An Empirical Study on the Influencing Factors of the Total Output Value of Construction Industry Based on Spss

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Abstract: The construction industry is a pillar industry of the country. The sustainable development of the national economy will depend to a large extent on the orderly and reasonable development of the construction industry. This study takes the total output value of the construction industry as the research object, combined with the characteristics of the Chinese construction industry, and uses SPSS analysis software to conduct targeted empirical research. The following conclusions are obtained: (1) The total output value of the construction industry is greatly affected by the gross domestic product, the net fixed assets of the construction industry, the wages of construction workers and the internal expenditures of construction R&D funds. (2) Compared with the internal expenditures of construction R&D funds, labor input has a greater impact on the total output value of the construction industry, indicating that the behavior of technology to change the market is not obvious. (3) By increasing capital investment and expanding the labor market, the total output value of the construction industry can be effectively increased and the high-quality development of the construction industry market can be promoted.

1. Introduction
The construction industry is a basic industry, not only related to China's social security, but also related to China's economic security, and plays a pivotal role in the national economic system. Since the founding of New China 70 years ago, Chinese economy has developed rapidly. As an important material production sector, the construction industry has a close relationship with the political and economic development of the entire country and the improvement of social life. In 1978, Chinese GDP was 367.87 billion yuan, and the total output value of the construction industry was 13.82 billion yuan. By 2019, the gross domestic product has reached 990865 billion yuan, and the total output value of the construction industry has reached 248446 billion yuan[1]. The construction industry has made significant contributions to maintaining social stability, advancing urbanization, and promoting employment development, and its overall strength continues to increase.

As the "13th Five-Year Plan" countries proposed supply-side structural reforms, Chinese economic structure has been continuously optimized, while the industrial structure has been significantly improved, but structural contradictions are still more prominent. On the one hand, compared with developed countries, Chinese tertiary industry accounts for a relatively low proportion, but the...
potential for improvement is still great; on the other hand, Chinese traditional industries have complex internal structures and slow adjustment and transformation. As a labor-intensive industry, the construction industry has a huge industry structure and urgently needs to make rationalized industry adjustments.

The reform and adjustment of the construction industry can not only comply with the policy and optimize its own structure, but also drive the development and change of its related industries. Therefore, in order to make China’s construction industry develop with higher quality, it is urgent to clarify the main factors affecting the development of the construction industry at this stage. This article takes the total output value of the construction industry as the research object, analyzes the relevant factors affecting the construction industry, and proposes scientific and reasonable solutions to ensure the orderly development of the construction industry.

2. Literature review

Li Xianguang[2] combined modern economic growth theory and related data, and used Cobb-Douglas function to establish a model to quantitatively analyze economic growth. Research shows that the economic growth of the construction industry is mainly driven by capital investment, labor investment and technological progress. Similarly, Du Xiaowu[3] also confirmed this view.

Chen Haibei[4] et al. used provincial panel data as samples to conduct multiple regression analysis on the factors affecting the development of China's construction industry. The results show that labor productivity has a positive effect on the total output value of the construction industry.

Wang Chongchong[5] established a data model based on the Cobb-Douglas production function. The study showed that the average annual income of construction workers and the net value of fixed assets have a positive impact on the development of the construction industry.

Ke Yanyan[6] analyzed the impact of technology investment on the economic development of China's construction industry, and found that the impact of construction industry technology investment on economic growth did not reach the predicted value.

All in all, it is not difficult to find that the construction industry itself is multidimensional. Although scholars have expounded the relevant factors affecting the development of the construction industry from different angles, their conclusions are quite different. Therefore, this research will further study on the basis of previous research results. This study uses SPSS correlation analysis and linear regression model to conduct empirical research on the factors that affect the total output value of Chinese construction industry, with a view to making targeted recommendations for the development of Chinese construction industry.

3. Indicator selection and description

3.1. Total output value of construction industry

The total output value of the construction industry refers to the sum of the products produced by construction enterprises in a certain period of time, and its performance in monetary form can more comprehensively reflect the output of the construction industry from different angles. And through the change trend of the total output value of the construction industry, the "hot and cold" of the national economic development can be judged, which is a core indicator reflecting the development of the construction industry.

