THE PERFORMANCE IMPLICATIONS OF CONTRACTUAL DESIGN: TOWARD A CONFIGURATIONAL PERSPECTIVE

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ABSTRACT

This study sets out to increase our understanding of the performance implications of contracts in interfirm projects in two fundamental ways. First, relying on configurational theories, we conceptually frame contracts as bundles of functional roles that simultaneously influence the governance of interfirm projects and its performance implications. Second, we expect that the importance of particular contractual roles and the interplay between them is likely to vary across different contextual and relational settings. Using a sample of 180 interfirm innovation projects, the findings of this study carry several key theoretical and managerial implications. Whereas prior research has tended to consider the different contractual functions in isolation, our configurational perspective illuminates the relevance of looking at them in concert. Second, this study shows that different settings ask for different contractual configurations. Third, our theoretical and methodological approach allows demonstrating the notion of equifinality in terms of contract design. For managers, our findings indicate managers for interfirm innovation projects should realize that contracts can have different functions and that it is important to consider these contracts in concert. Moreover, whereas a particular contractual configuration can be high-performing in some settings, in can be low-performing in others. Based on these findings we encourage practitioners to move away from the templatization of contractual design.

INTRODUCTION

Contracts, or "agreements in writing between two or more parties, which are perceived as legally binding" (Lyons and Mehta, 1997: 241) are important mechanisms to govern interfirm projects (Anderson and Jap, 2005; Ryall and Sampson, 2009; Sampson, 2004). Interfirm governance research has long focused on the initial contract design, examining transactional and relational characteristics that influence the structure of the contract (Contractor and Ra, 2002; Gulati, 1995; Hagedoorn and Hesen, 2007). More recently, scholars (Klein Woolthuis, Hillebrand and Nooteboom, 2005; Reuer and Ariño, 2007; Ryall and Sampson, 2009) have shifted from a structural contract perspective to a more functional one, identifying different functions – e.g. safeguarding and coordination - that contracts can play in interfirm projects (Schepker, Won-Yon, Matrynov and Poppo, 2014). Reviewing this literature, Schepker et al. (2014: 197) observe that 'few scholars, however, examine the performance implications of contract structure', which is the focus of this study.

We aim to increase our understanding of the performance implications of contracts in interfirm projects in two fundamental ways. First, whereas prior contract performance research tends to focus on one particular function of contracts (i.e. safeguarding or coordinating), we rely on configurational theories (e.g. Delery and Doty, 1996) to conceptually frame contracts as bundles of functional roles that simultaneously influence the governance of interfirm projects and its performance implications. Second, we expect that the importance of particular contractual roles and the interplay between them is likely to vary across different contextual and relational settings. We point to the strategic objectives of the interfirm project and the degree of relational embeddedness between participating partners as two important contextual variables in this respect. The core research question that guides our research is: 'What are high performing bundles of contractual functions in different kinds of contextual and relational settings.'

For this study, we collected data on the contract structure and performance of 180 interfirm new product development (NPD) projects. In line with our theoretically framing, emphasizing contracts as bundles of different contractual functions, we apply fuzzy set qualitative comparative analyses (fsQCA) to explore our core research question.

In line with prior research in the particular setting of NPD (Ryall and Sampson, 2009), we identify three important types of contractual provisions – i.e. coordination provisions, intellectual property safeguarding provisions, and provisions that safeguard from severe breaches. At the same time, our inductive, set-theoretic comparative method allowed generating new findings that go beyond the discrete-form analysis that dominate extant interfirm research on performance implications of contracts. First, instead of looking at the complexity of the contract in general, we identify particular configurations of contractual roles that consistently outperform other contractual configurations. Second, we show that the nature of such optimal configurations differs across strategic and relational settings. Third, we demonstrate that, for particular settings, partners can sometimes choose between different optimal configurations, pointing to the issue of equifinality. Jointly these findings contribute to building a configurational perspective on contracts and their performance implications in interfirm projects. Moreover, it provides managers with specific guidance in how to design contracts in different collaborative settings.

THEORETICAL BACKGROUND
Contracts in Inter-Firm partnerships: Structural and Functional Perspectives

When forming a partnership, collaborating firms almost inevitably draft an agreement with one another, keeping in mind envisaged future contingencies (Abdi and Aulakh, 2014; Colombo, 2003). Contracts specify the terms of an agreement between parties and represent how partnerships are governed. Making appropriate governance decisions when the inter-firm relationships are formed is therefore essential for reducing partners' incentives to behave opportunistically and enhancing the overall success of the alliance (Parkhe, 1993a; Reuer and Ariño, 2007; Wathne and Heide, 2000; Wuyts and Geyskens, 2005).

Research on the role and implications of contracts in inter-firm relationships has long been dominated by a structural approach (Schepker et al., 2014). Relying on insights from transaction cost theory, this stream of research (e.g., Dwyer and Oh, 1988; Hennart, 1991; Klein, Crawford and Alchian, 1978; Parkhe, 1993a; Pisano, 1989) mainly focused on the safeguarding function of contracts, emphasizing that, through specifying particular clauses in the contract, the risk of opportunistic action can be reduced. In line with this theoretical stance, these scholars have mainly focused on examining the relationship between transactional attributes (e.g. asset-specificity, uncertainty) and the level of contractual specification (i.e. number of contractual clauses).

