Income Distribution of PPP Mode in Transportation Infrastructure Construction

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Abstract Under the background of the national planning strategy such as "One Belt, One Road" and "Thirteenth Five-Year Plan", China introduced PPP as a financing model and used private capital to ease the government's financial pressure on transportation infrastructure construction. With the support of national supply-side reform and mixed-ownership economy, PPP has already caused a wave of application in China. However, due to the particularity of the PPP model, it is possible to make appropriate arrangements for core stakeholders when establishing a cooperation contract. The distribution of income largely affects the success of the project. Based on the feasibility of the argument, this paper constructs the income distribution model and mechanism, and designs and corrects the PPP model stakeholder the income distribution model based on the Shapley value method. The X urban rail transit project is taken as an example of empirical research. Analyze the influencing factors and correct the income distribution model.

Keywords PPP model · Transportation infrastructure · Stakeholders · Income distribution · Shapley model

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1

1 Introduction

With the peak of China's railway investment, the demand for transportation equipment has further expanded. The "13th Five-Year Plan" proposes that the state should vigorously promote the new urbanization of the country. The gradual increase of the urban population will expand the scale of existing cities, exacerbate the congestion dilemma, and increase the speed of construction and development of transportation infrastructure. The situation that the big market demand does not match investment and financing.

The traditional financing model is gradually unable to meet the development needs of transportation infrastructure. Because information asymmetry and human barriers will produce problems that bear the risk and the corresponding income distribution does not match. As the country's demand for transportation infrastructure development and investment scale increase, the economies of various regions have been affected to a large extent, and regional governments are facing greater financial pressure. In recent years, the supply-side structural reform strategy proposed by the state has accelerated the application of the PPP investment and financing model in the field of transportation infrastructure construction. The PPP model has become more and more widely used in transportation infrastructure construction projects, but there are few practical implementation cases. The possible reasons are the inefficient allocation of resources caused by the asymmetry of public capital and private capital information, or the external incentives of the transportation infrastructure PPP project. And the constraint mechanism is lacking.

Therefore, the research question of this paper is: How should the projected income under the PPP mode of transportation infrastructure construction be rationally distributed? How is income distribution affected by the behaviour of both public and private parties and the incentive system? What kind of income distribution design can effectively realize the rational allocation of costs, benefits and risks among stakeholders and improve the efficiency of transportation infrastructure PPP mode and regional economic development?

2 Literature Review

In the academic field, researchers focus on the research of PPP models and the mining of related concepts, as well as thinking about solving problems in practical applications [1, 2]. China's research in the field of PPP mode started late, but with the increase in the popularity of the PPP model in China, it has in turn promoted its development in the academic field. The research direction of the PPP model at an early stage focused on the analysis of the popularization and application of related concepts [3–5]. In the field of transportation infrastructure, Lei [6] focused on the whole life cycle of the transportation infrastructure construction PPP project

and discussed the key points of the optimization of the transportation infrastructure government and the social capital cooperation system.

In the research on income distribution of the infrastructure PPP mode, some scholars have conducted game analysis on the public sector and the private sector in the PPP mode from three aspects: cooperation structure, core competitiveness and balance of interests of related parties, combining the social attributes and the economy of the two departments. Introduced a relatively effective, fair and reasonable project income allocation program [7]. In the field of transportation infrastructure, Viegas [8] analyzes the relevant factors in the project that may affect the income distribution plan, such as contract duration, transaction costs, the attitudes of all parties, and in-depth discussion of the stakes involved in the PPP model. The problem of income distribution. In China's research, based on the analysis of key influencing factors, there are game theory models [9], Nash model [10], Shapley model [11], or based on risk sharing [12, 13] to conduct research on income distribution. In the study of transportation infrastructure, some scholars have used the Shapley model to analyze the interests of the three stakeholders of state-owned investment companies, private companies and relocated residents and construct a revenue distribution method [14]. In more in-depth research, some scholars have considered the impact of excess return distribution on the level of investor effort. By taking into account the horizontal and vertical fairness preferences of investors, the principal-agent model for constructing the optimal distribution of excess returns of PPP transportation projects [15].

