Research on the Impact of Industrial Policies on the Operating Efficiency of Coal Company Based on Data Analysis

Zhenlin Wang

Shenzhen Eastern Public Transport Co., Ltd

Abstract: Industrial policy orientation and efficient use of capital are important ways to promote the efficiency of the coal industry, and improving the efficiency of coal enterprises is an inevitable requirement to achieve the high-quality development of the coal industry. In this paper, based on the double difference model and super-efficient DEA model, we investigated the influence mechanism and effect of coal industry policy orientation on the operating efficiency of coal enterprises, taking the coal listed enterprises in Shanghai and Shenzhen as the research object from 2011 to 2022 in China.

Keyword: Coal industry policy; Double difference model; Super-efficiency DEA model; Operational efficiency

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I. Introduction

Building a strong coal country" is the central theme of all work on the coal front. It is clearly pointed out in the "14th Five-Year Plan" coal development plan that the status and role of the coal industry in the national economy have been significantly enhanced [1-2]. 2023, the first half of the year, coal companies added more than 2 million, "14th Five-Year Plan", the development goal of the coal industry is to reach a total scale of 5.5 million. The development goal is to reach a total scale of 5 trillion yuan, the proportion of added value to GDP reached 2%, the total scale of coal consumption of residents exceeded 2.8 trillion yuan, more than 8 million employees, the proportion of people who regularly participate in physical exercise reached 38.5%. Macro policy space is broad, the future development potential is huge, the development of coal industry will enter the "fast lane" [3-4].

In 2016, China's coal industry showed vibrant policy dividends frequently, "" Healthy China 2030 "" Outline of the Plan ", "" on accelerating the development of fitness and leisure industry guidance " and a series of national policies to promote the development of the coal industry has been introduced. In particular, the State General Administration of Coal issued the "Coal Industry Development "13th Five-Year Plan" (referred to as the "Plan"), which proposes to do a good job of financial leverage, optimise the financial support for coal industry projects, the "Plan" of this industrial policy really from the financial capital financing aspects of the effective support for the effective development of coal enterprises and industries, and promote the rapid growth of the total scale of the coal industry. The rapid growth of the total scale of coal industry. From the micro level, most of the coal enterprises in China are small and medium-sized enterprises, often relying on local government policy subsidies and policy preferences, the policy orientation of this part of the enterprise development planning has a strong guidance [5-6]. At the same time, in terms of enterprise production and operation, local governments to improve the market competitiveness of local coal enterprises, often through policy subsidies to incentivise the development of enterprises, in order to guide the production and operation of enterprises to promote the development of coal industry. Effective implementation of industrial policies can not only promote the improvement of business conditions, but also play an important role in the balanced development of the local industrial structure.

The state stimulates the development of coal industry and improves the efficiency of coal enterprises through the guidance of industrial policies at the macro level in order to promote the development of national coal. Nowadays, China's coal industry is developing at a high speed, and coal enterprises are facing realistic requirements such as transformation of industrial structure and renewal of industrial system while pursuing benefits and promoting economy. Reduce the investment efficiency of coal industry due to untimely policy follow-up in the process of transformation and development of coal enterprises, and enhance the positive role of coal industry in the social economy, so it is especially important to build the investment and financing system of coal industry and enhance the operational efficiency of coal enterprises. Therefore, exploring the mechanism of coal industry policy on the high-quality development of coal industry and the effective path of coal industry

policy to promote the high-quality development of coal industry has become an urgent research issue.

Existing scholars' research on the relationship between coal industry policy and coal industry development is mainly divided into two aspects, theoretical research and the mutual influence between the two. Theoretical research level.

In the research on the relationship between coal industry policy and coal industry development, theoretical research mainly focuses on two aspects: first, the theoretical analysis and evaluation of coal industry policy, and second, the research on the mechanism and effect of the impact of coal industry policy on coal industry development. Theoretical analysis and evaluation: at the level of theoretical research [7-11], scholars explore the objectives, principles and implementation paths of policies through theoretical analyses of coal industry policies. They study the internal logic and theoretical basis of the policies and analyse the rationality and feasibility of the policies. These studies provide policy makers with theoretical basis and effect research: on the other hand, researchers also pay attention to the influence mechanism and effect of coal industry policies on the coal industry [13-17]. They explore the direct and indirect effects of policy measures on the structure, market size, innovation capacity, and international competitiveness of the coal industry, and assess the effectiveness and sustainability of policies.

