

An Analysis Using Game Theory on the Investment Incentive of PPP Projects

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Abstract

According to the research of Taiwan Institute of Economic Research, the domestic PPP (Public Private Partnership) projects create economic growth rate of about 0.08% per NTD 10 billion of capital. In Feb. 2015, project report by Ministry of Finance indicated that signed PPP projects over the years have injected investment for an amount of approximately NTD 30.6 billion in 2014, which create economic growth rate of about 0.24%. Therefore, government is aggressively promoting PPP in recent years aiming to attract private investment of NTD 100 billion per year. Up to date, there are still some conflicts, especially the issue of royalty as PPP policy has been an important issue of the industry.

We establishes the analysis criterion through the concept of the game equilibrium and simulate to explore the PPP investment incentives of the equilibrium conditions. Investment incentives game model provides the method for the government and tenders to evaluate if the minimum royalty formulated by government have Investment incentive; this study proposed “fixed mode” and “change mode” two modes to discuss.

Fixed mode shows it has investment incentive when the minimum royalty decided by investments ratio or act lower than the reasonable profit allocated by the capacity of the government and tenders to create excess profit ratio. Changed mode shows it's difficult to have investment incentive when the land value higher then tenders' investments.

Keywords –

Public Private Partnership; Game theory; EVA; Investment incentive; Nash Equilibrium; Equilibrium solution; PPP

1 Introduction

1.1 Research motivations

The lack of government financial resources and the necessary of infrastructure make PPP an important industry in all countries. In recent years, Taiwan government has moved towards the goal of attracting NTD 100 billion of investment each year (Ministry of Finance, 2015). Over the years has signed the PPP project accumulated to 103 years of actual investment of about NTD 30.6 billion, it has created an economic growth rate of about 0.24%.

At present, the domestic distribution of PPP is on the basis of the value of the land provided by the government. For example, governments at all levels to set up land use right in accordance with the laws and regulations, usually expressly stipulates 30% to 70% of the land value ratio of the reserve price. The Ministry of Finance (2016) proposed to promote the type of PPP is not for the purpose to collect the royalties. The Taipei Municipal Government (2015) proposed the excess profits should be the allocate by the Government providing land value and the capital invested from the company. The views between The Ministry of Finance and Taipei City Government (2015) in PPP of the proportion of excess profits for the government and tenders are two extreme ways .

However, it is not applicable to allocate profits only by the proportion of the land use from government or capital investment from tenders in PPP. When the business failure, the government can still recover its investment capital (land) but tenders not. It is different from the co-financed shareholder relationship business of the common distribution of profit and risk. In the PPP project, it can be seen that the more investment capital (land) of the government does not mean that the excess profits can be generated. Therefore, the more the input capital is not enough to represent the higher excess profit distribution ratio.

The motivation of this study is how to promote the PPP project with reasonable investment incentive model. The process of PPP can be regarded as a game between the government and the tender. Game theory can be used to understand the interaction between the participants in the game and decide the optimal strategy according to the decision-making process to reach the equilibrium state of the contestants. This equilibrium state represents the balance strategy of the government and the tender, and also represents the goal of the government of engaging the PPP investment incentive.

1.2 Scope and limitations of study

This study mainly aims at the conditions of PPP project which is based on the setting land-using right type and the type of BOT which is based on the Participation Method. Other types or other laws and regulations based on the PPP project such as with the two types of PPP with the same characteristics can also refer to the analysis of this study. The PPP project especially means one kind of a project with excess profits in the concession period and another is included that the government only provided land but zero investment with excess profits of the financial assessment of the subject and subsidiary business. In one word, PPP projects that do not have excess profits are not covered by this study.

2 Literature review

The earliest use of BOT (Build-Operate-Transfer) case is the mid-18th century Turkey invited domestic and foreign contractors to participate in the planning of public sector privatization policy (Wikipedia, 2016).

Since 1990, the Taiwan government began to introduce civil participation in public construction PPP model to solve the government financial constraints, enhance public construction to promote efficiency (Executive Yuan Economic Construction Committee, 2011).

