Région et Développement

n° 52-2020

www. regionetdeveloppement.org

Productivity growth and job reallocation: Evidence from the garment industry in Vietnam

Thanh Tam NGUYEN-HUU[*]
Minh NGUYEN-KHAC[**]
Mai-Lan PHUNG[***]

Abstract - The paper investigates the aggregate productivity decomposition in the garment industry of Vietnam between 2000 and 2016. According to the Olley-Pack decomposition, there is an improvement in aggregate productivity because garment firms become more productive and there is some job reallocation from less to more productive firms. Meanwhile, the dynamic decomposition indicates that aggregate productivity growth is mainly driven by the dynamic entry-exit flow of firms. When firm ownership is considered, the productivity growth of private firms is principally conducted by their dynamic entry-exit flow, and to a lesser extent, by the productivity improvement of survivor firms. Differently, the dynamic entry-exit flow is the sole factor leading to the productivity growth of state-own-enterprises and foreign firms.

JEL Classification
D24, O10

Key-words
Productivity decomposition
Job reallocation
Productivity improvement
Entry-exit flow
Vietnam

This research is funded by NAFOSTED (Vietnam National Foundation for Science and Technology Development) under Grant number 520.01-2018.01.

[*] Corresponding author. EM Normandie Business School, Métis Lab ; tnguyenhuu@em-normandie.fr
[**] TIMAS, Thang-Long University, Hanoi, Vietnam ; khacminh@gmail.com
[***] Faculty of Economics and Management, Thuyloi University, Hanoi, Vietnam; mailanvpt@gmail.com

INTRODUCTION

Searching for factors contributing to productivity growth is not only of great importance for economic development but also drives an interesting question for economic research. There is a growing literature seeking to answer such a question by investigating the decomposition of Total Factor Productivity (TFP) at the industrial level. By using the productivity decomposition of Olley and Pakes (1996) (OP for short), some authors show how the plant-level improvement and the job reallocation may contribute to the aggregate productivity growth (Foster et al., 2001; De Loecker and Konings, 2006; Collard-Wexler and De Loecler, 2015 among others). By contrast, other researchers argue the static limit of the OP productivity decomposition as it may not take into account the entry-exit flow of firms. That is why they suggest a dynamic version by relying on the productivity decomposition of Baily et al. (1992) (BHC for short), Davis et al. (1998) or develop a dynamic version of OP decomposition (Melitz and Polanec, 2015).[1]

Noticeably, the literature on productivity composition mainly focuses on developed countries while transition economies and developing countries are less studied. In this context, the present paper investigates the static and dynamic productivity decomposition of the garment industry in Vietnam during the 2000-2016 period. This country serves as an interesting case study for at least three reasons. First, Vietnam has successfully passed from a central-planning to a market-oriented economy while reducing the role of state-own enterprises (SOEs).[2] Hence, there should be some job reallocation between SOEs or from SOEs to private firms. Second, the garment industry plays a very important role in the Vietnamese economy. Since 2010, the sector is the largest industrial employer, accounting for more than 20% of the total labor force in the manufacturing sector and 13% of total export revenue of the country. Third, Vietnam is the world fourth exporter of clothing, after China, the European Union, and Bangladesh.[3] The evolution of Vietnam in the clothing's international market can be explained, on the one hand, by the high integration of the country in the world economy. Many trade agreements have been signed between Vietnam and its main trade partners, particularly the bilateral trade with the US in 2001, the accession to the WTO in 2007, or recently the free trade agreement with the European Union in 2019. In spite of its substantial place in the Vietnamese economy, there are few studies on the garment industry and most of them are rather qualitative and/or analyze the situation of the industry before the entry of Vietnam into WTO in 2007 (see for example Knutsen, 2004; Nadvi et al., 2004; Nguyen and Le, 2005). Actually,since this entry, the sector has much more developed to achieve its current position in the world apparel market. This necessarily calls for a specific quantitative investigation. As productivity is an important development indicator, we attempt to investigate the productivity's evolution of the clothing industry and the contribution of plant-level productivity improvement, job reallocation and the entry-exit flow of firms.

The remainder of the paper is organized as follows. Section 1 provides a description of the data and methodology. Section 2 reports the main findings. Conclusions and remarks are given in the last section.

---

[1] For a complete review of productivity decomposition, please refer to Melitz and Polanec, (2015, Section 2) or to Murao (2017).

[2] Between the years 2000 and 2016, the number of manufacturing SOEs is dropped from 1,346 to 115. Meanwhile, manufacturing private firms are increased from 7 thousand to more than 57 thousand (Source: Authors compilation from the Vietnamese General Statistics Office database).

[3] Source: World trade statistic review, WTO.

1. DATA AND METHODOLOGY

1.1. Methodology

The estimation strategy includes two stages. First, we estimate the firm's TFP by using a Generalized Method of Moments (GMM) approach implemented by Wooldridge (2009). Second, we compute the static and dynamic decomposition of aggregate TFP developed in the literature.

