When does control curb opportunistic behavior: Evidence from the construction industry

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When does control curb opportunistic behavior: Evidence from the construction industry

Abstract

The subcontracting organizational arrangement has received limited attention in designing the control mechanism. This study has explored how managerial controls affect opportunistic behavior and developed a contingency framework to investigate the moderating effect of subcontracting dispersion. By using survey data from 323 general contractors in the Chinese construction industry, this study reveals that both outcome control and clan control curb the occurrence of subcontractors' opportunistic behaviors while behavior control scarcely helps. Besides, subcontractor dispersion distinctively moderates these relationships. A high level of subcontractor dispersion amplifies the opportunism-curbing effect of outcome control, but attenuates that of clan control, which leads to more opportunistic behaviors. Only at a lower level of subcontractor dispersion will behavior control mitigate subcontractors' opportunistic behaviors. Our configurational analyses reveal the substitute and complementary relationship between different control modes with different levels of subcontracting dispersion. This study contributes to the literature on governing opportunism and managerial control. The findings guide managers of the general contractor to exploit appropriate managerial controls to curb opportunistic behaviors across different organizational designs.

Keywords: Subcontracting, Opportunistic behavior, Organizational arrangement, Managerial control, Construction industry.

Introduction

Construction projects are inherently complex and require substantial planning, manual work, and various specializations, which makes subcontractors a necessity for most construction projects (Abdelmegid et al. 2021). However, multiple industry sources have estimated that 30–50% of subcontracting practices fail to realize their value expectations (Handley and Benton 2013). The *2020 Report: Construction Suffers from Wasted Time & Slow Payment*[1] shows that over 50% of contractors in the construction industry blame project delays and overruns on the failure of subcontractor management. Opportunistic behavior of subcontractors, such as withholding information and shirking responsibilities, has been one of the most intractable problems in terms of subcontracting management (e.g., P. Lu et al. 2016; Ikuabe, Oke, and Aigbavboa 2020; Yao et al. 2021). Mitigating the opportunistic behaviors of subcontractors is one of the key success factors in inter-organizational projects (Lui and Ngo 2004).

Both academics and practice have demonstrated that managerial control is the critical governance mechanism for dealing with opportunistic behavior (T K Das and Teng 2001a; Yap, Shavarebi, and Skitmore 2021), which has been categorized into formal (e.g., behavior/outcome control) and informal control (e.g., clan/self-control) (Ouchi 1979). Nevertheless, inconsistent conclusions have emerged about the efficacy of managerial control on governing opportunism (Paswan, Hirunyawipada, and Iyer 2017). For example, some studies have disclosed the opportunism-curbing effect of behavior control (e.g. T K Das and Teng 2001a) while evidence has also demonstrated that process-based control increases opportunism (Ju et al. 2011; Huo et

[1] https://www.levelset.com/blog/2020-report-construction-wasted-time-slow-payment/#The_high_cost_of_poor_coordination_Wasted_time_money

al. 2016a). Therefore, understanding the distinct efficacy of managerial control in specific contexts is vitally important.

The extant literature has revealed some of the contingencies that alter the efficacy of managerial controls on opportunistic behaviors, which are presented in Table 1. Most of them elaborate on the contingent role of the external environment, such as national culture (Handley and Angst 2015) and technological uncertainty (Mellewigt, Hoetker, and Lütkewitte 2018). However, the internal elements within the project organization are scarcely explored, such as the organizational arrangement of subcontracting, namely, how the general contractor outsources a part of the work on the project.

Table 1. Summary of contingency effects on the opportunism-control relationship

Control mode	Moderator	Reference
Formal/Informal control	National culture (individualism/collectivism)	Handley and Angst (2015)
Formal/Informal control	Uncertainty avoidance	Handley and Angst (2015)
Formal/Informal control	Environment volatility/ambiguity	Carson, Madhok, and Wu (2006)
Formal/Informal control	Technological uncertainty	Mellewigt et al. (2018)
Formal/Informal control	Performance ambiguity	Mellewigt et al. (2018)
Formal control	Demand uncertainty	Huo, Ye, and Zhao (2015)
Formal/Informal control	Asset specificity	Mellewigt et al. (2018)
Formal control	Interdependence between partners	Lu, Zhang, and Zhang (2016)
Informal control	Environment uncertainty	Tse, Wang, and Zhang (2019)
Outcome/Behavior control	Market orientation	Ju et al. (2011)
Outcome/Behavior control	Legal enforceability	Bai, Sheng, and Li (2016)
Outcome/Behavior control	Unilateral government support	Bai et al. (2016)
Outcome/Behavior control	Microlevel social contract	(Heide, Wathne, & Rokkan, 2007)

Subcontracting dispersion means the extent to which a general contractor distributes the subcontracted scope to subcontractors (Hui et al. 2008), which is a critical component of subcontracting organizational arrangement (Shi et al. 2022; Tang et al. 2021). A high level of subcontracting dispersion may cause complicated coordination, blur the responsibilities on work interfaces, and relieve the reliance on a few subcontractors (Tang et al. 2021), which may exert

potential influence on the way how different managerial control modes work. This research aims to reconcile the contradictory conclusion by comparing the efficacies of managerial controls on governing opportunism under different levels of subcontracting dispersion.

By doing this, this study introduces the organizational arrangement as a new perspective into the literature on mitigating opportunistic behaviors, which responds to the call for more insights into the complex governance processes for opportunism (Heide, Wathne, and Rokkan 2007). Furthermore, the investigation of the contingent effect of the subcontracting arrangement facilitates the reconciliation of the contradictory findings on the relationship between managerial control and opportunistic behaviors. The primary practical implication is to remind project managers to effectively employ different types of control to mitigate subcontractors' opportunism, especially under different organizational arrangements of subcontracting.

Theoretical background

Subcontractors' opportunistic behavior

Opportunism is one aspect of human nature and also a major source of transaction hazards in inter-organizational relationships (Williamson 1985; T K Das and Teng 2001a). With high complexity, uncertain environment, and specific assets, construction projects are minefields for opportunistic behavior (Pang et al. 2015; Haaskjold, Andersen, and Langlo 2021). In the current research, subcontractors' opportunistic behavior is defined as behaviors aimed at pursuing self-interest with deceit to achieve gains at the expense of the general contractor by withdrawing promises, shirking obligations, and breaching explicit or implicit agreements (Wang et al. 2019; W. Lu, Zhang, and Zhang 2016). For example, subcontractors may purposely fail to notify potential implications arising from change orders (Pang et al. 2015). It is also very common that subcontractors may take advantage of contract loopholes to raise claims during the execution

phase for recouping losses due to offering an unrealistically low price in the bidding stage (Barbarosoglu et al. 2016).

Opportunistic behavior can either occur before the initial agreement is made (ex-ante opportunism) or throughout the relationship (ex-post opportunism) (Williamson 1985). In the ex-ante period, the general contractor seeks the appropriate subcontractors with desired characteristics. Subcontractors have an information asymmetry advantage about their abilities over the general contractor. Ex-ante opportunism happens when subcontractors misrepresent their skills to win over the bid or negotiate for a better payment (Haaskjold, Andersen, and Langlo 2021). Ex-post opportunism comes in the forms of insufficient effort (cutting corners), hold-up on completion (Chang 2013), and intentional claim (Lo, Lin, and Yan 2007).

This study exclusively focuses on subcontractors' opportunistic behavior in the ex-post stage mainly for three reasons. Firstly, ex-post opportunistic behaviors are directly detrimental to the project implementation and cause enormous losses. Among various types of solutions to ex-post opportunism, conflict negotiation alone may account for as much as 15% of the contract value in construction projects (Gebken and Gibson 2006). Secondly, ex-ante opportunism can also lead to the ex-post one. For instance, opportunistic bidding is pervasive in the construction industry in that subcontractors deliberately lower bids and obtain beyond-contractual rewards through cutting corners or claims in the execution of the project afterward. Thirdly, managerial control is mainly about a set of management and control practices in the execution of the project, which exerts few effects on the other party's behaviors before the contract is signed. Thus, consistent with the previous studies that have investigated the relationship between managerial control and opportunism (e.g., Huo et al. 2016b; Ju et al. 2011), this study also focuses on the ex-post stage.