At present, the imperfect problem of PPP mode exists in the problem of not being able to solve the problem of income distribution of relevant participants. No matter in the theoretical field or the field of practical application, there is not much research on this aspect, and the PPP mode for specific fields, For example, in the field of transportation infrastructure, there are fewer related studies on the distribution of income.

3 Construction of the Income Distribution Model Based on Shapley Value

3.1 Model Design Ideas

The PPP model is a "full process" partnership between the government and social capital to build infrastructure projects and provide public services. It is of great significance to alleviate the pressure on government fiscal expenditures and reduce the burden on the government. The basic characteristics of the transportation infrastructure PPP model include the diversification of the participants' needs, the shared revenue sharing risks, and the quasi-public product and special economic characteristics. Choosing the Shapley value method to measure the income distribution plan for core participants in the PPP model of transportation infrastructure construction can avoid simple average distribution defects and enable the public and private sectors to

take positive decision-making behaviors in the construction of transportation infrastructure. Conducive to the implementation of the overall project construction and operation.

However, the basic Shapley value method cannot take into account the other influencing factors in the traffic infrastructure PPP model and the fluctuations caused by the incentive measures of all parties. The balance of the overall cooperation model and the promotion of positive measures among the participants are The lack of it is not conducive to the creation of the overall project revenue, and the direct application of the underlying income distribution model is not sufficient and comprehensive. Therefore, the basic model is adjusted, the influence of influencing factors is analyzed, and the factor correction model is added to improve the scientific defects of the basic model, to establish a fair and objective way to establish a PPP model income distribution model that encourages participants to take active measures.

3.2   Shapley Value Method Foundation Model Establishment

Assume that $I = \{1, 2, \ldots n\}$ is a set of n stakeholders in the PPP mode. For any subset of I, $S \in I$, there is a corresponding function $V(S)$, which satisfies:

$$V(\varphi) = 0 \tag{1}$$

$$V(S_1 \cup S_2) \geq V(S_1) + V(S_2), \, S_1 \cap S_2 = \varphi \tag{2}$$

$[I, V]$ is defined as a game with n stakeholders, and V is the corresponding special diagnosis function mentioned above. This article is the income of the construction project.

Use Y_i to represent the maximum income distribution value that the i-th stakeholder in the set I can obtain from the construction project income, so the income of the construction project that the different stakeholders in the set I can allocate with the vector $Y = (Y_1, Y_2, \ldots, Y_n)$, and the establishment of the income distribution model needs to meet the individual rationality of the participants as well as the overall rational requirements.

Overall rationality:

$$\sum_{i=1}^{n} Y_i = V(I) \quad i = 1, 2, \ldots n \tag{3}$$

Individual rationality:

$$Y_i \geq V(i) \quad i = 1, 2, \ldots n \tag{4}$$

$V(i)$ represents the income that stakeholders i can create if they are solely responsible for project construction. $V(I)$ represents the maximum benefit that can be created in the case of many cooperation possibilities. The Shapley value of the overall revenue of the project, defined as $Y_i(V)$:

$$Y_i(V) = \sum_{S_i \in S} W(|S|)[V(S) - V(S \backslash i)] \quad i = 1, 2, \ldots n \tag{5}$$

$$W(|S|) = ((n - |S|)!(|S| - 1)!)/n! \tag{6}$$

S represents the case of all cooperation modes including individual factors, stakeholders i, in the set I, $|S|$ is the number of stakeholders in cooperation mode S, and $W(|S|)$ represents a weighting factor. $V(S)$ represents the income of the construction project that can be created by the model S, and $V(S \backslash i)$ represents the project income that can be created if the cooperation model S does not include the stakeholder i.