1.1.1. TFP estimation: a GMM approach

The firm's TFP can be obtained through the estimation of its production function. However, a major problem of such estimation is the existence of endogeneity caused by a potential correlation between unobservable productivity shocks (known by firm owner, but unknown by the econometrician) included in the error terms and the firm's input selection. To deal with this issue, Olley and Pakes (1996) and Levinsohn and Petrin (2003) develop a two-step estimation in which in the first stage, semi-parametric methods are performed to estimate the parameters for variable inputs. The second step aims to identify the coefficient for capital. To control the unobserved productivity, Olley and Pakes (1996) (OP for short) propose the firm's investment while Levinsohn and Petrin(2003) (LP for short) suggest intermediate goods instead of investment as a proxy for such unobservable. There are two main contributions of the LP method relative to the OP method. From the methodological point of view, the investment proxy may not smoothly respond to unobserved productivity shocks, thus violating the consistency condition. From the data aspect, using investment could face a missing value problem since the firm may have no investment. In our sample, only 62% of clothing firms do an investment.

Although the OP and LP estimators are very useful to correct for the endogeneity issue, they still have two major limits. First, the assumption on the unconditional intermediate demands could generate functional dependence problems because inputs should be chosen after the decision about labor (Ackerberg et al., 2015). Second, the LP method overlooks the probability of correlation of error terms at the moment. To deal with such limits, Wooldridge (2009) suggests a GMM estimation while Ackerberg et al. (2015) propose an alternative method.

This research work applies the GMM suggested by Wooldridge (2009) to estimate the firm's production function. As in the LP method, raw materials are used to control for unobserved productivity. The value-added of a firm i at time t can have the following form (in logarithm):

$$y_{it} = \alpha + \beta_l l_{it} + \beta_k k_{it} + \omega_{it}(k_{it}, m_{it}) + \varepsilon_{it} \quad (1)$$

where y, l, k, m represent value-added, labor, capital stock, and material, respectively. ω is unobserved productivity shock known by the firm owner but unknown by the econometrician. It is assumed to be correlated with k_{it} and m_{it}, and

$$E(\omega_{it} / \omega_{it-1}, \ldots, \omega_{i1}) = E(\omega_{it} / \omega_{it-1}) \quad (t \geq 2)$$

ε_{it} is the error terms such that:

$E(\varepsilon_{it} / l_{it}, k_{it}, m_{it}) = 0$ and

$E(\varepsilon_{it} / l_{it}, k_{it}, m_{it}, l_{it-1}, k_{it-1}, m_{it-1}, \ldots, l_{i1}, k_{i1}, m_{i1}) = 0$ $(t \geq 2)$

From this set-up, Equation (1) can be also represented as:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + f[\omega(k_{it-1}, m_{it-1})] + u_{it} \quad (t \geq 2) \quad (2)$$

where u_{it} is the error term satisfying:

$E\ (u_{it}\ /\ k_{it},\ l_{it-1},\ k_{it-1},\ m_{it-1},\ \ldots.\ ,\ l_{i1},\ k_{i1},\ m_{i1}) = 0 \quad (t \geq 2)$

To estimate β_k and β_l, Wooldridge (2009) assume that $\omega(k_{it},\ m_{it})$ can be represented by a linear function

$\omega(kit,\ mit) = \gamma 0 + c\ (kit,\ mit)\ \gamma$

and $f(\cdot)$ can be represented by a polynominal in ω

$f(\omega) = \rho 0 + \rho 1\omega + \cdots + \rho n\omega n$

Hence, the production function can be rewritten as:

$$y_{it} = \zeta_0 + \beta_k k_{it} + \beta_l l_{it} + c_{it}\gamma + \varepsilon_{it} \tag{3}$$

and

$$y_{it} = \alpha_0 + \beta_k k_{it} + \beta_l l_{it} + \rho_1(c_{i1}\gamma) + \cdots + \rho_n(c_{it-1}\gamma)^n + u_{it} \quad (t \geq 2) \tag{4}$$

where $\zeta_0 = \beta_0 + \gamma_0$ and $\alpha_0 = \zeta_0 + \rho_0$.

The GMM estimators are applied to estimate Equations (3) and (4). Once parameters β_k, β_l are obtained, the firm's TFP can be computed as:

$$\omega_{it} = y_{it} - \beta_l l_{it} - \beta_k k_{it} \tag{5}$$

As a robustness test, the LP method is also performed to compute the firm's TFP.

1.1.2. Aggregate TFP decomposition

Static decomposition

Given the firm's TFP computed in Equation (5), the weighted aggregate productivity at a given time is defined by:

$$\Omega_t = \sum_i s_{it}\omega_{it} \tag{6}$$

where s_{it} is the firm-specific weight of firm *i.* There are many potential measures for firm-specific weight. For instance, Melitz and Polanec (2015) use both labor shares and nominal value-added shares. Differently, De Loecker and Konings (2006) refer to employment-based shares rather than output market shares. According to the latter, since this research focuses on job reallocation, we use labor shares as a measure of the firm-specific weight. Consequently, s_{it} is defined as: $s_{it} = \frac{L_{it}}{\sum_i L_{it}}$

The above productivity can be decomposed with two methods. The first is the well-known OP decomposition and expressed as:

$$\Omega_t = \bar{\omega}_t + \sum_i(\omega_{it} - \bar{\omega}_t)(s_{it} - \bar{s}_t) = \bar{\omega}_t + Cov_t^{OP} \tag{7}$$

where $\bar{\omega}_t$ is the unweighted average productivity: $\bar{\omega}_t = \frac{1}{N_t}\sum \omega_{it}$. Cov_t^{OP} is the OP covariance.

