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The influence of contractual and relational governance on the sustainable performance of public-private partnership projects: Findings from PLS-SEM

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Abstract. As a widely adopted model of infrastructure and public service provision, the goal of PPP projects is gradually shifting from traditional economic orientation to sustainable development orientation. During this process, contractual governance and relational governance are regarded as effective ways to improve the sustainable performance of PPP projects. This paper extends contractual governance (control, coordination, adaptation) and relational governance (trust, communication, reciprocity, and industry practices) to second-order constructs. On this basis, partial least squares structural equation model (PLS-SEM) is adopted to analyze the questionnaire data of 114 PPP project practitioners, aiming to study the influence of contractual and relational governance on the sustainable performance of PPP projects. The results of PLS-SEM verify the support effect of contractual and relational governance on sustainable performance, and the effect of relational governance is more significant. This paper enriches the governance mechanism of PPP projects from the perspective of sustainable development. At the same time, the research results can also help PPP project managers rationally use the governance mechanism of both contract and relationship to promote the project to achieve its sustainable performance.

Keywords: Contractual governance, relational governance, PPP projects, sustainable performance.

1. Introduction

Over the past 70 years, the proportion of urban population in China has increased by 50.63%. In the process of rapid urbanization, large numbers of people have poured into the cities people poured into cities, and the demand for infrastructure and services has continued to grow. However, large quantities of infrastructures need to be constructed and operated, but it is quite challenging for the government alone to meet the financial, technical and managerial requirements [1]. Therefore, Public-Private Partnership (PPP) has been introduced into China for providing public goods and service , and gradually become a widely adopted financing tool after more than 40 years of development [2]. The continuous trend of urbanization also provides a wide market for the future development of PPP projects.

Various types of infrastructure have been developed through PPP in China, including transportation facilities such as bridges and roads, civil buildings such as schools and hospitals, and living security facilities such as power stations and waste treatment stations. These infrastructure projects differ from general construction projects, as they place more emphasis on social and long-term benefits, which coincides the connotation of sustainable development. This requires projects to improve their performance in the economic, environmental, and social aspects, which is more in line with the nature and original intention of infrastructure. Apparently, sustainable performance is better suited to the ultimate goal than economic performance for infrastructure PPP projects [3,4]. But in the practice of PPP, the public sector pursues the maximization of social and public interests while the private sector pursues the maximization of their own interests[5]. This kind of natural opposition of project goals inevitably leads to opportunistic behavior in cooperation

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between partners. Consequently, the sustainability of PPP projects involving economic, social and environmental objectives has become a challenge.

Since governance theory was introduced into project management from corporate governance in 2002, it has been widely used to solve the arrangement of rights, responsibilities, interests and the allocation of resources among organizations[6]. Project governance plays a significant role in improving project management performance. In recent years, contractual and relational governance have been widely recognized as two basic mechanisms of project governance[7]. The former addresses the importance of formal contracts in safeguarding against opportunism[8]. The latter, as a self-enforcing and informal mechanism, relies on social relations and shared norms to mitigate exchange hazards[9]. In PPP projects, partners require to make detailed provisions on each other's responsibilities and rights in advance by signing contracts, thus forming a temporary contract organization. This project governance mechanism based on formal institutional framework and strictly performance contracts is named contractual governance. Many stakeholders closely linked through the contracts form the attributes of social network organization for the PPP projects. The project governance mechanism originates in trust, and a cooperation model between partners in the social network through relationship norms, which is relational governance. Based on the understanding of the dual attributes of PPP projects, a complete governance model must be included in the corresponding contractual and relational governance, thus forming a dual governance framework of PPP projects. Therefore, contractual and relational governance are currently significant issues to improve the sustainable performance of PPP projects.

