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Analyzing the impact of labor on the production and business value of industrial enterprises in Thai Nguyen province.

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ABSTRACT: When the trend of the knowledge economy has developed, labor becomes one of the most important and decisive factors in the development of enterprises. The article uses the Cobb – Douglas function and the panel data to analyze the impact of labor on the production value of industrial enterprises in Thai Nguyen province. We classified into three main industry groups: mining industry, processing and manufacturing industry, and electricity, gas, water production and distribution. Through the research results, some solutions are proposed to improve the efficiency of using labor in enterprises.

KEYWORDS: Labor, impact, industrial enterprises, Cobb – Douglas function, panel data

I. INTRODUCTION

Currently, the trend of globalization, regionalization, and deep integration into the world economy has brought businesses many opportunities and challenges, leading to competition among businesses in the global economy. The economy is becoming more and more severe. Therefore, in order to achieve high efficiency in production and business activities, enterprises need to well manage available resources, make the most of their advantages in terms of capital, technology or humanresources. This is a difficult problem for business leaders. Two factors that play a key role in socio-economic development as well as in enterprises are high-quality human resources and the level of scientific and technological development. In which human resources or labor is considered the most important productive force of each economy.

Thai Nguyen is a midland and mountainous province in the Northeast region, the third-largest university, professional and vocational training center in VietNam. In recent years, the activities of businesses in Thai Nguyen province have had a sudden development, especially in industry, the province's key industry. To summarize the period 2016 - 2020, the economic growth rate (GRDP) of Thai Nguyen will reach an average of 10.47% per year (GRDP scale will reach VND 116 trillion in 2020). In which, industrial production value increased on average 15.77% per year, the most importantcontribution to the overall economic growth of the province. Therefore, the analysis and assessment of the role of labor in industrial enterprises of Thai Nguyen is an important basis for the formulation of development policies for enterprises as well as the province. In this paper, the authors present the quantitative impacts of the labor factor on the production and business results of industrial enterprises in Thai Nguyen province by using the production functionCobb-Douglas and the panel data analysis model.

II. CONTRIBUTION EVALUATION MODEL

In production activities, there are three important inputs: labor (L); machine tools and raw materials (capital, K); scientific and technical level, ability to organize and manage the enterprise (general factors, A).The Cobb-Douglas model is often used to evaluate the impact of these factors on production results because it has the following advantages:

First, this model is the simplest in the models describing the production process

Second, although the model is simple, it still allows comments that are close to the actual production situation.

For another,the parameters of the model are easy to estimate.

The Cobb-Douglas function has the form:

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$Q_t = A_t L_t^{\alpha} K_t^{\beta} = A_t f(K_t, L_t)$ (1)

where:

Y = total production (the real value of all goods produced in a year or 365.25 days)

L = labor input (person-hours worked in a year or 365.25 days)

K = capital input (a measure of all machinery, equipment, and buildings; the value of capital input divided by the price of capital)

A = total factor productivity

α and β are the output elasticities of capital and labor, respectively. These values are constants determined by available technology, $0<\alpha,\beta< 1$.

Taking the natural logarithm of both sides of the equation (1) yields

$$\ln(Q_t) = \ln(A_t) + \alpha.\ln(L_t) + \beta \ln(K_t)$$

With the assumption that the Cobb-Douglas function is a continuous function of time, then we have the elastic coefficient of production value in terms of capital and labor as follows:

$$\varepsilon_L^Q = \frac{Q'_L}{\frac{Q}{L}} = \alpha;\ \varepsilon_K^Q = \frac{Q'_K}{\frac{Q}{K}} = \beta$$

Then the effect of labor on production value is α. We used the Cobb-Douglas production function and the panel data analysis model to evaluate the impact of labor on the production value of enterprises.In this paper, the authors will talk about panel data characterized by large (N) scale and small (T) time and using traditional panel data.

III. REARCH RESULT

The data source used is the enterprise survey data set in Thai Nguyen province for the period 2016-2020.

Model: $Ln\_Go_{ij} = f(ln\_ld_{ij} ; ln\_k_{ij})$

+ Dependent variable: Ln_Gois the logarithm production value of industry i enterprise during j

+ Independent variables: ln_ld và ln_k is the logarithm of the number of labor and the amount of capital used in enterprises of industry i in time j, respectively.