Equation (7) can be applied to compute the aggregate TFP by firm ownership ϑ (SOEs (*S)*, private firms (*P)*, foreign firm (*F*)).

$$\Omega_t(\vartheta) = \bar{\omega}_t(\vartheta) + \sum_i(\omega_{it} - \bar{\omega}_t(\vartheta))(s_{it} - \bar{s}_t(\vartheta)) = \bar{\omega}_t(\vartheta) + Cov_t^{OP}(\vartheta) \tag{8}$$

from where the within decomposition (the second measure of productivity decomposition) emerges:

$$\Omega_t = \sum_{\vartheta \in S,P,F} s_t(\vartheta)\Omega_t(\vartheta) \tag{9}$$

where $s_t(\vartheta)$ is the labor share of each firm ownership: $s_t(\vartheta) = \sum_{i\in\vartheta} s_{it}$.

Since productivity is expressed in log, its growth rate is simply obtained by subtracting the aggregate productivity between two period t and t–1:

$$\begin{aligned}\Delta\Omega_t &= \Omega_t - \Omega_{t-1} \\ &= \Delta\bar{\omega}_t + \Delta Cov_t^{OP} = \sum_{\vartheta\in S,P,F} \Delta(s_t(\vartheta)\Omega_t(\vartheta))\end{aligned} \tag{10}$$

Dynamic decomposition

The above decomposition only gives a static vision and may hide the role of different factors, particularly the dynamic impact of the firm's entry and exit on aggregate productivity. To deal with this issue, three sets of producers for a given time window t-1 and t are to be distinguished: survivors (S), entrants (E), and exiting firms (X). There are different kinds of dynamic productivity decomposition as in Baily et al. (1992), Davis et al. (1998) or Melitz and Polanec (2015). This research uses the dynamic productivity decomposition proposed by Davis et al. (1998) because it allows analyzing job reallocation from less to more efficient firms.[4] Hence, the aggregate productivity growth can be written as:

$$\begin{aligned}\Delta\Omega_t &= \sum_{i\in S}(s_{it}\omega_{it} - s_{it-1}\omega_{it-1}) + \sum_{i\in E} s_{it}\omega_{it} - \sum_{i\in X} s_{it-1}\omega_{it-1} \\ &= \sum_{i\in S} s_{it-1}\Delta\omega_{it} + \sum_{i\in E}\Delta s_{it-1}\omega_{it} + \sum_{i\in E} s_{it}\omega_{it} - \sum_{i\in X} s_{it-1}\omega_{it-1} \\ &= \underbrace{\sum_{i\in S} s_{it-1}\Delta\omega_{it}}_{Plant\ Improvement} + \underbrace{\sum_{i\in E}\Delta s_{it}\omega_{it-1} + \sum_{i\in E}\Delta s_{it\Delta}\omega_{it}}_{Reallocation} \\ &\quad + \underbrace{\underbrace{\sum_{i\in E} s_{it}\omega_{it}}_{Entry} - \underbrace{\sum_{i\in X} s_{it-1}\omega_{it-1}}_{Exit}}_{Net\ entry}\end{aligned} \tag{11}$$

The first term of Equation (11) measures the effect of within the firm's productivity improvement on aggregate productivity. The second term refers to the role of firms' reallocation. Importantly, the two last terms allow us to control for the contribution of entry-exit to aggregate productivity growth. Equation (11) can be also applied to compute the within dynamic productivity decomposition and the dynamic productivity decomposition for each firm kind ϑ.

1.2. Data

The data used in this research paper are collected from the Annual Enterprises Survey conducted by the General Statistics Office of Vietnam. The survey, starting in 2000, covers firm identification (taxation code), employment, nominal physical capital, costs of intermediate goods (materials and other services), investment, annual sales, and other information on wage, debts, social security, and so on. We only keep firms in the garment industry that have positive capital, employ at least one worker and provide a positive value-added.

After deleting firms in other industries and those with missing data, we obtain a database of 38,035 firms between 2000 and 2016 (the latest survey available).[5] Table 1 shows the number of firms including SOEs, private firms, and foreign firms, their aggregate productivity, and their labor shares in 2000 and 2016. The calculation of firms' aggregate productivity is based on Equation (6) above.

[4] The dynamic productivity decomposition of Davis et al. (1998) has been applied in several empirical works as De Loecker and Konings (2006), Collard-Wexler and De Loecker (2015).
[5] See Appendix for Statistic descriptive on value-added, labor, capital and TFP of firms in 2000 and 2016.

Table 1. Some statistics of firms in garment industry

	2000			2016		
	Number of firms	Labor shares (%)	Aggregate Productivity (in log)	Number of firms	Labor shares (%)	Aggregate productivity (in log)
All industry	494	100	1.64	5,106	100	2.2
of which						
Private firms	301	30.7	1.43	4,498	79	2.18
SOEs	101	45.9	1.56	3	0.1	2.26
Foreign firms	92	23.4	2.09	605	20.9	2.27

Source: Authors compilation from the Vietnamese General Statistics Office database.