In addition, the theoretical research also includes the comparison and reference of domestic and foreign coal industry policies. Scholars analyse the successful experiences and lessons learned from the coal industry policies of other countries and regions through the study of their policies, so as to provide reference and reference for the formulation of coal industry policies in China.

It should be pointed out that the relationship between coal industry policy and coal industry development is mutually influential. Theoretical research can not only provide theoretical guidance for policy formulation, but also provide empirical basis and practical experience for theoretical research through the study of policy implementation effect. Therefore, theoretical research and empirical research promote each other and jointly promote the virtuous circle of coal industry policy and coal industry development.

To sum up, the relevant research results on coal industry policy and coal industry development are quite abundant, but there are still some shortcomings, and no attention has been paid to the intrinsic mechanism of the role between the two; in addition, there are fewer applied analyses of coal industry policy for different regional coal industries, and it is difficult to explain the causes of the differences between different geographical areas. In view of this, this study selects the panel data of coal listed enterprises in Shanghai and Shenzhen from 2011 to 2022, and constructs a double-vehicle score model to explore the mechanism of the impact of coal industry policies on the operating efficiency of coal listed enterprises, with a view to providing theoretical references for the formulation and implementation of relevant policies.

II. Data sources, variable descriptions and empirical design

2.1 Data sources

The data source of this paper is mainly the financial data of enterprises from 2011 to 2022, and the original samples are processed to ensure the reasonableness of the subsequent data analysis in the following ways:

(1) The ST and *ST in the sample are eliminated; (2) Some of the missing data are filled in by linear interpolation; (3) The final sample data obtained for continuous variables are adjusted by 1% and 99% quantile Winsor shrinkage.

The input and expenditure data of enterprises are mainly from China Stock Market & Accounting Research Database, and some control variables are from EPS database (Easy Professional Superior).

2.2 Description of variables

2.2.1 Explained variables

The explanatory variables in this paper are efficiency indicators of listed coal enterprises, and the Data Envelopment Analysis (DEA) adopted in this paper is mainly used for efficiency analysis, and the traditional DEA model can only judge whether the DMUs are effective or ineffective, and can not make further distinction for multiple and effective DMUs. The super-efficient DEA model can make up for this deficiency, and the efficiency value of the super-efficient DEA model can be more than 1.

Input and output indicators are the main financial data of coal enterprises in the process of company operation, which can fully explain the operating ability of enterprises and can provide data support for calculating the operating efficiency of enterprises. There are four input variables, and the meaning or calculation method of each indicator is as follows:

(1) Operating costs of listed companies, using the weighted average cost method to calculate operating costs. The method weights the average of opening inventory and incoming costs to obtain the cost per unit of product.

(2) Business tax and surcharges. Business tax is a state tax levied on units and individuals that provide various taxable services, transfer intangible assets or sell real estate. Business tax is calculated by multiplying the size of the turnover or transaction amount by the corresponding tax rate, and the additional portion = total business tax payment \times applicable tax rate.

(3) The number of employees of the enterprise, i.e. the number of staff in each position of the enterprise.

(4) Selling expenses, selling expenses incurred by the enterprise in the process of selling products, self-manufactured semi-finished products and providing labour services, etc., including packaging costs, trancoal costs, advertising costs, loading and unloading costs, insurance costs, commissioned sales commissions, exhibition costs, leasing costs (excluding financial leasing costs) and sales service costs, salaries of personnel in the sales department, staff welfare costs, travel expenses, office expenses, depreciation costs and repair costs borne by the enterprise, material consumption, amortisation of low value consumables and other provisions. Travel expenses, and amortisation of low value consumables are included in administrative expenses [18]. Output variables include the following three:

(1) Assets per net share, net assets per share = net assets/number of common shares issued and outstanding, where net assets per share refers to the net amount of the firm's total assets minus liabilities.

(2) Gross profit margin on sales, which is the percentage of gross profit to sales revenue (or operating income), where gross profit is the difference between revenue and operating costs corresponding to revenue, expressed by the formula: gross profit margin = gross profit / operating income x 100% = (income from principal operations - cost of principal operations) / income from principal operations x 100%.

(3) Income from the main operating business, with reference to the difference between operating income and other business income in the income statement of the enterprise to measure as well as the net profit of the enterprise [19].

2.2.2 Explanatory variables

(1) Time variable: the Plan was issued by the State General Administration of Coal in 2016, so the dummy variable in this paper will take the value of 1 for 2016 and later, and 0 for the rest of the time.

