APPLICATION OF COBB - DOUGLAS PRODUCTION FUNCTION IN ANALYSING THE PRIVATE ENTERPRISES' ABILITY OF JOB CREATION IN PHU THO PROVINCE

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Abstract

The private enterprises' ability of job creation is influenced by many factors such as salaries, technology, investment in research and development, characteristics of enterprises (size, field, ownership, …). Using Cobb - Douglas production function to analyze the impact of factors on the private enterprises' ability of job creation in Phu Tho province is the basis to offer solutions to increase the ability of job creation in Phu Tho province. The results showed that an increase of profit and capital investment for private enterprises had a positive impact on the job growth, while salaries and levels of capital intensity would constrain labor used in enterprises. As a result, in order to foster the private enterprises' ability of job creation in Phu Tho province in the future, improving the favorable investment environment to help enterprises increase profits will be an important solution.

Keywords: *Employment, labor demand, private enterprise, Phu Tho province.*

1. Introduction

Employment is one of the basic human needs to bring rights and income to ensure their lives and their family. According to the International Labor Organization, the world is facing with unemployment and underemployment; poor quality jobs and ineffective jobs; unsafe jobs and unsecured income; non-guaranteed rights at work; gender inequality; lack of representation and no voice; inadequate social protection when workers face illnesses; disability and old age. Employees always face many risks in works and lives, what they are doing simply brings a small income to help them cover their tight lives [1].

In Vietnam, solving labor and employment problems, meeting the needs of the whole

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society is an urgent requirement that the real situation poses, especially with our country - a developing country which has an extremely abundant labor force. According to statistical sources, in the 2006-2015 period, compared to the state economic sector and the foreign direct investment sector (FDI), the private sector contributed more than 40% of the country's GDP, 30% of total industrial output value, nearly 80% of total retail goods and services transfers, 64% of total goods and 100% of total goods transfers. In the coming time, according to the forecast of the General Statistics Office, the private economic sector will still contribute about 30% of the budget and about 40% of GDP of the country. The private sector created an impressive number of jobs, contributing significantly to economic restructuring, increase income for people, especially create new jobs for those who have reduced their payroll or lost their jobs by the streamlining of administrative apparatus, reform of state-owned enterprises or the movement of labor from the agricultural sector. Private enterprises have played a role in creating 1,2 million jobs per year and helping maintain a low unemployment rate in Vietnam in recent years [2].

Phu Tho is a northeastern mountainous province. Over the past years, Phu Tho has made many achievements in economic development: The average economic growth rate in the 2010-2018 period reached 7,5%/year, higher than the national average; Labor productivity increased continuously, reaching 74,5 million VND/person in 2018; The economic structure has shifted in the right direction; Average income per person continued to increase to 40,8 million VND/

person in 2018. However, Phu Tho economy also revealed many shortcomings: Growth rate of labor productivity decreased after 2015, efficiency economic growth shown through VA/GO is declining, economic growth is still wide when the contribution of the productivity factor to growth is low (32,11%) [3].

Job creation is determined as the most important political task, both urgent and long-term basis in the local socio-economic development strategy. All levels of authorities in Phu Tho province has been deployed many solutions to improve the investment and business environment, promote the reform of administrative procedures, create the most favorable conditions for enterprises to feel secure to invest and operate, thereby creating many jobs for workers in the province. Although enterprises is the most important contributor to the size and economic growth of Vietnam, however in Phu Tho province whether the enterprises sector has brought into play or not, how is the private enterprises' ability of job creation in Phu Tho province are the questions that the authors have asked.

2. Overview of factors affecting the private enterprises' ability of job creation

Krauss studies on job creation and job destruction in the East Asia and Pacific region and showed that small enterprises (with a small number of employees) created more jobs than those with large ones [4]. Similarly, with the regression results of factors affecting job growth and profitability of manufacturing enterprises

of Agiomirgianakis et al. displayed that the number of employees in the business have had a negative effect on employment growth in enterprises [5] and this is confirmed in accordance with Krauss.

