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THE INCENTIVE EFFECTS OF PROJECT GOVERNANCE ELEMENTS ON AGENTS IN AGENT-LED CONSTRUCTION OF SOCIAL SECURITY HOUSING PROJECTS

Zhiqi CHEN[1], Liming YAO[2], Minghui ZHENG[1], Ling ZHANG[1*]

[1] *College of Civil Engineering and Architecture, Center for Balance Architecture, Zhejiang University, Hangzhou, China*
[2] *The Architecture Design & Research Institute of Zhejiang University, Zhejiang University, Hangzhou, China*

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Abstract. The agent-led construction system is a construction mode that emphasizes the introduction of professional management teams instead of government departments to develop public projects in China, including social security housing. In reality, the problem in practice is that the government owners' management system of the agent market is not sound enough, and it cannot effectively motivate the agents. Existing research has not paid enough attention to this agent construction market. To reveal the effective incentives of agent developers, using the stimulus–organism–response theory, this study constructed a structural equation model and proposed a research hypothesis about the effect of project governance elements on project performance. The study found that governance elements including internal contractual governance, external contractual governance, and relational governance, had a positive incentivizing effect on the project performance. The psychology and behavior of the construction agent played a partial mediating role. The results provide a policy implication for city government to improve the incentive system for agent construction of security housing projects.

Keywords: agent psychology, behavioral incentive, construction agent, project governance elements, security housing.

* Corresponding author. E-mail: *zlcivil@163.com*

1. Introduction

Like many countries worldwide, China has a housing security system. There has been continuous progress in the construction of social security housing (SSH) since 2000. In China, SSH is government-built housing that is rented or sold to low- and middle-income families and new college graduates with short-term housing affordability difficulties. The resettlement housing allocated to families whose houses have been demolished because of urban construction is also included in this category. Although the distribution form of SSH in China has changed with the policy changes in different stages, the construction of SSH is expected to remain a key focus of the national government during the "14th Five-Year Plan" period (2021–2025).

In the early days, the construction mode associated with SSH was dominated by government departments and their professionals, while project management experience was insufficient. In the past decade, the PPP and EPC models have been tried in SSH projects, but none could effectively ease the management of government owners. However, the agent construction model has made outstanding achievements in many public projects. Agent-led construction refers to the practice whereby a commissioning party, such as the government, selects professional developers through public bidding or direct commissioning and tasks them to perform construction management duties according to the contract (Cao et al., 2014). Although both government-led and commercial projects can adopt this construction mode, it is of particular importance in government-led public projects. With the growing demand for these services, research has been increasing on the mechanisms used to optimize the mode of SSH projects (Lin, 2019). The agent-led construction system has experienced comprehensive development due to its practical approach. This approach emerged from the Decision on the Reform of the Investment System in 2004, and has been in a maturing phase for more than ten years. For example, in 2018, two SSH projects built through the agent construction mode in Zhejiang Province won the Gold Award of Zhan Tianyou Award for Excellent Residential Community[1].

Since 2017, some new laws and regulations have been issued in advanced provinces across the country, with

[1] https://www.sohu.com/a/272680019_100070983

innovative approaches that have enabled agents with professional qualifications to undertake surveys, designs, and other business activities alongside project management. This is referred to as the "construction agency +" model (Qian et al., 2021), which means project management plus some other consulting service. In some areas, the combination model of agent construction and EPC is also being piloted. Although some demonstration projects have been successful, these innovative methods have not been widely promoted and have not been written into formal regulations in most cities. Moreover, the agent-led construction system has also exposed many problems. There are various risks from construction to completion, such as opportunistic behavior (Wang & Zhang, 2019) and rent-seeking behavior (Choi & Storr, 2019). Many studies have found that affordable housing projects often have defects and do not meet people's expectations (Olanrewaju et al., 2022). A major reason is that the agency construction market does not reflect high quality and prices, leading to the phenomenon of bad money driving out good money. Effective incentives for the construction agency are the key link to realizing the advantages of the construction agency model (Yan & Zhang, 2020). However, the existing literature has not investigated which of the project governance elements play an incentive role for an agent and how these factors incentivize an agent in the SSH agent-led construction market.

This study has the following research objectives. First, the study discussed the incentive factors and their meanings in the governance structure of SSH agent construction projects based on the current situation of China's housing construction market. Second, the study explored the influences of project governance factors on the project performance of agent-led construction, including the intermediate effect through the psychological and behavioral mechanisms of agents. The main motivation for this study is to determine ways to better encourage excellent developers to participate in the agency construction of affordable housing projects. This should foster a healthy competitive environment and a virtuous cycle in the agency construction market, to improve the performance of affordable housing projects and housing quality.

Based on a literature review, this study constructed a structural equation model describing the relationship between incentive factors in project governance, including contractual and relational governance; the psychology and behavior of a construction agent; and project performance. Contractual governance was further divided into internal and external contractual governance. Then, a corresponding research hypothesis was proposed, and a questionnaire survey was developed and deployed. Combined with the confirmatory factor analysis method, the scientific nature and authenticity of the research hypothesis and the influence of governance factors were tested, leading to a complete incentive system model with accompanying research conclusions.