Based on the review of relevant literature, two research gaps are found in this paper. Firstly, researches on relational and contractual governance are mainly aimed at achieving the economic performance [10,11]. But for infrastructure PPP projects, more emphasis should be put on long-term sustainable performance, not the inadequate economic performance. So far, scholars have demonstrated that relational governance [12] and contractual governance[13] are positively correlated with the sustainability of PPP infrastructure projects separately, while collaborative governance mechanisms under this goal has received limited attention. Secondly, the mutual influence of contractual and relational governance is complementary or substitutive, which has always been controversial. On the study of this topic, contractual and relational governance are investigated as single-dimensional indicators respectively. However, the multi-dimensional nature is ignored and the in-depth expansion is lacking.

To fill these research gaps, this study explores the impact of the dual governance composed of contractual and relational governance on the sustainable performance of PPP projects. The two aims of this study are:

(1) To explore the relationship between contractual governance, relational governance and sustainable performance in infrastructure PPP projects;

(2) To discuss the mutual influence between contractual and relational governance when they work together.

2. Literature Review and Hypothesis Development

2.1 Contractual Governance and Sustainable Performance of PPP Projects

Contractual governance declares the use of formal, legally binding written agreements to provide a legal institutional framework for the rights, obligations, and responsibilities of the partners in future actions[14] and to define the transactional relationships between the organizations[15]. Specifically, in infrastructure PPP projects, contractual governance mainly relies on the form of project contracts to specifies the commitment or obligation of each partner to perform a specific action in the future. Williamson[16] interpreted it as a mechanism for reducing transaction costs through institutional arrangements.

PPP project is characterized by large scale, long cycle, numerous participants and asymmetric information[17]. So, the shortcomings of single-dimensional research of contract governance are

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obvious. Recently, a new sight proposed by[18] is being widely used, where contract terms have multiple functions, that is control, coordination and adaptation. Combining the different contract functions helps mitigate the adverse effects of a single contract function and provides to a better understanding of how contractual governance contribute to the achievement of goals[19]. This view has been widely used in the field of corporate governance and project management, including studies on the impact of contract function on performance[20] and opportunism[21]. Therefore, the multifunction views were adopted in this study to measure the contractual governance status of infrastructure PPP projects and the three functions (contractual control, coordination and adaptation) are discussed in detail below.

Firstly, the function of contractual control is primarily to protect investments from the opportunism of partners. In PPP projects, the conditions for opportunistic behavior are easily formed due to the high degree of information asymmetry and separation of ownership and management rights[17]. The more perfect the terms, the stronger the binding effect[9], and this function can be reflected in setting incentive and punishment mechanisms[22].Secondly, due to the complexity and interconnectedness of PPP projects, the goals may be difficult to achieve, which needs coordination functions. The coordination terms in the contract include a clear description of the task[23], communication procedures[24], and more specific provisions. These rules can effectively reduce the ambiguity of tasks, solve the problem of individual cognitive limitations[25], and help partners reach a consensus on the understanding of tasks[26]. Finally, contractual adaptation mainly prevents environmental changes and various conflicts causing by emergency procedures[14]. In the actual project, due to various reasons such as limited rationality of people and frequent accidents of projects, the contracts of PPP projects are inevitably incomplete[25], which may aggravate the risks faced by the partners. Faced with the high degree of uncertainty, Beuve and Saussier [27] believed that contracts can only realize value in transactions if they are fully adapted to changing circumstances.

Therefore, these three functions can contribute to achieving the balance of goals between public and private sector and improving economic, social and environmental performance. Based on the above analysis, this study proposes the following hypotheses:

H1: In PPP projects, contractual governance can effectively improve the sustainable performance.

2.2 Relational Governance and Sustainable Performance of PPP Projects

Relational governance emphasizes social interaction and joint efforts to develop and sustain long-term relationships. The key points of this relationship are mutual trust and commitment developed through social interaction[28]. Relational governance involves not only the economic category, but also the sociological category. All participants in the PPP project tend to establish long-term stable partnerships to reduce the cost of consultations and negotiations[29]. In a society that pays attention to interpersonal relationships like China, the relationship between stakeholders in the project has also become a top priority in project governance.