However, the study results of Vlachvei and Notta on factors affecting the growth of enterprises in Greece showed that size of firm had a positive and significant effect on the rate of labor growth in enterprises [6]. At the same time, when studying the factors affecting the total employment flow in Estonia, the regression results of Masso et al. indicated that size of enterprises was consistent with the growth of labor in enterprises [7].

Along with the number of employees in enterprises, the age of the enterprises is also one of the characteristics that many studies consider when referring to labor growth in enterprises. It is expected that young enterprises will grow faster than older ones. Several studies of Glancey and Davidsson et al. have demonstrated that there was an inverse relationship between age of enterprises and labor growth in enterprises, older enterprises would increase labor more slowly than new ones [8, 9].

By sorting duration of enterprises, Evans showed that age of enterprises was an important factor in determining labor growth in enterprises [10, 11]. Labor growth is expected to decline gradually with age of enterprises. The authors Oliviera, Fortunato, Robson and Beenneti supported this notion by explaining that older enterprises had a safe position in the market where they competed in and have experienced an optimal scale of efficiency in terms of output [12, 13].

Krauss also found that there was an inverse relationship between wages and labor growth in enterprises [4]. Masso et al. showed that employee productivity was correlated with labor growth in enterprises [7]. This suggests that when labor productivity increases, enterprises tend to hire more workers due to the increase in marginal product and marginal product value.

The author Agiomirgianakis et al. did not have any specific theory about the relationship between enterprises engaged in export activities and growth [5]. However, recently, because the EU market has incentives for export taxes, he has entered this variable in his model in his study of factors affecting job growth and profitability in manufacturing enterprises in Greece. The research presented that there was a positive relationship between enterprises engaged in export activities with enterprises growth and there was a difference in performance between enterprises engaged in export activities and without orientation to engage in export activities. Both Agiomirgianakis et al. and Krauss agreed that when enterprises participated in exporting goods, they would produce more to attend in the production process [4, 5].

Research of Masso et al. indicated that there was an effect of capital ownership on labor growth in enterprises [7]. According to Masso et al., state-owned enterprises created 11% more jobs and destroyed 14% of the number of jobs each year, while foreign direct investment enterprises created 15% more jobs and only destroyed 8% of the number of jobs per year [7]. The research of Acquisti and Lehman showed that private

enterprises created jobs outperformed state-owned enterprises of the same size [14].

The authors Hamermesh, Heshmati, Hasan, Antonis and Thomas also confimed the relationship between labor demand and influencing factors through a function of labor demand limited by production costs in relation to the prices of the output goods or services. In conditions of profit maximization, an increase in output and an increase in the price of a product were due to an increased labor demand [15-17].

3. Methods

3.1. Research subjects

Research on factors affecting the private enterprises' job creation in Phu Tho province.

3.2. Research scopes

The research used the data set of enterprises survey results in the period 2011-2018 of the General Statistics Office. This was a survey of enterprises in the country conducted once a year by the General Statistics Office. The indexes used to estimate and analyze research impacts from the enterprise survey data set included: number of jobs in general, number of jobs by fields, number of jobs in manufacturing, employment in the non-agricultural sector, average salary in general, average salary by fields, type of enterprises...

3.3. Research methods

The authors have collected information from many different secondary data sources such as legal documents, articles, and research results related to ability of job creation.

To quantify the impact of factors to private enterprises' ability of job creation in Phu Tho province, the study used Stata 14 software to calculate the descriptive statistics and regression analysis. Cross data regression using OLS multivariate regression model were applied to estimate factors affecting private enterprises' ability of job creation in Phu Tho province.

The data was collected, catergorized and sorted by different topics. In cases of the large amount of information, it was summarized to ensure the information not omitted. Survey data were organized and processed on computers using Excel and Stata. The analysis results bring important and specific policy implications to improve private enterprises' ability of job creation in Phu Tho province.

