An Empirical Study on Effect Between Human Capital Investment and the Performance of Power Generation Enterprises

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Abstract. In the era of knowledge economy, human capital is the key to enterprises to obtain sustainable competitive advantage and improve performance. It is the "third resource" to promote enterprise development, and the reform of state-owned enterprises and the release of electricity sales will have a great impact on power enterprises. The study is based on the actual payment of human capital investment from 48 power companies in 2007 to 2016 in a shares. The results show that salary and employee benefits are positively related to the profitability, operating ability and solvency of Power generation enterprises. The trade union funds and the staff education funds are negatively related to profitability and solvency, and there is no significant positive correlation with the development ability of Power generation enterprises.

Introduction

Since the 1960s, some economists have pointed out that the rate of return on investment in human capital exceeds the rate of return on capital investment. As a resource-intensive power generation enterprise, the profitability of its material capital is much higher than that of human capital, which makes the power generation enterprises pay more attention to the investment of material capital and neglect the human capital investment. With the deepening of the reform of state-owned enterprises and the gradual liberalization of the electricity sales side, the operating environment of the power generation enterprises has been changed and the cost of resource acquisition has been improved, which highlights the importance of human capital for the performance of power generation enterprises. And further study the impact of human capital investment on the performance of enterprises in power generation enterprises, which is of great significance to optimize enterprise investment strategy and promote enterprise development.

Literature Review

Scholars study the research subject from different angles. In the study of the relationship between human capital investment and China's economic growth, the author indicates that there is a two-way causal relationship between human capital investment and economic growth (Yu Wang, Jian-ling Jiao, 2005). In the research about the relationship between the structure of human capital and economic growth also indicates that human capital has strong overall growth effect (Liang-qing Luo, Fei-xiao Yin, 2013); the research of strategic alliance enterprises as the starting point shows that human capital is very important for the value creation of enterprises (Chang-hong Li et al. 2011).

Such research has yielded fruitful results in all walks of life. The study of the computer industry found that the human capital have no significant positive influence on corporate performance
(profitability) (Jia-ming Li, Fu-bing Li, 2005). Based on the empirical analysis of high-tech industry and textile and garment industry, it is found that the increment rate of human capital and enterprise performance is significantly positive (Hai-zong Yu, Qian Deng, 2007). Based on the financial data of A-share listed companies in Shanghai and Shenzhen in 2004, human capital investment and enterprise performance were positively related (Ying Wang, 2008). In the study of bio-pharmaceutical, textile and garment industry, it is found that human capital has a positive effect on corporate performance (Ling Wang, He-jie Sun, 2012).

In most of the related research, scholars put total employee compensation as the human capital in substitution variables, using multiple linear regression analysis. Based on the analysis of human capital investment and enterprise value and enterprise performance, this paper proves that the human capital has no significant positive effect on the value of power generation enterprises (Qing-you Yan, Chao Kong, 2014) and the performance of human capital has a positive correlation relationship with power industry enterprises (Yong-jun Tang, Zhi-hui Zhao, 2015).

Through literature review, it’s found that the study of human capital is mostly related to the macroeconomic and industrial categories. There are many research results about enterprise human capital but few studies about the electricity generation enterprises’. On the study of human capital study, the total compensation are more directly used, while the salary breakdown data are few used. This paper will study the paid human capital investment data to get power generation business human capital investment decision-making conclusions.

Research Design

Research Assumptions

Employee compensation consists of wages and salaries, employee welfare, social insurance, housing fund, union funds and employee education expenses of five parts. China's listed power companies are state-owned enterprises, the social insurance and housing provident fund deposit ratio is fixed. And staff mainly concern wages and salaries, welfare workers and trade union funds and employee education funds.

High salary and good welfare can arouse employees’ enthusiasm and improve enterprise performance. The union funds are used for the cultivation and team construction of enterprise culture atmosphere, and good cultural atmosphere and team relationship play an important role in improving enterprise performance. The staff education funds are used for the follow-up training of employees, which is conducive to improving the overall quality of employees and thus improving their performance. The expenditure of union funds and staff education is mainly used to cultivate enterprises' culture, team building and improve staff quality. It is difficult to make a significant impact on the current performance. Based on the above analysis, combined with the existing research conclusions, the following assumptions are put forward:

   Hypothesis 1: Salary payroll has a significant positive correlation on enterprise performance.

   Hypothesis 2: Employee benefits expenditure has a significant positive correlation on enterprise performance.

   Hypothesis 3: Trade union spending and staff education expenditure have no significant positive correlation on enterprise performance.

