Economic Organization and Imperfect Managerial Knowledge

A Study of the Role of Managerial Meta-Knowledge in the Management of Distributed Knowledge

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WWW.CBS.DK

ISSN 0906-6934

Print ISBN: 978-87-93483-44-6
Online ISBN: 978-87-93483-45-3

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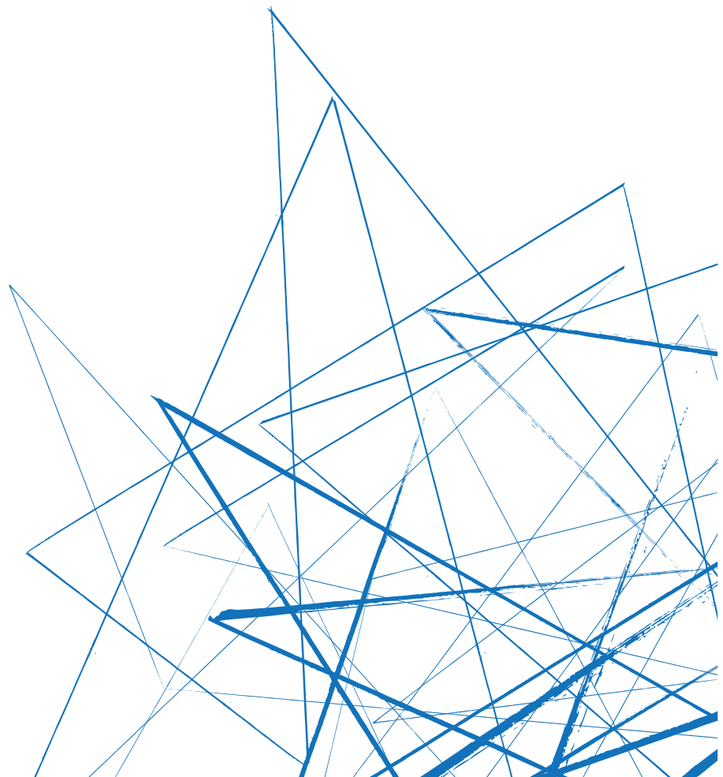
PhD Series 40-2016



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The PhD School of Economics and Management | **PhD Series 40.2016**

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A PhD dissertation by:

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2016

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1st edition 2016
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"The Doctoral School of Economics and Management is an active national and international research environment at CBS for research degree students who deal with economics and management at business, industry and country level in a theoretical and empirical manner".

Summary

When companies depend on knowledge distributed among employees, managers play a key role in establishing cooperation and coordination systems. This dissertation investigates the implications of managers' knowledge about the knowledge and skills of employees for economic organization. The research question guiding this effort is: *What managerial challenges arise from having distributed knowledge within a firm and how does the manager's knowledge of this knowledge matter for economic organization?*

The dissertation consists of three research papers, each exploring a dimension of the research question. The first paper investigates antecedents of coordination break-down and how teams differ in their ability to coordinate specialized knowledge and skills. The second paper provides a theoretical framework for theorizing about the role of managers' knowledge about employees' knowledge for economic organization and introduces the term *managerial meta-knowledge*. The third paper investigates the effect of managerial meta-knowledge on the successfulness of inter-organizational relations. Empirically, the dissertation is based on a dataset on public procurement projects, comprised of archival data, a survey of buyers and a survey of suppliers.

Together, the three papers argue that managers' knowledge about employees' knowledge is an important factor when managing the challenges of distributed knowledge. Such managerial knowledge allows managers to assess the capabilities available, make sure they fit contractual obligations, and rearrange tasks and employees when adapting to changes.

Resumé

Når virksomheder er afhængige af viden distribueret mellem medarbejdere, så spiller ledere en vigtig rolle i forbindelse med at etablere samarbejds- og koordineringssystemer. Denne afhandling undersøger hvorledes lederes viden om medarbejderes kompetencer og viden påvirker økonomisk organisering. Forskningsspørgsmålet der leder undersøgelsen er: *Hvilke ledelsesmæssige udfordringer opstår i forbindelse med at have distribueret viden i virksomheder og hvilken betydning har lederes viden om den distribuerede viden for økonomisk organisering?*

Afhandlingen består af tre forskningsartikler, der hver undersøger en dimension af forskningsspørgsmålet. Den første artikel undersøger en række betingelser på gruppeniveau der leder til koordinationsproblemer, samt hvorledes grupper er forskellige i deres evne til at koordinere specialiseret viden og kompetencer. Den anden artikel udvikler et teoretisk apparat til at forstå hvilken rolle lederes viden om medarbejderes kompetencer og viden spiller for økonomisk organisering. I den forbindelse introduceres begrebet *managerial meta-knowledge*. Den tredje artikel undersøger effekten af managerial meta-knowledge for succesfulde inter-organisatoriske relationer. Empirisk bygger afhandlingen på et datasæt over offentlige indkøbsprojekter, indeholdende arkiv-data samt spørgeskemaundersøgelse af både købere og leverandører.

Tilsammen udgør de tre artikler et argument for at lederes viden om medarbejderes kompetencer og viden er en vigtig faktor når distribueret viden skal koordineres og ledes. Denne form for leder-viden tillader bedre vurdering af de tilgængelige kompetencer, at sikre disse kompetencer matcher de kontrakter der indgås, samt at koordinere medarbejdere når organisationen skal tilpasse sig ændringer.

Acknowledgments

First and foremost, I am deeply grateful to the 907 busy professionals who each spend 15 minutes filling out my survey – without your 227 hours of combined effort this dissertation would be less interesting.

In general, I wish to thank the great faculty at the Department of Strategic Management and Globalization, Copenhagen Business School. In particular I am grateful to my two supervisors, Nicolai Foss and Jacob Lyngsie, who with each their area of expertise and each their own style have taught me so much. Nicolai Foss, thank you for helping me transition from the epistemic outskirts of the social sciences to the wide river of the mainstream management field. Jacob Lyngsie, I have met few people I enjoy trying out new ideas on as much as you. I have learned a lot from your open mind and quick wit – a few hints about statistics stuck along the way as well.

The cohort of Ph.D. students whose company I been graced with since august 2012 has made the long hours feel shorter. In particular, thank you, Manya, Olga, and Klement. Manya, your company and humor has made you a joy to share an office with. Olga, don't waste talent! Klement, thanks for all the great conversations and inspirational talks along the way. I would also take the opportunity to appreciate Jon Bingen Sande, who hosted me a dark winter at the BI School in Oslo, and Professor Anker Brink Lund, who showed me how academic work can be done with great relevance and taught me the joy of meticulous academic work. And to Kaja – thank you for the support and patience.

Henrik Jensen
Oslo, 2016

Chapter 1 - Introduction

> *There is something fundamentally wrong with an approach which habitually disregards an essential part of the phenomena with which we have to deal: the unavoidable imperfection of man's knowledge and the consequent need for a process by which knowledge is constantly communicated and acquired. Any approach (...) which in effect starts from the assumption that people's knowledge corresponds with the objective facts of the situation, systematically leaves out what is our main task to explain.* Hayek, 1945: 530

In this dissertation, I investigate the implications of managers' knowledge about the knowledge and skills of the employees they manage for economic organization and procurement relations. Specifically, I analyze the lack of such knowledge as an endogenous driver of unforeseen contingencies in project teams. The thesis consists of a theoretical paper as well as two empirical papers based on a unique dataset comprised of archival data on public procurement project matched with a two-sided survey of the public and private parties involved in those projects. The three papers constitute a coherent attempt to understand endogenous drivers of organizational uncertainty, how those drivers can be managed, and when such drivers matter for inter-organizational relations.

When a firm produces a good or service, it does so by undertaking and solving a myriad of major and minor tasks, and by addressing a number of challenges. Many of these tasks require interpersonal interactions, creating potential coordination problems. Such problems are routinely dealt with by employees who have faced similar tasks in the past or by following standard operating procedures, but others require more elaborate coordination mechanisms designed to establish solutions, such as committees or cross-functional task forces. Another way of dealing with coordination needs is by managerial fiat in which managers decide who does what, when and by

which specifications. This allows many coordination problems to be avoided. The quality of such managerial decisions depends on the knowledge of the given manager. Managers can hold more or less complete (or true) knowledge about the tasks at hand and the employees available to handle those tasks. Managers who know more about an employee's specific knowledge and skills is better able to direct and use those knowledge and skills in a productive setting, and to combine them with those of other employees. In this dissertation, this kind of managerial knowledge is termed "managerial meta-knowledge."

Managerial meta-knowledge also matters in inter-organizational relations. In the public procurement setting, it has an impact at several different points in time: 1) when a supplier submits an offer, as the offer is based on an assessment of employees' capabilities, 2) at the moment of contracting, when the specifics of a deal are settled, and 3) when managing a project, as planning and adapting to new information requires knowledge about the employees involved. Much extant research documents the positive effect of developing good inter-organizational relations, which allow for easier information sharing and better coordination, and thereby enable minor disputes to be resolved cheaply (Dyer & Singh, 1998; Elfenbein & Zenger, 2013; Lavie, Haunschild, & Khanna, 2012). However, the extant research has failed to explore how this effect is influenced by dealing with suppliers with various levels of managerial meta-knowledge.

The overall purpose of this dissertation is to examine the effect of endogenous drivers of unforeseen contingencies and coordination failures, and the role played by managerial meta-knowledge in mitigating these problems. To do so, I identify and empirically investigate important endogenous, team-level drivers of unforeseen contingencies in procurement projects (Chapter 2). My co-author Nicolai Foss and I then discuss the assumptions about manager's knowledge that underlie much of the extant research on economic organization, and we explore the implication of looser assumptions for organizational and transactional factors (Chapter 3). Moreover, I empirically study

the effect of managerial meta-knowledge and competitive pressure on the positive effect of relational capital (Chapter 4). The overarching research question guiding this dissertation are the following: *What managerial challenges arise from having distributed knowledge within a firm and how does the manager's knowledge of this knowledge matter for economic organization?*

The remainder of this introduction serves several purposes. First, it provides some additional context to the theorizing behind the thesis. Second, it introduces the reader to the important world of public procurement by giving an overview of the tender process as well as the most significant research on this topic. Finally, it provides an overview of the three papers constituting the dissertation and how they comprise a coherent investigation of the research question.

THEORETICAL CONTEXT

In order to understand the manager's role, we must understand how organizations deal with unforeseen contingencies, regardless of whether those contingencies arise from outside events or from internal coordination and cooperation problems. Organizations are entities that are naturally prone to coordination and cooperation failures. In fact, all theories of the firm propose that the defining characteristic of firms is their ability to solve cooperation and coordination problems that otherwise would be difficult to address (Foss, 1996; Kogut & Zander, 1992; Nickerson & Zenger, 2004; Williamson, 1985). This does not mean that simply organizing a project or a transaction within the boundaries of a firm resolves potential cooperation or coordination problems. Instead, it means that such projects are governed in a comparatively better organizational form.

With regard to mitigating problems emerging due to interdependent tasks, many challenges are dealt with through robust organizational routines. Such routines are best at reducing the risk of coordination failure when dealing with tasks similar to those done in the past, as routines are developed through the resolution of previous coordination problems (Hodgson, 2008; Nelson &

Winter, 1982). This is also in line with evolutionary analyses of firm routines, as evolutionary retention mechanisms maintain the characteristics of the firm that have helped it survive thus far (Alchian, 1950). Another way of dealing with coordination and cooperation problems is to rely on intentional planning and adaptation. One of the managers' tasks is to provide this intentional planning and adaptation. They do so based on their knowledge of the specific tasks at hand and their knowledge of employees' skill sets. Without knowledge of the specific tasks, a manager cannot know about the skills necessary to complete them or foresee potential problems of interdependence with other tasks. Without knowledge of the employees' skill sets, a manager cannot know which capabilities are available to complete the task or foresee potential problems of interdependence among employees.

"Knowledge" is a term that takes on numerous meanings in management research, but this dissertation does not aim to clear up the conceptual confusion. The starting point here is a mainstream, justified true belief, propositional approach (see, e.g., Hendricks, 2007). In this approach, agent *i* knows something if he is able to assign it a truth-value that is true, justified, and held as a belief. For example, an IT professional specialized in developing security systems for the healthcare sector can tell whether the specifications of a project violate the rules and regulations of the area. From a managerial perspective, a manager might know that this IT professional is able to detect such violations. Such a manager knows something about the other person's knowledge without having the necessary knowledge to make a judgment about IT-security standards himself.

In analyses of the management of knowledge, one important factor is how the knowledge is distributed among employees and managers. It is generally recognized that coordination requires some level of mutual knowledge. In terms of how knowledge is distributed among members of a group, the two (archetypal) extremes are common knowledge and completely distributed knowledge. "Common knowledge" is a strong assumption regarding how members of a group hold knowledge. Whereas mutual knowledge of *A* means that all members of a group know *A*, common knowledge of

A means that each member of the group knows *A*, that each member of the group knows that all the other members of the group know *A*, and that they each know that the other parties know that they know, *ad infinitum* (Lewis, 1969). An example of common knowledge is a statement made to a group in the presence of every member of the group. The need for managerial coordination in (theoretical) situations of common knowledge appears rather limited.

On the other hand, completely distributed knowledge is a situation in which something is only known in the combination (or union) of all of the individual group members' knowledge. In other words, one person would hold the distributed knowledge if that person knew what all of the individual group members know about the subject matter. This kind of knowledge distribution poses certain managerial problems. First, distributed knowledge creates situations of interdependence, which influence the classical organizational challenge of creating cooperation and coordination. Second, attempts to manage distributed knowledge require some knowledge about that knowledge and where it resides. This is not the same as saying that the manager must hold the knowledge that is distributed. Rather, the manager must know of it and of the individuals' knowledge that constitutes it. More formally, if the distributed knowledge of *A* (*DA*) is the combination of a group of individuals' knowledge about a particular fact ($K_i A_f$)[1] ($K_1A_1 \wedge K_2A_2 \wedge K_3A_3 \Rightarrow D\,A$), then the manager ($M_1$) knows of this knowledge ($M_1K_1A_1 \wedge M_1K_2A_2 \wedge M_1K_3A_3$) and of the distributed knowledge ($M_1 D\,A$). However, the manager does not necessarily have the same knowledge as the individual team members ($M_1K_1A_1 \nRightarrow M_1A_1$) (Hendricks, 2007). In this dissertation, I refer to this concept as "managerial meta-knowledge." The concept and its implications for economic organization are developed in Chapter 3.

I use the distinction between common knowledge and completely distributed knowledge as archetypes. In most organizations, the reality involves a mix of some common knowledge and some

[1] $K_i A_f$ means that individual *i* knows fact *f*.

distributed knowledge. Similarly, as managers economize on scarce cognitive resources, managerial meta-knowledge is neither complete nor completely absent.

The focus on the manager's knowledge of the manager or, to put it differently, on the epistemic conditions of the decision-making situation has implications for how we theorize about firms and strategic decision-making. First, it serves as a reminder of Buchanan's (1969) arguments that choices are always made by a specific person, whose knowledge and preferences influence the decision. Moreover, Buchanan (1969) argues that (opportunity) cost estimates are always subjective in nature. This is an important point when arguing that the knowledge the manager holds about employees' knowledge matters, as it matters only to the extent that the manager makes the relevant decisions (i.e., they are not delegated to employees). Second, arguing that the decision maker has imperfect knowledge about the decision space—the range of possible choices (e.g., possible combinations of different sets of employee skills)—represents a departure from much of the classical foundation of organizational economics. As the foundation of organizational economics lies in decision theory,[2] the axioms of positive and negative introspection from this tradition (i.e., that decision makers know what they know and what they do not know) also carries over (Binmore, 2009). These axioms state that if a decision maker knows something, he will also know that he knows it (positive introspection), and that if a decision maker does not know something, he will know that he does not know it. In the small world of a single decision maker, this axiom makes sense. However, whether this axiom will hold in the context of managerial decision making that draws on knowledge distributed among a group of individuals is unclear. One could say that Savage's (1954) small world of possible choices and outcomes to be considered (i.e., the decision space) is defined by the knowledge of the decision maker.

[2] Other traditions include the behavioral tradition stemming from Simon (e.g., 1959, 1979) and the tradition concerned with the implications of information asymmetries. See Chapter 3.

When considering managerial meta-knowledge as a foundation for coordinative efforts, we should also consider how it compares to one of the most common way of dealing with coordination problems—through the establishment of routines. An understanding of routines is central to understanding firms and the coordination process (Hodgson, 2008; Nelson & Winter, 1982). Routines serve to maintain previous successful coordination and allow for formation of expectations about the behavior of other actors: "[t]he capability of routines to enable coordination builds on the basis of a balance between interests of the participants in the routines" (Becker, 2004: 662). In other words, routines are stable because they allow for an actor to hold accurate expectations about the behavior of others when performing a routine (Feldman & Pentland, 2003). By recalling past interactions, members of an organization can solve coordination problems when they face them again. In this way, routines act as the organization's "memory" and can store knowledge of successful coordination efforts (Becker, 2004; Hodgson, 2008). Contrary to managerial meta-knowledge, routines do not depend on the knowledge or experience of a single individual. One limitation of routine-based coordination is that it depends on previous experiences and is, therefore, less useful in highly volatile environments and when dealing with strategic, non-repeated actions (Teece, 2012). Where routine-based coordination involves solving previously experienced coordination problems, managerial meta-knowledge is used to imagine alternative configurations of existing resources and to align interdependent tasks. This is a conscious, forward-looking effort.

Operationalization of Managerial Meta-Knowledge

The operationalization of the concept of managerial meta-knowledge for use in an empirical setting using survey measures poses a number of challenges. First, to measure managerial meta-knowledge, we must ask people about the boundaries of their knowledge; an area that is per definition difficult to give clear answers about. Second, and more problematically, I wish to measure managerial meta-

knowledge in relation to projects that have run over a period of time. One key question in this regard is the following: Are we trying to capture initial managerial meta-knowledge or are we trying to capture managerial meta-knowledge after the project, which is likely to be influenced by the project itself? The former would capture the effect of managerial meta-knowledge on bidding behavior and contracting, while the latter would help us understand the manager's ability to plan for and adapt to unforeseen contingencies. The data collected for this dissertation relate to the latter. However, it is argued that there is also an effect on bidding and contracting behavior (Chapter 3).

In some ways, the challenges associated with operationalizing the concept of managerial meta-knowledge are like those associated with operationalizing the concept of asset specificity. They are both concerned with the boundaries of the respondent's knowledge. In a purely theoretical sense, the concept of asset specificity is clear—it is the ability of an asset to generate higher (composite quasi) rents in a specific relationship than in any other use. In terms of operationalization, asset specificity is less clear. Shelanski and Klein (1995: 338) argue that of the main constructs of transaction-cost economics, "asset specificity is the most difficult to measure." The common approach is to use a number of items asking about the value of an asset in alternative setups or to directly ask whether a transaction is specific. The challenge in this approach is that it involves asking the respondent about knowledge he or she probably does not have. In other words, respondents are asked about the alternative uses of the focal asset, about what alternative partners or buyers would be willing to pay, and about the value that would be created in such relationship. Moreover, the temporal problem described above still exists. Are we talking about the current alternative uses of the asset or the alternative uses at moment of contracting?

The operationalization of managerial meta-knowledge is based on social-psychologists' work on transactive memory systems (Lewis & Herndon, 2011; Ren & Argote, 2011; Wegner, 1995). The transactive memory system concept describes the phenomenon of a dyad or a group developing a

cognitive division of labor in which different group members specialize in specific areas, know about the others' specializations, draw on that knowledge, and direct new information to those best able to process it. The approach to measuring the degree to which a group has developed a transactive memory system uses a second-order latent variable model with three latent first-order variables. The construct is reflective, meaning that it uses indicators of different phenomena that are expected to be present when the main, unobserved construct is present. The three first-order constructs used by Lewis (2003) to measure transactive memory systems are the team members' assessments of their coordination ability, the credibility each member assigns to the knowledge held by other team members, and the level of specialization among team members. If any one of these factors is absent, a well-developed transactive memory system is unlikely to exist (Lewis & Herndon, 2011).

In this dissertation, I attempt to capture the level of managerial meta-knowledge by following a similar approach. I measure the presence of managerial knowledge about team members' specializations, managers' trust in their team members' knowledge, and the ability to coordinate the use of that knowledge. The presence of all of these dimensions indicates that a manager has a high level of knowledge about the team members' knowledge.

THE EMPIRICAL SETTING—PUBLIC PROCUREMENT

I test the hypotheses developed in this dissertation using a dataset covering Danish public procurement projects that I collected as part of the PhD process. The dataset is comprised of three data sources: 1) information from the EU TED[3] database on calls for tenders and reports on which companies had won a given tender, 2) a survey of public buyers, and 3) a survey of private suppliers. In the following, I provide an overview of the public procurement process, an outline of the data

[3] Tenders Electronic Daily, http://ted.europa.eu/.

collection behind this dissertation, and a short summary of relevant scholarly work on the field of public procurement.

The public procurement area has a number of advantages as a setting for testing hypotheses about managerial meta-knowledge and inter-organizational relations. First, the regulatory framework governing the area makes the setting transparent and removes a number of confounding factors. Second, it is a setting in which multiple organizations' efforts are governed by the same overall set of rules, which allows for exploration of cross-organizational differences while holding regulation constant. Third, due to the non-discrimination principle and the repeated exposure to competition for public procurement projects, the incentive for suppliers to be less opportunistic is somewhat weaker than in the private sector. This creates a setting in which suppliers' behavior is determined more by the current project than by potential future contracts. This is also called the "shadow of the future."

The Public Procurement Process

The main regulations governing Danish public procurement are *Udbudsloven*, *Tilbudsloven*, *Lov om håndshævelse af udbud*, *Forsyningsvirksomhedsdirektivet*, *Koncessionsdirektivet*, and *Bekendtgørelse om annoncering af offentlige indkøb under tærskelværdierne med klar grænseoverskridende interesse og om anvendelsen af elektroniske kommunikationsmidler i udbud efter udbudslovens afsnit II og III*. Much of this legislation is the national implementation of EU directives, especially 2004/18/EC[4] on public procurement and 2004/17/EC on procurement in the utilities sector. I provide an idealized overview of the process related to a standard project of a size that it is covered by the EU regulation (approximately DKK 1 million/EUR 135,000 for the most common goods and services, but much higher for, e.g., construction projects), with emphasis on parts relevant to this dissertation. The procedure described is primarily the common *open procedure*, although I include some description of the most important alternative procedures.

[4] Since January 1, 2016, Denmark has implemented new procurement directives: 2014/24/EU and 2014/25/EU.

When an organization covered by public procurement regulation decides to procure a good or service, it must send out a *call for tenders*. Before doing so, it can—and often does—gather market information through a dialogue with potential suppliers. This communication, as with all other communication between the buyer and potential suppliers, must be based on principles of non-discrimination and transparency. The goal is to ensure that all necessary information is available to everyone and that no potential supplier has a competitive advantage due to information obtained through this dialogue. If such an advantage is gained, the supplier can be excluded from the process or, if discovered at a later stage, the contract can be annulled or economic compensation can be awarded to a rejected supplier.

The next step for the public organization is to specify the call for tenders. This includes describing the object to be procured in detail, usually including cost and time estimates, as well as deadlines, procurement procedures, and selection criteria. The procurement regulation allows for a variety of different procurement procedures from the "standard" open procedure to other, more restricted procedures that can only be used in certain circumstances. For example, pre-qualification and competitive dialogue can be used for more complex procurement projects. Before sending out a call for tenders, the buyer also needs to define the selection criteria that will be used to choose among the bidders. The selection criterion can be solely a matter of the lowest price, or the buyer can specify a number of additional criteria and give the relative weight of each of those criteria.

When the call for tenders is specified, it must be communicated to the market. This is done using the EU database, TED (Tenders Electronic Daily), and other channels (if so desired). The call for tenders includes the above-mentioned information, as well as information about the buyer, and a procurement code used to identify the type of good or service to be procured (called a CPV code; hierarchically structured, like an SIC industry code). The TED database (should) comprise information on all public procurement projects in the EU that exceed the above-mentioned threshold,

and it is freely accessible, searchable, and redistributable. After the TED notice is sent out, it is possible to have another round of dialogue with the market, although that dialogue must also take place under the same principles of non-discrimination and transparency.

When the deadline has passed, the buyer selects the winning bid based on the pre-specified criteria. If other criteria are used, suppliers that did not win the bid can petition the relevant authorities (or, ultimately, go to court) to have the tender cancelled or to be economically compensated. After the final contract has been agreed, the public buyer sends another notice to the TED database with information on the winner of the tender, the relevant dates, and the number of offers received.

This procurement procedure allows for the most open and unrestricted bidding. Other procurement procedures restrict the bidding by requiring bidders to meet pre-specified standards, while others involve invitation-only negotiations. The use of such procedures depends on the complexity of the procurement project and the competition in the market.

For this dissertation, I used the TED database to extract valuable pieces of information. More specifically, I used it to identify the population of buyer-supplier relations in public procurement in Denmark, and to gather relevant information on the procurement procedures, the selection criteria, the value of the tender, and the type of project (CPV code), as well as contact information for both the buyer and the supplier. This contact information was used to collect survey data from both buyers and suppliers. As the database consists of the entire population of public procurement projects that exceed the threshold value, it also makes it possible to calculate the number of repeat interactions and market characteristics, such as market size and concentration.

Extant Research on Public Procurement

The growing stream of empirical research on public procurement emphasizes similarities and differences between public and private procurement.[5] At the organizational level, the public ownership of assets removes the incentive generated by having a residual claimant. Moreover, public organizations generally have weaker incentive systems than private organizations, and it can be argued that public organizations often pursue goals other than economic efficiency (Boycko, Shleifer, and Vishny, 1996). At the transactional level, regulations governing public procurement create some important differences from the private setting. The repeated competitive bidding in combination with the non-discrimination principle mean that suppliers might have more incentive to behave opportunistically than in a private setting due to weaker incentives to build a good reputation.

In addition, contracting with a public organization, with its many stakeholders and its ability to (to some degree) set the rules governing the transaction, also entails its own kind of risk. Spiller (2008) argues that there are two kinds of opportunism that are specific to public-private interactions: governmental opportunism and third-party opportunism. By governmental opportunism, he refers to the risk faced by a private supplier that the government will change the "rules of the game" after investments are made on the supplier's side. By third-party opportunism, Spiller (2008) means the pressure coming from third-party stakeholders. In terms of the transparency of the transaction and the (legitimate) interest from third parties, contracting with public authorities is different than contracting with private parties. Public organizations routinely experience pressure from interest groups, politicians, or suppliers whose bids were turned down to change contracts (third-party opportunism).

Spiller (2013) suggests that transaction cost economics offers a good starting point for analyzing public-private interactions, such as procurement projects. Even though regulations might

[5] The present text is only concerned with studies that focus on questions with direct economic implications. However, it should be noted that a legally oriented stream as well as a stream driven by political scientists with different concerns (e.g., legitimacy, representation, transparency, good public governance) exist.

set different procedures and incentives for public and private organizations, the fundamental transaction and contract characteristics still matter (i.e., asset specificity, frequency, uncertainty, contract incompleteness, complexity). The empirical evidence regarding whether public organizations strictly economize on transaction costs is mixed. In a study of French public procurement, Chong, Saussier, and Silverman (2015) fail to find any effect of contract value and length (as proxies for complexity) on the choice of procurement awarding procedures. Saussier (2000) studies the procurement of coal in a French, publicly owned energy company and finds that the level of contractual incompleteness is as proposed by transaction cost economics. Similarly, Levin and Tadelis (2010) find that contracting difficulties related to monitoring performance and the need for flexibility play an important role in governmental decisions regarding whether to privatize a service.

The question becomes more complicated in the face of cross-organizational and cross-country differences. The effect of economic incentives (i.e., economizing on transaction costs) depends on the institutional environment of the transaction. One goal of public procurement regulations is to keep private interests from corrupting the public decision-making process. Baldi, Bottasso, Conti, and Piccardo (2016) provide a great example of how expected governance choices are altered by the presence of corruption. In a study of procurement in Italian municipalities, they find, as expected, that procurement of more complex projects often involves negotiation-based procedures, but that this link is much stronger in provinces with low levels of corruption.

An important decision in any procurement project relates to the choice of procedural form. A number of studies map the main differences between auction-based and negotiation-based procurement procedures. Procurement through the use of auctions, especially using fixed prices, creates strong incentives for cost reductions, while negotiation-based procedures and cost-plus contracts make ex-post adaptions smoother (Bajari & Tadelis, 2001). In a cross-country study of auctions in public transport procurement, Amaral, Saussier, and Yvrande-Billon (2009) find that the

ability of auctions to foster competition and reduce anti-competitive behavior depends on their specific design. The value of auctions declines when bidding for complex contracts (Bajari, McMillan, & Tadelis, 2009). Nevertheless, Chong, Saussier, and Silverman (2015) find that French public authorities heavily favor auction-based procurement procedures, even though they are associated with costly renegotiations. Negotiation-based procedures, which offer the buyer greater discretionary power, are more susceptible to individuals using public funds for private gain (Baldi, Bottasso, Conti, and Piccardo, 2016) or to being used to further political agendas in non-transparent ways ((Boycko, Shleifer, and Vishny, 1996).

An inherent tension in public procurement is between for public buyers to have discretionary power to rule out suppliers with a bad reputation while still maintaining transparency and non-discrimination. One could say that "limiting discretion to ensure public buyers' accountability comes at the possibly large cost of not allowing reputational forces to complement incomplete procurement contracts" (Spagnolo, 2012: 292). By limiting the effect of a supplier's reputation, the partner-selection process is derived of a quality indicator. Moreover, an incentive is removed for the supplier to behave non-opportunistically in order to build the value of its reputation as a reliable partner that provides quality goods or services, and thereby increase its likelihood of wining future contracts. The conundrum in this regard is whether assigning greater weight to reputational effects would hinder the entry of new suppliers and cross-border procurement, and whether it is possible to design a system that can mitigate the negative effect of the increased discretionary power of the public buyer (Spagnolo, 2012).

The bargaining position of the procuring public organization matters for the quality of the procured good. In an examination of municipalities' water provision that compares publicly provided water with franchisee-provided water, Chong, Saussier, and Silverman (2015) find that the size of the municipality alters its bargaining power and its ability to discipline franchisees. Smaller

municipalities pay a premium for water relative to larger municipalities. For larger municipalities, such premiums make them less likely to renew a contract. This is not the case for small municipalities, suggesting that they have a weak bargaining position. Desrieux, Chong, and Saussier (2013) show that public organizations can strengthen their bargaining position by using the same supplier for multiple services, as such a strategy may allow for tougher punishment of opportunistic behavior.

With regard to the literature focused on the challenges and conundrums of public procurement regulations, we should recall Williamson's (1976:72) dictum: "Merely to show that regulation is flawed, however, does not establish that regulation is an inferior mode of organizing economic activity".

THESIS OUTLINE

While the three papers included in this dissertation engage in different scholarly discussions, together they form a coherent exploration of endogenous drivers of unforeseen contingencies in project teams, how the manager's meta-knowledge affects the ability to efficiently manage groups of employees, and when such managerial knowledge matters for inter-organizational relations.

The first paper offers an empirical investigation of team-level antecedents of unforeseen contingencies in project teams. In much of the extant management literature, the source of uncertainty is often assumed to exogenous in nature or due to opportunistic actors. This paper argues that an important source of unforeseen contingencies lies in coordination failures, which arise due to the challenge of coordinating specialized employees and developing new solutions. Empirically, the paper tests the hypotheses using a dataset consisting of survey information gathered from 188 suppliers to public organizations. Overall, the paper finds that the level of unforeseen contingencies experienced by a team is influenced by the team's coordination ability, the level of specialization among team members, and whether the use of trust-based governance fits with the task at hand. Even

though the paper identifies a number of coordination challenges, it does not provide an answer as to how to mitigate them.

The second paper looks at the epistemic conditions for managerial intervention in coordination problems. The paper develops a general theory of the impact of managerial meta-knowledge—the knowledge managers hold about their employees' knowledge— on economic organization. The argument is that much of the extant research in the management and economic organization field builds on the assumption that managers know the productive capabilities of the firm or team they are managing. We challenge this assumption and show that looser assumptions about the level of managerial meta-knowledge leads to important insights for economic organization. We argue that imperfect managerial meta-knowledge reduces the manager's ability to write fitting contracts and coordinate the capabilities of the team. In addition, we argue that imperfect managerial meta-knowledge is an opportunism-independent driver of *ex-post* transaction costs. While the first paper focuses on important endogenous drivers of unforeseen contingencies, the second paper develops a theoretical framework that identifies the roles of managers and managers' knowledge in mitigating the challenges arising from such contingencies.