2.1 Game theory

In 1950, John F. Nash proved that there must be an "equilibrium solution" in non-zero-sum non-cooperative tournaments, and the concept of "Nash Equilibrium" in non-cooperative games was proposed. Albert William Tucker established the "Prisoner's Dilemma" equilibrium solution, which laid the foundation for the modern non-cooperative game theory. Since then, the game theory widely used in economics, political science and psychology and other fields, the study of human interaction equilibrium behavior. The 1994 Nobel Prize in Economics was presented to John C. Harsanyi, John F. Nash and Reinhard Selton for his outstanding

contribution to the theory of the tournament.

In the game theory, among the decision makers who define clever rationality, through the study of mathematical models, the best strategies are determined in the process of conflict and cooperation (Holland, 2013). There are two types of Extensive Form Game and Strategic Form Game (Normal Form) (David M. Kreps, 1990). In general, the strategic tournament is suitable for static games, and the extended tournament is suitable for dynamic tournaments (Zhang, Liu, 2003).

There are two kinds of Games : Cooperative Game and Non-cooperative Game. The analysis unit of the cooperative tournament is the group. The analysis unit of the non-cooperative tournament is the participant (David, 1990). Participants in the tournament can set out a co-ordinated strategy combination, known as a cooperative tournament, and vice versa (Roger, 2006).

2.2 PPP

Tiong & Alum (1997) proposed that the BOT royalty is required to be included in the concession contract through negotiations between the government and the concessionaire. Wu (2002) uses the mathematical planning method for the range of BOT royalty taking models to consider the self-compensation rate greater than 1, equal to 1 and less than 1.

Guo (2003) proposed second-order planning method to study the government and the optimal applicant's negotiation model. Study for the government to pursue their own financial recovery rate maximization and the best applicant for the goal of the largest profitability. Kan (2003, 2004) and Huang (2003) consider the point of financial and cash flow of the government and the concessionaire, calculate the financial decision-making model in both sides. Find out the capital contribution ratio and the bargaining space of the premium from the view of excess profit and financial recovery. And then deduce the civil participation in public construction royalty of the estimated model.

Zhou (2004) applied the Nash equilibrium of the cooperative game theory to discuss the financial-cooperation evaluation model between government and tender. Lin (2004) applied the game theory to construct the negotiation model to simulate the negotiation process of the franchise contract negotiation between the government and the franchise team. Carry out the estimating amount of the negotiating parties (the amount of sharing, the equilibrium convergence, the effect of the government and the people) and the time required to complete the negotiations and the impact of the negotiating factors on the process and its policy.

Wang (2008) adopted the Rubinstein bargaining theory to incorporate factors such as discount factor, bargaining cost factor, negotiation frequency,

negotiation ability, negotiation start value and negotiation limit. Finally, find the agreement point of bilateral connection by the model. Lin (2013) discusses the importance of PPP government-specific units and the impact of the conditions, results and negotiation time of the government's loan guarantee and its policy significance.

3 Study methods and processes

This study first explores the current situation of civil participation in public construction, with the aim of establishing a model for the government to set up a scheme of investment incentives and ensure that the government has a reasonable amount of money before the bidding of the PPP project, so that the PPP project can be effectively promoted. This paper studies the papers, periodicals and books of civil construction, tournament theory, PPP rights and EVA theory, and then sets up the strategy of the tournament and builds the model and analysis step of the research investment trail, and finally To simulate the case to verify the feasibility of the model feasibility.

The study processes are as follows:

