

**ANALYZE THE RELATIONSHIP BETWEEN FOREIGN OWNERSHIP
PROPORTION AND TOTAL FACTOR PRODUCTIVITY OF
PHARMACEUTICAL FIRMS IN VIETNAM**

Nguyen Quang Duy¹ and Nguyen Quoc Nghi¹

¹College of Economics, Can Tho University

ABSTRACT

Vietnam was considered one of the countries with high pharmaceutical growth (IQVIA, 2014). With expectations of market development, foreign investment in Vietnamese pharmaceutical firms tends to increase rapidly in recent years. This study was conducted to analyze the relationship between foreign ownership proportion and total factor productivity of pharmaceutical firms in Vietnam. The analysis results have shown that the proportion of foreign ownership had a negative impact on the total factor productivity of pharmaceutical firms in Vietnam in the period of 2014 - 2017. Besides, human resource quality and manager's characteristics positively affect the overall factor productivity. Several solutions were proposed to utilize foreign investment in improving total factor productivity of pharmaceutical firms in Vietnam.

Keywords: Total factor productivity (TFP), foreign ownership proportion, pharmaceutical firms, Vietnam

1. PROBLEM STATEMENT

In the process of integration and development, attracting foreign investment policy is said to be a motivation to promote the economic growth of many countries in the world. The presence of foreign ownership accompanied by technology transfer activities led to higher growth in productivity of domestic companies (Kathuria, 2001). In order to understand the impact of foreign ownership on productivity, many studies have been conducted. According to Aitken and Harrison (1999), the proportion of foreign investment was positively correlated with enterprises' overall factor productivity. However, this relationship was evident in small enterprises. Similarly, another study also showed that foreign ownership significantly improved the total factor productivity of businesses. This occurred in the first year when foreign ownership was formed and increased by more than 13.5% after the next three years (Arnold and Javorcik, 2009).

In developing countries, foreign-owned companies achieved higher total factor productivity than private domestic ones (Waldkirch, 2014).

Positive forecasts on the growth of Vietnam's pharmaceutical industry, as well as the improvement in the citizen's income and living standard in recent years, have created an attractive market for foreign investors. Therefore, foreign investment in Vietnam's pharmaceutical industry is increasing rapidly. Besides financial resources, foreign investors also bring modern management methods and advanced technology, which positively impact the total factor productivity of businesses. The study was conducted to help understand the relationship between the foreign ownership proportion and overall factor productivity of pharmaceutical firms in Vietnam, thereby propose some implications to effectively utilize foreign investment in improving total factor productivity of domestic pharmaceutical firms.

2. THEORETICAL FRAMEWORK AND RESEARCH MODEL

2.1 The relationship between overall factor productivity and foreign ownership

According to Comin (2006), total factor productivity (TFP) are additional outputs that are not explained by the inputs. Thus, the TFP value is measured by the efficiency of the input factors usage. In another viewpoint, there are three components that contribute to the production of goods and services, including as labor, capital and other factors (Vietnam National Center for Socio-Economic Information and Forecast, 2017). It can be understood that TFP is the increase in productivity, not because of the rise of capital and labor involved in the production process.

With foreign ownership factor, some studies showed that productivity gap among enterprises was mainly explained by business characteristics rather than foreign ownership factor. Accordingly, Barbosa and Louri (2003) found no evidence that foreign-owned companies performed better than domestic ones in Portugal and Greece. Similarly, in Austria, the performance gap (labor productivity, profit, etc.) of domestic and foreign-invested companies was not explained by the proportion of foreign ownership in the capital structure (Pfaffermayr and Bellak, 2000).

However, if companies can control and isolate foreign investment issues from other purposes (peripheral ownership, etc.), the relationship between foreign ownership and company productivity is significant. Accordingly, the research results of Yudaeva et al. (2003) showed that foreign-owned companies in Russia were more productive than domestic companies in terms of added value. For businesses in Turkey, similar results on the impact of foreign ownership were also indicated (Aydin et al., 2007). Besides, the theory of TFP growth has been mentioned in many previous theoretical and experimental studies. According to the research model proposed

to the Asian Productivity Organization, Oguchi (2001) referred to the capital structure as one of the sources affecting TFP growth.