It is assumed that according to the cooperation mode formed by random conditions, the probability of occurrence of each mode is equivalent, that is, $1/n!$. Stakeholder i forms an overall cooperation model S with other $|S| - 1$ stakeholders, so the marginal contribution of stakeholder i to the overall project benefit is defined as $V(S) - V(S \backslash i)$. There are a total of $(n - |S|)!(|S| - 1)!$ types of $S \backslash i$ and $N \backslash S$ stakeholders randomly sorted. The probability of occurrence in each case is $((n - |S|)!(|S| - 1)!)/n!$. At this time, the marginal contribution expected value created by stakeholder i is the assigned income value measured by the planning model.

3.3 Revised Model Construction Mechanism

In the application of PPP model for transportation infrastructure construction, according to the characteristics of PPP, the multi-stakeholder model of financing mode and the special economic characteristics of transportation infrastructure construction, the income distribution is mainly affected by three factors, namely, subjective factors and systems. Sexual factors and social factors, and three factors have a positive impact on income distribution.

The main factors include cooperation income, the proportion of capital investment, the degree of contract execution, the degree of innovation contribution and risk tolerance; institutional factors include government intervention, the legal system, transportation policy and market changes; social factors include social environment, line restructuring, Fares fluctuations and quality of service. In this paper, the subjective factor is selected as the main influencing factor, and the institutional and social factors are respectively classified into the risk-bearing evaluation index system of the transportation infrastructure construction PPP project. As a risk factor, it has an impact on the project income distribution, and its main influence. The mechanism is shown in the Fig. 1.
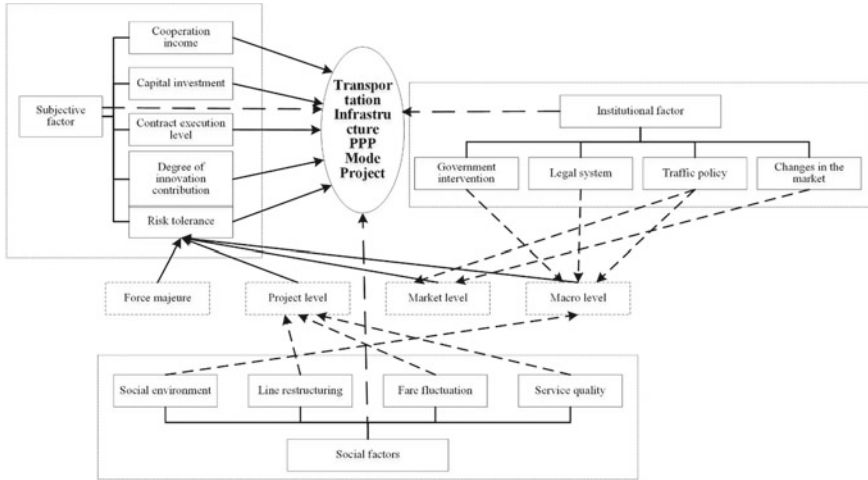
Fig. 1 Revised model construction mechanism diagram

The modified Shapley value method is not only simple in setting up the model and correcting the solution process, but also ensures the uniqueness of the income distribution plan, even if it is in a loss state. And given the characteristics of transportation infrastructure construction, most of the projects that were handed over during the construction and operation period are in a state of loss. The modified Shapley value method can distribute income even in the case of losses. Also, such projects are generally accompanied by factors such as the government's feasibility gap subsidy, and can also be considered by the influencing factors in the revised Shapley value, and can be adjusted according to the implementation, so that the model can be more in line with the actual situation.

4 Empirical Research

4.1 Empirical Case Selection

The total length of the X urban rail transit line is 233.6 km. Line 2 is the main skeleton line in the north-south direction of the X city rail transit network. Line 2 can cover the main north-south passenger flow tasks of X city, as the main city and the new city. The north-south fast-track has become the largest passenger route in the X-city rail transit network.

