter are TFP growth, technical progress, and efficiency change) is estimated by comparing outcomes directly between suppliers and non-suppliers. By doing so, we can observe whether firms who share similar characteristics before the time of being a supplier would enhance their TFP differently or not.

To estimate the propensity score we use the following variables: firm size, TFP, presence of foreign firms in a given district, proportion of foreign firms’ employees in a given industry. Since the information on the location and business sector of firms are available, we are able to calculate the proportion of foreign firms’ employees in a given district and a given industry. We include the density of foreign firms in the district as well as a proportion of foreign firms’ employees in a given industry into the model to control for spillovers caused by the geographical proximity or the competition with foreign firms. It should be noted that DEA estimates TFP growth rather than TFP at one point of time. Therefore, in order to calculate TFP of firms for every single year we apply the method proposed by Ackerberg et al. (2015) which is an advancement in production estimation techniques

We apply nearest neighborhood and the Kernel matching method to estimate the difference in outcome between being suppliers of foreign firms. However, the major methodological problem is the identification of the year when firms became suppliers since the sub-survey of the VN-Census 2013 do not provide information when domestic firms start supplying to foreign firms. Because a firm may have become a supplier already before 2013, this firm could have been benefitting from being a supplier and achieving a higher TFP growth. To minimize such endogeneity problems and meet the requirement that an intervention should be unrelated to the outcome (TFP) at the baseline, we opt for the following strategy: (i) firstly, we append the sub-survey data of the VN-Census 2013 with the previous rounds of the VN-Census to create a panel dataset. Since the sub-survey of 2013 has information on whether firms supply to foreign firms, we are able to identify suppliers and non-suppliers; (ii) then for every single year, we run a  $t$ -test on the TFP and the number of employees of supplier and non-supplier groups to examine whether the mean values of these two group are statistically significant different. (iii) The year in which the results of the  $t$ -test became insignificant is then considered as the baseline year. It should be noted that  $t$ -test provides us the general conclusion for the whole sample instead of individuals. However, since unobservable information might be interpolated through  $t$ -tests (Bernardo, 2003), the estimation to identify the baseline based on  $t$ -test are acceptable under the situation that the information is not fully enough. The  $t$ -test results show that for the years 2010, 2011, and 2012, the mean values of TFP and number of employees between suppliers and non-suppliers are significantly different. This is not the case in the year 2009. Therefore, our studied period spans from the baseline year 2009 to 2016. Our quality tests after and before matching presented in Appendix C also help to confirm the appropriation of our choice.

## 4. Total factor productivity growth of domestic suppliers of foreign firms versus other non-suppliers

The descriptive results presented in Table 1 show that in general domestic firms increase their TFP. This means that for a given level of input, domestic firms are able to produce more output in 2016 than in 2009. Regarding technical change, the relative high value indicates that domestic firms experience technical progress. Actually, almost all manufacturing firms in our dataset are in low-value added sectors.



**Table 1**  
Description of outcome and matching variables.  
Source: Author's calculation.

(Mean value)	The whole of Vietnam			The Southeast			The RRD		
	Full sample	Suppliers of foreign firms	Non-suppliers	Full sample	Suppliers of foreign firms	Non-suppliers	Full sample	Suppliers of foreign firms	Non-suppliers
<b>Output variables</b>									
TFP growth	1.2959	1.5052	1.2562	1.1996	1.3182	1.1594	1.2949	1.4051	1.2698
Efficiency change	0.3145	0.4110	0.2962	0.2640	0.2692	0.2622	0.3337	0.4068	0.2942
Technical progress	5.0165	5.3453	4.9541	5.2757	5.4552	5.2147	5.1541	5.6140	5.0493
<b>Firm characteristics</b> TFP at the year 2009	2.1295	2.3246	2.0944	2.7786	2.7297	2.7942	1.7113	1.8887	1.6734
Firm size (number of employees)	144.6	164.4	140.8	159.6	159.5	159.7	141.3	152.5	138.8
<b>Location characteristics</b>									
Logarithm of FDI employees in the district	0.9964	1.0869	0.9758	1.6945	1.4562	1.7774	0.6887	0.7407	0.6752
<b>Proportion of FDI employees in a given industry</b>	0.5186	0.6331	0.4969	0.6772	0.7864	0.6401	0.5773	0.5597	0.5814

Berger and Revilla Diez (2008) argue that suppliers from developing countries are normally labor intensive; therefore, they tend and need to increase their basic technological capabilities before conducting profound R&D activities and innovation. Following on, we expect that the observed technical progress in domestic firms might be based on the focus of firms in introducing new machines rather than innovations in order to improve the business performance. In terms of efficiency change, the mean values of both supplier and non-supplier groups which are less than 1 suggest the worsening of the efficiency.

While the mean levels of TFP growth, efficiency change, and technical progress of supplier groups in the whole of Vietnam as well as in the Southeast are higher than of the non-suppliers, in the Red River Delta non-suppliers experience a higher TFP growth. From this preliminary result, it is expected that spillover effects from foreign to domestic firms are different amongst regions. The longer experience with light industries might help firms in the Southeast gain more benefits from the presence of foreign firms in the region that are also mainly in light industries. Additionally, an interesting question arises whether being a supplier of foreign investors really helps domestic firms to gain the competitive advantages against non-supplier firms. The following analysis based on the propensity score matching method partly reveals an answer to this question.

