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# Differentiating two types of learning in contract design: Evidence from the construction industry

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ABSTRACT

This research investigates the learning of inter-organizational contract design in greater depth. Two types of learning, i.e. learning from all past partnerships and learning from one specific partner, are distinguished in terms of their influence on the complexity of three different functions of the contract, namely control, coordination, and adaptation. Contract design capability and interorganizational routines are employed as mediators to explain the two types of learning respectively. Empirical tests using data from the Chinese construction industry reveal that there are significant indirect effects between partner-specific experience and contractual coordination, and between general partnership experience and all the three functions of the contract. This research contributes to the literature by providing more nuanced conclusions regarding the contract learning issue.

## 1. Introduction

It has long been acknowledged that firms can develop various capabilities through experience for superior performance (Kale & Singh, 2007; Levitt & March, 1988; Sampson, 2005; Zollo, Reuer, & Singh, 2002). Whilst the strategic management and organizational literature mainly focus on how firms accumulate and leverage know-how and enhance alliance capability to achieve success, less research has examined learning related to contract design in interorganizational relationships compared with the extensive literature on organizational learning regarding technical knowledge and skills (Lumineau, Fréchet, & Puthod, 2011). The contract serves as a formal governance mechanism and plays an important role in controlling deviant behavior, mitigating potential transaction hazards, and ensuring the realization of organizational performance (Lu, Zhang, & Zhang, 2016; Luo, 2002; Mellewigt, Madhok, & Weibel, 2007; Poppo & Zenger, 2002; Wang, Chen, Wang, & Tang, 2016). Considering that firms tend to absorb prior partnering experience to facilitate contract design (Argyres & Mayer, 2007), this research aims to investigate such processes in more depth from an organizational learning perspective.

The extant literature on contract design learning has investigated the impact of firm's prior partnering experience on contractual complexity, but the scholars seem to have suggested more than straightforward conclusions. Specifically, some studies take the view that prior partnering experience will lower the costs of contracting through learning, leading parties to draft more complex subsequent contracts (Mayer & Argyres, 2004; Mellewigt, Decker, & Eckhard, 2012; Ryall & Sampson, 2009; Xing, Mayer, & Xie, 2015), while some others focus on the reduction of behavior uncertainty and the development of trust through repeated collaboration, drawing a conclusion that subsequent contracts tend to be less complex (Ariño & Reuer, 2005; Reuer & Arino, 2007).

These seemingly contradictory findings lead us to wonder what are the real evolving patterns of contracts given the participants' prior learning experience, and inspired us to conjecture that there might be more complicated considerations underlying the dyadic relationship between prior experience and contractual complexity. On the one hand, many research have categorized prior partnering experience into partner-specific experience (i.e., a firm's specific experience accumulated through repeated collaborations with the same partner) and general partnering experience (i.e., a firm's experience accumulated through collaborations with any partner) (Hoang & Rothaermel, 2005; Gulati, Lavie, & Singh, 2009; Reuer, Zollo, & Singh, 2002; Zollo et al., 2002). These two types of prior experience are worth differentiating because they imply quite different approaches of learning, i.e. learning from all the accumulated knowledge and learning from one specific partner. As addressed in the following parts of this article, the different learning routes yield quite different results on contracts.

On the other hand, regarding the contract as a whole and using a global measurement might neglect the diversity of processes in which

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contracts change with partnering experience. A three-functional perspective of the contract has gradually been recognized by contract researchers, that are control, coordination, and adaptation (Mellewigt et al., 2012). These three functions serve to mitigate different types of interorganizational relationship risks and therefore each of them is affected by different factors.

To briefly sum up, either a mere observation of one of the two partnering experiences, or a lack of a multi-functional view of contract in prior research, may has veiled the complicated patterns of learning in contract design. What a firm can learn from repeated collaborations with a single partner and merge into contract design is assumed to be different from the learning through accumulated knowledge from prior interactions with all partners. Therefore, this study aims to investigate this issue in greater detail by answering the research question: *What effects do partner-specific experience and general partnering experience have on the complexity of contractual control, coordination and adaptation?* To better interpret the mechanisms behind these learning effects and thus render the theoretical arguments empirical testability, two mediators, interorganizational routines and contract design capability are introduced in this research.

This research contributes to the contract design and organizational learning literature by differentiating two types of learning effect on the design of the three dimensions of inter-organizational contracts, which adds more detailed conclusions to the issue that was addressed in a more general way in previous studies. More specifically, this research contributes by showing that different parts of the contract benefit from different approaches of learning from prior experience. Our findings show that the complexity of contractual control benefits from the general partnership experience which enhancing the firm's contract design capability, but not influenced by the partner-specific experience; while the complexity of contractual coordination can be influenced indirectly by the partner-specific experience that promotes the formation of interorganizational routines, but is not influenced by the general partnership experience. Finally, our findings and analysis suggest that the complexity of contractual adaptation tend to be influenced by the transaction's objective characteristics instead of the partner-related factors, as it is neither influenced by the partner-specific experience nor the general partnership experience.

## 2. Theoretical background and hypotheses

### 2.1. Contractual complexity and the three functions of contract

According to transaction cost economics (TCE), economizing of transaction costs is a main concern in the selection of governance structures (Williamson, 1985). The balance of ex-ante and ex-post transaction costs is required when designing a contract (Benaroch, Lichtenstein, & Fink, 2016). Except for the common practice of choosing the contracting form from several alternatives such as market, hierarchy and other collaborative agreements (Gulati & Singh, 1998; Williamson, 1985), a more specific way to achieve such balance is reflected in the continuous change in contractual complexity (Mellewigt et al., 2012), namely the design feature of the contract agreements which represents the degree of explicitness and elaborateness of level of details. In recent years, the multiple functions of the contract have been addressed by scholars (Lumineau & Malhotra, 2011; Mayer & Argyres, 2004; Reuer & Arino, 2007). Mellewigt et al. (2012) present a three-functional perspective of the contract on the basis of a comprehensive literature review. This framework has its roots in the main threats that inter-firm relationships face: relational risk and performance risk (Das & Teng, 1996). Different transaction attributes arouse different risks, which appeal to corresponding contractual functions to deal with. With regard to relational risk that is primarily caused by asset specificity, contracts can serve as a mandatory controlling means of easing appropriation concerns (Ryall & Sampson, 2009). Performance risk originating from task interdependence and task complexity brings about coordination concerns, thus contracts also need to work as a coordination device (Vanneste & Puranam, 2010) that helps partners to achieve mutual goals. Performance risk related to transaction instability requires contracts to relieve adaptation concerns over unanticipated contingencies (Schepker, Oh, Martynov, & Poppo, 2014).