The first phase of Line 2 was laid south to north, with a length of 23.647 km and 23 stations. The preliminary design estimate for the first phase of X Urban Rail Transit Line 2 is 205,167.83 million yuan, and the technical and economic indicators are 86,762,300 yuan/positive line kilometers. The capital ratio of this project is 35%. The

first phase of Line 2 adopts the PPP operation mode, and the transaction structure is A + B mode, that is, the electromechanical equipment (Part B) construction-operation-transfer (BOT) mode. After the A and B projects are split, all the Part B investments are made. The capital of 35% is estimated, and the total investment of PPP projects is 6.316 billion yuan.

The X municipal government authorizes the implementing agency to determine social investors through bidding. The government has a good understanding of the project's operating conditions, exercised its supervisory responsibilities, and appropriately participated in the project company. The social investor and the municipal government investor signed a joint venture cooperation contract with X City Rail Transit Development Co., Ltd. to establish a project company (SPV). After the executing agency signs the contract agreement and other contract documents on behalf of the government and the project company, SPV obtains the concession and is responsible for investing in the construction of part B of the second phase of the second line during the concession period, symbolically renting part A facilities and conducting The operation of the first phase of Line 2 is responsible for the maintenance of the project and the maintenance of operational investment. In the meantime, to ensure the safety of project construction and operation, the quality of service, especially the provisions of the franchise agreement, the government must exercise the right to supervise the industry for the project company. At the end of the concession period, the project company ensures that the equipment and the charity are transferred to the X municipal government department or other organization designated in the contractual agreement.

4.2 Shapley Value Income Distribution Without Considering the Influencing Factors

(1) *Project cost benefits*

The financial analysis of the PPP project of X City Rail Transit Line 2 is 27 years, of which the construction period is 2 years (2017–2019), and the trial operation starts in July 2019, entering the 25-year franchise period, which is 2019~2044 years. The project capital is temporarily considered as 35%. In the capital, the ratio of government and social capital stocks is 5%: 95%. The government plans to invest 110,523,800 yuan and the social capital is planned to invest 209,995,600 yuan. Debt funds totaled 410,516,500 yuan, according to 22-year loans (2 year grace period, 20 year repayment period).

The ticket system income refers to the A city operating fare rate and average station spacing, average distance data, combined with the average distance and the average station spacing of the passenger flow forecast of the project, and calculated at the current price to obtain the initial, near and long term of the project. The average fare rates are 0.2512, 0.2509, and 0.2541 yuan/person-km. The operating income consists of ticket revenue and non-ticket revenue. Non-ticket revenue mainly

includes advertising, communication, retail and other business development income
directly related to the project facilities. According to the operation of other cities,
the non-ticket net income is temporarily 10% of the ticket revenue. Calculation.
Calculated by profit and loss analysis, the net income totaled RMB 2,373,008,400.
The costs incurred by the project company include operating costs, amortization and
financial expenses. Operating costs are mainly composed of labor costs, electricity
costs, maintenance costs, operating expenses, and management fees. The total cost
of the project was estimated to be 1,545,202,500 yuan.

The discount rate is 2.93% (average coupon rate of X city local bonds in 2016),
the long-term loan interest rate is 4.9%, the reasonable profit rate is 10.98%, and
the annual average non-ticket net income is temporarily calculated at 10% of the
ticket revenue. Under the premise that the financial internal rate of return after the
project capital income tax is 6.5%, the total revenue of the project company during the
concession operation period is 22.573 billion yuan, the income from other businesses
is 2.257 billion yuan, the net income is 23.730 billion yuan, and the total cost is 15.452
billion yuan. The total amount was 8.278 billion yuan, the income tax paid was 2.192
billion yuan, the net profit was 6.068 billion yuan, and the statutory reserve fund was
608 million yuan, and the profit available for distribution was 5.478 billion yuan.