The third paper investigates the effect of managerial meta-knowledge in and on inter-organizational relations. The paper shows that having a supplier with high-quality managerial meta-knowledge is a necessary condition for strong inter-organizational relations to be linked with buyer satisfaction. Competitive pressure from alternative suppliers is a similar necessary condition. I argue that these two conditions define the decision space of the supplier's manager and the incentives to ensure customer satisfaction. The paper tests the hypotheses on a dataset comprised of public procurement archival data and survey data covering both buyers and suppliers in 89 procurement dyads.

Together, the three papers establish the presence of endogenous, team-level antecedents of unforeseen contingencies. By identifying a number of endogenous antecedents of coordination failures, the first paper highlights the need to manage interdependent employees and their tasks. The second paper develops a general theory about the role of managerial meta-knowledge in economic organization. Managerial meta-knowledge is a necessary epistemic condition for managing interdependent employees. The third paper empirically investigates the effect of managerial meta-knowledge on inter-organizational procurement relations and provides evidence that strong inter-organizational relations are only advantageous for the buyer in situations with competitive pressure and when the supplier has good managerial meta-knowledge.

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Chapter 2 – Coordination and Contingencies

COORDINATION AND CONTINGENCIES:

TEAM-LEVEL ANTECEDENTS OF UNCERTAINTY

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July 2016

COORDINATION AND CONTINGENCIES:

TEAM-LEVEL ANTECEDENTS OF UNCERTAINTY

Abstract

The ability to solve the coordination and cooperation problems associated with interdependent tasks are two of the most important characteristics of the firm. In the management literature, the analysis of cooperation problems has overshadowed the analysis of coordination problems. The main challenges for efficient coordination are endogenous processes leading to miscommunication and the failure to integrate interdependent tasks. This paper explores important endogenous drivers of coordination failures and their implications in the form of an increase of unforeseen contingencies in project teams. The specific antecedents explored are a team's coordination capability, the degree of specialization among team members, the extent to which project development is required, and the use of trust-based governance. The hypotheses are tested using a unique dataset comprised of archival data and survey data on 188 project teams from private suppliers and organizations governed by public sector procurement regulations.

> *Organization theories describe the deliberate the delicate conversion of conflict into cooperation, the mobilization of resources, and the coordination of effort that facilitate the joint survival of an organization and its members.*
>
> March and Simon, 1958/1993: 2

INTRODUCTION

The act of organizing is a process that aims to ensure cooperation between parties, the marshalling and distribution of resources, and the coordination of interdependent tasks (March & Simon, 1958/1993). In the field of management, the challenges of coordinating interdependent tasks are often not given enough attention, leading to coordination neglect (Heath & Staudenmayer, 2000). When organizing projects—big or small—there is always a risk of miscommunication or miscoordination, and deadlines may not be met. Cooperative actions in general and projects that are divided into specialized tasks in particular are vulnerable to these challenges of dependence.

Even though uncertainty is often conceptualized as exogenous factors disturbing the internal workings of an organization or as an inherent condition of managerial decision making, one can also argue that organizations themselves create uncertainty (Power, 2008) and that we ought to theorize about multiple kinds of uncertainty (Koopmans, 1957; Williamson, 1985). Fundamentally, organizations are a way of managing the dependency problems arising from having multiple people working together. In this perspective, we can understand organizations as flows of information among more or less interdependent parties (March & Simon, 1958/1993). As Jarzabkowski, Lê, and Feldman (2011) remind us, coordinating this flow of information requires constantly breaking down old systems of coordination and developing new ones in order to adapt to new circumstances.

Individual- and group-level research has established that groups vary in their ability to coordinate. This is true in normal situations and in situations characterized by significant stress. For

example, studies of transactive memory systems make it clear that there are performance advantages to being part of a group in which the members know each other's abilities (Kozlowski & Bell, 2003; Lewis & Herndon, 2011; Ren & Argote, 2011). This makes it easier to coordinate problem-solving activities and ensure that the right skill sets are present. The effect of a strong transactive memory system is even stronger in highly uncertain external environments (Heavey & Simsek, 2015; Rau, 2005). Coordination can be carried out in numerous ways and be supported by many factors—a strong transactive memory system is only one of them. In project teams, coordination efforts are often undertaken by key individuals who take on the role of coordinator (Dahlander & O'Mahony, 2011), regardless of whether they formally hold this position. The coordination process can also take less explicit forms and be handled implicitly by members who are able to anticipate the actions of others within the group and dynamically adjust their actions (Rico et al., 2008). It can also be handled through well-established organizational routines (Becker, 2004; Feldman & Pentland, 2003).

The management literature mainly focuses on the team's ability to coordinate in two specific settings. The first relates to organizations' abilities to continuously adapt to volatile and changing environments. This research in dynamic capabilities studies both organizational phenomena and their micro-foundations (Argote & Ren, 2012; Helfat & Peteraf, 2015; Teece, Pisano, & Shuen, 1997). Second, a stream of research focuses on organizations' abilities to integrate employees' specialized knowledge. This research is particularly interested in the integration of knowledge-based skills (Gardner, Gino, & Staats, 2012; Kogut & Zander, 1992).

One implication of organizational heterogeneity with regard to coordination capabilities is that organizations differ with regards to how often coordination breaks down. Regardless of whether the source of this coordination failure is miscommunication, a lack of planning, misunderstandings, a lack of clear responsibilities, or an unwillingness to adapt existing plans, it produces uncertainties regarding the outcome of actions and it stems from the internal workings of the organization. This

perspective stands in contrast to prevalent ways of conceptualizing uncertainty in management theory, where uncertainty is understood as a change in the external environment with implications for the organization's performance. This paper puts forth arguments for conceptualizing unforeseen contingencies as an outcome of intra-organizational processes. I offer empirical evidence in this regard and argue that these kinds of coordination failures should be an important outcome variable in management research on organizations, as the breakdown of coordination is, in essence, the breakdown of an organization. The research question guiding this paper is the following: *Do team-level characteristics (i.e., coordination capabilities, level of specialization, and the use of trust-based governance) affect the level of problems experienced due to unforeseen contingencies?*

THEORY AND HYPOTHESES

Conceptualizing Endogenous Uncertainty

Not all aspects of organizing receive equal attention in today's management research. As Simon and March (1958/1993) argue,[6] organizing is fundamentally a matter of ensuring cooperation, marshalling resources, and coordinating interdependent tasks. Much of the literature focuses on ensuring cooperation—making independent parties work towards a common goal. This problem is often analyzed using an agency framework.[7]

In contrast, coordination is a concept that does not lend easily itself to a thorough analysis by a single theoretical framework. In this paper, coordination is defined as the bringing together of interdependent actions in such a way that they are performed without specification, temporal, or spatial problems. In other words, the right tasks are performed at the right time at the right location. The difficulty of analyzing the coordination problem stems from what March and Simon (1958/1993: 44) see as a theoretical exclusion of the real-world problems of coordinating: "One peculiar

[6] See the paper's opening quote.
[7] This is in not meant as a critique of agency theory or its boundary condition.

characteristic of the assignment problem [allocating a given set of assignments among a given set of employees], and all of the formalizations of the departmentalization problem in classical organization theory, is that, if taken literally, problems of coordination are eliminated." As Heath and Staudenmayer (2000) argue, this has meant that the problem of coordination has been studied less than its importance warrants. Other disciplines have more established research streams on coordination problems. Operation researchers often deal with coordination problems by analyzing optimization problems, while social psychologists address them by studying biases and group behavior. Heath and Staudenmayer (2000) argue that both agency problems and coordination problems are important issues for everyone studying organizations, but the latter have been overlooked:

> "Although the agency problem has become increasingly popular, the coordination problem has not seen an equivalent rise in popularity, despite the fact that it is equally central for organizations. In fact, in economics, the coordination problem predates the interest in agency (e.g. Marschak & Radner, 1972), yet it has fallen out of favor while the agency problem has become increasingly popular (Milgrom & Roberts, 1992)" (Heath & Staudenmayer, 2000: 154-155).

When interdependent tasks are not performed and coordination problems arise, the performance of an organization becomes more uncertain. The dominant approach to analyzing uncertainty is to consider it as an exogenous event in a dynamic environment that an organization can be more or less able to handle (e.g., Teece, Pisano, and Shuen, 1997). This approach is the same whether the antecedent of uncertainty is event of nature or, as often in the transaction cost economics literature, as the outcome of opportunistic agents.

In order to analyze the impact of uncertainty on the governance of transactions, Williamson (1985: 57-58) draws on Koopmans' (1957) distinctions among three kinds of uncertainty: behavioral,

primary, and secondary. Behavioral uncertainty is the focus of a great deal of management research. This type of uncertainty is produced by strategic and opportunistic actors, who use all available means to gain competitive advantages by. Primary uncertainty is often associated with financial and economic analyses of risk, where risk is an outcome variable with a value that is unknown, although its probability distribution is known. This approach is often used when dealing with risky states of nature. Secondary uncertainty refers to the coordination problems arising when multiple individuals work together and do not know what the other parties are doing. In other words, it stems “from lack of communication, that is, from one decision maker having no way of finding out the concurrent decisions and plans made by others” (Koopmans, 1957: 143). In contrast to behavioral uncertainty, secondary uncertainty is an opportunism-independent driver of unforeseen contingencies. In other words, while behavioral uncertainty leads to cooperation problems, secondary uncertainty leads to coordination problems.

The transaction cost economics tradition has focused on behavioral uncertainty with its link to strategic, opportunistic behavior, and on the role of primary (especially environmental) uncertainty. Few articles in this stream of literature mention the concept of secondary uncertainty, although the theme appears from time to time. For example, even though Sutcliffe and Zaheer (1998: 3-4) discuss the concept of secondary uncertainty with the goal of "distinguishing between different forms of uncertainty which arise from the different sources that are relevant to decisions about firm scope," they do not include the construct in their empirical analysis.

A focus on secondary uncertainty provides a somewhat different perspective than the focus on predicting performance that is common in management research. While performance depends on the specific contractual setup, secondary uncertainty does not. Performance is a composite construct dependent on a contractual agreement that gives the time and cost frames, as well as the project’s specifications. A coordination failure might lead to a decline in performance if it has serious

implications in terms of time or cost overruns, or if it means that the project specifications are not met. Performance and coordination are both managerial issues, although they are different in nature—one is a goal and the other is a task. Furthermore, an event can have different performance implications for different parties depending on the governance and contractual setup (e.g., internal or external, fixed price or variable pay). If an external firm is used as a supplier for a project and it experiences unforeseen contingencies, then the performance implications for the buyer depend on the contractual setup. Therefore, performance is dependent on a clear contractual relationship, but the occurrence of contingencies is not. Instead, such contingencies depend on the expectations and plans of those performing the relevant tasks.

Theorizing about uncertainty and coordination failure as endogenous outcomes of organizing emphasizes the importance of managers' and employees' abilities to cooperate and coordinate. One implication is that we should theorize about the firm as a social and communication group with tasks and abilities that need to be coordinated. In other words, we should not adopt the production function view (see critique by Williamson, 1985). Another implication is that we need to think about the act of coordination and the manager's role in that activity. When employees with diverse skill sets need to cooperate and their tasks need to be coordinated, the manager must have a good mental model not only of the environment, but also of the group he or she is managing. Employees and team members also vary in their coordination abilities, and these variations can be the result of individual-level factors (e.g., experience, skills, formal roles) and group-level factors (e.g., diversity, member turnover, degree of specialization). These theoretical considerations in combination with the empirical research discussed below suggest that we should more thoroughly consider the antecedents of coordination failures.

Coordination Capabilities

One antecedent of unforeseen contingencies lies in team members' abilities to communicate and coordinate actions. A team's coordination capability is its ability to ensure that interdependent actions are performed without unforeseen events causing problems. This ability has a static aspect and a dynamic aspect. The static aspect is the ability to make plans, communicate them to the affected parties, and carry them out. The dynamic aspect is the ability to adopt plans and actions to changing circumstances. Empirical research on group behavior shows that both static and dynamic aspects of a team's ability to coordinate are affected by team characteristics, such as team experience, individual experience, team composition, team turnover, and the social and communicative networks within the group. A meta-review of research on the link between team composition and performance (Stewart, 2006) finds that there are important antecedents at multiple levels, including the task, individual, and group levels. With regard to avoiding coordination failures, Brandts and Cooper (2007) use experiments to argue that the financial incentives of employees and managers do not matter as much the manager's communication. Both management research on team behavior and social psychological research on teams and transaction memory systems find that teams differ in their ability to coordinate in high-stress situations and in regular, everyday situations. Two important empirical streams of literature provide insights into the mechanisms underlying differences in coordination capabilities. One stream of literature focuses on individual biases and how they make efficient coordination more challenging. The second stream is social-psychology-based literature on team behavior, which covers a wide range of different empirical approaches.

As with any action requiring cognitive processes, the act of coordination is prone to biases. When an individual must coordinate his actions with another's, problems can be created not only by his or her own biases but also by those of the other person. Heath and Staudenmayer (2000) suggest that a main driver of coordination neglect is cognitive biases—an excessive focus on one aspect of a

project at the expense of other aspects—which harm the ability to coordinate. They suggest that two mechanisms are particularly important in this regard: an overly strong "partition focus" and an overly strong "component focus." The partition focus refers to the tendency of people to neglect coordination needs because they are dividing and delegating tasks to other people. The component focus reflects the tendency to put too much emphasis on a single component in a project and then neglect how it interacts with other components. Taken together, these two biases can create an environment in which the owner of each component focuses on his or her own task, and leaves the responsibility for its interaction with other components to other people. The most important way to mitigate these types of problems is through ongoing communication and consistent efforts to translate knowledge across areas of expertise (Heath & Staudenmayer, 2000; Ketokivi & Castañer, 2004; March & Simon, 1958/1993). Ketokivi and Castañer (2004) suggest that one way to mitigate the problems of employees exclusively focus on their immediate, local goals is by having explicit and integrative strategic-planning processes.

Studies of group behavior point to a number of mechanisms that help groups coordinate efficiently. The simplest form of coordination is the use of routines, where individuals act in a fashion that has worked in the past and depend on others doing the same. Routines enable coordination by allowing group members to form expectations about the behavior of others (Becker, 2004; Feldman & Pentland, 2003). One limitation to the types of coordination problems that can be efficiently solved through routines lies in the fact that routines are experience-based. This implies that they are less useful in new situations or when dealing with non-repeated actions (Teece, 2012). Other coordination mechanisms depend on the conscious choices and knowledge of individuals, managers, or employees. They include those mechanisms proposed in studies on knowledge of group members' knowledge, such as transactive memory systems. Overall, groups differ in how they plan, structure, adapt, and learn (Ilgen, Hollenbeck, Johnson, & Jundt, 2005), which in turn affects their performance. Work

teams are affected by countless mechanisms, which have been explored in a line of research too extensive to be described in this paper (for a review, see Kozlowski & Bell, 2003).

The transactive memory system literature argues that teams develop a system of knowledge in which each member holds some knowledge about the other members. This is a way of economizing on scarce cognitive resources, as it allows each team member to specialize and helps minimize redundancies. A group with a strong transactive memory system has a cognitive division of labor, as each member knows who holds what knowledge. This enables team members to direct new information to the relevant people, and they know who to ask when in need of expertise. Such a system has a positive effect on team performance (Lewis, 2004; Lewis & Herndon, 2011; Moreland & Myaskovsky, 2000; Ren & Argote, 2011; Rulke & Galaskiewicz, 2000). With regard to the dynamic element of coordination, a team can be more or less able to adapt to small changes and requests. Notably, a group that has worked together before is better to use the capabilities present in the team (Entin & Serfaty, 1999; Lewis, Belliveau, Herndon, & Keller, 2007; Moreland & Myaskovsky, 2000; Rulke, Zaheer, & Anderson, 2000). The positive effects of strong transactive memory systems on performance are even stronger in highly uncertain environments (Heavey & Simsek, 2015; Rau, 2005). They are not contingent on a given project. Instead, these positive effects follow the team to new projects (Lewis, Lange, & Gillis, 2005).

The above arguments and empirical evidence suggest that teams are heterogeneous in their abilities to solve internal coordination problems. Serious coordination problems may lead to unforeseen contingencies severe enough to affect the project at hand. This reasoning motivates the following hypothesis:

H1: *A team's coordination capability is negatively related to the severity of unforeseen contingencies.*

Specialization and Integration Challenges

When projects require team members with diverse, specialized skill sets, one major challenge is to make sure that unity of effort is achieved among various subsystems (Lawrence & Lorsch, 1967: 4). At the same time, the specialization of employees' skills is a necessity for solving problems and for ensuring a well-performing organization. In that sense, managers "are constantly struggling with the difficulty of reconciling the need for specialization with the need for coordination of effort" (Lawrence & Lorsch, 1967: 47).

The benefits of specialization are many. Specialization allows individuals and groups to concentrate on tasks that match their skills and abilities, and focuses their learning on this area. In this way, it mitigates some problems of bounded rationality (Heath & Staudenmayer, 2000: 157). The drawback of specialization lies in the lack of an overview of the entire project. Dahlander and O'Mahony (2010) empirically show a tendency for larger projects to develop more specialized groups and that these specialized groups tend to communicate less with each other. Formal models in economics also imply that increased specialization increases the cost of coordination because it creates cooperation challenges, such as principal-agent problems and hold-up problems. Moreover, specialization gives rise to coordination challenges, such as communication problems across specialized fields and a lack of common knowledge (Becker & Murphy, 1992; Bolton & Dewatripont, 1994).

The challenge of achieving unity of effort among specialized individuals and groups is discussed in management research as the problem of integration. In the knowledge-based view, the ability to coordinate specialized knowledge is the one of the defining characteristics of firms (Foss, 1996; Grant, 1996; Kogut & Zander, 1992). This integration of distributed knowledge and skills occurs through both formal and informal mechanisms involving group identity, ongoing communication, coordinated learning, and a supportive team (Orlikowski, 2002). The ability to

consciously integrate specialists' knowledge also requires knowledge of the focal area, although not at a detailed level. One of a manager's main roles is to ensure cooperation between parties that do not know each other's skills and to create interfaces for interdependent tasks (Brusoni, Prencipe, & Pavitt, 2001; Postrel, 2002). The literature suggests that a number of different mechanisms affect knowledge integration. Drawing on Kogut and Zander (1992), Gardner, Gino, and Staats (2012) distinguish among three kinds of antecedents to knowledge-integration capabilities: 1) those based on strong relational ties, 2) those based on collective experiences, and 3) those based on the structural characteristics of the team. They find that building strong integrative capabilities leads to better performance. This effect depends on the team being in an environment that is conducive to the integrative process. Moreover, Gardner (2012) finds that as performance pressure on teams rises, the ability to use specialized knowledge deteriorates.

The problems of integration can take many forms, such as redundancies in work and disappointing performance, unforeseen problems of incorporating disparate tasks, and the need to redo work. The above leads us to the following hypothesis:

H2: *The team members' level of specialization is positively related to the severity of unforeseen contingencies.*

Trust-based Governance and Risk Taking

Trust is predominantly seen as a desirable phenomenon with a positive effect on the functioning of organizations. A number of benefits have been suggested: less conflict, easier conflict resolution, and forbearance for minor transgressions. Other benefits usually develop over time, including better knowledge of each other and experience with cooperation. In much of the empirical research on trust in organizational settings, trust is viewed as a moderating factor that changes the strength of other effects, usually in such a way that more trust is better (see the review of Dirks and Ferrin, 2001). In addition to the beneficial effects of trust in teams, some research points to the more ambiguous

dimensions of trust and the costs involved in developing it: "To advance our understanding our understanding of trust as an organizing principle, attention to both its beneficial and detrimental effects is required. Moreover, quite apart from the downside of trust are the costs involved in creating, upholding, and maintaining trust" (McEvily, Perrone, & Zaheer, 2003: 100). I recognize that the costs of developing and maintaining trust are important for understanding the boundaries of trust-based governance and for understanding why some research finds a substitution effect between trust- and monitoring-based governance (Langfred, 2004), even though others argue that monitoring on the contrary can enhance the effect trust (Davis, Schoorman, & Donaldson, 1997; Schoorman, Mayer, & Davis, 2007). However, in this paper, I focus on a specific uncertainty-producing outcome of trust—its relationship with risk-taking behavior.

Some economists analyze trust as a matter of showing forgiveness for a transgression in order to gain a future advantage (Williamson, 1993). As such, they view trust as an investment. However, there is a general trend of defining trust as the accepting of vulnerabilities (Mayer, Davis, & Schoorman, 1995; Rousseau, Sitkin, Burt, & Camerer, 1998). A highly cited introduction to an Academy of Management special issue on trust gives the following cross-disciplinary meaning to the term: “Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” (Rousseau et al., 1998: 395).

In a managerial context, trust-based governance is governance that accept vulnerabilities based on expectations that those governed intend to work towards the organization’s goals. This is often seen as an alternative to more rigid monitoring and safeguarding regimes (McEvily et al., 2003). A willingness to accept vulnerabilities means that the outcome cannot be controlled as well. The expectations can either be met, such that members of a team apply their skills and knowledge to solve the task at hand in the best possible way, or the expectations and trust can be misplaced, meaning that team members might shirk or avoid doing tasks in the best possible way. An example of trust-based

governance is a manager assigning a team to a task, such as developing a software solution, without introducing any requirements other than the functions required of the final product. In such a case, the specific development approach and the tasks undertaken are up to the development team—the manager *trusts* the team to develop the software to the best of its members' abilities. In other words, the willingness to accept vulnerabilities has a double effect. It gives team members the freedom to come up with new, efficient solutions to problems, but it also creates a risk that team members will not develop any such solutions, and that they will instead spend their time either on barren efforts or shirking.

In terms of causality, the relationship between trust and risk taking is not such that a manager takes a risk by showing trust. Rather, the argument is that "risk is inherent in the behavioral manifestation of the willingness to be vulnerable. One does not need to risk anything in order to trust; however, one must take a risk in order to engage in trusting action" (Mayer et al., 1995: 724). In other words, in environments in which team members and managers engage in trusting actions, they also take more risks. This relationship has been found in a number of studies. A recent meta-analysis also uncovered a "moderately strong relationship between trust and risk taking" (Colquitt, Scott, & LePine, 2007: 918)

Risk-taking behavior comes with potential upsides and downsides. The outcome is uncertain and it will only become evident over time. Given this line of argument, I present the following hypothesis on the relationship between trust-based governance and unforeseen contingencies:

H3: *The team's reliance on trust-based governance is positively related to the severity of unforeseen contingencies.*

Development Projects

The empirical setting of this paper is public procurement projects in Denmark. These procurement projects are governed by rules put in place to ensure as much competition as possible as well as good

use of public budgets. These rules apply some limitations to the buyer-supplier dialogue prior to supplier selection. Some have argued that these limitations can lead to an underuse of the supplier's knowledge and expertise. In order to mitigate these problems, the central Danish authority overlooking this area (*Konkurrencestyrelsen*) recommends more widespread use of "functional specifications" of projects. This means that when a public call to tender is released, it does not give detailed specifications of the good or service, but instead specifies the functions, properties, and interfaces of the good or service. The argument is that this enables the suppliers' knowledge to better utilized, as their bids should include the best possible solutions.

One source of risk for the buyer in this type of process is that the winning project may be underspecified, such that significant development work is needed after signing the contract. When trying to win a tender that involves a new solution, a number of challenges can arise. For several reasons, developing new solutions is riskier than undertaking a project based on standardized routines and prior experience. First, the exact costs are more difficult to estimate, as the project might encounter unforeseen challenges that will take time or money to resolve. Second, when new projects or products are developed, there is often a learning process with regard to the required skills and knowledge. This is not only a question of employees learning or hiring new labor with the required skills, but also the fact that it is more difficult for managers to assess the costs and time of development-related projects ex ante. From a management perspective, projects with a significant development phase entail a different, more significant coordination challenge than projects similar to those handled in the past. In the latter case, potential coordination problems are more likely to be known, and it is easier to watch for cooperation problems and to create efficient incentive systems. These arguments lead to the fourth hypothesis:

H4: *The amount of development needed for a project is positively related to the severity of unforeseen contingencies.*

Trust-based Governance when Developing Projects

The relationship between trust-based governance and risk-taking behavior is affected by the increased likelihood of unforeseen contingencies when engaging in new development projects. In other words, the characteristics of the focal problem drive the effectiveness of different governance choices (for similar arguments, see Baldwin, 2008; Hsieh, Nickerson, & Zenger, 2007; Macher, 2006; Nickerson & Zenger, 2004). Three factors affect this relationship. First, development projects differ with regard to their risk profiles. As discussed above, the outcome is more difficult to anticipate. Moreover, as the employees are asked to developing something new, they are more likely to take risks. In terms of the severity of unforeseen contingencies, the baseline is different—risk-taking behavior is embedded in the project. Second, it is more difficult to monitor employees when developing new projects, which leads to more reliance on other governance mechanisms, such as trust-based governance. This implies a greater emphasis on the team-selection phase. Furthermore, the greater the amount of knowledge needed from outside the manager's domain of expertise, the more "the manager must trust that a culture of widespread knowledge sharing and consensus decision making is the organizational approach most likely to yield a valuable solution" (Nickerson & Zenger, 2004: 630). Third, as shown in the trust literature (Colquitt et al., 2007; Dirks & Ferrin, 2001; Mayer et al., 1995; Rousseau et al., 1998; Schoorman et al., 2007), trusted employees are less likely to shirk and more likely to communicate and share knowledge among colleagues. The reduced shirking means that employees are less likely to take advantage of the manager's struggle to monitor development projects. The increased communication and knowledge sharing mean that the project team is more likely to take full advantage of all available knowledge assets and come up with better solutions.

Taken together, the decreased ability to monitor and control development projects, the reduction in shirking among trusted employees, the increased knowledge sharing, and the explicit

desire for new and riskier solutions imply that the effect of trust-based governance is negatively moderated. I therefore propose the following hypothesis:

H5: *The effect of trust-based governance on the severity of unforeseen contingencies is negatively moderated by the degree of development needed in the project.*

[- FIGURE 1 -]

METHOD

The hypotheses are tested on a dataset comprised of surveys of suppliers to public organizations and archival data on project characteristics. The dataset covers a broad range of project types and is, therefore, suitable for wider generalizability than studies of a single type of project (e.g., studies of IT projects). The advantages of studying public procurement include not only data availability and natural public interest, but also the ability to study a set of suppliers that are governed by uniform, transparent rules with regard to their relationships with buyers. The unit of analysis is the supplier's organization of a specific project procured by a public authority. The outcome variable of interest is the severity of unforeseen contingencies in all of the estimated models.

All surveyed projects were made public in the pan-European public procurement tender database, TED. The procurement projects were initiated in the period from 2010-2014 and the surveys were distributed during the winter of 2014-2015. The survey was distributed by email, and was offered in both English and Danish (most respondents answered the Danish version). The email contained a short presentation of the research project, the name of the focal procurement project, a link to the focal project in the TED database, and a link to the survey. The survey was sent to the person responsible for the project at the supplier, as indicated in the TED database. The email's opening also stated that it should be forwarded to the person responsible for the project if the recipient was not that person. Furthermore, in the survey, respondents were asked about their job role to ensure that the responses were provided by the most relevant person. In cases where no contact information

was available, contact information on the supplier gathered from a separate survey of the buyers was used.

From the TED database, I collected 525 unique emails. These emails, together with those provided by the buyers, led to a total of 817 functional supplier email addresses. Two weeks after distributing the survey, I sent a reminder email to those who had not responded and had not opted out already. Two sets of reminders were sent. A total of 268 suppliers replied, giving an effective response rate of 33%. However, the analyzed sample is smaller due to missing data and the exclusion of projects involving less than three team members. Therefore, the final sample covered 188 projects.

Non-Response Bias

On the basis of information about the underlying population gathered from the TED database, I explored the degree to which the sample was representative of the population using a t-test, a Chi-squared test, and a Kolmogorov-Smirnov test, depending on the variable type and distribution. In terms of project types, there was an underrepresentation of procurement of supplies, and an overrepresentation of construction work and service projects. Furthermore, the process used to choose the winner of the tender (the respondent) was more likely to be restricted (criteria for participation) than completely open. Similarly, projects in which the supplier was chosen on the basis of more than just price criteria were overrepresented.

Overall, the non-response analysis suggests that the respondents were more likely to answer when the project was not a supply project, when participation criteria were included in the tender, and when price was not the only important factor for the buyer. In addition, a comparison of the buyers' performance suggests that the suppliers' willingness to answer the survey was higher when the project was successful. Nevertheless, the non-response problem does not appear to be a significant issue, although it should be kept in mind when thinking about the generalizability of the study.

Measures

Unless otherwise specified, the survey variables were measured using five-point Likert scales (the scales and individual items are found in the Appendix). The consistency of the measures is explored using alpha coefficients as well as a factor analysis of the three main constructs: coordination capability, division of labor, and trust in employees.

Dependent variable: Measuring the severity of *unforeseen contingencies* is inherently difficult, as the variable relates to the difference between an outcome and expectations (if any expectations were formed). The extant measures of unforeseen contingencies are almost entirely devoted to changes in the external environment. Therefore, I constructed four new items, which I tested on a small pilot group of randomly selected procurement projects with follow-up phone conversations in order to ensure that the items captured the intended phenomenon. The approach taken in this survey is to ask questions related to deviations from the original plan. The questions were about changes to the project plan, projects being more complex than expected, the need for additional competences, and whether there were no notable surprises (reverse coded). The alpha coefficient of 0.88 suggests that the measure is consistent and reliable.

As the items rely on the difference between ex ante expectations and ex post realities in order to capture the severity of unforeseen contingencies, this measure is unlikely to capture unforeseen contingencies that did not cause deviations from the plan. One could argue that the most interesting unforeseen contingencies are those that do result in such deviations. Nevertheless, the unforeseen contingencies are probably underreported. The measure reflects the level of problems arising due to unforeseen contingencies.

Independent variables: The three team characteristics—*specialization*, *coordination capability*, and *trust-based governance*—are measured using items developed by Lewis (2003) as part of her research on transactive memory systems (TMS). In TMS research, the TMS construct is a

second-order, formative latent variable composed of the three constructs. Each construct is covered by five items. The formative, latent character of TMS implies that the individual constructs cannot be interpreted as individually related to TMS. Instead, this relationship is only present when all three indicators are available: “We can meaningfully interpret coordination scores as indicative of a TMS (as opposed to indicative of other causes of coordination) if and only if coordination is observed in the presence of the other manifest variables, specialization and credibility" (Lewis & Herndon, 2011: 1257).

In this study, the three constructs are used separately as indicators of three distinct team characteristics. The three *specialization* questions focused on the specialization of knowledge and capabilities within the team, and the degree to which that knowledge needed to be combined in order to complete the project. In other words, the questions captured team members’ specialization with regard to the project rather than the team’s general level of specialization. Lewis’s original scale includes two additional items related to the respondent’s (in this case, the project manager’s) knowledge of the team members’ knowledge. Those items were not used in this study, which focuses on the team’s specialization rather than the meta-knowledge of the manager. The alpha coefficient is 0.72, suggesting an internally consistent measure.

The *coordination capability* of the team was also measured using five items, two of which were reverse coded. The questions covered the smoothness, confusion, and misunderstandings regarding to how the project was to be completed. The alpha coefficient is 0.78, suggesting a reliable and consistent measure.

Trust-based governance was also captured using five items, two of which were reverse coded. The questions were about the trust the responding project manager had in the knowledge, information, and expertise of his team members, and the likelihood that he or she would double-check information

provided by them. By including the question on double-checking information, the scale moves from feelings of trust to include behavioral indicators. At 0.71, the alpha value is still acceptable.

In order to ensure that the 13 items empirically capture distinct phenomena, I used a factor analysis to explore underlying factors. The exploratory factor analysis (principal component with varimax rotation) suggests four underlying factors with an eigenvalue greater than 1. Each factor loads nicely on each of the three constructs. The fourth factor primarily captures cross-loadings on the reverse-scored items. The finding of a fourth factor is not surprising, as some cross-loading is to be expected from questionnaire-based constructs due to common method variance. The cross-loading on the reverse scored items is a relatively common form of reversed-item bias (Podsakoff, MacKenzie, & Podsakoff, 2012; Swain, Weathers, & Niedrich, 2008; Weijters, Geuens, & Schillewaert, 2009). The upside of using reversed items is that they force the respondent to reconsider their answers and not use the baseline set in previous answers, thereby leading to greater reliability of the final construct. In order to ensure that the problem is not serious, I repeated the factor analysis using a set amount of three factors. The loadings are distributed along the three construct, as expected. This factor analysis, together with the methodological arguments (Herndon & Lewis, 2011), suggests that the three constructs from the TMS research can be validly used as distinct constructs.