## 3. Partnering experience and contractual complexity

### 3.1. The effects of partner-specific experience on contractual complexity

TCE considers humans to be opportunistic in nature, so any transactions involving specific assets need a contract to safeguard investments and property against misappropriation (Williamson, 1985). Does this contractual function change significantly with partner-specific experience? Some studies argue that trust emerging from successive collaborative relationships may substitute for formal safeguards in contracts (Reuer & Arino, 2007). However in practice, both sides in a transaction, as independent parties with potential conflicts of interest, will not remove the extant control provisions from contracts despite a higher level of trust. Zollo et al. (2002) illustrate this point with Hewlett Packard who had many alliances with a particular partner but never believed the partner would relinquish opportunism. Even with a prior relationship, it is risky to take for granted that the counterparty will not practice opportunism. Contractual control provisions must not be taken out of the contract. They can act as a warning even if they might not be implemented. Hence, the complexity of contractual control is unlikely to be reduced due to a prior relationship; otherwise more ex-post problems may arise.

On the other hand, partner-specific experience will not bring about more contractual control provisions either. Provisions of this type often serve as boilerplates, not partner-oriented (Wang, Chen, Fu, & Zhang, 2017). It's difficult to increase the capacity of enriching these specifications by an insufficient learning from a limited number of transactions with the same partner. Moreover, excessively detailed safeguarding provisions may be deemed as a signal of distrust, impeding interfirm relationships (Gulati, 1995; Macaulay, 1963). Therefore, it is suggested that partner-specific experience has little influence over contractual control clauses and the following hypothesis is developed:

**Hypothesis 1a.** Partner-specific experience is unrelated to the complexity of contractual control.

Now that task interdependence may cause performance risk in complex transactions, establishing powerful communication and coordination mechanisms by the contract will reduce this hazard. For example, the contract can specify the scope of works, task descriptions, and how to conduct regular communications, all of which can help reduce ambiguity and information asymmetry. Prior interactions between the parties will deepen their understanding of the counterparty's personnel, technical capacity, management style and communication methods (Reuer & Arino, 2007). As a result, they can integrate their knowledge about their partner into the current contract in order to achieve a better cooperation performance (Poppo & Zenger, 2002; Ryall & Sampson, 2009). Although some of this kind of knowledge is universal to interactions with any partner, a substantial part of it is specific to the focal partner. The cost of adding more coordination terms to the contract is likely to decrease due to familiarity fostered through repeated interactions. Therefore, the following hypothesis is developed:

**Hypothesis 1b.** Partner-specific experience is positively associated with the complexity of contractual coordination.

Compared with contractual control and coordination, contractual adaptation has been less investigated in the literature so far. Adaptation provisions are needed for planning in advance in case of unanticipated contingencies and external disturbances (Ariño & Reuer, 2005; Luo, 2002). However, the parties cannot conceive of all possible future contingencies so they can only restrictedly rely on the capacity of

contracts to foresee the potential risks (Mellewigt et al., 2012). It is especially difficult to draw up new clauses to deal with unanticipated contingencies just relying on previous experience with a partner. From this type of experience, firms cannot acquire adequate information and knowledge on more transaction attributes since learning is constrained within the specific range of previous experience (Levinthal & March, 1993). Similar to contractual control, complexity of contractual adaptation will not significantly increase with prior interactions between two firms. Mayer and Bercovitz (2008) also suggest that prior relationships can create interorganizational inertia, which makes firms render the same level of contingency planning in subsequent contracts as that in previous contracts. Such inertia is likely to be a result of balancing ex-ante contracting cost and expected benefits, as drafting extra adaptation provisions are costly and time-consuming. Therefore, the following hypothesis is developed:

**Hypothesis 1c.** Partner-specific experience is unrelated to the complexity of contractual adaptation.

### 3.2. The mediating role of interorganizational routines

During repeated exchanges, partners will develop tacit understanding and fixed processes. Consequently, some stable and recurring patterns of interaction involved in performing collaborative tasks are formed, namely interorganizational routines (Feldman & Rafaeli, 2002; Zollo et al., 2002). These routines extract lessons from the past, making it possible to avoid reinventing the wheel and making repeated mistakes (Gittell & Weiss, 2004; Levitt & March, 1988). Note that this interorganizational routine is different from the coordination routine used in the alliance management capability literature to describe an aspect of firm's capacity to manager all their strategic alliances (Schilke & Goerzen, 2010). This interorganizational routine focuses on firm's patterns of performing tasks with a specific partner, and thus is embedded in a specific dyadic interorganizational relationship.

Compared to other types of firm experience, partner-specific experience is the very trajectory which leads to the development of dyadic interorganizational routines (García-Canal, Valdés-Llaneza, & Sánchez-Lorda, 2014; Hoang & Rothaermel, 2005; Zollo et al., 2002). Through repeated interactions, partners acquire specific knowledge about the counterparty's organizational structure and management systems as well as the capabilities of the personnel (Luo, 2002), thereby constituting common performative and ostensive aspects and creating routines (Dionysiou & Tsoukas, 2013). Therefore, the following hypothesis is developed:

**Hypothesis 2.** Partner-specific experience is positively associated with interorganizational routines.

The formation of interorganizational routines can facilitate communication and coordination in return (Zheng & Yang, 2015), enabling partners to build shared meanings (Feldman & Rafaeli, 2002) and create a mutual understanding of how to fit each other's task into the overall work flow (Gittell & Weiss, 2004). With the help of routines, firms can incorporate the ways they interact with each other into contracts to minimize the emergence of potential problems (Park & Kang, 2013). In other words, the costs of designing coordination clauses will decrease considerably with prior experience, making contractual coordination terms more enriched. Therefore, the following hypothesis is developed:

**Hypothesis 3.** Interorganizational routines is positively associated with the complexity of contractual coordination. Thus, interorganizational routines mediate the relationship between partner-specific experience and the complexity of contractual coordination.

### 3.3. The effects of general partnering experience on contractual complexity

General partnering experience represents a firm's total partnering experience, but it tends to be overlooked in the literature, and is often considered to be less beneficial compared to partner-specific experience (Gulati et al., 2009; Mayer & Argyres, 2004). Partner-specific experience makes a great contribution to improving a firm's capability to create value in future collaborations, due to the cumulative benefits from a long-term cooperative relationship between the partners (Gulati et al., 2009). However, in contrast to value creation, contract design is not necessarily related to the dyadic relationship. Contract design is embedded in a continuous learning process in which the firm's own knowledge from past experience matters a lot. Knowledge management in organizations mainly includes creation, retention, and transfer (Argote, McEvily, & Reagans, 2003). As for contract design, the major learning occurs in knowledge retention, i.e., the problems and solutions identified and summarized from previous contracting experience could be incorporated into the contracts that serve as persistent repositories.