(2) *Estimation of the income distribution*

The two core stakeholders in the PPP model of X City Rail Transit Line 2 can
form a cooperative game (N, V) under the PPP model, where N includes two core
stakeholders, namely the X city public sector and The private sector, while V refers
to the different benefits obtained from the implementation of different subsets, that
is, the eigenvalues derived from the established eigenfunctions.

According to the Shapley model, all the cases in which the X-city rail transit line
2 PPP model X municipal public sector E participates and the benefits that should
be distributed are:

$$Y_E(V) = \sum_{E \in S} W(|S|)[V(S) - V(S \backslash E)]$$
$$= V(E)/2 + [V(E, T) - V(T)]/2 \qquad (7)$$

X City Rail Transit Line 2 PPP mode Private sector T participation in all cases
and the benefits that should be distributed are:

$$Y_T(V) = \sum_{T \in S} W(|S|)[V(S) - V(S \backslash T)]$$
$$= V(T)/2 + [V(T, E) - V(E)]/2 \qquad (8)$$

From the previous analysis, the construction and operation income of the PPP
model of X City Rail Transit Line 2 is available, *V(E, T) = 547,771,100* yuan,
V(E) = 69,434,100 yuan, and *V(T) = 3,864,105,900* yuan.

Table 1 Changes in the income level of core stakeholders in the PPP model of X city line 2 (unit: 10,000 yuan)

Case project core stakeholders	Seize the proceeds separately	Distribution income in PPP mode	Income increase	Income increase (%)
Public sector E	69,434.71	115,402.22	45,967.51	66.20%
Private sector T	386,401.59	432,369.10	45,967.51	11.90%
Total	455,836.30	547,771.32	91,935.02	20.17%

Therefore, the income distribution quotas $Y_E(V)$ and $Y_T(V)$ obtained by the public sector E and the private sector T in the PPP model of the X-city rail transit line 2 are (unit: 10,000 yuan):

$$Y_E(V) = V(E)/2 + [V(E, T) - V(T)]/2$$
$$= 69434.71/2 + (547771.31 - 386401.59)/2 = 115402.22 \qquad (9)$$

$$Y_T(V) = V(T)/2 + [V(T, E) - V(E)/2$$
$$= 386401.59/2 + (547771.31 - 69434.71)/2 = 432369.10 \qquad (10)$$

From the above calculations, after the PPP project of X City Rail Transit Line 2 is completed, the public sector E can benefit 115,504,200 yuan in the corporation, the income of the project, and the private sector T can cooperate in the corporation income of the case project. The gain was 432,369,100 yuan. After using the PPP model, the benefits have increased to some extent, which also proves the effectiveness of using the PPP cooperation model (Table 1).

4.3 Shapley Value Return Distribution Considering Influencing Factor Correction

(1) *Revised model construction*

According to the analysis of the factors affecting the income distribution of the PPP model by scholars [16, 17], combined with the characteristics of transportation infrastructure construction, the factors affecting the income distribution are summarized. Institutional, initiative and social factors will have a positive impact on income distribution. Capital investment, risk-taking, contract execution, innovation contribution, financial subsidy, return method, incentive system and other factors are positively related to income distribution. Based on the impact mechanism constructed in the previous section, this paper selects the four main influencing factors of capital investment proportion, risk commitment degree, innovation contribution degree and contract execution degree, and corrects the established income distribution model.

Four factors affecting the PPP mode income distribution of X City Rail Transit Line 2 are combined to establish a set of influencing factors $J = \{j\}$, $j = 1, 2, 3, 4$. In the PPP mode of X City Rail Transit Line 2, the corrected measurement index of the i-th core stakeholders on the factors affecting the j-th revenue distribution is α_{ij}. The correction coefficient matrix A is constructed according to the influencing factor correction coefficient:

$$A = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} \end{bmatrix} \tag{11}$$

Normalize matrix A to get matrix A'. In the calculation of the income distribution plan for the PPP mode of the X city rail transit line 2, it will be applied to the relevant experts, who use the traffic infrastructure construction as the special product field to score the influencing factors, thus obtaining the factor matrix of the four impact categories $\lambda = \begin{bmatrix} \lambda_1 & \lambda_2 & \lambda_3 & \lambda_4 \end{bmatrix}^T$, and $A \cdot \lambda = \beta = \begin{bmatrix} \beta_1 & \beta_2 \end{bmatrix}^T$ calculates the income distribution of the public sector and the private sector in the PPP model of X City Rail Transit Line 2 by the previous article. The four types of influencing factors mentioned are the combined effects of β_1 and β_2.