2. Literature review

Theoretical basis

This paper draws on three theories: incentive theory, principal-agent theory, and project governance theory. Incentive theory has developed over the years and now provides a strong scientific decision-making basis for management. In 1963, Arrow formally introduced the moral hazard problem, which occurs when an agent does not invest the effort needed to achieve the principal's best interests. Wilson (1967) expanded on Arrow's foundation and proposed the agency problem, thus giving rise to research on the "incentive problem". Principal–agent theory has developed rapidly in the past few decades and has become an important achievement in contract theory. Jensen and Meckling (1976) defined the agency relationship as one where one or more people entrust others to serve them. This includes entrusting some decision-making rights to the agent, and paying the agent according to the level of services provided. The theory of project governance is widely recognized as a key factor for successful project delivery and realization of benefits (ul Musawir et al., 2020). Müller et al. (2016) articulated that project governance encompasses the dynamics among project participants, emphasizing that the adopted mechanisms significantly shape stakeholder engagement and trust in a project. Governance guides participants and coordinates conflicts over the life cycle of projects, leading participants to take joint actions. It is a governance framework that includes multiple factors, including formal and informal governance elements also known as contractual and relational governance (Liao et al., 2021).

Contractual and relational governance of construction projects

Contractual governance can effectively reduce risks (Parella, 2022), reduce uncertainty (Prakash et al., 2022), avoid opportunistic behaviors (Wang et al., 2019), and improve project performance (Shamim et al., 2020). Based on the available scope of resources, contractual governance is divided into internal and external contractual governance.

There are two main forms of internal contractual governance: rewards and risk sharing. Economic incentives are the most direct and effective way to motivate construction agents. Adding incentive clauses into contracts has been widely used in engineering construction, and has been found to encourage more innovative solutions (Lam et al., 2010), effectively distribute risks, and improve communication between contract parties. These activities are important for improving the development of the agent-led construction system (Garg & Misra, 2023). From a project governance perspective, risk sharing is an important way to motivate agents. Reasonable risk sharing can avoid some loss and mobilize the enthusiasm of construction agents. Yin and Li (2019) proposed a comprehensive subsidy model based on the PFI model (private active

financing), enabling agents to obtain returns that match risks and achieve a risk-return balance.

External contractual governance mainly relies on external market competition, oversight, and management to monitor and motivate agents, including agent selection, namely proxy competition, regulatory accountability, and reputation. Zhao (2018) studied 322 enterprises and found that market competition can encourage enterprises to improve performance. Özcan and Elçi (2020) posited that an organization endowed with a robustly positive reputation, coupled with a workforce with elevated performance levels, is likely to secure enduring competitive advantages. With respect to regulatory accountability, government oversight plays an integral role in the existing building governance system (Lu et al., 2021). In addition, Cao and Wu (2021) analyzed a tripartite evolutionary game and concluded that when the public is highly involved in regulation, agents tend to work hard, even if the government relaxes regulation.

Relational governance is a form of flexible informal governance corresponding to rigid formal contractual governance. It mainly acts through the formation of norms such as unity, leading to the joint management of transaction risks with contractual governance. There are three common governance elements: flexibility, information exchange, and solidarity. Zheng et al. (2019) proposed that trust and the role of the government are more important than contracts in large-scale projects, especially in a country with rich relationships such as China. This view has been acknowledged by many scholars. Conflicts are a natural part of agent-led construction projects, and trust has a positive impact on conflict resolution (Li et al., 2021). This helps form a good social relationship between agents and owners.

Research gap

Scholars have adopted different indicators to measure project performance, including "hard" and "soft" standards. The "hard" criteria are usually objective and measurable, such as the common "iron triangle" of quality, cost, and duration. The "soft" criteria are usually subjective, such as customer satisfaction (Leon et al., 2018) and project participant satisfaction. Wang (2019) also noted that decision-making impacts project performance. Existing studies have paid little attention to project performance with subjective satisfaction in the agent construction model.

There has been significant study on ways to motivate agents, but there remain gaps. There is a need for additional in-depth analyses of the elements of contractual governance under different construction management models, especially the elements of internal and external contractual governance, and their characteristics under the agent-led construction model. This includes providing more focus on the meaning and implications of relational governance and its importance in the agent-led construction model.

The increased implementation of the agent-led construction system has led to an increase in related research. However, few studies have examined construction agent incentives in the context of SSH projects. In China's current practice, excellent agent developers have developed high-quality housing projects, and many have high-quality levels than those achieved in SSH projects managed by the government. However, attracting excellent developers to join the agent-led construction market is difficult in an under- regulated market. As SSH projects continuously improve, methods for implementing agent-led construction projects need stronger theoretical support. With the emergence of the "Agent Construction +" model, the content of the agent-led construction contract has played an increasingly prominent role. However, previous studies have not fully considered this key governance element. Moreover, studies have generally focused on the agent's project management activities and have not fully reviewed the agent's psychology and behavior, and its role in the transmission of project performance. Therefore, based on the above analysis, this paper further clarified the influencing paths and effects of governance factors on the psychology, behavior, and project performance of agent-led construction. It provides an empirical basis for establishing an effective incentive mechanism for agent construction.

