Will industrial restructuring under the infrastructure sector promote local governments to adopt the PPP model?

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Abstract. Based on the panel data of the industrial structure of 31 provinces (cities, autonomous regions) in China from 2007 to 2017, this paper studies the relationship between local government's choice of PPP financing and industrial structure and regional attributes. The study found that the advanced industrial structure has a restraining effect on the choice of PPP mode for local governments in the infrastructure sector. Further research after adding regional attributes shows that the attributes of the central and western regions have different effects on the selection of PPP mode. This paper believes that the industrial structure is an important factor for the government to use the PPP model for financing. Therefore, local governments should fully consider the impact of regional industrial structure when conducting infrastructure investment and financing.

1. Introduction

On September 23, 2014, the Ministry of Finance issued the “Notice on Promoting the Use of Government and Social Capital Cooperation Models” (Finance 2014 [76]) to conduct demonstrations of PPP model projects nationwide and encourage the promotion of PPP mode. However, from the investment intensity of local government PPP projects in 2007-2017, the local government's PPP model financing is very different. Some local government (Sichuan) PPP projects in the western region have even higher investment intensity than some in the east. Local government in the region (Beijing, Shanghai). Based on this, this paper attempts to explain the influencing factors that affect local governments' choice of financing using PPP.

The PPP financing model began in the western countries in the field of infrastructure exploration. With the gradual maturity of the PPP model, the distribution of investment in the PPP financing model in the infrastructure sectors of the world is quite different, which has caused extensive discussion in the academic community. Hammami et al. (2006), Chen Shijin and Liu Hao (2016) explored the determinants of PPP models in different countries from different perspectives and found that government policies and macroeconomic levels are the main determinants[1] [2]; Wang Zhuojun (2018) made a theoretical explanation on the promotion of the PPP model adopted by local governments in China in terms of the level of government information disclosure [3]; YH Kwak. (2009) considered that a reasonable capital structure is a very important factor for the success of PPP projects[4]; Xu Liping (2019) hopes to find PPP creates value in a way that encourages listed companies and governments to participate in the investment construction of PPP projects[5]; however, the research on the influencing factors of the local government's selection of the PPP model for financing does not consider the characteristics of China's industrial structure. This paper attempts to
explore the place from the perspective of industrial structure. The government chooses in the field of infrastructure.

The impact mechanism of PPP financing, and the role of regional attributes and regional industrial structure in the selection of PPP financing for local governments in the infrastructure sector, is also the innovation of this paper.

The contribution of this paper: (1) Exploring the influence mechanism of local government's choice of PPP financing mode in infrastructure from a new perspective of industrial structure, providing a new path for PPP financing model in the field of infrastructure diffusion, empirical discovery, industry. The structural upgrade has a reverse effect on the local government's choice of PPP financing model in the infrastructure sector. (2) Combining regional differences, specifically studying the impact of industrial structure upgrading on the selection of PPP financing models for local governments in the infrastructure sector, and enriching the mechanism of PPP financing model diffusion in the infrastructure sector through localized structural analysis, for local governments. The use of the PPP model for financing provides a theoretical basis.

2. Theoretical analysis and research hypothesis

Industrial structure refers to the proportion of agriculture, industry and service industries in the economic structure of a country. On the one hand, changes in the industrial structure will bring good development opportunities to certain industries, and on the other hand, they will bring threats to other industries. The advanced industrial structure refers to the process of industrial structure system evolving from a lower level to a higher level under the influence of technological progress, also known as industrial structure upgrading. From the perspective of the development of the industrial structure, the entire industrial structure will be developed from the dominant position of the primary industry to the second and third industries.

2.1. The impact of industrial structure on local government's choice of PPP model for financing behavior

In the process of the development of China's market economy, the industrial structure of each region is not the same, so the behavior of local governments will also be different.

Zhang Yanlong (2015) found that since the late 1990s, backward urban infrastructure has become a major problem in many cities in China, especially those that have experienced rapid industrialization and urbanization [6]. The industrial structure of these cities needs to be upgraded. Public-private partnerships in urban infrastructure and utilities are a new way to attract and utilize external resources to improve the quality of infrastructure and public services. Rapid industrial upgrading needs and rising living standards have increased the demand for new infrastructure and utility services in many cities, so these regions are more willing to use public-private partnerships to drive rapid infrastructure development.