We run a test to check the success of matching for the exogenous variables with the hypothesis that the mean value of each variable is the same in supplier and non-supplier groups. This test is conducted before and after matching. The null hypothesis cannot be rejected on the 10% significance level if  $p > 0.1$ . The results are presented in the Appendix C. To sum up, the null hypothesis cannot be rejected for any matching variable. This help to re-confirm that 2009 is appropriate to be considered as the time before treatment.

Tables 2–4 present the average treatment effects estimated by nearest neighboring matching and Kernel matching methods for whole Vietnam, the Southeast, and the RRD respectively. For Vietnam as a whole and the Southeast (Tables 2 and 3), t-star values of differences in

TFP growth and technical change between domestic suppliers of foreign firms and non-supplier more than 2 imply that these differences are statistically significant. In other words, being a supplier to foreign firms has a positive impact on the TFP growth and the technical progress of domestic firms. Apparently, the overall result and the result for the Southeast confirm the theoretical expectation that suppliers of foreign firms should have a better chance to approach new know-how and technology and are more productive than non-suppliers as a consequence. However, it should be noted that the efficiency change of suppliers in our study is not statistically different from that of non-suppliers.

Contrastingly, in the RRD the supplier group has not proved to gain a higher TFP growth even though their technical change is significantly higher. This insignificant difference in TFP growth might indicate that the suppliers are not more efficient than other local firms. Nonetheless, we should read this result with care. It could be the case that being a supplier of foreign firms does not automatically lead to an increase in productivity as noted in the study by Godart and Görg (2013). But alternatively, another case could be that under the pressure of competing and catching up (Berger and Revilla Diez, 2006) with firms which are already suppliers of foreign firms, non-suppliers try to improve their performance by applying new technology and enhance their efficiency. Regardless of the explanation we use, it is necessary to discover to what extent the linkage with foreign firms contributes to the productivity upgrading of firms and why domestic suppliers of foreign firms in the RRD are not that efficient. The analysis of additional secondary data and in-depth interviews with suppliers of foreign firms in the RRD in the following section enables us to give an appropriate answer.

**5. Reasons for different regional outcomes: industrial fabric and competences of domestic suppliers**

In order to explain the different results between suppliers in SE and RRD, we first look at the sectoral specialization of FDI compared to the

**Table 2**  
Average treatment effects: Propensity score matching, Vietnam.

Outcome variables	Matching algorithm	Suppliers	Non-suppliers	Difference in average outcome	S.E.	T-stat
Technical change	NNM	5.3660	5.0393	0.3266	0.0624	4.14
	Kernel	5.3660	5.0499	0.3138	0.0810	3.87
Efficiency change	NNM	0.4115	0.2772	0.1343	0.0859	1.56
	Kernel	0.4125	0.2851	0.1273	0.0855	1.49
TFP growth	NNM	1.5082	1.1983	0.3098	0.1089	2.84
	Kernel	1.5097	1.2482	0.2614	0.0989	2.64

NNM: Nearest-Neighborhood Matching.  
Kernel: Kernel Matching.

**Table 3**  
Average treatment effects: Propensity score matching, the Southeast.

Outcome variables	Matching algorithm	Suppliers	Non-suppliers	Difference in average outcome	S.E.	T-stat
Technical change	NNM	5.4536	5.1213	0.3322	0.1656	2.00
	Kernel	5.4436	5.1703	0.2732	0.1231	2.22
Efficiency change	NNM	0.2692	0.2418	0.0274	0.0203	1.35
	Kernel	0.2700	0.2612	0.0088	0.0174	0.51
TFP growth	NNM	1.3176	1.0981	0.2195	0.0999	2.20
	Kernel	1.3187	1.1419	0.1768	0.0918	2.34

NNM: Nearest-Neighborhood Matching.  
Kernel: Kernel Matching.

**Table 4**  
Average treatment effects: Propensity score matching, the Red River Delta.

Outcome variables	Matching algorithm	Suppliers	Non-suppliers	Difference in average outcome	S.E.	T-stat
Technical change	NNM	5.6262	5.2365	0.3897	0.1786	2.18
	Kernel	5.6371	5.1974	0.4397	0.1364	3.22
Efficiency change	NNM	0.5237	0.2516	0.2720	0.2559	1.06
	Kernel	0.5249	0.2728	0.2520	0.2577	0.98
TFP growth	NNM	1.4231	1.1426	0.2804	0.1447	1.94
	Kernel	1.4204	1.2311	0.1893	0.1349	1.40

NNM: Nearest-Neighborhood Matching.  
Kernel: Kernel Matching.

domestic firms. As discussed earlier, locational characteristics of the host region or country may matter for the occurrence of spillovers (Blömstrom and Kokko (2003) and Görg and Greenaway (2004)). As the similarity in sectoral specialization between foreign firms and their suppliers is a necessary condition for the occurrence of spillovers, they are not sufficient to guarantee the spillovers (Görg and Greenaway, 2004; Pavlinek and Zizalova, 2016) as well as the upgrading of domestic suppliers. The development of domestic suppliers depends much on their absorptive capacity (Görg and Greenaway, 2004). Therefore, in a second step we present results from in-depth interviews with domestic firms in RRD in order to assess the difficulties for absorbing technological spillovers.

