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Labor productivity gap between export and non-exporting firms in industrialization: The case of the Vietnamese manufacturing sector

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C H R O N I C L E

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A B S T R A C T

This paper examines the labor productivity gap between exporting and non-exporting Vietnamese manufacturing firms in industrialization during the period from 2010 to 2016 using enterprise-level panel data drawn from Vietnamese Annual Enterprise Censuses. Results show that the labor productivity of the manufacturing sectors increased during the study period. It can be concluded that the firms' productivity contributed to the current industrialization in Vietnam. On top of that, some manufacturing sectors with increasing labor productivity in the study period, namely: Fabricated metal products (code 25), Basic metals (code 24), Motor vehicles, trailers and semi-trailers (code 29), Computer, electronic and optical products (code 26), Leather and related products (code 15), Machinery and equipment not yet classified (code 28), Furniture (code 31), Electrical equipment (code 27), Other non-metallic mineral products (code 23), Other transport equipment (code 30), Wearing apparel (code 14), and Food products (code 10). Vietnam's government policy might play a crucial role in stimulating the current industrialization by targeting selective manufacturing sectors. Decomposing labor productivity gap between export and non-exporting firms, the results show that labor productivity in the former is about 57.5 percent lower than in the latter. By using Oaxaca-Blinder decomposition method, several firm-level variables are found to contribute significantly to the productivity gap via the endowment effect and the structural effect. Overall, the endowment effect surpasses the structural effect in the sample period. Among the factor contributions, capital stock plays the most important role. Empirical studies about the impact of the related policy on the manufacturing industries will be fruitful research agenda.

1. Introduction

Productivity growth of industries is a key driver of long-term economic growth, and plays a core pillar in industrialization (Acemoglu & Zilibotti, 2001; Diewert, 2014; El-hadj & Brada, 2009; Barro & Sala-i-Martin, 1995). While the manufacturing

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sector is ubiquitous in Vietnam and plays an important role in industrialization, little is yet known about its productivity (Ngo & Nguyen, 2019). The relative contribution of the manufacturing sector to the national economy is significant and has increased over time (Ngo & Tran, 2020). The manufacturing sector is further estimated to currently employ 15 percent of Vietnam's labor force and expected to create millions of jobs in Vietnam over the next decade. It is also expected to contribute to structural transformation and industrialization. At the same time, Vietnam has also observed a great increase in export volumes and in growth rate as well during recent industrialization. Export firms do play a vital role in stimulating economic growth, employment creation and increase in technology level.

There is a large literature documenting productivity differences between exporting and non-exporting firms. There is a robust evidence that exporting activity is positively correlated with productivity, although it is not certain if exporting causes firms to become more productive or productive firms self-select themselves into exporting activity (see, for example, Bernard & Jensen, 1999; Melitz, 2003; Wagner, 2007), and most recent research of Ngo and Nguyen (2019)). Nevertheless, the literature related to Vietnam so far is lacking of evidence on the productivity gap between exporting and non-exporting firms in the manufacturing sector. This knowledge gap in the manufacturing sector's productivity presents a serious space in the realization of industrialization in Vietnam.

Our paper contributes to the literature in some aspects. First, for the first time, we look at the labor productivity in the Vietnamese manufacturing industry in its recent development. Second, we explore the enriched dataset into the disaggregate level of twenty-four manufacturing sub-sectors to generate a most updated overview of the manufacturing sector. Third, this study adds to the existing literature by analyzing the differences in labor productivity between the exporting firms and the non-exporting ones using unique firm-level survey data that have been collected by Vietnamese General Statistical Office. Further, we employ the Oaxaca-Blinder decomposition which decomposes the productivity gap into an endowment effect and a structural effect. The estimation further uncovers factors that may explain, partly or fully, the productivity gap. Four, the implication from Vietnam might be a good lesson for transition countries with similar conditions.

The paper is structured as follows. In section 2 we describe the dataset and methods. In section 3 we overview the manufacturing sector in Vietnam during the research period. The final section summarizes the findings and discusses policy implications and future research.

2. Data and methods

2.1. Data

Our analysis is based on firm-level data for the period 2010 to 2016, which is collected by the General Statistical Office of Vietnam in the Vietnam Annual Enterprise Census (VAES). The primary unit of enumeration in the survey is a firm in the case of manufacturing industries, and data are based on returns provided by Provincial Statistical Office. The present study uses data on various firm-level production parameters such as output, sales, labor, employees, capital, materials. Similar researches employed this dataset, so far, include Ngo and Tran (2020) and Ngo and Nguyen (2019).

Each enterprise code is assigned to a unique industry, based on the industry of the enterprise that accounts for the greatest share of revenues. The sector classification system used here is based on VSIC 2007, which corresponds closely to the fourth revision of the International Standard Industrial Classification of All Economic Activities (ISIC4 Revision).

2.2. Methods

2.2.1. Measurement of labor productivity

Labor productivity is measured as a ratio of firm-level value-added per working labor. Other information to construct relevant indicators are presented as follows:

Labor: Total labor input is measured at the end of the year.

Depreciation: VAES collects balance sheet information, including opening and closing book values and depreciation, for the various classes of fixed assets.

In VAES, there is information on original value and accumulated depreciation of tangible fixed assets, financial lease fixed assets, and intangible fixed assets. We obtain a measure of depreciation of all assets by subtracting accumulated depreciation from the original value of each group of assets.

Output: In the VAES data, we use the measure of gross output or total revenue.

Value-added: Value-added includes wages, salaries, interest, depreciation, rent, taxes and profit. Specifically: (1) wages, salaries are directly reported in VAES; (2) interest payments, in VAES, are recorded as components of financial expenses; (3) depreciation; (4) rent and taxes; (5) profit.

Price deflation: We deflate the costs of production and intermediate materials at the sectoral level using the Index of Inputs in Industry Production (IIIP). We deflate revenues, value-added, and profits at the sectoral level using the Index of Industry Production (IIP). Using IIIP and IIP does control for cross-industry variation in the price of inputs and values of outputs used in different industries. The price deflators are obtained from GSO.

2.2.2. Labor productivity decomposition

The Oaxaca-Blinder decompositions have been mostly used to explore contributions to differences of gaps between groups of consideration in linear regression models such as Oaxaca (1973), Blinder (1973) and Jann (2008). In the current study, we apply the same methodology to explain the labor productivity gap between firms in the EXs and the NEXs. A brief outline of the decomposition methodology is as follows.

We estimate the log of labor productivity of a firm as follows:

$$Y_{EX} = \beta_{EX0} + \sum_{j=1}^{J} \beta_{EXj} X_{EXj} + \varepsilon_{EX}, \tag{1}$$

where Y_{EX} is the log of revenues per working labor for a firm in the EXs, and X is a vector of J observable factors that characterized the firms. E_{EX} is the error terms. The counterpart of equation (1) is presented in the following Eq. (2), where the subscript NEX is used to denote comparator firms. It is assumed that $E(\varepsilon_{EX}) = E(\varepsilon_{NEX})=0$.

$$Y_{NEX} = \beta_{NEX0} + \sum_{j=1}^{J} \beta_{NEXj} X_{NEXj} + \varepsilon_{NEX}. \tag{2}$$

Taking the expectation of the log labor productivity of firms in the EXs, Eq. (1) becomes as follows,:

$$E(Y_{EX}) = E\left(\beta_{EX0} + \sum_{j=1}^{J} \beta_{EXj} X_{EXj} + \varepsilon_{EX} \right) = \beta_{EX0} + \sum_{j=1}^{J} \beta_{EXj} E(X_{EXj}). \tag{3}$$

Similarly, taking the expectation of firms in the NEXs, Eq. (2) can be written as:

$$E(Y_{NEX}) = E(\beta_{NEX0} + \sum_{j=1}^{J} \beta_{NEXj} X_{NEXj} + \varepsilon_{NEX}) = \beta_{NEX0} + \sum_{j=1}^{J} \beta_{NEXj} E(X_{NEXj}). \tag{4}$$