2.2 Research model

Ownership proportion of foreign shareholders

Foreign ownership proportion, in particular, ownership proportion of foreign shareholders in the capital structure of enterprises has been mentioned in many studies. Researches showed that the percentage of foreign investment in the capital structure had a positive impact on TFP (Aitken and Harrison, 1999; Waldkirch, 2014; Lee, 2008; Yudaeva et al., 2003; Mueller and colleagues, 2003). In the study about Indonesian companies, Arnold and Javorcik (2009) found that the productivity of purchasing factories increased by 13.5% after three years when there were foreign investments. The same outcome was also mentioned by Yasar and Paul (2007) in a study about manufacturing factories in Turkey.

To measure the ratio of foreign ownership, Lee (2008), Pham et al. (2014) built the foreign ownership variable based on the percentage of shares held by foreign investors. In addition, the dummy variable to measure foreign ownership proportion was used by Yudaeva et al. (2003), Mueller et al. (2003). This study evaluates the foreign ownership proportion by the percentage value to reflect specifically the level of ownership. Therefore, hypothesis H1 is proposed as follows: *Foreign ownership proportion positively affects the TFP of pharmaceutical firms in Vietnam.*

Public ownership

Some studies suggested that public property had an impact on TFP of enterprises. The research on companies in Indonesia showed that companies with public ownership had a lower growth rate in TFP compared to private ones (Arnold and Javorcik, 2009). Because of the difference between public-owned firms and other kinds of firm, Wang J. and Wang X. (2014) eliminated state-owned firms from the research sample in the study about the effects of foreign ownership to firms' TFP. Thus, the study proposes hypothesis H2 as follows: *The proportion of public property harms the TFP of pharmaceutical firms in Vietnam.*

Factors related to enterprise characteristics

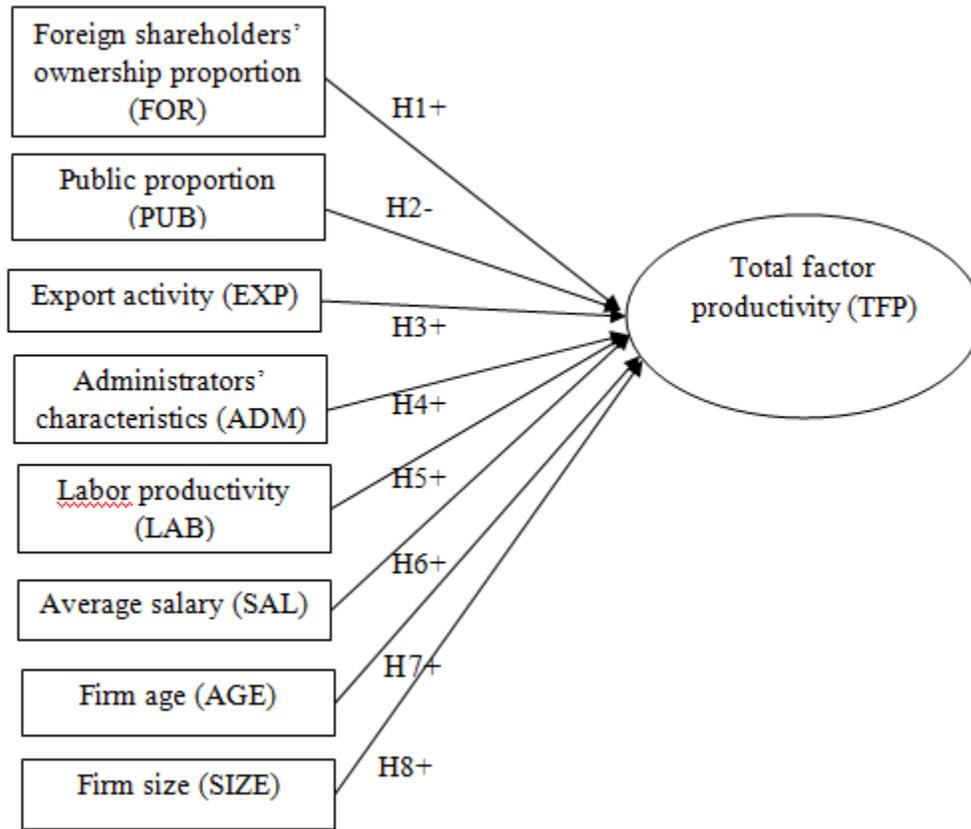
Studies showed that the export activity of firms had a positive impact on TFP values (Pham et al., 2014; Waldkirch, 2014). In addition, when the capital structure has reached the high ownership, foreign investors tend to bring their personnel to join the management board in the investee company and directly dominate the production process. Therefore, the study also