The degree to which the supplier was working on a project with a significant development phase (*development project)* was captured using a single item that has previously been used by the Danish public authority overseeing the public procurement and tender processes. The use of unidimensional constructs entails a number of problems, such as concerns about the reliability and validity of the construct, as well as more limited variance when using Likert scales. Therefore, the question needs to be worded carefully and should be easily understood by the respondent. As I used a scale already in use by the public authorities, the wording of the question matched the language used in the public procurement community. Furthermore, as a robustness check, three other questions

were added in order to form a new, related construct. The question asked on the single-item scale was about whether the tender material allowed for new, more efficient solutions to be submitted by the bidders, or whether bidders were asked to stick to the detailed specifications and plans found in the tender material.[8] This question captures the degree to which the good or service delivered is described in great detail in the tender material, and the degree to which the tender describes a problem that the supplier needs to solve in the manner it feels is best.[9] Five response options were provided with increasing degrees of freedom in terms of the supplier developing its own solutions. A number of robustness checks related to this variable are analyzed and reported. All of the robustness checks produced results qualitatively similar to those in the main model.

Controls: *Team size* was captured by asking the respondent about the number of employees involved in the project (using the official project name). If the answer was more than three, then the questions about team characteristics were also asked. The threshold of three is in line with research on transactive memory systems and other group research. The argument is that two is a dyad and that new group dynamics start to develop beyond this level.

To capture the effect on unforeseen contingencies of the buyer applying ex post pressure and trying to take advantage of the supplier, a measure of *buyer opportunism* was adapted from Carson, Madhok, and Wu (2006). The measures consist of six questions about the degree to which the buyer tried to get more value out of the cooperation by distorting information, being less cooperative, and trying to renegotiate to their own advantage. The scale was highly consistent with an alpha coefficient of 0.90.

[8] The tenders can be very detailed, as the case of the development of a new electronic travel-payment card illustrates. The public tender for this system included 2,100 functional specifications, which were later broken down into 17,000 technical specifications.

[9] This follows a general trend towards using more functional descriptions in tender material instead of describing in detail the characteristics of what is to be delivered. An example is specifying the functional characteristics of highway asphalt, such as the noise level and how slippery the asphalt should be when wet, instead of specifying the material to be used. This change attempts to take advantage of the suppliers' knowledge. As one publicly employed interviewee said about IT projects: "We often end up specifying the systems we already have, including their old setups and technologies."

The *value of the contract* is used as a control to capture the effect of larger, often more complex projects. The value of the contract was drawn from the TED database. As this source lacked much of the necessary data on this dimension, the value of the contract was also included as a question in the survey. The variable is constructed as the logged value in million DKK. As there are significant differences depending on whether a *service*, a *good*, or a *construction work* is being supplied, this is captured in a control variable based on the TED data.

Long projects may be more likely to experience unforeseen contingencies because there is more time for events to occur and because there is a longer period between the point of planning and the point of execution. In order to capture this effect, a *project length* variable was constructed based on the start date given in the TED database and the end date indicated in the survey responses. In order to capture the effect of being at a certain stage of the project, a variable taking values between 0 and 1 was constructed to capture the *completion percentage* of the project in terms of time.

ANALYSIS

In order to test the hypotheses, a number of OLS models are used to estimate unforeseen contingencies. First, the independent variables (IVs) and the interaction are introduced step-wise. Later, as robustness checks, a number of changes to the moderating variable are introduced. The descriptive statistics are reported in Table 1.

[- TABLE 1 -]

Table 2 presents three estimated models: 1) only controls, 2) controls and independent variables, and 3) controls, independent variables, and moderation effect. All are statistically significant and each new model fits the data significantly better than the previous model. The variance inflation (VIF) of the third model gives rise to some concern. The mean VIF is low (2.09), but the VIF of the direct effect of trust-based governance is high (7.13). Given the model, this is not surprising—the moderation effect is introduced as an ordinal variable, meaning that the trust-based

governance variable, in effect, is multiplied with the four different levels of project development. Therefore, the variance of this variable is present five times in the estimated model. As a high VIF may bias the parameter estimates due to multicollinearity, a number of robustness tests are applied (see robustness check section).

The residuals are approximately normally distributed. A quantile plot of the residuals against a normal distribution suggests some outliers at high and low values. This is confirmed by the Shapiro-Wilk ($p = 0.08$) and the Shapiro-Francia ($p = 0.03$) tests for normality, which suggest that the normality is not clear. Hamilton's IQR test highlights two mild outliers at low values and three mild outliers at high values. In order to accommodate these minor normality issues, robust standard errors are applied to all models.

[- TABLE 2 -]

The regression model (3) supports the baseline hypothesis (**H1**) that the coordination capability of the team is negatively correlated with unforeseen contingencies. The relationship is highly statistically significant ($P < 0.000$). Given the parameter estimate of -0.88, a one standard deviation rise in coordination capability will mean half of a standard deviation fall in unforeseen contingencies. This is in accordance with the hypothesis, and the parameter estimate is high enough to have operational significance. Hypothesis 1 cannot be rejected using this dataset.

The second hypothesis (**H2**) suggests that team members' level of specialization is positively correlated with unforeseen contingencies. This is explored by looking at the direct effect of specialization on unforeseen contingencies. Statistically, the relationship is highly significant ($P = 0.003$), and the parameter estimate of 0.24 means that a one standard deviation change in specialization will mean one-sixth of a standard deviation change in unforeseen contingencies. Whether this effect size is of economic significance is a subject covered in the discussion section. The data lend support to Hypothesis 2.

Hypothesis 3 (**H3**) suggests that heavy reliance on trust-based governance is related to higher levels of unforeseen contingencies. This direct effect is highly significant (P = 0.001) and has a parameter estimate of 0.66. This means that a one standard deviation rise in trust-based governance will lead to one-third of a standard deviation rise in unforeseen contingencies. This is at the baseline level of the interacted variable (development project). When the average marginal effect of trust-based governance is calculated instead, then the parameter estimate is 0.38 (P = 0.002). Therefore, a one standard deviation rise in trust-based governance will mean a two-fifths standard deviation rises in unforeseen contingencies. When interpreting Model 2 (without the interaction effect), the same pattern emerges. The parameter estimate of 0.36 is highly significant. Even though the estimate is statistically significant, the low parameter value could give rise to some concern regarding the operational/economic significance of the variable, but as this variable is part of an interaction effect, the question of operational significance should be considered at different values of the interactor. The estimated models lend support to Hypothesis 3.

The fourth hypothesis (**H4**) suggests that projects involving higher degrees of development are more likely to experience high levels of unforeseen contingencies. The variable of interest is an ordinal variable. This implies that, just like with a continuous variable, incremental changes of the IVs are not necessarily statistically significant. However, larger changes in the IV might still be statistically significant. Given the use of an ordinal variable, there is no assumption of a linear effect as with continuous variables. An analysis of the degree of development with a baseline of 1 reveals that statistical significance rises as we move away from the baseline. It also reveals a positive parameter estimate that that rises at an increasing rate. The predicted level of unforeseen contingencies depending on the development phase is plotted in Figure 2. We would expect similar behavior from a continuous variable, and we use this fact in our robustness checks. Regardless of the baseline, a two-step difference on the development-project scale is statistically significant. A move

from 2 to 4 on the scale entails an average difference of two-fifths of a standard deviation in unforeseen contingencies. Hypothesis 4 is supported by the data.

[- FIGURE 2 -]

The moderating effect of development projects on the relation between trust-based governance and unforeseen contingencies is the subject of Hypothesis 5 (**H5**). In order to test this relationship, the effect of the interaction effect between trust-based governance and development project is explored. As this is an interaction between a continuous variable and an ordinal variable, we should take the effect of both the direct effect and the interactor into account. In order to obtain an overview, the marginal effects of trust-based governance are calculated at all levels of development projects. The results are reported in Figure 3 and Table 3. First, in terms of the interaction effect of the model (3), the significance of the interaction effect depends on the baseline level. This is similar to the discussion above regarding the direct effect from the ordinal variables Moreover, looking at the interaction effects, smaller differences on the ordinal scale are not significant, while larger differences are. Second, when looking at the calculated average marginal effects of trust-based governance (Table 3), we see a flat line from level 1 to level 2 on the project-development scale with highly significant ($p = 0.001$) parameter estimates around 0.66-0.69. Thereafter, there is an almost constant drop in marginal effect. The decrease in the marginal effect of trust-based governance is such that it becomes negative at the highest level of project development, with a highly significant ($p = 0.013$) parameter estimate of -0.68. In other words, for projects involving high levels of development, governance that relies on trust-based mechanisms will generally lead to fewer unforeseen contingencies. Overall, the interaction effect behaves like a continuous variable. This finding is used in the robustness check. The data analysis supports Hypothesis 5.

[- FIGURE 3 -]

[- TABLE 3 -]

Robustness Checks

Two additional models are estimated as robustness checks for two reasons: 1) to ensure that the findings are not a product of the high (7.13) variance inflation of the main model, and 2) to ensure that the results are not driven by a potentially unreliable single-item measure (i.e., the degree of development in a project). The first model uses the single-item measure as a continuous variable. This assumes a linear effect, which is generally in line with prior empirical findings. This allows us to assess the model without high variance inflation. The downside of this approach lies in the fact that I am using a single item from a Likert-like scale as a continuous variable, which raises questions of validity and potential measurement error. To overcome these challenges, an additional model is estimated that includes a number of additional items that were originally part of a scale developed to capture asset specificity (Lunnan & Haugland, 2008; Reuer & Ariño, 2002). These items are combined with the original development-project item in order to create a new development-project construct. This introduces more variance and allows us to treat the construct as a continuous variable, just as with normal Likert-scale-based constructs. Furthermore, the newly added items refer to the actions taken by the supplier during the development phase. Therefore, the new composite measure is more oriented toward behavior than the single-item measure, which is focused on whether the tender material allow for development of new solutions. As such, the new variable is a behavioral indicator of the amount of development work done in a project. The variable is treated as continuous, as is the tradition with constructs based on Likert-type scales.

I carried out three analyses: a set of construct-fit statistics and two new OLS models. All regression models are reported in Table 4.

[- TABLE 4 -]

Model 1 in Table 4 uses the original single-item development-project scale (development1) as a continuous variable. The results seem to be in alignment with the main model, but as this model suffers from high variance inflation on two central dependent variables (highest value: 7.9), we do not spend more time interpreting it.

Whether adding three extra items to the development-project scale in order to form a construct constitutes a robust research approach depends on construct-fit statistics and on a careful reading of the items in order to ensure that the construct makes theoretical sense. One question related to the time and resources used for development. Another covered how much the supplier had to learn about the customer's business in order to complete the project. The final question was about the adjustments the supplier had to make in its production equipment or work plan. The exact wording of the items can be found in the Appendix. The three items capture different dimensions expected to be present at varying degrees in projects with a significant development phase. The four items have relatively low internal consistency (alpha: 0.57). This may be a problem when using multidimensional constructs in which the items capture very different dimensions. To explore the severity of this potential problem of item inconsistency, I looked at the item correlations and ran an exploratory factor analysis. The six correlations between the four items are all significant (all at 1% except one at 7.6%), suggesting some common source of variance. A principal component analysis finds only a single factor with an eigenvalue of more than 1. If we adopt the common cutoff, this points towards retaining only one factor from the four items. This suggests that despite the low alpha coefficient, the new set of items is relatively consistent (development2 in the regression table).

[- FIGURE 4 -]

The new regression model is highly significant and explains roughly the same amount of variance as the main model (Table 2, Model 3). This model does not suffer from variance inflation problems (average VIF = 1.46; maximum of 2.26). Qualitatively, there is little difference between

this model and the main model besides the fact that this linear interaction of continuous variables cannot capture the lack of difference between having no development or almost no development. This marginal effect of trust-based governance, which depends on development, is graphed in Figure 4. Furthermore, I do not find a positive marginal effect of trust-based governance at high levels of development in a project. Overall, this model suggests that the main model is robust, and not a product of variance inflation or a weak single-item measure. In addition, it provides similar results regardless of whether the measure of project development focuses on the planned (ex ante) development work or includes the actual (ex post) development work. In the first full model (Table 2, Model 3), there was no statistically significant difference between the effect of trust-based governance at the two lowest levels of project development. This is interesting as a reminder of a possible non-continuous relationship, even though I am unable to detect this relationship in the final model using an interaction between two continuous variables.

In terms of the estimated marginal effect of trust-based governance that is dependent on project development, we see a strong effect when little development work is done. In other words, when project development is at -1 standard deviation, a one standard deviation increase in trust-based governance equals a 1 standard deviation increase in unforeseen contingencies. On the other hand, at higher levels of project development (+1 standard deviation), there is no statistically significant relation. This suggests that relation between trust and unforeseen contingencies only exist in projects with limited development work.

An examination of the marginal effect of the development phase as contingent on trust-based governance is also interesting. The marginal effect is plotted in Figure 5. The positive relation between the development phase and unforeseen contingencies is moderated by the level of trust-based governance. Even though extensive development work is always associated with unforeseen contingencies, high degrees of trust-based governance help to mitigate this problem. This might

suggest that teams with high levels of trust-based governance are less likely to misuse the measurement problems or to take advantage of the management challenges associated with developing new projects.

[- FIGURE 5 -]

Discussion

The estimated main model and the robustness-check model are consistent. This demonstrates some robustness of the results, and suggest that the multicollinearity and the weak single-item measure in the first model do not introduce serious biases. The final model (Table 4) has statistically significant results in the directions hypothesized for all variables of interest. Nevertheless, the parameter estimate of the level of specialization is so small that it is unlikely to have any economic or operational significance (a one standard deviation change in specialization means a one-sixth of a standard deviation change in unforeseen contingencies). There are three potential explanations for this finding. The theory may be wrong, such that there is no relationship between specialization and unforeseen contingencies. The measurement of specialization may not capture the full extent of specialization and the corresponding level of the integration problem. Alternatively, the effect of specialization may not be uniformly distributed across all project types. In other words, the model may lack a variable interacting with specialization that can capture this.

The non-response tests suggest that some types of projects are under-represented in the surveyed sample of public procurement projects. This limits the generalizability of the study. Therefore, caution is warranted when generalizing based on this study about procurement of supplies, projects in which price is the only deciding factor for the choice of supplier, and projects in which suppliers report poor performance. However, there is no apparent reason why the proposed mechanisms should not be the same for projects not included the sample. Furthermore, based on this study, the proposed mechanisms and relations are expected to hold across a broad selection of

projects. The sample covers a highly diverse set of projects including construction work and procurement of supplies and services, as well as projects of different sizes and in different areas.

Another factor defining the boundary conditions for generalizability is that the suppliers studied are all contracting with organizations governed by public procurement regulations. This has two main effects. First, the incentive system within the buyer organization is generally weaker than it would be in a private firm. This implies that the behavior of private firms with regard to managing suppliers, especially in terms of dealing with supplier misbehavior, might be different. Second, the procurement process is more formalized in public organizations than it is in some private firms both with regard to the call for tender and with regard to choosing the supplier based strictly on the criteria set out in that call. If this process is not managed correctly, anecdotal evidence suggests that public organizations may contract with suppliers they know do not deliver the best, most cost-efficient solutions. Despite these concerns regarding this study's generalizability to more incentive-driven and less rule-driven environments, I suggest that the mechanisms discussed in this paper are likely to also be present in private-private relations.

CONCLUDING DISCUSSION

This paper identifies a number of endogenous, team-level drivers of unforeseen contingencies. In contrast to the widespread approach of construing uncertainty and unforeseen contingencies as exogenous in origin, or as stemming from strategic and opportunistic actions, this paper finds that an important source of unforeseen contingencies is found in organization-internal coordination failures and miscommunication. I use Koopmans' and Williamson's distinction among behavioral, primary, and secondary uncertainty, where secondary uncertainty is an important source of unforeseen contingencies. This is in line with Koopmans' (1957: 162-163) proposition that it is "quantitatively at least as important as the primary uncertainty" (cited from Williamson, 1985: 57).

Empirically, this paper shows that a number of factors make unforeseen contingencies more likely, such as lacking coordination capabilities, working with highly specialized teams, developing new projects, and using trust-based governance in the wrong kind of setting. The team's coordination capability is an important driver of unforeseen contingencies during a project. This underscores the necessity of construing coordination problems and cooperation problems as equally important, and suggests that coordination capability is a source of inter-team heterogeneity. As emphasized in research on knowledge integration, having specialized employees creates some potential for miscommunication and coordination failures. Effort is required to bridge the gap between knowledge fields—when this effort is not made, coordination can break down. Moreover, assembling a team in which a manager has a high degree of trust has both upsides and downsides. Such teams are associated with a higher degree of risk taking, which means more unforeseen outcomes. These kinds of risks are a natural part of developing new projects, but they might not be beneficial in other kinds of projects.

Overall, the paper presents evidence suggesting that secondary uncertainty is an important factor when trying to understand how organizations coordinate and why they sometimes fail to do so. We must remember that unforeseen contingencies not only stem from exogenous events and strategic, opportunistic behavior, but also from attempts to coordinate mutually dependent tasks. Teams and organizations differ in their abilities to coordinate tasks and actions. Some of these differences relate to differences in organizational routines that have been developed through previous interactions or through working on similar tasks. Others are due to differences in more conscious, forward-looking efforts to resolve coordination problems, such as employees' or managers' attempts to plan and organize.

Future research: This study has some limitations that might be addressed in future research. First, the notion of the team's coordination capability needs to be analyzed in more detail. Most prominently, we should consider whether it is valuable to distinguish between static and dynamic

coordination capabilities. Static coordination capabilities refer to the team's ability to make high-quality plans for the future and follow through on them, while dynamic coordination capabilities are the ability to change those plans in response to unforeseen events and to successfully adapt to changing circumstances.

Second, future studies should look into the differences between contracting with public and private organizations. This study focuses on projects delivered by suppliers to the public sector. In such projects, the buyer might have little incentive to ensure good project performance or to change the supplier's incentives to avoid opportunistic behavior.

Third, more knowledge is needed on the contingencies of the proposed mechanisms. Questions in this regard might include: When is the effect of team's coordination capability the strongest? Are there other moderators of trust-based governance? How is specialized knowledge best managed?

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FIGURES

Figure 1: Research model

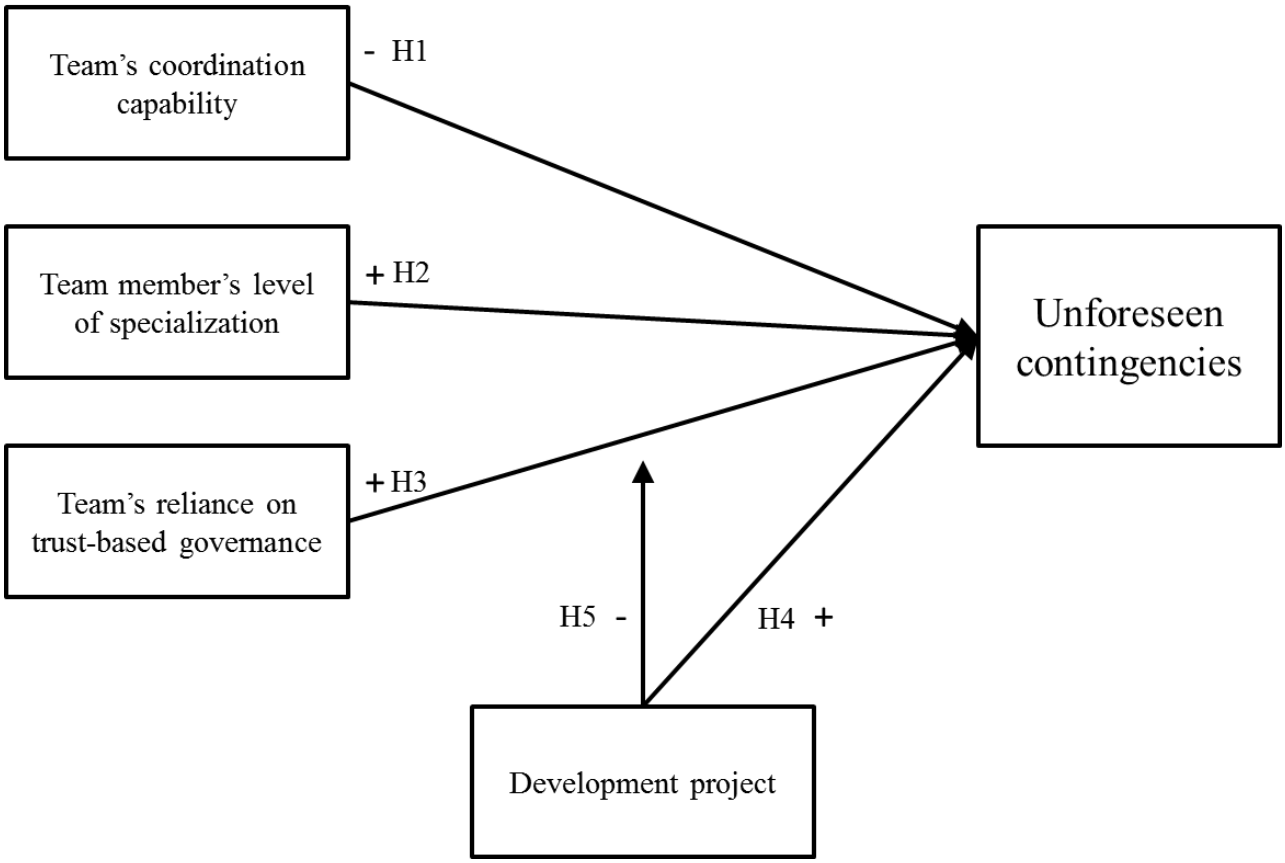


Figure 2: Predicted Level of unforeseen contingencies with 95% CIs

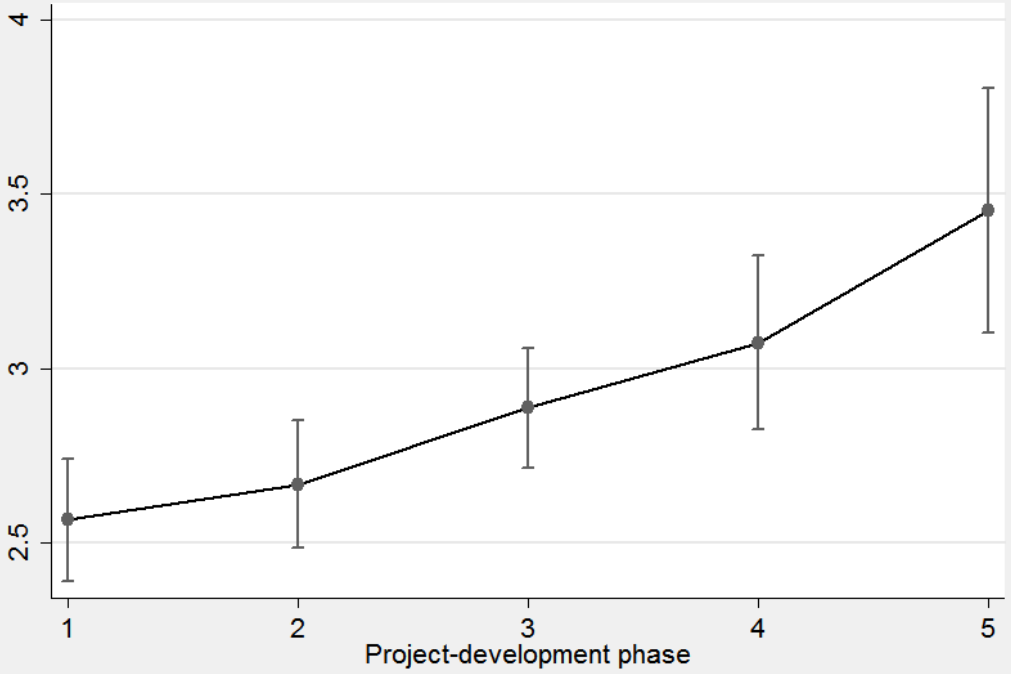


Figure 3: Marginal effects of trust-based governance. 95% CIs

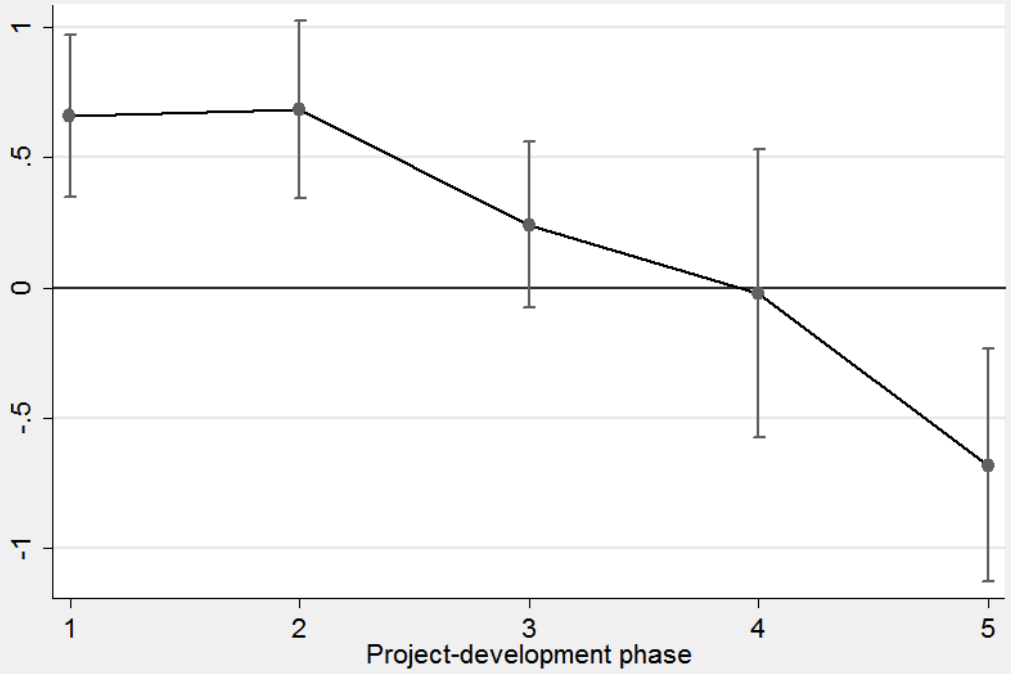


Figure 4: Marginal effects of trust-based governance. 95% CIs

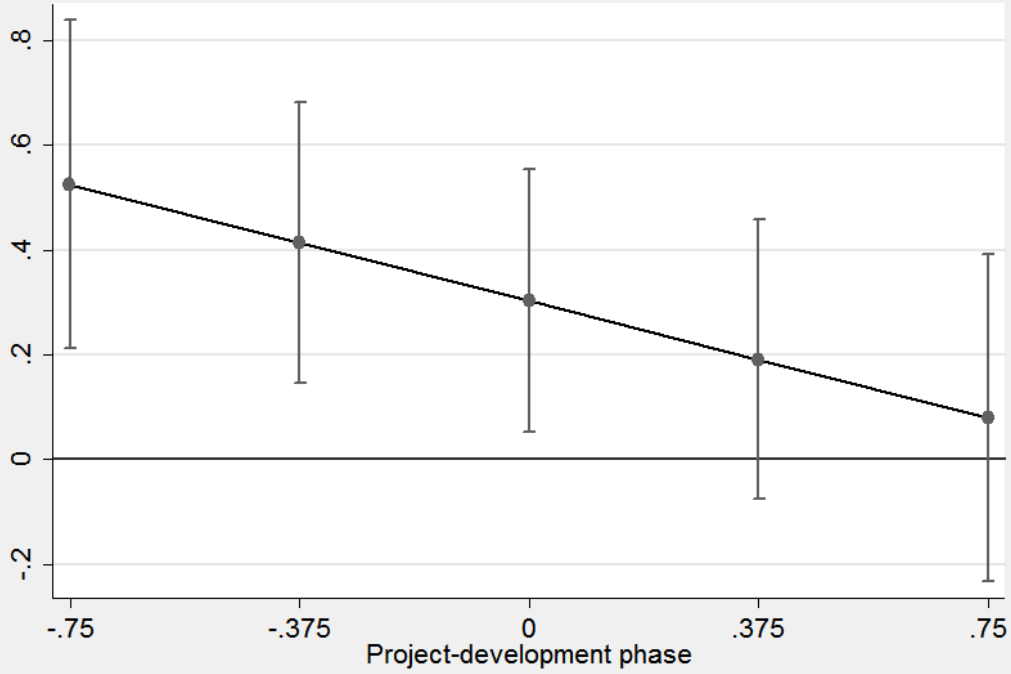
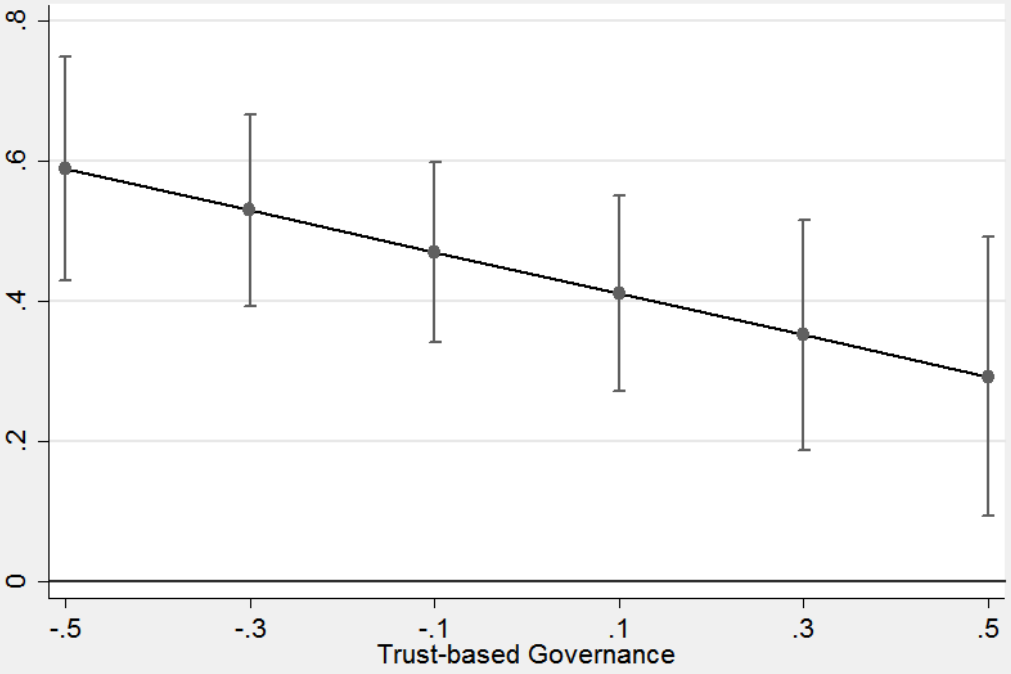


Figure 5: Marginal effects of project development phase level. 95% CIs



TABLES

Table 1

Descriptive statistics and correlation table														
	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10
1 Unforeseen contingencies	2.797	0.915	1	5	1									
2 Coordination capability	3.813	0.596	2	5	-0.55	1								
3 Trust-based governance	4.043	0.494	3	5	0	0.42	1							
4 Specialization	3.833	0.669	1.333	5	0.11	0.14	0.38	1						
5 Buyer opportunism	2.095	0.791	1	5	0.33	-0.44	-0.22	-0.11	1					
6 Value	15.297	1.824	0	19.489	0.11	0	0.12	0.01	0.06	1				
7 Team size	14.298	23.349	3	200	0.15	-0.07	0.13	0.22	0.17	0.23	1			
8 Percentage done	0.854	0.218	0.157	1	0.01	0.01	-0.04	-0.02	0.09	-0.12	0	1		
9 Length	28.723	27.264	-3	192	0.07	-0.04	-0.03	-0.1	-0.03	0.15	-0.04	-0.72	1	
10 Development project	2.543	1.071	1	5	0.29	-0.04	0.06	0.06	0	0.07	0.11	-0.04	0.08	1
11 bin: type_works	0.207	0.407	0	1										
12 bin: type_supply	0.165	0.372	0	1										
13 bin: type_service	0.628	0.485	0	1										

Table 2. Regression results

OLS. DV: Unforeseen contingencies			
	(1)	(2)	(3)
Coordination capability		-0.880***	-0.884***
		(0.113)	(0.115)
Trust-based governance		0.356**	0.659***
		(0.137)	(0.189)
Specialization		0.225***	0.242***
		(0.0832)	(0.0808)
1.Develop.(bin)		0	0
		(.)	(.)
2.Develop.(bin)		0.0860	0.103
		(0.129)	(0.126)
3.Develop.(bin)		0.319**	0.321**
		(0.130)	(0.127)
4.Develop.(bin)		0.498***	0.508***
		(0.160)	(0.157)
5.Develop.(bin)		0.905***	0.889***
		(0.287)	(0.201)
1.Develop.×Trust-b.Govern.			0
			(.)
2.Develop.×Trust-b.Govern.			0.0265
			(0.243)
3.Develop.×Trust-b.Govern.			-0.418*
			(0.252)
4.Develop.×Trust-b.Govern.			-0.681*
			(0.353)
5.Develop.×Trust-b.Govern.			-1.341***
			(0.308)
Buyer opportunism	0.339***	0.138*	0.151**
	(0.0811)	(0.0711)	(0.0721)
contract value	0.0177	0.0201	0.0268
	(0.0309)	(0.0202)	(0.0190)
Project team size	0.00191	-0.00148	-0.00188
	(0.00370)	(0.00265)	(0.00275)
Perc. done	0.402	0.621*	0.602*
	(0.454)	(0.355)	(0.353)
Project length	0.00333	0.00380*	0.00356
	(0.00394)	(0.00229)	(0.00233)
Type: Works (bin.)	0.210	0.153	0.160
	(0.163)	(0.120)	(0.114)
Type: Supply (bin.)	-0.438***	-0.403***	-0.412***
	(0.151)	(0.128)	(0.132)
Type: Services (bin.)	0	0	0
	(.)	(.)	(.)
Constant	2.825***	2.595***	2.600***
	(0.0838)	(0.101)	(0.0983)
N	188	188	188
r^2	0.175	0.494	0.527

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.
Marginal effect of trust-based governance dependent on level of development work

	β	p
1.Develop.	.659	.001
2.Develop.	.685	.001
3.Develop.	.240	.217
4.Develop.	-.023	.947
5.Develop.	-.682	.013

Table 4. Regression results

OLS. DV: Unforeseen contingencies		
	(1)	(2)
Coordination capability	-0.868***	-0.796***
	(0.114)	(0.110)
Specialization	0.245***	0.149**
	(0.0806)	(0.0718)
Trust-based governance	1.148***	0.303**
	(0.246)	(0.128)
Development1	0.196***	
	(0.0412)	
Trust-b.Govern.×Development1	-0.303***	
	(0.0881)	
Development2		0.441***
		(0.0671)
Trust-b.govern.×Development2		-0.297**
		(0.126)
Buyer opportunism	0.151**	0.109
	(0.0698)	(0.0690)
contract value	0.0226	0.0338
	(0.0189)	(0.0223)
Project team size	-0.00192	-0.00203
	(0.00263)	(0.00259)
Perc. done	0.613*	0.783**
	(0.357)	(0.347)
Project length	0.00360	0.00484**
	(0.00227)	(0.00203)
Type: Works (bin.)	0.152	0.114
	(0.113)	(0.116)
Type: Supply (bin.)	-0.428***	-0.407***
	(0.126)	(0.123)
Type: Services (bin.)	0	0
	(.)	(.)
Constant	2.346***	2.854***
	(0.126)	(0.0651)
N	188	188
r^2	0.520	0.567

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX

Measures

More detailed descriptions and discussions are found in the paper's method section. All questions were answered using a five-point Likert-scale.