More recently, a new stream of interfirm collaboration studies has emerged, shifting their attention to a more 'functional' approach on contracts in inter-firm relationships (Parmigiani and Rivera-Santos, 2011; Schepker et al., 2014). Relying on insights from relational and firm capability research, these scholars emphasize that, next to safeguarding, contracts can also have other functions such as promoting coordination and adjustment in inter-firm relationships (Ariño and Ring, 2010; Reuer and Ariño, 2007; Ryall and Sampson, 2009; Schilling, 2009). Given this different focus, these scholars also tend to take a different approach towards analyzing contracts. In particular, they move from studying the size of the contract (counting the number of contract clauses) to examining the actual content of the contract, acknowledging that different types of contractual clauses can have different functions in governing inter-firm relationships (Lumineau and Malhorta, 2011; Ryall and Sampson, 2009). Examining contracts of strategic alliances, Reuer and Arino (2007), for instance, make a distinction between enforcement provisions and coordination provisions. Focusing on technology development projects, Ryall and Sampson (2009), further identify three dimensions, entailing (i) the details to which firm obligations are specified, (ii) the degree of explicit monitoring of one another, and (iii) whether penalties exist for noncompliant behavior.

Toward a Configurational Perspective on Contracts

Whereas contractual governance scholars increasingly emphasize the fact that contracts can have different roles, an in-depth exploration of how different roles can simultaneously impact the outcomes of interfirm projects is lacking. In this paper, we rely on insights from configuration theory (McKelvery, 1982; Meyer, Tsui and Hinings, 1993) to argue for the importance to consider bundles of contractual roles. Configurational theorists apply a holistic mode of inquiry, emphasizing that 'parts of a social entity take their meaning from the whole and cannot be understood in isolation' (Meyer et al., 1993: 1178). Given this holistic stance, they assume non-linearity, implying that 'variables found to be causally related in one configuration may be unrelated or even inversely related in another' (Meyer et al., 1993: 1178). A final core

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assumption of configurational theory is equifinality, implying that different configurations of relevant factors can lead to optimal outcomes (Doty and Glick, 1994; Hess and Rothaermel, 2011; McKelvery, 1982). At the same time, configurational scholars acknowledge that the optimal configuration might vary across different settings. Applying these insights in the setting of strategic human resource management, Delery and Doty (1996) made a conceptual distinction between different types of employment systems (i.e. market-type versus internal), representing different combinations of particular HR practices. At the same time, they emphasize that the financial performance implications of such configurations depends on the level of vertical fit or the fit between the employment system and the organizational strategy. Relying on these theoretical insights, we conceptually frame contracts as holistic bundles of different contractual roles. Moreover, we expect that the effectiveness of particular contractual bundles depends on the setting in which the interfirm project is embedded. Based on extant research, we identify two contextual variables that are especially relevant in our particular setting of NPD projects: (i) innovation objective and (ii) history of prior relationship.

Innovation objective. Scholars have emphasized that firms can engage in inter-firm NPD projects for different objectives (Belberdos, Carree and Lokshin, 2004; Faems, Van Looy and Debackere, 2005; Schleimer and Shulman, 2011). On the one hand, they can collaborate with external partners to jointly exploit existing products and technologies to generate incremental innovations. On the other hand, they can also use inter-firm collaboration for more explorative objectives, leading to more radical innovations. Incremental NPD projects set out to improve existing products through conducting exploitative activities (March, 1991) such as optimization, standardization, and refinement. The aim of radical NPD projects, however, is to generate truly new products through conducting explorative activities such as fundamental research, experimenting, and prototyping (Tushman and Smith, 2002).

Extant research provides strong indications that, because of these differences, incremental and radical interfirm NPD projects are likely to require different types of contracts (Grant and Baden-Fuller, 2004; Rothaermel and Deeds, 2004; Ryall and Sampson, 2009). Conducting a case study on two explorative R&D alliances in which partners aimed to jointly explore the feasibility of a breakthrough inkjet technology, Faems et al. (2008), for instance, concluded that, for this kind of radical inter-firm innovation projects, partners require a broad contractual interface structure, where contractual clauses emphasize the need for intensive coordination and information sharing, stimulating the ability for joint problem solving on unexpected technological problems. At the same time, these scholars acknowledged that, for more exploitative R&D alliances, which are more focused on incremental innovation, a more narrow contractual interface, in which responsibilities and tasks of the different partners are more separated, might make sense. We therefore identify the innovation setting as a first relevant contextual factor when exploring the effectiveness of contract configurations in inter-firm NPD projects.