5.1. Sectoral specialization patterns

As already indicated in the introduction, the regional distribution of FDI is quite uneven. Already in 2005, more than half of the employment in manufacturing of the Southeast was working in foreign firms. In 2016, the share of employment in foreign firms of the Southeast has reached 63%. In the RRD the importance of foreign firms grew even

more drastically. The share of employment in foreign firms in the RRD was only 24% in 2005, and is now at 53% (2016). However, in total numbers FDI employment in the Southeast outcompetes the RRD. In 2016, the total number of employees in foreign firms in Southeast was more than 1,8 Mio and thus nearly double than the one in the RRD (988.152 employees).

In principle, whether the presence of foreign firms potentially has an impact on domestic firms depends on the degree of similarity in the industrial specialization between foreign and domestic firms (Dunning and Lundan, 2008). As can be seen in Figs. 3 and 4, FDI has shaped the industrial development of the RRD and the Southeast, but with different sectoral patterns. According to McCarty (1993) before Doi Moi, the light industries predominated in the Southeast while the RRD was strongly focusing on heavy industry. Apparently, these different historical trajectories have still some weight. The heavy industries like the manufacturing of non-metallic mineral products have retained their importance in the industrial development of the RRD with a strong presence of domestic firms. In the meanwhile, both domestic and foreign firms in the RRD have grown dynamically in the light industries like manufacturing of wearing apparel or tanning and dressing of

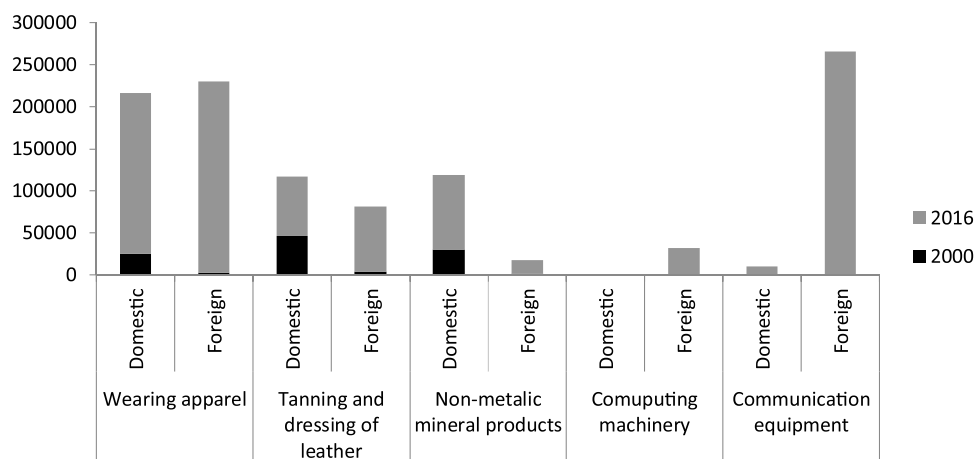


Fig. 3. Employment by ownership of selected industries in the RRD.  
Source: Author’s calculation based on VN-Census.

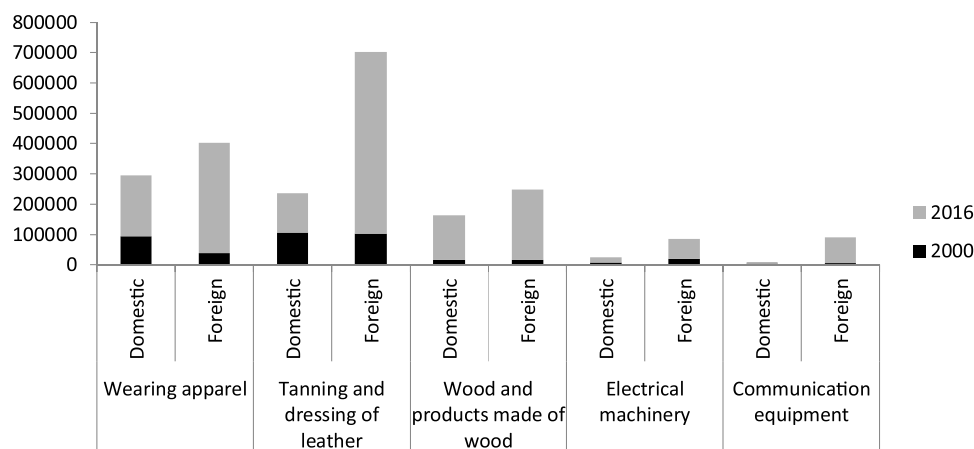


Fig. 4. Employment by ownership of selected industries in the Southeast. Source: Author’s calculation based on VN-Census.

leather. Additionally, the most recent years are marked by the emergence of a new high-tech industry in the RRD, the manufacturing of radio, television and communication equipment, introduced by foreign firms. While in the RRD domestic and foreign firms show a different sectoral specialization, in the Southeast foreign firms are investing in light industries where many domestic firms can be found.