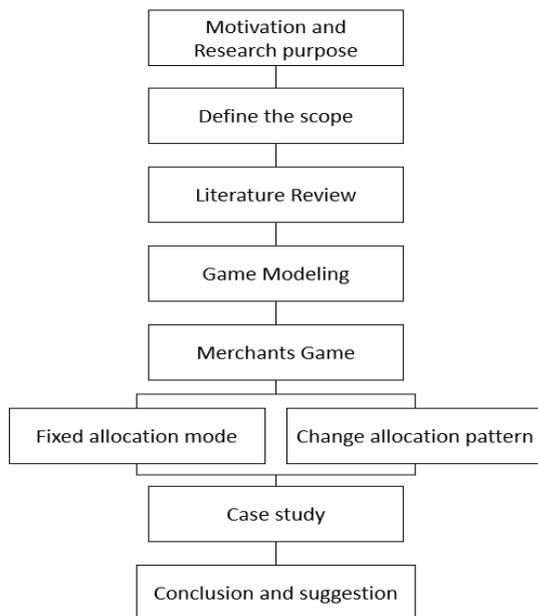


Figure 3.1 study processes

3.1 Definitions and conditions

The value of the enterprise lies in the ability to create excess profits. If the firm has the ability to earn a reasonable profit, it can be regarded as the value of the enterprise. Because it is the concept of opportunity cost or capital cost in economics, as long as the same invested capital is recycled through the appropriate

investment pipeline. The tenders involved in PPP at least need to recover the cost of capital that is to earn a reasonable profit.

So the government no matter what way to allocate the profits generated by PPP, naturally only to distribute the amount of excess profits. The excess profits for each year are expressed in (2-1) (S. Ping Ho, 2014):

$$EVA_i = IC_i(ROIC_i - WACC) = NOPLAT_i - IC_i \times WACC$$

$$i = 0 \sim n$$

ROIC: Return on investment capital

NOPLAT: net operating interests

IC: investing capital

WACC: Cost of capital

According to (2-1), after the capital cost (WACC) is fixed, it is necessary to increase the excess return on capital or net operating profit. In fact, the ability to create excess profits usually comes from the business capacity, such as operational efficiency and innovation.

The excess profits used in this study are based on economic definitions, ie, the remuneration of the capital costs of the PPP project over liabilities and shareholders' equity (S. Ping Ho, 2004). The Taipei Municipal Government (2015) separately defines the excess profit as the difference between the actual amount of the firm and the estimated operating profit, which is different from the definition of excess profits from the general financial analysis. However, the use of this special definition of excess profits to distribute the profits of the way has now become the Taipei City Government announced the operating procedures, this study will be in the investment incentive tournament to establish a "change allocation mode" to explore the special distribution of investment incentives.

The total present value of excess profits is expressed as follows:

$$EVA^* = NPV + \sum_i R_d + \sum_i R_m \quad (3-1)$$

$\sum_i R_d$: discounted value of the development rights

$\sum_i R_m$: discounted value for the operating premium.

In this study, the profitability is combined into the allocation rate to check the land value or the government and the firm to invest in the capital set by the difference between the rights of the reserve price is reasonable, and used to allocate PPP excess profits. For the purpose of rational allocation, the same investment capital refers to the same investment conditions as the tender, for example, the investment of the firm does not include the land purchase price or the levied cost, and the calculation of the government investment capital does not include the expenditure in order to avoid

unreasonably reducing the government distribution Weights.

Tender and the government profitability connotation, as follows:

(A) Tender profitability: Tender estimated to build a PPP project to create the ability to create excess profits. Based on the same capital investment conditions with the government, the analyst can estimate the total excess value of excess profits generated by the PPP project.

(B) Government profitability: This study discusses the government of the profitability is based on the same investment capital conditions, that is, not included in the cost of government land acquisition. So, Profitability can also be estimated to create excess profits to replace the total present value.

Civil efficiency is one of the purposes to promote PPP. Profitability reflects the differences between the government and the tender on the core characteristics of the same PPP project efficiency or innovation. Therefore, this study makes it reasonable to assume that the government's profitability is much lower than that of the tenders and PPPs of certain types of operations may be close to or consistent with the tenders. There is still lack of literature or research to set the government profitability and the proportion of tender profitability is reasonable.

In this study, the government and the tender's full profitability ratio can be expressed between 0 and 1, the profitability ratio is average of 0.5, that is, the range is set to 0.5 to 1 between the government and the tenders can accept the PPP project in the balanced profitability ratio, both sides are willing The scope of acceptance is the concept of equilibrium theory.