The difference between he EXs and the NEXs. is below:

$$D = \beta_{EX0} + \sum_{j=1}^{J} \beta_{EXj} E(X_{EXj}) - \beta_{NEX0} + \sum_{j=1}^{J} \beta_{NEXj} E(X_{NEXj}). \tag{5}$$

Or by rearranging Eq. (5) by adding and subtracting $\sum_{j=1}^{J} \beta_{EXj} E(X_{NEXj})$, we obtain:

$$D = \sum_{j=1}^{J} [E(X_{EXj}) - E(X_{NEXj})]\beta_{EXj} + \beta_{EX0} - \beta_{NEX0} + \sum_{j=1}^{J} \left[\beta_{EXj} - \beta_{NEXj}\right] E(X_{NEXj}), \tag{6}$$

where $\sum_{j=1}^{J} [E(X_{EXj}) - E(X_{NEXj})]\beta_{EXj}$ is the endowment effect, and $\beta_{EX0} - \beta_{NEX0} + \sum_{j=1}^{J} [\beta_{EXj} - \beta_{NEXj}] E(X_{NEXj})$ is the structural effect. Within the structural component, the first part $\beta_{EX0} - \beta_{NEX0}$ reflects differential regression intercepts for comparator firms in the EXs, while the second part $\sum_{j=1}^{J} [\beta_{EXj} - \beta_{NEXj}] E(X_{NEXj})$ is the differences in the slope coefficients, i.e. the combined effects of returns to all covariates.

3. Changes in the Vietnamese manufacturing sector during industrialization

Fig. 1 shows the number of firms in the manufacturing sectors during the period from 2010 to 2016. Our sample covers firms from twenty-four industries: (1) Food products (code 10), (2) Beverages (code 11), (3) Tobacco products (code 12), (4) Textiles (code 13), (5) Wearing apparel (code 14), (6) Leather and related products (code 15), (7) Wood and products of wood/cork (code 16), (8) Paper and paper products (code 17), (9) Printing and reproduction of recorded media (code 18), (10) Chemicals and chemical products (code 20), (11) Pharmaceuticals, medicinal chemicals (code 21), (12) Rubber and plastics products (code 22), (13) Other non-metallic mineral products (code 23), (14) Basic metals (code 24), (15) Fabricated metal products (code 25), (16) Computer, electronic and optical products (code 26), (17) Electrical equipment (code 27), (18) Machinery and equipment that are not yet classified (code 28), (19): Coke and refined petroleum products (code 19), (20) Motor vehicles, trailers and semi-trailers (code 29), (21) Other transport equipment (code 30), (22) Furniture (code 31), (23) Repair and installation of machinery and equipment (code 33), and (24) Other manufacturing (code 34). From Fig. 1, the following two findings can be pointed out. First, the number of firms has been increasing steadily during the period. Second, two sectors, Sector 12, the manufacture of tobacco products, and sector 19, the manufacture of coke and refined petroleum products, have a relatively small number of firms operating in these sectors, less than 100 firms.

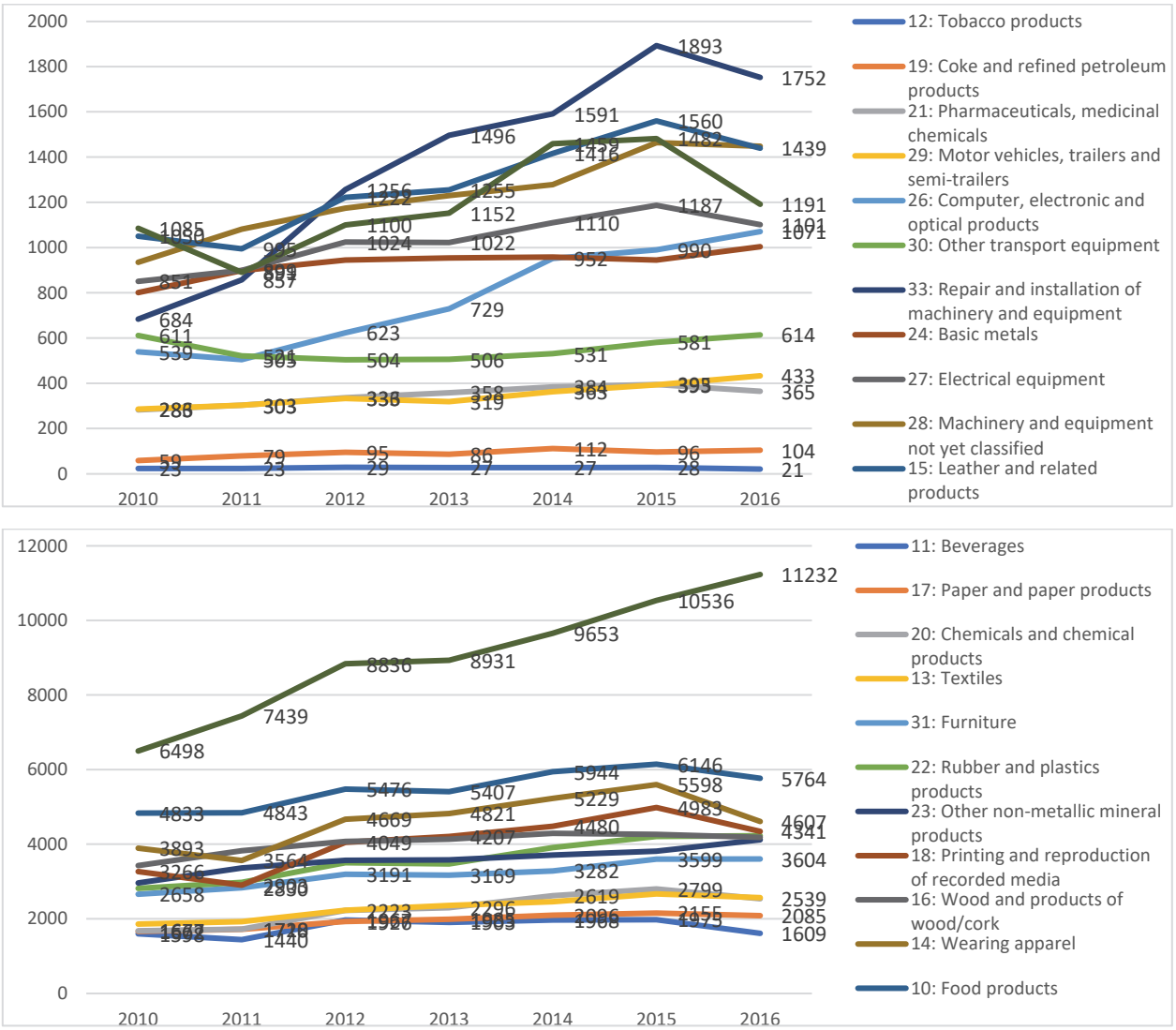


Fig. 1. Number of firms by industry and year, 2010-2016

Source: Authors' calculation from VAES 2010-16

Fig. 2 shows the total number of total persons engaged in the manufacturing sectors. The employment in all sectors is increasing in the study period, except for the sector of tobacco products. But, in two years 2012 and 2013, employment in some sectors (namely: Food products (code 10), Beverages (code 11), Coke and refined petroleum products (code 19), Other transport equipment (code 30)) decreased significantly. This can be the influence of the global economic crisis. Remarkable increases are observed in the sectors such as Motor vehicles, trailers and semi-trailers (code 29), Wearing apparel (code 14), Leather and related products (code 15), Computer, electronic and optical products (code 26), Pharmaceuticals, medicinal chemicals (code 21), and Repair and installation of machinery and equipment (code 33).