We find that firms in the garment industry improve their aggregate productivity, whatever their ownership. However, the labor share of SOEs drops from 46% to 0.1% between 2000 and 2016 while private firms have increased their labor share from 31% to 79%. As for foreign producers, their labor share nearly remains the same: 23% in 2000 and 21% in 2016. Private firms also dominate the industry in terms of numbers of firms. However, taking into account both the number of firms and their labor share, it is likely that private firms have a smaller size than that of SOEs or foreign firms. While the rise of domestic firms in the industry can be explained by the voluntary policies of the Vietnamese government, the increase in the overall number of garment firms should be related to the development of the industry. Indeed, if in 2000, Vietnam did not belong to the world's top ten exporters of clothing, the country becomes now the world fourth exporter. Besides, the share in the world export of the country has been improved year after year. It passed from 0.9% in 2000 to 5.9% in 2017. In terms of export level, the country experienced an increase from 2.1 to 28.7 billion US dollars between 2000 and 2016. Notice that the Vietnam position in the international clothing market has been considerably improved after the adhesion of the country to the WTO. Until 2005, the share of the country in the world exported clothing products was less than 2% (1.7% in 2005 for example), that share went up to 2.9% in 2010, and then 5.9% in 2017. Meanwhile, the Vietnam export value of those products was increased from 8.6 to 28.7 billion US dollars.[6]

2. ECONOMETRIC RESULTS

2.1. Industrial productivity decomposition

The static decomposition of productivity growth in the garment industry over the 2000-2016 period is presented in Column (1) of Table 2. The top part of the table shows the OP decomposition while the bottom part reports the within decomposition.

Column (1) of Table 2 indicates two important results. First, the OP decomposition shows that the firm's productivity improvement is the main source of aggregate productivity growth. On average, garment producers become 39.6% more productive. Job reallocation toward more efficient firms is another source of aggregate productivity growth, providing a 16.2% increase. Overall, aggregate productivity is improved by 55.8% because of firms becoming more efficient and bigger. Second, the within decomposition reveals that there should be some job reallocation from SOEs and foreign firms to private ones. Indeed, private firms' productivity growth

[6] Source: World trade statistic review, WTO and World Integrated Trade Solution, World Bank database.

appears to be the sole source of aggregate productivity growth, implying that either their productivity is improved or their labor share increases. By contrast, SOEs generate a negative contribution to industrial productivity growth while the impact of foreign firms is almost null.

Table 2. Static and Dynamic decomposition of aggregate productivity growth between 2000-2016 (percent)

	Static decomposition	Dynamic decomposition				
	Aggregate growth	Plant improvement	Reallocation	Net entry	Entry	Exit
	(1)	(2)	(3)	(4)	(5)	(6)
All industry	55.8	7.8	-17.4	65.5	216.6	151.2
OP decomposition	(100)	(14)	(-31.3)	(117.3)		
Unweighted average ($\Delta\overline{\omega}_t$)	39.6 (71)					
OP Covariance	16.2 (29)					
Within decomposition						
SOEs	-71.2	0	0	-71.2	0.3	71.5
	(-127.6)	(0)	(0)	(-127.6)		
Private firms	128.7	7.8	-17.4	138.3	169.1	30.7
	(230.5)	(14)	(-31.3)	(247.8)		
Foreign firms	-1.7	0	0	-1.7	47.2	48.9
	(-3)	(0)	(0)	(-3)		

Note: The share of each component in aggregate productivity growth is in parentheses.
Source: Authors compilation from the Vietnamese General Statistics Office database.

The dynamic decomposition shows very divergent results compared to the static decomposition. At the aggregate level, surviving firms become 8% more productive between 2000 and 2016, but their size reduces. Moreover, such a downsizing process is so strong that it generates a net decrease of 9% in aggregate productivity.[7] This finding differs from the OP decomposition where we observe both productivity improvement and job reallocation. Nevertheless, such difference comes from the fact that the OP decomposition may not take into account the dynamic entry-exit flow of firms. Yet, new entering producers bring about a 217% increase in aggregate productivity while exiting producers reduce it by 151%, generating a Net entry effect of a 66% increase. Therefore, we emphasize the importance of accounting for the firm's entry-exit phenomenon. In the case of the Vietnamese garment industry, it appears that entering firms are so productive and of big size that the Net entry process is the key source of aggregate productivity growth. On the one hand, entering firms are nearly half more productive than exiters. On the other hand, it is likely that the contribution of average productivity improvement ($\Delta\overline{\omega}_t$) and job reallocation (OP Covariance) reported in Column (1) is driven by the entry of new large productive firms.

Table 2 also provides important insights once we refer to the dynamic within decomposition. Once again, we observe the key role of private firms in the productivity growth of the garment industry. On the one hand, there is no public or foreign firm surviving over the studied period. As a consequence, industrial plant improvement and job reallocation are solely generated by surviving private firms. On the other hand, those firms contribute a net entry effect of 138% that is twice higher than the industrial level at 66%. By contrast, SOEs provide a negative net entry effect

[7] -17.4+7.8=-9.6%.

while the impact of foreign firms is almost null. Such findings possibly come from the fact that SOEs lose their labor share to the benefit of their private counterparts. Therefore, the Entry contribution of SOEs to the aggregate growth is quite negligible (only 0.3%) while their Exit effect is considerable (71.5%).

2.2. Productivity decomposition by firm ownership

The above negative contribution of SOEs and foreign firms to aggregate productivity growth raises a question about their productivity growth. This necessarily calls for a specific analysis of productivity decomposition by firm ownership. The results are reported in Table 3.