Managerial control

Project control is the primary task for the general contractor in project execution to align subcontractors' work with project objectives. In the control literature, control mechanisms are divided into formal and informal control (Ouchi 1979). Formal control can be exercised in two ways: outcome and behavior control. Outcome control explicitly states the intermediate and final outputs that contractors are expected to accomplish. For example, the general contractor provides evaluation criteria such as milestones, delivery timetables, and budgets by which subcontractors' accomplishments are judged (Tang et al. 2020; Ning 2017a). Behavior control focuses on the process of goal achievement, in which rules, methods, and procedures that help to achieve the desired goals are specified in detail. The general contractor would monitor subcontractors' behaviors and provide rewards based on the extent to which subcontractors adhere to the pre-specified procedures. In construction projects, regular meetings, walkthroughs, and weekly or monthly reports are some of the typical mechanisms to achieve behavior control (Ning 2017a; Tang et al. 2020). In consideration of the significant relevance of the two types of formal controls, this study includes both of them in the conceptual framework.

Informal control involves clan control and self-control (Ouchi 1979). Clan control refers to the control that is exercised through the enforcement of commonly accepted norms based on shared beliefs, values, and vision. In contrast, self-control refers to self-imposed norms that govern the work processes. In the context of inter-organizational relationships, clan control is an important mode (Tiwana 2010) and is thus included in this study. In contrast, when examining project governance from the controller's perspective, the exercise of self-control by the controlee might be weak and analogous to non-control on the part of the controller (Ning 2017a). Even though the general contractor could encourage a subcontractor to adopt self-control, this is

directly initiated and implemented by the subcontractor (Choudhury and Sabherwal 2003). Because the focal inquiry of this study is the efficacy of employing managerial control by the general contractor, self-control is excluded.

Organizational arrangement of subcontracting

This research aims to investigate how the general contractor curbs subcontractors' opportunism. In this setting, the organizational arrangement of subcontracting refers to how the general contractor subcontracts parts of the project (Hui, Davis-Blake, and Broschak 2008; Tang et al. 2021). Two constructs are adopted to define the organizational arrangement of subcontracting, namely (1) extent of subcontracting, which is defined as the proportion of the dollar volume of the work that is subcontracted, and (2) subcontractor dispersion, which is defined by the extent to which work is distributed among multiple subcontractors. Low subcontractor dispersion refers to subcontracted work that is undertaken by a small number of subcontractors regardless of the extent of subcontracting. While the extent of subcontracting defines the boundary between the general contractor and subcontractors, subcontractor dispersion describes the boundaries among subcontractors (Shi et al. 2022). Regardless of the general contractor's skills, a large portion of each project is in practice outsourced to subcontractors (Arditi and Chotibhongs 2005). Literature has probed the different effects of managerial controls across projects with different extents of subcontracting (e.g., Tiwana and Keil 2009) but the impacts of subcontractor dispersion have not received much attention.

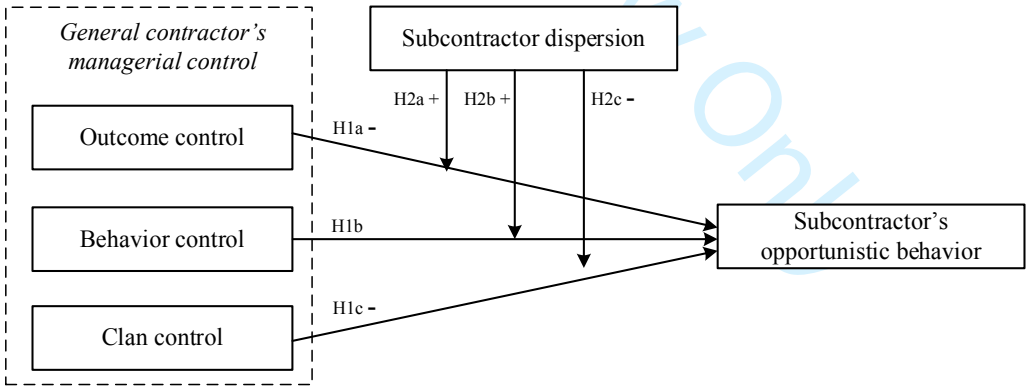
Jae-Nam Lee et al. (2019) implied that subcontractor dispersion as one of the key inter-organizational relationship elements may impact project performance. On the other side, different levels of subcontractor dispersion pose different challenges to the general contractor. Awarding subcontracts to multiple subcontractors can speed up project implementation (Arditi

and Chotibhongs 2005), enhance efficiency as subcontractors focus on their core competencies (Hui, Davis-Blake, and Broschak 2008), and reduce the contract price by encouraging competition. Moreover, a high level of subcontractor dispersion may elude the "small number" risk by reducing the dependence on certain subcontractors. Besides, contracting with many subcontractors also complicates the general contractor's efforts to coordinate and control the fragmented yet interdependent work, potentially hindering overall project performance (Shi et al. 2022). All these may relate to the occurrence of opportunistic behaviors. Therefore, this research will explore how subcontractor dispersion impacts the efficacy of managerial control.

Development of Hypotheses

Figure 1 illustrates the conceptual framework that proposes two categories of hypothesized relations: (1) the direct effect of managerial control on opportunistic behavior, and (2) the moderating effect of subcontractor dispersion.

Figure 1. Research framework



Effect of the general contractor's managerial control on the opportunistic behavior of the subcontractor

The effectiveness of managerial controls in improving project performance is largely grounded in the perspectives of transaction cost economics and social exchange theory (Wiener et al. 2016). The transactional perspective emphasizes governing the economic relationship through well-articulated and clear incentives and penalties, which constitute the underlying formal controls in Figure 1. The relational logic between partners is governed by social exchange theory and is represented by informal clan control in Figure 1.

Lui and Ngo (2004) suggested that by clearly specifying the dos and don'ts for contracting parties, formal control can curb opportunism through two mechanisms: changing the pay-off structure by increasing the cost of self-interest activities (e.g., penalties for opportunistic behavior) and reducing the monitoring cost by increasing the transparency of relationships and clarifying the objects of monitoring. In the context of the general contractor vs. subcontractor relationships, the general contractor's outcome control establishes the evaluation criteria, by which the outputs of subcontractors will be judged (e.g., milestones, delivery timetables, and budgets) (Kashyap, Antia, and Frazier 2012). As a result, less room is likely to be left for underhanded and surreptitious activities of subcontractors (Şengün and Wasti 2007). Therefore, the following hypothesis is proposed.

Hypothesis 1a: Outcome control by the general contractor is negatively associated with subcontractors' opportunistic behavior.

The effects of behavior control on opportunistic behavior are much more complicated. Some previous studies have discovered the opportunism-curbing effect of behavior control. Behavior control mechanisms, such as explicit rules on information exchange and progress reporting, are found to help regulate the conduct of the other party to comply with the written contract (T. K. Das and Teng 2001b). In contrast, some other studies have concluded that tight

monitoring and behavior control may be perceived as a signal of distrust, which may further erode the development of goodwill trust and cooperative tendency (Schweitzer, Ho, and Zhang 2016; Roehrich et al. 2020). Subcontractors may view this obtrusive monitoring as an intrusive and coercive attitude toward them, which may result in resistance and opportunistic behavior (Kashyap, Antia, and Frazier 2012).

The authors argue that the opportunism-strengthening role of behavior control dominates in construction projects. Opportunistic behavior can be distinguished between strong-form, referring to the actions that violate contractual norms (e.g., terms, clauses, and conditions), and weak-form, regarding the actions that violate relational norms not spelled out in a contract but embedded in the common understanding of both parties (Luo 2006). Behavior control may play a role in curbing opportunism by forcing the other party to comply with the written contract (avoid strong-form opportunism) (T. K. Das and Teng 2001b) but will encourage inappropriate actions that cannot be specified in documents (increase weak-form opportunism) because it can erode the relationship quality between parties (Wuyts and Geyskens 2005).

In construction projects, weak-form opportunism is much more prevalent since breaching contractual stipulations directly is easy to detect and judge, and sophisticated arbitration and legislation in the construction industry discourages subcontractors from contractual violations and strong-form opportunism even if there is no enhanced behavior control (W. Lu, Zhang, and Zhang 2016; Yao et al. 2021). On the contrary, high environmental uncertainty in the construction industry leads to opportunities for subcontractors to exploit contractual loopholes to engage in weak-form opportunism when unforeseeable events occur and the damaged relationship caused by the extensive use of behavior control increases the likelihood of subcontractors' exploiting these opportunities. Previous studies also exhibited a wider

observation of weak-form than strong-form in the construction industry (e.g., W. Lu, Zhang, and Zhang 2016; Wang et al. 2019; Shi et al. 2018). Therefore, we argue that behavior control plays a greater role in increasing weak-form opportunism than avoiding strong-form opportunism and the following hypothesis is proposed.