Table 3.1 PPP Operation Type Scope Table

Profitability	PPP operating type
0.50~0.65	With high efficiency or creativity operational requirements type.
0.65~0.85	Comprehensive type.
0.85 to 1.00	More commercial rental or ground right to sell the facility type

3.2 The game model for tender inducement

The game model of tender inducement is to discuss the PPP project with the incentive conditions of investment. This study assumes that the government and the tenders in the process of investment can master each other's messages, such as government land value, tenders to invest in capital, PPP type of operation and government and tenders profitability, etc., so the game model for a complete message dynamic game. This study is divided into "fixed mode" and "changed mode" and other two models, the establishment of different

rules. Merchant inducement rules by the government first action, tenders and then respond to the expansion of the dynamic tournament.

Table 3.2 Sign Def. Table

DEF.	Description
EVA^*	Estimated total excess value of PPP profits.
EVA_p^*	The government estimates the total present value of the actual excess profits.
EVA_r^*	Actual present value of actual excess profits of PPP.
EVA_b^*	The total present value of excess profits is estimated by the tender's investment plan.
$NOPLAT_r^*$	Actual net operating profit of PPP.
$NOPLAT_b^*$	Tender investment plan book estimate net operating profit.
IC	Estimated PPP investment capital.
$WACC$	Estimated PPP cost.
W_g	Government excess profit distribution rate.
Π_g	Government allocates excess profits.
Π_b	Tender allocates excess profits.
$\sum_i R_d$	The present value of the development rights.
$\sum_i R_m$	The present value of the operating premium.
a	Government/tenders profitability ratio.
B	The tender/government estimates the actual excess profit ratio.
c	Land value and investment ratio.

"Fixed mode" means that the premium at the end of the price shall be determined in accordance with the excess profits of the advance plan book, as set out with the ratio of the government and the tender's capital to the distribute. The fixed allocation pattern is that the government does not increase in the premium or in profit redistribution due to the actual operating profit of the tender. "Changed mode" simulates the "standard operating procedures for Taipei Municipal Government's plan to promote private participation in public works (BOT)." The operating procedures define the excess profits as the difference between the actual operating profit and the estimated operating profit.

Investment strategy of Merchants inducement game:

(A) Government strategy

In the fixed mode, the government will decide whether to hold PPP in accordance with whether the total present value of the excess profits of the plan book is greater than zero.

In the changed mode, the investment contract will stipulate that when the actual operating profit of the firm is higher than expected, it is necessary to increase

the operating profit of the government and the tender to increase the capital than the redistribution.

(B) Tender strategy

In the fixed mode, the tender will decide whether or not to bid on the basis of whether the reserve price of the premium raised by the government is lower than the reasonable rate of profit allocated by the profitability combination and the excess profits estimated by the tender.

In the changed mode, the tender will decide whether or not to bid if the redistribution profit proposed by the government is lower than the reasonable profit by the combination of excess profit difference estimated.

Investment incentives race tree model as follows:

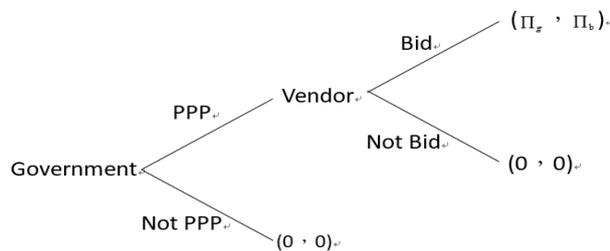


Figure 3.2 Investment incentives race tree model

Payoff describing below :

(A) Not PPP:

When the government evaluates NPV less than zero, does not hold PPP, game off. Government and tender remuneration are zero.

(B) PPP-Bid strategy combination:

In the fixed mode, the government allocates excess profits

$$\Pi_g \geq \sum_i R_d + \sum_i R_m \text{ or } \Pi_g \geq \frac{c}{1+c} EVA_p^*$$

Tender to allocate excess profits $\Pi_b = EVA^* - \Pi_g$.

In the changed mode, the government redistribution profits expressed as:

$$\Pi_g = \frac{c}{1+c} (NOPLAT_r^* - NOPLAT_b^*)$$

And tender's re-distribution profits as below :

$$\Pi_b = EVA_r^* - EVA_b^* - \Pi_g. \text{ The}$$

(C) PPP-Not Bid strategy portfolio:

When the firm assesses that the royalties raised by the government are higher than the reasonable profit for the distribution of the profitability and the excess profits estimated by the tender; or the redistribution of the government is higher than the profitability, And according to the tender's estimated excess profit margin of the distribution of reasonable profits, not participate,

game off. Government and tender remuneration are zero.