History of prior collaboration. Firms can engage in inter-firm NPD projects with familiar partners – i.e. partners with whom a history of prior collaboration is present - or unfamiliar partners. In inter-firm contract research, the presence/absence of prior collaboration has already been identified as a factor that can influence the initial contractual design of the inter-firm project (Poppo, Zhou and Ryu, 2008; Reuer and Ariño, 2007; Ryall and Sampson, 2009). Moreover, strong indications are present that the relational setting of the interfirm NPD project influences the effectiveness of particular contractual roles. For instance, research has emphasized that the safeguarding

role of contracts is particularly important in relationships in which a history of prior collaboration is absent (Gulati, 1995; Reuer and Ariño, 2007). When a history of prior collaboration is present, however, partners can rely on their mutual trust as an informal safeguarding mechanism reducing the need for a formal safeguarding function (Dyer and Singh, 1998; Madhok and Tallman, 1998). In this latter relational setting, the contract can have an important coordination function, codifying the joint learning experiences of partners in prior relationships (Mayer and Argyres, 2004).

METHODOLOGY
Sampling and data collection
To explore high performance contract configurations for inter-firm NPD projects in different innovation and relational settings, we needed to collect fine-grained data on the content of contracts, the performance of inter-firm NPD projects, and the setting in which they were embedded. In order to do so, we developed and distributed a new questionnaire. In this questionnaire, we defined inter-firm NPD projects as projects in which two independent firms are involved for the purpose of the joint development of new or improved products or services (Hoang and Rothaermel, 2010). To ensure the reliability and validity of the survey, we conducted an extensive literature review on these issues. The survey was pilot tested by 10 Dutch new product development managers who were members of the Dutch PDMA network.

For the final data collection, we relied on the practitioner population of the Product Development and Management Association (PDMA). Each year, this association conducts a research proposal competition, giving academics the opportunity to get a research grant as well as use the member list of the PDMA for survey purposes. As winners of this research grant, the authors of this paper distributed a survey among the PDMA members. Between November 2011 and February 2012, we attended two international practitioner conferences of the PDMA ('CoDevelopment Conference' and the 'PDMA Conference on Social Product Development and Co-Creation'), where we distributed and collected responses from participants. In April 2012, the PDMA distributed an online invitation to all PDMA members to complete an online version of the survey. In the introduction part of the survey, we asked the NPD managers to answer the questions for the most recently inter-firm NPD project in which they were active and which was still ongoing. By asking for the most recently initiated project, we aimed at avoiding self-selection bias (i.e. preference to report on a successful project). By asking to report on an ongoing project, we wanted to reduce retrospective respondent bias. The final sample included 180 fully completed survey responses, representing 180 different inter-firm NPD projects. This number of responses is similar to other studies (e.g. Griffin, 1997) that relied on the PDMA network to collect survey data on innovation related topics. At the end of the report, managers provided their contact details in order to receive an individual personalized report, where we benchmarked their collaborative project against the other 179 projects in our sample. This detailed report entailed helpful information, based on the key findings of the survey, on how to improve success in collaborating with external partners.

Methods
We conceptualize contractual provisions as systematically interdependent as opposed to isolated attributes. Therefore we utilized fuzzy set Qualitative Comparative Analysis (fsQCA) as our approach to conduct configurational analyses (Ragin, 2008). This analytic technique allows researchers to study how different causal conditions combine to contribute to a certain outcome of interest (Fiss, 2011; Meuer, 2013; Ragin, 2008).

Using fsQCA, we capture three types of causal complexity: Conjunction, equifinality, and asymmetry (Greckhamer, 2015; Ragin, 2008).

Conjunction means that contractual provisions may not impact inter-firm NPD project performance in isolation from one another. Instead, they represent specific combinations of causal conditions (e.g. types of contractual provisions) that consistently bring about high and low performance levels (Greckhamer, 2015). Both the presence as well as the absence of conditions in these combinations can influence related outcomes. Equifinality means that different combinations of initial conditions may lead to similar outcomes (Doty, Glick and Huber, 1993). This would imply that companies can choose from contractual designs with equal merits. Finally, in contrast to regression models, which are symmetrical by design, set-theoretic relations can be asymmetrical. This means that causal conditions leading to the presence of an outcome may be different from the conditions leading to the absence of the outcome (Ragin, 2008). Given our research goals and the recent applications in the domain of strategic management, this method deems suitable for holistically evaluating contractual designs and their impact on innovation outcomes (Crilly, Zollo and Hansen, 2012; Fiss, 2011; Greckhamer, 2015).

Outcome variable

Project performance. In the survey, we asked respondents to provide their perception on the current status of the project in terms of project performance. Relying on the scales of Hoegl et al. Hoegl, Weinkauf and Gmuenden (2004), we asked respondents to indicate on a 7-point Likert scale (from strongly disagree to strongly agree) the extent to which they agreed with the following statements: (i) going by the current status of the collaborative project, it can be regarded as successful, (ii) all collaborative project goals have so far been achieved, (iii) so far, the output of the collaborative project is of high quality, (iv) the people of our firm that participate in this collaborative project are satisfied with its performance so far, (v) our management is so far fully satisfied with this collaborative project. In this paper, we use the average score on these five items to measure project performance of the inter-firm NPD projects. The average performance in our sample of 180 projects is 5.14 with a standard deviation of 1.11.