In recent years, researches based on economic and social perspectives is gradually integrating, with trust as the core element and reciprocity, communication and other relationship norms expanded. At the same time, the element such as industry practices[30] is derived after the combination of industry and cultural background in relational governance. The PPP project is a social network organization, so the relational governance between organizations is widely recognized as a vital mechanism to improve the sustainability of the project[31]. Considering the high uncertainty and risk of PPP projects, a lasting and stable cooperative relationship must be formed between partners through full communication and win-win cooperation attitude. Therefore, this paper adopted four elements of trust, communication, reciprocity and industry practice to measure the relational governance of PPP projects.

Firstly, trust is the core element of relational governance. Deep trust in each other can offer a favorable atmosphere for the relationship, which is the basis for long-term cooperation success[22].

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Project organizations can make full use of trust-based relations to better promote cooperation and stable relations to achieve the project objectives[32]. Secondly, communication refers to partners exchanging effective and timely information in an open and honest manner[33]. Through communication, more comprehensive messages can be delivered, and information asymmetry between partners can be reduced, thus reducing transaction costs and coordination costs[3]. Studies have also shown that communication and trust have a mutually reinforcing effect and can effectively alleviate opportunism[12]. Thirdly, reciprocity is a code of ethics [34]. As a key feature of long-term transactions, reciprocal behavior can bring roughly equal benefits or feedback to both partners. Participants expect immediate or future benefits from helping other partners [35]. Reciprocity is not a weak constraint. If the partner violates the principle of reciprocity, the reputation will be damaged and cooperative willingness will also be weakened[36]. Finally, industry practice is all the rules and predictable trading behavior of the industry. Practices are not formal institutions, but they are mandatory, normative and self-enforcing. In other words, industry practices are tacit behaviors and norms that are implemented and followed by industry practitioners as opposed to written rules. In this study, industry practices mainly emphasize the nature of informal institutions compatible with formal institutions [30].

Therefore, the four elements of trust, communication, reciprocity and industry practice potentially support sustainable performance of PPP projects. Based on the above analysis, this study proposes the following hypotheses:

H2: In PPP projects, relational governance can effectively improve the sustainable performance.

2.3 The Interaction Between Contractual Governance and Relational Governance

The study of contractual governance mainly focuses on formal contract. Existing studies have shown that clear terms in contracts not only can help increase trust, but also stimulate participation of all partners, thus laying a foundation for maintaining stable relationship in the future[37]. The function of contractual coordination can promote frequent and positive communication between partners, which has a positive impact on avoiding disputes and improving trust [38]. Equal partnership based on contractual provisions helps to restrain opportunistic behavior, reduce conflicts and disputes between partners, so as to improve the quality of partnership[17]. Similarly, if there is sufficient trust and support in the process of cooperation, the partners can feel fully respected and fair[39], which can also improve the execution efficiency of the contract. Studies have shown that repeated communication and negotiation can perfect project contracts [40]. Implicit constraints based on reciprocity and industry practices will also make partners more expect long-term and stable returns[41] and hold a cautious attitude towards risk breaches, thus improving the reliability of contract performance.

In a word, contractual governance ensures the realization of relational governance through. Relational governance also promotes the continuous improvement of contract and improves performance of contract enforcement in different situations. Based on the above analysis, this study proposes the following hypotheses:

H3: In PPP projects, contractual governance positively affects relational governance.

H4: In PPP projects, relational governance positively affects contractual governance.

2.4 The Complementary Role of Contractual and Relational Governance

The relationship between contractual and relational governance is a hot topic in the field of project governance. The first is the complementary relationship. Poppo and Zenger[9] first verified that the integration of the two governance mechanisms can improve project performance. Many subsequent scholars also drew similar conclusions [42,43]. The second is the substitutive relationship. In this view, it is believed strict terms may reduce trust among partners[44]. The third is the coexistence of complementarity and substitution. This view holds that complementarity and substitution are not contradictory because informal and formal control mechanisms can be complementary and substitutive at the same time[45]. Yan and Zhang[46] concluded that contract

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completeness and ex post trust complement each other, but the contract enforcement is substituted for ex post trust.