Table 3. Decomposition of aggregate productivity growth by firm ownership between 2000-2016 (percent)

Static decomposition	SOEs	Private firms	Foreign firms
Aggregate growth ($\Omega_t(\vartheta)$)	70.5	75.2	17.7
Unweighted average ($\Delta\bar{\omega}_t(\vartheta)$)	103.3	56.2	-35.2
	(146.4)	(74.8)	(-198.8)
Within Covariance:	-32.8	19	52.9
	(-46.4)	(25.2)	(298.8)
Dynamic decomposition			
Plant Improvement	0	25.5	0
	(0)	(33.9)	(0)
Reallocation	0	-64	0
	(0)	(-85.1)	(0)
Net entry	70.5	113.7	17.7
	(100)	(151.2)	(100)
Entry	226.2	213.9	226.9
Exit	155.7	100.2	209.2
Entry premium	103.4	60.5	-35.2

Note: The share of each component in aggregate productivity growth is in parentheses.
Source: Authors compilation from the Vietnamese General Statistics Office database.

Let us first focus on static decomposition. Taking a look at private firms, their productivity is enhanced by 75.2%, that is much higher than the aggregate level, of which average productivity undergoes a 56.2% increase (i.e. three-quarter of total growth) and job reallocation from less to more productive private firms drives a 19% increase (a quarter of total growth). As for SOEs, they nearly experience the same incidence in terms of aggregate productivity growth as private firms: their total productivity goes up by 70.5%. However, the contribution of each component is different from their private counterparts. Average productivity is doubled while the variation of 'within OP covariance' is negative, implying that there is job destruction rather than job creation. Hence, it is likely that the productivity improvement of SOEs is related to a phenomenon according to which more productive firms are downsizing faster than less productive firms are. Unlike their domestic counterparts, foreign producers become 35% less productive between 2000-2016 while job reallocation is the main source of their aggregate productivity growth. Overall, the latter is about 18%, which is much lower than that of private and public firms.

Focusing on the dynamic decomposition by firm ownership, the results are shown at the bottom of Table 3. The picture becomes much more interesting as we observe how important controlling for the entry-exit flow of firms is. On the one hand, the Net entry is the main source of the firm's productivity growth, regardless of its ownership. On the other hand, the incidence of both Entry and Exit effect is quite high.

Looking at private firms, surviving firms become 25% more productive through a downsizing process. However, such job destruction is stronger than the within plant

improvement, driving a net decrease of 40% in aggregate productivity of private firms. Hence, it should be noted that the productivity improvement of private firms, either unweighted productivity improvement or job reallocation (Within covariance) reported in the first part of Table 3, is mainly caused by the entry of productive private firms. Obviously, entering firms are 60% more productive than exiters, generating a net increase of 114% in the total productivity of private firms. As for public producers, they experience a considerable structure change during the studied period. No public firm survives over this period and the dynamic entry-exit flow is the only source improving SOEs' aggregate productivity. On the one hand, less productivity public firms are forced to quit the industry, leading to a 150% decrease in SOEs' productivity growth. On the other hand, only very productive SOEs are allowed to enter the industry. Those firms are even twice more productive than public existers, generating an increase of 226% in aggregate productivity of SOEs. Turning to foreign firms, since none of them survives between 2000 and 2016, their productivity growth of 18% is uniquely driven by the *Net entry* effect. Interestingly, entering foreign firms are 35% less productive than exiters. It is possible that the productivity improvement of those firms follows an upsizing process according to which some firms are merged to create bigger firms causing lower productivity of entering firms compared to foreign exiters. The low productivity growth rate of foreign firms and their non-survivor over the studied period may be explained, on the one hand, by their strategic behavior in the garment industry. Indeed, they are likely to outsource domestic firms (Buchanan et al., 2013; Goto, 2013) and thus lose their position in favor of their domestic counterparts. On the other hand, the initial productivity of foreign firms is already high, and it becomes difficult for them to reach high productivity growth like domestic firms.

2.3. Robustness verification

2.3.1. Does the measurement of productivity decomposition matter?

As a robustness test, we provide, in this subsection, two alternative methods to compute the productivity decomposition. The first method is to calculate the aggregate productivity decomposition by relying on the LP method to estimate the firm's TFP. The static and dynamic aggregate TFP decompositions are reported in Table 4 while the static and dynamic TFP decompositions broken down by firm ownership are shown in Table 5.

Table 4 reports similar incidents as those of Table 2, implying that at the industrial level, our results remain robust, regardless of the estimators used to compute the firm's TFP. Indeed, the OP decomposition indicates that productivity improvement remains the main source of aggregate productivity growth while job reallocation is the second source. Overall, the productivity of the garment industry is enhanced because firms become more productive and bigger. On the other hand, the within decomposition shows that private firms are still the principal drivers of industrial productivity growth while SOEs have a negative contribution and the impact of foreign producers is quite negligible. Hence, there should be some job reallocation from SOEs or foreign firms to more productive private firms. Turning to the dynamic decomposition, the entry-exit flows of producers keep their key role in the productivity growth of the garment industry.

As far as the productivity decomposition broken down by firm ownership is concerned, Table 5 shows almost the same incidents as those of Table 3. It appears that the productivity growth of private firms is caused by the entry of efficient and large private firms while the productivity improvement of SOEs follows a downsizing process: new entering firms are very productive and of smaller size compared to exiting

public firms. By contrast, foreign firms improve their productivity through an up-sizing phenomenon: new entering firms are large compared to existing firms.