In order to determine the relationship of factors affecting to the enterprises' ability of job creation, we used Almas Heshmati approach using Cobb-Douglas production function model to analyze influence of a number of factors on the private enterprises' ability of job creation [18]. Accordingly, it is possible to start from the production function and solve it for labor as a function of capital and output. We used the Cobb-Douglas production function in terms of labor L:

$$L = A^{-1/\alpha} K^{-\beta/\alpha} y^{1/\alpha}. \qquad (1)$$

Therefore, in the logarithmic form of 2 sides we have:

$$lnL = a_0 - \frac{\beta}{\alpha} lnK + \frac{1}{\alpha} \ln Y \qquad (2)$$

With $a0 = -1 / a * \ln A$

In the experiment, the labor demand equation often adds a number of other determinants such as average salary, capital per employee, the total factor productivity according to the following model:

$$\ln L_i = \beta 0 + \beta 1 \ln V A_i + \beta 2 \ln K_i + \beta 3 \ln APL + \beta 4 ratio K L_i + e_i \; (*) \qquad (3)$$

In which, i is the index showing the enterprise i, value added growth (lnVA), capital growth (lnK), salary growth (lnAPL), capital intensity (ratioKL) and residual (e).

Parameters βj (j = 0.10) are determined by estimating the above model by the OLS method, the estimated results will get the values βj (j = 0,10). Thus, the parameter βj will reflect the relationship between independent variables such as value-added growth, capital growth, salary growth, ... with the dependent variable being the number of employees in firm i.

The influence of a certain independent variable (X) on the dependent variable LnL is defined as a partial derivative of (*) according to variable X as follows:

$$\frac{\partial LnL}{\partial x} = \beta$$

Thus, the coefficient of the independent variable (β) reflects the trend and degree of influence of the independent variable on the dependent variable, namely the impact of the growth variable VA, capital, salaries, ... on the private enterprises' ability of job creation.

With the variables identified above, the expected effect of these variables on labor demand is as follows:

Table 1. Expected impact of the independent variables on the private enterprises' ability of job creation

TT	Variable name	The expected impact
1	lnVA	-
2	lnAPL	+
3	lnK	-
4	ratioKL	+

4. Results and discussion

4.1. An overview of the private enterprise sector in Phu Tho province

In Phu Tho province in the period 2011-2018, the number of enterprises has steadily increased over the years. If not discussing quality, this was a very exciting development for the economy of Phu Tho province. In 2011, the province had 2.603 enterprises, by 2018 this number was 4.630 enterprises with an average growth rate of 8,57% in the 2011-2018 period. It can be seen that the Enterprise Law has really untied and strongly promoted the entrepreneurial spirit of the Vietnamese people in general and in Phu Tho province in particular.

However, when considering the type of enterprise structure, it showed that in the period 2011-2018, the number of state-owned enterprises decreased compared to the previous year; The number of non-state

enterprises had an opposite movement compared to state-owned enterprises, and accounted for over 80% of the total number of enterprises in the province. Regarding FDI enterprises, the number of enterprises of this type has increased, but only accounted for a very small proportion among businesses in Phu Tho province.
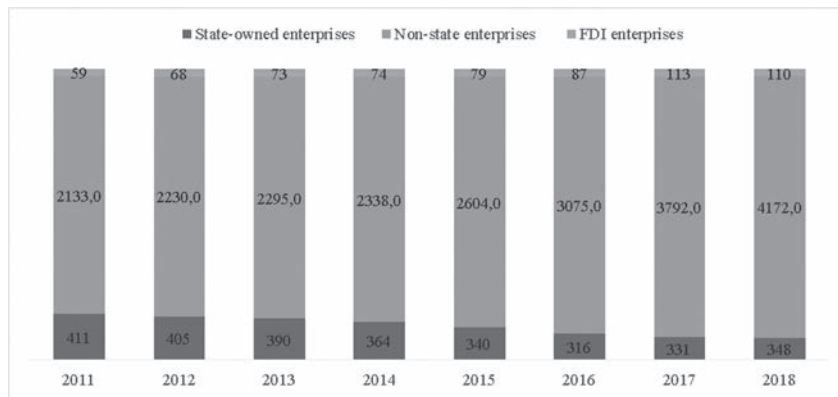
Figure 1. Number of enterprises in Phu Tho province in the period of 2011-2018