While the complexity of contractual control is not assumed to be affected by partner-specific experience, a firm's general partnering experience may offer an explanation for such a cumulative effect. The more transactions a firm has completed, the more opportunistic behavior it may have encountered. Effective means to prevent undesirable behavior will be deposited into the bank of contract. Therefore, the contracts are more likely to include safeguarding clauses when a firm has collaborated with many different partners (Ryall & Sampson, 2009).

Referring to contractual coordination, general partnering experience also has an incremental influence. After engaging in plenty of exchanges with various partners, a firm gets to know the structural features and operating styles of different organizations during the processes of contacting with their business partners. With the accumulation of general partnering experience, more detailed stipulations regarding coordination and effective ways of communication are likely to be involved in the contract.

Similarly, contract design of contingency adaptation can benefit from this type of partnering experience. Contracts often play the role of knowledge repositories (Mayer & Argyres, 2004). Compared with partner-specific experience, general partnering experience provides opportunities to run into different unexpected conditions. Generally speaking, most contingencies are related to the change of tasks and external environment rather than partners. Therefore, the previously encountered contingencies with any partner can be used as reference in a new contracting relationship, adding to the complexity of contractual adaptation.

All in all, a firm can learn from its partnering experience with all the partners in similar transactions. By taking account the problems met before, a firm will devise a more inclusive and detailed contract in the subsequent transaction with low contract design cost. Based on the above reasoning, the following hypotheses are developed:

**Hypothesis 4a.** General partnering experience is positively associated with the complexity of contractual control.

**Hypothesis 4b.** General partnering experience is positively associated with the complexity of contractual coordination.

**Hypothesis 4c.** General partnering experience is positively associated with the complexity of contractual adaptation.

### 3.4. The mediating role of contract design capability

Under the effect of learning-by-doing, firms are able to acquire their capabilities over time. Nonetheless, they are faced with trade-offs when allocating limited physical and time resources to alternative capabilities (Ethiraj, Kale, Krishnan, & Singh, 2005), thus only the most cost-efficient ones will be chosen. Accumulated partnering experience could promote a firm's capability in many aspects and create more value in a current exchange (Dyer & Singh, 1998; Kale & Singh, 2007). In particular, as firms' knowledge accumulation is influenced by exchange experience (Zollo et al., 2002), the capability to amend existing

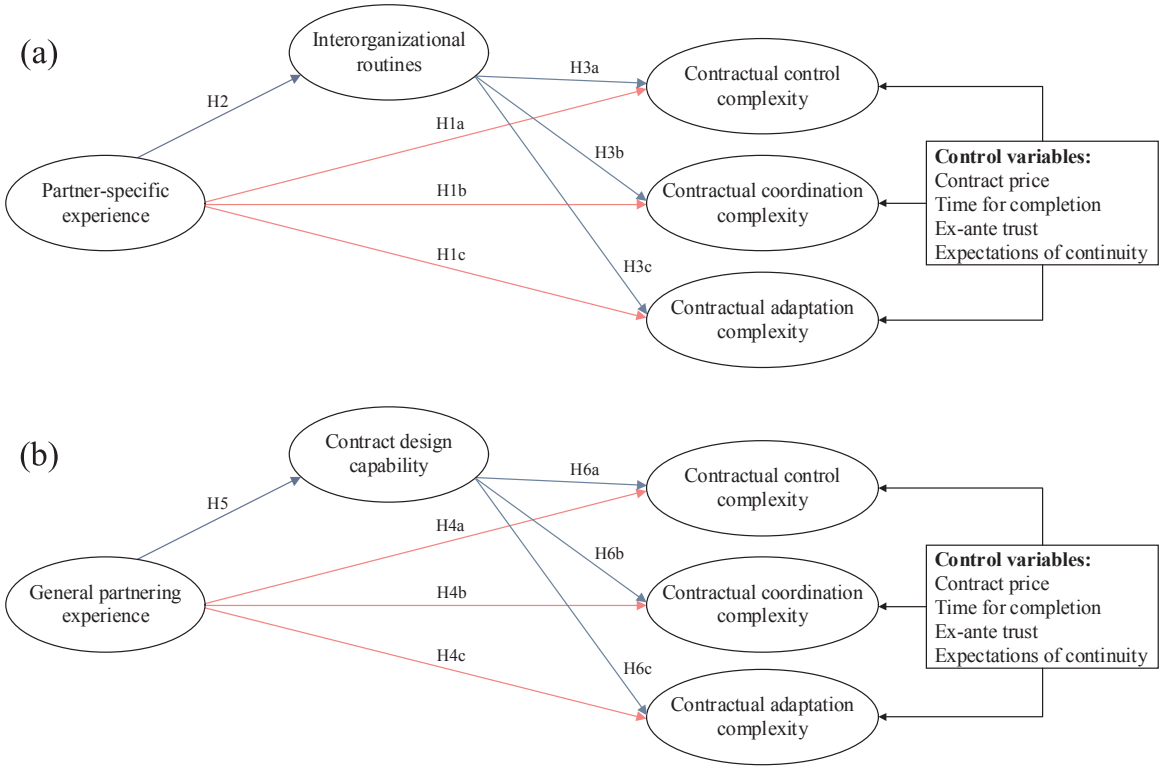


**Fig. 1.** Research framework.

contracts is enhanced (Reuer et al., 2002). Firms tend to embody the relevant knowledge they learn in subsequent contracts rather than other informal ways of governance, because contracts have always been the core governance means and main repository of learning (Mayer & Argyres, 2004). As a firm experiences more extensive interactions with any partner, its capability of foreseeing potential problems in the stage of contracting will be enhanced and it is aware of a diverse variety of conditions that need to be specified in the contract. When a firm designs a new contract, it tends to look back to the earlier transactions. The previously obtained information and knowledge can be used as reference because the experience gained from other relationships can also help in the focal contract (Hoang & Rothaermel, 2005). The accumulated experience helps the firm to pay more attention to issues prone to disputes in both business part and technology part, and know how to avoid the undesired situations by refining contract provisions in advance. Consequently, less cost is incurred to promote the capability involved in contract design.

**Hypothesis 5.** General partnering experience is positively associated with contract design capability.

Contract design capability could have an influence on firms' contract design choices, but prior studies haven't investigated this sufficiently (Argyres & Mayer, 2007). This capability helps firms better arrange the appropriate volumes and categories of clauses in a contract (Argyres & Mayer, 2007). Faced with relational risk aroused by idiosyncratic investment in a transaction, a firm with greater contract design capability knows better how to prevent partners' opportunistic behavior through detailed contract provisions, such as more specific stipulations about the division of the rights, routine supervision process, and breaches and penalty clauses. Even in the worst case, when a transaction turns into early termination, the contract will provide both parties legal basis for rights and interests protection, as long as the party awarding the contract has the capability of anticipating such situations. In this way, the complexity of contractual control is increased.