Following Dunning (1998), we calculate FDI concentration quotient of some selected industries in order to detect different sectoral specialization patterns. The FDI concentration quotients are the deviation between the percentage of employment of foreign firms in various industries and that of the percentage of employment of all domestic firms in the same industries. The results for the RRD and the Southeast are presented in Tables 5 and 6. In the RRD, the FDI concentration quotients are the highest in the manufacturing of radio, television and communication, and the least in non-metallic mineral products. It reflects that foreign firms are especially concentrated in the manufacturing of radio, television and communication in which there is almost no presence of domestic firms. The development of the radio, television and communication equipment industry has been initiated by the establishment of Samsung’s large-scale smartphone assembly line worth about US\$700 million in Bac Ninh in the RRD in 2008 (Vietnamnews, 2009). This heavy investment was followed by more than 150, mostly Korean foreign firms being 1-Tier suppliers for the Koran giant (Saigontimes, 2017). Having developed almost from scratch, the local production system of the radio, television and communication equipment industry now employs more than 270,000 employees (only 3% of these employees work for domestic firms)(author’s calculation based on VN-Census). In contrast, the sectoral employment distributions between domestic and foreign firms in the Southeast are relatively similar (Table 6).

Table 5 Industrial distribution of foreign and domestic firms by employment in the RRD in 2016. Source: Author’s calculation based on VN-Census 2016.

	FDI		Domestic		FDI concentration quotient (col.3 / col.5)
	No. of FDI firm employment	% of total employment	No. of domestic firm employment	% of total employment	
Wearing apparel	227314	23%	191535	23%	1.00
Tanning And Dressing Of Leather	78030	8%	70517	8%	1.00
Non-metallic mineral products	16284	2%	88454	10%	0.20
Fabricated Metal Products	36093	4%	90477	10%	0.40
Radio, television and communication equipment	265308	27%	9538	1%	27.00
Motor Vehicles	66139	7%	7524	1%	7.00
Others	189840	29%	530107	47%	0.62

In order to capture the sectoral mismatch between foreign firms and domestic firms in the two regions, we follow Dunning (1998) and calculate a coefficient of deviation which measures the average difference between the employment shares of FDI/ domestic firms in a particular industry and that of their employment in all industry. If the difference in the coefficient of deviation equals to 0, the distribution of foreign firms is identically or similar to domestic ones. Our calculated figures for the Southeast and the RRD are 0.23 and 0.34 respectively. This means that the sectoral specialization of FDI in the Southeast compared to the one of the RRD fits better with that of the domestic firms. Against this result, it can be argued that the potential for spillovers from foreign to domestic firms in the Southeast is higher than in the RRD. In the following, we will demonstrate the challenges which firms in the RRD face in order to tap into foreign knowledge sources which are principally available through foreign firms.

5.2. Knowledge transfer channels and absorptive capacities of domestic supplies

We contacted domestic suppliers in the sub-survey of the Vietnam Census data round 2013 in the Red River Delta for getting a better understanding of the impediments for stronger absorption of knowledge spillovers from MNE. In total, we got 15 interviews which are meant to illustrate the challenges for domestic suppliers. In order to guarantee their anonymity, we coded them from A to O (see Appendix A). These firms are from different manufacturing sectors and produce different kinds of products, like shell transformers, threaded connectors, jigs and molds, packaging foam, or plastic products. Almost all firms are small and medium sized, except for two firms each with a total of around 400 employees. The overview of interviewed domestic firms and the

**Table 6**  
Industrial distribution of foreign and domestic firms by employment in the Southeast in 2016.

	FDI		Domestic		FDI concentration quotient (col.3 / col.5)
	No. of FDI firm employment	% of total employment	No. of domestic firm employment	% of total employment	
Wearing apparel	362991	20%	200482	19%	1.05
Tanning And Dressing Of Leather	598153	33%	129519	12%	2.75
Wood and products made of wood	232655	13%	148704	14%	0.93
Food products and beverages	63503	3%	124307	12%	0.25
Textile	95401	5%	45369	4%	1.25
Others	480541	26%	415225	39%	0.67

summary of the interview results are presented in Appendices 1 and 2 respectively. For the analysis of the interviews we follow the principles of qualitative content analysis suggested by Schreier (2013). The data was coded through coding guidelines with terms derived from the theoretical framework (Schreier, 2013) based on the possible supports of foreign firms to domestic suppliers (UNCTAD, 2001), backward spillovers (Dunning and Lundan, 2008), and absorptive capacity of firms (Cohen and Levinthal, 1990). In order to explore supports from foreign firms and the extent of backward linkages, we identify the following aspects: (i) supports of foreign firms to domestic suppliers, and (ii) sources for the new technology and knowledge of domestic suppliers. Regarding absorptive capacity of domestic firms, we cover these issues: firm specific (i) technological capabilities, (ii) R&D activities, and (iii) human resource policies.