Source: The authors calculated from GSO Enterprise Survey data

Not only increasing in quantity, the private enterprises sector has added a large source of capital to the economy of Phu Tho province. Accordingly, in the period of 2011-2018, private enterprises sector in Phu Tho province have been making a great contribution to the overall efforts of mobilizing capital and resources being hoarded by people for effective use purposes and for production and business activities. The strong growth in capital, the rate of fixed assets and the long-term investment of the private sector have contributed to the economic growth in Phu Tho province.
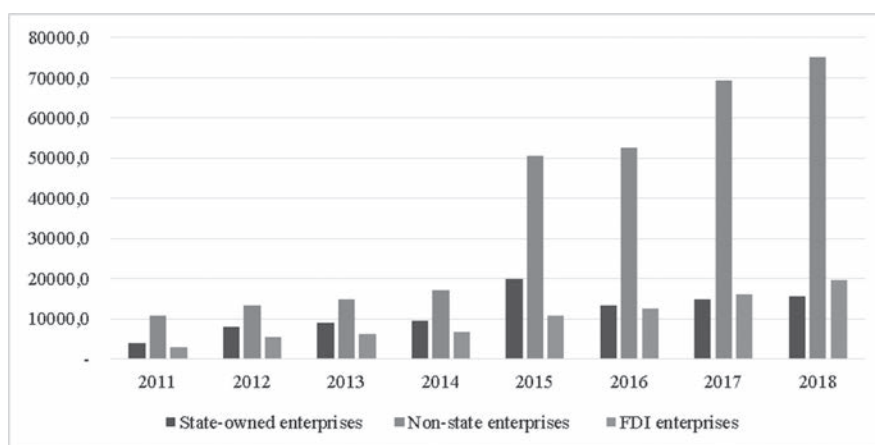
Figure 2. Size of equity by business type in Phu Tho province in the period of 2011-2018

Source: The authors calculated from GSO Enterprise Survey data

The private enterprise sector not only showed a remarkable growth in size, it was also the sector that has created the most jobs for workers in Phu Tho province. Accordingly, in the period 2011-2018, this sector increased from 116.416 to 145.756 employees, corresponding to the average growth rate of the whole period (3,26%).
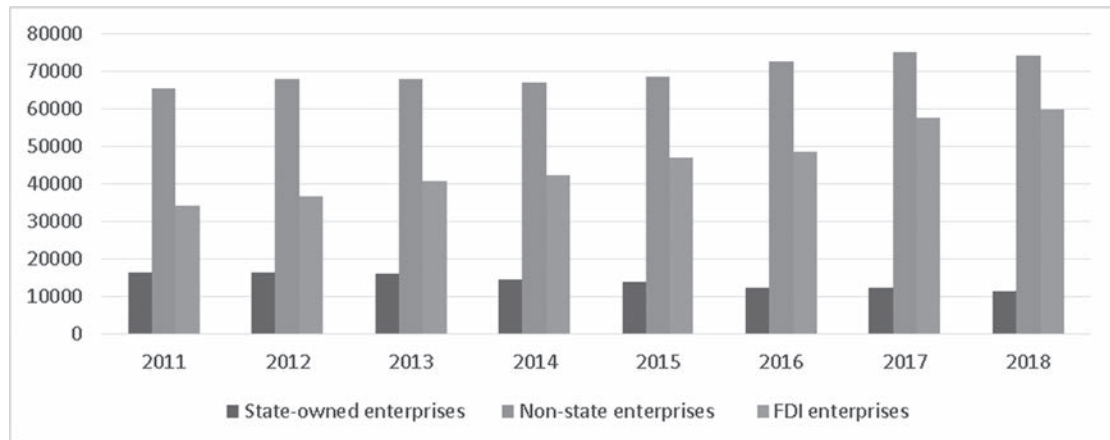

Figure 3. Number of employees working in the enterprise sector in Phu Tho province in the period of 2011-2018

Source: The authors calculated from GSO Enterprise Survey data

4.2. Results of experimental analysis

The results of the model estimation by using the WEIGHTED LEAST SQUARES-WLS regression method, overcoming the variance of variation in OLS model, the model had statistical significance.