considers the characteristics of managers in domestic companies receiving foreign investment (Xu, X. and Y. Wang, 1997). Hence, hypotheses H3 and H4 are stated. *H3: Export activity has a positive impact on TFP of pharmaceutical firms in Vietnam; H4: Administrator characteristics have a positive effect on TFP of pharmaceutical firms in Vietnam.*

Besides, Vo Van Dut et al. (2017) showed that the quality of resources had a positive relationship with the TFP of enterprises in Vietnam. This study has mentioned that labor usage efficiency (reflected by labor productivity) has a positive impact on TFP. Accordingly, labor productivity demonstrates the level of efficiency in the use of human resources in production and business activities and is measured by the ratio of added value to the total number of employees. Besides, the average wage was also a factor that had a positive impact on TFP of enterprises (Pham et al., 2014; Vo Van Dut et al., 2017). Therefore, hypotheses H5 and H6 are proposed. *H5: Labor productivity has a positive impact on TFP of pharmaceutical firms in Vietnam; H6: Average wage has a positive effect on TFP of pharmaceutical firms in Vietnam.*

In addition, the factor of firm age (calculated by the number of operation years at present) was also used in the TFP estimation model (Waldkirch, 2014; Wang J. and Wang X., 2014; Arnold and Javorcik, 2009). Moreover, several studies also showed a positive relationship between firm size and TFP. To divide enterprises according to their size, the authors used different indicators such as the number of employees (Van Biesebroeck, 2005; Mai et al., 2018) or logarithm value of total firm assets (Lopamudra, D. S. et al., 2017). Hence, hypotheses H7 and H8 are proposed. *H7: Firm age has a positive impact on TFP of pharmaceutical firms in Vietnam; H8: Firm size has a positive effect on TFP of pharmaceutical firms in Vietnam.*

Based on the literature review and proposed hypotheses, the research model on the relationship between foreign ownership and TFP of pharmaceutical firms in Vietnam is proposed as follows:



Source: author's proposal, 2019

Figure 1: The proposed research model

Table 1: Interpretation of observed variables in the research model

Observed variable	Sign	Interpretation	Scale	Reference source
Foreign shareholders' ownership proportion	FOR	The foreign shareholders' capital ownership proportion in the total capital structure of the firm.	Ratio scale (by percentage)	Aitken and Harrison (1999); Waldkirch (2014); Lee, (2008); Yudaeva et al. (2003); Mueller et al. (2003)
Public ownership	PUB	The state shareholders' capital ownership proportion in the total	Ratio scale (by percentage)	Arnold and Javorcik (2009); Wang J. and Wang X. (2014); Xu