Independent variables used for creating membership sets

Content of the contract. In his seminal paper, Parkhe (1993a) identified a set of eight different contractual clauses that often are used in contracts governing inter-firm relationships. This set has been substantially used in subsequent research to both measure the degree of specification in contracts (Parkhe, 1993) and to make a distinction between different contract functions (Reuer and Ariño, 2007). In our questionnaire, we listed the same eight contractual clauses and asked respondents to indicate whether these clauses were present or absent in the contract.

Following Reuer and Ariño (2007) we subsequently performed an exploratory factor analysis to verify the dimensionality of our eight clauses. Binary variables violate the assumption of multivariate normality required for factor analyses. Therefore, we first calculated the tetrachoric correlations among the eight clauses which formed the input of our factor analysis. To compute these correlations we used the SPSS syntax 'Tetra Com', written by Lorenzo-Seva and Ferrando (2012). Table 1 provides an overview of the eight clauses and shows the estimated tetrachoric correlations among the contractual provisions. In our sample out of 180 projects, 125 used a formal contract. Five of these had missing values. Therefore, a subset of 120 inter-firm NPD projects formed the input for our tetrachoric correlation and factor analyses.

Table 1a: Matrix with tetrachoric correlations among contractual provisions[a]

	Mean	1	2	3	4	5	6	7
Obligation to exchange periodic written reports of all relevant transactions	0.65							
Obligation to give prompt written notice of any departures from the agreement	0.74	0.55**						
Right to examine and audit all relevant records	0.56	0.54**	0.43**					
Designation of certain information as proprietary and subject to the confidentiality provisions of the contract	0.98	-0.28	-0.17	0.06**				
Non-use of proprietary information even after termination of agreement	0.84	0.04**	-0.20	0.05**	0.77**			
Termination of the agreement	0.92	0.44**	0.35**	0.08**	0.21**	0.55**		
Arbitration clauses	0.77	0.52**	0.43**	0.29**	-0.13	0.35**	0.50**	
Lawsuit provisions	0.73	0.40**	0.32**	0.37**	0.64**	0.49**	0.65**	0.93**

[a] correlations before smoothing, N=120 and includes all alliances that employed a contract and had no missing data, **$p < 0.05$

Table 1b: Matrix of smoothed tetrachoric correlations among contractual provisions

	Mean	1	2	3	4	5	6	7
Obligation to exchange periodic written reports of all relevant transactions	0.65							
Obligation to give prompt written notice of any departures from the agreement	0.74	0.25						
Right to examine and audit all relevant records	0.56	0.23	0.10					
Designation of certain information as proprietary and subject to the confidentiality provisions of the contract	0.98	0.00	0.00	0.00				
Non-use of proprietary information even after termination of agreement	0.84	0.00	0.00	0.00	0.57			
Termination of the agreement	0.92	0.10	0.00	0.00	0.00	0.24		
Arbitration clauses	0.77	0.21	0.09	0.00	0.00	0.01	0.19	
Lawsuit provisions	0.73	0.05	0.00	0.03	0.38	0.17	0.39	0.86

N=120 and includes all alliances that employed a contract and had no missing data

Table 2 presents the results of a principal components factor analysis after Varimax rotation. We retained three factors with an Eigenvalue of one and above that together explain 63.23% of the variance in our data. As shown in Tables 2, the first factor loaded on the same variables as the first factor in Reuer and Ariño (2007). However, the five clauses that loaded on the second factor in their study and represented safeguarding provisions, broke down into two factors in our study. In a more recent study, Ryall and Sampson (2009) also identified three factors that accounted for a large portion of the variance across 52 contracts used in technology development projects. Taking into account these two prior studies, we label our three factors as (1) coordination provisions, (2) intellectual property safeguarding provisions, and (3) provisions that safeguard from severe breaches (Ryall and Sampson. 2009; Reuer and Ariño. 2007). These three factors were subsequently used to create three fuzzy set measures.

Table 2: Varimax rotated factor pattern of contractual provisions[a]

	Contractual provision	Breach of contract provisions (Factor 1)	Intellectual property provisions (Factor 2)	Coordination provisions (Factor 3)
1	Obligation to exchange periodic written reports of all relevant transactions	.156	-.040	**.757**
2	Obligation to give prompt written notice of any departures from the agreement	.013	-.012	**.643**
3	Right to examine and audit all relevant records	-.057	.044	**.630**
4	Designation of certain information as proprietary and subject to the confidentiality provisions of the contract	.129	**.866**	-.010
5	Non-use of proprietary information even after termination of agreement	.080	**.880**	.011
6	Termination of the agreement	**.492**	.174	.023
7	Arbitration clauses	**.923**	-.145	.099
8	Lawsuit provisions	**.949**	.195	-.024
	Eigenvalue	2.23	1.52	1.31
	Percent of variance	27.09	19.00	16.31
	Cumulative percent of variance	27.09	46.91	63.23

n = 120 innovation alliances that used a contract (5 contracts had missing data and were removed by Tetra-Com)

Prior collaboration. In the survey we asked respondents whether they had collaborated with the same partner before. Based on this information, a binary variable was constructed, having the value of 0 when no prior collaboration was present and the value of 1 when prior collaboration was present. In total 66 out of the 180 alliance partners collaborated before.