Table 2. Description of basic statistics for the variables

Variable name	Mean	Standard deviation	Describe
lnL	2,318287	1,315056	Labor growth in enterprises
lnVA	6,553669	1,864727	Value added growth in enterprises
lnAPL	3,73217	0,8292217	Salaries growth in enterprises
lnK	7,850404	1,901929	Capital growth in enterprises
ratioKL	1019,526	9157,404	Level of capital per employee

Source: The authors calculated from GSO Enterprise Survey data [19]

We look in the regression results table and consider R-Squared. The level of the dependent variables explained by the independent variables was 77%. The estimated results also showed that most of the estimated coefficients were nonzero at the level of $\alpha = 5\%$, the sign of the estimated coefficients was consistent with economic theory. The analytical results of the regression model are shown in the table 3.

Table 3. Estimated results of effects of some factors on the private enterprises' ability of job creation by ownerships

Variables	General	Government	Outside of government	FDI
	lnL	lnL	lnL	lnL
lnVA	0,713 ***	0,709 ***	0,687 ***	0,658 ***
	-0,0032	-0,0075	-0,00352	-0,0292
lnAPL	-0,618 ***	-0,638 ***	-0,580 ***	-0,713 ***
	-0,00607	-0,0119	-0,00693	-0,0581
lnK	0,00777 ***	-0,00268	0,00528	0,159 ***
	-0,00296	-0,00543	-0,00328	-0,0324
ratioKL	-2,27e-05 ***	-4,22e-06 ***	-2,34e-05 ***	-0,000330 ***
	0,000	0,000	0,000	0,000
Constant	-0,0402 *	0,166 ***	-0,0257	0,119
	-0,0228	-0,0302	-0,028	-0,29
Observations	23,800	2,619	20,590	591
R-squared	0,769	0,85	0,736	0,775
Notes_Titles				
	Standard errors in parentheses			
	*** p <0,01, ** p <0,05, * p <0,1			

Source: The authors estimated from GSO Enterprise data [19]

Number of tests on multicollinearity, functional form and variable variance were performed. Accordingly, when comparing this VIF value with 10, the variables in the model had the values under 10, so the model did not have the phenomenon of multicollinearity. Both regression specification error test and tolerance test had p-value < 5%, the variables were not concurrently zero and the model did not change the residual variance.

Based on the estimated results of the effects of some factors on labor demand by ownerships, some comments are given as follows:

- Value added growth and investment capital: Always a driving force and an important channel to create jobs for employees in private enterprises in Phu Tho province. The coefficient of value-added growth and investment capital growth has a positive sign, indicating that growth creates a driving force for increased demand for products, investment to expand production will boost demand for labor in private enterprises in Phu Tho province. Specifically, if value-added growth increases by 1%, other factors in the model remain unchanged, and job creation in the private enterprises increases by 0,7%. The labor demand elasticity by investment capital is lower than the growth-based elasticity of labor demand, with for every 1% increase in capital while other factors remain constant, employment

increases 0,008%. So, if enterprises expand to invest in production, the labor demand will increase lower than enterprises with an increase in value added.

When looking at the effect by type of enterprises, there is a clear difference in the impact of value-added growth on labor demand in the private enterprises in Phu Tho province, whereby the value added growth will lead to the largest increase in labor demand in the state-owned enterprise sector (0,7%), the non-state sector (0,687%) and the FDI sector at 0,658%. Notably, investment in expanding production of enterprises helps to increase labor demand in the FDI sector while the investment capital growth has not shown a clear sign in the private enterprises' ability of job creation in state-owned enterprises and non-state enterprises in Phu Tho province.

- The salaries factor in the model affects the labor demand in accordance with the market law. The salaries increase due to decrease in the labor demand; the salaries increase 1%, the labor demand decreases 0.618%. These results are consistent with those of many researches which indicate that when the average salaries in the market increase, enterprises tend to hire less workers and replace them with machines and technology, so labor demand tends to decrease. To increase salaries for employees without limiting the labor demand of enterprises in Phu Tho province, it is necessary to invest in both equipment and human capital and improve labor productivity of employees. Salaries have a rapid decrease in labor demand in the state-owned enterprises and the FDI enterprises (coefficients are

-0,638 and -0,713, respectively) and the effect is slower in the non-state enterprises (coefficient -0,58).