#### 5.2.1. Extent of backward linkages and support from foreign firms

The integration of domestic firms into foreign firms' supplier networks in the RRD seems to be still very limited regarding both the product and the number of suppliers. Our interviews confirm results from UNIDO (2011) that for high value added intermediates, foreign firms have a demand on imported products and products supplied by Vietnam-based foreign suppliers instead of input supplied by domestic firms. The interviewed managers from leading foreign firms confirm that their firms only purchase simple products with low value added from local suppliers. They explained that they fail to find suitable domestic suppliers because they produce highly-specialized products which require a very high quality. This generally makes it difficult for domestic suppliers to benefit from potential economies of scale (Aitken and Harrison, 1999; Blömtrom and Kokko, 1998) which are important contributions to the efficiency gains of firms. This could partly explain our empirical finding that the efficiency change of both domestic suppliers and non-suppliers of foreign firms was worsening (see Table 3). Against our discussion above, this statement is not a surprise as the sectoral mismatch is larger in the RRD than in the Southeast.

When it comes to support measures, only two firms receive direct support with finance and training. One of them (firm A) which supplies shell transformers receives financial support from its main MNE customer (around 1% of sales contract). This amount must be used to reinvest in technology in firm A and this firm has to submit the audited balance sheet to its customer at the end of the financial year. Additionally, the customer forces firm A to train employees who are involved in producing the product supplied to the customer. The revenue from the main MNE customer accounts for 25% of firm A's revenue. Almost all other firms report that in order to meet the requirements from the MNE customers, they have to upgrade technology themselves without support from foreign firms. Corresponding to this finding, most interviewed firms are limited to simple manufacturing and provide standardized products like plastic components for car or gearbox parts based on detailed customer specifications. The production of simple standardized products does not require cutting-edge technology.

Despite the limited direct support, it cannot be denied that some

domestic suppliers can still learn from MNE customers about technology, quality management methods, or working skills and attitude through visiting and observing foreign firm customers (four cases). Additionally, the domestic suppliers can recruit employees who used to work for their foreign firm customers or other foreign firms in the same sectors (one case). Those who do not receive direct or indirect assistance from MNE customers learn about new technologies through joining technological exhibitions, taking part in short courses, and visiting suppliers abroad. Amongst these firms, the director of firm B actively acquires knowledge about production technology and management skills by attending short courses and exhibitions in Japan, Singapore, and China. Unsurprisingly, firm B has observed a TFP growth and increased its number of employees over the years from 8 when it was established in 1999 to more than 400 in 2013. Another example is firm C where a director had been working in Japan and Vietnam-based Japanese firms before establishing his own company. He applied acquired business knowledge and technology in his own firm, and one of the customers is his former Japanese employer in Vietnam. 10 years after the establishment of his firm in 2005, it has increased the number of employees from 10 to 130. Based on these success stories of two domestic suppliers, we argue that the source of new technology and knowledge is not limited to foreign firms if domestic suppliers and their managers devote effort in upgrading their productivity. However, due to demanding requirements of MNE customers on quality standards, delivery, or production organization, many interviewed firms have been motivated to upgrade machines or adapt with new management methods, therefore backward linkages are still expected to be very important (Berger and Revilla Diez, 2008), but not effective yet when acknowledging our results on TFP growth (see chapter 4).

#### 5.2.2. Absorptive capacity of domestic suppliers

In general, while our interviewed suppliers of foreign firms in the RRD have invested on updated machines, engagement in R&D activities is rare and few resources are devoted to innovation. This is in line with our expectation based on the quantitative analysis that the technical progress of domestic firms we observed is limited to the introduction of new machines rather than own innovation. Additionally, only four out of fifteen interviewed firms consider skills and qualifications of labor to be important criteria in their recruitment policies. The reasons given by these firms for this approach are twofold. On the one hand, some managers state that the supply of skilled labor is short due to the low quality of the education system in Vietnam (Wrana and Revilla Diez, 2016) and that skilled labor is attracted by foreign firms who offer much better working conditions and higher salaries. Therefore, they focus on internal training for employees after recruitment, and some firms make use of external training courses in Vietnam or abroad. It is in line with the report of MOIT and UNIDO (2011) that many firms have to retrain their workers at high cost because the level of skills produced by Vietnam's current educational and vocational training system is inadequate. On the other hand, several firms argue that their products are simple and standardized so it is not necessary to hire highly skilled or qualified workers. Especially for firms with declining TFP, training



activities do not seem to be given the proper attention.

Along with the low qualifications of employees in interviewed firms, their application of quality management systems remains relatively limited. Several firms said that it is difficult for them to engage comprehensively in management methods like 5S<sup>1</sup> or Kaizen<sup>2</sup> because their employees are locked in unprofessional working routines. One director explained that he faced difficulties in applying 5S in his firms because it was difficult for him to change the mindset of his employees. Noticeably, firms that face difficulties in applying international standard management methods normally do not have R&D activities and do not invest much on training. Surprisingly, these directors acknowledge the low quality level of their human capital but through our interview we do not see their endeavors or motivation to change the situation. Our interview with a manager from a foreign firm also reveals this fact. He said that *'We provide domestic suppliers training on quality management issues. However, for Vietnamese enterprises they understand, but it is not easy for them to apply'*. In his opinion, the difference in culture hinders domestic suppliers from the implementation of the management methods from developed countries. He mentioned that *'For managers who receive trainings, they understand and can adapt but it is very hard for them to change their employees'*. One training center which works closely with foreign firms to provide training courses about Kaizen for domestic firms shares the same view. After every course, they conduct a survey to evaluate the implementation of Kaizen in the firms of the participants. They also send an expert from the foreign firm to consult them on how to implement Kaizen. However, after many training courses, they conclude that some managers learn and know about these advanced management methods but they do not apply them to their firms.