Incremental and radical innovations. To differentiate incremental from radical inter-firm NPD projects. we relied on the scale of Gatignon et al (2002) and asked respondents to indicate on a 7-point Likert scale (from strongly disagree to strongly agree) if the aim of the innovation project: (i) Was a minor improvement over the previous technology (reversed item), (ii) was a breakthrough innovation, (iii) led to products that were difficult to replace with substitute using older technology, and (iv) represented a major technological advance. Next, we computed the average value of the scale's four items which is 4.80 with a standard deviation of 1.40. We used the midpoint of this 7-point scale to differentiate between incremental and radical innovations. More specifically, innovations with an average value below four were labeled as incremental innovations. The remaining innovations, which had an average value of 4 or above, were labeled radical innovations.

Calibration of measures

FsQCA requires the transformation of variables into calibrated sets. Calibration rescales an interval variable using a crossover point as an anchor from which deviation scores are calculated. The values of full membership and full non-membership are taken as the upper and lower bounds (Fiss, 2011; Ragin, 2008). For calibration we used the direct method of calibration described by Ragin (2008). For each variable, we specified a threshold value determining full membership (1), full non-membership (0) and a crossover point of maximum ambiguity regarding membership in a set of interest (0.5). These values were used to transform the original interval-scale values to fuzzy

membership scores ranging from 0 to 1. Below we describe our setting of threshold values for calibrating fuzzy sets.

We created one fuzzy set measure for 'high performance' and one for 'low performance'. With regard to the membership in the set of high performing inter-firm NPD projects, we coded the firm 1 if it had a 'high' performance (a score ≥ 6.0, i.e. the 75th percentile or higher), and 0 if it had a 'low' performance (a score ≤ 4.4, i.e. the 25th percentile or lower). The crossover point was set at 5.14, which is the average performance of all innovation projects in our data set. In order to examine what configurations lead to low performance we used the negation of high performance. This means cases with low performance (a score ≤ 4.4, i.e. the 25th percentile or lower) are coded '1' and cases with high performance (a score ≥ 6.0, i.e. the 75th percentile or higher) are coded '0'. The crossover point was again set at 5.14. The contractual factors representing safeguarding from severe breaches, intellectual property safeguarding and coordination provisions, include 3, 2 and 3 provisions respectively. For calibration of the penalty and monitoring provision measures we used thresholds of 3 for full membership, 0 for full non-membership and the midpoint of 1.5 as the crossover point. For the factor *secrecy provisions* we used the values of 2 for full membership, 0 for full non-membership and 1 as a crossover point.

Cases with scores of exactly 0.5 are difficult to analyze using fsQCA. To prevent that these cases are removed from the analyses, Ragin (2008) recommended avoiding the use of a precise 0.5 membership score for causal conditions. We thus followed prior applications and added a constant of 0.001 to all causal conditions under full membership scores of 1 (Fiss, 2011; Greckhamer, 2015; Ragin, 2008).

Analytical procedures and membership sets

The first step in our fsQCA involved the construction of a truth table with sets that specify the possible outcomes (e.g. NPD project performance) and causal conditions (e.g. penalty, secrecy and monitoring provisions). The cases' membership in each set were determined by using the direct calibration method, (see p. 86-94 in (Ragin, 2008). As social phenomena tend to be limited in their empirical diversity, the fsQCA software deletes the unobserved configurations from the truth table. Consistent with recent applications, we further reduced the set of configurations using consistency and frequency cutoffs (Fiss, 2011; Greckhamer, 2015; Ragin, 2008). Set-theoretic consistency measures "the degree to which instances of an outcome agree in displaying the causal condition" (Ragin, 2008: 44). For this analysis, we set the consistency threshold at the recommended minimum value of 0.75 (Fiss, 2011; Ragin, 2008). Next, we fixed the minimum acceptable solution frequency at two and removed cases that fell into configurations below this threshold. In the next step, using Boolean algebra, fsQCA reduces the remaining configurations by eliminating all irrelevant conditions. We here used the algorithm for counterfactual analysis that is included in the fsQCA 2.5 software (Ragin, Drass and Davey, 2006) and allows for the identification of core and peripheral conditions (Fiss, 2011). Core conditions are those that are essential for the outcome of interest, in our case high and low performance; peripheral conditions support core conditions but are not vital for explaining high versus low performance in the configurations (Meuer, 2013). The final output of our analyses includes combinations of conditions that consistently lead to a high performance outcomes and low performance outcomes. For each combination, the output not only specifies if the presence of a condition is crucial to achieve a specified outcome, but also if the absence of a condition is required.