Tableau 4. Static and Dynamic decomposition of aggregate productivity growth between 2000-2016 relying on the LP estimation of firm's TFP (Unit: percent)

	Static decomposition	Dynamic decomposition				
	Aggregate growth	Plant improvement	Reallocation	Net entry	Entry	Exit
	(1)	(2)	(3)	(4)	(5)	(6)
All industry	57.9	7.7	-18.9	69.1	242.3	173.2
	(100)	(13.3)	(-36.6)	(119.3)		
OP decomposition						
Unweighted average ($\Delta\bar{\omega}_t$)	32.4					
	(57.6)					
OP Covariance:	24.5					
	(42.4)					
Within decomposition						
SOEs	-83.2	0	0	-83.2	0.3	83.5
	(-143.8)	(0)	(0)	(-143.8)		
Private firms	142.6	7.8	-18.9	153.8	189.1	35.2
	(246.3)	(13.3)	(-36.6)	(265.6)		
Foreign firms	-1.5	0	0	-1.5	52.9	54.4
	(-2.5)	(0)	(0)	(-2.5)		

Note: The share of each component in aggregate productivity growth is in parentheses.
Source: Authors compilation from the Vietnamese General Statistics Office database.

The second alternative is to compute the aggregate productivity decomposition in level instead of in logarithm. According to Melitz and Polanec (2015), although computing the productivity decomposition in logarithm is commonly used in the literature, it could not be a relevant measurement for aggregate welfare. By contrast, using the aggregate productivity decomposition in level should be a solution because it captures the real firm's productivity. The aggregate productivity growth in level is now given as:

$$g_\Omega = \frac{\Omega_t - \Omega_{t-1}}{\bar{\Omega}} = \frac{\Delta\bar{\omega}_t + \Delta Cov_t^{OP}}{\bar{\Omega}} = \frac{\sum_{\vartheta \in S,P,F} \Delta(s_t(\vartheta)\Omega_t(\vartheta))}{\bar{\Omega}} \quad (12)$$

where $\bar{\Omega} = \frac{\Omega_t + \Omega_{t-1}}{2}$ while the dynamic decomposition is rewritten as:

$$g_\Omega = \underbrace{\frac{\sum_{i\in S} s_{it-1}\Delta\omega_{it}}{\bar{\Omega}}}_{Plant\ Improvement} + \underbrace{\frac{\sum_{i\in E}\Delta s_{it}\omega_{it-1} + \sum_{i\in E}\Delta s_{it\Delta}\omega_{it}}{\bar{\Omega}}}_{Reallocation}$$
$$+ \underbrace{\underbrace{\frac{\sum_{i\in E} s_{it}\omega_{it}}{\bar{\Omega}}}_{Entry} - \underbrace{\frac{\sum_{i\in X} s_{it-1}\omega_{it-1}}{\bar{\Omega}}}_{Exit}}_{Net\ entry} \quad (13)$$

Although the productivity decomposition in level provides slightly lower incidents, the global picture remains the same.[8] It follows that the dynamic entry-exit flow of

[8] For the sake of brevity, the results are available upon request. The GMM is kept to estimate the firm's TFP.

firms is the main source of aggregate productivity growth. Looking at the productivity decomposition by the firm's ownership, private firms improve their productivity thanks to the entry of large and productive firms. Differently, SOEs enhance their productivity through a downsizing process: large and less productive firms are forced to quit the industry while the entering firms are more productive and of smaller size. As for foreign firms, their productivity is improved through an upsizing phenomenon.

Table 6. Static and Dynamic decomposition of aggregate productivity growth (Unit: percent)

	Static decomposition	Dynamic decomposition				
	Aggregate growth (1)	Plant improvement (2)	Reallocation (3)	Net entry (4)	Entry (5)	Exit (6)
Period 2000-2007						
All industry	2.91 (100)	1.1 (37.8)	-54.8 (-1883.2)	56.7 (1945.4)	132.4	75.7
OP decomposition						
Unweighted average ($\Delta\bar{\omega}_t$)	2.28 (78.4)					
OP Covariance	0.63 (21.6)					
Within decomposition						
SOEs	-41.6 (-1430.6)	1.61	-22.36	-20.9	17.82	38.72
Private firms	5.43 (186.6)	2.44	-14.92	17.88	41.04	23.16
Foreign firms	39.1 (1344.3)	-3.95	-17.53	59.63	73.49	13.86
Period 2007-2016						
All industry	52.92 (100)	6.89 (14.91)	-15.05 (-28.44)	61.57 (116.35)	208.59	147.52
OP decomposition						
Unweighted average ($\Delta\bar{\omega}_t$)	37.34 (70.56)					
OP Covariance	15.59 (29.44)					
Within decomposition						
SOEs	-29.59 (-55.91)	0	0	-29.59	0.33	29.88
Private firms	123.3 (232.97)	6.89	-15.05	131.45	161.06	29.61
Foreign firms	-40.78 (-77.06)	0	0	59.63	73.49	13.86

Note: The share of each component in aggregate productivity growth is in parentheses.
Source: Authors compilation from the Vietnamese General Statistics Office database.