(2) Treatment variable: that is, the dummy variable of the treatment group and the control group, using the absolute value of government subsidies and sales to calculate the degree of policy subsidies for coal listed enterprises, to find out the median of the degree of government subsidies, as a dummy variable, when the enterprise's annual policy subsidies are higher than the median for the experimental group, the dummy variable will be 1, and the rest will be 0.

(3) Capital investment: according to previous studies, this paper chooses the net fixed assets of listed coal industries in Shanghai and Shenzhen to measure.

2.2.3 Control variables

(1) investment cash flow: investment cash flow reflects the enterprise on the purchase and sale of fixed assets and securities, as well as mergers and acquisitions of other enterprises generated by the cash flow situation, belongs to the enterprise "to the outside blood" function, this paper selects the Shanghai and Shenzhen investment cash flow data on behalf of the index.

(2) Enterprise establishment time: the choice of the length of time to measure the establishment of the enterprise, for example, the company was established 37 months to the unit of years, the company was established 3.083, retain three decimal places.

(3) Research level: the level of research and development determines the innovation ability of an enterprise, and the improvement of innovation ability helps to improve the level of technology, which improves the efficiency of the use of production factors, and ultimately can make the operational efficiency. In this paper, we use R&D investment to measure the research level of Coal Company.

(4) Average Employee Compensation: The ratio of employee compensation payable to the number of employees in the balance sheet of the enterprise is used to measure the average employee compensation, and the incentive behaviour of the enterprise towards employees can significantly improve the operational efficiency of the enterprise.

(5) Enterprise development scale: the larger the enterprise scale, i.e., the higher the market share, the stronger the risk-resistant ability, and the better the enterprise operational efficiency, this paper chooses to use the total assets of the enterprise to measure the development scale of the enterprise.

(6) Management level: this indicator can measure the level of cost control of the enterprise, the operational efficiency of the enterprise, the use of the cost is relatively low, so this paper adopts the value of operating costs / operating income to measure the management level of the listed coal enterprises in Shanghai and Shenzhen.

The types, names, codes and brief descriptions of the empirical variables selected for this paper are shown in Table 2.

2.3 Empirical modelling

At present, China is in the stage of high-speed, high-quality development, all walks of life to technological breakthroughs in the direction of innovation to promote enterprise development, coal enterprises are no exception. Now coal enterprises due to the policy of reverse phenomenon causes coal enterprise input and output efficiency enhancement power is insufficient, at present the existing literature research from the coal industry, few coal enterprise level to analyse the impact of coal industry policy on the efficiency of coal listed enterprises of the relevant literature. In order to study and analyse the impact of policies on coal listed enterprises in the operation process of coal listed enterprises in China, and to verify the hypotheses put forward above, this paper makes the following empirical model design from the enterprise level.

III. Empirical results and analyses

3.1 Empirical test of the impact of industrial policy on the operating efficiency of coal listed firms

Starting from the national policy level, this paper considers the implementation of the Plan issued by the State General Administration of Coal as a quasi-natural experiment, and uses the generalised double-difference method to investigate the relationship between this national policy and coal-listed firms.

Table 2 shows the double difference results of the national coal industry policy orientation and the operational efficiency of coal listed firms. Column (1) shows the results of regression analysis without control variables, and the double difference coefficient of the interaction term Treated \times Time is significantly negative at the 1% test level, i.e., the research hypothesis proposed in this paper is valid, and under the over-incentivisation of the coal industry policy, the input-output efficiency of the listed enterprises in the coal category that are subjected to a higher degree of subsidy is reduced.

Column (2) contains all the control variables, and the double difference coefficient of the interaction term Treated \times Time in its regression results is significantly negative at the 5% test level, which again indicates that the research hypothesis of this paper is valid.

The empirical results show that the improvement of government policy subsidies for coal listed enterprises makes the operating efficiency of coal enterprises with higher degree of policy subsidies not improve, and excessive policy subsidies have a negative effect on the operating efficiency of coal enterprises. The reason for this conclusion is related to the reverse phenomenon of "seeking subsidies for policy dividends" that exists in China's coal enterprises.

As for the control variables, the coefficients of investment cash flow (Incaff), scientific research level (R&D) and management level (E.G) are significantly positive to the operating efficiency of coal enterprises, while the coefficient of enterprise development scale (Scale) is significantly negative to the operating efficiency of coal enterprises.