Contractual and relational governance have limitations when used separately. For example, contracts can never specify all contingencies, resulting in opportunism and disagreement. Overly detailed contractual terms also lack adjusting room, leading to inefficiencies[8,47]. This shows that transactions relying only on contract mechanism will result in speculative behavior or rigid terms, which are not conducive to the balanced sustainable goal of the project. Conversely, excessive reliance on relational governance can lead to blind trust, which leads to partners not strictly enforcing contracts. These are behaviors that harm the sustainable performance of the project, and therefore such trust will not survive in the competitive environment[48]. Therefore, the extreme use of any governance mechanism is not conducive to the project, thus affecting the sustainable performance of the project. Performance is improved only when contractual and relational governance complement each other and maintain a balance. Based on the analysis, this study proposes the following hypotheses:

H5: In PPP projects, the combined use of contractual governance and relational governance can improve the sustainable performance of the project.

H6: In PPP projects, there is a complementary relationship between contractual governance and relational governance.

According to the proposed research hypothesis, Figure 1 shows the conceptual model of this study.

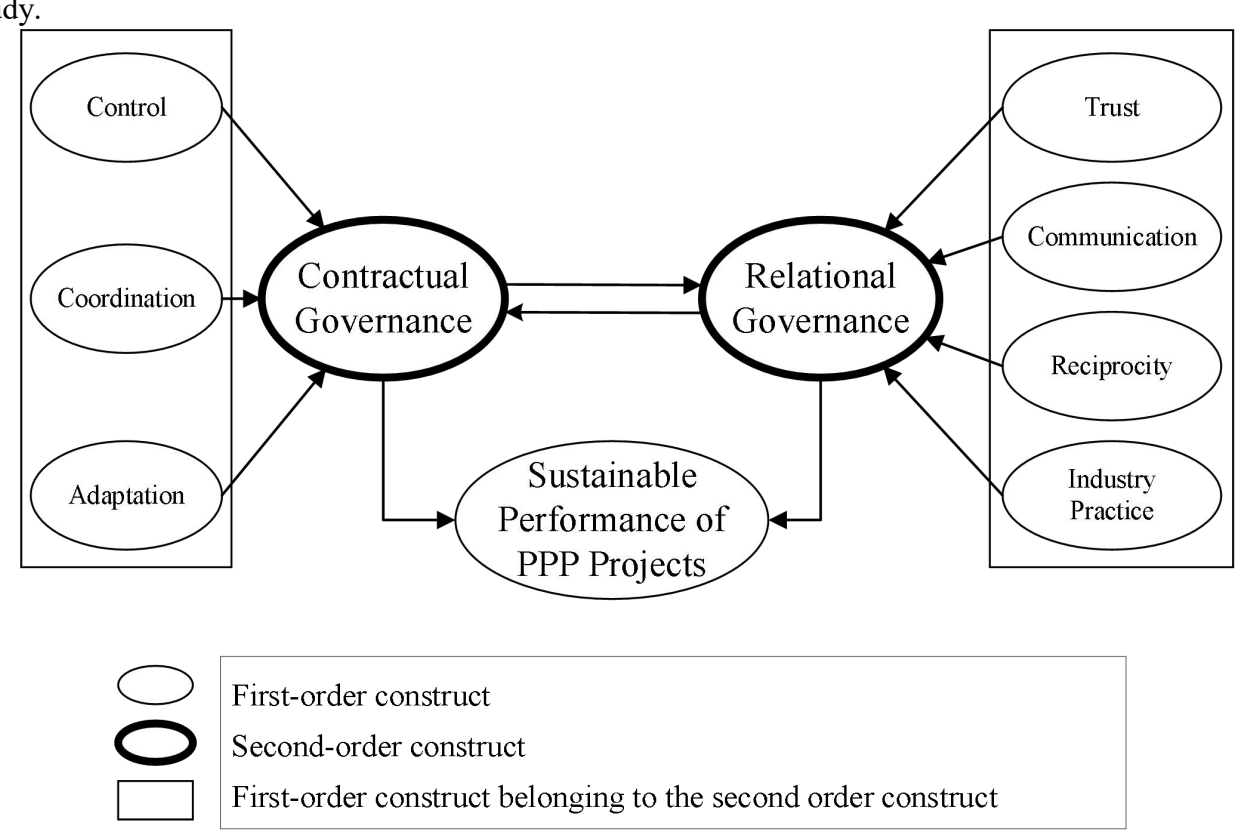

Fig.1 Conceptual model

3. Methodology

3.1 Instrument Development

A questionnaire survey is conducted to collect sample data. The measurement items of the variables are determined by the following three steps. Firstly, the measurement items are originally written in English based on extensive review of the literature, and translated into Chinese by a scholar with overseas study experience and engaged in PPP research, and then translated back to

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English by other translators for conducting a dual check for accuracy. Secondly, to verify the measurement items and match the context of Chinese PPP projects, an expert with more than 15 years of academic and practical experience in PPP is invited for an interview. Finally, a pre-testing is conducted. The questionnaire is distributed to 25 respondents with more than 10 years of experience in PPP projects and modified according to their feedback. The retained items are used for large-scale sampling (see Table 1).

Table 1. Constructs and items

Constructs	Measurement items	Sources
Sustainable performance of PPP projects (SP1-SP8)	The reduction of ecological impact is fully considered in the project.	Chan and Chan[49], Babatunde et al. [4], Meng et al. [50], Hueskes et al. [51]
	Energy and resource consumption is well controlled in the project.	
	The waste from the project is well managed in the project.	
	Air pollutants have been well controlled in the project.	
	The local culture is well protected and respected in the project.	