Hypothesis 1b: Behavior control by the general contractor is positively associated with subcontractors' opportunistic behavior.

Clan control builds on the social exchange theory, where the existence of many nonlegal sanctions makes it expedient for partners to fulfill their commitments (Carson, Madhok, and Wu 2006). Socialization mechanisms help in cultivating a common understanding and language between participants (S. Liu 2015). Shared understanding and values provide a rich, broad, and implicit guide to subcontractors as to what is considered by the general contractor to be acceptable or deviant behavior without the general contractor formally monitoring whether subcontractors are adhering to acceptable behaviors (Kirsch, Ko, and Haney 2010). Clan control also promotes mutual trust and interests through social interactions (Choudhury and Sabherwal 2003). Thus, the relational perspective suggests that over time, clan control fosters cooperative working relationships between the project participants (Srivastava and Teo 2014; Sihag and Rijsdijk 2019). Subsequently, these relationships serve as efficient safeguards against opportunistic behavior (Srivastava and Teo 2014; Kim and Nguyen 2018). Thus, the following hypothesis is formulated:

Hypothesis 1c: Clan control by the general contractor is negatively associated with subcontractors' opportunistic behavior.

Moderating role of subcontractor dispersion

Parceling out activities to multiple subcontractors increases organizational interfaces and potential conflicts in construction projects (Fellows and Liu 2012). Shirking problems may be triggered by fuzzy responsibilities and duties on the interfaces between the tasks of different subcontractors (Aarseth et al. 2012). Outcome control with objective, explicit, and specific criteria about output and performance may lessen the ambiguity of subcontractors' roles and obligations (Kashyap, Antia, and Frazier 2012) and may limit discretion in interpreting or adjusting subcontractors' performance (Tiwana 2010). When accountability for the outputs is well established by outcome control, it becomes nearly impossible for subcontractors to shirk their responsibilities. The detailed specification of requirements and the consistent understanding of responsibilities also provide a solid foundation for collaborative communication. Therefore, developing outcome control by the general contractor intensively has much stronger efficacy in eliminating subcontractors' misbehaviors under a higher level of subcontractor dispersion.

Hypothesis 2a: The negative relationship between outcome control and opportunistic behavior is strengthened when subcontractor dispersion is high.

Behavior control is implemented through mechanisms that specify a set of rules, methods, procedures, and standards that the general contractor expects subcontractors to follow. Enforcing behavior controls requires evaluation of subcontractor behavior, which is typically obtained through direct monitoring and subcontractors' self-reports (e.g., weekly progress reports, periodic meetings, conference calls, and ongoing documentation of work processes) (Choudhury and Sabherwal 2003). Unlike outcome control which is directly discernible from outputs, specifying behavior control mechanisms, by itself, cannot guarantee the reliability, integrity, and timeliness of the pertinent evaluation information obtained from the subcontractor (Tiwana 2010). The challenge can be further exacerbated in a subcontracting arrangement that is

characterized by high subcontractor dispersion because the weaker formal authority and organizational separation among all the subcontractors make it difficult for the general contractor to effectively monitor all subcontractors' compliance with the prescribed methods and procedures (Choudhury and Sabherwal 2003; Tiwana and Keil 2007). Indeed, in high subcontractor dispersion environments, the likelihood of the subcontractor being caught engaging in opportunism is low. When there are fewer subcontractors in the project, subcontractor behavior is more readily observed by the general contractor, thus subcontractors' opportunistic behavior is more readily avoided.

Hypothesis 2b: The positive relationship between behavior control and opportunistic behavior is strengthened when subcontractor dispersion is high.

Clan control relies on shared values and norms among project participants to curb opportunistic behavior (Wiener et al. 2016). Clan control is tightly bound to specific individuals and their interrelationships (Hoetker and Mellewigt 2009), which implies that great relationship investment is required by the general contractor to enforce clan control. However, awarding work to multiple subcontractors discourages the formation of dedicated relational investments (Shi et al. 2022). In this case, the foundation of shared values, common norms, and recognized goals is also hard to build. Thus, this research predicts that the efficacy of clan control will be impaired in high subcontractor dispersion.

Hypothesis 2c: The negative relationship between clan control and opportunistic behavior is weakened when subcontractor dispersion is high.

Methodology

Sampling and data collection

This study employed a questionnaire survey to collect data. The unit of analysis was a

construction project. The target respondents were professionals in managerial roles employed by general contractors, including project managers, engineers, and lawyers, as they have the most complete knowledge of the project. Respondents were asked to fill out the survey using information from their most recently completed project to reduce any bias toward choosing only high-performing projects.

Since a truly simple random sample of recent construction projects is almost infeasible in the construction industry (Franz et al. 2017) and often results in poor quality due to limited direct access to target respondents (Zhang and Qian 2017), the data in this study were collected using the convenience sampling method. A total of 366 questionnaires were obtained during the four months of data collection from employee training programs in China. Those vocational educations were administrated by construction companies or industry associations to improve the project management skills of construction project professionals. Note that we did not employ a random sampling strategy because of the unit of analysis, i.e. construction projects, it is difficult to identify the clear population of sampling. At the same time, compared to stranger respondents, trainees have a greater sense of responsibility to give detailed and accurate answers to the survey questions, which is conducive to ensuring the quality of the survey data. To better ensure the validity of the sample, the questionnaires completed in less than eight minutes (the minimum time required for completion based on the pilot survey) and the questionnaires marked with the same score across most questions were eliminated.

The final sample includes 323 valid questionnaires with an effective response rate of 88.3%. This high rate of response was expected considering that the data were collected from a captive audience during training programs. Table 2 presents basic information about the respondents and the projects. The table shows that 72.8% of the respondents have more than 5

years of working experience and 61% are project managers or contract and business staff, indicating that the participants can understand the survey questions given their work experience and positions are suitable for filling in the questionnaires. Although 51.4% of the projects in the sample were not located in China, the data satisfied Levene's test of homogeneity (Levene 1961) by showing that the differences between the variances of projects in China and projects outside China are not statistically significant at p=0.05 level for subcontractor dispersion. In other words, no significant difference in subcontractor dispersion exists between projects in China and other countries.

Table 2. Characteristics of respondents and their projects

Characteristics		Frequency	Percentage (%)
Work experience (Year)	< 3	30	9.29
	3-5	58	17.96
	6-8	66	20.43
	9-11	49	15.17
	> 11	120	37.15
Job position	Project manager	39	12.07
	Contract and business staff	170	52.63
	Legal staff	70	21.67
	Engineer	42	13.00
Project type	Road, bridge, and pipeline	93	28.79
	Housing	50	15.48
	Port and waterway	47	14.55
	Energy development	99	30.65
	Industrial	34	10.53
Contract price (million RMB)	< 30	24	3.72
	30-100	41	7.43
	100-1,000	172	12.69
	1,000-3,000	34	53.25
	> 3,000	52	10.53
Project location	China	157	48.61
	Other countries	166	51.39

To reduce the common method variance, the respondents were informed that their responses would be confidential and would only be used in academic research. They were also

informed that there were no right or wrong answers. Two methods, introduced by Podsakoff et al. (2003), were adopted to test for common method variance. First, Harman's one-factor test was performed by using exploratory factor analysis (EFA). Five factors explain 63% of the total variance emerged, and the largest one accounts for only 17% of the total variance, suggesting that no single underlying factor accounts for the majority of the variance. Second, a new factor was added to the CFA model to represent the common method and all the items loaded on it. The result shows that the method factor only explains 20.7% of the total variance, below the threshold of 25% suggested by Williams, Cote, and Buckley (1989). In summary, common method variance is not a significant issue in this research.