At this time, the adjusted income distribution of the PPP project alliances of the public sector and the private sector in X City are:

$$Y_E(V)' = Y_E(V) + (b_1 - 1/n) \times V(E, T) \tag{12}$$

$$Y_T(V)' = Y_T(V) + (\beta_1 - 1/n) \cdot V(E, T) \tag{13}$$

In the PPP model of X City Rail Transit Line 2, because of the complexity of the capital investment in the PPP model proposed in the previous section, this paper proposes to select the capital investment of the public and private sectors of X City and the financial subsidies given by X municipal government departments as the basis for calculation. Government departments accounted for 5% of capital investment, and private sector capital investment accounted for 95%. According to the subsidy model, X city government's feasibility subsidy during the concession operation period was about 10,796.43 million yuan, which can be used to calculate the public sector of the X city and the private sector. The respective capital investment ratios are 0.36 and 0.64, that is, the capital input weight vector $(a_{11}, a_{21}) = (0.36, 0.64)$.

Determine the overall risk degree vector of both parties. This paper adopts the analytic hierarchy process. According to the actual situation of X City Rail Transit Line 2, the public sector and private sector of X City are the first levels, and the risks identified in the whole cycle are divided into macroscopic. Level, market level, project, level, force majeure, and each category contain multiple risk factors of three levels, based on a total of 50 risk factors identified, filtered and combined, and then determined by analytic hierarchy process The weight of the risk index of the X-ray rail transit line 2 is calculated by the expert grading analysis method, and the weight vector $(a_{12}, a_{22}) = (0.42, 0.58)$ of the risk-bearing degree distribution is obtained.

The income distribution of the PPP mode of X City Rail Transit Line 2, the impact of the sudden situation on the line construction and operation should be considered. Before the end of the franchise period, the emergency is difficult to determine and preliminary judgment is required. And estimate the overall revenue loss of the line caused by the possible unexpected events. This paper tentatively sets the level of innovation contribution of the two core stakeholders and can do everything possible to cope with the emergencies in the line construction, operation, that is, the innovation contribution factor $(a_{13}, a_{23}) = (0.50, 0.50)$.

Also, in the PPP model income distribution of X City Rail Transit Line 2, this paper assumes that the public sector and private sector of X City are expected to meet the requirements of quality and schedule by the contract documents in the whole process of construction and operation of the line. Each phase completes its respective mission objectives intact, that is, this paper assumes that the contract execution factor $(a_{14}, a_{24}) = (0.50, 0.50)$.

Each of the influencing factors has different impacts on different fields and even different construction projects. Therefore, when determining the λ coefficient matrix of the influencing factors of income distribution under the PPP mode of X City Rail Transit Line 2, it is necessary to consider the X city. The actual situation and the characteristics of transportation infrastructure construction. This paper selects the expert scoring method and obtains the income distribution effect $\lambda = (0.41\ 0.31\ 0.16\ 0.12)^T$ of the four factors of capital investment, the degree of risk commitment, the degree of innovation contribution and the degree of contract execution on the PPP model of X City Rail Transit Line 2.