+ The production value (Go) of the enterprise is calculated in units of millions of dong

+ Labor used in the enterprise is calculated according to the number of people

+ Capital used in the enterprise is calculated in units of millions of dong.

The rearch uses a regression model of panel data with observations of N=1032 enterprises by industry and over time T=6. The data set only counts businesses that have been in continuous operation for 6 years and excludes those that have no practical significance: negative revenue, number of employees, zero capital can be wrong, or mistakenin the questionnaires.

We have the following table of test results:

Table 1. Hausman test for enterprises in Thai Nguyen province

```
. hausman fe
                 ---- Coefficients ----
                 (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                 fe           .           Difference          S.E.
-------------------------------------------------------------------------
       ln_ld     .5467669     .6690009      -.122234       .0038587
        ln_k     .2323456     .3078928     -.0755472       .0017912
------------------------------------------------------------------------
              b = consistent under Ho and Ha; obtained from xtreg
              B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

              chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =  2112.73
              Prob>chi2 =   0.0000
```

Data source: Processed from Thai Nguyen enterprise data set on Stata

From Table 1, we find that Prob>chi2=0.0076, this value is less than the statistical significance level α=0.05. Thus, rejecting the hypothesis H0, that is, Ui and the independent variable are correlated. Thus, to avoid violating the OLS assumptions and avoid errors in the model, we should use a fixed-effects model.

The estimated results of the fixed impact model of industrial enterprises in Thai Nguyen province are as follows:

$\widehat{lnGo}$ = 3,555117+ 0,3981895 lnL + 0,4468099 lnK

Se = (0,6183874) (0,1200589) (0,0523441)

N=1032 ; sigma_u = 1,2625676; sigma_e=0,80623718; rho=0,71034278

P_value = 0.000

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The coefficient of labor is 0.3981895, which means that when labor increases by 1% (other factors remain unchanged), the average value of production increases by 0.3981895%. This is also an easy result that shows us that the production value of enterprises in Thai Nguyen province is greatly influenced by the labor source. This is also a reasonable result for the entire economy of the province because Thai Nguyen is a province with a young population and abundant labor. From the above results, it shows that the coefficient of capital is 0.4468099, that is, when capital increases by 1% (other factors do not change), Go increases to 0.4468099 %. This can be shown that in the case of industrial enterprises in Thai Nguyen province, the labor factor has a smaller impact than the capital factor on the production value of the enterprise.

In order to compare the level of influence of labor on industrial enterprises in Thai Nguyen province by industry group, the authors divide enterprises into 3 main industries: mining industry; processing and manufacturingindustry; distribution of electricity, gas and water.

Table 2: Elasticity of production value by capital and laborby industry

	Mining industry	Processing and manufacturing industry	Distribution of electricity, gas and water
Labor	0,372246	0,2264209	0,2119055
Capital	0,4894202	0,5503364	0,3896028

Source: Author's calculations

The results presented in the table show that the impact of labor on production value is smaller than the impact of capital in all industries. This could be due to:

- Labor resources are abundant but the quality of labor is not high and the use of labor is not effective.
- Paying labor is not commensurate with the contribution of workers to production.
- Machines today have replaced many tasks performed by humans before.

The industry with the highest labor impact is mining (0.37%), the industry with the lowest labor impact is the electricity and water industry (0.212%). This shows that the model closely reflects the actual situation:

- The mining industry of Thai Nguyen still uses a lot of human labor, which is not much modern machinery and means.
- The industry of production, distribution of electricity, gas and water is mainly done by machines, people only do management and administration, so the impact of labor on the production value of enterprises is not much.

IV. CONCLUSION

In the condition that society is shifting to a knowledge-based economy, labor is a strategic resource for every business. Through the research results, it is shown that for industrial enterprises in Thai Nguyen province, labor has a positive impact on the production value of enterprises, the level of impact on the three main industries is different. . However, the impact of labor factor on production value is still smaller than capital.

Through the research, the authors make some recommendations to improve the efficiency of labor use in enterprises:

- Clearly identify the role of the labor factor, thereby planning to allocate labor accordingly to avoid unemployment and unequal income distribution.
- Secure and mobilize capital sources for human resource development; promote socialization to increase capital sources for human development.
- Specially, attention to the development of human resources of the province with the advantage of trained labor resources, associating with universities, colleges, vocational secondary schools in the province. Promote international cooperation to develop human resources and transfer modern technology.

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