For designing a contract mitigating performance risk in a transaction derived from task interdependence and task complexity, interorganizational routines developed during partner-specific experience is the most helpful. Nonetheless, there could also be some general experience in coordinating which applies to different partners. Previous experience with any partner informs the firms of common communication barriers to a contractual relationship, making it easier to acquire capability of conduct effective communication across organizational boundaries through a contract containing more detailed coordination clauses. As a result, the complexity of contractual coordination is very likely to be increased.

Contract design capability also helps deal with performance risk related to future uncertainty. It enables a firm to take the contingencies that were met before into account in future transactions. Therefore, the party issuing the contract will be more knowledgeable in drafting detailed contract terms about how to respond to contingency adaptation, leading to more complex contractual adaptation provisions.

Different from interorganizational routines, trust and other social ties in a certain dyadic relationship, contract design capability can be enhanced by partnering experience with any partner and be used to modify the contracts in any contracting relationship. A firm can learn from general partnering experience and make subsequent contracts more capable to cope with transaction hazards without incurring high ex-ante contract design costs. Therefore, the following hypotheses are developed:

**Hypothesis 6a.** Contract design capability is positively associated with the complexity of contractual control. Thus, contract design capability mediates the relationship between general partnering experience and the complexity of contractual control.

**Hypothesis 6b.** Contract design capability is positively associated with the complexity of contractual coordination. Thus, contract design capability mediates the relationship between general partnering experience and the complexity of contractual coordination.

**Hypothesis 6c.** Contract design capability is positively associated with the complexity of contractual adaptation. Thus, contract design

capability mediates the relationship between general partnering experience and the complexity of contractual adaptation. Fig. 1 depicts the research framework.

## 4. Methods

### 4.1. Sample and data collection

This research used a questionnaire survey to collect data from Chinese companies in the construction industry. A pilot test using semi-structured, in-depth interviews with three professors and 11 managers who specialize in contract management was conducted. Each interview lasted about an hour. The interviews helped to ascertain the face validity of the measurement and helped to refine the constructs.

The data collection process lasted about two months. Alumni who majored in and engaged in contract management were contacted to participate in the survey. Snowball sampling was also adopted to collect more qualified questionnaires. Note that the party who issues the contract dominates contract design because it plays the role of "system integrator" and knows how to formalize the knowledge generated in projects (Cacciatori, Tamoschus, & Grabher, 2012). Therefore, we collect data only from the party issuing the contract (i.e., the employer for the main contract of the project or the contractor for a subcontract). In total, 362 informants from different projects responded to the electronic questionnaire, and 295 valid questionnaires were obtained. To ensure the quality of the dataset, responses completed in less than 240 s were eliminated, resulting in 262 valid questionnaires as the final sample.

As Table 1 shows, more than half of the respondents have work experience of over 9 years, and the respondents with 3–5 years and 6–8 years of work experience account for 17.6% and 16.4% respectively, which indicates that respondents have a good understanding of their work content and are able to make accurate judgments. The projects include housing, road and bridge, port and waterway, water conservancy, municipal engineering, energy, telecommunication, industrial projects, etc., covering almost all types of construction projects.

**Table 1**
Characteristics of respondents and their projects.

| Range | Frequency | % |
|---|---|---|
| **Work experience** | | |
| < 3 years | 22 | 8.4 |
| 3-5 years | 46 | 17.6 |
| 6-8 years | 43 | 16.4 |
| 9-11 years | 56 | 21.4 |
| > 11 years | 95 | 36.3 |
| **Job position** | | |
| Project / Department manager | 65 | 24.8 |
| Contract manager | 101 | 38.5 |
| Staff at the headquarters | 57 | 21.8 |
| Others | 39 | 14.9 |
| **Contract price** | | |
| < RMB 30,000,000 (i.e., < USD 4,347,300) | 49 | 18.7 |
| RMB 30,000,000 to 100,000,000 (i.e., USD 4,347,300 to 14,490,900) | 65 | 24.8 |
| RMB 100,000,001 to 1,000,000,000 (i.e., USD 14,490,900 to 144,909,000) | 112 | 42.7 |
| RMB 1,000,000,001 to 3,000,000,000 (i.e., USD 144,909,000 to 434,725,900) | 26 | 9.9 |
| > RMB 3,000,000,001 (i.e., > USD 434,725,900) | 10 | 3.8 |

Note: The currency exchange rate for RMB-USD was 0.1450 on March 3rd, 2017.

## 5. Measures

### 5.1. Dependent variable: contractual complexity

We used the 13-item scale developed by Wang, Chen, Zhang, and Wang, (2018) to measure the three dimensions of contractual complexity. This scale is particularly developed for construction contracts, which is suitable for this research as the empirical context is also the construction sector.

### 5.2. Independent variable: partnering experience

In line with Zollo et al. (2002), *partner-specific experience* was measured by the number of projects that the respondent's firm has completed with the focal partner before contracting for the focal project. *General partnering experience* was measured by the number of projects of similar type that the respondent's firm has completed with any partner before contracting for the focal project. Considering that answering this question requires thought and time, the item was transformed from blank-filling into a multiple-choice one. According to the interviews with five experienced project managers and contract managers in the construction industry, the choices given for partner-specific experience included "0″, "1″, "2-3″, "4-5″, "6-7″, and "more than 7″, successively taking a value of 1, 2, 3, 4, 5 and 6; the choices given for general partnering experience included "3 or less", "4-10″, "11-20″, and "more than 20″, successively taking a value of 1, 2, 3 and 4.

### 5.3. Mediating variables: interorganizational routines and contract design capability

Although there is no lack of discussion on the concept of *interorganizational routines* in the literature, scarcely any direct operationalization could be found. In some studies, alliance experience is used as a proxy of this construct (Park & Kang, 2013), but in this paper, interorganizational routines are perceived as products of prior experience. Therefore, we should measure the construct directly instead of treating it as being correlated with prior experience for granted. Based on the definition given by Zollo et al. (2002) and Feldman and Rafaeli (2002), the authors interviewed ten project managers and contract managers to gain their reflections on the "stable and recurring patterns of interaction involved in performing collaborative tasks". The three most frequently mentioned reflections were employed to generate the measure items to reflect the recurring patterns of interaction between the two parties involved in the project: (1) fixed work procedures, (2) effective ways of communication had been formed between the parties for similar projects before the focal collaboration, and (3) the handbook and program document used in prior collaborations between the parties would continue to be used in the focal project. Reliability and validity of this three-item measure are examined and reported in the next section.