2.3.2. Does the accession of Vietnam to the WTO matter?

It is interesting to investigate whether or not the accession of Vietnam to the WTO in 2007 affect the aggregate productivity growth. To this end, we divide the studied period into two sub-samples: a pre-accession period between 2000 and 2007 and a post-accession period between 2007 and 2016. Table 6 below displays the static and dynamic aggregate productivity decomposition for the two sub-samples.

Table 6 reports some important results. First, the high aggregate productivity growth in the Vietnamese garment industry is mainly generated after the entry of the

country to the WTO. Indeed, the aggregate productivity during the pre-accession period was slightly improved by 2.9% while the aggregate productivity growth between 2007-2016 was 52.9%. Second, there should be a structural change in the studied industry. Before 2007, we observe that productivity growth is mainly generated by foreign firms, and more specifically by the entry of more productive foreign firms. Since 2007, foreign firms lose their dominant position to their domes- tic private counterparts such that the aggregate productivity growth during the post-accession in the garment industry is uniquely contributed by the dynamic growth of domestic private firms. Notice that the negative contributions of domestic public and foreign firms to the aggregate productivity growth can be explained by using Equation (10) according to which both kinds of firms lose their employment shares to the domestic private counterpart.

Table 7. Decomposition of aggregate productivity growth by firms ownership (Unit: percent)

	Period 2000-2007		
Static decomposition	SOEs	Private firms	Foreign firms
Aggregate growth ($\Omega_t(\vartheta)$)	40.81	14.7	-44.77
Unweighted average ($\Delta\bar{\omega}_t(\vartheta)$)	55.23	12.01	-50.29
	(135.33)	(81.7)	(112.33)
Within Covariance	-14.52	2.69	5.52
	(-35.58)	(18.30)	(-12.33)
Dynamic decomposition			
Plant Improvement	3.5	7.94	-12.62
	(8.58)	(54.01)	(28.19)
Reallocation	4.43	-49.11	-110.07
	(10.86)	(-334.08)	(245.86)
Net entry	32.89	55.92	77.95
	(80.56)	(380.41)	(-174.15)
Entry	117.15	131.4	137.27
Exit	84.26	75.48	59.32
Entry premium	73.27	10.56	-58.24
	Period 2007-2016		
Static decomposition	SOEs	Private firms	Foreign firms
Aggregate growth ($\Omega_t(\vartheta)$)	29.71	60.46	62.48
Unweighted average ($\Delta\bar{\omega}_t(\vartheta)$)	48.03	44.19	15.09
	(161.66)	(73.9)	(24.15)
Within Covariance	-18.32	16.27	47.39
	(-61.66)	(26.91)	(75.85)
Dynamic decomposition			
Plant Improvement	0	22.06	0
	(0)	(36.49)	(0)
Reallocation	0	-69.5	0
	(0)	(-116.72)	(0)
Net entry	29.71	108.97	62.48
	(100)	(180.23)	(100)
Entry	226.21	203.7	226.88
Exit	196.5	94.73	164.43
Entry premium	48.05	47.07	15.06

Note: The share of each component in aggregate productivity growth is in parentheses.
Source: Authors compilation from the Vietnamese General Statistics Office database.

Focusing on the productivity decomposition broken down by the firm ownership, the results are reported in Table 7. Some diverge results emerge. Looking at the pre-accession to the WTO, SOEs experience a high productivity growth rate of 40.8% and this is mainly conducted by the entry of highly productive firms. Besides, the productivity growth rate of domestic private firms is enhanced by 14.7% thanks to the entry of productive private producers, on the one hand, and the improvement in productivity of survivor firms, on the other hand. Very surprisingly, foreign firms exhibit a negative growth rate of productivity due to a downsizing phenomenon. In other words, there are more foreign firms but with a smaller size in the garment industry in 2007 than in 2009.[9]

Turning to the post-accession, both private and foreign firms exhibit a high productivity growth rate of around 60% while that of SOEs is about 30%. The static decomposition tells us that the productivity growth of foreign firms is mainly driven by a job reallocation from less to more efficient firms. Differently, the productivity growths of SOEs and private firms are generated because they become more productive. Looking at the dynamic decomposition, we state that the entry of high efficient firms is the main reason explaining the firms' productivity growth, whatever they are SOEs, private or foreign firms.

CONCLUSION AND REMARKS

The paper investigates the productivity decomposition in the Vietnamese garment industry over the years 2000- 2016. The sector is chosen thanks to its importance in the Vietnamese economy, either in terms of export or job creation. We find that the dynamic entry-exit flow of firms is the main driver of industrial productivity growth. Besides, there should be some job reallocation from SOEs or foreign firms to private counterparts. In other words, the latter gain some labor share to the detriment of SOEs and foreign producers. Consequently, private firms have a very important role in industrial productivity growth while the contribution of SOEs is negative and the impact of foreign producers is nearly null.

Two important policy recommendations may be conducted from these findings. On the one hand, policies should facilitate the dynamic entry-exit flow of firms, e.g. restructuring SOEs such that they become more productive, or promote the change of firm ownership. On the other hand, given the role of private firms, there should be policies in their favor. Such policies could include low-interest rate loans or public subsidies for investing in R&D, new technologies or human capital.

REFERENCES

Ackerberg, D. A., Caves, K., and Frazer, G. (2015). Identification properties of recent production function estimators. *Econometrica*, 83(6):2411–2451.