Samples, Variable Selection and Model Establishment

Based on the CSMAR database, this paper selects the industry code as "D44" based on Industry classification of the CSRC 2012. Date in December 2007 for screening, screening of listed power companies after 49, out of which two companies of B share, eliminating two heating and sell electricity enterprise, joined the three is not classified as power but main business include power products company, a total of 48 companies as the research sample. This article will use the 48 power generation enterprise human capital investment from 2007 to 2016 data to carry on the empirical study, data from corporate annual reports, CSMAR database and Wind Info, use Eviews 6.0 software for analysis.
Human capital investment in power generation enterprises also should cover the two aspects. In view of the current power generation enterprises recruitment form, permissions, as well as the principle of importance, in reference to human capital investment on the basis of existing research, combining the theory of generalized investment and human resources incentive theory, selection of enterprises in the notes to financial statements "to cope with the worker pay" segmentation project (including social insurance, housing fund and other project) as the explained variable, the corresponding data for "paid in current period (or decrease) in current" under the project data, namely the actual spending of human capital investment.

According to the above research hypothesis, the selection variables are as follows: (1) explained variables: enterprise performance indicators, including profitability(Y1), operational capability(Y2), solvency(Y3) and development capabilities(Y4). Profitability includes Operating cost ratio(Y11) and EBIT(Y12); Operating capacity includes Total Assets Turnover(Y21) and Shareholder equity turnover rate(Y22); Solvency includes Asset-liability ratio(Y31) and Equity multiplier(Y32); Development capability includes Capital preservation and appreciation rate(Y41) and Sustainable growth rate(Y42). (2) explanatory variable: human capital investment, covering salary and salary(X1), employee benefits(X2), labor union funds and three aspects of staff education(X3). In order to eliminate the influence of the enterprise scale and the electricity to access grid on the research, the enterprise scale(S) and the electricity to access grid(P) are treated as controlled variables. The specific information of each variable is as follows.

According to this design regression model:

$$Y_{mnit}=\alpha+\beta_1it\ln X_{1it}+\beta_2it\ln X_{2it}+\beta_3it\ln X_{3it}+\gamma_{n}S_{it}+\delta_{n}P_{it}+\varepsilon \quad (m=1,2,3,4; n=1,2; 1\leq i\leq 48, 1\leq t\leq 10; i,t \in Z)$$ (1)

Where $\alpha$ is a constant term, $\beta$ is the regression coefficient of the independent variable, $\gamma$ is the regression coefficient of S, $\delta$ is the regression coefficient of P, and $\varepsilon$ is the error term.

**Empirical Test Analysis**

**Co-integration Test**

In this paper, the Kao Residual Co-integration Test method is used to test the panel data. The test results are shown in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Y_{11}</th>
<th>Y_{12}</th>
<th>Y_{21}</th>
<th>Y_{22}</th>
<th>Y_{31}</th>
<th>Y_{32}</th>
<th>Y_{41}</th>
<th>Y_{42}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob.**</td>
<td>0.0078</td>
<td>0.0002</td>
<td>0.0013</td>
<td>0.0036</td>
<td>0.0007</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Residual variance</td>
<td>0.0083</td>
<td>0.4063</td>
<td>0.0087</td>
<td>1.9702</td>
<td>0.0079</td>
<td>1.7044</td>
<td>0.2039</td>
<td>12.0544</td>
</tr>
<tr>
<td>HAC variance</td>
<td>0.0066</td>
<td>0.2900</td>
<td>0.0071</td>
<td>0.4790</td>
<td>0.0082</td>
<td>1.4024</td>
<td>0.1494</td>
<td>1.4103</td>
</tr>
</tbody>
</table>

*Note: ** indicates significant at 5% significance level.

As can be seen from Table 1, the dependent variable and the independent variables, control variables in co-integration test, its P value is less than 5%, indicating that there is a long-term relationship between the selected variables.

**Model Regression**

The regression results were obtained by using $X_1$, $X_2$, $X_3$, S and P for Y, and the results of the model regression are shown in Table 2.
Table 2. Regression results and effects.

<table>
<thead>
<tr>
<th></th>
<th>Regression results</th>
<th>Regression effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>X₁</td>
</tr>
<tr>
<td>Y₁₁ coefficient</td>
<td>1.3007</td>
<td>-0.0116</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0000</td>
<td>0.4273*</td>
</tr>
<tr>
<td>Y₁₁ coefficient</td>
<td>1.8949</td>
<td>0.2749</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0805</td>
<td>0.0027</td>
</tr>
<tr>
<td>Y₂₁ coefficient</td>
<td>2.7181</td>
<td>0.1002</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Y₂₁ coefficient</td>
<td>4.6172</td>
<td>0.1181</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Y₂₂ coefficient</td>
<td>-0.5934</td>
<td>-0.0461</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0018</td>
<td>0.0025</td>
</tr>
<tr>
<td>Y₂₂ coefficient</td>
<td>-7.9603</td>
<td>-0.5846</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Y₃₁ coefficient</td>
<td>0.5345</td>
<td>-0.0151</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.1712*</td>
<td>0.4565*</td>
</tr>
<tr>
<td>Y₃₁ coefficient</td>
<td>0.4471</td>
<td>0.0262</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.1519*</td>
<td>0.3849*</td>
</tr>
</tbody>
</table>

Note: * indicates no significant at the 5% significance level.