3.2. Gross Domestic Product

Gross domestic product (GDP) is an important indicator to measure the overall economic conditions of a country or region. The increase in the "quantity" of GDP not only represents the vigorous development of the national economy and the increase in national income, but also directly reflects the "quality" development level of the construction industry.
3.3. Net value of fixed assets of the construction industry
The net value of fixed assets of the construction industry is presented in monetary form. It refers to the original value of the fixed assets of the construction industry within a fixed period minus the net amount after depreciation, which can reflect the amount of funds actually occupied in fixed assets and the extent of use of fixed assets in the current period.

3.4. Wages of construction workers
Due to multiple factors such as political reforms, trade exchanges, and technological progress in different periods, it will directly affect the wages and benefits of construction workers. Changes in wage levels will significantly reflect the development of construction workers’ wage levels and the theoretical significance of labor input. More consistent.

3.5. Internal expenditures of construction R&D expenditures
The internal expenditures of construction R&D expenditures refer to the expenditures for basic research, applied research and experimental development in the construction industry's scientific and technological activities, as well as the expenditures for management and service of these three types of projects.

4. Empirical analysis

4.1. Data source
This study takes the total output value of the construction industry as the research object and uses SPSS25.0 software for correlation analysis. The data comes from the 2010-2019 China Statistical Yearbook.

4.2. Correlation analysis

4.2.1. Related analysis concepts
Correlation analysis is to accurately define the relationship between variables and variables from the perspective of quantity, and use numbers to reflect the closeness of the correlation. "r" is used to describe the degree of linear correlation between two variables. When r=0, the two variables are not correlated; \(|r| \in (0,0.3]\), the two variables are weakly correlated; \(|r| \in (0.3,0.5]\), the two variables are low-correlated; \(|r| \in (0.5,0.8]\), the two variables are significantly correlated; \(|r| \in (0.8,1]\), the two variables are highly correlated; \(|r|=1\), the two variables are completely correlated.

4.2.2. Data analysis
Based on statistical data, Pearson binary correlation analysis was performed, and the results are shown in Table 1.

|                          | Total output value of construction industry | GDP       | Construction worker wages | Net value of fixed assets in the construction industry | Internal expenditure of construction R&D expenditure |
|--------------------------|---------------------------------------------|-----------|---------------------------|-----------------------------------------------------|-----------------------------------------------------|
| Total output value of construction industry | Pearson correlation | 1         | .992**                    | .969**                                               | .987**                                               | .836**                                               |
|                           | Sig. (Double tail)                          | .000      | .000                      | .000                                                | .000                                                | .003                                                 |
| Number of cases           | 10                                          | 10        | 10                        | 10                                                  | 10                                                  | 10                                                   |
| GDP                      | Pearson correlation                         | .992**    | 1                         | .936**                                               | .964**                                               | .885**                                               |
|                           | Sig. (Double tail)                          | .000      | .000                      | .000                                                | .000                                                | .001                                                 |
4.2.3. Result analysis

(1) Through data analysis, it can be seen that the total output value of the construction industry is roughly a linear function of the GDP, the net fixed assets of the construction industry, the wages of construction workers and the internal expenditures of the construction industry R&D expenditure.

(2) It can be seen from Table 1 that under the confidence level of 0.01, the correlation coefficient between construction industry output value and GDP is 0.992; the correlation coefficient between construction industry output value and construction worker wages is 0.969; The correlation coefficient with the net value of fixed assets is 0.987; the total output value of the construction industry and the internal expenditure of R&D expenditures in the construction industry is 0.836. It is generally believed that the correlation coefficient r is extremely strong between 0.8-1, so it can be judged that the total output value of the construction industry is highly correlated with GDP, construction worker wages, net fixed assets, and internal expenditures of R&D funds.

(3) r1>r3>r2>r4, indicating that the total output value of the construction industry has the highest correlation with GDP, and the lowest correlation with the internal expenditure of construction R&D expenditure.

4.3. Linear regression analysis

4.3.1. Regression analysis

Under the premise of correlation analysis, this study considers that the research conclusions should be comparable, so the multiple linear regression analysis is continued. Establish specific functional expressions to further determine the degree of influence of explanatory variables on the explained variables and determine the relationship between them.