	The project is supported and accepted by the public.	
	The economic benefits of the project are up to standard in the project.	
	The project has a positive impact on the local economy.	
Trust (TR1-TR3)	Our partners are trustworthy.	Pinto et al. [52], Chow et al. [53], Zaheer et al. [54]
	Partners will take our interests into account while making decisions.	
	The partner's behavior is in line with our expectations.	
Communication (CO1-CO3)	Communication between project partners is adequate and timely.	Bstieler and Hemmert [55], Wong and Cheung [56]
	Communication between project partners is complete and accurate.	
	Various communication methods are adopted by project partners.	
Reciprocity (RE1-RE3)	The partners of the project are willing to do me a favor if I did one for them before.	Xue et al. [57]
	I'm willing to do our partners a favor if they did one for me before.	
	We treat our partners with a win-win attitude.	
Industry practice (IP1-IP3)	During the implementation of the project, activities such as investigation and study are often organized between all partners.	Deng et al. [30]
	During the implementation of the project, there are often leaders to inspect.	
	During the implementation of the project, there is the influence of leadership preference.	
Control (CT1-CT4)	The contract defines the rights and obligations of both parties specifically.	Schepker et al. [18]
	The contract specifically stipulates the rights entitled to one party when the other one breaches the contract.	
	The contract specifically stipulates items on early termination of the contract after breaching the contract.	
	The contract specifically stipulates how the party awarding the contract monitors the contractor.	
Coordination (CR1-CR4)	The contract provides detailed technical specifications and drawings.	
	The contract specifically stipulates the quality acceptance procedures.	
	The contract specifically stipulates the personnel qualification or	

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	dispatching scheme.	
	The contract defines the division of labors of both parties specifically.	
Adaptation (AD1-AD3)	The contract explicitly defines what will happen in the case of unplanned events occurring.	
	The contract explicitly defines how disagreements will be resolved.	
	The contract explicitly defines the changes and adjustment clauses.	

Relational governance (RG) is conceptualized as a second-order construct formative formed by four first-order constructs–trust (TR1-TR3), communication (CO1- CO3), reciprocity (RE1- RE3) and industry practice (IP1- IP3). Contractual governance (CG) is also conceptualized as a second-order construct formative formed by three first-order constructs–control (CT1- CT4), coordination (CR1- CR4) and adaptation (AD1- AD3). Sustainable performance of PPP projects measurement items (SP1 - SP8) covers three aspects: economic, social and environmental. The questionnaires are in the form of a five-point Likert-type scale (1= strongly disagree; 5= strongly agree).