Development of measurements

Multi-item scales are used to measure all variables except for control variables. All these statements were originally written in English and then deliberately translated into Chinese. In addition, inappropriate or vague words were edited according to interviewees' suggestions in a pilot test of 3 professionals in construction projects. The statements were assessed by using a 7-point Likert scale, ranging from 1 = strongly disagree to 7 = strongly agree, as shown in Table 3. For each item, respondents were instructed, both verbally and in the form of a questionnaire instruction, to assess it based on the general features of all subcontractors involved in the reference project.

Table 3. Measures Reliability and Validity Assessment.

Constructs and Constituent Items	Standardized Factor Loading
Opportunistic behavior (α = 0.914; AVE = 0.683; CR = 0.915)	
1. Subcontractors may incompletely disclose information to us in order to benefit at our expense.	0.792
2. Subcontractors sometimes violate contractual terms and conditions for their own sake.	0.849
3. Subcontractors fail to invest in resources (like human, materials, or equipment) as required by our contract.	0.879

4. Subcontractors will try to take advantage of "holes" in the contract to further their own interests.	0.830
5. Subcontractors sometimes make oral promises without actually doing them later for their own sake.	0.778
Outcome control (α = 0.850; AVE = 0.592; CR = 0.852)	
1. At the project implementation stage, the general contractor established specific and clear performance objectives for subcontractors.	0.807
2. At the project implementation stage, the general contractor continuously monitored the achievement of the objectives set for subcontractors.	0.822
3. At the project implementation stage, the general contractor set a detailed deadline as the basis for monitoring.	0.813
4. At the project implementation stage, the general contractor linked rewards and penalties to the subcontractors to the targets achieved.	0.649
Behavior control (α = 0.879; AVE = 0.650; CR = 0.881)	
1. At the project implementation stage, the general contractor drew up specific and clear procedures to be strictly followed by subcontractors.	0.848
2. At the project implementation stage, the general contractor modified the subcontractors' procedures if the predicted results were not obtained.	0.690
3. At the project implementation stage, the general contractor provided feedback and information to subcontractors about the results of their activities, intending to foster appropriate changes.	0.862
4. At the project implementation stage, the general contractor continuously supervised the implementation plans and the construction schedules of subcontractors.	0.816
Clan control (α = 0.821; AVE = 0.540; CR = 0.824)	
1. The general contractor organized training on values, task goals, and norms for the involved subcontractors.	0.795
2. The general contractor made fine-grained informal communication with the involved subcontractors.	0.790
3. The general contractor placed significant weight on understanding the goals, values, and norms of the subcontractors.	0.774
4. The employees from the general contractor attempted to be a "regular" member of the subcontractor team.	0.608
Subcontractor dispersion (α = 0.811; AVE = 0.605; CR = 0.819)	
1. Compared with other similar projects, this project involved a large number of subcontractors.	0.798
2. Compared with other similar projects, the general contractor segmented this project into many work packages.	0.847
3. Compared with other similar projects, there was a large number of work interfaces between subcontractors.	0.665
Goodness-of-fit: *$\chi 2$ /df = 1.465; GFI = 0.938; RMSEA = 0.043; TLI = 0.965; CFI = 0.971; IFI = 0.971; NFI = 0.928*	

Notes: α = Cronbach's alpha coefficient; AVE = Average variance extracted;
CR = Composite reliability.

Opportunistic Behavior: Derived from Luo (2006) and P. Lu et al. (2016), five items were used to measure opportunistic behavior in this study, with appropriate wording

modifications to fit the research context. Respondents from the general contractor were asked to assess their subcontractors' behavior, which avoids the social desirability bias of self-reports.

Managerial control: This study adopted existing instruments with demonstrated construct validity to measure three kinds of managerial control modes. Outcome control was measured by four items that assessed the extent to which the client placed significant weight on project goals, whereas behavior control was measured using four items that assessed the extent to which the general contractor expected the subcontractor to follow an understandable, written sequence of steps toward accomplishing project goals (Ning 2017a; Heide, Wathne, and Rokkan 2007; Tiwana 2010). Clan control was measured with four items that capture a general contractor's effort toward socializing (Han et al. 2019).

Subcontractor dispersion: Subcontractor dispersion was measured by considering the number of subcontractors, contract packages, and work interfaces based on the instruments developed by Hui, Davis-Blake, and Broschak (2008) and Moeen, Somaya, and Mahoney (2013). Whereas subcontractor dispersion may be naturally disparate across different types and sizes of projects, respondents were instructed to make a comparison with those of the projects that are similar in the project type and scale to determine the level of subcontractor dispersion.

Control variables:

Contract price was controlled as a proxy of project size. *Project duration* was controlled since it may influence the general contractor's attitudes and behaviors toward subcontractors (Trada and Goyal 2017).

General contractor's experience was controlled because it may influence subcontractors' intentions to conduct opportunistic behaviors (Tang et al. 2020). A single item, "The general contractor is experienced with this type of project and in the area where the project was located,"

was used to measure it.

Prior collaboration is related to partners' opportunism (Y. Liu, Luo, and Liu 2009). It was measured by a single item: "Before contracting for this project, how often was the prior collaboration between the general contractors and subcontractors?"

Shadow of the future was controlled in the model because it may relate to opportunistic behaviors (Schepker et al. 2013). It was measured with the following item: "When contracting for this project, the general contractor and subcontractors expect to have further cooperation in the future."

Performance ambiguity was controlled since empirical studies supported that performance ambiguity of the task influences both the choices of managerial control modes and opportunistic behavior (Ning 2017b). It was measured by a single item: "It is difficult to assess whether the information provided by the subcontractor is reliable."

Construct reliability and validity

Tables 3 and 4 show the evaluation results of the measurement models. A Cronbach's alpha coefficient of at least 0.70 is normally considered to indicate the reliability and internal consistency of the measurement (Nunnally and Bernstein 1994). All Cronbach's alpha coefficients in Table 3 range from 0.811 to 0.914, displaying satisfactory levels of reliability. Convergent validity (i.e., the extent to which different attempts to measure a construct agree) and discriminant validity (i.e., the extent to which a construct differs from others) can be examined by the result of confirmatory factor analysis (CFA). Table 3 shows that the model fits the data well ($\chi 2$ /df = 1.503, GFI = 0.932, RMSEA = 0.039, TLI = 0.972, CFI = 0.976, IFI = 0. 0.977, NFI = 0.933).

A satisfactory level of convergent validity of the factors was achieved by examining the

values of the composite reliability (CR) > 0.7 and the average variance extracted (AVE) > 0.5 (Fornell and Larcker 1981). The square root of the AVE of each construct, which is shown in the diagonal row in Table 4, is higher than the corresponding coefficients between that construct and all other constructs, confirming acceptable discriminant validity.

Table 4. Means, standard deviations, and correlations

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1.Opportunistic behavior	4.79	1.23	**0.826**								
2.Outcome control	5.35	1.30	-0.28**	**0.769**							
3.Behavior control	5.05	1.44	-0.10	0.42**	**0.806**						
4.Clan control	2.83	1.23	-0.31**	-0.22**	-0.22**	**0.735**					
5.Contract price	3.15	1.07	0.07	0.13*	0.12*	-0.09	**0.778**				
6.Project duration	2.32	0.65	0.12*	0.11*	0.09	-0.09	0.64**	N/A			
7.GC's experience	4.87	1.67	-0.08	0.25**	0.19**	-0.10	0.02	0.01	N/A		
8.Prior collaboration	4.36	2.12	0.02	0.08	0.12*	-0.05	0.18**	0.08	0.31**	N/A	
9.Shadow of future	5.37	1.52	0.01	0.15**	0.16**	-0.11*	0.16**	0.12*	0.18**	0.30**	N/A
10. Ambiguity	3.44	1.84	0.21**	-0.14**	-0.09	-0.15**	0.17**	0.09	-0.22**	-0.01	-0.03

Notes: Boldface signifies that the number is greater than the off-diagonal correlation. N/A means not applicable.
*p < 0.05, **p < 0.01. GC's experience = General contractor's experience, Ambiguity = Performance ambiguity

Data analysis methods

Two methods, including hierarchical regression and the fuzzy-set qualitative comparative analysis (fsQCA), were combined to conduct more robust data analyses. Hierarchical regression analyses were performed to identify the separate effects of different types of control and the moderating role of subcontractor dispersion in the above effects. A configurational analysis was conducted with the fuzzy-set qualitative comparative analysis (fsQCA) to further explore the complicated relationship between managerial controls and opportunism.