Construct	Adapted from	Items
Unforeseen contingencies		Evaluate the following statements about surprises during the project. • The task was more complex than we thought when we started. • During the project, we had to get additional competences from other employees. • During the project, we had to change our project plan. • The project progressed without mentionable surprises. (reversed)
Specialization of team members	Lewis (2003)	Evaluate the following statements about the specialization of the employees involved in [PROJECT NAME]. • Each team member had specialized knowledge of some aspect of our project. • Different team members were responsible for expertise in different areas. • The specialized knowledge of several team members was needed to complete the project deliverables.
Trust-based governance	Lewis (2003)	Evaluate the following statements about the competences of the employees involved in [PROJECT NAME]. • I was comfortable accepting procedural suggestions from other team members. • I trusted other team members' knowledge about the project was credible. • I was confident relying on the information that other team members brought to the discussion. • When other members gave information, I wanted to double-check it for myself. (reversed) • I did not have much faith in other members' "expertise." (reversed)
Team-coordination capability	Lewis (2003)	Evaluate the following statements about the ability to coordinate of the employees involved in [PROJECT NAME]. • Our team worked together in a well-coordinated fashion. • Our team had very few misunderstandings about what to do. • Our team needed to backtrack and start over a lot. (reversed) • We accomplished the task smoothly and efficiently.

		• There was much confusion about how we would accomplish the task. (reversed)
Development-project—used as dummy with different cutoffs as well as continuous for robustness check	(Rådet for Offentlig-Privat Samarbejde, 2014) Additional items: Lunnan & Haugland (2008); Reuer & Ariño (2002)	To what degree did the tender material allow for new, more efficient solutions? 1. Not at all – the task should be carried exactly as described in the tender material. 2. Almost not – only minor technical changes were possible. 3. To a limited degree – only on part of the task was it possible to suggest new, smarter solutions. 4. To a high degree – the end goal was set, but not how to get there (task was described with functional specifications). 5. To a very high degree – the tender were designed as a collaboration on the development of new, innovative solutions. Additional items for the robustness check • We have used much time and resources in order to develop this project. • We had to learn extensively about our customer's business in order to complete the project. • We have adjusted our production equipment or work plan in order to establish this project.
Buyer opportunism	(Carson, Madhok, & Wu, 2006)	Evaluate the following statements about cooperating with the buyer. • The buyer sometimes exaggerated the necessity of the changes it wanted to the development plan or budget. • The buyer sometimes altered facts to get what it wanted. • The buyer would try to renegotiate to its own advantage. • The buyer became less cooperative as the project progressed. • The buyer would do anything within its means to get a larger share of the gains from our relationship. • It was hard to get the buyer to accept changes without us making certain concessions and compromises.

Chapter 3 – Managerial Meta-knowledge and Adaptation

MANAGERIAL META-KNOWLEDGE AND ADAPTATION:

GOVERNANCE CHOICE WHEN FIRMS DO NOT KNOW THEIR CAPABILITIES

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July, 2016

Acknowledgment: We thank, but do not implicate, audiences at the Academy of Management and the Copenhagen Business School, for comments on earlier versions of this paper. In particular, we are grateful to Michael Mol, Jon Bingen Sande, and Libby Weber for comments.

MANAGERIAL META-KNOWLEDGE AND ADAPTATION: GOVERNANCE CHOICES WHEN FIRMS DO NOT KNOW THEIR CAPABILITIES

Abstract

Dominant theories of the firm, especially transaction cost economics and the knowledge-based view, assume that managers know the capabilities of the firms they manage in the sense that they know their basis and how to apply them well. However, micro research streams on resource cognition, transactive memory, and organizational self-knowledge suggest that this assumption often is not warranted as managers' knowledge of firm capabilities, which we refer to as *managerial meta-knowledge*, is imperfect. Building on these research streams, we examine the implications of imperfect managerial meta-knowledge for economic organization (i.e., governance choice). Specifically, we show that imperfect managerial meta-knowledge leads to surprises in contractual relationships, negatively influences the ability to engage in coordinated adaptation, and is an opportunism-independent driver of *ex post* transaction costs. For these reasons, managerial meta-knowledge holds implications for governance choices.

Scholars increasingly build bridges between the knowledge-based view (KBV) and transaction cost economics (TCE) (Argyres, Felin, Foss & Zenger, 2012). Early research explored the effects of capability differences among firms in a vertical chain on firm boundaries (e.g., Jacobides & Winter, 2005; Kogut & Zander, 1992; Langlois, 1992). More recent work highlights the importance of learning how to efficiently govern contractual relations with other firms (e.g., Argyres, Bercovitz, & Mayer, 2007; Argyres & Mayer, 2007; Mayer & Argyres, 2004). Other recent studies show how the characteristics of technological and commercial problems (e.g., Baldwin, 2008; Hsieh, Nickerson, & Zenger, 2007; Macher, 2006; Nickerson & Zenger, 2004) drive governance choice. However, such work generally assumes that managers have accurate knowledge of the capabilities of the firms they manage and, sometimes, even of the capabilities of partner firms. This assumption also characterizes the KBV and TCE themselves. However, we argue that this assumption is generally incorrect, and that problematizing it (Alvesson & Sandberg, 2011) produces new insights into economic organization. Fundamentally, the assumption is not tenable for reasons of bounded rationality, that is, imperfect information interpretation and processing ability, leading to knowledge that is incomplete, fragmentary and biased (Simon, 1955; Weber & Mayer, 2011).

To illustrate, consider the recent development of a new national, electronic ticketing system for the Danish public-transportation network. In 2003, a consortium was formed by the Danish public transportation providers, Rejsekort A/S, charged with developing and running the electronic ticketing system. After deciding on project specifications, a public tender was announced, which was won East-West Denmark ApS, a consortium of two companies—Thale (80%) and Accenture (20%)—with prior experience from similar projects. In June 2005, a contract worth USD 180 million was signed. This contract assigned full responsibility for the project to East-West Denmark (Rigsrevisionen, 2011). East-West Denmark believed that some of its existing resources (i.e., software) could be utilized for the project. However, this was an overly optimistic assumption. Five supplementary contracts were needed, with each pushing the project milestones further into the future,

and with each enhancing the need for cooperation and joint project management with the supplier. In the end, the project's time overrun was approximately 230%. The development of the system was marred by problems stemming from deficient knowledge on at least two levels. First, East-West Denmark lacked accurate knowledge about its own capabilities in the context of the project. Second, Rejsekort's hands-off approach to the supplier relationship meant that it failed to undertake the due diligence necessary to understand the supplier's abilities to actually fulfill its intended role. Many frictions ensued in the contractual relationship between the parties.

While this and many other examples suggest that deficient knowledge of capabilities can create friction in contractual relations, this issue has not been conceptualized in the literature and its implications for economic organization (e.g., contracting, firm boundaries) have not been theorized. We therefore require a conceptualization of "managerial meta-knowledge"—the extent to which managers know the capabilities of the firms they manage, and, secondarily, the capabilities of other firms. Given such a conceptualization, the implications of managerial meta-knowledge can then be examined.

We argue that managers do not have, and in fact cannot have, direct knowledge of much of the knowledge held by organizational members, or of the knowledge stored in organizational relations, routines, procedures, or databases (Foss, 1999; Grant, 1996; Hayek, 1945; Jensen & Meckling, 1995). However, managers can hold knowledge (or, at least awareness) *about* such knowledge without necessarily possessing it, akin to what Rulke, Zaheer, and Anderson (2000) call "organizational self-knowledge." Work on transactive memory (Wegner, 1987) suggests that group members hold knowledge about the expertise of others without possessing the same expertise themselves. Partly inspired by this idea, we argue that managers form beliefs about employees' knowledge and how employee knowledge underlie productive activities. These beliefs form the basis for managers' assessments of the capabilities of the firms they manage, that is, their managerial meta-knowledge.

Managers' incomplete, incorrect, and biased views of their firms' capabilities may result in severe frictions in relations with partner firms when those capabilities are, unexpectedly, found to be lacking, such that an adaptation of the activities of one or both of the partners is required. We argue that such surprises give rise to transaction costs in the *ex post* contracting phase (Gibbons, 2005; Wernerfelt, 1997; Williamson, 2000). Although these surprises may be conceptualized as contractual hazards (Williamson, 1985), they are not rooted in opportunism but rather in imperfect knowledge. Often, these hazards can be reduced and contractual difficulties can often be sorted out, particularly in cases where the parties have a high level of mutual trust (Dyer & Chu, 2003; Gulati, 1995; Macaulay, 1963; Williamson, 1985). However, in some cases, surprises and subsequent learning reveal major obstacles to a cooperative relationship, which may prompt costly contractual renegotiations or even a termination of the partnership. Although no opportunistic intentions may have been present at the contract-drafting stage or even in later stages, the consequences of such surprises may still be highly negative for the other partner (Alchian & Woodward, 1988). Firms wish to avoid partnering with partners that may learn unfavorable things about their own capabilities. Therefore, when searching for potential partners, managers should also seek to assess the managerial meta-knowledge of the potential partner.

In sum, we add a new set of arguments to the discussion of the relation between knowledge-based perspectives and TCE (and other organizational economics views), and we develop insight into the knowledge-based determinants of contracting outcomes. The extant work on the link between knowledge-based arguments and TCE has typically addressed the *ex ante* contracting phase and suggests that *ex ante* capability differences among firms influence economic organization (e.g., Jacobides & Winter, 2005; Kogut & Zander, 1992; Langlois, 1992). In contrast, we also examine knowledge-based mechanisms that influence behaviors in the *ex post* phase—which have implications for *ex ante* contracting. Our argument is related to the emerging stream of research on inter-organizational relations, which posits that transaction costs and contracts are responsive to

learning in relationships. In particular, such learning influences the ability to set up frameworks in a way that ensures smooth cooperation (Argyres & Mayer, 2007; Lumineau, Fréchet, & Puthod, 2011; Mayer & Argyres, 2004; Vanneste & Puranam, 2010). However, our key argument is that that parties may also learn about the knowledge they hold *themselves*, and that this may have implications for contractual dynamics in both the *ex post* stage (i.e., when the relationship unfolds) and the *ex ante* stage (i.e., in the context of partner selection).

THEORETICAL BACKGROUND:

MANAGERIAL META-KNOWLEDGE IN THE THEORY OF THE FIRM

Managerial Knowledge of Firm Capabilities

Economics and management research on the links among capabilities, learning, and economic organization (contractual and governance choice) has evolved significantly over the past four decades (see Argyres, Felin, Foss, & Zenger, 2012, for an overview). Nevertheless, there are still significant gaps in our understanding of the mechanisms that link capabilities and learning to governance choices because of strong assumptions in the dominant theories regarding managers' knowledge of firm capabilities, which we refer to as managerial meta-knowledge.

Specifically, although the KBV and TCE differ in many ways, they share one important assumption: Managers know the capabilities of the firms they manage. Thus, TCE models, such as the model developed by Riordan and Williamson (1985), superimpose costly transacting on the production-function view of textbook economics with its attendant assumptions that production knowledge is free and wholly explicit (Demsetz, 1988; Langlois & Foss, 1999). These assumptions imply that there are no real differences among the knowledge held at the employee, managerial, or firm levels, or even in the knowledge held between firms.[10] As has often been pointed out (e.g., Langlois & Foss, 1999), capability differences therefore do not play a part in the standard TCE

[10] For example, in the TCE analysis of the organization of labor (Williamson, 1985, chapter 10), knowledge differences between managers and employees are disregarded, and the analysis focuses on uncertainty, human-asset specificity, and the separability of work tasks.

explanation of the boundaries of the firm (Williamson, 1985, 1996). Such differences are key in the KBV which conceptualizes firms as entities dedicated to producing, storing, maintaining, and deploying specialized, experientially produced, tacit knowledge in productive tasks (Bingham, Eisenhardt, & Furr, 2007; Kogut & Zander, 1992; Nelson & Winter, 1982). Differential firm-level capabilities are the key antecedents of heterogeneity in competitive outcomes and in firm boundaries (Jacobides & Winter, 2005; Langlois, 1992). Therefore, unlike the TCE, the KBV is predicated on a notion of differential knowledge (Kogut & Zander, 1992). However, the knowledge differences highlighted by the KBV are those that may exist *between* firms on the capability level. Internal knowledge differences—those that exist between employees or between management and employees—have thus far captured less interest (but see Conner & Prahalad, 1996). Therefore, firms may not know the capabilities of *other* firms (Kogut & Zander, 1992), even though they are assumed to know their *own* capabilities at any given point in time.

In sum, the KBV and TCE share the assumption that firms are high in "organizational self-knowledge" (Rulke, Zaheer, & Anderson, 2000). In the following, we discuss and problematize this assumption by examining its microfoundations. In other words, we ask what it means for "firms to know their own capabilities."

Organizational Knowledge

The knowledge residing in an organization (i.e., organizational knowledge) can be held in many different forms. Moreover, it is allocated across organizational members (Argote & Ingram, 2000; Marengo, 1995).[11] A key dimension in this respect is the extent to which such knowledge overlaps. In some theories, such as in basic theory of production of economics (Demsetz, 1988; Langlois & Foss, 1999), all organizational members are assumed to hold exactly the same knowledge. Thus, not only the manager(s) but also all employees know which inputs (resources) are available,

[11] Not all such knowledge is relevant (e.g., employees' hobby-related knowledge). In this study, we only consider knowledge that is decision-relevant in the context of the goals of the organization and its managers. Moreover, we do not consider knowledge embodied in, for example, databases or blueprints.

the ways in which they can be combined and deployed in production, and the consequences of those different combinations for output (Nelson, 1980; Foss & Stea, 2014). In economics parlance, the relevant knowledge is "symmetrical." In management theory, this assumption characterizes what Nickerson and Zenger (2004) call "consensus-based hierarchy."

An even stronger assumption about knowledge is often held. Not only may knowledge be assumed to be shared among organizational members, but each member may also be assumed to know that the other members have that knowledge and *vice versa ad infinitum* (i.e., the assumption of "common knowledge," Lewis, 1969). Under such conditions, managers do not have a knowledge advantage and the managerial function cannot be explained in terms of such an advantage (Demsetz, 1988).[12]

At the other extreme, knowledge may be assumed to be completely *distributed*, so that organizational members only hold knowledge that is relevant to the specific decision that they control and there is no knowledge overlap beyond this point (Gerbrandy, 1998; Marengo, 1992). Therefore, no single actor holds distributed knowledge. The market system exemplifies that coordination can still be achieved in social systems characterized by distributed knowledge (Hayek, 1945; Nickerson & Zenger, 2004). Relatedly, some contributions to the KBV research stream (Grant, 1996; Jensen & Meckling, 1995; Nickerson & Zenger, 2004; Tsoukas, 1996) highlight that much of the knowledge in firms is distributed across multiple organizational members and cannot possibly be concentrated in any "single mind" (Hayek, 1945). However, routines and capabilities may be viewed as the repositories of such distributed knowledge, and they enable its use for productive purposes (Grant, 1996; Nelson & Winter, 1982).

The middle-ground position—that is, knowledge is neither completely held in common, nor completely distributed—is the common position. In this situation, managers can

[12] However, there may still be a need for managers, for example, for handling incentive problems (see Milgrom & Roberts, 1992, for this view).

perform a coordination function within an "authority-based hierarchy" (Nickerson & Zenger, 2004) based on a managerial knowledge advantage (Demsetz, 1988; Conner & Prahalad, 1996). This advantage is often based on a superior understanding of how the knowledge of employees can be combined in and deployed to productive activities—which in turn presupposes knowledge about the knowledge of employees (Demsetz, 1988). For example, the delegation of tasks to specific employees requires some degree of understanding of the abilities of those employees to make the right decisions. In other words, task delegation requires managerial meta-knowledge. Relatedly, establishing well-functioning project teams is highly dependent on team composition. Efficient team composition does not usually occur spontaneously. Instead, managers with an adequate understanding of individual capabilities and how those capabilities fit together staff teams in a way that matches internal capabilities with external opportunities (Eggers & Kaplan, 2013).

Managerial Meta-Knowledge

Meaning. The meaningfulness and rigor of the managerial meta-knowledge construct depends on a clear definition, good scope conditions, and logically coherent semantic relationships with related constructs (Suddaby, 2010). We define managerial meta-knowledge as the manager's knowledge of the knowledge held by organizational members that she manages and how that knowledge may be combined (for the sake of simplicity, we abstract from resources other than employee knowledge).

Whereas such constructs as shared or common knowledge refer to epistemic ideal states in which all individuals hold exactly the same knowledge about something (some decision-relevant fact) (Halpern & Moses, 1990; Lewis, 1969), managerial meta-knowledge does not require the full congruency of decision-relevant knowledge. In fact, managerial meta-knowledge is a relevant construct because lack of such congruency is the normal condition (Moreland & Myaskovsky, 2000; Ren & Argote, 2011; Wegner, 1987).

Function. Managers must have two kinds of knowledge in order to coordinate employee activities. First, they need to know whether an employee possesses the skills that will enable her to carry out a specific activity in a certain context. Second, the manager needs knowledge of how the exercise of the skill fits into a set of activities that involves other employees. Managerial meta-knowledge allows for organizational coordination (Heath & Staudenmeyer, 2000), which is the integration of specialized employees and functions (Lawrence & Lorsch, 1967). It also makes managers capable of judging the abilities of employees, assists in the formation of cross-functional teams, and allows managers to find substitutes for employees in specific roles, projects, and functions. As such, managerial meta-knowledge is a response to the coordination need introduced by distributed knowledge in organizations (Heath & Staudenmayer, 2000; Postrel, 2002), and its presence reduces coordination costs (Becker & Murphy, 1993). However, because managerial meta-knowledge is a scarce resource (Lucas, 1978) that is subject to economizing, it is highly unlikely to be perfect.

Scope conditions. The above definition is most obviously applicable in the context of "simple hierarchies," which are typically small organizations with very few hierarchical layers (Alchian & Demsetz, 1972; Williamson, 1975: 49). It may be thought of as applying to business units or departments within firms, such as purchasing or procurement departments. In larger and more complex organizations, delegation is possible, which makes managerial meta-knowledge layered or vertically distributed. In this perspective, hierarchical layers are a way of organizing a cognitive division of labor to allow for efficient management (Garicano, 2000).[13] However, for reasons of simplicity, we here assume that firms can be described as "simple hierarchies."

Related constructs. The managerial meta-knowledge construct is part of a family of knowledge-based constructs in management that relate to the idea that the organizations are complex, social, knowledge systems in which managers do not always know the abilities of organizational members or the connections among them. This family of constructs encompasses notions of

[13] Thus, in TCE, this affects adaptive, sequential decision making and measurement (Williamson, 1985).

"transactive memory systems," "cross-understanding," "resource cognition," and "organizational self-knowledge" (see Table 1).

------- Insert Table 1 Here -------

Research in transactive memory systems explores how intragroup divisions of cognitive labor are established and function. A transactive memory system is the well-developed use of memory and the knowledge of other members of a group. The group's information flow is conceptualized as a process in which information "is entered into memory at the *encoding* stage, it resides in memory during a *storage* stage, and it is brought back during the *retrieval* stage" (Wegner, 1987). When observed by group members, this system facilitates the creation of meta-knowledge—that is, knowledge about the encoding, storage, and retrieval processes—, thereby allowing for the placement of memory, and the subsequent recall and use of that memory. This "produces a knowledge-holding system that is larger and more complex than either of the individuals' own memory systems" (Wegner, 1987: 189).[14] Whereas research on transactive memory systems focuses on the creation of and gradual increase in the cognitive division of labor among a group of employees, managerial meta-knowledge is concerned with the implications of a particularly important actor's, the manager's, knowledge.

A group's ability to engage with the dispersed knowledge is also influenced by "cross-understanding" (Huber & Lewis, 2010), which is the ability to understand other team members' mental representations. Managerial meta-knowledge and cross-understanding are similar in their focus on understanding other individuals' cognitions. However, whereas cross-understanding is a group-level construct, managerial meta-knowledge is an individual-level construct. This difference, together with the focus on productive knowledge, allows for a connection with management theories in which the decision maker matters. Together with transactive memory systems, cross-understanding is an important antecedent of meta-knowledge and the efficient cognitive division of labor.

[14] A number of studies link the strength of transactive memory systems to group problem-solving performance (Lewis 2004; Lewis, Lange, & Gillis, 2005; Moreland & Myaskovsky, 2000).

Managerial meta-knowledge is closely related to the more rarely used concept of "organizational self-knowledge," which reflects the "managers' assessments of the capabilities and shortcomings of their units" (Rulke, Zaheer, & Anderson, 2000). It is also related to the notion of "resource cognition," that is, the "identification of resources and the understanding of their fungibility" (Danneels, 2011: 21). Other streams of literature deal with phenomena similar to managerial meta-knowledge, but without subsuming them under a single construct. For example, Denrell, Arvidsson, and Zander (2004) find that the interrater reliability of capability evaluations in large MNCs is determined by the general knowledge of subsidiaries, their ages, and their perceived importance. The reported heterogeneity in managerial capability evaluations is an important factor informing the managerial meta-knowledge construct. An emerging research stream examines the cognitive mechanisms related to the cognitive dimensions of capability construction, assembling, and application (summarized in Eggers & Kaplan, 2013). While these research streams focus on the different cognitive and social psychological mechanisms that are active in strategic decision making and in the process of creating and exploiting capabilities, the managerial meta-knowledge construct as developed and used in this paper refers to a specific and particularly important knowledge state—the knowledge underlying the intentional managerial coordination of in-house resources.

Antecedents of Managerial Meta-knowledge

Knowledge about other peoples' knowledge, skill, and expertise is gained through social interactions (Ren & Argote, 2011; Wegner, 1987); hence, the managerial meta-knowledge construct is an individual-level construct that has antecedents at the social level. As Coleman (1988, 1994: chapter 12) argues, human capital and social capital are intrinsically intertwined. The ways in which individuals interact in the organization result in intricate flows of information and knowledge that form the social capital of the organization and establish the human-capital context (Denrell et al., 2004; Hansen, 1999; Nahapiet & Ghoshal, 1998; Ren & Argote, 2011; Tsai & Ghoshal, 1998; Wegner, 1987). Similarly, managerial meta-knowledge can be understood as a type of specific human

capital held by the manager that is formed through the interactions between employees and the manager.[15] Thus, managerial meta-knowledge is influenced by both the relational and the structural characteristics of the manager's intra-firm network. That network is particularly important when dealing with administrative tasks revolving around the resolution of new problems (rather than routine tasks) (Ibarra, 1993): It allows for the creation of new contacts and serves as a set of conduits of knowledge. As such, it forms the repertoire of heterogeneous knowledge with which the manager can engage (Rodan & Galunic, 2004), for example, when directing employees with certain expertise to carry out tasks for which their expertise is adequate.

Employee turnover introduces shocks to this network, as the contents of nodes may be harmed (although ties to positions may remain) and, hence, conduits of knowledge may be eliminated from the network. From the perspective of managerial meta-knowledge, high employee turnover requires the manager to constantly update her knowledge about the organizational members. Knowledge of employees' capabilities takes time to acquire, and high employee turnover limits the ability to form deep and stable managerial meta-knowledge. At the same time, the knowledge flow among employees also decreases due to the introduction and socialization of new members, which may help explain why group longevity has a positive influence on group performance (Katz, 1982). It may also help explain why turnover is negatively associated with organizational performance (see Park and Shaw, 2013, for a meta-analysis of the empirical research). For these reasons, transactive memory is a likely moderating variable of the links between longevity/turnover and performance.

A number of factors influencing the creation of knowledge about fellow group members' knowledge have been identified in empirical research on the formation of transactive memory systems. In particular, transactive memory systems develop as a consequence of the frequency of face-to-face communication (Hollingshead, 1998; Lewis, 2004), written and verbal communication (Moreland & Myaskovsky, 2000), and non-verbal communication (Hollingshead, 1998).

[15] In non-simple hierarchies, this depends on organizational structure and the knowledge that is funneled to the manager.

Furthermore, the meta-knowledge gained in one task environment is transferred to new assignments, which demonstrates that non-task specific learning takes place (Lewis, Lange, & Gillis, 2005). Generally, this research stresses the importance of physical presence and communication for the creation of managerial meta-knowledge.

Evolving Meta-Knowledge

Managerial meta-knowledge changes over time (Lachmann, 1986; Orlikowski, 2002). Employee turnover, the reordering of processes and routines, new work assignments, and the need for new kinds of knowledge prompted by such events all have the potential to change managerial meta-knowledge. The knowledge held by organizational members also changes as a result of experience, training, and social interaction (Lewis & Herndon, 2011; Lewis et al., 2005; Wilson, Goodman, & Cronin, 2007). Accordingly, coordination needs and the ability of managerial meta-knowledge to cope with these needs change over time (Heath & Staudenmayer, 2000).

Eggers and Kaplan (2013) argue that in order to understand firm-level capabilities, it is necessary to understand how routine building blocks of capabilities are constructed and assembled into capabilities that can be matched with external opportunities. In their account, capabilities change when routines change (see also Nelson & Winter, 1982). However, in contrast to the routines/capabilities distinction, the knowledge held by employees can change without a corresponding change in managerial meta-knowledge (i.e., the manager does not notice that employee knowledge has changed). Conversely, managerial meta-knowledge may change (i.e., managers learn about employee knowledge) without employee knowledge changing. Thus, managerial meta-knowledge and the knowledge held by organizational members may evolve in an asynchronous manner. This means that the analysis of managerial meta-knowledge is inherently an analysis of a dynamic phenomenon. Research suggests that this matters in terms of the opportunities that the organization can recognize and seize. Felin and Foss (2005) argue that managers cannot build

capabilities for seizing perceived opportunities if they do not have a reasonably clear understanding of how the skills and actions of organizational members aggregate into firm-level capabilities.

In the following, we deploy the managerial-knowledge construct in the context of contracting and, more broadly, in the context of economic organization. Managers enter into various contractual relations in, for example, their roles as suppliers based on their views of their firms' capabilities in terms of product specifications, price, quality, delivery time, and so on—views that are based on their managerial meta-knowledge. We argue that the nature of managerial meta-knowledge (i.e., the extent to which it is imperfect) influences contractual hazards and, hence, incidents of conflict.

MANAGERIAL META-KNOWLEDGE AND ECONOMIC ORGANIZATION I:

IMPLICATIONS FOR GOVERNANCE CHOICE

We start by considering a relation between a legally independent firm and its legally independent supplier—the "paradigm case" of TCE (Williamson, 1989). TCE analyzes this situation in contexts defined by varying degrees of asset specificity, transaction frequency, and uncertainty. Recent work has added substantially to the contextualization of this situation. Scholars have examined the implications of various aspects of trust for contracting and performance in a vertical dyad (Chiles & McMackin, 1996; Gulati, 1995; Parkhe, 1993; Zaheer & Venkatraman, 1995), repeated dealings (Gulati, 1995), and (mutual) learning about contracting (Argyres & Mayer, 2007; Mayer & Argyres, 2004). However, the implications of the firms' managerial meta-knowledge for performance and contracting have not yet been discussed. We introduce managerial meta-knowledge to the TCE on the basis of the basic research model depicted in Figure 1. As the figure suggests, managerial meta-knowledge relates to TCE through two mechanisms: it serves as a source of unforeseen contingencies and it influences a firm's ability to engage in coordinated adaptation.

------- Insert Figure 1 Here -------

Contracting, Surprises, and Uncertainties in Transaction Cost Economics

TCE starts from an assumption of incomplete contracting. Williamson notes that the "primary ramification of bounded rationality for the study of economic organization is that *all complex contracts are unavoidably incomplete*" (2000: 8; italics in original). Contractual incompleteness is a core tenet of TCE. Without this assumption, there can be no *ex post* bargaining, including opportunistic hold-up. In turn, bargaining and hold-up in the presence of specific assets are key to the discriminating alignment logic of the theory (Williamson, 1996a). In the presence of contractual incompleteness, unforeseen contingencies may emerge that affect the contractual relation (Williamson, 1985; Dekel, Lipman, & Rustichini, 1998; Kreps, 1992, 1996). This gives rise to bargaining between the parties concerning how they should adapt to the contingency. TCE predicts that under conditions of high asset specificity, this results in opportunistic behavior on the part of one (or both) of the parties to the contract. In other words, unforeseen contingencies are potential antecedents of *ex post* haggling. As such, they are of interest for theory development in TCE (Kreps, 1990, 1996; Williamson, 1985, 1996b).[16]

Unforeseen contingencies include both genuinely unexpected contingencies (i.e., events about which there is no knowledge at the time of contracting) and contingencies that can be characterized along the lines of: "We have little idea what exactly may happen, but we can anticipate that something may happen that can upset our relationship" (Kreps, 1992). While contractual parties cannot construct dedicated safeguards against the former, they can take precautions against the latter (Hart, 1990; Kreps, 1996). Thus, research into the economics of the firm highlights that the allocation of ownership rights (Grossman & Hart, 1986) and the existence of relational contracting (Williamson, 1985) can

[16] Property rights theory adds that when the parties anticipate that they may not get their investments covered in the presence of opportunistic hold-up (i.e., they believe that the other party may partly appropriate their quasi-rents), their incentives to invest in the relation are reduced (Hart, 1995).

be conceptualized and explained in terms of making *ex post* adaptations to unforeseen contingencies possible at a low cost.