According to the two models of "fixed model" and "changed mode", this paper discusses the equilibrium conditions of the portfolio equilibrium strategy combination.

(A) Fixed mode

According to the classification of this section, set the type of land power PPP to determine the proportion of the land value of the reserve price, the type of PPP can refer to set the type of land type PPP, or government and tenders to invest in the proportion of capital allocation rate, The excess profit determines the reserve price of the premium. And according to one of the above provisions of the right to set the reserve price, must be less than or equal to the basis of both profitability and the actual estimate of excess profits calculated by the tender's reasonable distribution of profits. Therefore, the allocation of excess profits in the fixed allocation of PPP with the incentive conditions of investment incentives, according to the right to set the price of the different ways, you can the following two types of which said:

$$\sum_i R_d + \sum_i R_m \leq \frac{a}{1+a} EVA_r^* \quad (3-2)$$

$$\frac{c}{1+c} EVA_p^* \leq \frac{a}{1+a} EVA_r^* \quad (3-3)$$

Which $\sum_i R_d$ is the present value of the development of the right, $\sum_i R_m$ the present value of

the operating premium, where "a" is set for the profitability of government, "c" tenders than for the government to provide land value and estimate the amount of investment ratio. (3-2) type for the establishment of the right type of land by the value of land according to the value of the right to reserve the price of the conditions of investment incentives. In the government plan, the premium floor price is usually expressed as development rights and operating premiums. (3-3) is the type of reference PPP by the land-using value and the estimated amount of investment in the amount of investment decisions, and then refer to the pre-planned assessment of the excess profits to reserve the reserve price of the conditions of investment incentives. "b" is the actual excess profit ratio between the tender and the government ($b = \frac{EVA_r^*}{EVA_p^*}$),

then (3-3) the equilibrium condition of the investment incentive is as follows formula:

$$b \geq \frac{c(1+a)}{a(1+c)} \quad (3-4)$$

(B) Changed mode

The "changed mode" is a model of the "Standard Practice Procedures for the Planning and Promotion of

Civil Participation in Public Works (BOT) by the Taipei Municipal Government (Taipei Municipal Government, 2015). The operating procedure defines the excess profit as the difference between the actual amount of the firm and the estimated operating profit, which can be redistributed according to the government land value and the private investment. According to the provisions of the Taipei Municipal Government, the distribution of profits in the distribution of the allocation of PPP with the incentive conditions of investment incentives for the ratio of investment capital than the redistribution of the difference between the operating profit value must be less than or equal to the profitability ratio of redistribution excess profits, (3-5) :

$$\frac{c}{1+c} \left(NOPLAT_r^* - NOPLAT_b^* \right) \leq \frac{a}{1+a} \left(EVA_r^* - EVA_b^* \right) \quad (3-5)$$

Tender participation in PPP The main input capital comes from the construction cost, the evaluation of construction costs are usually calculated according to the tender conditions, volume restrictions and market conditions. Under the premise of detailed assessment, the estimated and actual construction costs can be regarded as the same; and the cost of capital from the after-tax debt costs and the combination of shareholder costs (Dutch level, 2013).

According to the above two points can more simplify, that is, assuming that the tenders of PPP estimates and the actual financial analysis, the investment capital and capital costs are close to the calculation. So the further derivation of investment capital than with the incentive conditions of investment:

$$c \leq a \quad (3-6)$$

In order to assist the government and the tenders in the investment before the assessment of the law, the early plan book, the value of land and the capital invested by the company to develop the right of the reserve price of capital incentives. When the fixed allocation model is used for analysis, the variables that affect the incentive of investment include four restrictions: legal restriction, profitability ratio, excess profit ratio and investment capital ratio. When the changed allocation mode is used, the influencing factors of investment incentive include only the profitability ratio and the investment capital ratio. When the land value is higher than the investment capital of the tenders, the change allocation model for the PPP, even if the tenders estimate profits higher than the government estimates of profits, it is difficult to attract investment incentives.