Based on the major aspects of contract design by Argyres and Mayer (2007), as well as the interviews with sophisticated project and contract managers, the authors also generated three items to form a seven-point Likert scale to value the *contract design capability* of the respondent's firm (i.e. the party issuing the contract). The first two items focused on the firms' capability in terms of technology and law and business negotiation, since contracts for construction projects usually consist of two aspects: a commercial part and a technical part. Furthermore, firms with higher contract design capability will take more incidents that might happen in the future into account and incorporate them into the contract, which was measured by the third item. Reliability and validity tests are reported later.

### 5.4. Control variables

Four control variables were considered in order to eliminate

potential interference with the model. First, *contract price* and *time for completion* were controlled for since these two variables reflect project size which is likely to influence contractual complexity (Benaroch et al., 2016). With regards to contract price, values from 1 to 5 represent five levels, as shown in Table 1. Time for completion has values of 1 (less than 1year), 2 (1 to 3 years), or 3 (more than 3 years).

Second, *expectations of continuity* were controlled for (Poppo, Zhou, & Ryu, 2008) because the shadow of the future is related to prior relationship and it may affect contract design. It is measured by the possibility of repeated transactions between the focal partners in the future.

Third, *ex-ante trust* needs to be controlled for because prior relationships between partners may build trust (Gulati, 1995), and may influence the parties' decision of which provisions to be included in the contract (Malhotra & Lumineau, 2011; Mellewigt et al., 2007). In accordance with Jiang, Li, Gao, Bao, and Jiang, (2013), three seven-point Likert items were adopted to measure the level of trust between the partners at the first formal contact for the focal project.

### 5.5. Common method variance

In order to reduce the common method variance, the respondents were informed that there was no standard answer for each question in the questionnaire and their responses would be confidential, only to be used in academic research (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Harman's one-factor test was conducted to test for common method bias. All items in the study underwent a confirmatory factor analysis (CFA) to verify whether the majority of the variance could be accounted for by one general factor. The model fit indices were $\chi^2$ / df = 10.229 > 3, GFI = 0.561 < 0.9, RMSEA = 0.188 > 0.05, TLI = 0.298 < 0.9, CFI = 0.356 < 0.9. The results show that several distinct factors related to all the variables, indicating that common method bias is not a significant problem in the research.

### 5.6. Construct reliability and validity

To assess the reliability of items, internal consistency was tested using SPSS. As Table 2 shows, all values of Cronbach's alpha for multiple reflective indictors were more than 0.7 (ranging from 0.733 to 0.987), indicating that the measurement items have sufficient internal consistency and reliability.

A CFA using AMOS was conducted to examine the validity of the constructs. The results are shown in Table 2, e.g., $\chi^2$ / df = 1.874, GFI = 0.891, RMSEA = 0.058, TLI = 0.944, CFI = 0.953, IFI = 0.953, indicating a satisfactory model-data fit. To estimate the convergent validity, composite reliability (CR) and average variance extracted (AVE) were examined. Table 2 shows that all values of CR of these constructs were more than 0.7 (ranging from 0.770 to 0.987), and all AVEs were more than, or very close to, the 0.5 benchmark (only the AVE of contractual coordination equaled 0.485, slightly below 0.5), suggesting acceptable convergent validity. Additionally, we assessed the discriminant validity of the measures by comparing the square root of AVE for each construct and the correlations with other constructs (Fornell & Larcker, 1981). As shown in Table 3, the square roots of AVEs in diagonals exceed their inter-correlations (the off-diagonal elements), providing evidence of discriminant validity.

## 6. Results

### 6.1. Basic hypothesis analyses

Hierarchical multiple regression using SPSS software was applied to test the impact of partnering experience on contractual complexity, interorganizational routines and contract design capability. The values of variance inflation factors (VIF) for all the regression equations were well below the benchmark of 10 (ranging from 1.045 to 3.097). Thus, multicollinearity was not an issue.

As Table 4 shows, contract price, time for completion, expectations of continuity and ex-ante trust were entered into each model to control for their effects. Then, the independent variables were added into Model 1, 3 and 5 to examine the association between two types of partnering experience and contractual complexity. Model 7 and Model 8 show the effects of partnering experience on interorganizational routines and contract design capability.

As shown in Model 1, partner-specific experience ($\beta = -0.009$, $p > 0.05$) does not have significant effect on contractual control, while general partnering experience ($\beta = 0.129$, $p < 0.05$) does, supporting H1a and H4a. In Model 3, partner-specific experience ($\beta = 0.133$, $p < 0.05$) is shown to exert an influence on contractual coordination, but general partnering experience ($\beta = 0.058$, $p > 0.05$) does not, indicating that H1b is supported but that H4b is rejected. Model 5 shows that neither partner-specific experience ($\beta = -0.008$, $p > 0.05$) nor general partnering experience ($\beta = 0.085$, $p > 0.05$) has a significant effect on contractual adaptation, thus H1c is supported but H4c is rejected.

In Model 7, partner-specific experience ($\beta = 0.795$, $p < 0.001$) is positively associated with interorganizational routines. In Model 8, general partnering experience ($\beta = 0.157$, $p < 0.05$) is positively associated with contract design capability. Hence, H2 and H5 are supported.

### 6.2. Mediation hypothesis analyses

To test for mediation, both the causal steps approach (Baron & Kenny, 1986) and bootstrapping (Hayes, 2009) were adopted and analyzed as follows.

First, following the procedure of the causal steps approach, mediation is supported if (1) the coefficient between the independent variable and the dependent variable is significant (Model 1, 3 and 5), (2) the coefficient between the independent variable and mediator is significant (Model 2), and (3) the coefficient between the mediator and the dependent variable is significant when both the independent variable and mediator are counted as antecedents of the dependent variable, but the coefficient between the independent variable and the dependent variable is lower or no longer significant (Model 2, 4 and 6). The results in Section 4.1 meet the criterion of step 1 and step 2 for H3 and H6a. Based on that, Model 2 demonstrates that contract design capability ($\beta = 0.394$, $p < 0.001$) plays a mediating role in the relationship between general partnering experience and contractual control, supporting H6a, and Model 4 shows that interorganizational routines ($\beta = 0.264$, $p < 0.01$) mediate the relationship between partner-specific experience and contractual coordination, supporting H3.

However, because the direct effect of general partnering experience on contractual coordination and adaptation is not significant, the mediating effect of general partnering experience cannot be verified by the causal steps approach. Therefore, H6b and H6c require further verification.