RESULTS: FSQCA subgroup analyses

Using FSQCA, we identified contractual designs that lead to high performance in four different subgroups. The subgroups were created with inter-firm NPD projects between existing or new partners that worked on incremental or radical innovations.

Conditions for high and low performance of inter-firm NPD projects

Table 3 and 4 show the results of our fuzzy set subgroup analyses of interfirm NPD projects that are associated with high and low performance outcomes. Each column represents a configuration of conditions, in our case three types of contractual functions. We use the notation system from Ragin and Fiss (2008) where black circles denote the presence of a condition, empty circles with a cross indicate its absence. Large circles represent core conditions while small circles indicate peripheral conditions. Core conditions only appear in the intermediate and parsimonious solutions, while peripheral (sometimes referred to as complementary conditions) occur only in the intermediate solutions. Empty cells in a solution indicate that the presence or absence of the condition does not change the outcome.

Table 3: High performance configurations, subgroups created using Raddummy and Priordummy.

Innovation type	Incremental	Incremental	Incremental	Radical	Radical	Radical
Relational enforcement	No Prior collaboration	No Prior collaboration	Prior collaboration	No Prior collaboration	Prior collaboration	Prior collaboration
Solution	1a	1b	2	3	4a	4b
Formal enforcement						
Coordination provisions	●		●	●	●	●
Intellectual property provisions	•	●	•	•		•
Breach of contract provisions	●				•	
Consistency	0.79	0.75	0.86	0.79	0.79	0.78
Raw Coverage	0.54	0.13	0.57	0.18	0.63	0.57
Unique Coverage	0.44	0.04	0.57	0.18	0.08	0.02
Overall Solution Consistenc	0.80		0.86	0.79	0.80	
Overall Solution Coverage	0.58		0.57	0.18	0.65	

For the configurational analysis with FSQCA 2.5 the full sample of 180 alliances was used. Black circles (●) indicate the presence of a condition, circles with a cross (⊗) indicate its absence, large circles are core conditions; small circles are peripheral conditions; blank spaces indicate a "don't care" condition.

Table 4: Low performance configurations, subgroups created using Raddummy AND Priordummy.

Innovation type	Incremental	Incremental	Incremental	Radical	Radical
Relational enforcement	No Prior collaboration	No Prior collaboration	Prior collaboration	No Prior collaboration	Prior collaboration
Solution	5a	5b			
Formal enforcement	$\otimes$		no solution	no solution	no solution
Coordination provisions		●			
Intellectual property provisions	$\otimes$	$\otimes$			
Breach of contract provisions		●			
Consistency	0.76	0.90			
Raw Coverage	0.70	0.13			
Unique Coverage	0.60	0.02			
Overall Solution Consistenc	0.76				
Overall Solution Coverage	0.72				

For the configurational analysis with FSQCA 2.5 the full sample of 180 alliances was used. Black circles (●) indicate the presence of a condition, circles with a cross ($\otimes$) indicate its absence, large circles are core conditions; small circles are peripheral conditions; blank spaces indicate a "don't care" condition.

High performance configurations: ideal types

Table 3 illustrates the high performance configurations in the four different subgroups. All solutions have a high consistency of 0.75 and above. The solution coverages in the four subgroups range from 0.18 to 0.65 which indicates that 18% to 65% of the high performance cases are a member of the identified and presented solutions. We sorted solutions within the four subgroups based on their unique coverage (Fiss, 2011; Greckhamer, 2015). Next, we compared the high performance configurations within and across the four subgroups.

<u>Subgroup 1 (Solutions 1a and 1b): Incremental NPD projects with new partners</u>

For incremental innovations developed by partners without a history of prior collaboration, the sufficiency analysis reveals two contractual role configurations (solution 1a and 1b) that lead to membership in the set of high performing projects. Solution 1a combines the inclusion of coordination and safeguarding from severe breaches as core contractual functions with intellectual property safeguarding as a peripheral contractual function. Solution 1b shows an alternative path to a high performance that combines three core conditions: the presence of intellectual property safeguarding provisions with the absence of coordination provisions and provisions that safeguard from severe breaches.

The coverage scores provided in table 3 indicate the percentage of cases that rely on the identified contract designs for achieving a high performance. Comparing the unique coverage of 1a and 1b shows that solution 1a's unique coverage is substantively larger than that of solution 1b, which also indicates the relative high importance of this particular configuration in this subgroup. Still, the two solutions suggest that the presence of coordination and breach of contract provisions (with a peripheral presence of condition of intellectual property safeguarding) as well as their simultaneous absence (with a core presence of intellectual property safeguarding provisions) can both result in a high project performance for incremental NPD projects where partners do not have a history of shared collaboration.

<u>Subgroup 2: Incremental NPD projects with existing partners.</u>

For incremental innovations developed by partners who share a history with one another, the sufficiency analysis resulted only in one contractual design that leads to high performance, depicted in solution 2. This configuration combines the contractual coordination function as a core condition and is supported by intellectual property safeguarding as a peripheral contractual functions. As indicated by the blank space, whether safeguarding from severe breaches clauses were present or absent did not affect performance outcomes. Comparing solution 2 with solution 1a, the results indicate that for incremental NPD projects, a history of prior collaboration eliminates the need to contractually safeguard from severe breaches as a requisite condition for high performance.