3.2 Sampling and Data Collection

Due to the low response rate of random sampling, this study adopts a non-probabilistic convenience sampling method widely used in construction projects [58]. In this study, paper questionnaires are distributed to participants of construction conferences, and it is confirmed in advance that they have participated in PPP projects. Moreover, electronic questionnaires are sent to PPP experts from the China Public Partnerships Center and potential respondents, who must have participated in one or more PPP infrastructure projects in China. The survey spans across four months, from September 2021 to December 2021. A total of 132 questionnaires are collected, of which 114 are deemed valid with the valid response rate being 86.4%. Among them, 25 valid paper questionnaires are collected using the former approach above, and 89 valid online questionnaires are collected from the latter approach above. Before carrying out statistic studies, researchers should ensure that the sample size is large enough so that the results are robust and have adequate statistical power. Following the rule of thumb suggested by Hair et al. [59], power analysis is conducted by using G*Power to calculate the minimum sample size, which equals 109 (statistical power=0.80; effect size index=0.15; highest number of predictors=8; and significance level=0.05). It is smaller than the number of valid questionnaires (N=114) in this study.

The results of the questionnaire show that 114 respondents all have a bachelor's degree or above，and more than 71% of respondents have been working on PPP projects for over 10 years. In general, the sample has high diversity and representativeness, which meets the requirements of basic characteristics of statistical sample data. The descriptive statistical analysis is shown in Table 2.

Table 2. Descriptive analysis results

Characteristic	Category	Frequency	Percentage (%)
Work experience	1-3	9	7.89%
(years)	3-5	8	7.02%
	6-10	16	14.04%
	>10	81	71.05%
Education background	PhD	16	14.04%
	Master	52	45.61%
	Bachelor	46	40.35%
	College or below	0	0.00%
Disciplinary role	Government party	22	19.30%
	Partnership party	42	36.84%
	Contractor	27	23.68%

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	Consultant	45	39.47%
	Supplier	8	7.02%
	Operator	13	11.40%
	Other	17	14.91%
Job title	Unit leader	13	11.40%
	Department manager	27	23.68%
	Project manager	17	14.91%
	General management/technical staff	25	21.93%
	Project consultant	17	14.91%
	Other	15	13.16%
Project information	Transportation project	73	64.04%
	Water supply and drainage system	27	23.68%
	Post and telecommunications projects	8	7.02%
	Environmental protection project	26	22.81%
	Energy supply project	12	10.53%
	Civil construction project	40	35.09%
	Other	16	14.04%

3.3 Data Analysis Procedures

In this study, the software smartPLS of PLS-SEM is used to analyze the collected data. There are three reasons for choosing PLS-SEM instead of covariance-based SEM (CB-SEM). Firstly, PLS-SEM calculates weightings of indicators and can furnish more information about their importance, while CB-SEM cannot[59]. Secondly, CB-SEM requires normal distribution of data, otherwise the results will be inaccurate. In contrast, PLS-SEM does not have this limitation[59]. Thirdly, PLS-SEM exhibits a higher level of statistical power than CB-SEM when the sample size is relatively small[59].

4. Data Analysis and Hypotheses Testing

4.1 Measurement Model

Smart PLS 3.0 software is used to assess the measurement model for reliability and validity. According to Hair et al. [59], the reliability is evaluated first using composite reliability (CR) and Cronbach's α. The CR values need to be greater than 0.7. Cronbach's α values between 0.60 and 0.70 were considered acceptable in exploratory studies, while values between 0.70 and 0.95 were considered satisfactory. As shown in Table 3, except for the industry practice of Cronbach's α of 0.632, the Cronbach's α values of the remaining constructs are greater than 0.7, and the CR values are also greater than 0.7, indicating acceptable internal consistency reliability.