3. Theoretical model and research hypotheses

This study involved constructing a theoretical model of excitation based on the stimulus-organism-response (S-O-R) paradigm. This paradigm reflects a general pattern of human behavior (Kamboj et al., 2018) and can be applied to the research field of construction project management (Li et al., 2022).

Governance elements are considered to be stimulus variables (S), based on the governance theory of public projects, and combined with the characteristics inherent in the agent-led construction of SSH projects and the agent's subjective needs. As such, this study established a multidimensional governance framework that covers contractual and relational governance. Contractual governance is designed to solve the agent problem and restrain opportunistic behavior, while relational governance encourages enhancements in cooperative relations and conflict resolution. The psychology of the agents is the perceptual or emotional response variable (O). Psychological variables are perceived variables generated by a series of incentives. Through mutual respect and shared goals, parties form a harmonious and close working relationship and a good working atmosphere. This generates a positive working attitude and the expectation of long-term cooperation between partners (Luthans et al., 2006; Basinska & Rozkwitalska, 2022). The behavioral variable (R) refers to the behavior generated under the stimulation of incentives, with the support of the perception variable. In the agent construction industry, this is mainly reflected in joint action, suppression of opportunistic behavior, and support from senior leaders.

The project performance of agent construction was set as the final response variable, with cost, duration, and quality established as the basic measurement criteria. In addition, establishing good partnerships with different partners is important in project processes. Finally, most resettlement housing projects need to consider social effects, so public satisfaction also needs to be considered. This S-O-R theory can be verified using structural equation models (Kamboj et al., 2018). The research hypotheses to be tested are as follows.

3.1. The incentive effect of internal contractual governance

Internal contractual governance includes three dimensions: reward, risk sharing, and contract content.

Agents need remuneration to participate in the agent-led construction projects. There are two components of the use of remuneration to address incentives. First, the government needs to set the collection standard for the agent management fee in a reasonable and scientific way. Second, after meeting target requirements, such as cost, schedule and quality, the agent needs to be rewarded for its efforts in project implementation. Financial incentives can directly enhance performance (Abdalla et al., 2023) and improve project participant motivation and behaviors, supporting the achievement of performance objectives (Rose & Manley, 2011).

Risk sharing is a way to encourage the construction agent. An unreasonable transfer of risk can generate high risk costs, reduce project benefits, and lead to project failure (Zhang & Li, 2019). The benefit of risk sharing is twofold. There is organic unity in "responsibility, rights, and benefits", based on the principal-agent relationship; this enable the re-sharing of risk when an incomplete contract is encountered during project implementation. In the interview for this study, it is found that in China's current public housing agency construction market, the rights and responsibilities of the agent do not match, and the government usually transfers excessive risks to the agent. As "agent construction +" and other innovative models have emerged, the contract content associated with affordable housing projects also changes. When undertaking more tasks, the construction agency receives more remuneration; it also becomes more convenient for the agent to manage as a substitute for the government, reducing the coordination between different participants, and effectively reducing communication friction. Taking on some other profitable consulting business to make up for the shortage of agency construction management fees has a positive incentive effect on the psychology and behavior of an agent.

Based on the above analysis, the following hypotheses are proposed:

H1: Increased internal contractual governance has a positive impact on the performance of agent construction projects.

H1a: Increased internal contractual governance has a direct positive impact on the performance of agent construction projects.

H1b: Increased internal contractual governance elements have a positive incentive effect on the psychology of agent managers.

H1c: Increased internal contractual governance elements have a positive incentive effect on the behavior of agent construction units.

3.2. The incentive effect of external contractual governance

External contractual governance mainly includes agent selection and reputation, and the oversight and accountability of government departments.

The scientific and reasonable selection of agents can restrain opportunistic behavior and reduce the difficulty of identifying and judging the comprehensive quality of those agents. Meanwhile, proper competition plays a role in improving the economic and social sustainability of the construction industry (Ye et al., 2015). More importantly, a reasonable selection mechanism can give candidates a sense of fairness and respect and create positive incentives for their behavior. Reputation is an important mechanism for maintaining the smooth operation of agent-led SSH projects. There are three main functions associated with reputation. The first is the information function of reputation, as the exchange and circulation of reputation information among stakeholders reduces information asymmetry. The second is the capital effect of reputation, as reputation can reduce the cost of information screening. The third is the halo effect of reputation. That is, contractors who have performed well in the past may cover up shortcomings, such as a lack of experience (Biong, 2013). Uncertainty is hidden behind industry environment and organizational behavior, and formal supervision measures can reduce the uncertainty of large-scale projects (Wang et al., 2020).

The current SSH agent construction market still lacks an effective selection mechanism, and the bid evaluation method can not reflect the high quality and price. In the investigation of some cities, it is found that enterprises with a good reputation do not have advantages in the bid evaluation process. Further, the lack of supervision in the process of project implementation leads to low-price winning enterprises to muddle through, resulting in poor project results but difficult to hold accountable. Therefore, for good agent developers, strict supervision is welcome and is even an incentive for them. It is particularly important for good agents to gain a sense of fairness and maintain their high standards of conduct. Unqualified agents should be removed from the market and omitted from future bidding for agent construction projects. This analysis leads to the following hypotheses:

H2: More external contractual governance has a positive impact on the performance of agent-led construction projects.

H2a: More external contractual governance has a direct positive impact on the performance of agent-led construction projects.