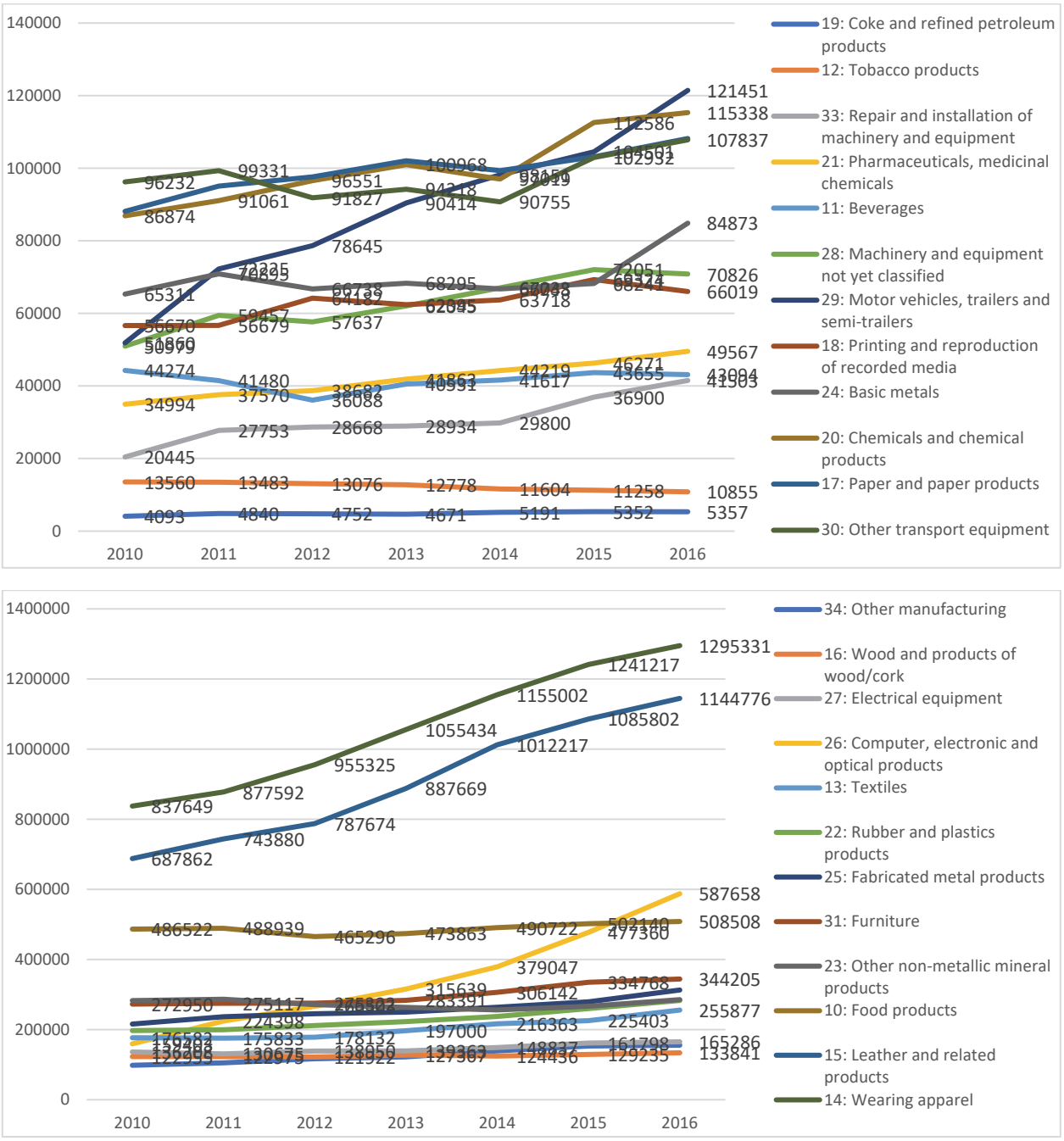


Fig. 2. Number of total persons in the manufacturing sector by years, 2010-2016

Source: Authors' calculation from VAES 2010-16

Fig. 3 shows the average total capital in the manufacturing sectors. The overall level of capital in all sectors is increasing in the study period, except for Coke and refined petroleum products (code 19). Amazing growths of total capital have belonged to

Textiles (code 13), Rubber and plastics products (code 22), Tobacco products (code 12), and Computer, electronic and optical products (code 26).

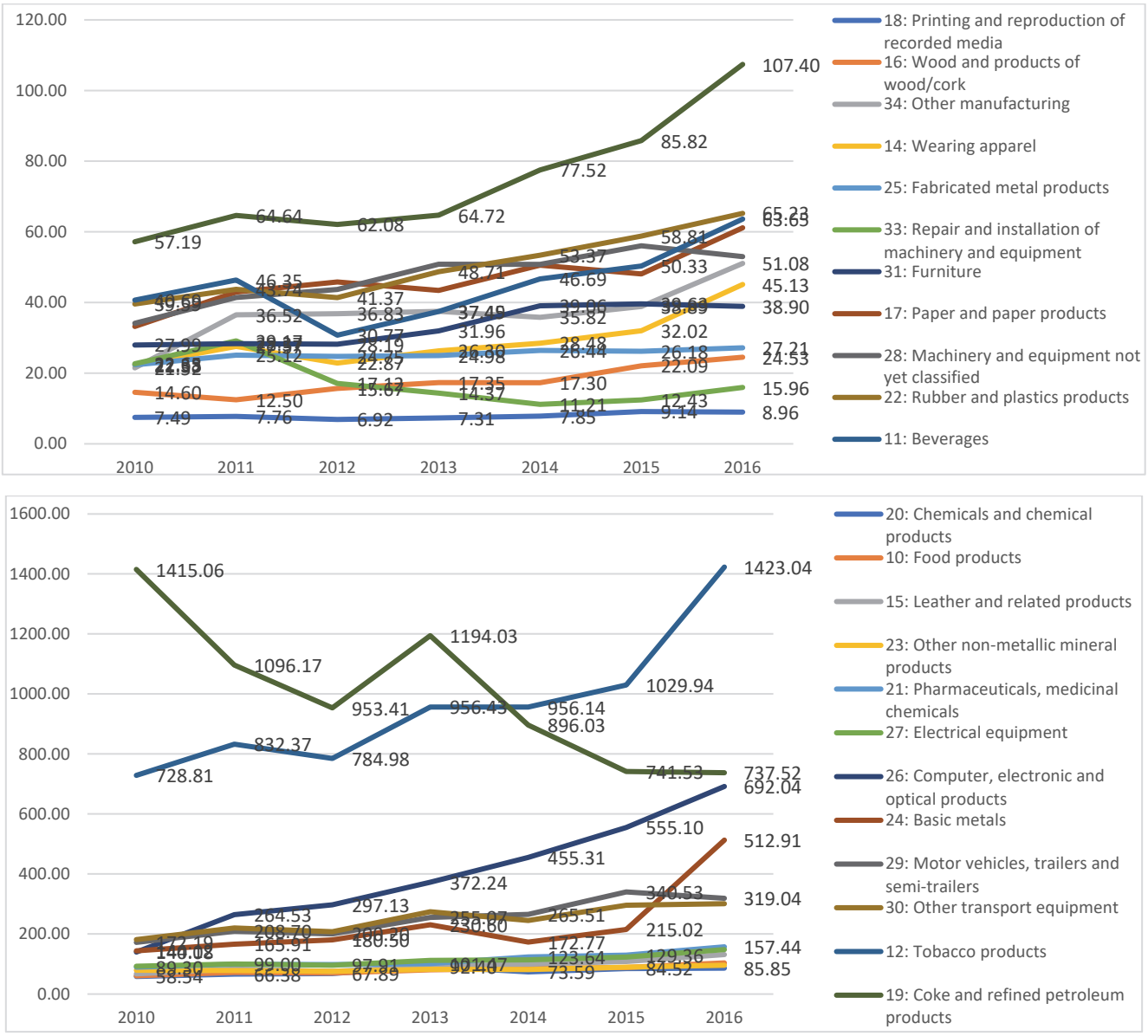


Fig. 3. Average total capital of the manufacturing sector by years (bill. VND)

Source: Authors' calculation from VAES 2010-16

Fig. 4 indicates the share of the fixed capital of organized manufacturing sectors. It is noted that since the early 2010s the shares have increased in such manufacturing sectors: Textiles (code 13), Wearing apparel (code 14), Leather and related products (code 15), Wood and products of wood/cork (code 16), Paper and paper products (code 17), Rubber and plastics products (code 22), Basic metals (code 24), Computer, electronic and optical products (code 26), Motor vehicles, trailers and semi-trailers (code 29), and Repair and installation of machinery and equipment (code33). However, some manufacturing sectors have been facing a decline, namely: Food products (code 10), Beverages (code 11), Tobacco products (code 12), Printing and reproduction of recorded media (code18), Coke and refined petroleum products (code 19), Pharmaceuticals, medicinal chemicals (code 21), Other non-metallic mineral products (code 23), Fabricated metal products (code 25), Electrical equipment (code27), Other transport equipment (code 30), and Furniture (code31).