Observed variable	Sign	Interpretation	Scale	Reference source
		capital structure of the firm.		and Wang, (1997)
Export activity	EXP	A dummy variable takes value 1 if the firm exports to the international market; vice versa, takes value 0.	Nominal scale (binary variable)	Walckirch (2014); Wang J. and Wang X. (2014); Pham et al., 2014; Mai et al. (2018)
Administrator characteristics	ADM	The number of representatives of the foreign firm in the structure of the management board in the investee firm.	Ratio scale (by the number of managers)	Xu and Wang, (1997)
Labor productivity	LAB	The added value generated per employee per year.	Ratio scale (added value/total labor)	Vo Van Dut et al. (2017)
Average wage	SAL	The average value of wage per employee per year.	Ratio scale (labor cost /total labor)	Pham et al., 2014), Vo Van Dut et al. (2017)
Firm age	AGE	The number of operation years from the time the firm was established to the time of data collection.	Ratio scale (number of operation years)	Walckirch (2014); Wang J. and Wang X. (2014); Arnold and Javorcik (2009)
Firm size	SIZE	Estimated by the firm size. Get value 1 if the firm size is very small, 2 if the firm has a small scale, 3 if its size is medium, and 4 if the firm has a large scale.	Ordinal scale	Biesebroeck (2005), Mai et al. (2018), Lopamudra et al. (2017)

Source: Author's proposal, 2019

3. RESEARCH METHOD

Data collection method

Research data was collected from the annual report of 20 pharmaceutical firms in Vietnam in the period of 2014 - 2017 (65 observations). These were reputable firms in the pharmaceutical industry and attracted foreign investors in this period.

Analytical method

Currently, there are many methods to measure TFP, but there is still no formula which can be used worldwide. According to the Asian Productivity Organization (APO - 2004), the following production function is the general formula to measure TFP: $Q_t = A_t F(K_t, L_t)$, where the Q_t is the total output/actual output, the L_t is labor, the K_t is capital, and the A_t is TFP.

According to the Vietnam Central Institute for Economic Management, TFP is calculated by using Cobb-Douglas production function:

$Y = A K^\alpha L^\beta$; It means Y is the output. A is TFP. K is the input capital. L is the labor. α and β are the elasticity of the output corresponding to capital and labor. This formula was widely used in studies related to TFP (Chen and Démurger, 2002; Pham et al., 2014).

After taking the logarithm of both sides of the above equation ($\ln Y = \ln A + \alpha \ln K + \beta \ln L$), the study estimated α and β by the ordinary least squares (OLS) to build the formula for measuring TFP. In this formula, Y is measured by the firm's sales. K is measured by the book value of machinery and equipment (Pham et al., 2014; Vo Van Dut et al., 2017); L is measured by the number of employees (Chen and Démurger, 2002).

Once TFP value has been determined. The study applies a multivariate linear regression method to estimate the relationships as well as the level of effectiveness of these variables, which are foreign ownership, Public ownership, Export activity, Manager characteristics, Labor productivity, Average wage, Firm age, and Firm scale on TFP of pharmaceutical firms in Vietnam.

4. RESEARCH RESULTS AND DISCUSSION

4.1 Actual state of foreign ownership proportion and total factor productivity of pharmaceutical firms in Vietnam

The result of the ordinary least squares shows that α and β are 0,411 and 0,582, respectively (with 1% significance level). Accordingly, the estimated values of TFP are shown in the following table.