H2b: More external contractual governance elements have a positive incentive effect on the psychology of agent managers.

H2c: More external contractual governance elements have a positive incentive effect on the behavior of agent-led construction units.

3.3. The incentive effect of relational governance

Through flexible management, relational governance can create a fair and just working atmosphere, satisfy the agent's internal needs, and encourage the agent to work hard, improving project performance.

First, by strengthening communication among all parties and creating a good communication atmosphere among all project participants, relational governance can generate more information, improve the cognitive functioning of all parties, and encourage smooth project implementation (Johari & Jha, 2021). Second, a trusting relationship can reduce transaction costs. Trust is advantageous as it allows the trustor to conserve resources by (a) entrusting a third party with the execution of a task and (b) diminishing the extent of direct engagement required to guarantee a task's appropriate completion (De Filippi et al., 2020). Third, relational governance also proposes increased flexibility in the handling of events and enhances the sense of an agent's identity. This flexibility allows the agent to negotiate with all parties within a set range to jointly solve unforeseen risks (Swanson & Sakhrani, 2020). This yields the following hypotheses:

H3: Improved relational governance has a positive impact on the performance of agent-led construction projects.

H3a: Improved relational governance has a direct positive impact on the performance of agent-led construction projects.

H3b: Improved relational governance elements have a positive incentive effect on the agent psychology.

H3c: Improved relational governance elements have a positive incentive effect on the agent behavior.

3.4. The relationship between the agent's psychology, behavior, and project performance

During project implementation, there are some dominant emotions felt by agents under different incentives, which largely dominate their behaviors and further affect the performance of agent-led construction projects (Zhang et al., 2020). A smaller psychological distance between the agent and the owner leads to a reduction in disputes, encouraging project completion (Lin & Cheung, 2022). This can also promote a good relationship between the agent-led construction unit and other partners. This forms a highly cohesive team and improves the degree to which the agent-led construction unit is perceived as fair; this helps the team actively address project events, and improves the project management level. This supports continuous efforts to complete the project and improve project performance (Feng et al., 2020).

The analysis above leads to the following hypotheses:

H4: Positive psychology among agents (positive management intention) promotes positive agent behavior.

H5: Positive psychology among agents (positive management intention) affects the positive performance of agent-led construction projects.

H6: Positive agent behavior has a positive impact on the performance of agent-led construction projects.

In summary, Figure 1 shows the theoretical model and research hypothesis.

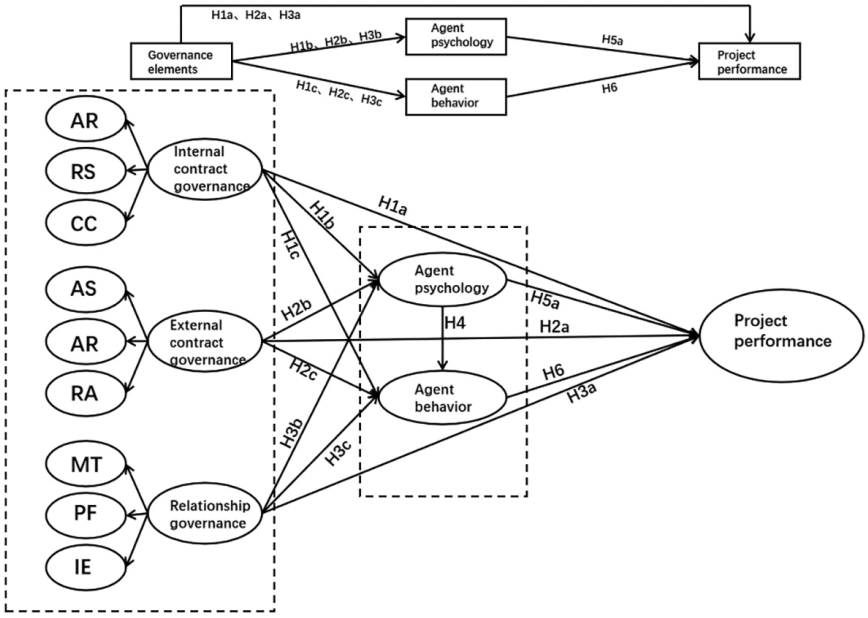


Figure 1. The relationship between the hypotheses addressing governance elements and project performance

4. Empirical study

4.1. Questionnaire design

Designing the scientific questionnaire used in this study began with a systematic analysis of relevant theories and empirical studies. A seven-point Likert scale was adopted to provide a greater level of differentiation within each scale.

The questionnaire includes three parts: questionnaire description, background questions, and measurement questions. The measurement questions make up the main part of the questionnaire and include: (1) a measurement scale assessing governance elements; (2) a psychological measurement scale assessing the agent; (3) a behavior measurement scale assessing the agent; and (4) a performance measurement scale assessing agent construction projects (see Table 1 for details). According to Hou et al. (2004), 3–5 questions are required for each factor to be measured, and the number of questionnaires issued should be at least 100 and preferably 200.