The fsQCA is an analytical method that is based on the configurational perspective and a set-theoretic approach, which is a combination of qualitative and quantitative analyses.

Compared with hierarchical regression, fsQCA has a different rationale behind the investigation of the relationship between different variables. In regression analyses, the regression coefficients reflect the extent to which the independent variable increases or decreases the value of the dependent variable after excluding the effects of other relevant factors. There are two fundamental assumptions in regression analyses: 1) if a greater value of the independent variable leads to a greater value of the dependent variable, then a smaller value of that independent variable will also lead to a smaller value of the dependent variable, which is known as causal symmetry; 2) if the signs of the regression coefficients of the independent variables X and Z on the dependent variable Y are the same (the opposite), then a high level of X can offset the effect of a low (high) level of Z on Y, and vice versa. However, these two assumptions do not necessarily hold in the complex real world.

In contrast, studies using fsQCA do not need to uphold the above two assumptions, and fsQCA-based analyses present the following characteristics (Mellewigt, Hoetker, and Lütkewitte 2018): 1) equivalence, i.e., a combination of many different conditions (corresponding to the independent variables in regression analyses) can lead to the same outcome (corresponding to the dependent variable in regression analyses) (Linder 2019); 2) nonlinearity, i.e., the effect of a condition may vary with the presence or absence of other conditions; and 3) causal asymmetry, i.e., the presence of a condition is associated with an outcome (e.g., high opportunism), but this does not necessarily imply that the absence of that condition leads to the absence of outcomes (e.g., low opportunism). Because QCA assumes that causal relationships in reality are complex, intertwined, and holistic, it focuses more on the combined effects of multiple conditions than regression analyses that focus on the independent net effects of competing independent variables (Ragin and Fiss 2008).

The fsQCA was suitable for serving as robustness tests as well as further analyses for regression analyses in this study because 1) it is generally recognized that organizations usually use combinations of different control modes instead of using controls in isolation (Tang et al. 2020), 2) scholars advocated that managerial control is best depicted as a configuration, which refers to a co-existence of multiple controls based on typologies (Cardinal et al. 2010), and 3) this approach has been examined as well suited in recent managerial control literature (e.g., Ning 2017a; Mellewigt, Hoetker, and Lütkewitte 2018).

Results and Analysis

Hierarchical regression analyses

Hierarchical regression analyses were conducted to test the hypotheses. The variance inflation factor for each variable ranges from 1.129 to 1.890, suggesting that multicollinearity is not a concern. Table 4 reports the means, standard deviations, and correlations for all variables. All the variables pass the normality check. Table 5 reports the results of the regression model predicting the subcontractors' opportunistic behavior. Control variables were first introduced into Model 1 and then three independent variables and the moderation variable were added to Model 2. As shown by Model 2 (R^2=0.31, $p < 0.001$) in Table 5, outcome control (β = -0.310, $p < 0.001$) and clan control (β = -0.448, $p < 0.001$) do have significant negative effects on subcontractors' opportunistic behavior. Thus, Hypotheses 1a and 1c are supported. The regression coefficient of behavior control on subcontractors' opportunistic behavior is also negative (β = -0.079, $p < 0.1$), although it is slightly insignificant at a significance level of 0.10. Therefore, Hypothesis 1b is not supported.

Table 5. Results of regression analysis

Variables	Subcontractors' opportunistic behavior		
	Model 1	**Model 2**	**Model 3**
Control variables			
Contract price	-0.041	-0.017	-0.035
Project duration	0.270†	0.231†	0.220*
General contractor's experience	-0.041	-0.021	-0.007
Prior collaboration	0.015	0.005	0.012
Shadow of future	-0.040	-0.032	-0.018
Performance ambiguity	0.128***	0.045	0.040
Independent variables			
Outcome control (OC)	—	-0.310***	0.396***
Behavior control (BC)	—	-0.079†	-0.768***
Clan control (CC)	—	-0.448***	-0.567***
Moderating variable			
Subcontractor dispersion (SD)	—	-0.019	-0.205
Interactions			
OC × SD	—	—	-0.163***
BC × SD	—	—	0.178***
CC × SD	—	—	0.059*
R^2	*0.06*	*0.31*	*0.43*
$\triangle R^2$	*0.06*	*0.25*	*0.13*
F	*3.51***	*13.73****	*18.12****

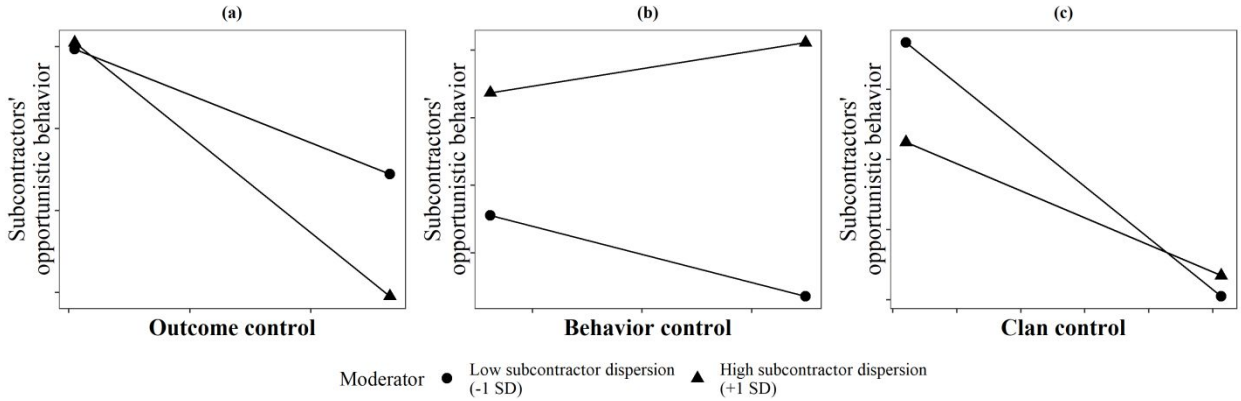
Notes: † <0.100; * p < 0.050; ** p < 0.010; *** p < 0.001. R-squared is the percentage of the dependent variable's variation that a linear model explains. F is the probability that the null hypothesis for the full model is true.

The moderating effects were tested by introducing the interaction terms of managerial control modes and subcontractor dispersion in Model 3. The independent and moderating variables were rescored by using the mean centering technique to reduce multicollinearity when testing the moderating effects. The results show that the interaction item between the outcome control and subcontractor dispersion (OC×SD, β = -0.163, $p < 0.001$) has a significant negative impact on subcontractors' opportunistic behavior, which supports the prediction of Hypothesis 2a that the opportunism-curbing effect of outcome control will be strengthened in the high level of subcontractor dispersion. The interaction between behavior control and subcontractor

dispersion (BC×SD, $\beta = 0.178$, $p < 0.001$) has a significant positive impact on opportunistic behavior, indicating that Hypothesis 2b is supported. Hypothesis 2c is also confirmed since the interaction item between clan control and subcontractor dispersion (CC×SD, $\beta = 0.059$, $p < 0.05$) indicates that a higher level of subcontractor dispersion will weaken the negative relationship between clan control and subcontractors' opportunistic behavior.

Simple slope tests were conducted to get more insight into the interaction effect of subcontractor dispersion. Following the procedure of (Hayes 2013), we split the sample into two groups by subcontractor dispersion: a low group (one standard deviation below the mean) and a high group (one standard deviation above the mean). The effects of three managerial control modes on the subcontractors' opportunistic behavior were estimated for the low and high groups. Figure 2(a) indicates that when the subcontractor dispersion is high, outcome control has a stronger negative impact on subcontractors' opportunistic behavior (β = -0.475, $p < 0.001$) than when it is low (β = -0.234, $p < 0.01$). By contrast, clan control has a weaker negative impact on subcontractors' opportunistic behavior in high level subcontractor dispersion (β = -0.231, $p < 0.01$) than in low level (β = -0.440, $p < 0.001$), as indicated by Figure 2(b). Moreover, the impact of behavior control changes from negative ($\beta = -0.417, p < 0.001$) to positive ($\beta$ = 0.2583, $p < 0.001$) when the level of subcontractor dispersion increases from low to high in Figure 2(c).