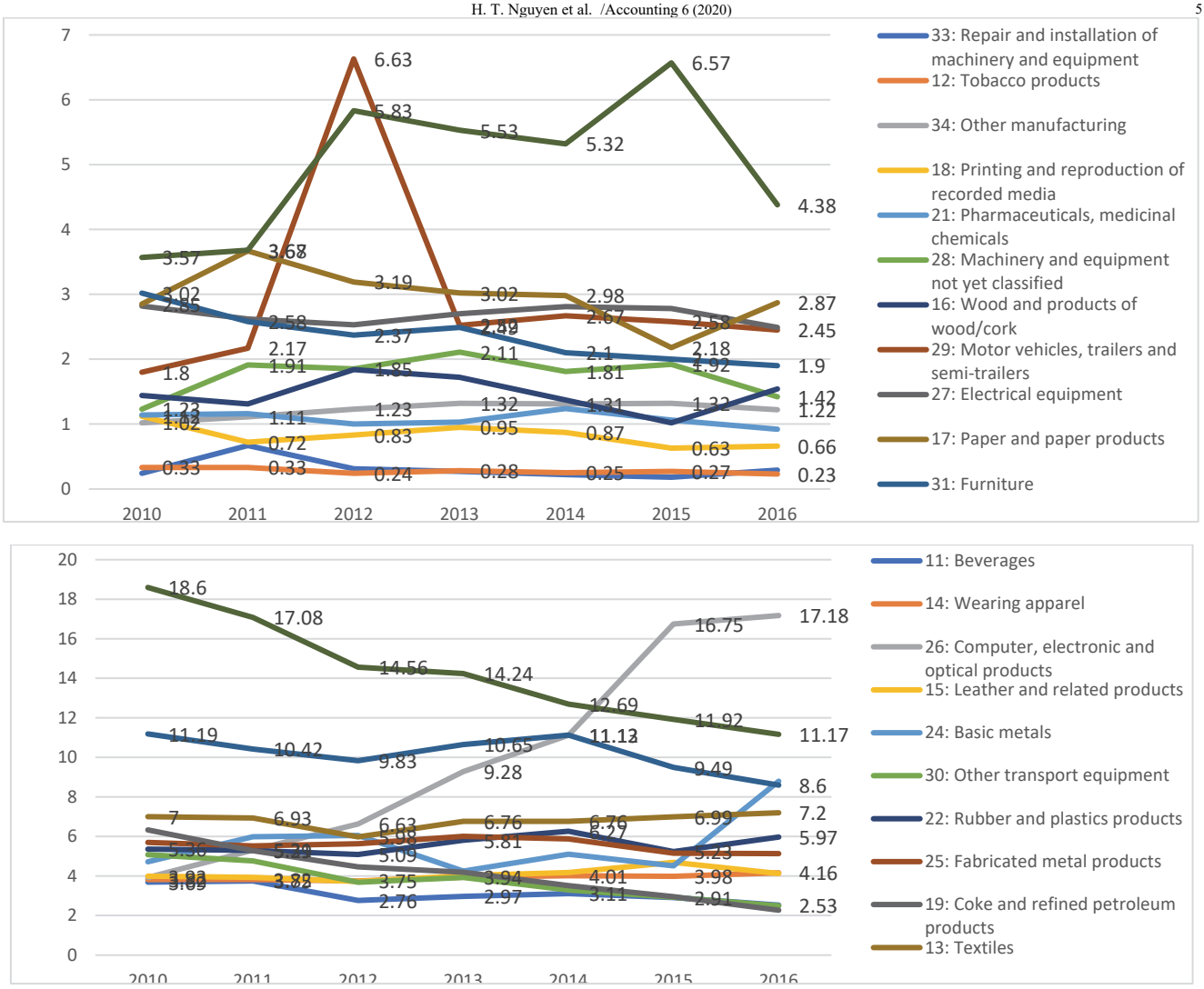


Fig. 4. Share of fixed capital of the manufacturing sector (%)

Source: Authors' calculation from VAES 2010-16

Fig. 5 indicates the gross value added of organized manufacturing sectors. Observed from the early 2010s, the shares have increased in such manufacturing sectors: Computer, electronic and optical products (code 26), Wearing apparel (code 14), Leather and related products (code 15). In contrast, many manufacturing sectors have been facing a decline, namely: Basic metals (code 24), Paper and paper products (code 17), Wood and products of wood/cork (code 16), Machinery and equipment not yet classified (code 28), Food products (code 10), Other non-metallic mineral products (code 23), and Electrical equipment (code 27). Fig. 6 indicates the capital-labor ratio, showing that the relative upward trend in favor of capital until 2015. That is, it strongly suggests that there is a high possibility that capital-intensive industries are driving force for the development of industrialization in Vietnam in recent years. Generally increasing capital-labor ratios are found in such sectors: Wearing apparel (code 14), Electrical equipment (code 27), Machinery and equipment not yet classified (code 28), Other manufacturing (code 34), Computer, electronic and optical products (code 26), Motor vehicles, trailers and semi-trailers (code 29), Fabricated metal products (code 25), Food products (code 10), Other non-metallic mineral products (code 23), Rubber and plastics products (code 22), and Basic metals (code 24). The facts that crucial sectors in industrialization with high capital-labor ratios, namely Electrical equipment (code 27), Machinery and equipment not yet classified (code 28), Other manufacturing (code 34), Computer, electronic and optical products (code 26), Motor vehicles, trailers and semi-trailers (code 29), Fabricated metal products (code 25), Other non-metallic mineral products (code 23), Rubber and plastics products (code 22), and Basic metals (code 24) are a good message to the Vietnamese economy.