Unforeseen contingencies are related to the TCE's analysis of uncertainty. The occurrence of opportunism is a source of uncertainty, which Williamson refers to as "behavioral uncertainty" (e.g., Williamson, 1985, 56-59; 1989, 143-144). He states that such uncertainty is of "special importance to an understanding of transaction cost economics issues" (1985: 57) because it is driven by the "strategic nondisclosure, disguise, or distortion of information"(Williamson, 1989: 144), or opportunism. Opportunism leads "parties [to] make strategic plans in relation to each other that are the source of … *ex post* surprise" (Williamson, 1985: 57-8).

Drawing on the work of Tjalling Koopmans, Williamson (1985: 57-58) distinguishes between such opportunism-based behavioral uncertainty and "primary" and "secondary uncertainty." Primary uncertainty is state-contingent uncertainty that can be represented by a probability distribution over exogenous contingencies. While primary uncertainty is the standard way of representing uncertainty (in, for example, decision theory, economics, and finance),[17] secondary uncertainty is often overlooked. It arises "from lack of communication, that is, from one decision maker having no way of finding out the concurrent decisions and plans made by others" (Koopmans, 1957: 143). While secondary uncertainty may arise between firms, it may also arise within firms, especially when managers are uninformed about others' decisions and plans made because they do not know or understand the knowledge, skills, and other characteristics that influence those decisions and plans (see Malmgren, 1961). In other words, imperfect managerial meta-knowledge is an antecedent of secondary uncertainty (Weber & Mayer, 2011).

Williamson mainly focuses on the behavioral uncertainty arising from opportunism, and argues that secondary uncertainty refers to a "rather innocent or nonstrategic kind" of uncertainty that has no distinct implications for economic organization because it does not involve opportunism. In

[17] This is the interpretation of uncertainty as "risk."

contrast, Koopmans (1957: 162) proposes that this kind of uncertainty is "quantitatively at least as important as the primary uncertainty," and Malmgren (1961) suggests that it may explain key aspects of firms' internal organization, especially shared beliefs and corporate culture. We concur and argue that the secondary uncertainty caused by imperfect managerial meta-knowledge matters for economic organization. Specifically, secondary uncertainty can lead to coordination problems and the suboptimal use of resources, which may have important ramifications for contractual relations.

Imperfect Managerial Meta-Knowledge as a Source of Secondary Uncertainty

Managerial meta-knowledge matters for contractual relations and economic organization to the extent that it is imperfect. If managerial meta-knowledge were perfect, we could eliminate it from the equation because it would not give rise to hazards and frictions in contractual relations. In actuality, managerial meta-knowledge is always imperfect because local employee knowledge is fleeting and tacit (Hayek, 1945), managers are boundedly rational, and managers need to economize their scarce attention. Managerial meta-knowledge is particularly challenged in dynamic contexts in which organizational memberships and employee knowledge change, patterns of cooperation and communication shift, and new skills are learned and old skills are forgotten. As a result, the manager's understanding of the organization's capabilities is always incomplete. Such incompleteness is the source of secondary uncertainty in a contractual relation.

While secondary uncertainty is dependent on the internal workings of the organization, it may spill over into the exchange relations in which the manager's firm is engaged. For example, secondary uncertainty may prompt *ex post* contractual renegotiations because it may give rise to unexpected contingencies. This can occur when, for example, the supplier's initial cost estimates were significantly off the mark. In general, unexpected contingencies are central to literature on the relationship between incomplete contracting and economic organization (Hart, 1995; Hart & Moore, 1988, 1990; Williamson, 1985, 1996). TCE proffers the argument that, given the inability to specify all relevant future states of the world (or the costs of doing so), *some* unexpected contingencies that

are relevant to the relation are likely to occur (Kreps, 1996). In turn, such unexpected contingencies can be used as levers for opportunistic behaviors (Grossman & Hart, 1986; Williamson, 1985). However, in spite of their importance in the theory, these contingencies are usually seen as exogenously produced by some unspecified mechanism. Thus, their nature and antecedents are not made explicit in TCE.

Imperfect managerial meta-knowledge is one mechanism that may endogenously produce unexpected contingencies. Changes in managerial meta-knowledge may lead the manager holding the relevant knowledge to revise her estimates of the relation's outcomes. This can create a situation in which the contractual obligations of the firm(s) must be reconsidered. The *ex ante* managerial meta-knowledge held at the moment of contracting changes *ex post*. If this knowledge has relevant implications for the possible states of the world considered at the moment of contracting and reflected in contractual clauses—such as the firm's ability to deliver a given good or service at, for example, an agreed price, quality, or location—then the contract may have to be reconsidered.

Imperfect Managerial Meta-Knowledge as a Driver of Transaction Costs

TCE focuses on a small number of antecedents of transaction costs and governance choices, mainly the frequency, uncertainty, and asset-specificity dimensions of transactions. These antecedents influence the costs of conducting a transaction within a given governance structure. However, while TCE primarily focuses on these three antecedents of transaction costs, it acknowledges the presence of parameters that can influence governance costs and, hence, governance choices. These are the "shift parameters" (Williamson, 1991). A pivotal shift parameter in TCE is the institutional environment, which refers to the contract-law and property-right regimes governing the transaction (North, 1990; Oxley, 1999; Williamson, 1991). The effects of shift parameters on transaction costs and governance choices are mediated through asset specificity, frequency, and uncertainty. Although managerial meta-knowledge is not exogenous to a relation, it too can "shift" the comparative costs of governance in two ways. First, managerial meta-knowledge influences the

ability of various governance forms to efficiently organize different kinds of transactions. Second, it directly influences the uncertainty characterizing transactions (see Williamson, 1991, 1999). Both are relevant to the full understanding of what Williamson calls "discriminating alignment"—the fundamental idea that different kinds of transactions (i.e., transactions that differ in terms of uncertainty, frequency, and asset specificity) are best governed by different governance structures that have different capacities for regulating transactions with different characteristics.

Building on Hayek (1945) and Barnard (1938), Williamson (1991: 278) highlights that "adaptability is the central problem of economic organization and that both Hayek and Barnard are correct, because they are referring to adaptations of different kinds, both of which are needed in a high-performance system." Governance structures differ with respect to the kinds of adaptation they facilitate. Thus, the market facilitates the spontaneous adaptations of autonomous economic actors to changes in the market, especially changes in prices (Williamson, 1991). The "marvel" of the market, Hayek explains, resides in "how little the individual participants need to know to be able to take the right action" (1945: 526-527). As stressed by TCE, the market is an efficient governance structure for transactions with a low degree of asset specificity. As asset specificity increases, the efficient choice becomes hybrids, followed by hierarchies. When unforeseen contingencies affect the transaction, both parties must reconsider whether they want to continue the current relationship, renegotiate the contract, or abandon future transactions. The form of the adaptation is determined by the relationship's governance structure.

TCE posits that while markets handle autonomous adaptation well, they face difficulties when adaptation needs to be "coordinated" (Malmgren, 1961; Williamson, 1996), as in the case of interdependent changes in (complementary) activities, assets, investments, or actions. Depending on the degree of specificity in the relation, such coordination can be undertaken by hybrids or hierarchies. Coordinated, intentional adaptation works through different mechanisms (see Williamson, 1991). To successfully adapt to changes, managers must know—in the sense of managerial meta-knowledge—

which activities, assets, investments, and actions should be deployed to address the change, and how such adaptation should be carried out. Often, managers of legally independent entities can jointly accomplish such adaptation. However, fiat allows for adaptation without renegotiation and, along with internally more convergent expectations (Malmgren, 1961), can ease adaptation in a system with mutually dependent activities (Williamson, 1991), especially activities that are reciprocally interdependent (Thompson, 1967) or complementary (Milgrom & Roberts, 1995). Disputes arising in the context of the employment relationship can be solved by fiat (Williamson, 1985). Therefore, TCE argues that when exogenous "disturbances" are many or severe, a hierarchy may offer advantages relative to coordination by independent parties (Williamson, 1991). Thus, from a TCE perspective managerial meta-knowledge can be seen as a coordination device that is generally more effective within, rather than across, the boundaries of the firm, as managers tend to know more about their own employees than about employees in other firms.

However, managerial meta-knowledge primarily matters for our understanding of transaction costs because it influences secondary uncertainty. Indeed, secondary uncertainty may be largely caused by imperfect managerial meta-knowledge rather than by strategic (opportunistic) actions. In recurring market transactions characterized by a nontrivial level of asset specificity, secondary uncertainty is a potential source of contractual friction. When the secondary uncertainty is partly resolved—that is, when the manager learns something new about the knowledge of the employees he manages—frictions may arise because, for example, the contract was based on an overly optimistic projection of production costs. In this case, problems may be resolved, or frictions may rise to such an extent that the firm will engage a new supplier. TCE reasoning suggests that the outcome will depend on the size of the quasi-surplus in the relation. In turn, changing managerial meta-knowledge can change the amount and distribution of appropriable quasi-rents in the relation, creating incentives to reevaluate, renegotiate, and potentially cancel existing contracts, with implications for governance choice.

Managerial Meta-Knowledge and Governance Choice

Managerial meta-knowledge and secondary uncertainty provide additional insight into the well-established explanatory mechanisms in TCE. Specifically, these factors add to our understanding of how uncertainty and unexpected contingencies give rise to a need for adaptability that can be met, to varying degrees, by alternative governance structures (Williamson, 1985, 1996).

Managerial meta-knowledge and the likelihood of contractual renegotiation. In the following, we assume that (primary) uncertainty and frequency as well as managerial meta-knowledge are all at "intermediate" levels (see Williamson, 1985); however, asset specificity varies. Moreover, we assume that the imperfect managerial meta-knowledge exists only on the side of the supplier (we later relax this assumption). TCE predicts that as asset specificity increases in the relation, the risks of costly haggling and hold-ups also increase (Reuer & Ariño, 2002; Williamson, 1985, 1996). Governance outcomes are also influenced by the level of secondary uncertainty and by the two firms' abilities to adapt to unforeseen contingencies. We argue that these abilities are influenced, in part, by managerial meta-knowledge.

Consider the "fundamental transformation" of TCE from an initial "large numbers" situation to a subsequent "small numbers" situation in the context of a vertical relation. The focal firm approaches a number of potential suppliers regarding a contract for the repeated delivery of an intermediate product. The supplier winning the bid installs "dedicated assets" to supply the firm (Williamson, 1985). The supplier's bid is partly based on its estimates for a number of cost components, many of which require managerial meta-knowledge at a certain level. Assume that the manager of the supplier holds highly imperfect managerial meta-knowledge, such that she has little knowledge of the skills and knowledge of the employees in the firm she manages, and she has little knowledge of how those skills and knowledge relate to the firm's production activities. In this case, three situations can arise. The manager of the supplier may (by chance) have had correct expectations about the actual costs of meeting the contractual obligations, which is the situation assumed in TCE. Alternatively, as a result

of imperfect managerial meta-knowledge, the manager may have under- or overestimated the actual costs.

If the manager has overestimated the capabilities of her organization, the costs of meeting the obligations are higher than projected. This means that the quasi-rents are lower than expected, potentially leading to a situation in which the assets could be put to better use. The implication is that the supplier will wish to renegotiate the contract (or, ultimately, opt out of the relation). If the manager has underestimated the capabilities of her organization, the costs of meeting the obligations are lower than projected, such that the rents generated are higher than expected. From the supplier's perspective, this may seem to be a pure windfall. However, if word gets out about the additional rents, trouble may ensue because the quasi-rents are more vulnerable to opportunistic appropriation by the downstream firm. As the rents are higher than expected, the incentives for the downstream firm to engage in opportunistic hold-up increase. Thus, in either case, the supplier's imperfect managerial meta-knowledge negatively affects the stability of the contractual relationship involving asset-specific transactions. This reasoning motivates our first proposition:

> ***Proposition 1****: The higher the imperfection of managerial meta-knowledge, the higher the likelihood of contractual renegotiation in a relation between two firms.*

Imperfect managerial meta-knowledge and comparative governance costs. Now consider the three archetypical governance structures identified in TCE research: markets, hybrids, and hierarchies. For transactions with low levels of asset specificity, the most efficient governance structure is the market. The quasi-rents are low, and the need for coordinated adaptation is low due to both low asset specificity and the related ability to easily change partners. In the context of our simple supplier-firm dyad, either party, or both, can have incomplete managerial meta-knowledge. In any case, the outcome may be that the transaction is either more or less costly to carry out than expected. If it is less costly than expected, then rents are created. If it is more costly, then the transaction has to be reevaluated, possibly leading to a search for another transacting partner.

Managerial meta-knowledge affects market-based transactions only slightly, namely through higher search and negotiation costs.

For transactions with medium levels of asset specificity, TCE predicts that governance forms characterized by higher levels of commitment will be most efficient. In the hybrid form of governance, which includes "various forms of long-term contracting, reciprocal trading, regulation, franchising, and the like" (Williamson, 1991: 280), quasi-rents arise from the moderately specialized assets on one or both sides of the relation. As stressed by TCE (Williamson, 1991), transactions governed by hybrid governance are more difficult to adapt to unforeseen contingencies than other governance forms due to the need for coordination of and mutual agreement on adaptive measures.

While the parties can easily find another party with which to trade in market-based transactions, this is less of an option in hybrids. As it is more difficult to find good alternative uses of the firm's resources (specificity is higher) and because adaptation cannot be accomplished by fiat, governing a transaction with a hybrid form is challenged by incomplete managerial meta-knowledge. This is true even if only the supplier is characterized by imperfect managerial meta-knowledge. If both firms in the vertical dyad have imperfect managerial meta-knowledge (which is the assumption in the following), the hybrid form is disadvantaged further. To the extent that transactions that are high in asset specificity create a need for coordinated adaptation, the imperfect managerial meta-knowledge of both the supplier and the downstream firm may give rise to secondary uncertainty and unexpected contingencies, leading to *ex post* haggling and, possibly, opportunistic hold-up. As reaching mutual agreements in hybrids about how to adapt to unforeseen contingencies depends on the ability to adapt to the partner, the fact that both sides have imperfect managerial meta-knowledge enhances the resulting inefficiency. The managerial meta-knowledge of either party affects hybrid-based transactions through higher adaptation and negotiation costs, and through the increased risk of *ex post* haggling and hold-up.

Hierarchical governance is affected by imperfect managerial meta-knowledge in different ways. As the manager in a hierarchy can make decisions by fiat, negotiations aimed at mutual agreement are less relevant. The hierarchical governance form gives the manager privileged access to information, which allows him to improve his managerial meta-knowledge (see Williamson, 1985; Nickerson & Zenger, 2004). In contrast, these managers generally do not have similar access to other firms. In contexts characterized by high asset specificity (and quasi-rents), when an unforeseen contingency occurs, the incentive to look for an alternative, external partner is low. On the other hand, hierarchies have the ability to adapt in a fast, coordinated fashion using fiat, which carries low adaptation costs.

While low managerial meta-knowledge affects market-based transactions through higher search and negotiation costs, hybrids are affected by higher adaptation and negotiation costs, and by the additional risks of *ex post* haggling and hold-up. Through the use of fiat, a hierarchy is relatively better than a hybrid at adapting to unforeseen situations. Our argument follows Williamson's (1991) discussion of the influence of uncertainty on discrete organizational structures—low managerial meta-knowledge affects hierarchies more than markets but less than hybrids. In sum, we offer the following proposition:

> ***Proposition 2****: The higher the imperfection of managerial meta-knowledge, the less favorable the hybrid governance structure relative to the market and hierarchical governance structures.*

The proposition is illustrated in Figure 2, which is an adaptation of the figure in Williamson (1991: 284). We treat managerial meta-knowledge as a parameter that changes the comparative governance costs (dotted curves) relative to those depicted in the standard TCE analysis (solid curves). As the figure shows, the region of asset specificity that will support the hybrid-governance structure is smaller under imperfect managerial meta-knowledge than in the standard analysis in which managerial meta-knowledge is perfect. In other words, lower managerial meta-knowledge (of

either or both parties) pushes the cost function for hybrid governance forms higher than for hierarchy- or market-based transactions.

------- Insert Figure 2 Here -------

MANAGERIAL META-KNOWLEDGE AND ECONOMIC ORGANIZATION II:

IMPLICATIONS FOR PARTNER SELECTION

Managerial Meta-Knowledge *Ex Ante* Contracting

While the above reasoning relates to the situation following the signing of a contract, it also has implications for partner selection, an *ex ante* issue. The extant literature on the advantages of entering into hybrid relationships (e.g., strategic alliances) focuses on resource complementarities (Das & Teng, 2000), learning capabilities (Doz, 1996; Grant & Baden-Fuller, 2004; Hamel, 1991), access to and transfer of knowledge (Grant & Baden-Fuller, 2004; Mowery, Oxley, & Silverman, 1996), and the type of relationship (Lavie, 2006) as important determinants of the relationship's rent-creation potential and, therefore, as important motives in partner selection. Propositions 1 and 2 suggest that managerial meta-knowledge influences the stability and success of a hybrid governance form. For this reason, managers seek to form expectations regarding the managerial meta-knowledge held by their potential partners.[18]

The alliance literature stresses pre-alliance interactions as a way of gaining information about potential partners and as a way of building trust between them (Das & Teng, 1998; Sako & Helper, 1998; Shah & Swaminathan, 2008). In contexts in which managerial meta-knowledge is imperfect, frequent transactions serve as a mechanism for gaining knowledge about the partner,

[18] In effect, they seek to acquire second-order knowledge, which might be referred to as "managerial meta-meta-knowledge." The costs of doing this may be seen as a particular case of the "measurement costs" highlighted by Barzel (1982) and featured in the early TCE literature (e.g., Williamson, 1985).

especially the partner's managerial meta-knowledge. Indeed, research suggests that the longer two firms have cooperated, the more precisely they can assess each other's actual capabilities (Li & Rowley, 2002). This ability to evaluate partner capabilities influences the likelihood of forming closer relationships, as inter-firm hybrid relationships often are formed in order to access complementary resources (Das & Teng, 2000).

An analysis of the partner-selection choice from a managerial meta-knowledge perspective suggests that knowledge about the partner's capabilities and resources is not a given. Along these lines, the extant literature offers two main arguments to explain the empirical observation that many firms choose to repeatedly enter into alliances with the same firms, and why prior alliances enhance the likelihood of successful M&A (Zaheer, Hernandez, & Banerjee, 2010). One stream focuses on the inherent inertia and path dependency of alliance partner choices (Lavie & Rosenkopf, 2006; Li & Rowley, 2002). This also aligns with the local search arguments found in related literature streams (Gavetti & Levinthal, 2000; Levinthal & March, 1993). Another stream of literature focuses on partner-specific knowledge, such as knowledge-sharing routines, trust, and conflict-resolution mechanisms (Carson, Madhok, Varman, & John, 2003; Gulati, Lavie, & Singh, 2009). Partner-specific knowledge can take many forms, and it can be more or less tacit. These two streams have at least one thing in common—an investment in the relationship in the form of partner-specific knowledge. From a managerial meta-knowledge perspective, this can entail learning about the partner's capabilities and how they fit with one's own capabilities. Parts of this activity can be managed through codification, while other parts occur in a complex mutual-learning process in which both parties must manage "(u)nforeseen coordination difficulties, communication hurdles, resource spillovers, and information asymmetries" (Heimeriks, Bingham, & Laamanen, 2014: 464). This process allows for the development of managerial meta-knowledge with relevance to the specific partner and for the identification of complementary capabilities. We therefore suggest:

Proposition 3: *The more two firms have worked together in the past, the more developed is their partner-relevant managerial meta-knowledge, which makes it easier to identify complementary capabilities. This increases the likelihood of those firms transacting using a hybrid form of governance.*

Models of hybrid governance structures, especially alliances, often focus on the behavioral consequences of the repetitive nature of the relation (e.g., Lavie, 2006; Parkhe, 1993). Partners with which a firm expects to be involved in the future will be more reliable because they have more at stake. Thus, in a repetitive setting, the "shadow of the future" becomes relevant for the stability of the relation. In other words, partners assess the costs and benefits of staying in the relationship or opting out, and they do so for the entire relationship. These calculations involve not only estimates of the costs, payment profiles, and the discount rates of the partners, but also assessments of the business risks in the relation. In general, an assessment of business risks will be part of the partner-selection process (Beckman, Haunschild, & Phillips, 2004). The risk entailed in the partner-selection choice has both potential upsides and potential downsides. As argued above, depending on whether the partner firm's manager under- or overestimates his company's capabilities, contractual renegotiations can entail either opportunities or risks. Moreover, the willingness to engage with firms with low levels of managerial meta-knowledge is dependent on the risk preferences of the manager making the decision. We therefore propose the following relationship between managers' risk preferences and their partner-selection choices:

Proposition 4*: The risk preferences of managers influence their partner selection such that risk-averse managers prefer partners that have high levels of managerial meta-knowledge.*

Trust as a Substitute for Managerial Meta-Knowledge

Even though too much focus on the trust between alliance partners may "hid[e] other 'real problems'" (Bierly III & Gallagher, 2007: 142), much of the literature points to the key role played by trust in mitigating opportunism-driven contingencies or, in other words, behavioral uncertainty. In

particular, much of the alliance research highlights the importance of the multidimensional construct of trust (Bierly III & Gallagher, 2007; Das & Teng, 1998, 2001; Nielsen & Nielsen, 2009; Shah & Swaminathan, 2008; Zaheer & Venkatraman, 1995). Despite differences in trust typologies and the invoked mechanisms (for an overview, see Vanneste, Puranam, & Kretschmer, 2014), the majority of the extant research agrees that the presence of trust reduces the likelihood of costly *ex post* haggling and opportunistic behavior, and enhances performance, regardless of the governance form (Gulati & Nickerson, 2008).

One common distinction among different kinds of trust is the distinction made between benevolence-based trust and competence-based trust (Ganesan, 1994; Levin & Cross, 2004; Sako, 1992; Shah & Swaminathan, 2008).[19] The former relates to the intentions of the partner, while the latter refers to trust in the partner having the capabilities necessary to honor the agreement. These two forms of trust differ fundamentally with regard to the *ex ante* knowability of their objects. When holding benevolence-based trust, one places faith in at state of mind (the intention) that one cannot be knowledgeable of *ex ante*. This is not the case with competence-based trust, which can (for a cost) be substituted with *ex ante* knowledge of the partner's capabilities. Both kinds of trust are related to a firm's investments in interorganizational relations, although some conceptual issues arise from the conflation of the two types of trust.

From a basic economics perspective (e.g., Parkhe, 1993), trustworthiness represents an investment in being deliberately forbearing in order to obtain higher future payoffs. This line of argument stresses the investment in benevolence-based trust by the party wanting to engage in future opportunistic actions. Even though one cannot know a partner's intentions, one can know whether the firm's capabilities and available capacity are such that they could allow the partner to engage in opportunistic behavior (e.g., whether the level of asset specificity is such that threats are credible or

[19] This distinction falls within more overarching definitions of trust, such as that of Rousseau, Sitkin, Burt, and Camerer (1998): "Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another."

not). In this way, more knowledge about the partner's capabilities can serve as a partial substitute for the need for benevolence-based trust, although this substitution can never be complete due to the unknowability of the partner's intentions. On the other hand, competence-based trust is a state that can be left, as it is possible to develop knowledge on the object of trust, such as the potential partner's capabilities or the potential partner's manager's understanding of the company's own capabilities (i.e., the partner's managerial meta-knowledge). This kind of trust becomes less needed as the amount of information available regarding the partner's managerial meta-knowledge and capabilities increases. Such information can be obtained through prior interactions and social ties (Carson et al., 2003; Gulati, 1995, 1999).

One might argue, like Williamson (1993), that this understanding of trust comes close to the definition of risk. In this regard, the *ex ante* outcome variance can be offset by investing in information about the partner. Given little knowledge about a partner's meta-knowledge, it is difficult to assess the complementarities between one's own capabilities and those of the partner firm. However, without full information about the partner, the only alternative is to trust that the partner will not behave overly opportunistically by, for example, lying about available capabilities in an attempt to gain a better bargaining position. On the other hand, if the decision maker is fully knowledgeable about the partner, then there is less need for trust, as pure calculativeness secures the stability of the relationship (Williamson, 1993). In this way, trust can serve as a substitute for a lack of knowledge about the partner. This leads us to suggest the following:

Proposition 5*: Trust is a stronger antecedent of partner selection when knowledge of potential partners' managerial meta-knowledge is low.*

The three propositions dealing with the conditions for partner selection are depicted in Figure 3.

------- Insert Figure 3 Here -------

CONCLUDING DISCUSSION

Contribution to Theory

The knowledge-based view of the firm, with its notions that firms not only learn differently but also store, use, and deploy knowledge in different ways, has become an important stream of macro-management research. However, this perspective has mainly stressed inter-firm heterogeneity. As such, it has been less forthcoming with regard to *intra*-firm knowledge heterogeneity and the challenges this poses for management. Another influential macro-management research stream, namely TCE, also tends to avoid discussions of the managerial challenges associated with intra-firm knowledge heterogeneity (as well as inter-firm heterogeneity). As these theories do not acknowledge the presence of imperfect managerial meta-knowledge, they do not link managerial meta-knowledge to choices of contractual and organizational forms.

We argue that the manager's incomplete knowledge about the organization's capabilities at the moment of contracting is a source of endogenous uncertainty that affects the manager's ability to efficiently coordinate the resources at her disposal, and that this has implications for the choice of organizational and contractual forms. The loosening of the epistemic assumptions underpinning much of the current organizational and management theories allows us to explore the formation and implications of heterogeneous managerial knowledge levels. The construct we have developed in this article helps us to better understand the firm as a knowledge-organizing entity and the important role of the manager in that regard. The essence of our argument is that the complicated coordination of dispersed knowledge serves as a potential source of friction and surprises in transactions, which may influence the choice of governance form.

By focusing on the epistemic condition of the contracting situation, we argue that the manager's knowledge at the moment of contracting is a factor subject to change. From the perspective of the decision maker, this creates a difference between the *ex ante* and the *ex post* situations. The change in expectations raises the likelihood of contractual renegotiations, which implies higher costs for

transactions between parties with lower levels of managerial meta-knowledge. In bridging the KBV and TCE in this manner, we also bring in the managerial factor, which has thus far not been highlighted in the KBV and the TCE.

Future Research

An important future step forward is the development of a measurement scale that will allow for the operationalization of the managerial meta-knowledge construct. This is necessary to test the propositions developed in this paper. This work may take its start in the extant empirical research on transactive memory systems (Austin, 2003; Lewis, 2003), which proffers several measures have been developed that will allow researchers to grasp different sides of the construct.

Qualitative studies on the influence of managerial meta-knowledge on daily managerial work may provide more insights into the various causal mechanisms that influence the application of discretionary power. This would also move the focus away from complex, counter-factual situations, such as hold-ups, towards more mundane daily coordination tasks. Even though both are important, the sheer amount of daily coordination tasks ought to earn such tasks a more prominent place among the subjects of management research.

One relevant area for both theoretical and empirical exploration of the managerial meta-knowledge perspective is its influence on the organizational structure. There are limits to the size of an organization about which a manager can have a significant amount of correct knowledge. In the context of the historical change of diversified firms from U to M-forms, Williamson suggests that "in the language of transaction cost economics, bounds of rationality were reached as the U-form structure labored under a communication overload while the pursuit of sub-goals by the functional parts (sales, engineering, production) was partly a manifestation of opportunism." (1985: 280-281). We argue that managerial meta-knowledge plays a significant role in our understanding of the link between the bounds of rationality faced by the manager and the choice of organizational form. This

idea lurks on the sidelines in TCE and in other literature streams focused on the information processing of organizations (March & Simon, 1993).

We have solely focused on the intentional, managerial configuration of resources within the firm. However, this is not the only manner in which rent-generating resource combinations are made. These can also emerge in more spontaneous ways. We have followed the main road, as laid out by Williamson (1991), in which the firm is the epicenter of intentional coordinated adaptation and the marketplace is the space of spontaneous adaptation. Even though we analytically distinguish between (for the manager) intentional and unintentional coordination, one important antecedent affecting the level of managerial meta-knowledge also influences coordination among employees. As the extant research has emphasized, the group's transactive memory system is a determinant of the efficiency of groups' information systems. Therefore, additional theoretical and empirical research should try to bridge the analytical gap between intentional and the unintentional coordination inside firms. We hope that the concept of managerial meta-knowledge and its antecedents will serve as a first step in this direction.

Conclusions

Much current management theory starts from the assumption that managers know the capabilities of their organizations. In this article, we examine the implications of relaxing this assumption for governance choice in a framework that combines a focus on knowledge heterogeneity and distributed knowledge characteristic of parts of the KBV with the comparative contracting framework of TCE. We argue that low levels of managerial meta-knowledge affect the ability to coordinate, create endogenous "secondary" uncertainty, and serve as opportunism-independent drivers of *ex post* transaction costs. Together, these effects influence the economic organization of transactions. Most importantly, they change the comparative costs of governance structures in such a way that hybrid forms become relatively more costly. The organization of transactions in hierarchical governance structures is also affected. The ability to consciously coordinate and, therefore, the ability

to efficiently use fiat depends on the manager's knowledge of his employees. Overall, the managerial meta-knowledge construct provides a step towards analyzing the effects of less-than-perfect managerial knowledge on governance choices.

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TABLES AND FIGURES

Figure 1: Research Model

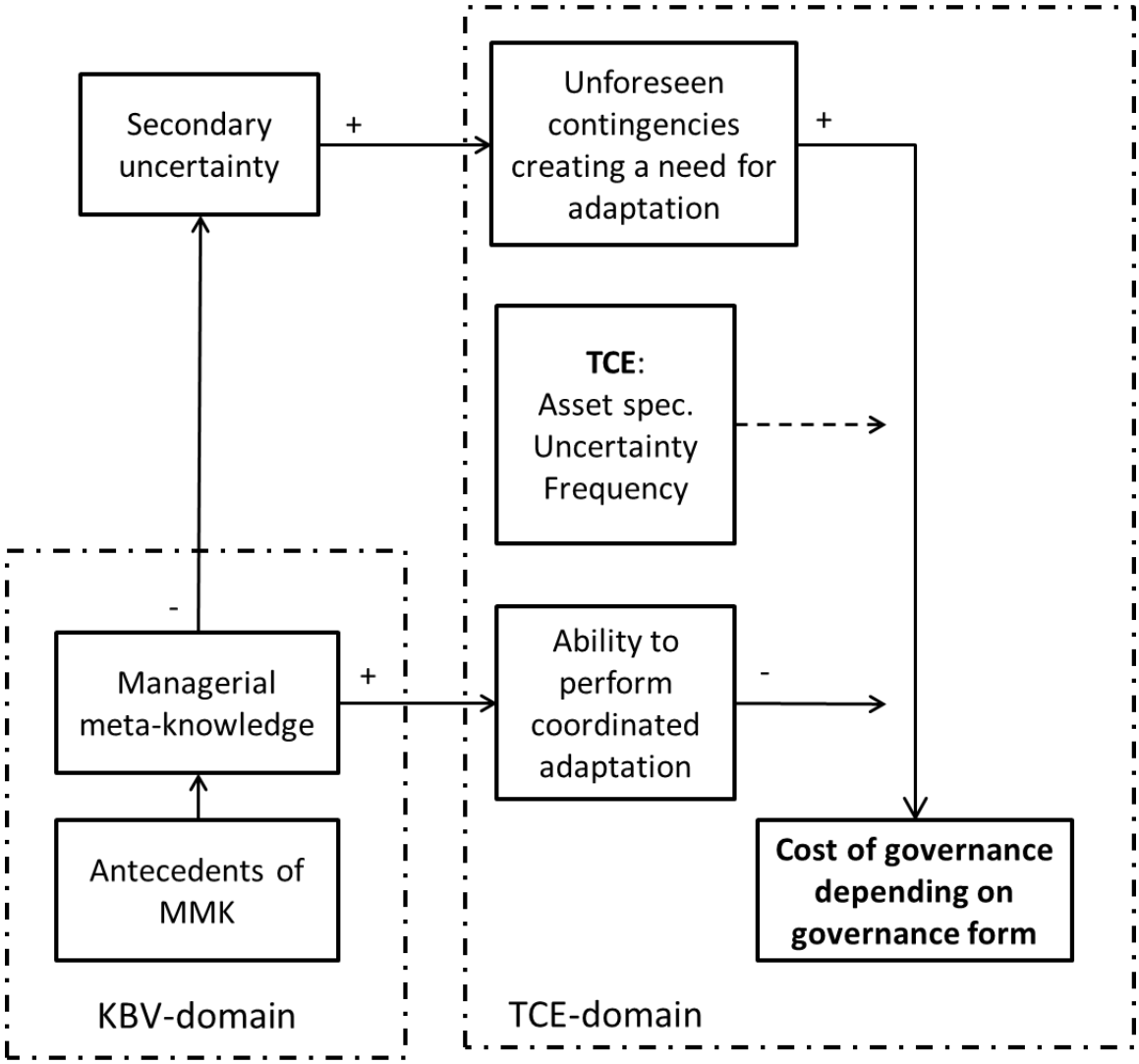

Figure 2: Managerial Meta-Knowledge, Asset Specificity & Governance Costs.