Figure 2. Graphical representation of moderation effects



Configurational analyses

To conduct fsQCA, the first step is to calibrate the Likert-scale variables into fuzzy sets. Set membership is anywhere on a continuum ranging from "fully in" the high category (coded 1) to "fully out" of the low category (coded 0) through calibration of the data. For example, the cases with a high set membership of outcome control are deploying more outcome control in the project. Consistent with prior studies (e.g., Ning 2017a), the values of the 95th, 50th, and 5th percentiles of the conditions and outcome were assigned as the thresholds of full membership, the crossover point, and full non-membership, respectively. Data were split into subsets of cases characterized by the low and high levels of subcontractor dispersion for analysis.

In line with the assumption of causal asymmetry of fsQCA, the authors separately tested the results for the presence and the absence of the outcome (i.e., for high and low opportunistic behaviors). Following Ragin and Fiss (2008), necessary and sufficient conditions were analyzed separately. No condition turned out to be necessary on its own for reaching the outcomes. Hence, the authors proceeded to the analysis of the sufficient conditions for both outcomes. A truth table of 2^3 was built for each subset, listing all logically possible combinations of conditions and the outcome (Ragin and Fiss 2008). The frequency threshold was 3 (Ning 2017a), which means that only the configurations that have at least 3 cases are empirically relevant and included in the analysis. The consistency threshold was set to 0.70, indicating the proportion of cases in each truth table row that displays the outcome. Configurations that fell below this cutoff were eliminated.

Ragin and Fiss (2008) recommended consistency and coverage for validating the solutions: raw coverage is the extent to which each configuration covers the cases of the outcome; unique coverage of a configuration is the portion of coverage that is explained by the configuration,

without its overlapping with other configurations; and overall solution consistency and coverage measure the degree to which all configurations together consistently result in the outcome and cover the cases of the outcome, respectively. Table 6 displays analysis results following the graphical method introduced by Ragin and Fiss (2008), which shows that Configurations 1, 2, and 3 are sufficient for a high frequency of subcontractors' opportunistic behaviors and Configurations 4, 5, 6, and 7 are sufficient for achieving low opportunistic behavior. Configuration 1 is the pathway for projects with a low level of subcontractor dispersion, which involves the presence of high behavior control along with the absence of clan control. Within this configuration, extensive use of outcome control may be either present or absent. In projects with high subcontractor dispersion, Configuration 2 indicates that a combination of weak outcome control and weak clan control is the pathway to opportunistic behaviors, regardless of the usage of behavior control. Configuration 3 demonstrates that strong outcome control combined with weak behavior control can result in opportunistic behaviors, which will not be altered by the deployment of clan control.

The combination of conditions connected to high opportunistic behaviors is not necessarily the same as those that produce low opportunistic behaviors, so-called causal asymmetry. The same conditions can play different roles in different contexts. In projects with low subcontractor dispersion, two configurations were produced for low opportunistic behaviors. Configuration 4 combines the strong outcome control and both the weak behavior control and clan control. Configuration 5 indicates that a combination of strong outcome control, strong behavior control, and strong clan control can curb the occurrence of opportunistic behaviors. In conditions of a high level of subcontractor dispersion, another two configurations were generated. Configuration 6 indicates that strong outcome control combined with strong behavior control leads to low

opportunistic behaviors, while clan control is redundant. In Configuration 7, a combination of strong outcome control and strong clan control can result in low opportunistic behaviors, while behavior control may be either present or absent in the solution.

This additional analysis provides a more nuanced understanding of how managerial control modes contribute to curbing opportunistic behavior in different contexts of subcontractor dispersion. These results of additional analysis combined with the results of hypotheses testing will be further discussed in the next section.

Table 6. Configurations for achieving high or low opportunistic behavior

	High opportunistic behavior			**Low opportunistic behavior**			
	Low subcontractor dispersion	High subcontractor dispersion		Low subcontractor dispersion		High subcontractor dispersion	
Configuration	1	2	3	4	5	6	7
Outcome control		⊗	•	•	•	●	●
Behavior control	●		⊗	⊗	●	●	
Clan control	⊗	⊗		⊗	●		●
Consistency	0.815	0.967	0.742	0.880	0.830	0.790	0.782
Raw coverage	0.515	0.256	0.684	0.432	0.432	0.741	0.701
Unique coverage	0.515	0.100	0.529	0.135	0.135	0.203	0.164
Overall solution consistency	0.815	0.762		0.808		0.737	
Overall solution coverage	0.515	0.785		0.567		0.904	

Notes. Solid circles indicate the required presence of a condition and crossed-out circles indicate its required absence. Large circles refer to core conditions, and small circles refer to peripheral conditions (indicating less strong evidence). Unfilled cells indicate "do not care" conditions.

Discussion

As predicted in Hypotheses 1a and 1c, subcontractors' opportunistic behaviors will be curbed by the outcome and clan control. The results echo the findings of studies in the construction industry (Maqsoom et al. 2020; Ning 2017a) and inter-organizational project management in the adjacent field (Tiwana and Keil 2007), which pointed out that both outcome control and clan control contribute to project performance. Therefore, mitigating opportunistic behaviors is confirmed to be a solid mechanism to explain how these two managerial controls

improve project performance. The result of Hypotheses 1b shows that the negative relationship between behavior control and opportunistic behavior is significant at the 90% level. In line with T. K. Das and Teng (2001b) but contrary to Wang et al. (2019), Ju et al. (2011) and Hypothesis 1c, the result shows a salient effect of behavior control on curbing subcontractors' opportunistic behaviors. The moderation analysis further explains that the effects of behavior control contingently rely on the level of subcontractor dispersion in projects. In addition, Table 4 displays that the level of clan control (mean = 2.83) deployed by the general contractor is relatively lower than those of outcome (mean = 5.35) and behavior control (mean= 5.05). As argued by Choudhury and Sabherwal (2003), due to the difficulty of creating a shared goal and shared beliefs, clan control is likely to be more difficult to achieve.

Moreover, as predicted by Hypotheses 2a, 2b, and 2c, distinguishing moderating roles of the subcontractor dispersion are confirmed. As subcontracting dispersion represents the organizational complexity in the project, this study also responds to the call of Maqsoom et al. (2020), who recommended that organizational control research should take into consideration the complexity to make it more practically relevant. The findings speak to long-lasting debates on whether managerial controls may restrain opportunistic behavior (Wang et al. 2019; Huo et al. 2016a) and verify subcontractor dispersion as a critical contingency variable beyond environment uncertainty (Handley and Angst 2015), the social contract (Heide, Wathne, and Rokkan 2007), and marketing orientation (Ju et al. 2011).

Our regression analyses also reveal the effects of some control variables on opportunistic behavior. Table 5 shows that project duration breeds opportunistic behavior. One of the possible explanations is that a longer project duration means greater dedicated investments into the project, which provides room for subcontractors' opportunism. Besides, performance ambiguity

has a positive effect on subcontractors' opportunism. The finding is consistent with Ning (2018) suggesting that performance ambiguity discounts the effectiveness of control and thus, increases opportunistic behavior. Surprisingly, relational experience, including prior collaboration and shadow of the future, exert little effect on opportunism. Combined with the significant effects of clan control (one of the significant relational mechanisms), this study suggests that compared to the relational mechanisms in previous projects or future projects, what the general contractor employs in the current project takes a dominant role, which is consistent with the one-off characteristics of construction projects.

In addition, this study explored the effect of the configuration of different managerial controls to provide more nuanced information on how to reduce opportunistic behaviors. The results indicate that when subcontractor dispersion is at a low level, the existence of behavior control with the absence of clan control leads to frequent opportunistic behaviors (Configuration 1) while the coexistence of behavior and clan control leads to a low frequency of opportunistic behaviors (Configuration 5). Moreover, the absence of both behavior and clan control (Configuration 4) is the equifinal pathway to fewer opportunistic behaviors. These findings further elaborate on the result of moderation analysis (Hypothesis 2b) that notwithstanding behavior control reduces opportunistic behavior in subcontracting arrangements with low subcontractor dispersion, the use of clan control is indispensable. In such cases, with the application of clan control and the development of shared norms, the potential "dark side" of behavior control can be suppressed. Nevertheless, the complementary relationship between behavior and clan control in reducing opportunistic behavior turns into a substitutive relationship in projects with high subcontractor dispersion as either the behavior control or clan control is present in Configurations 6 and 7. This is possibly because the two control modes entail

substantial costs and investments when the project involves multiple subcontractors. Thus, it is wise for the general contractor to deploy both of them simultaneously. The findings of Tiwana (2010) are thus expanded upon with a new insight that the use of clan control strengthens and diminishes the benefits of behavior control in low and high subcontractor dispersion, respectively.