Table 1. Key governance factors and measurement items related to the project agent

Governance elements	Governance factors	Measurement items
Internal contract governance (IG)	Agent reward	AR1: The agent does not object to the composition and payment method of the agent construction management fee; AR2: The agent does not object to the collection standard of the agent construction fee; AR3: The government adjusts and pays the contract price for changes caused by unpredictable factors; AR4: There are corresponding penalty clauses in the contract for failing to effectively perform the contract; AR5: There are corresponding reward clauses in the contract for good contract performance.
	Contract content	CC1: As the contract content increases, the agent's income also increases; CC2: The willingness of the agent to participate in the project increases when the "agent construction+" model is used; CC3: An increase in contract content improves communication between different units; CC4: An increase in contract content decreases disputes between different units; CC5: The application of "agent construction +" mode reduces the complexity of project management for the construction agent.
	Risk sharing	RS1: The agent clearly knows the risks it needs to manage; RS2: Risk sharing at each stage of the project is complete and reasonable, including the risks associated with design change and preliminary preparatory work; RS3: The contract is clear with respect to the obligations and rights of the parties and the project objectives; RS4: All parties involved have a good risk attitude; RS5: Reasonable claims of all parties are fully considered when addressing matters not previously agreed upon.
External contract governance (EG)	Agent selection	AS1: The project bidding process is fair and just; AS2: The selection method and indicators given to agents are reasonable and comprehensive; AS3: The agent selection procedure is appropriate for different construction modes; AS4: The Government effectively oversees the tendering process.
	Agent reputation	AR1: Historical performance information of agents can be publicly queried; AR2: The government collects reputation information using different channels when selecting agents to lead construction units; AR3: Project performance evaluations are publicly released within the industry or in the media.
	Regulatory accountability	RA1: The regulatory body overseeing agents is clear during project implementation; RA2: The government's oversight of agents is very effective; RA3: Agent oversight and evaluation help increase their work enthusiasm; RA4: The accountability mechanism is effective during project implementation.
Relationship governance (RG)	Mutual trust	MT1: The project stakeholders believe that the agents can efficiently complete their tasks; MT2: The parties believe in the technical strength of agent's staff; MT3: The parties believe the agent will abide by the contract; MT4: The parties believe the agent will honor its commitment throughout the project; MT5: The parties believe that the agent will consider the interests of all parties.
	Project flexibility	PF1: During the implementation of the agent-led construction project, in case of conflict, the parties to the conflict can flexibly address it; PF2: The contract contains alternative plans to address contingencies; PF3: All parties are willing to adapt existing relationships to respond to changing circumstances.
	Information exchange	IE1: Honest communication occurs between all parties; IE2: Information sharing between parties is timely and abundant; IE3: The communication between the parties is frequent and effective; IE4: There is an efficient information sharing platform between all parties.

End of Table 1

Governance elements	Governance factors	Measurement items
Agent psychology (AP)		AP1: The return obtained by the agent is fair compared with the effort and capital invested; AP2: The agent-led construction units are respected, the government departments are honest, polite, and the relationship between the two sides is equal; AP3: The procedures of government departments for contract management and oversight of agent construction projects are fair and just; AP4: In the project, the agent's team of the construction unit has high enthusiasm for the project and is willing to take the initiative to complete the project; AP5: During project implementation, the members of the agent-led construction project feel a responsibility to maintain team relationships and maintain a high degree of cohesion to smoothly conduct the project; AP6: The agent construction company is willing to undertake an agent-led construction project again in the future and cooperate with the government again.
Agent behavior (AB)		AB1: The agent tries to avoid opportunistic behavior and not seek benefits by using information unknown to other parties; AB2: During project implementation, the senior management of the agent-led construction unit is supportive of the project; AB3: During project implementation, the leadership of the agent-led construction unit provides good resource allocations, including the allocation of high-quality teams, and actively provides resources; AB4: The construction agent promotes joint planning among other parties and timely reports on production plans and progress.
Project performance (PP)		PP1: The degree of satisfaction that the competent government authorities have with the project deliverables after the project is completed; PP2: After project completion, the degree of satisfaction that the government department has with the project delivery results; PP3: Public satisfaction with project delivery after completion.

4.2. Questionnaire collection and sample description

This study focused on the agent-led construction of SSH projects. As such, the study participants included people who participate in SSH project construction. During field visits to more than a dozen agent-led SSH projects under construction in Hangzhou, China, questionnaires were issued to principals, agent developers, and design, construction, supervising, and consulting enterprises during face-to-face meetings. Based on the analysis of the pre-survey, this study deleted the first item CC1 in the "contract content" and the fifth item MT5 in "mutual trust". The validity of the remaining measurement items performed well. Exploratory factor analysis indicates that factors can explain governance elements well. The survey subjects were units participating in the construction of affordable housing projects across China, mainly in Hangzhou, Ningbo, Jinhua, Shenzhen, Suzhou, Xiamen, and other cities. The questionnaire was filled out by the manager of the relevant parties involved in the project, mainly the construction agent, as well as the owner's representative and the person in charge of the design and supervision companies. The questionnaire was in an electronic form, which was distributed through a link and QR code accessing the questionnaire. It was also distributed through the medium of WeChat and e-mail to contact the target subjects. Eventually, 283 questionnaires were collected, among which 252 response were valid, for a recovery rate of 89.0%. Subject descriptions included the respondent's occupation, educational status, number of social security housing projects, affiliations, number of working years, and other indicators.