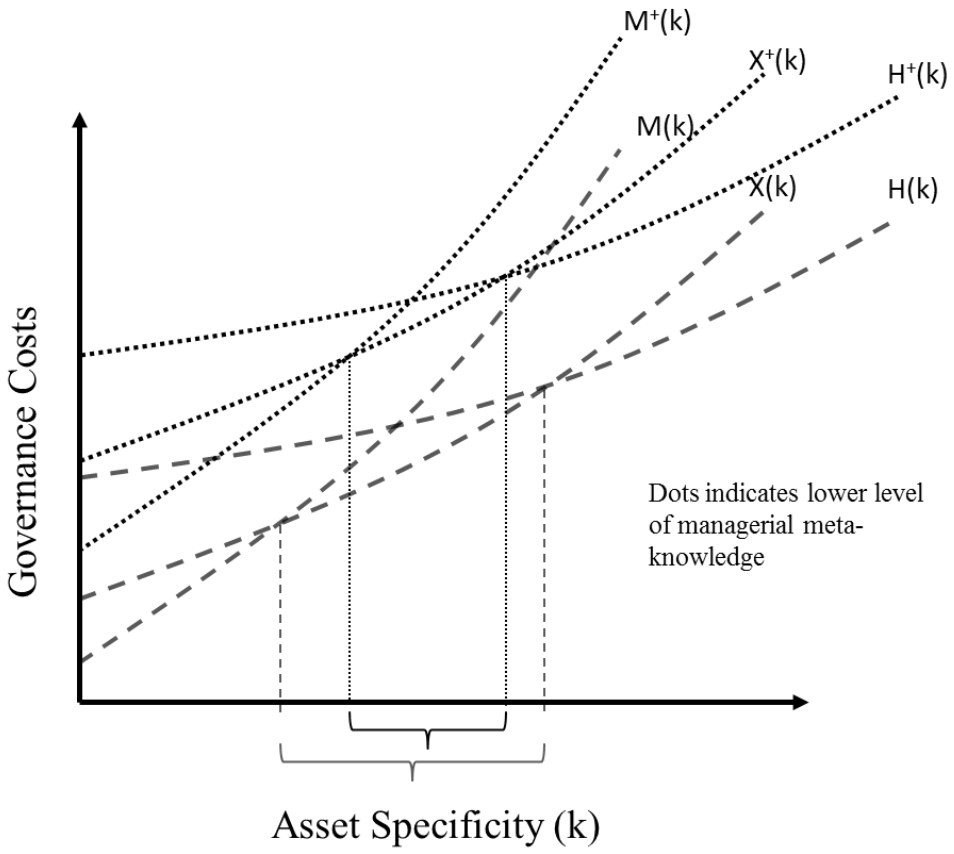

Figure 3: Research Models for Partner Selection

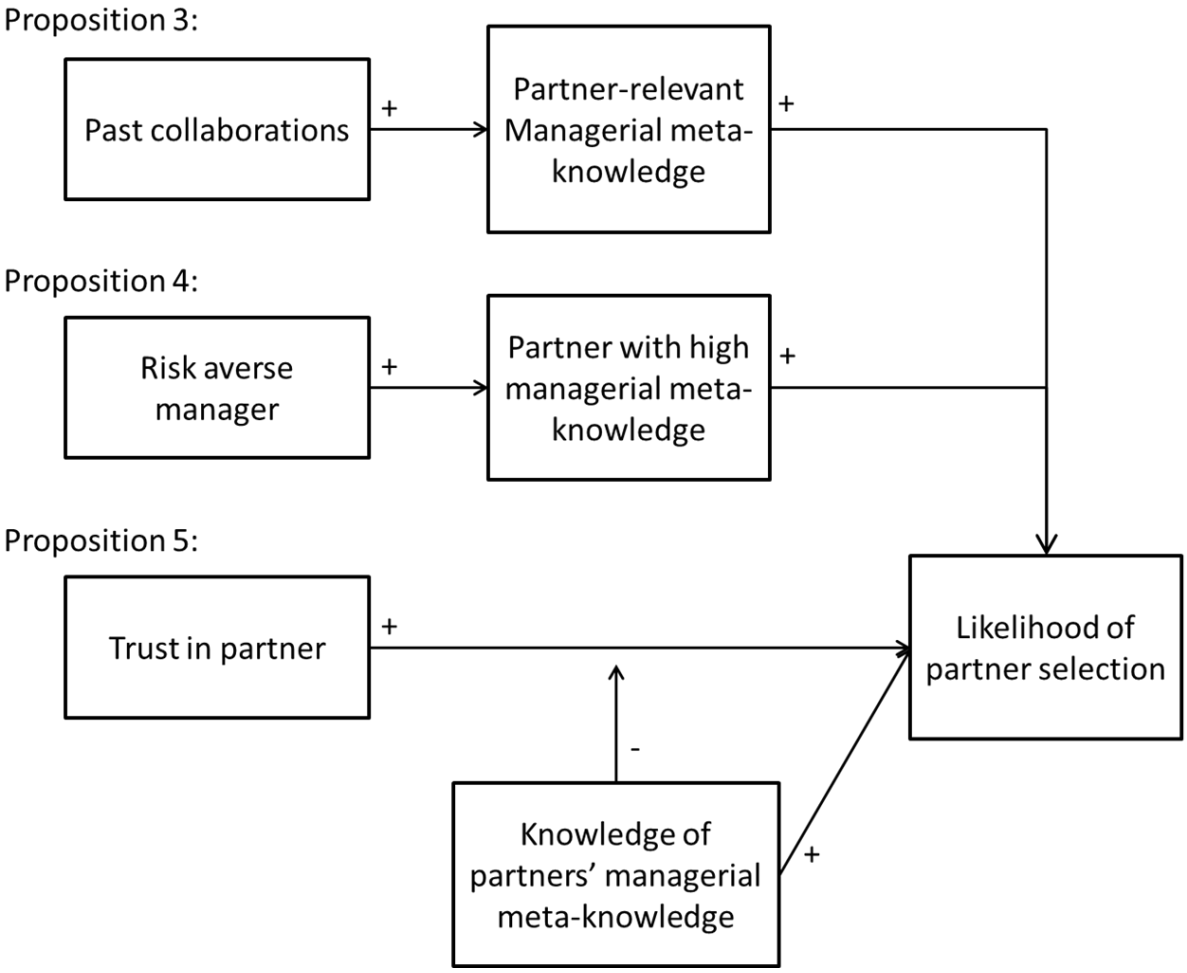

TABLE 1: ***MANAGERIAL META-KNOWLEDGE AND RELATED CONSTRUCTS***

	Transactive memory systems	**Cross-understanding**	**Organizational self-knowledge**	**Resource cognition**	**Managerial meta-knowledge**
Definition of construct	"The cooperative division of labour for learning, remembering, and communicating relevant team knowledge." (Lewis, 2003: 587) "A combination of the knowledge possessed by each individual and a collective awareness of who knows what." (Austin, 2003: 866)	The ability to understand other team members' mental representations	The "managers' assessments of the capabilities and shortcomings of their units." (Rulke, Zaheer, and Anderson, 2000: 136)	"The identification of resources and the understanding of their fungibility" (Danneels, 2010: 26) leading to the creation of a mental model	The *manager's knowledge of the knowledge of members of the organization (division, business unit, department, etc.) he manages and how this knowledge may be combined (for simplicity, we abstract from other resources than employee knowledge)*
Level of analysis	Group	Group	Individual	Individual	Individual
Antecedents level	Individual and group	Individual and group	Type of information source	Indicated for additional research	Individual and group
Antecedents	Numerous antecedents (see review by Ren and Argote, 2011)	Focuses on the implications, distinctiveness, and potential measures of the construct	Type of "learning channel" Type of information source	Indicated for additional research	Individual and group characteristics; network, transactive; memory system; group turnover
Outcomes of interest	Division of cognitive labor, learning, cooperation	Learning and group product quality (+ other less developed)	Learning about current capabilities of the organization	Learning and the inertia of changing mental models	Organizational economics factors
Discipline	Social psychology	Management	Management	Management	
Breadth of use	Wide	Very limited	Very limited	Very limited	

Chapter 4 – Procurement Relations and Managerial Knowledge

PROCUREMENT RELATIONS AND MANAGERIAL KNOWLEDGE:

NECESSARY CONDITIONS FOR THE USE OF RELATIONAL CAPITAL

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July 2016

PROCUREMENT RELATIONS AND MANAGERIAL KNOWLEDGE:

NECESSARY CONDITIONS FOR THE USE OF RELATIONAL CAPITAL

Abstract

This paper explores the effect of strong inter-organizational relations on buyer satisfaction, and how this effect is mitigated by the supplier's managerial meta-knowledge and by the competitive pressure from alternative suppliers. Strong relations allow for easier exchanges of information and cheaper adaptations to changes. It is argued that this effect is stronger when the supplier's manager has more precise information to exchange and is better at managing adaptations—both of which are affected by his or her knowledge of the team's capabilities. The building of strong inter-organizational relations is an investment that can generate rents for both buyers and suppliers. In order for the buyer to appropriate more of this rent, there needs to be competitive pressure on the supplier. In extreme cases in which the supplier's manager has little knowledge about his team or those in which there is no competitive pressure, there is no mechanism that leads to an effect of relational capital on buyer satisfaction. In other words, a supplier's managerial meta-knowledge and competitive pressure are independently necessary conditions for the relational capital effect. These arguments are tested on a dataset comprised of archival data on public procurement projects combined with a two-sided survey of the public and private parties involved in those projects. Public procurement is an interesting research field due to its economic importance and the widespread interest in well-functioning governments. From a research perspective, it allows for the testing of hypotheses in a multi-organizational setting governed by a common regulatory framework.

INTRODUCTION

> *The strategy problem is that of attempting to estimate the best use of the resources in hand.*
>
> Lippman & Rumelt, 2003a: 1083

When organizations cooperate with external parties, they are dependent on developing good relations with those parties. When goods or services are procured from a partner, the governance mechanisms that are introduced depend on the properties of the transaction. These mechanisms can be of a formal contractual character or of a more informal, relational kind. The length, quality, and type of contract depend on several factors. As the extant literature stresses (David & Han, 2004; Geyskens, Steenkamp, & Kumar, 2006; Leiblein & Miller, 2003; Williamson, 1985), the contract's characteristics are highly dependent on the characteristics of the object of contracting, such as the value of the contract, the level of investments needed, possible other uses of the assets, and expectations of similar contracts in the future.

The development of a relationship makes it easier for the parties to share information, solve disputes, and access each other's knowledge (Das & Teng, 1998, 2000; Dyer & Singh, 1998; Elfenbein & Zenger, 2013; Lavie, Haunschild, & Khanna, 2012; Mowery, Oxley, & Silverman, 1996). An additional factor is often overlooked—the effect of the knowledge held by the managers who are drafting and signing the contract. The more a manager knows about the productive capabilities of the organization he or she is managing, the more concise the contract can be. This arguments is inspired by the line of reasoning within the learning-to-contract literature (Argyres & Mayer, 2007; Lumineau, Fréchet, & Puthod, 2011; Mayer & Argyres, 2004; Vanneste & Puranam, 2010) in which parties improve their abilities to write contracts, both as safeguards and as a reservoirs of knowledge of how to deal with potential conflicts.

The most common form of inter-organizational relation involves the procurement of goods and services from external parties. Even though some procurement projects are relatively simple and deal with standardized goods and services (e.g., non-technical office supplies or cleaning services), many are more complex, such that they require at least some degree of dialogue and cooperation. Standard transaction cost logic would suggest that standardized projects that require very few specific investments can be carried out in short-term market transactions, while the rest require longer-term, more elaborate contracts with safeguards. The likelihood of an elaborate contract is higher in public procurement projects because the tender procedures are subject to legal requirements aimed at creating a fair and transparent process.

The procurement projects studied in this paper are all above the threshold for inclusion in the EU's Tender Electronics Daily (TED) database.[20] The European Union regulations governing the process mean that public procurement sometimes follows a more rigid procedure than procurement in private companies. On the one hand, this creates limitations in terms of our ability to learn about more flexible procurement processes. On the other hand, it offers the potential for greater generalizability, as the overall procedure is held constant across organizations.

Good inter-organizational relations have positive effects on most kinds of contractual relations (Gulati & Nickerson, 2008). However, how this relationship is affected by intra-organizational factors is more complicated. A common starting point for analyzing the firm is to view it as a "nexus of contracts." This approach has clear analytical advantages and necessary legal consequences regarding responsibility, but it fails to consider a key set of agents—the individuals who draft and sign the contracts. Those individuals do so based on their knowledge of the firm and its capabilities. The importance of such knowledge has previously been explored and discussed

[20] The threshold is approximately EUR 207,000, although it is higher for certain projects, such as construction work. More information on the rules governing public procurement in the EU is provide in the Method section, where I discuss how those rules affect the generalizability of the study.

(Danneels, 2008, 2011; Rulke, Zaheer, & Anderson, 2000). In this paper, I contribute to this discussion by offering a clear definition of and an empirical approach to researching the importance of the contracting agent's knowledge of his or her firm's capabilities.

Procurement projects never occur in a vacuum. The contracts agreed upon, and the quality of product or service delivered must be judged in comparison with the available alternatives. Price and quality differ between markets with many suppliers with overcapacity and markets with a few suppliers with limited capacity. This effect needs to be considered when comparing buyers' satisfaction with procurement projects. One challenge lies in the large differences in how competition is construed in different research streams—from the asset specificity of transaction cost economics to the concentration ratios of industrial organization. This paper introduces a new approach to grasping the multidimensional construct of competition by utilizing data that is usually readily available to researchers and practitioners alike.

Overall, the purpose of this paper is threefold. First, it aims to persuade the reader of the value of analyzing the knowledge held by the supplier's manager about his team, which I call *managerial meta-knowledge*. Secondly, it aims to give the question of competition a more central position in discussions of inter-organizational relations. Third, it aims to show the promise of a research-based dialogue between public procurement and management studies. In this paper, I develop propositions from a previous paper (Foss & Jensen, Chapter 3 in this dissertation) into testable hypotheses. I test them using a unique dataset on public procurement projects comprised of archival data, and a two-sided survey of suppliers and buyers. The overarching idea of the paper is that the manager's decision space is determined by his knowledge, while the incentives behind the various choices are defined by the competitive pressure from the environment. This paper addresses the following research question: *How is the effect of relational capital on buyer satisfaction affected by managerial meta-knowledge and competitive pressure from alternative suppliers?*

THEORY AND HYPOTHESES

The two dominant approaches to understanding why and how organizations contract with external parties are transaction cost economics (TCE; Williamson, 1985), with its focus on the adaptive capabilities of governance mechanisms in combination with the specificity of the assets deployed, and the relational view (Dyer & Singh, 1998; Lavie, 2006), with its focus on generating relational rents by exploring, deploying, and governing different sets of complementary resources (Das & Teng, 2000). Within this field of research, as in others (e.g., strategic organization; Argyres & Zenger, 2012), the resource-based arguments and the transaction-cost arguments are being synthesized (e.g., Elfenbein & Zenger, 2013). The integration of these research streams revolves around interpreting relational rents as a specific form of partner asset specificity (as both streams start by discussing and distinguishing between quasi-rents and composite quasi-rents, this is not an area of disagreement). Given this insight, this paper argues that two important factors influence relational rent generation; 1) the managerial knowledge of the parties and 2) the competitive environment of the interaction. The two factors are intertwined, as the knowledge of the manager defines his decision space and the competitive environment defines the incentives for the various decisions in that space.

Interfirm Relations and Rent Generation

The standard argument is that companies transact when their assets generate higher rents when combined than the sum of the rents from their separate uses (superadditivity).[21] When this is the case, the assets generating this rent are said to be specific to the relation. This specificity can take many forms (most commonly listed as physical, human, time, and site; Williamson, 1991). Whereas many TCE studies assume that investments in specific assets happen simultaneously with the choice of

[21] In the Marshallian tradition, the economic rents generated by such a situation are called composite quasi-rents

governance form (Williamson, 1991), the relational view analyzes the development of relation-specific assets as happening over time (Dyer & Singh, 1998). The latter view offers a more dynamic perspective, as it focuses on learning necessary capabilities; setting up formal and informal governance mechanisms; learning to write contracts that fit the relationship; and incrementally increasing trust in each other, thereby making adaptation faster and smoother. The process of developing successful inter-organizational relations entails learning about the right contractual governance mechanisms (Argyres & Mayer, 2007; Lumineau et al., 2011), examining possible resource combinations (Gulati, Lavie, & Singh, 2009; Harrison, Hitt, Hoskisson, & Ireland, 2001; Wang & Zajac, 2007), and understanding how the relationship's formal setup influences the willingness to share information across organizations (Grant & Baden-Fuller, 2004; Mowery et al., 1996).

Part of what is learned in a given relationship is general knowledge about how to manage inter-organizational relations, while another part is partner specific. Gulati et al. (2009) show that the positive effect of partner-specific experiences is greater than the effect of general-partnering experience when comparing market returns after partnership announcements. This effect seems to be even stronger in relations between firms that are not similar. Prior exposure to a partner means that the relationship does not begin from scratch with respect to establishing trust, developing routines, and introducing conflict-resolution mechanisms (Carson, Madhok, Varman, & John, 2003; Gulati et al., 2009). Prior experience with a partner makes it is easier, ex ante, to assess the inter-organizational fit (Li & Rowley, 2002). The general argument is that the effect of partner-specific experiences leads to higher quasi-rent generation and, relatedly, to inertia and path dependency in the choice of external partners (Lavie & Rosenkopf, 2006; Li & Rowley, 2002; Zaheer, Hernandez, & Banerjee, 2010). The higher rents and the path dependency are the result of investments into communication channels, inter-organizational trust, and common norms; the establishment of formal and informal conflict

resolution mechanisms; and knowledge about the supplier's capabilities, routines, and product or services (as well as investments in complementary physical assets). The ability to generate higher rents based on strong inter-organizational relations is often construed as a matter of relational capital.

When theorizing about relational capital and developing relevant research designs, we must remember that repeated interactions are not necessarily an indicator of relational capital. They can just as well be the result of market conditions in which only few firms have the necessary investments in place or due to entry barriers that stop other firms from competing. As the data behind this study show, prior relations strongly predict future relations. Overall, a strong inter-organizational relationship allows the parties to better share information, build trust, and put aside minor disagreements. It also increases the partner's willingness to adapt. When working with an external supplier, these are all desirable characteristics that increase the likelihood of successful projects. This leads to the first hypothesis, which serves as our baseline hypothesis because of its uncontroversial nature:

Hypothesis 1*: Relational capital is positively associated with buyer satisfaction.*

Managerial Meta-Knowledge

The most common explanations for when and how firms build lasting relations with external parties focus on the transaction's properties (Williamson, 1985), the resources and capabilities available to the firm and its partner (Gibbons & Henderson, 2012; Hoopes, Madsen, & Walker, 2003; Wang & Zajac, 2007; Wernerfelt, 1984), strong inter-organization relations supported by good governance mechanisms (Elfenbein & Zenger, 2013; Lavie, 2006; Lavie et al., 2012), and the ability of a party to add value in a value chain (Chatain, 2011). An overlooked factor is the knowledge needed to transform resources and capabilities into valuable assets. The argument put forth in this paper is that an important antecedent is the knowledge held by the supplier's manager. This knowledge matters

both ex ante and ex post contracting. The knowledge held by the supplier's manager is important when assessing whether the organization has the capabilities needed to deliver the contracted good or service (regardless of whether it is a simple or complex task), when managing day-to-day operations, and in relation to decision-making authority. The ability to assess and manage the firm's capabilities depends on the knowledge of the responsible manager(s) at the supplier firm.

The mental models of managers reflect the small world they evaluate and in which they act (Danneels, 2011; Eggers & Kaplan, 2013; Foss & Klein, 2012; Gary & Wood, 2011; Hodgkinson & Johnson, 1994; Mahoney, 1995). Fundamentally, the idea is that both the external environment and internal organizational capabilities are interpreted by a manager in order to develop and deploy those capabilities in relation to external opportunities. Danneels (2011) argues for "resource cognition"—the manager possesses clear mental models outlining the use of organizational resources. Other management scholars focus on similar issues regarding the manager's understanding of the capabilities of his or her organization, such as cross-understanding (Huber & Lewis, 2010) and organizational self-knowledge (Rulke et al., 2000). In social psychology, a related concept is that of transactive memory systems, which are "[t]he cooperative division of labour for learning, remembering, and communicating relevant team knowledge" (Lewis, 2003: 587). When working together, an understanding of the competences of teammates offers a number of advantages, even though this understanding is rarely (if ever) perfect (Moreland & Myaskovsky, 2000; Ren & Argote, 2011; Wegner, 1987). Empirical research also shows that this is not a task-specific effect, as this knowledge can be applied in new projects (Lewis, Lange, & Gillis, 2005). The ability to assess the internal capabilities of a firm affects contractual relations with external parties, as a precise understanding of the organizational capabilities allows a manager to write more concise contracts, to deliver more accurate budgets for projects, and to develop relatively better bids and offers for potential customers.

This line of argument is explored in more depth in a related paper (Foss & Jensen, Chapter 3 in this dissertation). The concept of "managerial meta-knowledge" is introduced in order to help us grasp the phenomenon. Managerial meta-knowledge is the manager's knowledge of the knowledge held by organizational members that she manages and how that knowledge may be combined.[22] Precise managerial meta-knowledge (i.e., an understanding of the actual capabilities of the organization) offers several advantages when dealing with an external customer both *ex ante* and *ex post*. When writing bids and contracts, precise meta-knowledge allows the manager to better judge the production costs and to foresee more potential problems. This allows the supplier to develop lower-priced bids because less risk needs to be included in the price. Furthermore, managerial meta-knowledge allows a manager to more easily adapt a project to *ex ante* unforeseen events. Alternative combinations of resources are already known by the manager (Danneels, 2011), and resources can be redeployed to their most productive use in the face of unforeseen events. This leads to the second hypothesis:

Hypothesis 2*: The more precise managerial meta-knowledge a supplier's manager has, the better the procurement project will perform.*

Strong inter-organizational relations make it easier to mitigate potential problems that may arise, and to tailor goods or services if needed (Elfenbein & Zenger, 2013). I propose that this effect is stronger when dealing with partners with more precise managerial meta-knowledge. I make this argument regarding the effect of more (or less) precise managerial meta-knowledge based on the three most common mechanisms suggested in the interfirm-relations literature: trust building, the establishment of governance mechanisms, and information sharing.

[22] By focusing on managerial meta-knowledge, I do not discount the importance of other kinds of managerial knowledge, such as knowledge of rules and regulations affecting the business, knowledge of customer preferences, or knowledge of financial control systems or market trends. The focus is on a specific kind of knowledge that is of pivotal importance when managing distributed knowledge.

Trust is often mentioned as both an outcome and an antecedent of successful relations. The concept of trust has been analyzed numerous ways, although such analyses usually focus on the willingness to be vulnerable "based upon positive expectations of the intentions or behavior of another" (Rousseau, Sitkin, Burt, & Camerer, 1998: 395). Distinguishing between intentions and behavior allows us to distinguish between benevolence-based trust and competence-based trust (Ganesan, 1994; Levin & Cross, 2004; Sako, 1992; Shah & Swaminathan, 2008). While benevolence-based trust is completely a matter of intentions and, therefore, fundamentally unknowable, competence-based trust is trust in the other party's ability to do as promised. In contractual relations, it is easier to hold competence-based trust in a partner that has more precise knowledge about the capabilities of his firm.[23] In other words, dealing with a supplier with high levels of managerial meta-knowledge helps build interfirm trust.

The strength of the tie between the contracting parties carries important information about several areas that are key during the initial contracting phase and thereafter. In the initial contracting phase, the elements that are codified in the contract are not only affected by the ability of information to flow between the parties but also by the quality of that information. More precise managerial meta-knowledge allows the supplier to better judge its capabilities and, thereby, write more precise contracts. Empirical studies of contractual learning show that contracts are dependent on the knowledge of the contracting parties, who codify parts of what they learn about inter-organizational dealings in contracts (Argyres & Mayer, 2007; Lumineau et al., 2011). Throughout the contractual relationship, factors and events not foreseen in the codified contract can emerge and require adaptations. Williamson (1991) offers a concise way to theorize about this problem.

Whenever the supplier's manager is involved in adaptive processes, his or her knowledge about the firm's capabilities establishes the epistemic boundaries for his potential actions. A

[23] This potentially adds an additional epistemic layer—knowledge about the partner's knowledge—that is outside the scope of this paper.

manager's knowledge of his or her subordinates creates an advantage in terms of knowing their capabilities, and in terms of knowing how to incentivize and manage them. When inter-organizational relations are set up, they can be used to solve conflicts and adapt to change when contractors have clear knowledge of their firms' capabilities.

In summary, a good relationship between contracting partners allows buyers to take better advantage of the supplier's capabilities. This leads to the third hypothesis:

> ***Hypothesis 3****: The positive effect of relational capital on buyer satisfaction is enhanced by the level of the supplier's managerial meta-knowledge.*

Relational Capital and Alternative Suppliers

While the direct effect of competition and bargaining position is well researched, we do not have a clear understanding of how having multiple alternative suppliers affects the use of relational capital. The availability of alternative suppliers is important as a matter of contingency planning and in order to strengthen one's bargaining position. The two main approaches to analyzing the effect of alternative suppliers on a transaction are to focus on asset specificity or on value generation. The conclusions from both approaches are somewhat similar—having alternative suppliers is an advantage for the buyer. To understand the effect of having multiple alternative suppliers on the use of relational capital, we must understand how the presence of alternative suppliers defines the opportunity costs for the buyer and determines the incentives for suppliers.

The assets supporting a transaction can be more or less specific. In other words, they differ in terms of the level of quasi-rents generated (i.e., the difference between the generated rent and the second-best use; Alchian, 2008; Riordan, 2008). The monetary value created in the context of a relationship is then split between the parties according to each party's ability to use its assets in other transactions. Therefore, before one part will be willing to invest in a specific asset, a contractual

safeguard is needed. As discussed above, the extant literature construes relational capital as a form of "interfirm relation-specific assets" (Dyer & Singh, 1998). Assets with a relation-specific premium are less likely to be used in alternative settings, as they create relatively more value in the focal transaction than in any other. From a buyer's perspective, alternative suppliers are desirable, as the potential for using their assets in alternative transactions is higher, which limits the threats of hold-ups.

The value-capture analysis (Brandenburger & Stuart, 1996, 2007; MacDonald & Ryall, 2004) attempts to drop the opportunity cost argument inherent in the quasi-rent approach and replace it with the notion of payment for resources (Lippman & Rumelt, 2003b).[24] The ensuing division of payments between the resources' owners depends on co-specialization and bargaining power. The cooperative game theory framework provides a formal way of showing the influence of both upstream and downstream competitive situations. In this approach, there is no assumption that assets are being used in the best way. Rather, the assumption is that they are being used in the best possible *discovered* way (Lippman & Rumelt, 2003a). In this regard, the discovery of new partners and resource combinations plays a key role in the competitive process, as the presence of alternative suppliers allows the focal actor to change suppliers if one supplier tries to appropriate more value than it adds.

In order to understand how relational capital and the presence of alternative suppliers affect public procurement, we must look at the stages of a public procurement project. When a project is specified, an invitation for tenders is sent out and private firms can submit their bids. As submitting an offer for a public tender carries a cost, we can assume that the bidder believes it has assets that make it possible to win the bid. When the most economic bid or the one with the lowest price is chosen, a contract is agreed upon with the winning company (or companies). The static approach is to perceive this as a relation that will last until the good or service is provided or the contract expires

[24] The focus here is on the Lippman and Rumelt (2003b) version of the value-capture approach because these authors make the most ambitious attempt to provide another foundation for thinking about value in competitive situations.

(unless one party dishonors the contract). The dynamic approach is to think about the procurement relation as one of constant bargaining over the value created in the relation. The buyer can make additional, small requests or minor changes to the original contract (that are not costly enough to lead to a renegotiation of the contract), and the buyer can slack on some project specifications and areas that are not covered by the (always incomplete) contract. As specified in the TCE and value-capture literature, the extent to which this kind of opportunistic behavior is possible is determined by the alternative partners available. The choice between leaving a contractual relationship or forcing a renegotiation of the contract should be viewed from the perspective of alternative uses of the assets.

Even if the relational capital is in place, there are still opportunity costs of using informal relational governance mechanisms. Therefore, they will only be used when the expected gains are higher than the costs. As the incentives for providing better performance are stronger in more competitive environments, such environments affect the use of relational governance mechanisms. The buyer will shift suppliers when the gain from striking a better deal is higher than the sunk costs of abandoning the current contractual obligations (i.e., the costs of specific assets guarded by the contract). One (relatively cheap) way for the current supplier to mitigate this risk is to use its assets to the best of its abilities (the same conclusion can be reached the evolutionary way, e.g., Alchian, 1950, by arguing that the firms that do not optimize the use of their assets are outcompeted). One of these assets is relational capital. As such, we would expect a greater positive effect of relational capital on buyer satisfaction in environments with many competing suppliers.

A different argument for the same effect is to think about the boundary conditions of trust, which is one part of the multidimensional concept of relational capital. Even though the focus on trust between transactional partners may "hid[e] other 'real problems'" (Bierly III & Gallagher, 2007: 142), much of the literature points to the key role played by trust in mitigating opportunism-driven contingencies. In particular, research highlights the importance of the multidimensional construct of

trust in inter-organizational relation governance (Bierly III & Gallagher, 2007; Das & Teng, 1998, 2001; Nielsen & Nielsen, 2009; Shah & Swaminathan, 2008; Zaheer & Venkatraman, 1995). Despite differences in trust typologies and the invoked mechanisms (for an overview, see Vanneste, Puranam, & Kretschmer, 2014), the majority of the extant research agrees that the presence of trust reduces the likelihood of costly ex post haggling and opportunistic behavior, and enhances performance. This is true regardless of the governance form (Gulati & Nickerson, 2008) but not regardless of the competitive environment. A market with multiple potential suppliers makes it relatively safer to trust the extant supplier, as that supplier knows it can more easily be replaced than in uncompetitive environments. In other words, it is easier to trust a supplier in an environment where it is less likely that the supplier will act opportunistically. Even though one could argue that "[c]alculative trust is a contradiction in terms" (Williamson, 1993: 463), the empirical research documenting the effect of trust on governance is so extensive (see the reviews mentioned above) that we must start considering the boundary conditions for trustworthiness, and how they are affected by formal contractual relationships (Lazzarini, Miller, & Zenger, 2004; North, 1990) and overall market conditions.