Next, bootstrapping based on the Sobel test was conducted to verify the existence of indirect effects (Hayes, 2009). As illustrated in Table 5, there is a significant specific indirect effect of partner-specific experience on contractual coordination through interorganizational routines ($z = 3.4850$, $p < 0.001$), and the specific indirect effect of general partnering experience on contractual control ($z = 2.6841$, $p < 0.01$), contractual coordination ($z = 2.7015$, $p < 0.01$) and contractual adaptation ($z = 2.2605$, $p < 0.05$) through contract design capability is significant as well. Thus, H3, H6a, H6b and H6c are supported. Of particular note are H6b and H6c. In the absence of a main effect of general partnering experience on contractual coordination and adaptation, the results of bootstrapping indicate that general partnering experience can exert an indirect effect on contractual coordination and adaptation through contract design capability, explicable as one of

**Table 2**
Measures Reliability and Validity Assessment.

| Construct and Measuring Items | SFL |
|---|---|
| **Partner-specific experience** | – |
| Before contracting for this project, how many projects has your firm completed with the focal partner? | |
| **General partnering experience** | – |
| Before contracting for this project, how many projects of similar type has your firm completed with any partner? | |
| **Contractual control** (α = 0.793; AVE = 0.510; CR = 0.804) | |
| 1. The contract defines the rights of both parties specifically. | 0.731 |
| 2. The contract specifically stipulates how the party awarding the contract monitors the contractor. | 0.799 |
| 3. The contract specifically stipulates the rights entitled to one party when the other party breaches the contract. | 0.729 |
| 4. The contract specifically stipulates provisions on early termination after breaching the contract. | 0.578 |
| **Contractual coordination** (α = 0.814; AVE = 0.485; CR = 0.825) | |
| 1. The contract specifically stipulates how the parties send written documents (such as letters, periodical reports and e-mails). | 0.682 |
| 2. The contract provides detailed technical specifications and drawings. | 0.655 |
| 3. The contract specifically stipulates the quality acceptance procedures. | 0.751 |
| 4. The contract specifically stipulates the personnel qualifications or dispatching issues. | 0.716 |
| 5. The contract defines the division of labor of both parties specifically. | 0.675 |
| **Contractual adaptation** (α = 0.806; AVE = 0.551; CR = 0.822) | |
| 1. The contract specifically stipulates the adjustments due to the changes in cost. | 0.504 |
| 2. The contract specifically stipulates the adjustments due to the changes in exchange rates. | 0.578 |
| 3. The contract specifically stipulates the handling procedures when geological conditions, against which an experienced contractor could not reasonably be expected to react, arise. | 0.882 |
| 4. The contract specifically stipulates the handling procedures when climatic conditions, against which an experienced contractor could not reasonably be expected to react, arise. | 0.916 |
| **Interorganizational routines** (α = 0.987; AVE = 0.961; CR = 0.987) | |
| 1. Before the focal collaboration, fixed work procedures have been formed between the parties for similar projects. | 0.987 |
| 2. Before the focal collaboration, effective ways of communication have been formed between the parties for similar projects. | 0.989 |
| 3. The handbook and program document used in prior collaborations between the parties would continue to be used in the focal project. | 0.965 |
| **Contract design capability** (α = 0.763; AVE = 0.528; CR = 0.770) | |
| 1. Your firm has a strong professional capability in terms of technology for this project. | 0.659 |
| 2. Your firm has a strong law and business negotiation capability for this project. | 0.704 |
| 3. Your firm knows the issues which need attention in the future contract executing stage very well. | 0.810 |
| **Expectations of continuity** | |
| When contracting for this project, we expect to have further cooperation with this partner in the future. | |
| **Ex-ante trust** (α = 0.733; AVE = 0.557; CR = 0.780) | |
| 1. The parties thought each other to be trustworthy at the first formal contact for this project. | 0.734 |
| 2. The parties thought each other to be honest at the first formal contact for this project. | 0.942 |
| 3. The parties believed that each party will make decisions for the other party's sake at the first formal contact for this project. | 0.495 |
| Goodness-of-fit: $\chi 2$ / df = 1.874, GFI = 0.891, AGFI = 0.858, RMSEA = 0.058, TLI = 0.944, CFI = 0.953, IFI = 0.953 | |

Note: SFL = standardized factor loading; α = Cronbach's alpha; AVE = average variance extracted; CR = composite reliability.

many different paths of influence.

### 6.3. Robustness check

To further examine whether the results drawn from the multiple hierarchical regression are robust, the authors employed the structural equation modelling (SEM) technic to conduct a double check using AMOS 17.0 statistic package. Fig. 2 shows the structural model and the path coefficients. Indirect, direct, and total effects of the potential mediation relationships are examined based on a 2000-time bootstrapping, and the results are shown in Table 6.

It can be seen that the estimation results of SEM and multiple hierarchical regression are highly consistent except for the total effect of partner-specific experience on contractual coordination. A closer look at the difference reveals that the significant main effect between partner-specific experience and coordination in the multiple hierarchical regression is actually rather weak (β = 0.133; $p < 0.05$). Taking together with the estimation results from the SEM, the main effect of partner-specific experience on contractual coordination is treated as positive but not so significant. Therefore, H1b is partially supported.

**Table 3**
Means, standard deviations, and correlations.

| Variable | Mean | S.D. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Partner-specific experience | 1.851 | 1.594 | – | | | | | | | | | | |
| 2. General experience | 2.443 | 1.220 | 0.274** | – | | | | | | | | | |
| 3. Contractual control | 5.663 | 0.803 | 0.032 | 0.134* | **0.714** | | | | | | | | |
| 4. Contractual coordination | 5.346 | 1.016 | 0.133* | 0.095 | 0.596** | **0.696** | | | | | | | |
| 5. Contractual adaptation | 4.344 | 1.445 | 0.016 | 0.088 | 0.413** | 0.590** | **0.742** | | | | | | |
| 6. Interorganizational routines | 2.575 | 3.896 | 0.795** | 0.191** | 0.119 | 0.235** | 0.091 | **0.980** | | | | | |
| 7. Contract design capability | 5.129 | 1.030 | 0.160** | 0.192** | 0.472** | 0.483** | 0.279** | 0.202** | **0.727** | | | | |
| 8. Contract price | 2.553 | 1.026 | −0.060 | 0.006 | 0.128* | 0.185** | 0.242** | −0.116* | 0.059 | – | | | |
| 9. Time for completion | 1.985 | 0.606 | 0.057 | 0.061 | 0.133* | 0.121* | 0.126* | 0.040 | 0.036 | 0.593** | – | | |
| 10. Ex-ante trust | 5.172 | 0.941 | 0.052 | 0.022 | 0.360** | 0.347** | 0.174** | 0.109 | 0.266** | 0.086 | 0.105 | **0.746** | |
| 11. Expectations of continuity | 3.157 | 0.627 | 0.411** | 0.129* | 0.059 | 0.092 | 0.083 | 0.318** | 0.192** | 0.097 | 0.067 | 0.184** | – |

Note: Boldface signifies that the values are greater than the off-diagonal correlations.
* $p < .05$; ** $p < .01$.