From Table 2, we can see that from the four dimensions of profitability, management ability, solvency and development ability, we can evaluate the goodness of fit of human capital investment and power generation performance, profitability, management ability and solvency is good, only in the evaluation of development capacity the fit is not ideal. But it still reveals that human capital investment in the evaluation of power generation business performance has a good value, in order to further explore the impact of human capital investment on the performance of power generation companies, the regression coefficient will be analyzed.

**Regression Coefficient Analysis**

Based on the “Ad. R²” in Table 2, we know the goodness of fit. According to the definition and index analysis of the previous variables, combined with the contents of Table 2, the coefficient and significance of the respective variables are summarized, results are as follows.

X₁ is no significant negative correlation on Y₁₁ and significant positive correlation on Y₁₂. So X₁ is positive correlation on profitability. X₁ is significant positive correlation on Y₂₁ and significant positive correlation on Y₂₂. So X₁ is significant positive correlation on operational capacity. X₁ is significant negative correlation on Y₃₁ and significant negative correlation on Y₃₂. So X₁ is significant positive correlation on solvency. X₁ is no significant negative correlation on Y₄₁ and no significant positive correlation on Y₄₂.

X₂ is no significant negative correlation on Y₁₁ and no significant positive correlation on Y₁₂. So X₂ is no significant positive correlation on profitability. X₂ is no significant positive correlation on Y₂₁ and no significant positive correlation on Y₂₂. So X₂ is no significant positive correlation on operational capacity. X₂ is no significant negative correlation on Y₃₁ and no significant negative correlation on Y₃₂. So X₂ is no significant positive correlation on solvency. X₂ is no significant positive correlation on Y₄₁ and no significant negative correlation on Y₄₂.

X₃ is no significant negative correlation on Y₁₁ and no significant positive correlation on Y₁₂. So X₃ is no significant positive correlation on profitability. X₃ is no significant positive correlation on Y₂₁ and no significant negative correlation on Y₂₂. X₃ is no significant positive correlation on Y₃₁ and no significant positive correlation on Y₃₂. So X₃ is no significant negative correlation on solvency. X₃ is no significant positive correlation on Y₄₁ and no significant positive correlation on Y₄₂.

X₄ is no significant negative correlation on Y₁₁ and no significant negative correlation on Y₁₂. So X₄ is no significant negative correlation on profitability. X₄ is no significant positive correlation on Y₂₁ and no significant negative correlation on Y₂₂. So X₄ is no significant positive correlation on operational capacity. X₄ is no significant negative correlation on Y₃₁ and no significant negative correlation on Y₃₂. So X₄ is no significant positive correlation on solvency. X₄ is no significant negative correlation on Y₄₁ and no significant positive correlation on Y₄₂.
empirical research to prove that there may be an effect in the future due to the nature of the trade union funds and the educational expenses of the staff education and the large gap between the amount of the provision and the actual expenditure.

**Conclusions and Recommendations**

Based on the previous research results and the conclusions of this paper, the following Suggestions are proposed combined with the actual situation of China's power generation enterprises.

1. To establish a new mechanism for human capital investment to improve the effectiveness of human capital investment

   With the deepening of state-owned enterprise reform, the operating environment of power generation enterprises is undergoing tremendous changes. The release of electricity on the side of the power generation business is not only an opportunity but also a crisis, only to effectively improve the efficiency of enterprises can be retained in the market. The power generation enterprises should develop a reward system based on their own operating conditions and the specific operating environment, to develop the human capital investment in the new mechanism, to improve employee initiative, to give full play to the effectiveness of human capital.

2. To improve the actual investment amount and improve the overall benefits of human capital investment

   The trade union funds and staff education funds, the two charges can be deducted before tax the maximum limit of 4.5%, the amount is far less than the daily wage, which maintain the salary. Enterprises should make full use of the accrued expenses to enhance the actual human capital investment in the provision of the proportion of the amount. Only if the actual amount of spending, the number of atmosphere cultivation and staff training increased, the staff capacity can be effectively enhanced, and business performance can be substantial enhanced.

3. To establish feedback, supervision mechanism and shorten the formation period

   We can target on establish investment feedback mechanism, track and monitor the human capital investment expenditure. We can ask the relevant personnel for information feedback, such as trade union funds and staff education funding, require the trainee to organize the training content for the feedback, form an effective supervision, avoid the disguised use of such funds. Establishing feedback, supervision mechanism is advantageous to the relevant personnel to review and share the end of the training content, improving the investment benefit.

**References**