IV. Inspection

Based on the analysis and exploration of the empirical results above, it shows that the research hypothesis proposed in this paper is valid. However, the conclusion may be affected by factors such as heterogeneity and the relationship between variables, therefore, the need to verify the robustness of the conclusions of the study, this paper on the basis of the basic regression, respectively, using the heterogeneity test and the robustness test two ways to do further testing, the use of the two different tests are also intended to corroborate each other.

4.1 Heterogeneity test

Due to the influence of geographic distribution, natural conditions, relevant policies, human resources allocation, market reform and urban-rural dualism and other factors, China's inter-regional economic disparity is more obvious, and the economic growth rate of different regions is not balanced, and the overall performance of the eastern coastal areas of the environment and the rapid economic development of the central and western regions of the lack of economic resources and the slow development of the situation.

The development of the coal industry is affected by regional economic differentiation, and now we explore the impact of the differences in the environment and economic development level of different regions on the operational efficiency of coal enterprises, and this paper takes the data of the three major regions of Eastern China, Central China and Western China (only the sample data of the inland region of China is collected) as the research data.

According to the National Bureau of Statistics division standards, this paper divides the specific content as shown in Table 3:

V. Conclusions

Building a strong coal country is a major strategic plan made by the Party Central Committee with Comrade Xi Jinping as the core for the reform and development of coal, which is the goal of coal work in the new era. This paper takes the coal listed enterprises in Shanghai and Shenzhen as the research object, from the coal industry policy orientation, focuses on the operating characteristics of different coal enterprises in the process of development, empirically analyses the impact of the coal industry policy orientation on the operating efficiency of the enterprise, and finally we draw the following conclusions [10-21].

(1) There are some problems in China's coal industry at present, which are mainly reflected in the aspects of lower quality and imperfect industrial structure. In order to improve the effectiveness and efficiency of the industry, we need to further solve these problems. By analysing the operating data and empirical results of coal listed enterprises, we find that most of the coal enterprises are small and medium-sized enterprises, which are smaller in scale and shorter in establishment compared with other industries, which makes them face some unfavourable factors. These enterprises generally face the problem of lagging coal industry policy and also lack of industrial pioneering experience, which leads to the existence of a series of problems such as irrational enterprise structure and loss of operational efficiency.

(2) The current coal industry policy in China mainly promotes the development of the industry by means of financial guidance, which leads to some enterprises pursuing quantity rather than quality in order to obtain policy preferences or subsidies, which is the reverse phenomenon of producing for the sake of subsidies and seeking subsidies for the sake of policy dividends. This phenomenon can lead to industrial policy can not effectively improve the efficiency of coal enterprises, but rather have a dampening effect on the improvement of efficiency. At the same time, there is a proliferation of policy follow-up, competition and imitation in the implementation of industrial policy by local governments, and this irrational industrial policy further inhibits the motivation of coal enterprises to pursue efficiency maximisation. Under such circumstances, enterprises may pay more attention to the acquisition of policy subsidies and neglect the importance of improving operational efficiency and quality. Therefore, in order to enhance the operational efficiency of coal enterprises, we need to deepen the reform of coal industrial policy, pay more attention to the improvement of quality and efficiency, and at the same time strengthen the supervision of industrial policy implementation to avoid the reverse effect caused by policy subsidies, so as to promote the sustainable development of coal industry.

(3) In the coal industry, shortage of capital investment and insufficient industrial capital formation are important factors leading to efficiency loss. When the level of other factors remains constant, the lack of sufficient capital input will limit the development of coal enterprises and their ability to enhance efficiency.

For coal enterprises, capital investment needs to be used for human resources and product R&D transformation. On the one hand, capital investment can enhance the operational ability of business personnel and increase management experience, thus improving the operational efficiency of the enterprise. On the other hand, capital investment can be used for continuous research and development of products matching the market demand, improving customer satisfaction and enhancing the competitiveness of the enterprise. However, at present, there is a phenomenon of retreating capital investment in China's coal listed enterprises, which is one of the reasons why the operating efficiency of enterprises and even the whole industry cannot be significantly improved. Lack of sufficient capital investment will limit the research and development ability, market expansion ability and operation ability of enterprises, thus affecting the competitiveness and efficiency of enterprises. In order to improve the efficiency of the coal industry, it is necessary to increase capital support for coal enterprises and promote the formation of industrial capital in order to promote the development of the coal industry.

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