#### 5.2.3. Four domestic suppliers as examples for firm heterogeneity in the RRD

In order to deeply explore the characteristics which enable domestic suppliers to gain a better performance and to see whether the direct support from foreign firms matters to firms in the RRD or not, we choose four extreme examples (firms A, C, D, and E) to carry out a comparative analysis.

They are referred to as follows:

- Firm A produces shell transformers. For almost ten years, annually it has received financial support from its main MNE customer. The TFP change of this firm is around the mean level of the RRD. Its resources are devoted to training and R&D activities are limited. This firm stands for an example in which TFP growth was achieved with limited support from foreign firms.
- Firm C produces jigs and molds. It does not receive any support from foreign firms. However, TFP change of this firm is the second highest amongst interviewed firms. The firm is active in R&D activities as well as enhancing the quality of its labor force. This firm shows that upgrading is possible without direct support from foreign firms.
- Firm D produces engine pylons. It receives limited training support from MNE customers. TFP change of this firm is the highest amongst interviewed firms. Similar to firm C, firm D has paid attention to R&D and human resources. This firm represents an "ideal" example where positive impacts are triggered by the foreign firms.
- Firm E produces packaging foam. It receives no support from foreign firm customers. Its TFP change is the worst amongst interviewed firms. This firm does not pay any attention to R&D nor training for employees. Unfortunately, this firm represents the majority of domestic suppliers in our case study.

As can be seen from Table 7, even though firm A gets direct support from its main MNE customer, its TFP change (1.081) is lower than the average value of domestic suppliers in the RRD (1.273). The two highest TFP growth firms (firm C and firm D) amongst the interviewed ones have received limited or no direct support or knowledge transfer from MNE customers. Both firms have introduced new products. One factor that explains the different growth patterns amongst these firms is the difference in how active they are in increasing their absorptive capacity. Actually, both firm C and firm D pay attention to R&D by establishing R&D departments and on training programs for their employees. They are the only two firms in our interviews which have a R&D department. Our finding is in line with the survey performed by NASATI in Vietnam in 2008 that Vietnamese firms devote minimal resources to R&D and innovation. The low level of R&D suggests a low absorptive capacity of firms (UNIDO, 2013). Without R&D activities, it seems plausible that firm A simply follows the instructions of its main customer and is not able to create its own know-how. This prevents firm A from benefitting from direct spillover and makes it dependent on its main customer. The director of firm A also said that they only provide training to workers who are involved in production supplied to its main customer and implement quality management systems for a workshop producing these products. If a firm depends heavily on its main customers for information and upgrading assistance, it is more likely to be locked into the relationships and in danger of being replaced by the emerging lower-cost rivals (Humphrey, 2003). In contrast, firm D has a short term plan to export its products, and firm C has diversified its product portfolio and started producing precise components. The investment in R&D partly allows both firm C and firm D to develop independently and supply to different foreign firms.

Additionally, we also observe a notable difference in the human capital development strategy amongst these firms. Firm C and firm D put a lot of effort in recruiting and training employees. For instance, firm C not only provides internal and external training courses to all employees but also sends key staff to short courses about QC (Quality Control) and QA (Quality Assurance) in Japan. In the case of firm D, over and above training courses its recruitment strategy gives a higher priority to people who have working experience in foreign firms like Samsung, ABB, or Canon. As such, these employees might introduce new technology or working skills to these two firms on the one hand and might help to increase their absorptive capacity on the other hand. This provides an interesting example that foreign firms which have a superior ability to attract highly skilled workers seem to impede knowledge flows via labor mobility. Apart from this, they endeavor to create favorable working conditions to attract and keep high skilled labor. In contrast, similar to some other interviewed domestic suppliers, firm A complains that they lost many qualified and skilled workers. It seems that these firms have no proper solutions to this brain drain issue and they have to accept this fact. That is one reason why firm A only chooses loyal employees to involve in the production of product supplied to its main customers and provide training courses for them. For firm E and some other firms who have no demand for highly skilled workers, they do not face the issue of brain drain. In their opinion, their employees have no chance to be recruited by foreign firms because they lack of many skills and qualifications normally required by foreign firms. One director said *'There are only few employees moving to other firms. My firm is a Vietnamese firm so that we can understand Vietnamese workers. In my firm, the working time is more flexible than foreign firms. For example, when you work for foreign firms, you must come to work in time. However, in my firm, it is still fine if employees come to work late. We do not have a great working condition but we provide flexible working time'*. Actually, the lack of skilled labor and the inappropriate working attitude and routine of labor hinder domestic suppliers from taking full advantages of new technology and business knowledge. As a consequence, they fail to enhance their productivity. For instance, firm E has upgraded the technology through investment on the updated machines, but failed to apply quality management programs or

<sup>1</sup> 5S are techniques which help to increase the efficiency of firm

<sup>2</sup> Kaizen is a Japanese word for improvement. It is a method of performance improvement in a company.