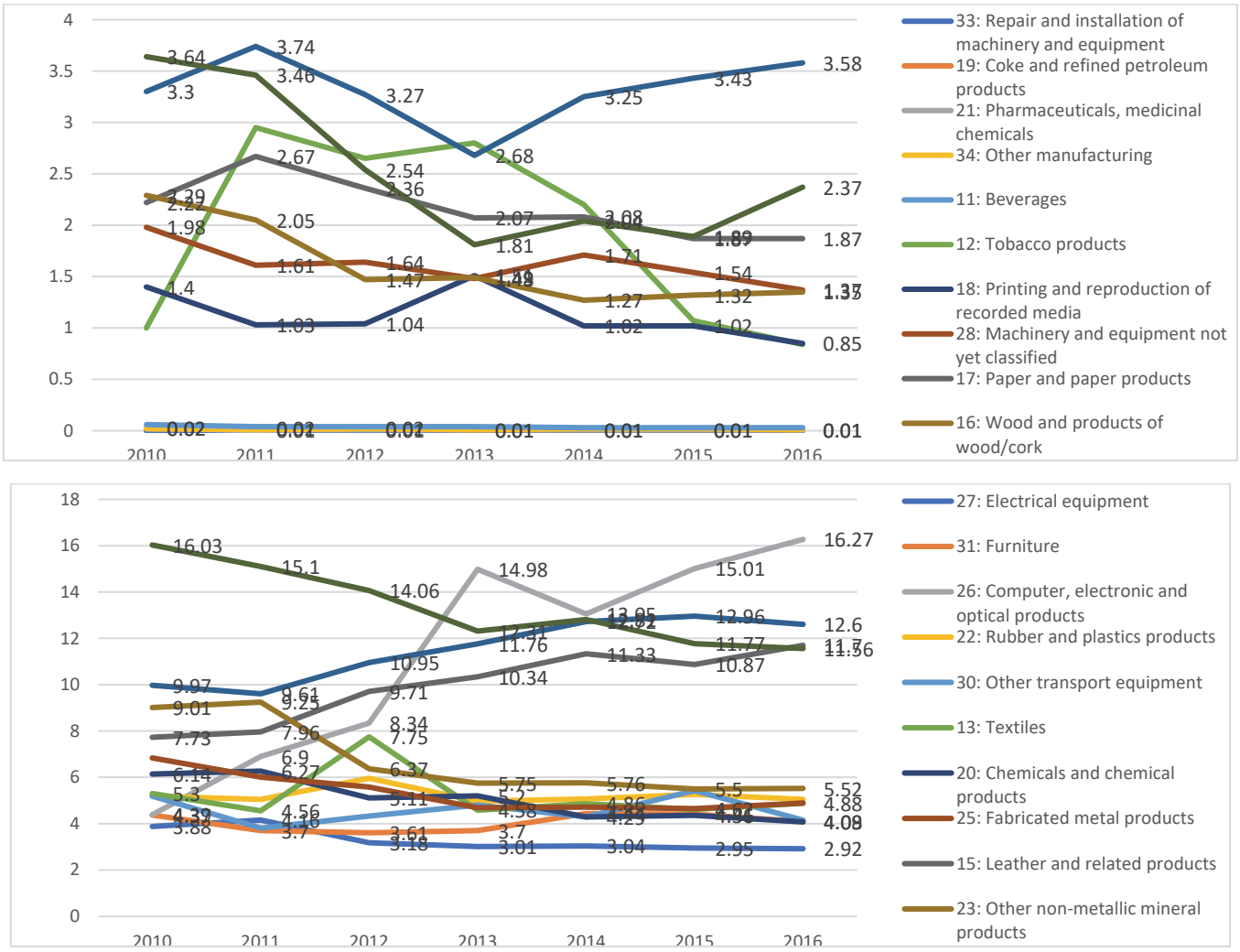
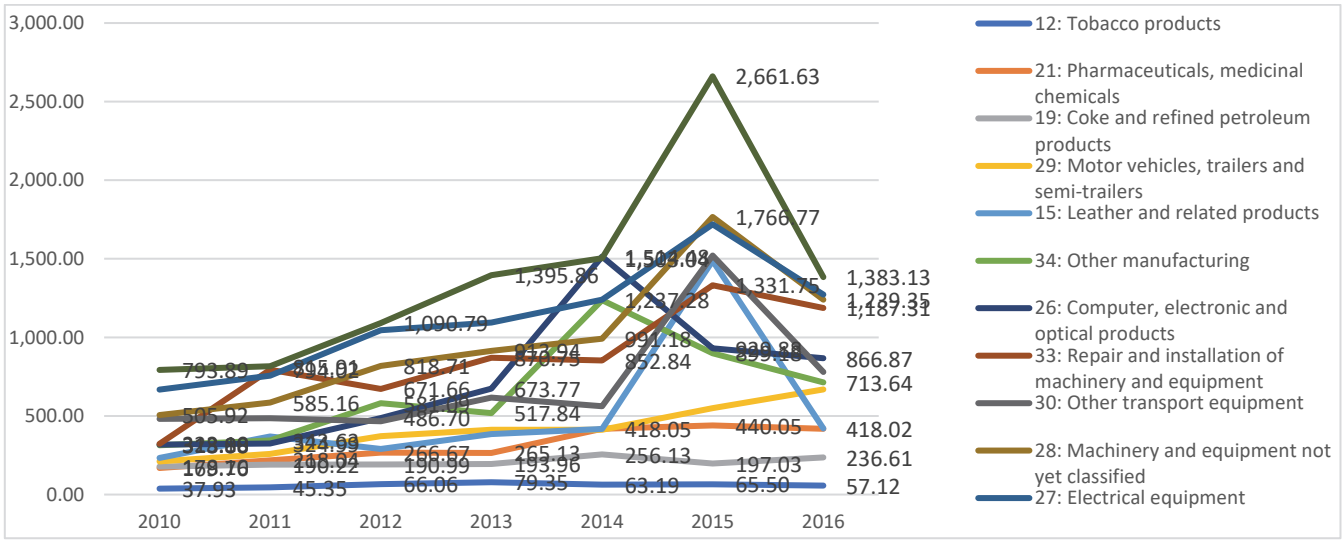


Fig. 5. Share of gross value added of the manufacturing sector (%)

Source: Authors' calculation from VAES 2010-16



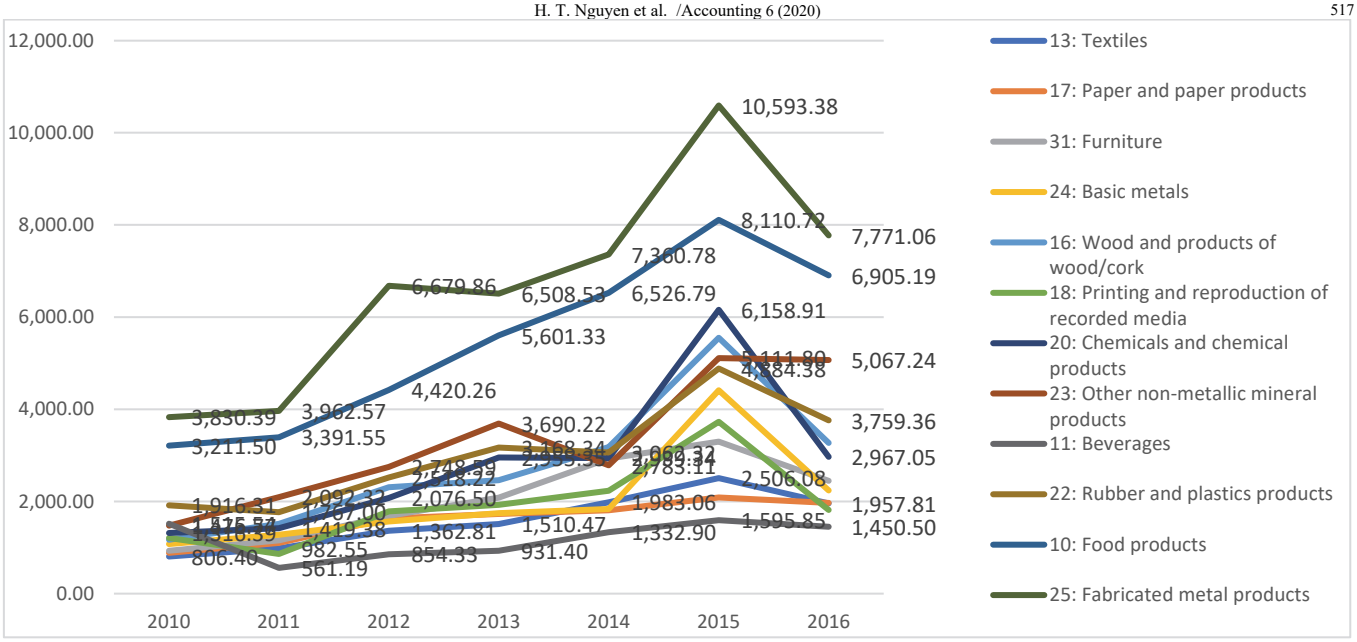
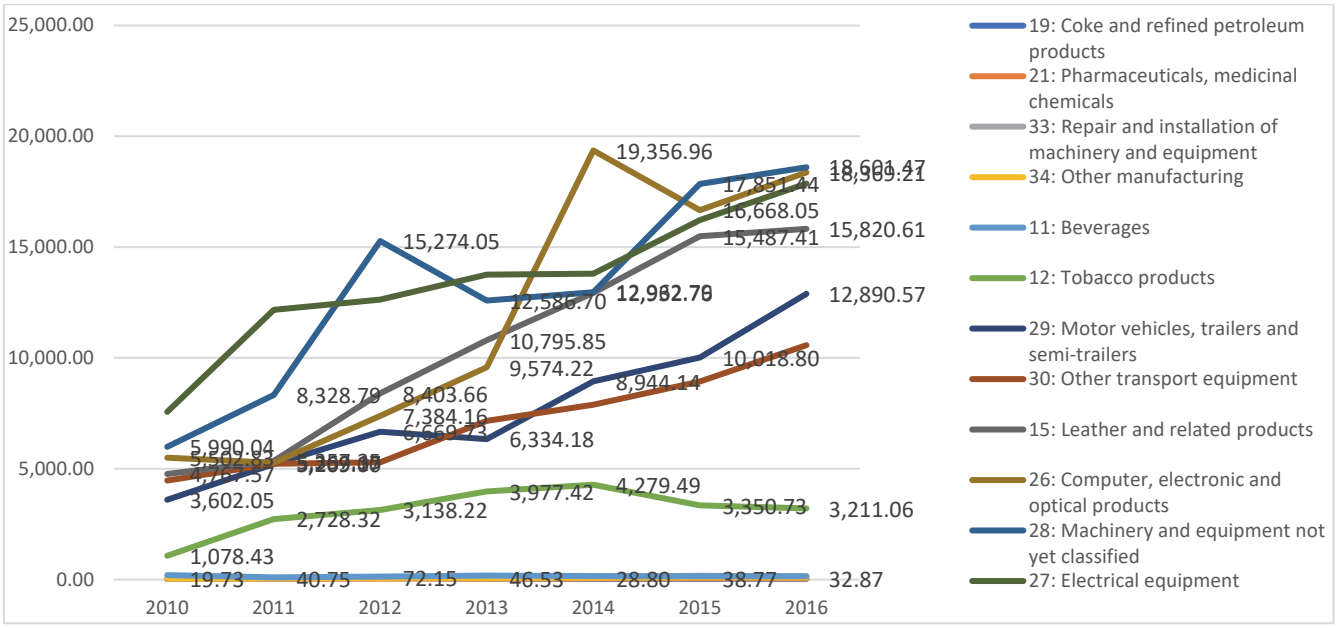