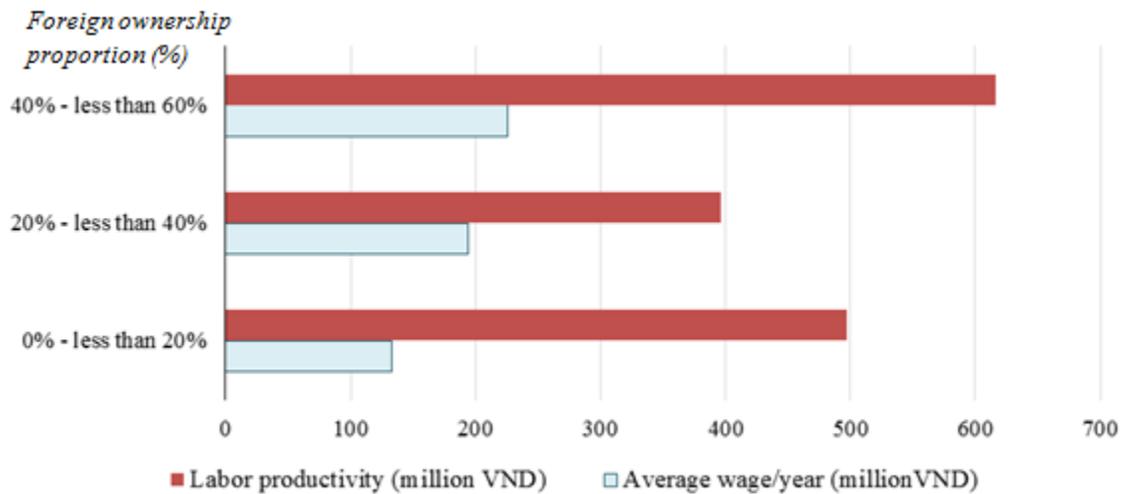
Table 2: Total factor productivity, foreign ownership and public ownership of foreign-owned pharmaceutical firms in Vietnam

	Mean	Standard deviation	Min	Max
TFP	3.662	1.499	1.309	7.456
Foreign shareholders' ownership proportion (%)	19.02	20.71	0.02	59.42
Public ownership proportion (%)	18.28	17.06	0.00	51.00

Source: Collected data in the period of 2014 - 2017

The TFP values of pharmaceutical firms in Vietnam were not equal in the period of 2014 – 2017 because of the internal characteristics. Also, the statistics show that there was a big difference in the proportion of foreign ownership and public ownership in domestic pharmaceutical firms (with standard deviations of 20.71% and 17.06%, respectively).

Besides, the added value (labor productivity) generated by employees varied considerably according to the fluctuation of foreign ownership (Figure 2). In particular, if the proportion of foreign shareholders' property in capital structure increased from 20% to 40%, labor productivity decreased and reached the value of less than 400 million VND/person/year. However, when this proportion was over 40%, labor productivity rose rapidly and reached 616.9 million VND/person/year. Besides, the statistical results pointed out that the average labor cost in the year was positively correlated with the foreign ownership proportion.

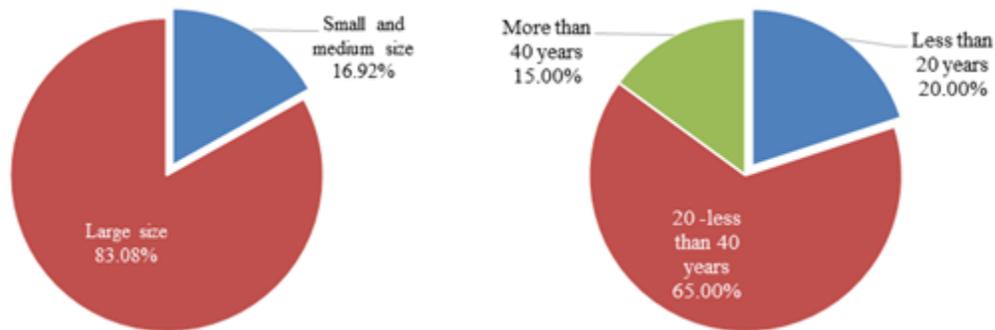


Source: Collected data in the period of 2014 - 2017

Figure 2: Changes in labor productivity and average wage according to foreign shareholders' ownership proportion

Besides, the research sample was the leading firms in the pharmaceutical industry. Of which 83.08% were large-sized firms, the rest were small and medium-sized ones (Figure 3). The results indicated that the average foreign ownership proportion in large-sized domestic pharmaceutical firms was 22.20%. Meanwhile, this number for small and medium firms was 3.38%. This infers the interest of foreign investors in large-scale domestic pharmaceutical firms in Vietnam. These companies have stable market share and distribution network, production factories as well as are properly invested. These are essential factors to promote investments in stocks or long-term cooperation from foreign investors.