4.3.2. Data analysis

Based on the relevant raw data, the gross output value of the construction industry $Y_1$ is used as the dependent variable, and the gross domestic product $X_{i1}$, construction worker wages $X_{i2}$, net fixed assets $X_{i3}$ and R&D expenditures $X_{i4}$ are used as independent variables. Using multiple regression analysis, the results are shown in Tables 2 to 4.

Table 2  Model summary

| Model | $R$  | $R^2$ | $R^2$ after adjustment | Standard estimation error |
|-------|------|-------|-------------------------|--------------------------|
| 1     | .999* | .999  | .998                    | 2418.90991               |
a. Predictor variables: (constant), internal expenditures of construction R&D expenditure, wages of construction workers, net fixed assets of the construction industry, gross domestic product

| Model                | Sum of square | Degree of freedom | Mean square | F      | Significance |
|----------------------|--------------|-------------------|-------------|--------|--------------|
| return               | 24022373766.710 | 4                 | 6005593441.678 | 1026.400 | .000b        |
| residual             | 29255625.704   | 5                 | 5851125.141  |        |              |
| total                | 24051629392.414| 9                 |             |        |              |

a. Dependent variable: total output value of construction industry

b. Predictors: (constant), internal expenditures of construction R&D expenditure, wages of construction workers, net fixed assets of the construction industry, gross domestic product

| Model                              | Unstandardized coefficient | Standardization factor | t   | Significance |
|------------------------------------|-----------------------------|------------------------|-----|--------------|
| B                                  | Standard error              | Beta                   |     |              |
| (constant)                         | -57920.329                  | 34555.107              | -1.676 | .155        |
| GDP                                | .167                        | .044                   | .587 | 3.825        | .012        |
| wages of construction workers      | 1.916                       | .805                   | .183 | 2.379        | .063        |
| net fixed assets of the construction industry | 9.281                       | 5.625                  | .239 | 1.650        | .160        |
| internal expenditures of construction R&D expenditure | .022                        | .427                   | .003 | .052        | .961        |

a. Dependent variable: total output value of construction industry

### 4.3.3. Result analysis

(1) From Table 2, we can see that in the goodness of fit test (R test), $R^2=0.999$, adjusted $R^2$ is 0.998, and $R$ is close to 1. It shows that the gross domestic product, construction worker wages, net fixed assets and internal expenditures of construction industry R&D expenditures in this model can explain 99.8% of the changes in the construction industry's total output value. The model has a strong explanatory ability.

(2) From the analysis of variance in Table 3, the significance test (F test) is at the significance level of $\alpha = 0.05$, and the calculated sig = 0.000, indicating that the regression result is extremely significant.

(3) From Table 4, a multiple linear regression equation can be established, that is, total construction industry output value = $-57920.329 + 0.167 \times$ gross domestic product $+ 1.916 \times$ construction worker wages $+ 9.281 \times$ net fixed assets of construction industry $+ 0.22 \times$ internal R&D expenditure of construction industry expenditure.

### 5. Conclusions

This research takes the total output value of the construction industry as the research object, selects the
GDP, the net value of fixed assets in the construction industry, the wages of construction workers, and
the internal expenditures of construction R&D expenditures as explanatory variables. Based on the
classification of the original data, SPSS25.0 Perform correlation analysis and linear regression analysis.
Finally, based on the empirical research results of this article, the following conclusions are drawn:
First, the total output value of the construction industry is greatly affected by the explanatory variables
GDP, fixed asset expenditure (net value of fixed assets in the construction industry), labor expenditure
(construction workers’ wages) and technological progress (internal expenditure on R&D expenditure
in the construction industry). Second, compared with the internal expenditures of construction R&D
expenditures, labor input has a greater impact on the total output value of Chinese construction
industry, indicating that the behavior of technology changing the market is not obvious. Chinese
construction industry is still a labor-intensive industry, and the development of the construction
industry is mainly extensive development. Third, by increasing capital input and expanding the labor
market, the total output value of the construction industry can be effectively increased and the
high-quality development of the construction industry market can be promoted.

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