- Level of capital per employee: In this model, there is a negative sign, showing that the high level of capital per employee leads to an increase in labor productivity and the ability of using machines to replace workers tends to increase. However, the estimated results show that this factor affects very weakly to labor demand (almost zero). The effect is not significant, implying that level of capital per worker, or level of technology of enterprises in Phu Tho province has not been really reformed or is not strong enough to increase labor productivity and withdraw labor from the field.

5. Conclusions and recommendations

Cobb-Douglas results showed that growth and investment were always the driving force and an important channel to create job positions. Growth created a driving force to increase demand for products, and investment to expand production will boost labor demand in enterprises. The salaries factor in the model affected labor demand in accordance with the market law. The level of capital per employee had a very weak impact on labor demand (almost zero). The impact was not significant, implying that the level of capital per employee or level of technology in the enterprises was not really reform or not strong enough to increase labor productivity and withdraw labor from the fields.

Accordingly, we propose some solutions to promote the private enterprises' ability of job creation in Phu Tho province as follow:

Firstly, continuing to improve the domestic business environment; Giving more favorable conditions for enterprises to develop; Expanding investment in production to bring efficiency to enterprises and create jobs; Improve income for employees. However, the orientation to expand production and business development in depth also needs to ensure availability of correspondingly qualified resources to avoid the shortage of qualified manpower and reduce social instability when replacing simple labor by equipments, science and technology.

Secondly, continuing to promote economic restructuring, in which the restructuring of state enterprises. Although state-owned enterprises have a lot of capital, they have not brought into full play, and creating jobs is limited. The transfer of state-owned enterprises to joint stock companies will increase competitiveness and use effectively resources due to promoting growth and creating jobs in society.

Thirdly, continuing to create a mechanism to attract foreign investment capital to take advantage of foreign capital for domestic investment, expanding production, creating jobs for employees, especially in the context of the proportion of trained workforce (about 20%) and the rate of paid workers (40%) in Phu Tho province are low.

Fourthly, integration will promote the value of goods import and export to help enterprises expand markets. Therefore, it is possible to expand the production scale or convert from a wide form of production to production with modern equipments to bring higher efficiency. This will affect the labor structure in the market. The need for skilled labor may increase in some fields.

Fifthly, adopting a mechanism to encourage enterprises investing in science and technology which increases competitiveness in the market and creates stability and spillover effects in the economy, thereby creating jobs and raising incomes for employees. In addition, continuing to improve education and training policies and vocational training for employees to promote efficiency of working in enterprises.

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ỨNG DỤNG HÀM SẢN XUẤT COBB – DOUGLAS TRONG PHÂN TÍCH KHẢ NĂNG TẠO VIỆC LÀM CỦA KHU VỰC DOANH NGHIỆP TƯ NHÂN TẠI TỈNH PHÚ THỌ

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Tóm tắt

Khả năng tạo việc làm của khu vực doanh nghiệp chịu ảnh hưởng bởi nhiều yếu tố như tiền lương, công nghệ, đầu tư nghiên cứu phát triển, đặc điểm của doanh nghiệp (quy mô, ngành, hình thức sở hữu...). Sử dụng hàm sản xuất Cobb-Douglas phân tích mức độ ảnh hưởng của các yếu tố đến khả năng tạo việc làm của khu vực doanh nghiệp tại tỉnh Phú Thọ là cơ sở để đưa ra giải pháp nhằm thúc đẩy khả năng tạo việc làm cho người lao động tại tỉnh Phú Thọ trong thời gian tới. Kết quả phân tích cho thấy gia tăng lợi nhuận và vốn đầu tư cho doanh nghiệp sẽ thúc đẩy tăng trưởng việc làm, trong khi đó gia tăng tiền lương và tăng mức độ thâm dụng vốn sẽ hạn chế việc sử dụng lao động trong khu vực doanh nghiệp... Theo đó để thúc đẩy khả năng tạo việc làm của khu vực doanh nghiệp tại tỉnh Phú Thọ trong thời gian tới cần tiếp tục cải thiện môi trường đầu tư giúp doanh nghiệp gia tăng lợi nhuận sẽ là giải pháp quan trọng.

Từ khóa: *Việc làm, lao động, doanh nghiệp, tạo việc làm, tỉnh Phú Thọ.*