Fig. 6. The capital-labor ratio of the manufacturing sector (bill. VND)

Source: Authors' calculation from VAES 2010-16

Fig. 7 indicates labor productivity. From the figure, we see the relative upward trend over the study period. It also noted that since the early 2010s, manufacturing sectors with highly increasing labor productivity are Electrical equipment (code 27), Machinery and equipment not yet classified (code 28), Leather and related products (code 15), Computer, electronic and optical products (code 26), Other transport equipment (code 30), Motor vehicles, trailers and semi-trailers (code 29), Fabricated metal products (code 25), Food products (code 10), Other non-metallic mineral products (code 23), Wearing apparel (code 14), Basic metals (code 24), and Furniture (code 31). Interestingly, among these manufacturing sectors, Electrical equipment (code 27), Machinery and equipment not yet classified (code 28), Computer, electronic and optical products (code 26), Other transport equipment (code 30), Motor vehicles, trailers and semi-trailers (code 29), Fabricated metal products (code 25), Other non-metallic mineral products (code 23) are so important in industrialization.



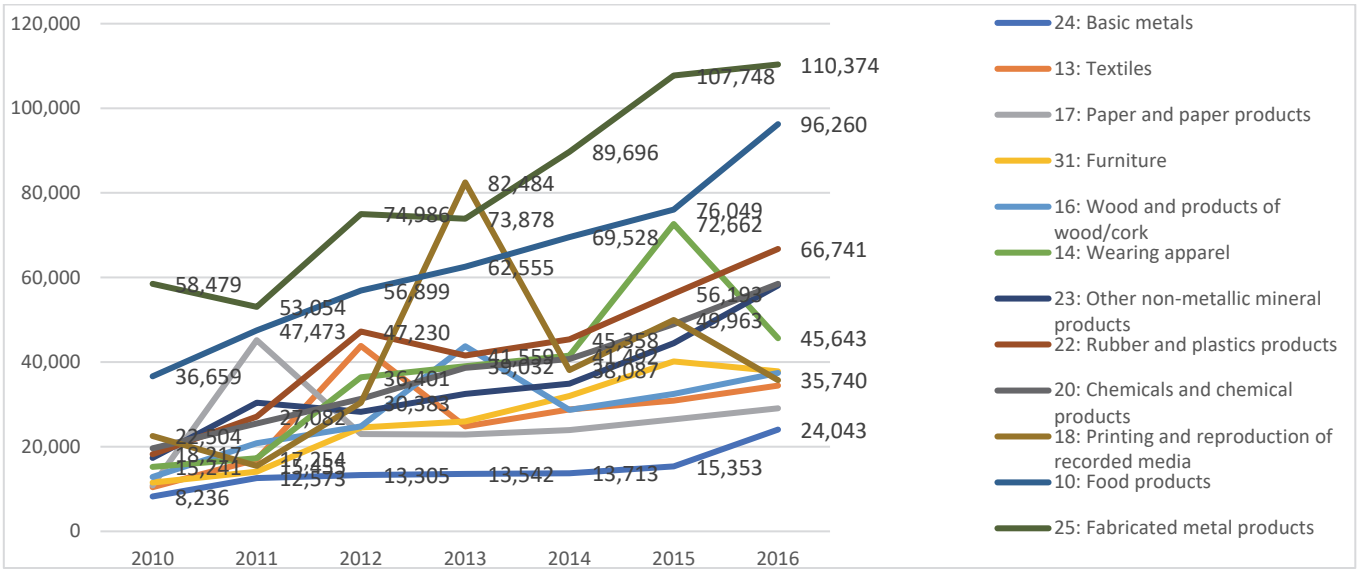


Fig. 7. Labor productivity of the manufacturing sector (bill. VND)

Source: Authors' calculation from VAES 2010-16

Figs. (1-7) indicate that: (a) some manufacturing sectors have increases in terms of (1) number of firms, (2) total of labor employment, (3) total capital, (4) capital-labor ratio, and (5) labor productivity, namely: Fabricated metal products (code 25), Basic metals (code 24), Motor vehicles, trailers and semi-trailers (code 29), Computer, electronic and optical products (code 26); (b) some manufacturing sectors have increases mostly in terms of (1) total of labor employment, (2) total capital, and (3) labor productivity, namely: Leather and related products (code 15), Machinery and equipment not yet classified (code 28), Furniture (code 31); (c) some manufacturing sectors have increases mostly in terms of (1) total capital, (2) capital-labor ratio and (3) labor productivity, namely: Electrical equipment (code 27), Other non-metallic mineral products (code 23); (d) some manufacturing sectors have increases mostly in terms of (1) total capital, and (2) labor productivity, namely: Other transport equipment (code 30), Wearing apparel (code 14); and (e) manufacturing sector has increases only in terms of labor productivity, namely: Food products (code 10).

4. Labor productivity decomposition

4.1. Data description

Table 1 provides the mean value of labor productivity and several of its potential determinants for the EXs and the NEXs, and whether the difference between the two groups is significant. The mean level of labor productivity in EXs equals VND 17,736.05 million and VND 7,664.05 in NEXs, and the difference between them is significant at the 1 percent level. Apart from labor productivity, there are other significant differences between firms in NEXs and the EXs in Table 2. Relates to firm-size as measured by the log of the number of workers at the firm at the end of the last fiscal year, firms in EXs tend to be relatively large as compared to firms in the NEXs. The mean difference in employment level (in logs) equals 2.37, implying that employment in firms located in EXs is almost 237% higher than in firms in the NEXs. This difference is statistically significant at the 1 percent level. With respect to the age of the firm, there is a significant difference at 1% level in the average age of the firms in EXs and the NEXs. Regarding the total capital stock, there is a significant difference at 1% level in the total fixed assets (in logs) of the firms in EXs and the NEXs, and the mean difference in employment level (in logs) equals to 2.47, implying that employment in firms located in EXs is almost 247% higher than in firms in the NEXs. An important aspect in the sample related to firms with foreign direct investment shows that the mean difference in FDI or not equals 0.38, implying that FDI firms in EXs is almost 38% higher than in firms in the NEXs.