4.3. Result analysis

First, Cronbach's alpha coefficient was used to test the internal consistency of the scale of variables. The values of all factors exceeded 0.7 (see in Appendix Table A1), indicating good internal consistency.

Before the confirmatory factor analysis, model fit analysis was conducted to test the overall model fit for each governance element (Jackson, 2009). The results indicated that the overall fit of all governance elements and psychological and behavioral factors of the agent construction unit was good. As an example, the convergence validity of internal contractual governance elements is presented in Appendix Table A2. The validity test results of other governance elements are omitted and can be provided upon request.

Therefore, the study deemed that project governance can be measured using the governance mechanisms of internal contractual governance, external contractual governance, and relational governance. The incentive effect of the agent can be measured in three dimensions: the agent's psychology, the agent's behavior, and project performance.

Based on the confirmatory factor analysis, the whole model was fitted. Next, AMOS software was used to analyze the present research hypothesis and explore the

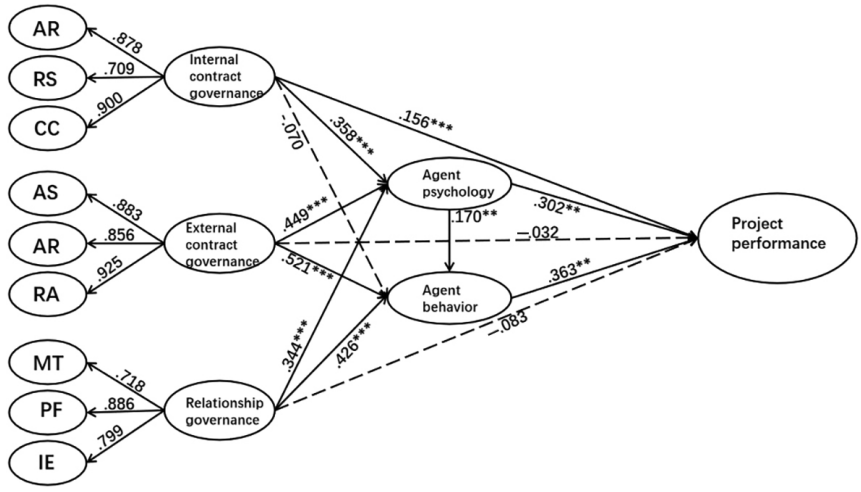
path of the structural equation. Table 2 indicates that the standardized path coefficient of internal contractual governance on the performance of agent-led construction projects was 0.156, at the 1% significance level. Internal contractual governance has a direct positive effect on the performance of agent construction projects, which supports H1a. External contractual governance and relational governance have no direct positive effect on project performance, indicating that the results do not support Hypothesis H2a and H3a. Similarly, several other hypotheses were tested.

Figure 2 shows the path relationships and sizes of the influence among variables. All path coefficients are standardized values. A solid line indicates a path with a significant relationship; a dashed line indicates the path has no statistically significant relationship.

This study constructed a model illustrating the mediating effect of governance factors on the performance of agent-led construction projects. The bootstrap method (Wen & Ye, 2014) was used to test the mediating effect; sampling was repeated 5000 times to test the research hypothesis. Table 3 presents the results of the mediation effect test and the path coefficient.

The total effect includes the direct and indirect effect. For the project performance of agent-led construction (PP), relational governance, internal contractual governance, and external contractual governance had total impact values of 0.280, 0.286, and 0.350, respectively (see Table 4).

Among the internal contractual governance elements, contract content played a key role in internal contractual governance, followed by remuneration and risk sharing. In general, internal contractual governance directly affected the performance of agent-led construction projects, with a path coefficient of 0.156. Moreover, project performance was indirectly affected through the psychology and behavior of the agent-led construction unit, with an indirect effect of 0.130. In the indirect path, the largest standardized path coefficient was IG→AP→PP; this relationship also had the smallest associated p-value. This indicates that the internal contractual governance delivered a greater indirect influence through the agent's psychology.



Note: "***", "**" and "*" in the upper right corner of the coefficient represent significance levels of 0.01, 0.05, and 0.1, respectively.

Figure 2. Path coefficient showing the interaction between structural equation model variables and its significance test

Table 2. SEM causal path coefficient and hypothesis verification

Hypothesis	Causal path	Standardized coefficient	T	P	Results
H1a	Internal contract governance → agent project performance	0.156	2.174	0.030	Supported
H2a	External contract governance → agent project performance	–0.032	0.034	0.973	Not supported
H3a	Relationship governance → agent project performance	–0.083	–0.881	0.379	Not supported
H1b	Internal contract governance → agent psychology	0.358	5.220	***	Supported
H2b	External contract governance → agent psychology	0.449	5.907	***	Supported
H3b	Relationship governance → agent psychology	0.344	4.735	***	Supported
H1c	Internal contract governance → agent behavior	–0.070	–1.050	0.294	Not supported
H2c	External contract governance → agent behavior	0.521	5.506	***	Supported
H3c	Relationship governance → agent behavior	0.358	4.987	***	Supported
H4	Psychology of agent → behavior of agent	0.170	1.880	0.060	Supported
H5	Psychology of agent → performance of agent project	0.302	3.119	0.002	Supported
H6	Behavior of agent → performance of agent project	0.363	2.837	0.005	Supported