However, Zhu Min (2013) found that the contradiction in the imbalance of industrial structure in China has become more and more prominent, and the industrial structure has already developed a trend of abnormal development [7]. Local governments have found that growth clogging due to industrial structure problems will reduce investment in infrastructure and other areas. Under this circumstance, the government will rely more on the operation and implementation of monopoly state-owned enterprises to carry out government investment behaviors, resulting in a phenomenon of “national advancement and retreat”. A cautious attitude. The root cause is that there are still many binding factors in China's industrial structure at this stage. It is these constraints that bind the government to invest in the PPP model.

Ge Hongling (2009) also believes that the willingness of regional investment and financing activities is adjusted by the regional industrial structure [8]. From the perspective of the mechanism of action, the regional industrial structure affects the total amount of capital demand, and the demand structure and financing methods have led to changes in regional financing needs. Changes in financing demand have led to changes in regional investment, regional investment structure and regional
investment patterns, which ultimately led to changes in regional financing methods. In areas with higher industrial structure, the government has enough budget to carry out investment and financing projects, and the willingness to supplement social expenditures for social capital is lower than that of lower-level industrial structure. At the same time, in areas with high industrial structure, the service industry is relatively developed, and the demand for large-scale projects is not too large. Therefore, the total amount of investment and financing required is not large, and the government's willingness to use the PPP model for financing is not strong.

It is thus found that changes in the industrial structure have two effects on the government's willingness to use the PPP model.

Propose research hypotheses:

Hypothesis H1a: The industrial structure is positively correlated with the number of financing (investment) selected by local governments in the field of infrastructure investment.

Hypothesis H1b: The industrial structure is negatively correlated with the number of financing (investment) selected by local governments in the field of infrastructure investment.

2.2. The role of regional attributes in the adjustment of industrial structure and local government's choice of PPP model for financing behavior

Yan Chengliang (2016) found that the difference in the degree of industrial structure development between the eastern region and the central and western regions has led to regional imbalances in development [9]. The impact of industrial structure changes on regional economic development imbalance is higher than that of physical capital investment, human capital, population growth. Zhu Mei and Song Ying (2018) believe that the economic growth rate in the eastern coastal areas has always been higher than that in the central and western regions in the past 20 years [10]. There are many reasons for the widening of the regional economic development gap. In the eastern region, with the increase in the degree of industrial structure, local governments have more budgets, and the number of infrastructure investment and financing projects in the east is small. Therefore, the possibility of the government adopting the PPP model for financing may exist in different provinces. Large differences; in the central region, the degree of economic development is less than that of the eastern cities, and it is at a critical stage of building urban infrastructure. It may increase investment in the construction of service infrastructure with the upgrading of industrial structure, such as new subways and bus lines. Such investment, this is the possibility that the industrial structure will increase the government's use of PPP projects; in the western region, even if the industrial structure is high, the local government adopts the PPP model to finance, and the public will think that this improvement lacks a strong market environment. Without robustness and sustainability, the attributes of the western region have weakened the role of higher industrial structure. Therefore, the improvement of industrial structure may have a reverse impact on promoting local governments to adopt PPP financing.

Therefore, the research hypothesis is proposed:

Hypothesis H2: Regional attributes have a regulatory effect on the relationship between industrial restructuring and the use of PPP models for financing behavior in the infrastructure sector. In the eastern region, the advanced industrial structure may weaken the local government's choice of PPP mode for financing in The infrastructure sector; the advanced industrial structure in the central region will promote the government to choose the PPP model; and the western region's industrial structure will be advanced to the local government. The use of the PPP model for financing in the infrastructure sector has a Reverse effect.

3. Research design

3.1. Sample selection and data source

Sample selection: This paper selects the number of investment and investment amount of PPP mode selected by local governments in China's infrastructure sector from 2007 to 2017 as a sample. In view of the high degree of monopoly in the communication industry and the PPP mode rarely used during
the sample study period, this paper will eliminate it. Data Sources: The data of the PPP project is taken from the World Bank PPI database and the government and social capital cooperation center project library. The relevant data of the industrial structure are taken from the csmar database and the wind database, and other data are taken from the National Bureau of Statistics.