(2) *Estimation of the income distribution*
According to the formula, the overall affected degree β_1, β_2 and income distribution of the public and private sectors of the Shapley model are corrected under the influence mechanism of the revenue distribution of the transportation infrastructure PPP model (unit: 10,000 yuan):

$$
\begin{aligned}
\begin{bmatrix} \beta_1\ \beta_2 \end{bmatrix}^T &= A \cdot \lambda \\
&= \begin{bmatrix} 0.36\ 0.42\ 0.5\ 0.5 \\ 0.64\ 0.58\ 0.5\ 0.5 \end{bmatrix} \cdot \left(0.41\ 0.31\ 0.16\ 0.12 \right)^T \\
&= \begin{bmatrix} 0.4178\ 0.5822 \end{bmatrix}^T
\end{aligned}
\tag{14}
$$

$$
\begin{aligned}
Y_E(V)' &= Y_E(V) + (\beta_1 - 1/n) \cdot V(E, T) \\
&= 115402.22 + (0.4178 - 1/2) \cdot 547771.31 = 70375.42
\end{aligned}
\tag{15}
$$

$$
\begin{aligned}
Y_T(V)' &= Y_T(V) + (\beta_2 - 1/n) \cdot V(E, T) \\
&= 432369.10 + (0.5822 - 1/2) \cdot 547771.31 = 477395.90
\end{aligned}
\tag{16}
$$

Before the model was revised, the increase in the income allocated by the public sector in X City was much larger than that in the private sector. The increase in income

Table 2 Changes in income level of the core stakeholders of the PPP project of X city line 2 (unit: 10,000 yuan)

Case project core stakeholders	Seize the proceeds separately	Distribution income in PPP mode	Income increase	Income increase (%)
Public sector E	69,434.71	70,375.42	940.71	1.35%
Private sector T	386,401.59	477,395.90	90,994.31	24%
Total	455,836.30	547,771.32	91,935.02	20.17%

made the government agencies in X City have the incentive to introduce social capital into the PPP model while improving the overall line construction operating income. Help develop emerging investment models and coordinate the allocation of government budgets. However, after the model was revised, the private sector's revenue increased even more. As shown in the table, the private sector has a higher proportion of investment and a higher risk than the public sector in the actual operation. Require a higher return on earnings (Table 2).

5 Conclusion

Under the background of China's current economic environment and policy system, Part B of City Rail Transit Line 2 adopts a PPP financing model. After constructing the income distribution model and correcting it, the income distribution plan of the case will distribute the income of the PPP mode of transportation infrastructure construction. It has good reference significance. The research conclusions of this paper mainly include the following three points:

(1) *The revised Shapley model income distribution is more scientific and fair.* After the revision, the Shapley revenue distribution model will actually allocate part of the project revenue to the private sector. After considering the influencing factors, the distribution model will be more in line with the actual situation of the private sector investment and the high risk.

(2) *The PPP model can bring about an increase in the revenue of the transportation infrastructure.* Before considering the correction factors, the government's distribution income is higher than that of the private sector. After considering the influencing factors, the efficiency changes before and after, and the private sector obtains higher income distribution because of the high investment and high risk. And its increase is greater than the government sector.

(3) *The impact mechanism of the construction can provide the basis for adjusting the income distribution.* Based on the consideration of the factors affecting the distribution of income, based on the impact mechanism constructed, the principle of distribution of the private sector in terms of equity can be guaranteed, and the private sector can be selected to cooperate with government

agencies in the process of construction and operation of transportation infrastructure. Effective behavioral measures in the direction of guidance can improve the overall revenue, efficiency of transportation infrastructure construction and operation, and ultimately create social and economic benefits for the area where the transportation infrastructure is located.

However, there are still some shortcomings in the research of this paper. First of all, the social benefits of the PPP model for transportation infrastructure construction are difficult to quantify. Secondly, when constructing the PPP mode impact mechanism of traffic infrastructure construction, it is difficult to quantify each factor by implementing the influencing factors on the indicators. Also, because the relevant data of transportation infrastructure construction is difficult to collect, in the research of this paper, the internal data measurement and analytic hierarchy process are combined with expert judgment. The method has certain empirical influence, and there may be subjective bias and the scheme. The calculation results have a certain impact.

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