Table 3. Item loadings, measurement reliability and convergent validity assessment

Construct	Item	Item loading	Composite reliability	Average variance extracted	Cronbach's α
Trust	TR1	0.887	0.906	0.763	0.845
	TR2	0.867			
	TR3	0.868			
Communication	CO1	0.920	0.908	0.767	0.847
	CO2	0.837			
	CO3	0.868			
Reciprocity	RE1	0.869	0.907	0.765	0.847
	RE2	0.882			
	RE3	0.873			
Industry practice	IP1	0.824	0.795	0.568	0.632
	IP2	0.817			

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	IP3	0.599			
Control	CT1	0.922	0.940	0.796	0.914
	CT2	0.891			
	CT3	0.905			
	CT4	0.850			
Coordination	CR1	0.921	0. 927	0. 810	0.884
	CR2	0.918			
	CR3	0.860			
Adaptation	AD1	0.922	0.946	0.854	0.914
	AD2	0.928			
	AD3	0.922			
Sustainable performance	SP1	0.766	0.932	0.634	0.917
	SP2	0.859			
	SP3	0.796			
	SP4	0.854			
	SP5	0.834			
	SP6	0.772			
	SP7	0.711			
	SP8	0.766			

As for convergent validity, two different ways are followed for the reflective and formative constructs. For the reflective constructs, this study assesses convergent validity using two criteria: average variance extracted (AVE) and factor loadings[59,60]. As shown in Table 3, the factor loads are greater than the recommended value of 0.5, and the AVE values are more than 0.5, suggesting that the convergent validity is acceptable. For the formative constructs, the convergent validity is assessed by outer weights that represent their relative contributions to second-order constructs. Then the second-order formative models are developed using the repeated indicators approach in PLS following the suggestion of Wang and Haggerty [61].The results show that the weights are significant for all first-order constructs, which support the second-order construct of contractual and relational governance(see Table 4). In summary, these results show that the reflective and formative constructs satisfied the required convergent validity.

Table 4. Index weights of second-order constructs

Higher-order constructs	Formative indicators	Outer weights	t-values
Contractual governance (CG)	Control	0.425***	26.351
	Coordination	0.319***	20.467
	Adaptation	0.868***	21.100
Relational governance (RG)	Trust	0.920***	17.001
	Communication	0.837***	21.988
	Reciprocity	0.868***	21.678
	Industry practice	0.869***	8.804

Note: *p<0.05, **p<0.01, ***p<0.001

As for discriminant validity, Fornell-Laker[62] criterion is adopted. The square root of each construct's AVE value exceeds its largest correlation coefficient with other constructs (see Table 5), meeting the Fornell-Larcker criterion. The variance inflation factors (VIF) obtained by employing the PLS algorithm are used to assess multicollinearity. For each first-order variable and second-order variable meets requirements for VIF values below 5[63]. Therefore, there is no significant multicollinearity problem.

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Table 5. Construct correlations

	TR	CO	RE	IP	CT	CR	AD
TR	0.874						
CO	0.712	0.876					
RE	0.743	0.765	0.875				
IP	0.584	0.657	0.651	0.753			
CT	0.51	0.684	0.599	0.599	0.892		
CR	0.662	0.722	0.694	0.616	0.682	0.9	
AD	0.606	0.65	0.628	0.609	0.757	0.816	0.924

Note: Bold values on the diagonal represent the square root of AVE.

4.2 Hypotheses Testing

4.2.1 Structural equation model results

First, after the construct reliability and validity are confirmed, the structural model's predictive accuracy is assessed using the determination coefficient R2. According to Hair et al. [64], R2 values of 0.75, 0.50, and 0.25 can be considered significant, moderate, and weak predictive accuracy, respectively. By running the PLS algorithm for 300 iterations, R2 value for PPP project sustainable performance is 0.510 which shows the structural model's predictive accuracy can be considered moderate. Next, the predictive relevance of a structural model is evaluated using the cross-validated redundancy index Q2. The value of Q2 must be greater than 0 to be considered to have predictive relevance, values below 0 indicate a lack of predictive relevance[65]. The results show that the Q2 value of endogenous structures is greater than 0, which ensures the predictive relevance of the model. Overall, these results suggest that the structural model achieves satisfactory quality.