3.2. Research variables
PPP financing data: This paper uses the PPP quantity and investment amount as the local government to select the PPP model financing variable, PN(PI) represents the number(investment) of project investments. Industrial Structure Index: This paper uses the industrial structure level coefficient (upgrade) to explain the industrial structure upgrade level of each province, and the calculation formula is: \[ \text{upgrade} = \sum q_i \times i = q_1 \times 1 + q_2 \times 2 + q_3 \times 3, \] \( q_i \) is the proportion of the output value of the \( i \)-th industry. \[11\] Control variables: Based on the research of Zhang Yanlong (2015) and IMF Working Paper (2006), this paper studies the annual population data, annual fixed asset investment, annual GDP and annual financial industry added value as control variables. Ps, fix, gdp, and bank represent population, fixed assets investment, gdp, and financial industry added value. Regional attributes: According to China’s 2005 Health Statistics Yearbook, this paper divides the national economic zone into three regions of the eastern, central and western regions.

3.3. Model design
Descriptive statistics: Table 1 shows the descriptive statistics of variables, where the variables PI, PS, FIX, GDP, BANK take the natural logarithm value on the original basis. The maximum amount of PPP investment (investment amount) is 16 (8.902), and the minimum value is 0 (0), which shows that the intensity of financing by different local governments in the PPP mode in the infrastructure sector is quite different.

| Variable | Obs | Mean  | Std   | Min  | Max   |
|----------|-----|-------|-------|------|-------|
| PN       | 341 | 1.980 | 2.353 | 0    | 16    |
| PI       | 341 | 3.134 | 2.550 | 0    | 8.903 |
| UPGRADE  | 341 | 5.448 | 0.053 | 5.348| 5.635 |
| PS       | 341 | 8.102 | 0.850 | 5.649| 9.321 |
| FIX      | 341 | 9.016 | 1.013 | 5.600| 10.919|
| GDP      | 341 | 9.385 | 1.045 | 5.833| 11.404|
| BANK     | 339 | 4.541 | 1.219 | -1.079| 7.178 |

Model setting: To test the hypothesis H1a and H1b, the regression equation is defined as:

\[ PN = \alpha_0 + \alpha_i MI + \sum \lambda_i \text{Control}_i + \varepsilon \]

\[ PI = \alpha_0 + \alpha_i MI + \sum \lambda_i \text{Control}_i + \varepsilon \]

To test the hypothesis H2, the regression equation is defined as:

\[ PN(PI) = \alpha_0 + \alpha_i MI + \alpha_{\text{East}} \times MI + \alpha_{\text{Middle}} \times MI + \alpha_{\text{West}} \times MI + \sum \lambda_i \text{Control}_i + \varepsilon \]

Among them: East, Middle, and West are dummy variables. When East is taken as 1 for the eastern region, otherwise 0 is used; similarly, Middle and West are defined.

4. the empirical results and analysis
To test hypothesis H1, this paper establishes a regression model between the industrial structure and the amount of investment and the amount of investment that the local government chooses for the PPP model in the infrastructure sector. The results are shown in columns (1) and (2) of Table 2. The relationship between the number of PPP investments (investment) and the industrial structure of each local government is significantly positive at the level of 5%. This shows that in areas with high industrial structure, the government has enough budget to carry out investment and financing projects.
Compared with lower industrial areas, the willingness to supplement social expenditures for social capital is lower, so local governments in the region are in infrastructure. The amount of investment and investment in PPP in the sector is relatively low. In addition, the coefficient results of the control variables are in line with the basic expectations, and thus, it is assumed that H1b is verified.