<u>Subgroup 3: Radical NPD projects with new partners.</u>

For radical NPD projects with new partners, the presence of contractual coordination and the absence of safeguarding from severe breaches are core conditions, whereas the presence of intellectual property safeguarding provisions is a peripheral condition. Comparing solution 3 with solution 1a shows that when new partners work on a radical instead of an incremental NPD project, the only difference between high-performing contractual configurations involves the explicit absence of clauses that safeguard from

severe breaches in radical inter-firm NPD projects instead of their presence as a requisite for high performance in incremental projects.

Subgroup 4: Radical NPD projects with familiar partners

In the subgroup of radical NPD projects with familiar partners, two high performing contract designs emerge. The presence of a contractual coordination function is at the core of both of these high performing configurations. Solutions 4a indicates that, in the presence of coordination clauses, the presence of clauses that safeguard from severe breaches allows for high performance regardless of whether intellectual property safeguarding clauses are present or not; this is indicated by the blank space. In solution 4b, the opposite can be observed. This means that for radical innovation projects where partners share a collaborative history, the two types of safeguarding clauses act as substitutes and allow for 'neutral permutations' around the core condition of contractual coordination. Comparing solutions 4b and 2 suggests that for existing partners, high performing radical and incremental NPD projects do not necessarily require different contract configurations. However, comparing solution 4b with solution 3 shows that for radical innovations developed by partners with prior ties, the presence or absence of clauses that safeguard from severe breaches no longer affects performance.

Low-performance configurations

FSQCA allows studying causal asymmetry, which implies that the negation of configurations that lead to high performance do not necessary lead to low performance. Therefore, we conducted sufficiency analyses to identify contracts that consistently lead to poor performance outcomes. We created a 'low performance' measure (perffuzzylow) as follows: a performance below 4.4 (25% percentile) = full membership, a performance $> =5,4$ (50% percentile) = full non membership, crossover was set at the 4.9.

Table 4 shows that only one out of four subgroups fuzzy set analyses identified has consistent solutions that can lead to low performance outcomes. This indicates causal asymmetry, because while only few contract provision configurations consistently lead to high performance, there are many, inconsistent, constellations leading to failure. In particular, in the subgroup of incremental innovations developed by new partners, our analyses identified two paths that lead to a low performance outcome. Solution 5a is the most dominant solution (raw/unique coverage of 0.60/0.70) and shows that an absence of all three types of provisions results in low performance. This solution almost mirrors the high performance solution 1a with the key difference that the absence of intellectual property safeguarding provisions is now a core condition and is supported by the absence of the two safeguarding functions as peripheral conditions. Solution 5b suggests that a removal of clauses that safeguard from severe breach results in a low performance in this particular context. This finding underpins the relevance of solution 1a as an ideal constellation. Interestingly, solution 5b has the same configuration of conditions as solution 3, highlighting the importance of context. Put differently, identical contract configurations can lead to high performance outcomes in some innovative contexts and to low performance in others.

DISCUSSION
Summary of Main Findings

 In this study, we set out to increase our understanding of the performance implications of contract in interfirm innovation projects. We here relied on configurational theories to conceptually frame contracts as bundles of functional roles that influence both the performance of interfirm projects and we expected both the importance and interplay between specific contractual roles to be different across different contextual and relational settings. Whilst some of our findings confirm prior research in the NPD project settings, our inductive, set-theoretic comparative method also allowed generating new findings that reach beyond the discrete-form analyses of most prior interfirm collaborative research. Below, we first discuss our main results. Subsequently, leaning on configurational theory, we explain below how this study compares to and extends our current knowledge on contractual designs in different collaborative settings. Next, we discuss the managerial implications of our findings. Finally, we point to the main limitations of our study and discuss avenues for future research.

Using FSQA, we identified four different subgroups that each represents specific bundles of contractual designs leading to high performance outcomes depending on the contextual and relational setting. For the subgroup of incremental NPD projects where partners lack a history of prior collaboration, we identified two high performing contractual configurations. This finding is important as it confirms our configurational arguments of equifinality (Doty and Glick, 1994; McKelvery, 1982): In particular, we find that completely different configurations of relevant provisions (solutions 1a and 1b) both lead to high performing outcomes for incremental innovation alliances. This finding thus illustrates the ability of fsQCA to explain the value-adding relationships of variables within configurations, in this case completely different constellations of clauses that usually remain completely unknown in more standard statistical approaches (Fiss, 2011).