Table 1
Mean differences

Variable	NEXs	EXs	Difference
Value added per worker (mill. VND)	7664.049	17736.05	-10072***
Labor productivity (log)	8.164	9.011	-.8463238***
Employment (log)	2.329	4.705	-2.375127***
Firm's age (log)	7.605	7.603	.001586***
Total fixed assets (log)	8.321	10.79	-2.469055***
FDI (dummy)	0.017	0.383	-.3655824***

Note: *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculation from VAES 2010-15

4.2. Regressions results

Tables 2, 3 and 4 provide the regression results for the drivers of labor productivity. We explore the determinants of labor productivity in a pooled sample of all firms in the EXs and the NEXs (Table 2) and separately for firms in the EXs and the NEXs (Tables 3 and 4, respectively). For the pooled sample regressions and to capture the difference in labor productivity between EXs and the NEXs, we use a dummy variable equal to 1 if the firm belongs to the EXs and 0 otherwise (the NEXs). Note that the dataset does not provide information on export in 2016 therefore our regression is based on the period 2010-2015 only.

First of all, about the firm size. Our results support the view that there exist a diminishing labor productivity with firm-size (see for example, Acs and Audretsch (1988), Cohen and Klepper (1996), Diaz and Sánchez (2008), Pagano and Schivardi (2003), Söderbom and Teal (2004), Van Biesebroeck (2005)). Secondly, about the age of the firm. We find the reverse effect of firm age on productivity. Thus. This proves the vintage effect due to younger firms who employing new and improved technology or equipment, and inefficient firms with ages implying lower productivity for the surviving older firms, (see for example, Bahk and Gort (1993), Jensen, McGuckin, and Stiroh (2001), Jovanovic (1982)). In relation to the role of physical capital in determining labor productivity, regression in Table 2 shows that physical capital had a positive relationship with labor productivity and it is significant at 1 percent level. The outward orientation of the firm as captured by exports and FDI ownership has a positive association with labor productivity. All two variables are significant at 1 percent level in the full-year sample. These results support the empirical findings of Griffith and Simpson (2004) who find a positive effect of export and foreign ownership on labor productivity, respectively.

Table 2
Base regression results (All manufacturing sectors)

VARIABLES	(1) 2010	(2) 2011	(3) 2012	(4) 2013	(5) 2014	(6) 2015
Employment (log)	-0.318***	-0.194***	-0.296***	-0.258***	-0.168***	-0.143***
	(0.00494)	(0.00598)	(0.00499)	(0.00454)	(0.00508)	(0.00520)
Firm's age (log)	-16.91***	-32.69***	-9.316***	-11.79***	-10.92***	-6.575***
	(1.417)	(1.827)	(1.457)	(1.314)	(1.591)	(1.442)
Total fixed assets (log)	0.421***	0.389***	0.391***	0.369***	0.309***	0.301***
	(0.00470)	(0.00475)	(0.00499)	(0.00453)	(0.00488)	(0.00507)
FDI (dummy)	0.115***	0.119***	0.156***	0.213***	0.307***	0.295***
	(0.0190)	(0.0177)	(0.0175)	(0.0171)	(0.0159)	(0.0166)
Export (dummy)	0.153***	0.184***	0.268***	0.227***	0.343***	0.264***
	(0.0151)	(0.0128)	(0.0139)	(0.0113)	(0.0128)	(0.0122)
Manufacturing sector (dummies)	Yes	Yes	Yes	Yes	Yes	Yes
Constant	129.8***	249.5***	72.29***	91.13***	84.69***	51.90***
	(10.78)	(13.90)	(11.08)	(9.998)	(12.10)	(10.97)
Observations	44,252	41,407	53,994	55,024	44,343	38,532
Adjusted R squared	0.812	0.740	0.804	0.813	0.756	0.806

Note: For the sake of brevity, coefficients of manufacturing sectors (dummies) are not presented.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' estimation from VAES 2010-15

Regression results in both Tables 3 and 4 for EXs and NEXs separately and respectively, uncover concerned factors highly correlated with labor productivity. In general, the results are similar to the results obtained from the full-year regression in Table 2.

Table 3
Results by exporting firms

VARIABLES	(1) 2010	(2) 2011	(3) 2012	(4) 2013	(5) 2014	(6) 2015
Employment (log)	-0.361***	-0.350***	-0.322***	-0.272***	-0.284***	-0.235***
	(0.0145)	(0.0112)	(0.0131)	(0.0114)	(0.0108)	(0.0116)
Firm's age (log)	-21.25***	-28.39***	-19.72***	-19.75***	-13.75***	-10.22***
	(3.265)	(2.776)	(2.595)	(2.333)	(2.148)	(2.269)
Total fixed assets (log)	0.475***	0.472***	0.440***	0.412***	0.423***	0.386***
	(0.0122)	(0.00926)	(0.0118)	(0.0114)	(0.0103)	(0.0118)
FDI (dummy)	0.0329	0.112***	0.162***	0.199***	0.272***	0.303***
	(0.0232)	(0.0198)	(0.0194)	(0.0193)	(0.0175)	(0.0172)
Manufacturing sector (dummies)	Yes	Yes	Yes	Yes	Yes	Yes
Constant	162.9***	216.9***	151.2***	151.5***	105.9***	79.26***
	(24.83)	(21.12)	(19.74)	(17.76)	(16.34)	(17.27)
Observations	5,517	8,836	8,444	10,502	9,243	9,421
Adjusted R squared	0.711	0.725	0.716	0.731	0.756	0.765

Note: For the sake of brevity, coefficients of manufacturing sectors (dummies) are not presented.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' estimation from VAES 2010-15

Table 4
Results by non-exporting firms

VARIABLES	(1) 2010	(2) 2011	(3) 2012	(4) 2013	(5) 2014	(6) 2015
Employment (log)	-0.300***	-0.132***	-0.277***	-0.242***	-0.124***	-0.0933***
	(0.00536)	(0.00704)	(0.00546)	(0.00501)	(0.00580)	(0.00591)
Firm's age (log)	-14.29***	-34.84***	-3.543**	-6.144***	-7.802***	-2.537
	(1.555)	(2.355)	(1.738)	(1.588)	(2.108)	(1.803)
Total fixed assets (log)	0.406***	0.361***	0.367***	0.345***	0.266***	0.258***
	(0.00515)	(0.00542)	(0.00556)	(0.00488)	(0.00554)	(0.00565)
FDI (dummy)	0.228***	0.255***	0.192***	0.281***	0.515***	0.494***
	(0.0336)	(0.0417)	(0.0431)	(0.0456)	(0.0399)	(0.0537)
Manufacturing sector (dummies)	Yes	Yes	Yes	Yes	Yes	Yes
Constant	109.7***	266.0***	28.54**	48.39***	61.29***	21.47
	(11.83)	(17.92)	(13.22)	(12.08)	(16.03)	(13.71)
Observations	38,735	32,571	45,550	44,522	35,100	29,111
Adjusted R squared	0.822	0.731	0.814	0.823	0.744	0.811

Note: For the sake of brevity, coefficients of manufacturing sectors (dummies) are not presented.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' estimation from VAES 2010-15

4.3. Decomposition Results

Table 5 presents the decomposition results. The labor productivity among firms in the EXs is, on average 58.1 percent higher than among firms in the NEXs (log difference of 0.581) and it is significant at 1 percent level. This labor productivity gap is further decomposed into an endowment effect and a structural effect. Endowment effect refers to the attributes of certain factors experienced by the firm, whereas the structural effect refers to the returns to these attributes or factors. For example, the size of a firm. Firms in EXs are on average larger than the firms in the NEXs, and this contributes to the labor productivity gap via the endowment effect. Furthermore, the returns of a unit increase in firm-size (or marginal working labor) may have differential effects for firms in EXs vs. NEXs, and this would be captured as a structural effect. Our results show that the labor productivity gap is almost come from the endowment. That is, the structural effect explains 34.4 percent of the productivity gap while the endowment effect explains the remaining 65.6 percent of the productivity gap (0.380 divided by 0.581). Firm-level factors contribute significantly to the productivity gap via the structural effect and the endowment effect. These factors are discussed below (Table 6).