Moreover, Configurations 6 and 7 also indicate that outcome control is critical to equifinal pathways (core condition) to low opportunism in the high level of subcontractor dispersion while in Configurations 4 and 5, the outcome control is merely the peripheral condition that has weaker causal relationships with low opportunism in the low level of subcontractor dispersion. The findings are consistent with the results of the moderation analysis for Hypothesis 2a, that the opportunism-curbing effect of outcome control will be accentuated in high subcontractor dispersion. Thus, this study expands on the work by Maqsoom et al. (2020) by showing how outcome control can be strengthened to achieve both tractability and managerial predictability and thus improve project performance, in a complicated subcontracting arrangement that involves multiple subcontractors.

The fsQCA analyses also show that when the level of subcontractor dispersion is high, the absence of outcome control will lead to more opportunistic behavior (Configuration 2). The result indicates that outcome control contributes to avoiding a high level of opportunistic behavior effectively through setting up explicit and specific criteria about output, especially when the general contractor needs to coordinate multiple subcontractors. It supports the curbing role of outcome control (Hypothesis 1a) and the moderating effects of subcontractor dispersion (Hypothesis 2a). Configuration 3 shows that the absence of behavior control is the core condition of more opportunistic behavior with high subcontractor dispersion, which is seemingly

contradictory with Hypothesis 2b since Figure 2 shows that stronger (weaker) behavior control will result in higher (lower) opportunism when subcontractor dispersion is high. But notably, outcome control serves as the peripheral condition in this case. In another word, although weaker behavior control may exert a negative effect on opportunism, a combination of outcome control will weaken its effect or even turn the above effect into a positive one. This finding, combined with the result of Configurations 4-7, implies that it is worth investigating the substitutive or complementary relationship between different control modes, which responds to the recent calls for exploration of the interrelationship between different types of control (Ning 2017a).

Conclusion

This study has explored how the managerial controls used by general contractors affect subcontractors' opportunistic behaviors, and developed a contingency framework to investigate the moderating effect of subcontractor dispersion. Using survey data from 323 general contractors in the Chinese construction industry, this study revealed that the use of outcome control and clan control curbs the occurrence of subcontractors' opportunistic behaviors and that behavior control is unrelated to opportunistic behaviors. Furthermore, subcontractor dispersion, delineating the organizational arrangement of subcontracting, may distinctively impact these relationships. The opportunism-curbing effect of outcome control will be strengthened at a high level of subcontractor dispersion, which is also highlighted by the additional configurational analysis. Behavior control will mitigate subcontractors' opportunistic behaviors in the low level of subcontractor dispersion. The negative relationship between clan control and subcontractors' behaviors will be attenuated with a high level of subcontractor dispersion, leading to a higher frequency of opportunistic behaviors.

Theoretical contributions

This article contributes to the literature on governing opportunism and fills up in the

studies on managerial control in the following ways. First, this study introduces the organizational arrangement of subcontracting as a new perspective to explore how to mitigate opportunistic behaviors. In this way, the current work responds to the call for research to provide more insights into the complex governance processes for opportunism (Heide, Wathne, and Rokkan 2007; Galvin, Tywoniak, and Sutherland 2021). Second, the findings on managerial controls from previous research are inconsistent in terms of their efficacy in governing opportunistic behaviors. This study contributes to reconciling the controversy by investigating the contingent effect of the subcontracting arrangement. Third, this study explores the configurational effect of different managerial control modes, which also provides more nuanced information on mitigating opportunistic behaviors of subcontractors. The findings enhance the previous understanding that the complementary and substitutive relationship among different managerial control modes may change upon the organizational arrangement of subcontracting.

Practical implications

Arising from the ineffectiveness of subcontracting managerial control, subcontractors' opportunistic behavior has plagued general contractors. The findings from this study provide some practical implications to help the general contractor curb subcontractors' opportunistic behaviors, including not only the separate roles of different control modes but the roles of their combinations, as well as their effective application in the contexts of different subcontracting arrangements.

First, more attention should be paid to the use of outcome control, especially when the general contractor hires multiple subcontractors. Subcontractors' opportunism regarding interfaces will be diminished by clarifying the project goals, project scope, and quality standards, and making necessary interpretations to avoid any disagreements which may lead to ambiguity

and deviance from important milestones. Nevertheless, the configurational analyses also remind managers that failure to complement outcome control with moderate behavior control in such situations may breed high opportunism.

Second, this study implies that the general contractor can mitigate subcontractors' opportunistic behaviors by intervening in subcontractors' processes and behaviors more closely when there is a limited number of subcontractors. In such cases, clan control can serve as a complementary way to ensure low opportunism. On the contrary, when the general contractor subcontracts the project to multiple subcontractors, it is cost-saving and effective to select one from close clan control and tight behavior control, instead of deploying both of them.

Third, in consideration of the high volume of investments, clan control is used less than the other two control modes in construction projects. However, the significant and strong inhibitory efforts on subcontractors' opportunistic behavior encourage the general contractor to put more efforts into employing clan control by developing and enhancing the common understanding of the value, task goal, and norms of the project work. Such investments are more worthwhile when subcontracting dispersion is low.

Limitations and future research directions

This article has several limitations that provide avenues for further research. Firstly, this study serves as an exploratory study on the efficacy of and interrelationship between different control modes in dealing with subcontractors' opportunistic behaviors. Factors including market conditions and cultural characteristics may impact the efficacy of managerial control on governing opportunism. For example, in a segmented market lacking competitiveness among subcontractors, the positive relationship between subcontractors' opportunistic behaviors and the level of managerial control might be further enhanced in projects with a dispersed subcontracting

arrangement. In terms of culture, the efficacy of clan control may be more prominent and play a more effective role in the places with collectivism culture, such as China. In addition, different contextual events, such as conflict from goal fuzziness, unclear project requirements, and noncompliance with local regulations, may trigger different interactions between the control modes. Future studies could investigate the substantive or complementary relationship after different events occur.

Secondly, subcontractor dispersion is merely one aspect of the organizational arrangement of subcontracting. Future studies could consider other elements, such as relationship length and contract type, and explore how different combinations of those organizational arrangement elements are best matched with different configurations of managerial control modes. More generally, future studies could incorporate both the external environment (such as legal system, market conditions, and culture) and internal elements within the project organization to explore the efficacy of the control modes in different contexts.

Thirdly, control modes in this study primarily focused on what to control. Recent literature on managerial control puts forward an enactment perspective to consider how the controller interacts with the controlee. Future studies could integrate other concepts, such as control style and control congruence, to probe the relationship between how the managerial control modes are enacted by the general contractor and subcontractors' opportunistic behaviors.

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Table 1. Summary of contingency effects on the opportunism-control relationship

Control mode	Moderator	Reference
Formal/Informal control	National culture (individualism/collectivism)	Handley and Angst (2015)
Formal/Informal control	Uncertainty avoidance	Handley and Angst (2015)
Formal/Informal control	Environment volatility/ambiguity	Carson, Madhok, and Wu (2006)
Formal/Informal control	Technological uncertainty	Mellewigt et al. (2018)
Formal/Informal control	Performance ambiguity	Mellewigt et al. (2018)
Formal control	Demand uncertainty	Huo, Ye, and Zhao (2015)
Formal/Informal control	Asset specificity	Mellewigt et al. (2018)
Formal control	Interdependence between partners	Lu, Zhang, and Zhang (2016)
Informal control	Environment uncertainty	Tse, Wang, and Zhang (2019)
Outcome/Behavior control	Market orientation	Ju et al. (2011)
Outcome/Behavior control	Legal enforceability	Bai, Sheng, and Li (2016)
Outcome/Behavior control	Unilateral government support	Bai et al. (2016)
Outcome/Behavior control	Microlevel social contract	(Heide, Wathne, & Rokkan, 2007)

Table 2. Characteristics of respondents and their projects

Characteristics		Frequency	Percentage (%)
Work experience (Year)	< 3	30	9.29
	3-5	58	17.96
	6-8	66	20.43
	9-11	49	15.17
	> 11	120	37.15
Job position	Project manager	39	12.07
	Contract and business staff	170	52.63
	Legal staff	70	21.67
	Engineer	42	13.00
Project type	Road, bridge, and pipeline	93	28.79
	Housing	50	15.48
	Port and waterway	47	14.55
	Energy development	99	30.65
	Industrial	34	10.53
Contract price (million RMB)	< 30	24	3.72
	30-100	41	7.43
	100-1,000	172	12.69
	1,000-3,000	34	53.25
	> 3,000	52	10.53
Project location	China	157	48.61
	Other countries	166	51.39

Table 3. Measures Reliability and Validity Assessment.