For incremental inter-frim NPD projects between partners who share a history of prior collaboration, one high performing contractual configuration emerged: coordination clauses need to be present as a core condition in support of intellectual property safeguarding clauses as a peripheral condition. Unlike incremental innovation projects without a history between partners, a shared past eliminates contractual safeguarding from severe breaches as a prerequisite for high performance. Ryall and Sampson (2009) already found that the inclusion of clauses to safeguard from severe breaches is more likely in settings where partners dealt with each other repeatedly. Focusing on the performance implications, our findings however show that, whereas such clauses improve performance for incremental innovations where no prior collaboration is present, their presence has no performance implications in repeated settings. In other words, whereas Ryall and Sampson (2009) indicate that contractual safeguarding from severe breaches is more likely when prior collaboration becomes established, our finding suggest that such contractual function become less necessary in this particular context to reach high performance.

For radical inter-firm projects between new partners, we find that, whilst coordination provisions should prevail, excluding provisions that safeguard from severe breaches leads to higher performance. This result aligns with prior studies who found that the inclusion of such clauses is less likely in radical innovation projects (compared to incremental projects) because a penalty may be triggered by poorly assessed contingencies that are unrelated to firm efforts (Ryall and Sampson, 2009). Therefore, it has been argued that the uncertainty linked to innovation may demand more task

description and coordination instead (Argyres and Mayer, 2007; Argyres, Bercovitz and Mayer, 2007).

For radical innovation projects where partners share a collaborative history, we again identify two high-performing contractual configurations. Here, the two types of safeguarding clauses act as substitutes for each other and allow for 'neutral permutations' around the core condition of monitoring provisions. Similarly to solutions 1a and 1b, this finding illustrates the ability of fsQCA to explain different optimal relationships within configurations rather than assuming just one optimal configuration as in most standard statistical approaches (Fiss, 2011). Comparing solution 4b with solution 3 (radical innovations without prior ties) shows that for radical innovations developed by partners with prior ties, the presence or absence of penalty clauses no longer affects performance - but only where secrecy clauses support monitoring clauses.

Interestingly, our findings show that for radical innovation alliances, monitoring provisions - comprising the least stringent clauses, play a core role in achieving high performance independently of whether partners share a joint history.

Theoretical Implications

In this paper, we deviate from prior contract research through developing a configurational perspective on contracts and their performance implications. This configurational perspective increases our understanding of the role of contracts in inter-firm relationships in three important ways. First, whereas prior research has tended to consider the different contractual functions in isolation, our configurational perspective illuminates the relevance of looking at them in concert. Identifying particular high-performing and low-performing bundles of contractual functions, we demonstrate that, in some circumstances, it is the actual combination of the *presence* of some functions and the simultaneous *absence* of other functions that consistently leads to success. This implies that future research on contractual functions should not only consider their independent performance implications, but should also explicitly the interactions among them.

Second, we show that different settings ask for different contractual configurations. In particular, we show that the nature of high-performance contractual configurations depends on the particular strategic – i.e. incremental versus radical innovation objectives - and relational – i.e. presence versus absence of prior collaboration - setting in which the inter-firm NPD project is embedded. In other words, these findings suggest that high-performance contractual configurations are not universalistic but rather depend on the particular context at hand.

Finally, our theoretical and methodological approach allowed demonstrating the notion of equifinality in terms of contract design. In particular, we demonstrate that, within particular contexts, partners sometimes can choose between different high-performance contract configurations. This notion of equifinality suggests that decision makers might have more degrees of freedom in designing contracts than prior research would suggest.

Managerial Implications

Negotiating contracts in inter-firm NPD projects often is a complex process that requires the involvement of different organizational actors. Our findings indicate that these actors should realize that contracts can have different functions and that it is important to consider these contracts in concert. Moreover, our findings suggest that, whereas a particular contractual configuration can be high-performing in some settings,

in can be low-performing in others. Based on these findings we encourage practitioners to move away from the templatization of contractual design. When firms negotiate contracts, they often have the tendency to use templates of contracts that worked in the past. However, our results suggest that, when the context changes, the collaborative project might require a different contractual design, emphasizing different functions. In other words, instead of contractual standardization we emphasize the need for contractual flexibility, searching for a bundle of contractual functions that is aligned with the strategic and relational setting of the collaborative project.

LIMITATIONS AND FUTURE RESEARCH

In this study, we explored contractual configurations in a particular setting (i.e. bilateral inter-firm NPD projects), which limits the generalizability of our findings. For instance, whereas Reuer and Arino (2007) identified two factors, our study was aligned with Ryall and Sampson's (2009) three-factor solution of contractual functions. Both our study and the study of Ryall and Sampson (2009) considered the particular context of inter-firm NPD projects. In this particular context, intellectual property is a very important issue, which might explain why it emerged as a separate safeguarding function, which was not the case in the study of Reuer and Arino (2007), which looked at strategic alliances. These observations point to the need for testing the generalizability of our findings in a wide variety of collaborative and institutional settings.

In this paper, we relied on validated survey instrument (Parkhe, 1993b) to identify contractual configurations. At the same time, we acknowledge that getting access to the actual contracts would allow for developing a more fine-grained and richer typology of contractual configurations. Although getting access to contracts is challenging, some studies (Faems, Janssens, Madhok and Van Looy, 2008; Hagedoorn and Hesen, 2007) have managed to secure such access, pointing to a very valuable avenue for future research.

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