Endowment effect

Recall that firms in the NEXs are less productive than firms in the EXs. Thus, any factor that narrows the productivity gap favors firms in NEXs over firms in EXs. The findings for the endowment effect are presented in column 1 of every year in 2010-2015 in Table 8. The biggest contribution to the productivity gap via the endowment effect comes from the difference between NEXs and EXs in the level of total fixed assets followed by firm's age, and then being an FDI.

Structural effect

The structural effect refers to the role of the returns to production factors or attributes of firms that lead to the widening or narrowing of the productivity gap. In Table 6, the structural effect is displayed in columns 2 and 3 of every year in 2010-2015. The biggest contribution comes from differences between the NEXs and the EXs in returns to total fixed assets, firm size and being an FDI.

Table 5
Decomposition results: the endowment and structural effects

VARIABLES	2010	2011	2012	2013	2014	2015
Labor productivity (log) in the NEXs	7.888***	7.908***	8.216***	8.263***	8.253***	8.472***
	(0.00794)	(0.00948)	(0.00775)	(0.00802)	(0.00931)	(0.00970)
Labor productivity (log) in the EXs	8.469***	8.868***	9.000***	9.041***	9.234***	9.315***
	(0.0195)	(0.0159)	(0.0164)	(0.0147)	(0.0153)	(0.0151)
Labor productivity difference (NEXs minus EXs labor productivity)	-0.581***	-0.960***	-0.784***	-0.777***	-0.981***	-0.843***
	(0.0210)	(0.0185)	(0.0181)	(0.0168)	(0.0179)	(0.0180)
Endowments	**-0.380***	**-0.632***	**-0.544***	**-0.596***	**-0.596***	**-0.511***
	(0.0285)	**(0.0220)**	**(0.0254)**	**(0.0205)**	**(0.0218)**	**(0.0212)**
Coefficients	-0.0997***	-0.0695***	-0.272***	-0.230***	-0.265***	-0.165***
	(0.0194)	(0.0191)	(0.0208)	(0.0183)	(0.0184)	(0.0222)
Interaction	-0.101***	-0.258***	0.0319	0.0486**	-0.121***	-0.167***
	(0.0271)	(0.0229)	(0.0273)	(0.0217)	(0.0224)	(0.0251)
Observations	44,252	41,407	53,994	55,024	44,343	38,532

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

Source: Authors' estimation from VAES 2010-15

2. Conclusions and implication

The manufacturing sector in Vietnam is accounted for large shares of the labor force and capital accumulation during the process of economic growth. It is also expected to contribute to structural transformation and industrialization. Nevertheless, the literature related to Vietnam is still silent on evidence on the productivity of the manufacturing sector. This knowledge gap in the manufacturing sector's productivity presents a serious space in the realization of industrialization in Vietnam.

Results show that the labor productivity of the manufacturing sectors increased during the study period. It can be concluded that the firms' productivity contributed to the current industrialization in Vietnam. On top of that, some manufacturing sectors with increasing labor productivity in the study period, namely: Fabricated metal products (code 25), Basic metals (code 24), Motor vehicles, trailers and semi-trailers (code 29), Computer, electronic and optical products (code 26), Leather and related products (code 15), Machinery and equipment not yet classified (code 28), Furniture (code 31), Electrical equipment (code 27), Other non-metallic mineral products (code 23), Other transport equipment (code 30), Wearing apparel (code 14), and Food products (code 10), and some are not. Thus, it can be argued that Vietnam's government policy plays a crucial role in stimulating the current industrialization. By targeting selective manufacturing sectors, policies might strengthen relevant advanced manufacturing sectors with currently high labor productivity, and give supports to potential manufacturing sectors those need to go advance in the future.

By using Oaxaca-Blinder decomposition method, several firm-level variables are found to contribute significantly to the productivity gap via the endowment effect and the structural effect. In overall, the endowment effect surpasses the structural effect in our sample period. Among the factor contributions, capital stock plays the most important role. Empirical studies about the impact of the related policy on the manufacturing industries will be fruitful research agenda.

Table 6
Decomposition results: Firm-level factor contributions

VARIABLE	2010			2011			2012		
	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction
Employment (log)	0.888***	0.299***	-0.144***	0.723***	1.021***	-0.449***	0.834***	0.223***	-0.117***
	-0.0364	-0.0792	-0.0381	-0.0239	-0.0621	-0.0276	-0.0343	-0.0699	-0.0367
Firm's age (log)	-0.0353***	52.85*	0.0115*	-0.0410***	-49.03*	-0.00932*	-0.0368***	123.0***	0.0302***
	-0.00552	-27.59	-0.00602	-0.00415	-27.68	-0.00526	-0.0049	-23.75	-0.00586
Total fixed assets (log)	-1.138***	-0.744***	0.166***	-1.211***	-1.179***	0.284***	-1.162***	-0.799***	0.193***
	-0.0313	-0.142	-0.0317	-0.0256	-0.114	-0.0276	-0.0321	-0.142	-0.0344
FDI (dummy)	-0.0145	0.0900***	-0.0849***	-0.0393***	0.0530***	-0.0505***	-0.0645***	0.0125	-0.0121
	-0.0102	-0.019	-0.0179	-0.00698	-0.017	-0.0163	-0.00778	-0.0195	-0.0188
All sectors (dummies)	-0.0806***	0.197**	-0.0501***	-0.0638***	-0.0676	-0.0335***	-0.114***	-0.0362	-0.0617***
	-0.0193	-0.0868	-0.0122	-0.0156	-0.0445	-0.00818	-0.0163	-0.0437	-0.00925
Total	-0.380***	-0.0997***	-0.101***	-0.632***	-0.0695***	-0.258***	-0.544***	-0.272***	0.0319
	-0.0285	-0.0194	-0.0271	-0.022	-0.0191	-0.0229	-0.0254	-0.0208	-0.0273

VARIABLE	2013			2014			2015		
	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction
Employment (log)	0.638***	0.138**	-0.0703**	0.683***	0.759***	-0.384***	0.559***	0.671***	-0.337***
	-0.027	-0.0571	-0.0291	-0.0264	-0.0582	-0.0296	-0.028	-0.0619	-0.0312
Firm's age (log)	-0.0349***	103.4***	0.0240***	-0.0216***	45.25**	0.00934**	-0.0153***	58.39***	0.0115***
	-0.00418	-21.46	-0.00501	-0.00341	-22.88	-0.00473	-0.00342	-22.03	-0.00435
Total fixed assets (log)	-1.004***	-0.719***	0.163***	-1.033***	-1.712***	0.383***	-0.875***	-1.401***	0.289***
	-0.0288	-0.134	-0.0303	-0.0264	-0.128	-0.0288	-0.0276	-0.144	-0.0297
FDI (dummy)	-0.0679***	0.0290*	-0.0279*	-0.101***	0.0938***	-0.0902***	-0.109***	0.0713***	-0.0688***
	-0.00663	-0.0175	-0.0169	-0.00664	-0.0169	-0.0163	-0.00636	-0.021	-0.0203
All sectors (dummies)	-0.126***	-0.0258	-0.0404***	-0.124***	-0.0559	-0.0382***	-0.0715***	-0.102***	-0.0609***
	-0.0149	-0.0358	-0.00767	-0.0159	-0.0414	-0.00823	-0.016	-0.0354	-0.0079
Total	-0.596***	-0.230***	0.0486**	-0.596***	-0.265***	-0.121***	-0.511***	-0.165***	-0.167***
	-0.0205	-0.0183	-0.0217	-0.0218	-0.0184	-0.0224	-0.0212	-0.0222	-0.0251

Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Authors' estimation from VAES 2010-15

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