3.3 Summary

In the case of the analysis of the allocation pattern, the variables that affect the incentive of investment include four restrictions on the law, the profitability

ratio, the excess profit ratio and the invested capital ratio. In the analysis of the change distribution mode, Variables only include profitability ratio and investment capital ratio. When the land value is higher than the estimated investment of the capital, the change allocation model for the PPP, even if the tenders estimate excess profits higher than the government estimates of excess profits, it is difficult to attract investment incentives.

4 Tender inducement game model and case analysis

Now, we will introduce the simulated PPP of two investment inducement games. By the previous chapter, set up the reasonable hypothesis simulation parameters to the equilibrium condition, establish the analysis step of the investment incentive course and discuss the simulation results to verify the study value.

The following two simulation cases are divided according to the government and the tenders to invest in the capital ratio of the distribution rate, and then refer to the advance planning book estimates of excess profits to reserve the present value, and according to the land value of the present price reserve two types, Each type will explain the different result of fixed allocation mode and variable distribution model.

4.1 Fixed mode

4.1.1 Simulation case I

Assuming that the government has completed a pre-assessment of the 50-year BOT project, it is about to carry out investment. The total value of over-profit is estimated to be NTD 5 billion and the market value of the government is NTD 6 billion. The estimated investment is NTD 5 billion. The government assesses its own Profitability is about 0.65 to 0.80 times between the tender, try to study with the conditions of investment incentives by the two types of the fixed distribution model and the changing distribution model in the PPP case.

This case is based on the government and the tenders to invest in the ratio of capital to determine the distribution rate, and then refer to the advance plan of the excess profits estimated by the reserve price of the reserve price, so (3-4) as a balanced condition:

$$b \geq \frac{c(1+a)}{a(1+c)} \quad (3-4)$$

“a” is the government and tenders profitability $a=0.65\sim 0.80$, than c for the government and tenders to invest in capital ratio, $c=60/50=1.2$, b for tenders and the government to estimate excess profits

ratio.

Take “a” into (3-4), respectively, the average estimated excess profit ratio \bar{b} and the standard deviation σ , and then by (\bar{b}, σ) to explain its equilibrium conditions:

$$\bar{b} \geq 1.305, \sigma = 0.075 \quad (4-1)$$

And then \bar{b} will be multiplied by NTD 50 billion, respectively, to find the average tender’s estimating actual excess profits \overline{EVA}_r^* and standard deviation, and then the equilibrium conditions:

$$\overline{EVA}_r^* \geq 65.25, \sigma = 3.75 \quad (4-2)$$

In the case, when the actual excess profit is estimated to be NTD 6.525 billion or above, the PPP-Bid strategy combination is a contingent portfolio, that is, the investment incentive, and then the average value plus or minus standard deviation the effective range of excess profits represents NTD 6.15 billion to NTD 6.9 billion.

4.1.2 Simulation case II

Assuming that the government has completed a pre-assessment of BOT project for the land using right of a period of 50 years concession by setting up a preliminary assessment of the land using right project. The total present value of excess profits is estimated to be NTD 5 billion and the market value of the provision of land is NTD 6 billion. The government stipulates that the market value of 40% Reserve price. Try to fixed mode and changed mode respectively to explore the PPP case with the conditions of investment incentives.

In this case, the reserve price of the premium is set according to the public property management. Therefore, the equilibrium condition is as follows:

$$\sum_i R_d + \sum_i R_m \leq \frac{a}{1+a} EVA_r^* \quad (3-2)$$

$$\text{And } \sum_i R_d + \sum_i R_m = 60 \times 40\% = 24 \text{ billion}$$

So the fixed mode with investment incentives to allow the conditions of tolerance:

$$24 \leq \frac{a}{1+a} EVA_r^* \quad (4-3)$$

combination of Table 3.1 (PPP operating type range) to distinguish between different profitability ratio and type of operation with the incentive conditions of investment incentives, the equilibrium conditions can be the average tenders to estimate the actual excess Profit and standard deviation $(\overline{EVA}_r^*, \sigma)$. When EVA_r^* higher than the PPP type of operation corresponding to the average tenders to estimate the

actual excess profits, that is, on behalf of the type of operation of the PPP investment incentives.