These two arguments—the competitive pressure for optimizing the use of relational capital and the conditions for trustworthiness—lead us to the same hypothesis:

> ***Hypothesis 4:*** *The effect of relational capital on buyer satisfaction is greater when there are many alternative suppliers in the market.*

Alternative Suppliers and Market Concentration

As argued above, the availability of alternative suppliers matters for buyer satisfaction. This way of construing competitive pressure comes from a specific tradition of thinking about competition. Another way is the influential industrial organization approach, which is focused on the structure of the market. One factor overlooked in the focus on alternative suppliers and asset specificity is the

heterogeneity in firms' abilities to use their market power to affect price setting. The industrial organization literature represents one of the disciplinary origins of the strategic management field and, thus, the analysis of competitive pressure has been central to the field (Hansen & Wernerfelt, 1989; Porter, 1981). Market concentration (the Herfindahl-Hirschman Index) is added as a control variable in this study. However, due to the project-level perspective adopted in this study, we are also able to add the number of alternative suppliers competing for the tender. This is somewhat outside the industrial organization research program, which is focused on the market level (for an overview, see Schmalensee, 1989). In line with the industrial organization argument, we expect higher average profits in oligopolistic industries. Moreover, we expect higher average buyer satisfaction in projects for which the tenders receive many offers despite being in a market with relatively little competition. In markets that are already competitive and not concentrated, the specific numbers of alternative suppliers should not matter as much. This leads us to the following hypothesis:

> ***Hypothesis 5****: In concentrated markets, the number of alternative suppliers has a positive effect on buyer satisfaction.*

[- FIGURE 1 -]

METHOD

The hypotheses are tested on a dataset containing register data on public procurement projects tendered from 2010 to 2014 combined with data from matched surveys of the public buyers and the private suppliers in these projects. The surveys were undertaken in late 2014 to early 2015. The surveys were sent to the assigned contact persons in the projects, who were often the responsible project managers. The cover letter instructed the recipient to forward the email to the project manager if he or she did not have that role. Moreover, respondents were asked to provide their official title as a check.

The empirical setting being public procurement introduces both limitations and possibilities. Much extant research on supplier collaboration has been gathered in specific industries or with a single firm as the focal actor. The ambition of this study is to explore effects across industries and firms. The public procurement setting contains public buyers, which are organized in different ways and in organizations of different sizes. All of the public buyers are governed by the same set of rules regarding tendering behavior. This allows for generalizations beyond single firms or single organizational forms. The tender process is relatively open and governed by EU regulations that require the public party to provide transparent decision criteria. Furthermore, as the procurement projects included in this study were tendered by Danish officials, we would expect the risk of corruption to be very small. Overall, these conditions should allow us to generalize about procurement relations in competitive environments across organizations.

Public procurement in Denmark is regulated through the implementation of common EU regulations. These rules govern all procurement projects pertaining to public law that are above the threshold value, which is approximately EUR 207,000 for most projects, although it is higher for construction work. All public procurement projects governed by these regulations must be reported to a common EU database—the Tenders Electronic Daily (TED). For tenders in open competition, the calls for tenders are sent to TED when released.[25] After a supplier is chosen, the buyer has 30 days to send a contract-award notice to the TED with information about the choice of supplier and a number of additional details, including the type of project, the tender procedure used, the number of offers received, and (usually) the value of the contract. The resulting TED entry also contains information on contact persons for both of the contracting parties. I used this information to gather the survey data used for this paper.

[25] Non-competitive tenders are only allowed in very specific circumstances.

The units of analysis are the procurement project and the parties involved. The sample contains all Danish public procurement projects announced in TED between May 2010 and March 2014. I removed all framework agreements from this sample, as they are governed in ways that are significantly different from those used in the procurement of other goods and services. This left a sample of 5,296 tender projects from TED. In situations where contracts were signed with numerous different suppliers in a single tender, the first (and often the primary) supplier was chosen as the focal actor. From this set, I drew all available and functional email-addresses for the assigned contact persons.[26] As each respondent could be responsible for multiple procurement projects, I created a filter to avoid sending multiple emails to individual respondents. When the same contact email was indicated for several procurement projects, I chose a random project for the survey (this could affect the sample, as larger organizations are more likely to have these duplicates; this possibility is explored in the non-response analysis). This gave an efficient survey sample size of 1,993 unique public email addresses and 525 unique private email addresses. This difference in contact-data availability (or quality) was mitigated by sending out the two surveys in serial and asking the public side for the email address of the supplier's project manager, creating a total of 817 functional, unique email contacts on the private side.

The respondents were all contacted via email, and all of the survey answers were provided using an online system. The email contained the name and title of the specific project to be surveyed, as well as the name of the supplier. This allowed the respondent to identify the procurement project. Both the email and the survey were available in Danish and English, and the vast majority chose to respond to the Danish version. The cover letter in the email instructed the respondent to forward the email to the person with project responsibility if the original recipient did not have that role. In addition, respondents were asked about their role in the project in order to rule out irrelevant

[26] I removed obvious non-relevant addresses and addresses with instant bounces.

responses. Furthermore, the emails to the private suppliers included a link to the procurement project in the TED database.[27]

After sending out the invitations to the survey, the respondents were given two weeks to answer before I sent out a reminder email. I sent two sets of reminders. 640 responses were gathered from the public buyers (response rate of 32%), while 268 were received from the private suppliers (response rate of 33%). There were 138 matched responses. After dropping observations with missing data and only including projects that involved three or more employees[28] on the supplier side, the final sample size was 89.[29]

Non-response biases

The archival data and the two-sided survey made it possible to check whether the matched responders were similar to the rest of the population. The non-response tests were done by comparing the final matched sample with the underlying population using the archival TED data. In addition, the two sets of survey-data were used to analyze whether a decision to participate in the survey by either party correlated with any of the measured quantities. Together, the three data sources allow us to detect differences between the different samples and the final matched sample. The TED data covers the entire population of procurement projects, while the two surveys are two partially overlapping subsets of that population. The statistical tests applied are a t-test, a chi-squared test, and a Kolmogorov-Smirnov test for the non-normally distributed continuous variables.

The non-response tests show some notable differences between the underlying population and the analyzed sample, which create some limitations for the generalizability of the study. There are a number of statistically significant differences between the matched survey sample and the underlying population in the TED database. These differences suggest that individuals involved in certain kinds

[27] I only became aware of this possibility after sending the emails to the public side.
[28] This is the size at which dyadic relations become group relations.
[29] In a study with two-sided matched samples, this sample size is within the normal range (e.g., 124 in Luo, 2005, and 78 in Kale, Dyer, & Singh, 2002.

of projects might be more willing to participate than those involved in others. The projects surveyed are somewhat similar in value, although the difference is statistically significant (means of DKK 15.3 million and DKK 14.9 million when logged; means of DKK 16.7 million and DKK18.6 million when not logged; the medians are both DKK 3.4 million). Additionally, the surveyed projects are generally from smaller, less competitive markets, , less likely to be the procurement of "supply" (contrary to construction works and services; 18 % of respondents were involved in supply projects; supply projects covered 37% of the population), are more likely to use restricted tendering procedure (as opposed to completely open; 56 % of respondents and 38 % of the population), and the supplier was more likely to be chosen based on cost as well as additional criteria (72 % of respondents and 59 % of the population).[30] Together, these findings imply that those procurement project managers who responded were more likely to be responsible for projects that had more specific selection criteria than just price and more likely to engage potential suppliers in more ways than just asking them to submit bids.

An exploration of the differences between the observations in which both buyer and supplier completed the survey and observations in which only one party did so offers us an idea of whether the decision to participate in the survey was influenced by the measured quantities. To ensure that the buyer's decision to participate was not influenced by the relationship with the supplier (i.e., that those with good relations were more likely to answer), I tested for differences between the relational capital in procurement projects in which only the supplier responded and those in which both parties responded. There is no significant difference between these groups, meaning that the relationship does not affect the likelihood of participating. I achieve the same result when looking at relational capital as reported by the buyer. Moreover, the same is true for the level of managerial meta-knowledge, unforeseen contingencies, and asset specificity.

[30] Furthermore, the average number of projects procured by the buyer is higher in the population than in the sample. As discussed above, this is predictable due to the need to avoid sending multiple email-invitations to the same respondent.

An analysis of differences in reported buyer satisfaction reveals a small but statistically significant difference between those procurement projects in which only the public buyer responded and those in which the supplier also responded. On average, projects for which a supplier answered were better performers than those not covered by a supplier response (mean scores of 3.8 and 4.0, respectively), suggesting a higher willingness to participate in survey research when customers were satisfied.

In order to understand whether the same mechanisms affect the buyer, I analyzed how supplier-reported project satisfaction differs between those observations in which only the supplier responded and those in which the buyer also responded. There is no statistically significant difference between the two groups, suggesting that the buyer's decision to participate was not influenced by the supplier's level of satisfaction with the project.

This analysis of non-response biases highlights two main considerations. First, there are a number of differences between the final matched sample and the underlying population. These differences are probably driven by project managers being more likely to answer surveys about procurement projects that required more of their attention. This suggests a need to be careful when drawing conclusions about more rudimentary types of procurement projects. Second, some of the evidence suggests that suppliers were more likely to participate when the survey focused on a successful project. This is not surprising and is a common challenge in these kinds of studies. Nevertheless, the difference is not very large (approximately 0.25 of a standard deviation in buyer satisfaction) and should not be cause for concern.

Despite these reservations, the study is still representative of a large group of important procurement projects. Furthermore, the analysis of differences in the survey answers from the public side and the private side suggests that the decision to respond was not driven by the quality of the buyer-supplier relationship. I discuss the issue of generalizability in detail in the discussion section.

Measures

The questionnaire was kept relatively short, such that the median duration for answering was 15 minutes for both suppliers and buyers. The mail inviting the participants to fill out the survey contained both an English and a Danish version. The questionnaire itself was also available in both in Danish and English. All measures were pre-tested on a small subset of the population. Phone calls were made to these test respondents afterwards in order to resolve unclear formulations and to ensure that the questions had been read as intended. All items are reported in the Appendix.

Dependent variable: The dependent variable is *buyer project satisfaction* as reported by the public buyer. The measure used in this study, which was developed and used in previous studies (Poppo & Zenger, 1998; Zenger, Lazzarini, & Poppo, 2002), consists of three items: one measuring satisfaction with overall costs, one covering the overall quality, and one covering the supplier's responsiveness to problems and inquiries. These items were placed near the end of the questionnaire in order to avoid creating a successful/unsuccessful framing effect. The alpha coefficient (0.85) suggests that this is a consistent set of indicators. The measure fits well with the wide range of different types of projects in the sample. Moreover, it is a satisfaction measure that fits well with project management's focus on cost, time, and quality. There is no item on time overrun in this set of measures, as not all projects in the sample include a final project that was to be delivered before a deadline (e.g., some involved services that were to be delivered repeatedly over a given time period). In combination, the three items measure the buyer's satisfaction with the procurement project. This is the only variable of interest measured on the buyer's side. It serves to mitigate the challenge of common method bias and creates a more reliable analysis.

Independent variables: *Managerial meta-knowledge* is a difficult concept to operationalize, as it aims to capture the manager's unobservable epistemic state. Researchers in social psychology have developed methods for quantitative research on knowledge about other people's knowledge

within groups. Within research on transactive memory systems (Wegner, 1987), two scales exist for measuring and assessing transactions within the group's memory system (Austin, 2003; Lewis, 2003). One of these (Lewis, 2003) is used in this study to explore the manager's knowledge about the organizational members' knowledge. Even though this measure was designed for application to multiple group members, it has also been used on single, key individuals (Heavey & Simsek, 2015) to grasp their level of knowledge about the rest of the group members.

The measure consists of 15 items organized into three latent constructs: credibility, specialization, and coordination. All three factors are necessary but not sufficient indicators of a group's internal knowledge-sharing and knowledge-accessing systems (Lewis & Herndon, 2011). Without knowledge of the team members' specializations, it does not matter if a manager finds team members credible or if a manger has good coordination skills. Knowledge of team members' specialized abilities is necessary in order to combine their skill sets. Overall, the items capture the manager's level of trust in the knowledge of his employees (credibility), the manager's ability to identify special skills in individual group members (specialization), and the manager's ability to organize the group's resources (coordination). The questions were only posed to those respondents who indicated that they had worked in groups of three or more people. The number of employees in the team is also added as a control variable.

The scale consisting of the three constructs (each with five questions) was developed to form one overarching construct. To check that the items follow this pattern, I carried out a factor analysis and calculated the Cronbach alpha coefficients for the latent construct. The Cronbach alpha is highest when loading all items on a single construct (alpha: 0.79), while the individual constructs all have similar alpha coefficients (ranging from 0.69 to 0.78). A principal component factor analysis with varimax rotation of the 15 items reveals a pattern that nearly as expected, although there are four factors with an eigenvalue greater than one (the fourth is 1.05). Three of the factors follow the three

latent constructs, while the fourth loads primarily on a reversed item and two associated items. Some cross-loading is common when using reversed items (Swain, Weathers, & Niedrich, 2008; Weijters, Geuens, & Schillewaert, 2009) and should not be cause for concern. Overall, the factor analysis and the alpha coefficients suggest that the managerial meta-knowledge construct's items correlate as we would expect for a latent construct with three latent sub-constructs.

To measure *relational capital*, I modified a scale developed by Kale, Singh, and Perlmutter (2000).[31] There are two differences between this scale and the original scale. Kale, Singh, and Perlmutter's scale is about alliances, while this one is about projects. In addition, the original scale consists of five items asking about the characteristics of interactions with the partner. In an attempt to disentangle the effect of managerial- and operational-level relational capital, I asked Kale, Singh, and Perlmutter's five questions about the managerial and operational levels separately. A principal component factor analysis suggested that the ten items can be grouped in three factors with eigenvalues or more than one. One was primarily comprised of four items—two from the managerial level and two from the operational level. The two other factors mainly consisted of three items each from either the managerial or operational level. Overall, the factor analysis suggests that there is some overlap between the two levels, which creates some concern about using the items to measure two levels. If we look at them as one construct, the alpha of the ten items is 0.84, which indicates good internal consistency. The statistical analysis in this paper applies the items this way. As I include both levels in a single composite construct instead of using only one level, the construct captures the average level of relational capital regardless of the level. This is advantageous when comparing a very diverse set of projects—some are more dependent on good managerial-level relations, while others are useful for operational-level relations.

[31] They reference a number of other articles using similar items.

The *number of alternative suppliers* that submitted an offer for a tender is reported in the TED database. The buyer must report this information to the TED database shortly after a supplier has been chosen. The use of this kind of archival data as an indicator has strengths and weaknesses. For example, not every firm submitting an offer is necessarily able to complete the task. On the other hand, as there is a cost associated with bidding (sometimes a substantial cost), firms only submit bids when they believe they have a chance of winning. In other words, there is an incentive for only qualified suppliers to bids, which gives a good measure the number of alternative suppliers. In order to ensure that the results are not driven by a few outliers, the reported parameter estimates are based on a variable in which all numbers of alternative suppliers higher than 10 are set equal to 10.[32] The regressions were also carried out using an unmodified variable, and the results were the same.

The tender *market concentration* ratio was calculated using the entire TED dataset. Each market was defined using the tender's primary CPV (common procurement vocabulary) code. As CPV codes are used by buyers and supplier to identify each other, all parties have a strong incentive to carefully select the most relevant codes. This means that the CPV code is a reliable way of identifying tender markets. This market definition makes it possible to calculate the market share of each supplier as well as the Herfindahl-Hirschman index for each market.

Control variables. Supplier *asset specificity* is measured using a scale adapted from Lunnan and Haugland (2008) and Reuer and Ariño (2002). In order to analyze the effects of competition and relational capital, we must also take the asset's level of specificity into account, as suggested in transaction cost research. The items capture both human capital and physical asset specificity at the supplier. The alpha coefficient of 0.87 suggests a reliable measure.

The measurement of the buyer's reported *unforeseen contingencies* is a challenge, as it depends on the difference between expectations and actual outcomes. In this survey, I measure the

[32] The results do not change when this is the case. In addition, this cutoff creates a total of four observations with ten alternative suppliers.

outcome of unforeseen contingencies. In other words, I examine situations requiring adaptations. This control is designed to capture some of the random events that can affect the buyer's satisfaction with the project. The four questions used for this measure relate to challenges arising from complexity, the need to obtain new competencies, the need to redefine the project plan, and whether there were any noteworthy surprises. As the effect of such unforeseen contingencies can materialize on either side of the relationship, the four questions were asked of the buyer. The alpha of this measure is 0.86, suggesting a reliable and consistent measure.

Furthermore, in order to check whether the results are driven by characteristics associated with a specific type of tender and the different procedures they entail, I controlled for a number of process characteristics. First, tender procedures can range from completely open calls for tenders to procedures with more restricted access, such as those based on pre-qualification or available by invitation only. I added a binary control variable to indicate the effect of completely *open competition*. Second, the discretionary power of the buyer is affected by whether the supplier is chosen based only on price or on price together with a number of quality characteristics. Therefore, I included another binary variable covering whether tenders had *quality-based evaluation criteria*. Data for both binary variables were collected from the TED database.

The complete TED population from which the sample was drawn was used to create a control variable for *prior relations* between the buyer and the supplier. This variable is constructed as the count of the number of such instances.

Moreover, when dealing with managerial meta-knowledge, the *size of the project team* may matter. Therefore, the (supplier's) questionnaire included a measurement of the number of employees involved in the procurement project in the supplier's organization.

As a number of the surveyed projects were completed months or years prior to the survey, there are risks of a retrospective bias and of being overly optimistic at the beginning of a

project. In an attempt to control for these effects, two variables were constructed. One counted the *months since the end* of the project. This variable took a negative value for projects not yet completed. The other variable took a value from 0 to 1 indicating the time-wise *completion percentage* of the project.

Procurement projects of high value are often associated with a number of issues that are not as prevalent in smaller projects. These projects are typically bigger in many dimensions, and they may be more complex. Due to their financial importance, they are often subject to a different degree of managerial attention from both the buyer and the supplier. A *contract value* variable was therefore created to capture some of these effects. For some projects, the value of the contract was indicated in the TED database. As the TED database suffered from missing values to a high degree, respondents were also asked to indicate the value of the contract in the survey. These responses together with the TED data formed the variable—logged contract value in millions of DKK.

Organizational *experience* is commonly used as a control variable due to learning effects. It also captures some of the effects of organizational size. Two variables were created to count the number of times a given buyer or supplier was listed in the TED database as having signed a contract. The *size of the tender market* itself can have an effect—a good reputation on a larger market is more valuable. To control for this, a variable was created containing the logged value (millions of DKK) of all contracts in a given market (using three-digit CPV codes). A last control variable indicated whether the procurement project primarily involved a *service*, a *good*, or *construction work*. Data for this variable were gathered from the TED data.

[- TABLE 1 -]

ANALYSIS

The hypotheses are tested using ordinary least squares models. All of the continuous independent variables are centered at the mean. Mean values, standard deviations, and correlations are reported in Table 1. The predicted variable is the buyer's project satisfaction as reported by the buyer's side of the procurement project. Three models are reported: one with only controls, the next with controls and the main variables, and a final model including interaction effects. The overall fit of Model 3 is good (f-statistic of 0.001). None of the models suffer from variance inflation (no single item VIF of more than 4.15 and no mean VIF of more than 2.1). The residuals of the models are almost normally distributed, with only one mild outlier (using Hamilton's Interquantil range (IQR) Stata command).

[- TABLE 2 -]

The regression models lend support to the baseline hypothesis (**H1**) that there is a positive association between relational capital and buyer satisfaction. This is not surprising, as the relationship is well established in the literature, but it does lend some external validity to the study. This effect is stable in all of the models and it is highly statistical significant ($P < 0.01$). In the final model, the effect of a one standard deviation increase in relational capital is, on average, associated with a quarter of a standard deviation increase in buyer satisfaction.

The second hypothesis (**H2**) suggests a direct effect of the supplier's managerial meta-knowledge on the buyer's satisfaction. This hypothesis is not supported by the data, suggesting that other factors need to be taken into account before meta-knowledge matters. I discuss this finding in the discussion section.

I find empirical support for the third hypothesis (**H3**), which proposes an interaction effect between relational capital and managerial meta-knowledge. This effect is positive and significant (P

= 0.013 when it is the only interaction; P = 0.016 with all interactions included). Figure 2a shows the effect of relational capital at plus/minus one standard deviation of managerial meta-knowledge. The effect of relational capital is significantly stronger at higher levels of managerial meta-knowledge, which supports Hypothesis 3. When looking at the interaction, it becomes clear that when managerial meta-knowledge is around one standard deviation below the mean, the level of relational capital has no statistically significant effect on buyer satisfaction. On the other hand, when the level of managerial meta-knowledge rises, so does the effect of relation capital on buyer satisfaction. This occurs to such a degree that when the managerial meta-knowledge is one standard deviation above the mean, a positive one standard deviation change in relational capital results in half a standard deviation change in buyer satisfaction. In other words, the effect of relational capital is dependent on the level of managerial meta-knowledge to such an extent that it can cancel its effect or enhance it greatly.

The fourth hypothesis (**H4**) is supported (P = 0.040)—the positive effect of relational capital on buyer satisfaction is stronger when there are many alternative suppliers. In the final model, when there is a high number of alternative suppliers (+1 standard deviation), the effect of having one standard deviation higher relational capital is, on average associated with half a standard deviation increase in buyer satisfaction. This is graphed in Figure 2b. After calculating the slope of relational capital dependent on alternative suppliers, we see that the effect is only statistically significant when there are four or more alternative suppliers (for a graphical representation, see Figure 3b). In other words, the effect of relational capital on buyer satisfaction is dependent on a competitive environment with multiple alternative suppliers.

The fifth hypothesis (**H5**) is also supported. The number of alternative suppliers only matters when the market is relatively non-competitive (concentrated). In this situation, there is a positive effect between number of offers and the buyer's satisfaction. When the market concentration is high

(a little less than +1 standard deviation), two extra offers (i.e., one standard deviation) will, on average, lead to an increase in buyer satisfaction of about 45% of one standard deviation. When the market concentration is very low (e.g., when there are many firms with similar market shares), there is no significant effect of having alternative suppliers bidding for the project. The effect becomes significant (and positive) when the market is more concentrated (see Figure 2c for a graphical representation). In other words, having alternative suppliers matters only in markets where the market structure does not ensure competitive pressure.

[- FIGURE 2a -]

[- FIGURE 2b -]

[- FIGURE 2c -]

Endogeneity Considerations

A potential source of bias in the estimated models is endogeneity caused by simultaneity. One could argue that not only do strong inter-organizational relations lead to better-performing projects and more satisfied buyers, but that the reverse is also plausible—that satisfied buyers may be more willing than unsatisfied buyers to develop strong relations with suppliers. This effect could bias the parameter estimates of the reported regressions.

I argue that endogeneity does not bias the results of the analysis for three reasons. First, the problem of simultaneity is not as salient in models in which the variable of interest is an interaction term (Aiken & West, 1991). The estimated model includes two interaction effects that have an impact on the main effect of relational capital on buyer satisfaction: managerial meta-knowledge and the number of alternative suppliers. The exploration of the problem of simultaneity in a model like this

needs a bit more consideration than in models without interactions. An argument for simultaneity should take into account the specific interaction effects and consider whether the moderated relationship is likely to be simultaneously significant in both directions dependent on the moderator. In addition, the problem of biased OLS estimates is reduced for the interaction when one of the interactors is exogenous (Bun & Harrison, 2014; Nizalova & Murtazashvili, 2014).

Second, the specific nature of the two-sided survey design lessens the potential simultaneity problem of buyer satisfaction leading to relational capital. The general proposition of relational capital leading to higher buyer satisfaction is more prone to simultaneity biases than the specific test of the association between how the *supplier* views the relation and the buyer's satisfaction. As I ask the supplier to judge the relationship with the buyer, I not only capture the perception of the party delivering the project, but I am also asking a party different from the one whose satisfaction is being estimated. As a result, the likelihood of relation capital affecting the satisfaction level is mitigated. We can, for example, imagine a situation in which the supplier has a trusting and information-sharing relationship with the buyer, but the buyer is not satisfied with the quality of the good or service. This does not suggest that two-sided surveys necessarily reduce simultaneity, but it is an argument in favor of this specific research design (two-sided surveys also reduce other potential problems, such as common method biases). In other words, the specific measures of the two-sided survey mitigate the risk of simultaneity-based endogeneity biases.

Third, in order to model and explore the potential problem of endogeneity, I utilize an instrumental variable model (IV-models). As instruments for relational capital, I use and interact two variables: a dummy variable indicating whether the buyer's and supplier's project managers have the same educational backgrounds, and a variable indicating the difference in educational level. These instruments reflect the fact that it is easier to build relations with someone with the same professional language and a comparable level of education (McPherson, Smith-Lovin, & Cook, 2001). An

overidentification test suggests that the instruments are not correlated with the error term of the main model (Wooldridge's robust score test's p-value = 0.45). Two IV models are estimated, one without the interactions and one with the interactions. The results are qualitatively similar. The parameter estimates are qualitatively similar to those of the OLS models. The strength of the instruments is explored by comparing the (Kleibergen-Paap Wald rk) F-statistic with the critical values suggested by Stock and Yogo (2005), which reveals that the instruments are relatively weak (F-statistic: 4.6). To mitigate this problem, the LIML estimator is used, as suggested by Stock and Yogo (2005). The Hausman test for endogeneity of the instrument variable does not allow us to reject the hypothesis that relational capital is an exogenous variable (p = 0.26). Despite the relatively weak instruments, this provides some evidence that relational capital is not endogenously determined. In other words, there is no advantage to using instrumental variable regression over ordinary least squares.

Together, these three considerations and techniques—the measurement of dependent and independent variables on different parties, the inclusion of interaction effects as the variables of interest, and the failure to detect endogeneity using instrumental variable models—indicate that endogeneity problems most likely do not bias the estimated OLS models.

DISCUSSION

There is strong support for the direct effect of relational capital, and for the hypothesized moderators of managerial meta-knowledge and the number of alternative suppliers. Whereas the direct effect of relational capital is well established in the literature, the findings on moderating effects are new. The two significant interaction effects emphasize the point that relational capital is only as valuable as the cooperation it facilitates given the incentives created by the environment.

Strong relationships with suppliers whose managers know the productive capabilities of their teams offer two advantages. One, they allow for the writing of better contracts. Two, the supplier is

better able to adapt to unforeseen contingencies. The information flow allowed by good inter-organizational relations means that it is easier to make use of these advantages. While high levels of managerial meta-knowledge greatly enhance the outcome of relational capital, the effect is fully mitigated at low levels (the marginal effect of relational capital dependent on managerial meta-knowledge is plotted in Figure 3a). At very low levels (below -1 standard deviation), the effect of relational capital on buyer satisfaction turns negative, suggesting a situation of misinvestments in developing relations, which may even end in a situation where the supplier is able to take advantage of the buyer because of the good relationship. In other words, the quality of inter-organizational relations does not matter for buyer satisfaction if the supplier's manager does not know much about the capabilities of the team he is managing.

A similar effect is found with regard to the interaction between relational capital and the number of alternative suppliers. The association between relational capital and the buyer's satisfaction is stronger in a competitive environment with many alternative suppliers. When there are many suppliers, it is easier for the buyer to find a new, alternative supplier, and the competitive pressure provides an incentive for the supplier to get the most out of the relational capital. Empirically, this effect is only present when there are four or more alternative suppliers (see Figure 3b). Below this threshold, relational capital has no statistically significant effect (at the mean level of managerial meta-knowledge). This analysis suggests that a competitive environment is a necessary condition for the effect of relational capital.

As the effect of relational capital depends on both managerial meta-knowledge and the number of alternative suppliers, an exploration of the combined effect of these two factors is relevant. The calculation of marginal effect of relational capital in these situations is graphed in Figure 3c. When there are no alternative suppliers, there is no statistically significant effect of relational capital on buyer satisfaction regardless of the level of managerial meta-knowledge (-1 to +1 standard

deviation from the mean). Similarly, there is no statistically significant effect of relational capital when managerial meta-knowledge is low, regardless of the number of alternative suppliers (-1 to +1 standard deviation from the mean). These results suggest two necessary, but not sufficient, conditions for using relational capital to enhance buyer satisfaction—a competent manager on the supplier side who has accurate knowledge of his team and a competitive environment that motivates the use of relational capital.

[- FIGURE 3a -]

[- FIGURE 3b -]

[- FIGURE 3c -]

The interaction between the number of alternative suppliers and market concentration reveals that being in a concentrated market as well as having many alternative suppliers are associated with higher buyer satisfaction. In terms of the effect of market concentration, this is only statistically significant when four or more alternative suppliers are available. Another way to look at it is as an effect of alternative suppliers that only becomes significant when the market reaches a certain level of concentration (approximately 0.15). Either way, the analysis suggests that there is a link between the competitive situation and buyer satisfaction. When thinking about the relationship between market concentration and the number of alternative suppliers submitting bids, we can construe it as a structural indicator of a competitive market and as a concrete indicator of the number of interested bidders. The latter also takes into account more concrete considerations of competition, such as the current productive capacity, the concrete project specifications, and the bidders' beliefs that they can win the tendered project. The fact that the analysis finds no effect of alternative suppliers when the market is widely dispersed (i.e., it has many small suppliers) could suggest that the effect of

competitive pressure is ensured at a structural level. However, this structural competition does not matter if there are no alternative suppliers willing to bid on a project.

The empirical analysis finds no support for a direct effect of managerial meta-knowledge on the buyer's satisfaction. There may be a number of reasons for this finding. First, there might not be a direct effect between managerial meta-knowledge and buyer satisfaction—there may only be an indirect effect through its enhancement of the effect of relational capital. This does not mean that managerial meta-knowledge does not affect other factors of interest, such as the level of relational capital or the supplier's ability to efficiently manage projects. Even though there is no direct effect of managerial meta-knowledge, it can still affect the level of relational capital. Relational capital is an asset that takes time and effort to develop. In other words, it has a cost. One implication is that buyers are careful when choosing relations in which to invest, and that when they identify valuable relations, they increase their investments in them. It seems plausible that strong relations make it possible for buyers to identify the level of the supplier's managerial meta-knowledge. This line of theorizing would lead to a more dynamic model than the model presented here, and to a situation in which relational capital mediates the link between managerial meta-knowledge and buyer satisfaction. Along these lines, the descriptive statistics (Table 1) show a positive, statistically significant correlation between managerial meta-knowledge and relational capital. This might be viewed as evidence favoring the mediation hypothesis, even though additional analysis would be necessary (especially after controlling for other factors that could affect the willingness to invest in relational capital). In other words, the effect of managerial meta-knowledge might be an indirect effect mediated by the level of relational capital.

Another reason for the lack of a statistically significant link between buyer satisfaction and managerial meta-knowledge may related to the contract governing the relationship. If the supplier's manager misjudges his team's capabilities when bidding for the project, such that fulfilling the

contract is costlier than expected, or if the supplier is unable to adapt to small changes along the way, the costs of the project might rise and the quality might decline. The division of these costs among the buyer and supplier depends on the type of contract, such as fixed-price or cost-plus contracts. As I do not have contract data for the focal projects, it is not possible to test this hypothesis. Nevertheless, some preliminary evidence links managerial meta-knowledge to supplier evaluations of project performance (their satisfaction) and to the amount of unforeseen contingencies they experience in a project.[33] In other words, the lack of a statistically significant relation between managerial meta-knowledge and satisfaction might reflect the fact that we look at satisfaction from the buyer´s side rather than the supplier´s.

Is this analysis generalizable to other procurement projects? While the non-response tests showing some differences between the sample and the population suggest a limitation to generalizability, the wide variety of project types and the cross-organizational data suggest some basis for generalizing the results of the study. Additional studies should explore whether the same mechanisms exist in the procurement of supplies, in projects where the supplier is chosen based solely on price criteria, and in unrestricted tender situations. Based on the proposed mechanisms, I would expect relational capital to play a smaller role in the procurement of simpler supplies, such as office equipment, although competition should still play a part. This hypothesis becomes more complicated given the way the procurement of standardized supplies and services is handled in those cases where a central public organization acts as an intermediary between the public buyer and the suppliers. Such public organizations may create framework agreements (e.g., Staten og Kommunernes Indkøbs Service A/S in Denmark or Crown Commercial Services in the UK). However, this study's findings are derived from a dataset comprised of a wide variety of procurement projects undertaken under

[33] See the Appendix for a simple, preliminary regression model predicting the supplier's project satisfaction and unforeseen contingencies. With the exception of buyer-specific variables and interaction effects, the model is identical to the main model in this paper.

different market conditions, and involving a large number of different suppliers and buyers. This suggests robust results that hold across different settings, which can be used to generalize about the antecedents of successful public procurement projects.