Most domestic pharmaceutical joint-stock companies' precursors were state-managed firms with a long history of formation (Figure 3). Base on the results, firms which were 20 years old accounted for 80%. In particular, 15% of firms had a history of over 40 years (until 2017). The average number of operation years of these firms was 28.75 years. With a long-distance of the development, domestic pharmaceutical firms are experienced in production activities. However, improving production technology needs to be taken into consideration to meet the strict quality standard and be able to compete with foreign products directly.



Source: Collected data in the period of 2014 - 2017

Figure 3: Firm size and number of operation years

4.2 The relationship between foreign ownership proportion and TFP of pharmaceutical firms in Vietnam

After measuring TFP values, the study applies the linear regression with 8 independent variables, namely foreign shareholders' ownership proportion (FOR), public ownership proportion (PUB), export activity (EXP), administrator characteristics (ADM), labor productivity (LAB), average wage (SAL), firm age (AGE), and firm size (SIZE).

Table 3: Regression analysis result

Factor	B coefficient	Beta	Significance level (Sig.)	Variance inflation factor (VIF)
Constant	-36.609		0.000	
FOR	-0.026	-0.365	0.034**	3.095
PUB	-0.002	-0.022	0.848 ^{ns}	1.391
EXP	-0.057	-0.016	0.908 ^{ns}	2.018
ADM	0.321	0.224	0.100*	1.965
LAB	1.115	0.588	0.000***	1.570
SAL	0.887	0.315	0.041**	2.491
AGE	0.011	0.071	0.582 ^{ns}	1.819
SIZE	0.449	0.142	0.227 ^{ns}	1.482
Sig.F = 0,000				

Adjusted R-squared = 41.7%

Durbin-Watson = 1.907

Note: *** 1% significance level, ** 5% significance level, * 10% significance level, ^{ns} not statistically significant.

Source: Analysis results, 2019

Table 3 shows that the variance inflation factor (VIF) of all independent variables is all less than 10, so there is no multicollinearity. There is no autocorrelation because the Durbin-Watson coefficient = 1.907 meeting the following condition, $dU < D < 4 - dU$. ANOVA analysis result claims that $\text{Sig.F} = 0,000 < 0.05$. This means the proposed model is statistically significant. And there is at least one independent variable that has the impact on the dependent variable; thereby, we can generalize the result. Adjusted R-squared = 41.7% indicates that independent variables in the model explain 41.7% of TFP variation. The rest is explained by other factors not included in the model.

Next, the study takes the Spearman test to determine whether there is error variance. The result shows that all Sig. Values are higher than the 1% significance level, so it is impossible to reject the hypothesis H_0 : the rank-order correlation of the sample is 0. Therefore, there is no error variance.

In summary, the analysis results show that with eight factors included in the model, four factors affect TFP of pharmaceutical firms (with the significance level of 1%, 5%, and 10%). The regression model is formed as follow: $TFP = - 0,026 FOR^{**} - 0,002 PUB^{ns} - 0,057 EXP^{ns} + 0,321 ADM^* + 1,115 LAB^{***} + 0,887 SAL^{**} + 0,011 AGE^{ns} + 0,449 SIZE^{ns}$

Result explanation:

According to the regression equation, the foreign shareholders' ownership proportion (FOR) negatively affects TFP; particularly, if the foreign ownership ratio increases by 1%, the TFP value decreases by 0.026. Besides capital and labor, which help the productivity grow, there are still other factors such as technical progress and corporate administration which play a role as motivation for promoting productivity. This amount of increasing productivity is considered the total factor productivity (TFP). Therefore, in order to fully understand the relationships between the ownership proportion of foreign shareholders and each factor constituting production results, this study tests the correlation among elements by Pearson index.

Table 4: Factor correlation analysis

		Firm sales (Y^{ln})	Tangible assets value (K^{ln})	Labor (L^{ln})	TFP
FOR	Pearson Correlation	0.780***	0.744***	0.764***	0.066
	Sig. (2-tailed)	.000	.000	.000	.599
N = 65					

*Note: *** 1% significance level (both sides)*

^{ln} variables took logarithms.