Table 4.1 Simulation case 2

$a = \frac{E_g}{E_h}$	PPP operating type	$(\overline{EVA}_r^*, \sigma)$ (billion)
0.50~0.65	with high efficiency or creativity operational requirements type	(6.646, 5.54)
0.65~0.85	comprehensive type	(5.658, 4.34)
0.85~1.00	more commercial rental or ground right to sell the facility type	(5.012, 2.12)

According to the case, the government estimates that the excess value of the excess profits is NTD 5 billion although it is lower than the average excess profit of the manufacturer with more commercial rental or land sales facilities but which is still within the effective range. Assuming that the case of the government pre-planned excess assessment profits are enough to represent the excess profits expected then PPP with more commercial rental or land on the right to sell the type of facilities, PPP-Bid strategy portfolio for the balanced combination of For investment incentives, if PPP belongs to the other two types of business do not have the incentive to attract investment.

In the fixed mode, the incentive for PPP is limited by the restriction of the law, the ratio of the government and the firm to profitability, the capital ratio between the government and the tender, and the excess profit ratio between the government and the tenders. The capital reserve price set by the government according to the investment capital ratio or the restriction of the law must be less than or equal to the reasonable profit of the profitability ratio and the reasonable profit of the excess profit distribution.

4.2 Changed mode

When the government take the changed mode for PPP, the law restricts the rights of the reserve price or government and tenders estimate excess profits than the impact of investment incentives have not affected. Simulated cases I and II have the conditions of investment incentives are satisfied (3-6):

$$c \leq a \quad (3-6)$$

The two cases of the government and the tenders into the capital ratio $c = \frac{60}{50} = 1.2$, greater than the upper limit of 1, PPP-Not Bid strategy combination for the contingent portfolio, it does not have the incentive to attract investment.

4.3 Simulation results

To change the distribution model for PPP investment incentives, only by the two factors which are the profitability and invest capital of the ratio. As the government's profitability is usually less than the

profitability of the tenders, when the government to provide land value is higher than the tenders to invest in capital, regardless of whether the excess profit forecast is higher than the government estimation, are difficult to have investment incentives.

5 Conclusion

The purpose of the study is to assist the government and the tenders in judging whether the different types of PPP royalty reserve price has the incentive for investment.

Government contractors often have two kinds of negative mentality when dealing with PPP, one is worried that questioned by lower income royalties, the review of the audit department, and even the judicial prosecution, so prefer to have the right to reserve the provisions of the law, and give up more flexible to promote the PPP; The other one is to complete the investment policy objectives by using of flexible law to deliberately underestimated the government should receive royalties. Two cases may hinder the investment incentives and reasonable profit distribution for the negative development of the PPP. Take the experience of Taipei City government rights rules established by the changed allocation mode, because the government land value is higher than the tenders to invest in capital, resulting in difficult to attract investment incentives. In fact, the government PPP to provide public land prices higher than the amount of investment in the city of Taipei or New North City and other urban development areas generally, so the Taipei City Government 104 years established BOT premium rules based on maintenance Government interests, but the investment incentives have been adversely affected.

In this study, the investment incentive is divided into fixed mode and changed mode. The fixed mode for PPP investment incentives, by the laws and regulations, the government and tenders profitability ratio, investment capital ratio and the estimated excess profit ratio and other factors. It is difficult for the government to provide the land value higher than the investment capital of the firm, and the changed mode is difficult to attract the investment incentive, because the government and the tender's profitability ratio and the investment capital are more influential than the two factors. The investment incentive is based on the profitability allocation of excess profit as the conditions of the competition balance. We will use the model to explore whether the capital reserve price has the incentive for investment. The study establish the game model by simulating case to verify and providing a proper way to check the royalties reasonable of the government for positive promoting policy.

For the current situation of civil participation in

public construction, this study through the game theory, PPP rights and EVA theory, and then sets up the strategy of the tournament to provides a good method for the government to set up a scheme of investment incentives and ensure that the government has a reasonable amount of money before the bidding of the PPP project so that the PPP project can be effectively promoted.

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