Constructs and Constituent Items	Standardized Factor Loading
Opportunistic behavior (α = 0.914; AVE = 0.683; CR = 0.915)	
1. Subcontractors may incompletely disclose information to us in order to benefit at our expense.	0.792
2. Subcontractors sometimes violate contractual terms and conditions for their own sake.	0.849
3. Subcontractors fail to invest in resources (like human, materials, or equipment) as required by our contract.	0.879
4. Subcontractors will try to take advantage of "holes" in the contract to further their own interests.	0.830
5. Subcontractors sometimes make oral promises without actually doing them later for their own sake.	0.778
Outcome control (α = 0.850; AVE = 0.592; CR = 0.852)	
1. At the project implementation stage, the general contractor established specific and clear performance objectives for subcontractors.	0.807
2. At the project implementation stage, the general contractor continuously monitored the achievement of the objectives set for subcontractors.	0.822
3. At the project implementation stage, the general contractor set a detailed deadline as the basis for monitoring.	0.813
4. At the project implementation stage, the general contractor linked rewards and penalties to the subcontractors to the targets achieved.	0.649
Behavior control (α = 0.879; AVE = 0.650; CR = 0.881)	
1. At the project implementation stage, the general contractor drew up specific and clear procedures to be strictly followed by subcontractors.	0.848
2. At the project implementation stage, the general contractor modified the subcontractors' procedures if the predicted results were not obtained.	0.690
3. At the project implementation stage, the general contractor provided feedback and information to subcontractors about the results of their activities, intending to foster appropriate changes.	0.862
4. At the project implementation stage, the general contractor continuously supervised the implementation plans and the construction schedules of subcontractors.	0.816
Clan control (α = 0.821; AVE = 0.540; CR = 0.824)	
1. The general contractor organized training on values, task goals, and norms for the involved subcontractors.	0.795
2. The general contractor made fine-grained informal communication with the involved subcontractors.	0.790
3. The general contractor placed significant weight on understanding the goals, values, and norms of the subcontractors.	0.774
4. The employees from the general contractor attempted to be a "regular" member of the subcontractor team.	0.608
Subcontractor dispersion (α = 0.811; AVE = 0.605; CR = 0.819)	
1. Compared with other similar projects, this project involved a large number of subcontractors.	0.798
2. Compared with other similar projects, the general contractor segmented this project into many work packages.	0.847
3. Compared with other similar projects, there was a large number of work	0.665

interfaces between subcontractors.

Goodness-of-fit: *$\chi 2$ /df = 1.465; GFI = 0.938; RMSEA = 0.043; TLI = 0.965; CFI = 0.971; IFI = 0.971; NFI = 0.928*

Notes: α = Cronbach's alpha coefficient; AVE = Average variance extracted;
CR = Composite reliability.

Table 4. Means, standard deviations, and correlations

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1.Opportunistic behavior	4.79	1.23	**0.826**								
2.Outcome control	5.35	1.30	-0.28**	**0.769**							
3.Behavior control	5.05	1.44	-0.10	0.42**	**0.806**						
4.Clan control	2.83	1.23	-0.31**	-0.22**	-0.22**	**0.735**					
5.Contract price	3.15	1.07	0.07	0.13*	0.12*	-0.09	**0.778**				
6.Project duration	2.32	0.65	0.12*	0.11*	0.09	-0.09	0.64**	N/A			
7.GC's experience	4.87	1.67	-0.08	0.25**	0.19**	-0.10	0.02	0.01	N/A		
8.Prior collaboration	4.36	2.12	0.02	0.08	0.12*	-0.05	0.18**	0.08	0.31**	N/A	
9.Shadow of future	5.37	1.52	0.01	0.15**	0.16**	-0.11*	0.16**	0.12*	0.18**	0.30**	N/A
10. Ambiguity	3.44	1.84	0.21**	-0.14**	-0.09	-0.15**	0.17**	0.09	-0.22**	-0.01	-0.03

Notes: Boldface signifies that the number is greater than the off-diagonal correlation. N/A means not applicable.
*p < 0.05, **p < 0.01. GC's experience = General contractor's experience, Ambiguity = Performance ambiguity

Table 5. Results of regression analysis

Variables	Subcontractors' opportunistic behavior		
	Model 1	**Model 2**	**Model 3**
Control variables			
Contract price	-0.041	-0.017	-0.035
Project duration	0.270†	0.231†	0.220*
General contractor's experience	-0.041	-0.021	-0.007
Prior collaboration	0.015	0.005	0.012
Shadow of future	-0.040	-0.032	-0.018
Performance ambiguity	0.128***	0.045	0.040
Independent variables			
Outcome control (OC)	—	-0.310***	0.396***
Behavior control (BC)	—	-0.079†	-0.768***
Clan control (CC)	—	-0.448***	-0.567***
Moderating variable			
Subcontractor dispersion (SD)	—	-0.019	-0.205
Interactions			
OC × SD	—	—	-0.163***
BC × SD	—	—	0.178***
CC × SD	—	—	0.059*
R^2	*0.06*	*0.31*	*0.43*
$\triangle R^2$	*0.06*	*0.25*	*0.13*
F	*3.51***	*13.73****	*18.12****

Notes: † <0.100; * p < 0.050; ** p < 0.010; *** p < 0.001. R-squared is the percentage of the dependent variable's variation that a linear model explains. F is the probability that the null hypothesis for the full model is true.

Table 6. Configurations for achieving high or low opportunistic behavior

	High opportunistic behavior			**Low opportunistic behavior**			
	Low subcontractor dispersion	High subcontractor dispersion		Low subcontractor dispersion		High subcontractor dispersion	
Configuration	1	2	3	4	5	6	7
Outcome control		⊗	•	•	•	●	●
Behavior control	●		⊗	⊗	●	●	
Clan control	⊗	⊗		⊗	●		●
Consistency	0.815	0.967	0.742	0.880	0.830	0.790	0.782
Raw coverage	0.515	0.256	0.684	0.432	0.432	0.741	0.701
Unique coverage	0.515	0.100	0.529	0.135	0.135	0.203	0.164
Overall solution consistency	0.815	0.762		0.808		0.737	
Overall solution coverage	0.515	0.785		0.567		0.904	

Notes. Solid circles indicate the required presence of a condition and crossed-out circles indicate its required absence. Large circles refer to core conditions, and small circles refer to peripheral conditions (indicating less strong evidence). Unfilled cells indicate "do not care" conditions.

Figure 1. Research framework

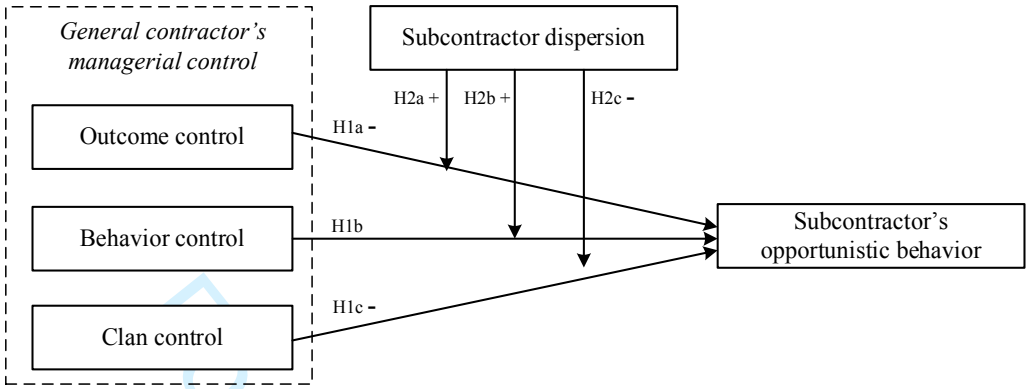

Figure 2. Graphical representation of moderation effects