**Table 7**  
Characteristic of selected domestic suppliers.

	Highest TFP growth		Strong support from foreign firms	Negative TFP change
	Firm D	Firm C	Firm A	Firm E
<b>TFP change</b>	1.67	1.59	1.081	0.335
<b>Number of employees</b>	65	130	166	100
<b>Products supplied</b>	Engine pylons	Jigs and mold	Shell transformer	Packaging foam
<b>Support from MNE customer</b>	Yes	No	Yes	No
- Finance	No	No	Yes	No
- Technology	No	No	Yes	No
- Training	Yes	No	Yes	No
<b>Invest on new machines</b>	Yes	Yes	Yes	Yes
<b>Introduce new product</b>	Yes	Yes	No	No
<b>Innovation activities</b>				
- R&D department	Yes	Yes	No	No
- R&D activities	Yes	Yes	No	No
- R&D partner outside	No	No	No	No
<b>Human capital development</b>				
- Internal training	Yes	Yes	Yes *	Yes
- External training in Vietnam	Yes	Yes	No	No
- External training abroad	No	Yes	No	No
- Recruitment strategy	Experienced workers in foreign firms	Experienced workers	x	x
<b>Quality management systems</b>	Yes	Yes	Yes*	No

\*As a requirement of MNE customer.

management methods due to the limited absorptive capacity.

In short, the qualitative analysis shows that almost all firms state the need to invest on more updated machines to be more competitive and meet requirements of foreign firms, but few of them pay attention to human capital or R&D activities which might help domestic suppliers to achieve a more effective production. This is a reason why we observe the technical progress due to the new machines but the efficiency decline of domestic firms in our quantitative analysis. Our observation about the low absorptive capacity of domestic suppliers is consistent with the argument of Arnold et al. (2000) and Berger and Revilla Diez (2008) that most small and medium size enterprises face difficulties to acquire technical and craft skills and capabilities for technology absorption. As one of the exceptions, one interviewee stated that ‘Our technical staff must be very innovative and we have conducted some R&D activities. Therefore, we can take full advantage of the current technologies while still supply the quality products to the customers’. Actually, this firm (firm L) currently lacks of capital to enhance its production facilities and equip the updated machines in all their workshops. For the long-term development, they have been upgrading technology gradually and have a long-term plan to improve the infrastructure. However, with the special efforts for R&D, training activities, and following the management methods from Japan, they still meet the requirements of foreign firms and gain TFP. There is a separate department in firm L for quality control and how to apply 5S and Kaizen. The responsibility of this department is to make sure that everybody in the firm follows 5S, Kaizen, and ISO. Besides the two success stories of firm C and firm D, the stable development of firm L could also provide a useful example for other small and medium size Vietnamese firms that also have limited capital.

## 6. Conclusion and policy implications

The number of foreign firms investing in Vietnam has been increasing drastically over the years. Accordingly, domestic firms might have a chance to become suppliers of foreign firms and acquire access to the state of art technology and know-how of foreign firms. As a consequence, firms that are chosen to be suppliers are expected to enhance their productivity. This expectation is valid for Vietnam in general and for the Southeast region in particular. However, it is necessary to note that the TFP growth of domestic firms comes from technical change rather than efficiency change. It might indicate that if domestic firms pay more attention to their production management

improvements, resource allocation, or economies of scale, they are more likely to gain a higher TFP.

Contrastingly, our empirical analysis for the RRD shows that there is no significant difference in the TFP growth between domestic suppliers and non-suppliers of foreign firms. This finding implies that domestic suppliers do not always benefit from the presence of foreign firms. Our in-depth interviews with 15 domestic suppliers partly help to explain this result. Firstly, due to the ‘lock-in’ into the simple standardized production, almost all interviewed domestic suppliers do not seem to receive strong support from foreign firm customers. Secondly, low absorptive capacity might hinder many firms in achieving productivity gains. Acknowledging the different regional context conditions across Vietnam, the results obtained are not surprising. Our analysis has shown that the sectoral specialization of the foreign firms fits better to the existing industrial fabric in the Southeast than in the RRD. The industrial legacy of the pre-reform era still has some weight.

All in all, being a supplier of foreign firms might bring domestic firms the opportunity to enhance their business performance. However, while linkages with foreign firms are important for domestic firms, they are by no means decisive. Whether domestic firms can take full advantage of this chance or not, especially in developing countries like Vietnam where the effects from foreign firms are indirect and limited, depends on the internal competence of firms. The most striking feature of our interviewed domestic suppliers in the RRD is their weak absorptive capacity. Therefore, in order to gain the TFP growth, domestic firms should not only invest in updated machines, but also make an effort to enhance their absorptive capacity.

In order to profit from foreign firms’ presence, the question is how to acquire the potential benefits to upgrade the productivity as well as upgrade to higher stages in the value chain of foreign firms. This study demonstrates the importance to consider a regional perspective in order to better understand the impact of foreign firms on domestic suppliers. Spillovers from foreign firms to domestic suppliers are influenced by the industrial setting of the host region. As in many countries, regional specializations and development trajectories differ and therefore influence the impact of foreign firms. Our finding draws two important implications for policy makers, especially in the RRD. Firstly, since the absorptive capacity of domestic firms is considered the main driver, we highlight the need to invest not only in basic education, but also in higher level education and technical training based on industry demands. Secondly, there should be programs to raise the awareness of domestic firms about the importance of R&D and innovation to create

their own know-how. To do so, it requires a strong linkage between higher education and vocational training centers, government research institutes, and firms. In parallel, similar to other Asian countries like Singapore, South Korea, Taiwan, Thailand, or Malaysia, the Vietnamese government should provide incentives to encourage endogenous technology upgrading and R&D activities in domestic firms.