To test the significance of the path coefficients, bootstrapping is employed with 5,000 subsamples. here are significant positive relationships between contractual governance and sustainable performance (β=0.260, t=2.089*), and between relational governance and sustainable performancb (β= 0.492, t= 4.554***). These findings support the H1, H2. The contractual governance is positively associated with relational governance (β= 0.795，t=16.700***). Similarly, relational governance is also positively correlated with contractual governance (β=0.795 ，t=16.773***). These findings support the H3, H4. At the same time, this paper proved that the combination of contractual and relational governance can significantly improve the sustainable performance of PPP projects, which supports H5. If contractual governance and relational governance have a positive impact on the sustainable performance of the project and themselves have a positive impact on each other, they have a complementary impact on the sustainable performance[9]. Thus, it can be concluded that relational governance and contractual governance are complementary, rather than substitutional. H6 is thus supported.

5. Discussion

This paper examined the role of contractual and relational governance in the sustainable performance of PPP projects. The results of the structural equation model show that both contractual and relational governance significantly improve the sustainable performance of PPP projects when the two governance mechanisms work together. This finding supports the views of Cheng et al.[13] and Tian[12] respectively.

One prominent discussion exploring the influence of governance mechanisms on performance is whether contractual governance and relational governance work as complements or substitutes. This study is in agreement with the conclusion that contractual and relational governance is complementary, which supports the views of Goo et al. [42] and Poppo and Zenger[9]. Surprisingly, the results show that the relational governance has a stronger impact on sustainable performance of PPP projects than the contractual governance, which is contrary to the findings of Lu et al.[66].

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There could be two reasons. First, the empirical setting of this study is in China, where the PPP industry has not yet developed to a mature stage. PPP application in present-day China is still focused on solving financing issues and improving management efficiency, and the idea of sustainable development has not been consciously embedded in PPP projects. At present, there is no compulsive requirement for the partners of PPP projects to practice sustainable development. Therefore, the requirement of sustainable development does not fall within the scope of contractual provisions. Gradually, with the increasing attention to social responsibility, enterprises will proactively strive to gain a better internal and external reputation and maintain long-term cooperative relations with partners. Second, relationship is an important part of Chinese culture and life, and has been deeply rooted in Chinese thoughts and behaviors. This special relationship culture originates from the philosophy of Chinese Confucian culture, and is characterized by mutual benefit and obligation. Under this background, the implementation of relational governance in PPP projects is more necessary and effective. Relational governance can gradually transform personal relationships into connections between organizations, thus subtly promoting the establishment of common goals and norms between partners. With the implicit constraints and incentives of relational governance, project participants will be more willing to make efforts in sustainable development. Therefore, relational governance plays a noticeable role in the scope not specified in the contract.

6. Conclusion

This paper examined how contractual governance and relational governance affect the sustainable performance of PPP projects by adopting PLS-SEM. Contractual and relational governance have proven to be effective ways to improve sustainable performance. The relationship of contractual and relational governance turns out to be complementary, and the effect of relational governance is more significant. The results provide reference for the government to promote PPP projects and even urban sustainable development. The government should fully clarify the goal of sustainable development of PPP projects, and balance the three elements of environment, society and economy. As for project managers, due to the consideration of Chinese cultural and industry background, they should not only adopt tough measures (contractual governance), but also attach more importance to soft measures (relational governance).

Notwithstanding the theoretical and practical contributions, this study has some limitations that draw forth potential research opportunities. Firstly, the research background and data source of this paper are China. Differences in cultural characteristics and economic systems may lead to different results. Secondly, the statistical data of this study are static cross-sectional data. However, the relationships between partners evolve with the project progress, and the dynamics between contractual and relational governance during the project's life cycle should be considered in future research.

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