Baily, M. N., Hulten, C., and Campbell, D. (1992). Productivity dynamics in manufacturing plants. *Brookings Papers on Economic Activity*, 23(1992 Microeconomics):187–267.

Buchanan, F. R., Anwar, S. T., and Tran, T. X. (2013). Spotlight on an emerging market: Assessing the footwear and apparel industries in vietnam. *Global Business and Organizational Excellence*, 32(2):38–51.

[9] Notice that although this negative productivity growth, foreign firms can contribute to the aggregate productivity of the whole industry because they still dominate the industry in terms of labor share. Indeed, the labor share of foreign firms in 2007 is 53.5% compared to 15.2% of SOEs, and 31.3% of private firms and the contribution of the former to aggregate productivity growth given in the first panel of Table 6 is obtained by: $39.1\% = (0.535 * 1.644 - 0.234 * 2.092) * 100$ where 1.644 and 2.092 are respectively the aggregate productivity of foreign firms in 2007 and 2000, and 0.535 and 0.234 are their associated labor share.

Collard-Wexler, A. and De Loecker, J. (2015). Reallocation and technology: Evidence from the us steel industry. *The American Economic Review*, 105(1):131–171.

Davis, S., Haltiwanger, J., and Schuh, S. (1998). *Job Creation and Destruction*. The MIT Press, 2 edition.

De Loecker, J. and Konings, J. (2006). Job reallocation and productivity growth in a post-socialist economy: Evidence from Slovenian manufacturing. *European Journal of Political Economy*, 22(2):388–408.

Foster, L., Haltiwanger, J., and Krizan, C. (2001). Aggregate productivity growth: Lessons from microeco- nomic evidence. In *New Developments in Productivity Analysis*, pages 303–372. National Bureau of Economic Research, Inc.

Goto, K. (2013). Starting businesses through reciprocal informal subcontracting: Evidence from the informal garment industry in Ho-Chi-Minh-City. *Journal of International Development*, 25(4):562–582.

Knutsen, H. M. (2004). Industrial development in buyer-driven networks: the garment industry in Vietnam and Sri Lanka. *Journal of Economic Geography*, 4(5):545–564.

Levinsohn, J. and Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies*, (2):317.

Melitz, M. J. and Polanec, S. (2015). Dynamic Olley-Pakes productivity decomposition with entry and exit. *RAND Journal of Economics*, 46(2):362–375.

Murao, T. (2017). Aggregate Productivity Growth Decomposition: an Overview. *Public Policy Review*, 13(3):269–286.

Nadvi, K., Thoburn, J. T., Thang, B. T., Ha, N. T. T., Hoa, N. T., Le, D. H., and Armas, E. B. D. (2004). Vietnam in the global garment and textile value chain: Impacts on firms and workers. *Journal of International Development*, 16(1):111–123.

Nguyen, C. M. and Le, Q. V. (2005). Institutional constraints and private sector development: The textile and garment industry in vietnam. *ASEAN Economic Bulletin*, 22(3):297–313.

Olley, G. S. and Pakes, A. (1996). The dynamics of productivity in the telecommunications equipment industry. *Econometrica*, (6):1263.

Wooldridge, J. (2009). On estimating firm-level production functions using proxy variables to control for unobservables. *Economics Letters*, 104(3):112–114.

ANNEX

Table 8: Statistic descriptive of garment firms in 2000 (in log)

Variable	Observations	Mean	Standard Deviation	Min	Max
Value-added	494	6.81	1.84	1.56	11.5
Labor	494	5.07	1.46	1.1	8.74
Capital	494	7.79	1.65	1.79	12.92
TFP	494	1.37	0.84	-1.92	3.99

Source: Authors compilation from the Vietnamese General Statistics Office database.

Table 9: Statistic descriptive of garment firms in 2016 (in log)

Variable	Observations	Mean	Standard Deviation	Min	Max
Value-added	5,106	5.81	2.43	-2.32	12.51
Labor	5,106	3.56	2.03	0	9.56
Capital	5,106	7.01	1.84	-0.67	14.24
TFP	5,106	1.76	1.03	-5.04	7.25

Source: Authors compilation from the Vietnamese General Statistics Office database.

Croissance de la productivité et réallocation du travail dans l'industrie de l'habillement au Vietnam

Résumé – L'évolution de la productivité entre 2000 et 2016 dans l'industrie de l'habillement au Vietnam est décomposée selon la méthode d'Olley-Pakes. Une amélioration de la productivité agrégée est constatée du fait d'une hausse de la productivité des firmes déjà localisées en 2000 et d'une réallocation du travail des firmes ayant une productivité faible vers celles ayant une productivité plus élevée. Mais la croissance de la productivité est principalement générée par le flux d'entrée-sortie des firmes. En considérant le statut juridique, il apparaît que la croissance de la productivité des firmes privées est surtout due aux flux d'entrée-sortie, et dans une moindre mesure par l'amélioration de la productivité des firmes survivantes. A l'inverse, seuls les flux d'entrée-sortie expliquent la croissance de la productivité des firmes étatiques et celle des firmes étrangères.

Mots-Clés
Décomposition de la productivité
Réallocation du travail
Amélioration de la productivité
Flux d'entrée-sortie des firmes
Vietnam