Source: Analysis results, 2019

The analytical results indicate that there is a positive correlation between FOR and Y, K and L at the 1% significance level, respectively. Accordingly, that the proportion of foreign shareholders' ownership increase will help increase the value of tangible assets (capital factor), the number of employees (labor factor) and company turnover (output factor). From 2014 to 2017; When foreign investment in pharmaceutical firms increased, these firms tended to increase investment in capital and labor resources to improve the output quality and meet market demands and maintain their market share. However, most domestic pharmaceutical firms have not focused on developing technical progress or corporate governance to increase both output quantity and quality. On the other hand, from 2014 to 2017, the number of domestic pharmaceutical firms with foreign investment that engaged in technology and technical improvement activities was minimal, and this had an unclear impact on TFP. Therefore, the foreign shareholder's ownership proportion negatively affected the TFP of domestic pharmaceutical firms in this period. This result is consistent with the study on the impact of resource quality on TFP of Vietnamese enterprises (Vo Van Dut et al., 2017). Accordingly, the reason for foreign-invested Vietnamese enterprises' slow growth is the failure in meeting the technological transferring standards.

Besides, the results confirm that public ownership has no relationship with TFP value. Statistics show that firms with 40% to 60% public ownership ratio have a lower average TFP value than those with below 40%. In particular, domestic firms with public ownership proportion of between 20% and 40% achieve the average TFP value of 4.18 (1.5 times higher than those with the percentage from 40% to 60%). When the share of public ownership falls below 20%, the average TFP value reaches 3.58 (1.3 times higher than those with the proportion from 40% to 60%). In general, from 2014 to 2017, the TFP value of pharmaceutical firms tended to increase when the ratio of public ownership decreased.

Moreover, administrator characteristics (ADM) and average salary (SAL) have a positive impact on the TFP value. Direct participating in the management board of the investee company, foreign managers bring effective solutions and contribute to improving productivity. Besides, the improvement in income motivates workers to improve their performance and help increase the TFP value. This result is consistent with the outcome of Pham et al. (2014) related to the productivity of enterprises in Vietnam.

According to the regression equation, labor productivity has the most definite impact on the TFP value with a coefficient of (+) 1.115. Although labor and TFP are two independent factors affecting the output quality, labor also affects TFP growth (Vietnam National Productivity Institute, 2018). Besides investing in modern technology, the professional qualifications of workers directly related to the ability to apply technological advances to the actual production process, thereby increasing labor productivity and improving the ability to use technology into all business aspects. Therefore, this impact contributes to improving TFP value.

5. CONCLUSIONS AND RECOMMENDATIONS

The study has demonstrated the relationship between foreign ownership proportion and TFP of pharmaceutical firms in Vietnam. However, the majority of domestic firms still have not effectively utilized foreign investments in developing other factors ; such as technical progress or corporate governance, so the proportion of foreign ownership hurt TFP value from 2014 through 2017. Also, administrator characteristics and human resource quality (reflected through labor productivity and average wage) have a positive impact on TFP. From the above research results, several solutions are proposed to effectively utilize foreign investment in improving the TFP of pharmaceutical firms in Vietnam.

Firstly, strengthen the cooperation in all aspects with prestigious pharmaceutical companies in the world. With the advantage in the domestic market, Vietnam's pharmaceutical industry has been attracting investments from foreign companies/corporations. This is an opportunity to expand production scale, promote research and development activities for new products (including brand-name and equivalent drugs). However, to maximize the efficiency of investments; domestic firms should strengthen cooperation in all aspects, including technology transfer, management solutions, material area development, etc., with prestigious pharmaceutical companies in the world. This is an opportunity to improve the TFP of domestic firms.

Secondly, improve the quality of human resources to meet development requirements. Pharmaceutical firms in Vietnam need to develop appropriate solutions for training activities in terms of professional qualifications and skills for employees. Also, foreign-invested

pharmaceutical firms should pay attention to invest in high-quality human resources for research and technology transfer activities.

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