Table 3. Indirect influence results of SEM variables

Causal path	Point estimation	Bootstrap				
		SE	Z	Lower	Upper	P
Internal contract governance → Project performance of agent construction (indirect effect)						
IG→AP→PP	0.108	0.068	1.44	0.015	0.254	0.049
IG→AB→PP	–0.025	0.052	–0.43	–0.137	0.039	0.453
IG→AP→AB→PP	0.022	0.022	0.91	0.002	0.088	0.057
External contract governance → Project performance of agent construction (indirect effect)						
EG→AP→PP	0.136	0.090	1.46	0.010	0.316	0.066
EG→AB→PP	0.189	0.125	1.46	0.038	0.421	0.026
EG→AP→AB→PP	0.025	0.027	1.00	0.004	0.108	0.053
Relationship governance → Project performance of agent construction (indirect effect)						
RG→AP→PP	0.104	0.115	1.10	0.006	0.381	0.074
RG→AB→PP	0.155	0.122	1.54	0.052	0.465	0.016
RG→AP→AB→PP	0.021	0.030	0.87	0.002	0.127	0.061

Table 4. Statistical results of the total influence among variables in SEM

Variable	Effect	RG	IG	EG
PP	Direct effect	–	0.156	–
	Indirect effect	0.280	0.130	0.350
	Total impact	0.280	0.286	0.350

There were three aspects of external contractual governance: agent selection, reputation, and regulatory accountability. Of these, regulatory accountability played a significant role in external contractual governance. Agent selection had a weak relationship with project performance, and reputation had the second strongest/weakest relationship with performance. In general, external contractual governance did not significantly directly impact the project performance of agent-led construction, but indirectly affected project performance through the psychology and behavior of agent-led construction units, with an indirect impact effect of 0.350.

As for relational governance, flexibility played a major role in it, followed by information exchange and trust. Relational governance only indirectly affected project performance through the psychology and behavior of agent-led construction units. The indirect effect was 0.280. Relational governance delivered a greater indirect influence through agent behavior.

5. Discussion and implication

This study attempts to investigate the elements of project governance that can motivate agents to be more willing to participate in such projects and complete the projects better. Based on previous studies, this paper proposed theories related to the relationship between different governance elements, and the psychology, behavior, and project performance of construction agents. The main findings are as follows.

First, in the agent-led construction of SSH projects, external contractual governance, including reputation, agent selection, and regulatory accountability, has a significant impact on project performance. The total influence coefficient of external contract governance is 0.35. The impact of regulatory accountability is the most prominent, with its standardized loading factor (0.925) being the highest among the three elements included in external governance. This result reflects the current contradictions in the market for the construction of affordable housing. In the absence of effective supervision and constraints, the moral hazard behavior of agents is likely to occur. This can result in a mixed market, where it is difficult to embody the value of excellent construction agents, and where it is impossible to generate reasonable project profits. The positive impact of external contractual governance on the positive work of the agency is a well-established law of social development. A case study of public works projects in Massachusetts by Kassel (2008) demonstrated that compliance with procurement and contracting rules helps ensure project success. Yan (2016) also confirmed that the accountability mechanism is one of the important ways to motivate agents. Strong and effective supervision and accountability policies can somewhat restrain the agency, promote work quality, and establish the agency's brand and reputation. With the advent of the Internet and credit era, the involvement of third party supervision is expected to deepen, and the important role of external contractual governance is likely to become increasingly clear. This finding is similar to Xiang's et al. (2017) study on the regulatory performance of PPP projects.

Second, it is also important to engage in effective internal contractual governance with core project stakeholders, and make corresponding institutional arrangements.

As the standard load factor of agent reward and contract content is relatively high, at 0.878 and 0.900, respectively, it is important to formulate reasonable agent construction fees according to actual operations and policies, and select the appropriate agent-led construction mode and work content according to project characteristics and the comprehensive strength of agents. In addition, the indirect effect coefficient of relationship governance is as high as 0.28. The flexible role of relational governance should also be engaged to better promote the role of governance elements. This point has received less attention in previous studies. However, for the affordable housing agent construction project, giving more flexibility to an agent can enrich the characteristics of the product, and the developer can make more satisfactory products based on his understanding of users' needs. This flexibility is the advantage of the agent construction model for affordable housing projects. Zheng et al. (2019) also confirmed that the adaptability of contract contingencies has a positive impact on project performance when project uncertainty is high. Trust, information exchange, and other relationships should be used throughout the process of agent construction projects. As relevant studies (Wang et al., 2020; Benítez-Ávila et al., 2018; Lu et al., 2015) have revealed, trust has a positive effect on the relationship between project participants. It is needed to create an atmosphere of harmonious cooperation, improve the active willingness of construction agents, and provide supportive relationships for the sustainable and healthy development of social security housing agent projects.

Third, the psychology and behavior of the agent play a partial mediating role. Both external contractual and relational governance influence project performance through the mediating effect of the agent's psychology and behavior. Even internal contractual elements produce project effects, partly through the indirect effect of psychological influence. This analysis is consistent with the conclusions of previous studies (Zheng et al., 2019). A fair market environment and a flexible trusting relationship may enhance a positive psychological frame and enthusiasm for participation by agent builders. This may improve their behavior and lead them to work harder to achieve better project performance.