**Table 4**
Results of regression analysis.

| | Contractual control | | Contractual coordination | | Contractual adaptation | | Interorganizational routines | Contract design capability |
|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
| *Control variables* | | | | | | | | |
| Contract price | 0.071 | 0.063 | 0.190** | 0.194** | 0.253** | 0.261*** | −0.104* | 0.059 |
| Time for completion | 0.049 | 0.059 | −0.035 | −0.031 | −0.046 | −0.047 | 0.051 | −0.045 |
| Expectations of continuity | −0.028 | −0.064 | −0.048 | −0.082 | 0.025 | 0.006 | −0.011 | 0.095 |
| Ex-ante trust | 0.352*** | 0.246*** | 0.335*** | 0.221*** | 0.151* | 0.082 | 0.074 | 0.241*** |
| *Independent variables* | | | | | | | | |
| Partner-specific experience | −0.009 | −0.153 | 0.133* | −0.105 | −0.008 | −0.188 | 0.795*** | 0.071 |
| General partnering experience | 0.129* | 0.071 | 0.058 | 0.004 | 0.085 | 0.057 | −0.029 | 0.157* |
| *Mediating variables* | | | | | | | | |
| Interorganizational routines | | 0.146 | | 0.264** | | 0.207* | | |
| Contract design capability | | 0.394*** | | 0.392*** | | 0.220** | | |
| $R^2$ | 0.158 | 0.309 | 0.166 | 0.339 | 0.091 | 0.155 | 0.645 | 0.126 |
| $\triangle R^2$ | 0.016 | 0.167 | 0.021 | 0.194 | 0.007 | 0.070 | 0.502 | 0.033 |
| F | 7.964*** | 14.118*** | 8.452*** | 16.207*** | 4.260*** | 5.782*** | 77.156*** | 6.142*** |
| $\triangle F$ | 2.405 | 15.251*** | 3.189* | 18.542*** | 0.964 | 5.262*** | 180.144*** | 4.834** |

Note: * p < .05; ** p < .01; *** p < .001.

**Table 5**
Results of bootstrapping analysis.

| Hypotheses | IV | DV | M | Indirect effect of IV on DV through M | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Bias corrected confidence intervals | | |
| | | | | Effect | Boot SE | Lower | Upper | z |
| H3 | PSE | CN | IR | 0.1670 | 0.0483 | 0.0743 | 0.2658 | 3.4850*** |
| H6a | GPE | CL | CDC | 0.0458 | 0.0176 | 0.0151 | 0.0849 | 2.6841** |
| H6b | GPE | CN | CDC | 0.0603 | 0.0235 | 0.0182 | 0.1116 | 2.7015** |
| H6c | GPE | CA | CDC | 0.0479 | 0.0237 | 0.0128 | 0.1093 | 2.2605* |

Note: PSE: partner-specific experience; GPE: general partnering experience; CL: contractual control; CN: contractual coordination; CA: contractual adaptation; IR: interorganizational routines; CDC: contract design capability.
SE: standard error.
* p < .05; ** p < .01; *** p < .001.

**Table 6**
Estimation results of the indirect, direct, and total effects.

| Path | Indirect effect | Direct effect | Total Effect |
|---|---|---|---|
| PSE → routines → coordination | **.125**** | −.067 | .058 |
| GPE → routines → control | **.082**** | .006 | **.090*** |
| GPE → routines → coordination | **.148**** | −.067 | .087 |
| GPE → routines → adaptation | **.086**** | −.039 | .074 |

Note: PSE = partner-specific experience; GPE = General partnership experience; ** = p < 0.01; * = p < 0.05.

## 7. Discussion

According to the empirical results, partner-specific experience has no significant impact on the complexity of contractual control. Dekker and Van den Abbeele (2010) believe that accumulated partner information make it less needed for control. Their definition of control includes procedures both specified and used, while this research suggests viewing ex-ante design and ex-post execution separately. A more complex contract does not necessarily imply more strict enforcement. So the authors of this paper partly agree with them by consenting that prior experience reduces the need for enforcement of control rather than the need for design. Reuer et al. (2002) also consider that what partner-specific experience changes is not the existing contract but the ex-post governance. This is reasonable for the contractual control function, because familiar partners are not likely to spend time and effort altering these terms. In contrast, the enforcement may be more flexible due to familiarity. Similarly, the study by Wang et al. (2017) also suggests an unchanged complexity of contractual control for partner-specific experience. That is to say, parties that have had prior collaborations with each other tend to treat contractual control clauses

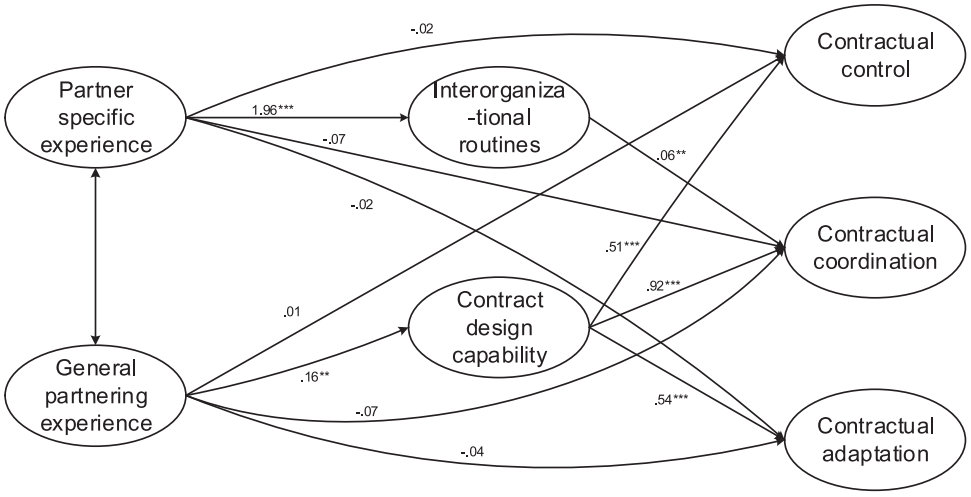


**Fig. 2.** The structural equation model and estimation results.
Note: *** = p < 0.001; ** = p < 0.01.
Indicators of all latent variables and error terms for all endogenous variables are omitted for parsimony. The four control variables (namely contract price, time for completion, expectations of continuity, and ex-ante trust) which are loaded on the dependent variables and are set to be correlated with the independent variables are also omitted for parsimony.

as boilerplate terms (Hagedoorn & Hesen, 2007). The result of H1c suggests that partner-specific experience will not influence the complexity of contractual adaptation. This also verifies the results of Wang et al. (2017) that it is not effective to enhance the adaptation function through prior interactions. Partner-specific experience is not sufficient for parties to properly identify all the contingencies, or even if it could promote their prediction ability, parties may rely on other non-contractual mechanisms rather than make more specifications in the contract (Chen & Bharadwaj, 2009). Consistent with this paper's theoretical expectation, partner-specific experience is positively related to the complexity of contractual coordination. The results above give a systematic echo of three propositions presented by Mellewigt et al. (2012), who argue that partner-specific experience has a positive effect on the complexity of the three contractual functions, but at a decreasing rate for contractual control and adaptation. Combined with the results in this paper, it can be inferred that contractual control and adaptation change slightly with partner-specific experience. This type of experience primarily affects contractual coordination.