Of course, our paper is not without limitations. The quantitative research result is more robust if we know exactly the year domestic firms start supplying to foreign firms. Therefore, we do hope that the Vietnam Enterprise Census data will include the information on when firms become suppliers of foreign firms is available for the following period of time. Additionally, our qualitative analysis is only limited to the RRD to explain why some domestic firms in the RRD fail to absorb

the spillovers from foreign firms. The future research might carry out interviews in the Southeast and throughout Vietnam to reveal potential reasons for regional difference in productivity upgrading.

**Conflict of interest**

We assure that this paper has not previously been published (in whole or in part), that it (or part of it) is not currently under consideration by another journal, and that it will not be submitted for publication elsewhere until a decision has been made by Research Policy. There is no conflict of interest.

Javier Revilla Diez and Thu Nguyen.

**Appendix A. An overview of interviewed domestic suppliers**

Code	Products	TFP change	Firm size	R&D Department	Support foreign firms	Qualitative
A	Shell transformers	1.08	166	No	Finance	Yes
B	Steel products	1.22	420	No	No	Yes
C	Jigs and mold	1.59	130	Yes	No	Yes
D	Engine pylons	1.67	65	Yes	Training	Yes
E	Packaging foam	0.36	100	No	No	No
F	steel boxes	0.93	401	No	No	Yes
G	wheel blocks	1.03	120	No	No	Yes
H	metal products	0.96	23	No	No	No
I	metal products	0.68	48	No	No	No
J	industrial fans components	1.15	35	No	No	No
K	Threaded connectors	1.34	140	No	No	Yes
M	Plastic products	1.23	301	No	No	Yes
L	gearbox parts	1.75	75	No	No	Yes
N	Pressure equipment	0.30	40	No	No	Yes
O	Steel plating	1.24	46	No	No	Yes

**Appendix B. Summary of in-depth interviews**

	TFP Growth (Total: 10 firms)	TFP Decline (Total: 5 firms)
Direct support from foreign firms	2	0
Introduce new products	2	1
External training	7	1
No training activities	0	2
Demand on high skilled workers	4	0
R&D department	2	0
R&D activities	6	1
R&D partner outside	0	0
Invest on updated machines	10	2
Apply quality management system	7	2

**Appendix C. Test the success of the matching for the exogenous variables**

**For Vietnam as a whole**

Variable	Sample	Mean		%bias	%reduct bias	t-test	
		Treated	Control			t	p > t
firm size	Unmatched	166.02	156.17	2.5		0.56	0.575
	Matched	166.02	170.02	-1	59.4	-0.19	0.849
tfp	Unmatched	2.3569	2.1981	2.7		0.49	0.623
	Matched	2.3569	2.1676	3.2	-19.2	1.22	0.224
intensity of FDI in the district	Unmatched	1.0938	0.9856	6.8		1.46	0.145
	Matched	1.0938	1.0979	-0.3	96.2	-0.05	0.961
intensity of FDI in the industry	Unmatched	0.6291	0.5454	9.4		2.26	0.024
	Matched	0.6291	0.625	0.5	95.1	0.08	0.94

**For the Southeast**

Variable	Sample	Mean		%bias	%reduct bias	t-test	
		Treated	Control			t	p > t
firm size	Unmatched	167.17	166.45	0.2		0.03	0.978
	Matched	167.17	149.04	5	-2422.5	0.71	0.478
tfp	Unmatched	2.7298	2.8456	-1.2		-0.14	0.886
	Matched	2.7298	2.6892	0.4	65	0.17	0.869
intensity of FDI in the district	Unmatched	1.4615	1.578	-6.5		-0.98	0.329
	Matched	1.4615	1.462	0	99.5	0	0.997
intensity of FDI in the industry	Unmatched	0.7427	0.64902	9		1.46	0.146
	Matched	0.7427	0.73622	0.6	93	0.07	0.946

**For the Red River Delta**

Variable	Sample	Mean		%bias	%reduct bias	t-test	
		Treated	Control			t	p > t
firm size	Unmatched	152.12	152.56	-0.1		-0.01	0.991
	Matched	152.12	222.17	-14.1	-15733.8	-1.01	0.313
tfp	Unmatched	1.91	1.7344	9.3		1.39	0.164
	Matched	1.91	1.8575	2.8	70.1	0.27	0.784
intensity of FDI in the district	Unmatched	0.7578	0.6971	6.6		0.8	0.424
	Matched	0.7578	0.7507	0.8	88.3	0.08	0.937
intensity of FDI in the industry	Unmatched	0.5787	0.5821	-0.4		-0.05	0.957
	Matched	0.5787	0.5369	5.3	-1142.2	0.62	0.537

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