In order to test hypothesis H2, this paper establishes a regression model of regional attributes and industrial structure for local governments to choose PPP mode for financing. The results are shown in columns (3) to (8) of Table 2. The relationship between the industrial structure in the eastern region and the number of PPP investments (investment) of local governments is not obvious. On the one hand, there is a big difference between the industrial structure and the degree of economic development of the provinces in the eastern region. The willingness of provincial governments to use the PPP model for financing varies widely; on the other hand, the policies applied in the eastern provinces are not the same. For example, cities such as Beijing and Shanghai may be highly inclined by policies, compared with other provinces in the same region, big different. The central region is in the stage of vigorously developing infrastructure construction. Therefore, the advanced industrial structure will lead to an increase in infrastructure investment, and the government is willing to adopt the PPP model for financing. In the western region, due to the economic underdevelopment, even if there is a change in industrial structure for local governments to choose PPP mode for financing. The results are shown in

| VARIABLES   | Regardless of Region | EAST | MIDDLE | WEST |
|-------------|----------------------|------|--------|------|
|             | (1)                  | (2)  | (3)    | (4)  | (5) | (6) | (7) | (8) |
| UPGRADE     | -8.171***            | -3.392** | -1.447 | -9.915 | 11.778* | 12.018* | -12.921* | -4.501* |
|             | (-2.892)             | (-2.104) | (-0.165) | (-1.056) | (-1.83) | (-1.937) | (-1.978) | (-1.841) |
| PS          | 0.705***             | 1.009*** | 2.362** | 2.552** | 1.744* | 0.447** | -0.109 | 0.697 |
|             | (2.776)              | (3.366) | (-2.199) | (-2.218) | (-1.725) | (-2.344) | (-0.291) | (-1.549) |
| FIX         | 1.086*               | 0.212** | -0.109 | 0.346 | -1.137* | -0.91* | 0.799** | 0.771* |
|             | (1.953)              | (2.224) | (-0.126) | (-0.375) | (-1.732) | (-1.880) | (-2.16) | (-1.742) |
| BANK        | -0.201**             | -0.402 | 0.013 | -0.579 | -0.06 | 0.063 | -0.002 | -0.007 |
|             | (-2.635)             | (-1.291) | (-0.032) | (-1.339) | (-0.150) | (-0.167) | (-0.482) | (-1.531) |
| GDP         | 2.132*               | 1.321* | -0.644 | -0.782 | 1.997 | 1.918 |  | 0 | 0 |
|             | (1.909)              | (1.816) | (-0.386) | (-0.437) | (-1.188) | (-1.215) | (-0.323) | (-0.116) |
| CONSTANT    | 39.580*              | 11.409** | -2.266 | -64.913 | -84.436 | -75.398 | 66.188* | 15.916 |
|             | (1.955)              | (2.535) | (-0.048) | (-1.281) | (-1.563) | (-1.486) | (-1.704) | (-0.342) |
| Observations| 339                  | 339 | 119 | 119 | 88 | 88 | 132 | 132 |
| R-squared   | 0.180                | 0.190 | 0.278 | 0.234 | 0.171 | 0.126 | 0.133 | 0.222 |

*** p<0.01, ** p<0.05, * p<0.1

5. Robustness test
In order to test the robustness of this paper, the independent variable was replaced by Duan Longlong. Wang Linmei (2018) proposed that the ratio of the secondary industry of the primary industry to the
tertiary industry should be brought into the original model as the new explanatory variable [12]. The main research conclusions remain unchanged. In order to control the endogeneity between variables, this paper firstly lags the explanatory variables into one-stage processing and substitutes them into the original model. The main research conclusions are unchanged and the results are stable.

6. Conclusion and revelation

This paper uses the World Bank's 2007-2017 local government in the field of infrastructure to select the PPP model for investment, and examines the impact of industrial structure on local governments' choice of PPP financing. The results show that in the process of industrial restructuring, the advanced industrial structure has a restraining effect on the local government's choice of PPP financing. After adding the regional attributes, the results show that the local government in the eastern region chooses the PPP model for financing and industrial structure adjustment. The relationship between the local government PPP financing behavior and the industrial structure is improved; the local government PPP financing behavior in the western region The increase in the industrial structure has declined. Although the PPP model is vigorously promoted in China, there are few studies on the influencing factors of local government's choice of PPP investment. This paper studies the influence of local structure and regional property on the financing of local government's PPP model. There is a research perspective of the literature.

The above conclusions have implications for the relationship between industrial structure and local government's choice of PPP model. The following suggestions are proposed: 1. The PPP construction infrastructure should be adapted to market demand, economic development level and industrial structure; 2. The application of the PPP model in the region should adopt different policies, and it is best to play the role of PPP as a tool for local financing.

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