The findings have implications for government owners to improve the project governance structure, establish a better incentive mechanism, attract excellent developers to participate and actively strive for better project performance. As found in the above model results, external contract governance does not directly affect project performance but indirectly through psychology and behavior. The government should cultivate the agent-led construction market to promote the sound and healthy development of the agent-led construction system and build a unified credit platform based on the Internet. Regulatory channels and diverse methods of participation should be maximized to encourage the advantages of third-party oversight, enhance the transparency of market transactions, and strengthen the regulatory accountability and constraints of agents. It is also important to improve the scientific approaches for selecting agents for construction units, emphasizing that the market is a leading force in promoting the quality of agents for long-term development. In practice, if a developer actively participates in the bidding of the affordable housing project and takes the initiative in the construction management after winning the bid, it indicates that the incentive policy has a positive effect. As the internal contract governance is the only factor that has been proven to directly affect project performance, it is necessary to pay attention to it, especially the agent reward and contract content. Given the background of a relatively low agent management fee at the current national policy level, giving more types of work to the agent in the contract along with project management, such as design or consulting work, may help the agent effectively integrate the implementation and management of different project stages and improve the effectiveness of project management. This result has not been found in previous studies. This study enriches the elements of internal contractual governance and reveals the effective incentive factors for developers in the current affordable housing agency construction market. Some projects in Hangzhou have attempted this approach, with good project performance. The empirical results of this paper theoretically confirm the validity of this approach, and the practice could be expanded across the country.

6. Conclusions

Understanding the mechanism of psychological motivation and behavioral effects may effectively motivate agents to perform better in agent construction projects. This study provides guidelines for the construction and management of SSH projects. Government departments should actively create a fair and transparent market environment and a scientific and objective mechanism to select construction agents. This way, the best agents can win through their technical and management skills. Giving project agents a clearer legal status, rather than being informal representatives for government affairs, may facilitate the coordination of the agent's work with all relevant departments during the pre-project phase and as the project progresses. This allows the agent to increase its sense of self-respect and better complete the project. Gaining market reputation is the main motivator for developers to participate in security housing construction at this stage, even more so than earning agency fees. Establishing a reasonable reward and penalty mechanism can support the regulation of the agency construction market and may eliminate unqualified enterprises. When the contract is expanded beyond the construction management of the project to include corresponding design and consulting services, the developer can better utilize its project coordination capabilities, generating more opportunities for profit. This should motivate the developer to more actively participate in the agent-led project and pursue better project performance. In short, the perception of fairness, fair treatment, and a

reasonable, if small, profit are key to effectively motivate the agent and improve project performance.

According to China's current housing policy, there is still a large potential for the construction of SSH in the future. The agent construction mode undertaken by professional real estate developers has unparalleled advantages over EPC, PPP, and other construction modes in providing high-quality housing planning and development. For shareholders of affordable housing projects, relevant government departments, or urban investment companies, the key is to attract outstanding developers to participate in and guide the healthy development of the market, fully consider the psychology of developers in contract design and cooperation mode, and give reasonable profit margins and good cooperative relations.

For this research to be as in-depth and specific as possible, the research subjects selected were specifically tied to the specific situation of the agent construction of affordable housing projects. This somewhat limited the study sample size. Its applicability to other public construction projects, such as schools and gymnasiums, needs to be further verified. Future studies should involve more detail on specific elements, such as trust in relational governance. This variable could also be decomposed into multiple dimensions, such as computational trust and goodwill trust. More detailed studies may identify new, previously unidentified incentive paths.

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Appendix

Table A1. Variable reliability test

Variable	Measurement items	Cronbach'α	Cronbach'α range and corresponding reliability level
AR	5	0.875	$\alpha \leq 0.30$ (unreliable) $0.30 < \alpha \leq 0.40$ (barely reliable) $0.40 < \alpha \leq 0.50$ (slightly reliable) $0.50 < \alpha \leq 0.70$ (reliable) $0.70 < \alpha \leq 0.90$ (very reliable) $\alpha > 0.90$ (totally reliable)
RS	5	0.890	
CC	4	0.845	
AS	4	0.843	
AR	4	0.842	
RA	3	0.778	
MT	4	0.884	
PF	3	0.897	
IE	4	0.870	
AP	6	0.893	
AB	4	0.842	
PP	3	0.918	

Table A2. Convergence validity of internal contractual governance

Factors	Measurement items	Standard error	T-value	P	Standardization coefficient	CR	AVE
AR	BC1				0.836	0.874	0.582
	BC2	0.067	14.010	***	0.780		
	BC3	0.065	13.199	***	0.747		
	BC4	0.069	11.481	***	0.672		
	BC5	0.073	13.770	***	0.770		
RS	FF1				0.734	0.892	0.624
	FF2	0.079	11.802	***	0.760		
	FF3	0.082	12.986	***	0.833		
	FF4	0.076	12.412	***	0.798		
	FF5	0.083	12.777	***	0.820		
CC	HN2				0.780	0.847	0.583
	HN3	0.077	10.452	***	0.655		
	HN4	0.079	13.470	***	0.817		
	HN5	0.082	12.991	***	0.791		