To explore the mechanism of the relations, interorganizational routines were introduced as the mediator. It offers an explanation for how repeated relationships between partners affect the complexity of contracts. Many prior studies agree with the fact that interorganizational routines influence partner cooperation, but in most cases this term is only used to provide a theoretical explanation without operationalization (Feldman & Rafaeli, 2002; Hoang & Rothaermel, 2005; Zollo et al., 2002). This research offers empirical evidence by directly measuring interorganizational routines. It is noteworthy that despite such a significant indirect effect, the positive main effect of partner-specific experience on contractual coordination is not quite significant. A reasonable guess is the existence of another indirect path in the opposite direction, such as "knowledge inertia" (Liao, 2002). That is to say, when involving in a repeated relationship, the two partners may directly resort to effective coordination approaches in their prior cooperation experience instead of writing all of them into the contract. Therefore, acquiring low cost ways for designing a more detailed contract does not necessary result in an increase in contractual complexity.

From the results of H4a, it is supported that general partnering experience has a positive effect on the complexity of contractual control, in line with Mellewigt et al. (2012) about the boilerplate effects of this contractual function. This study shows that contractual control provisions are devised as basal components, not specific to certain partners. However, the complexity of contractual coordination does not significantly increase with this type of experience, as H4b shows. This demonstrates that contractual coordination specification is mainly affected by interactions between the focal partners, while a firm's collaborative experience with other partners counts for little. The results of H4c show that general partnering experience has no obvious impact on contractual adaptation. It is plausible that the level of detail of adaptation clauses depends on the attributes of transactions per se. For instance, projects involving plenty of underground construction with a high degree of uncertainty need to emphasize interference due to the geological environment, and contracts for international projects may contain more terms about currency exchange rate changes than domestic projects. These adaptation clauses change greatly under different conditions.

By examining the indirect effect of contract design capability in H6a, H6b and H6c, the mediating paths are verified. It suggests that general partnering experience benefits a firm's capability to improve contract design, thus increasing the complexity of subsequent contracts (Hoang & Rothaermel, 2005; Mayer & Argyres, 2004; Reuer et al., 2002). This cumulative effect applies to every contractual function. It is remarkable that this research not only gives new empirical evidence supporting the phenomenon that partner-specific experience is unrelated to the complexity of contractual control (Wang et al., 2017), but also gives a further explanation that general partnering experience is the main source of more detailed control provisions due to the improvement of contract design capability.

To sum up, this research contributes to the literature on contract design and organizational learning by distinguishing and validating of two kinds of learning in contract design, and highlighting the underlying mechanisms. This study offers not only empirical evidence for the existence of the incremental effects of two types of partnering experience on contractual complexity, but also the differentiation of these effects on three contractual functions. Partner-specific experience is more effective in promoting contractual coordination since this aspect of contract is specific to a particular transaction between partners (Mellewigt et al., 2012), while general partnering experience plays a major role in drafting contractual control provisions which are universal for transactions with any partner. Overall, given the two competitive points of view that prior experience will increase or decrease contractual complexity, this paper supports the former. In other words, partnering experience can raise contractual complexity on the whole, or at least the complexity of a certain function won't be reduced due to any type of partnering experience, if not increased. This observation implies that firms involved in complex transactions like construction projects tend to rely on formal control and make their contracts more complex in order to better cope with potential transaction hazards. In spite of the sample limited to construction industry, the implication is not confined within construction projects. It also provides insights into experience-based learning in contract design in other interfirm transactions.

The above discussion can be interpreted by the TCE rationale. The more hazards that contracts can safeguard against, the lower the ex post costs. Overall, contractual complexity increases with partnering experience, implying that the added ex ante contracting cost is not obvious compared to its ex post benefits. More specifically, the complexity of each contractual function is influenced by different types of prior experience, because there is a trade-off between the costs of drafting a more detailed contract and the risks hidden in a less complex one (Benaroch et al., 2016; Crocker & Reynolds, 1993). On account of the differential effects of partner-specific and general partnering experience on the design costs of each contractual function, contracting parties will choose the equilibrium of economizing on ex-ante and ex-post costs.

## 8. Conclusions

This study offers a nuanced argument for the debate about how partnering experience affects contractual complexity. By adopting a three-functional view of contracts and two different types of partnering experience, the results suggest that contractual control largely depends on a firm's accumulated knowledge for contract design, while contractual coordination is more specific to the dyadic tie, which is in accordance with the theoretical logic of TCE. It sheds some light on the process of organizational learning and improves the understanding of the influence of relational attributes on governance mechanism design.

Despite the conclusions that have been drawn, this study still has some limitations which offer much scope for future research. First, this study only focuses on contract design, while learning may also exist in the enforcement of contract. Future study could investigate how the enforcement of each contractual function evolves with partnering experience. In the contract execution stage, many interesting patterns may appear. For example, contractual control provisions are usually written based on existing templates, but there may be more flexibility in the enforcement. As partners collaborate repeatedly, the development of trust may reduce the enforcement of contractual control. Similarly, although interorganizational routines may increase the complexity of contractual coordination, the existence of the stable methods of interaction may substitute for the enforcement of contractual coordination terms.

Second, different facets of a transaction arouse various kinds of risk. As a multiple functional governance mechanism, contracts are devised to mitigate different transaction hazards. Prior partnering experience

reflects the feature of partner relationship. Apart from it, contract design is influenced by transaction attributes, irrelevant to the transaction participants. In this research, the influencing effects of partnering experience on contractual adaptation are not observed. The complexity of this contractual function is likely to be highly related to the attributes of transactions. Future study may conduct a comprehensive discussion on the multiple functions of contracts relating to both relational and transactional attributes.

Another limitation is that we did not pay enough attention on the power structure between the parties as a potential influence factor of contract design (Choi & Triantis, 2012). For instance, greater bargaining power of one side may influence the contractual safeguarding of its assets (Buvik & Reve, 2002). Both contract design capability and bargaining power are participants' important characteristics with respect to contract design. While this study focuses on the former aspect, a more complicated analysis of the interplay of those two factors may offer a bigger picture of contract design determinants.

## Conflict of interest

There are no conflicts of interests.

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