Whether the results hold for private-to-private procurement projects is beyond this study's scope, but I find no apparent reason for the proposed mechanisms to be absent in such projects. Three major differences between public and private procurement are the stronger incentives usually present in private firms, the formalized procurement processes in the public sector, and the fact that public organizations are not usually able to make a product or service themselves if external procurement is too costly. The stronger incentives in private firms could be an advantage in simpler procurement projects. However, depending on the contractual relation, the effect is less clear in more complex, long-term projects (Bajari & Tadelis, 2001). The formalized process in public procurement is a mechanism designed to ensure competitive pressure in lieu of strong incentives. Although these processes are flexible, they do require the buyer to have some knowledge of the regulatory framework in order to avoid situations in which they either have to choose a supplier they do not want or risk a costly complaint process. Nevertheless, it is unclear how these differences would reduce the effect of the proposed mechanisms in private procurement. On the contrary, stronger incentives for the buyer´s manager are one reason to more extensively develop and use relational capital.

The research design, the fact that the dependent variable is measured on the buyer's side, and the measurement of the independent variables of interest on the supplier's side mean that there is no risk of common method bias. This adds reliability to the findings.

CONCLUDING DISCUSSION

This paper examines the role of relational capital for buyer satisfaction in procurement projects, and it shows how the use of relational capital is affected by managerial meta-knowledge and competitive

pressure from the presence of alternative suppliers. The study finds that the effect of relational capital on the buyer's satisfaction is dependent on the supplier's managerial meta-knowledge and on competitive pressure from alternative suppliers. Moreover, this paper adds to our understanding of the role of managerial meta-knowledge.

The extant literature on relational capital has demonstrated that strong inter-organizational relations have a number of advantages in terms of cooperation, from enhancing the willingness to share information (Grant & Baden-Fuller, 2004; Mowery et al., 1996) to easing the resolution of potential conflicts and enhancing learning about potential combinations of resources (Gulati et al., 2009; Harrison et al., 2001; Wang & Zajac, 2007). More trusting relationships are associated with less costly, less formal contracts and higher performance (Gulati & Nickerson, 2008).

However, the literature has not yet concerned itself to any great extent with the partner and environmental conditions under which relational capital leads to better performance. It has instead focused on the characteristics of projects that lend themselves to inter-organizational cooperation, the level of these characteristics (Parkhe, 1993; Williamson, 1991), organizational capabilities (Gibbons & Henderson, 2012; Kale, Dyer, & Singh, 2002), and the decomposability of a problem (Baldwin, 2008; Nickerson & Zenger, 2004). A number of studies have found important moderators of the effect of relational capital on project performance. In a study of IT outsourcing Poppo, Zhou, and Zenger (2008) find that higher measurement difficulties, greater asset specificity, and longer exchange tenure are all associated with a stronger positive link between relational governance and performance. The use of relational capital is also found to be contingent on the enforceability of contractual relations (Zhou & Poppo, 2010). Relatedly, in a study of 126 international alliances, Krishnan, Martin, and Noorderhaven (2006) find that the effect of trust on performance is stronger under high levels of behavioral uncertainty and weaker under high levels of environmental uncertainty. This paper adds

to this stream of literature by exploring what have been called the "conditional limits" (Poppo, Zhou, and Zenger, 2008) of relational capital.

In summary, this paper shows the importance of the supplier's managerial meta-knowledge and competitive pressure from alternative suppliers for the use of relational capital. Not only do these two factors moderate the effect of relational governance, but they are also able to fully mitigate that effect. More specifically, competitive pressure from alternative suppliers and the presence of a supplier with good managerial meta-knowledge are necessary, but not sufficient, conditions for relational capital to have an effect on buyer satisfaction.

Contrary to Hypothesis 2, the study finds no evidence of a direct effect of managerial meta-knowledge on the buyer's project satisfaction. This does not mean that we can rule out other effects of managerial meta-knowledge. At least two potential additional effects should be kept in mind. First, the supplier's managerial meta-knowledge may have an effect on the level of relational capital. As higher levels of managerial meta-knowledge are associated with a greater positive effect of relational capital, there is more incentive to invest in relational capital when managerial meta-knowledge is high. This mediation hypothesis would also create a more dynamic perspective on escalating relational commitment. Second, we should consider the effect of the supplier's imperfect managerial meta-knowledge on the supplier's organization. As the specifics of contractual agreements differ, it is not always easy to say who will bear the cost of a supplier's lack of knowledge, bad bids, and poorly executed daily operations. This suggests that future research should focus on the satisfaction of the organization for which the manager's meta-knowledge is in focus.

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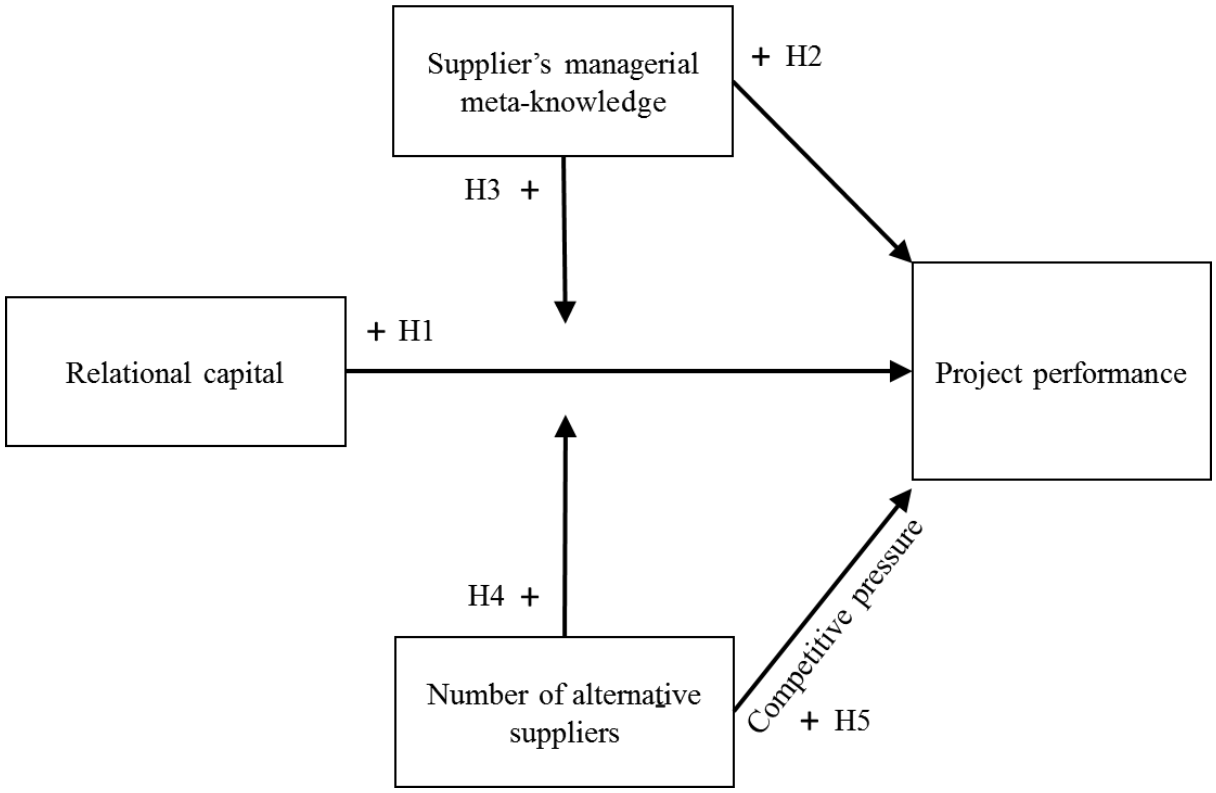
FIGURES

Figure 1: Research model



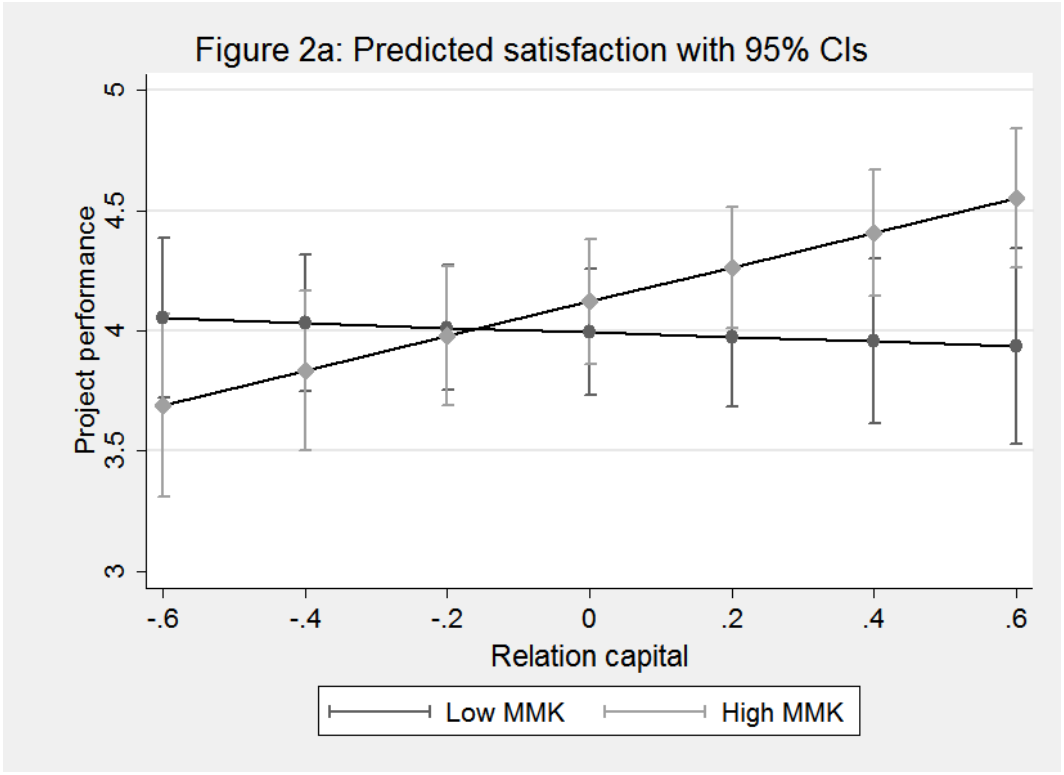


Figure 2a: Predicted satisfaction with 95% CIs
Project performance
3
3.5
4
4.5
5
-.6
-.4
-.2
0
.2
.4
.6
Relation capital
Low MMK
High MMK

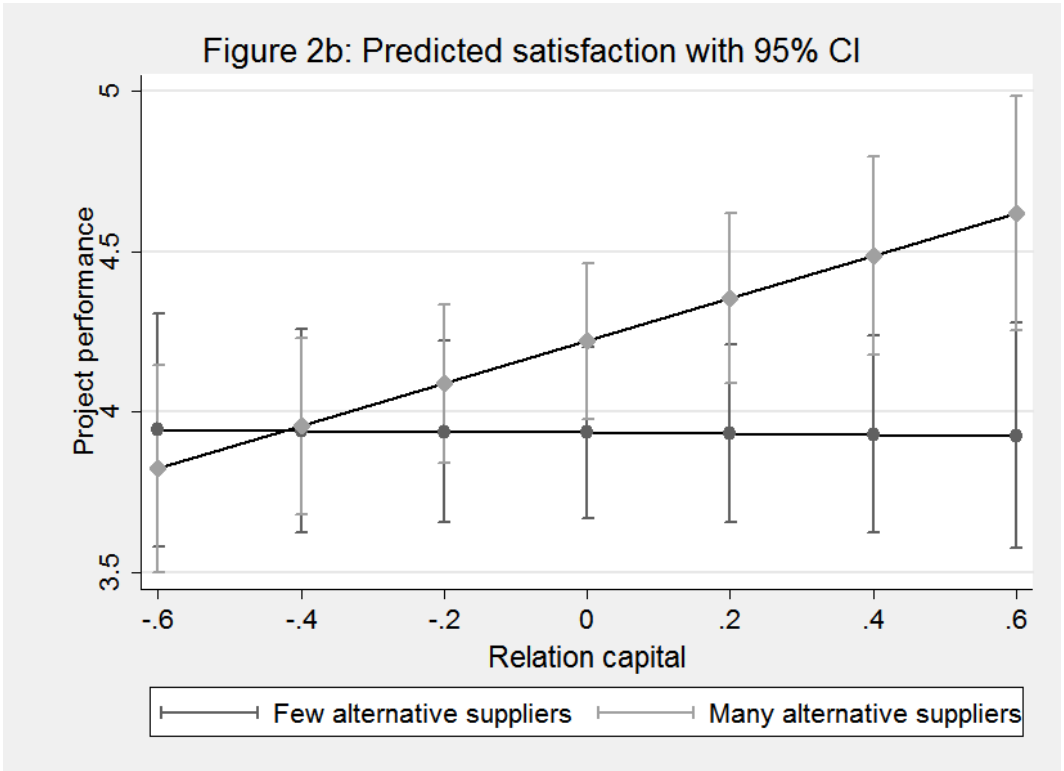


Figure 2b: Predicted satisfaction with 95% CI
Project performance
3.5
4
4.5
5
-.6
-.4
-.2
0
.2
.4
.6
Relation capital
Few alternative suppliers
Many alternative suppliers

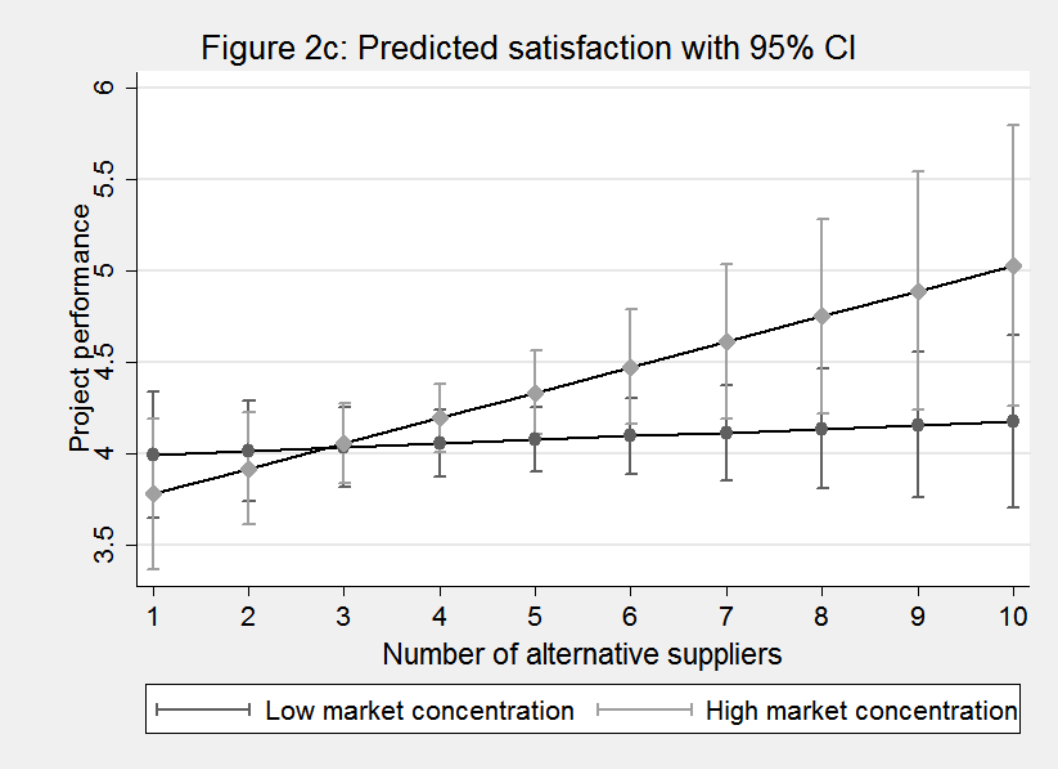


Figure 2c: Predicted satisfaction with 95% CI
Project performance
3.5
4
4.5
5
5.5
6
1
2
3
4
5
6
7
8
9
10
Number of alternative suppliers
Low market concentration
High market concentration

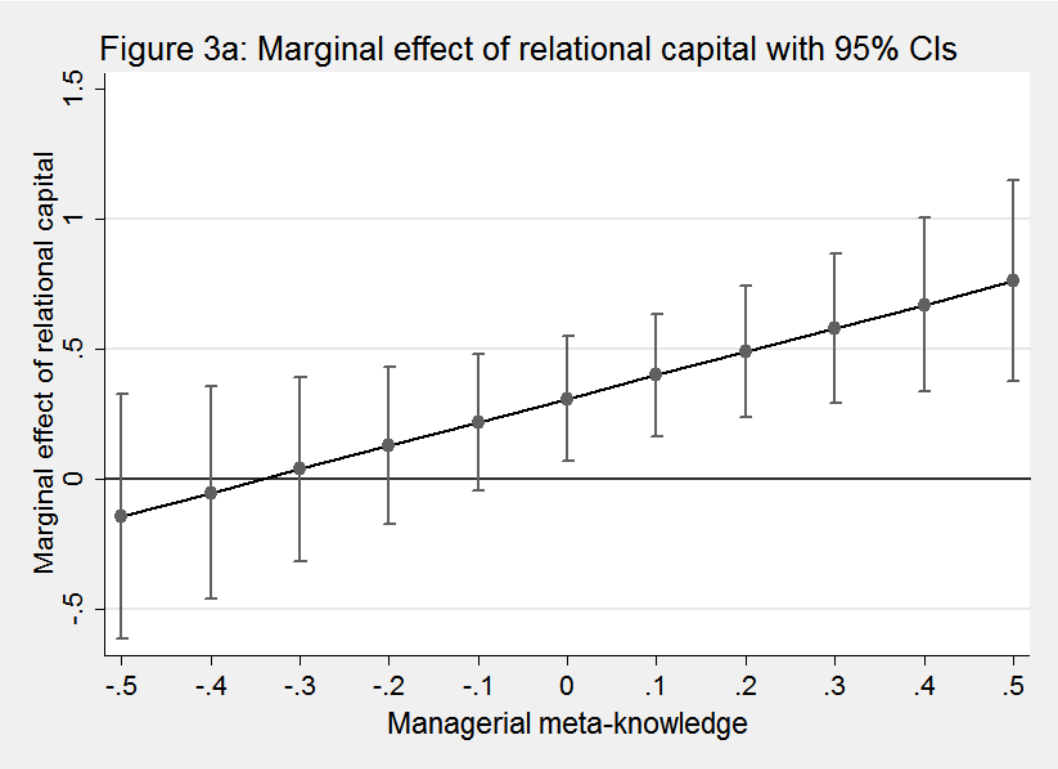


Figure 3a: Marginal effect of relational capital with 95% CIs
Marginal effect of relational capital
-.5
0
.5
1
1.5
-.5
-.4
-.3
-.2
-.1
0
.1
.2
.3
.4
.5
Managerial meta-knowledge

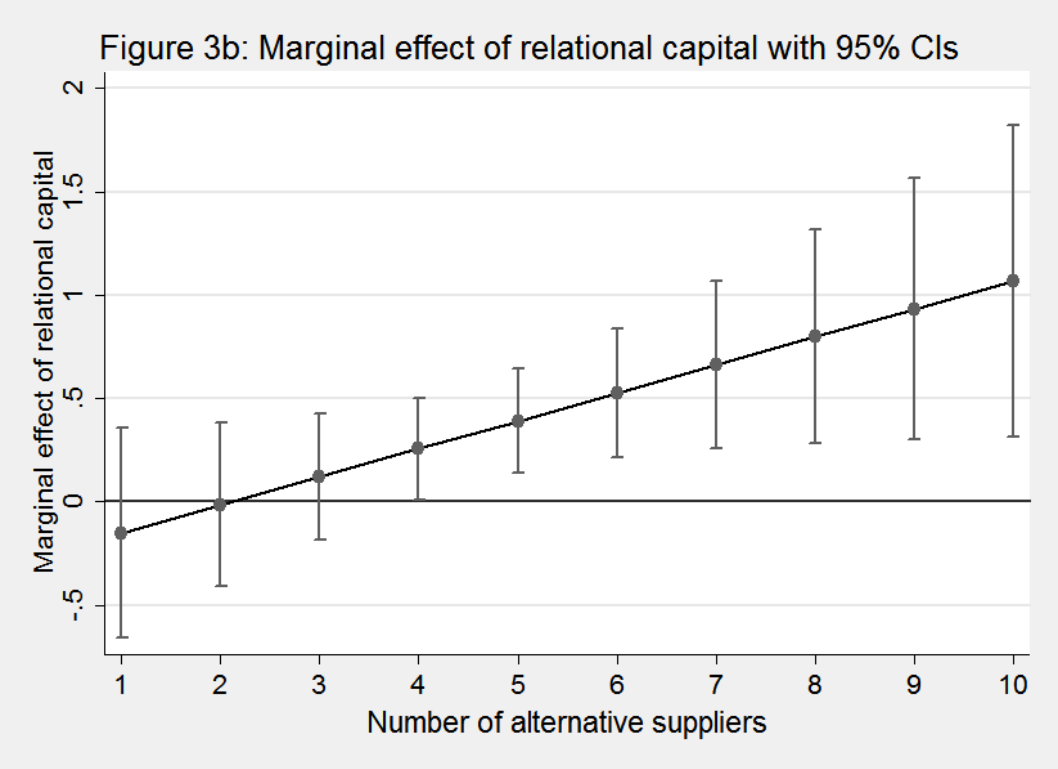


Figure 3b: Marginal effect of relational capital with 95% CIs
Marginal effect of relational capital
-.5
0
.5
1
1.5
2
1
2
3
4
5
6
7
8
9
10
Number of alternative suppliers

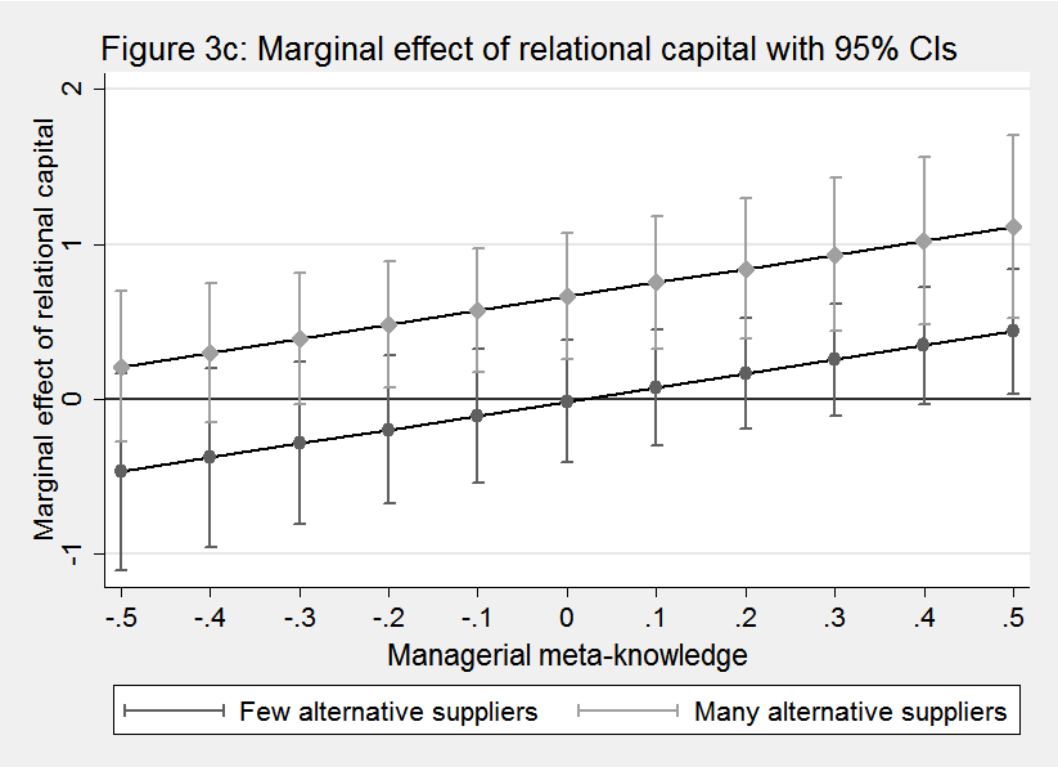


Figure 3c: Marginal effect of relational capital with 95% CIs
Marginal effect of relational capital
-1
0
1
2
-.5
-.4
-.3
-.2
-.1
0
.1
.2
.3
.4
.5
Managerial meta-knowledge
Few alternative suppliers
Many alternative suppliers

TABLES

Table 1

Descriptive statistics and correlation table

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Project performance	4.086	0.81	1	5	1														
2 Managerial meta-knowledge	3.912	0.433	2.556	4.933	0.16	1													
3 Relational capital	3.447	0.59	2.2	5	0.21	0.22	1												
4 Number of alternative suppli	4.393	2.059	1	10	0.03	-0.09	-0.13	1											
5 Market concentration	0.062	0.139	0.002	1	-0.05	-0.1	-0.06	-0.06	1										
6 Asset specificity	2.906	0.644	1.273	4.273	0.12	0.14	-0.05	0.07	0.05	1									
7 Unforeseen contingencies	2.557	0.846	1	5	0.04	-0.03	-0.08	0.09	-0.01	0.1	1								
8 Prior relations	0.117	0.317	0	1.609	0.16	0.05	-0.01	-0.06	-0.11	-0.18	0.03	1							
9 Team size	14.36	24.703	3	200	0	0.13	-0.08	-0.04	-0.04	0.24	0.1	0.19	1						
10 Time since end	0.978	30.241	-50	145	0.03	-0.21	-0.06	-0.16	-0.09	0.13	0.14	-0.04	0.02	1					
11 Percentage done	0.8	0.255	0.174	1	0.01	0.15	0.09	0.09	0.12	-0.1	-0.2	-0.04	-0.06	-0.82	1				
12 Contract value	15.324	1.466	12.024	19.114	0.04	0.22	0.13	-0.13	-0.04	0.15	0.05	0.03	0.18	0.33	-0.29	1			
13 Supplier experience	21.528	39.106	1	168	0.03	0.05	-0.06	0.14	-0.03	-0.23	0.2	0.32	0.14	0.15	-0.3	-0.04	1		
14 Buyer experience	139.753	221.723	1	795	0.04	0.15	0.13	0	0.12	-0.08	0.16	0.14	-0.09	-0.06	0.08	-0.03	0.14	1	
15 Market size	7.444	2.225	1.724	11.109	0.07	0.16	0.08	-0.08	-0.53	0.03	-0.05	0.17	0.23	0.04	-0.01	0.44	-0.13	-0.02	1
16 bin: type_works	0.213	0.412	0	1															
17 bin: type_supply	0.135	0.343	0	1															
18 bin: type_service	0.652	0.479	0	1															
19 bin: Open procedure	0.506	0.503	0	1															
20 bin: Price criteria	0.281	0.452	0	1															

Table 2. Regression results

OLS. DV: Buyer satisfaction			
	(1)	(2)	(3)
Relational capital		0.397***	0.310**
		(0.125)	(0.122)
Managerial meta-knowledge		0.104	0.141
		(0.244)	(0.237)
Alternative suppliers		0.0507	0.0572
		(0.0464)	(0.0418)
Market concentration		0.909*	1.296*
		(0.541)	(0.752)
Rel.cap.×MMK			0.904**
			(0.364)
Rel.cap.×Alt.suppliers			0.135**
			(0.0658)
Mark.conc.×Alt.suppliers			0.819**
			(0.391)
Asset specificity	0.0961	0.0451	0.0756
	(0.162)	(0.148)	(0.136)
Unforseen contingencies	0.0882	0.112	0.104
	(0.127)	(0.126)	(0.114)
Prior relations	0.507**	0.545**	0.511**
	(0.207)	(0.221)	(0.228)
Project team size	-0.00103	0.000175	-0.000250
	(0.00225)	(0.00246)	(0.00223)
Open procedure	0.0463	0.0883	0.0545
	(0.212)	(0.208)	(0.207)
Price criteria	-0.502*	-0.593**	-0.580**
	(0.257)	(0.272)	(0.255)
Time since end	0.00699	0.00890*	0.00612
	(0.00475)	(0.00495)	(0.00471)
Perc. done	0.628	0.424	0.304
	(0.611)	(0.629)	(0.629)
Contract value	-0.000524	-0.0676	-0.0699
	(0.0849)	(0.0836)	(0.0826)
Supplier's experience	-0.000435	-0.000969	0.000839
	(0.00212)	(0.00236)	(0.00252)
Buyer's experience	0.0000882	-0.0000991	-0.000418
	(0.000413)	(0.000392)	(0.000405)
Market size	0.110*	0.160**	0.150**
	(0.0570)	(0.0720)	(0.0696)
Type: Works (bin.)	-0.699*	-0.761**	-0.761**
	(0.387)	(0.375)	(0.338)
Type: Supply (bin.)	0.136	0.287	0.338
	(0.318)	(0.305)	(0.275)
Type: Services (bin.)	0	0	0
	(.)	(.)	(.)
Constant	4.334***	4.332***	4.325***
	(0.156)	(0.155)	(0.163)
N	89	89	89
r2	0.198	0.286	0.375

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX

Measures

More detailed descriptions and discussions are found in the paper's Method section. All questions were answered using a five-point Likert scale.

Construct	References	Items
Buyer satisfaction [Buyer side]	Poppo & Zenger (1998); Zenger, Lazzarini, & Poppo (2002)	In general, how satisfied are you with: • the overall cost of the product or service? • the quality of the product or service? • the vendor's responsiveness to problems or inquiries?
Relational capital [Supplier side]	Kale, Singh, & Perlmutter (2000)	Evaluate the following statements about the relationship with the counterpart at the managerial level: • There is close, personal interaction between the partners at the managerial level. • The project is characterized by mutual respect between the partners at the managerial level. • The project is characterized by mutual trust between the partners at the managerial level. • The project is characterized by mutual friendship between the partners at the managerial level. • The project is characterized by high reciprocity among the partners at the managerial level. Evaluate the following statements about the relationship with the counterpart at the operational level (between employees with no managerial responsibility): • There is close, personal interaction between the partners at the operational level. • The project is characterized by mutual respect between the partners at the operational level. • The project is characterized by mutual trust between the partners at the operational level. • The project is characterized by mutual friendship between the partners at the operational level. • The project is characterized by high reciprocity among the partners at the operational level.
Managerial meta-knowledge [Supplier side]	Lewis (2003)	Evaluate the following statements about the specialization of the employees involved in [PROJECT NAME]: • Each team member has specialized knowledge of some aspect of our project. • I have knowledge about an aspect of the project that no other team member has.

		• Different team members are responsible for expertise in different areas. • The specialized knowledge of several different team members was needed to complete the project deliverables. • I know which team members have expertise in specific areas. Evaluate the following statements about the competences of the employees involved in [PROJECT NAME]: • I was comfortable accepting procedural suggestions from other team members. • I trusted other team members' knowledge about the project was credible. • I was confident relying on the information that other team members brought to the discussion. • When other members gave information, I wanted to double-check it for myself. • I did not have much faith in other members' "expertise." Evaluate the following statements about the ability to coordinate of the employees involved in [PROJECT NAME]: • Our team worked together in a well-coordinated fashion. • Our team had very few misunderstandings about what to do. • Our team needed to backtrack and start over a lot. • We accomplished the task smoothly and efficiently. • There was much confusion about how we would accomplish the task.
Asset specificity [Supplier side]	Lunnan & Haugland (2008); Reuer & Ariño (2002).	Evaluate the following statements about the development of your company's competences in relation to this project: • In order to solve the tasks, we had to acquire new competencies that have limited value if the project were terminated. • We had to learn extensively about our customer's business in order to complete the project. • If this project was terminated, we would have substantial difficulty in redeploying our people and facilities presently serving the project to other uses . • Our company has acquired new competencies through this project. However, it is difficult to see how these competencies can be used if the project were terminated. • If this project were dissolved, our investments in training and hiring people would be lost. Evaluate the following statements about your company's general investments in relation to this project:

		• We have made specific investments in plants and equipment in order to develop this project. • It is important that this project continues, as termination will result in financial losses due to our investments. • Making investments that are tailored to this cooperation was a precondition for establishing this project. • We have adjusted our production equipment or work plan in order to establish this project. • Terminating this project would be a great loss for our company. • We have used much time and resources in order to develop this project.
Unforeseen contingencies [Supplier side]	Own development, see Chapter 2 for discussion.	Evaluate the following statements about surprises during the project: • The task was more complex than we thought when we started. • During the project, we had to get additional competences from other employees. • During the project, we had to change our project plan. • The project progressed without mentionable surprises. (reversed)

Appendix table

Appendix Table. Regression results. OLS

	(1) Supplier's Unforeseen contingencies	(2) Supplier satiscation
Managerial meta-knowledge	-0.525**	0.397**
	(0.233)	(0.194)
Relational capital	0.159	0.471***
	(0.168)	(0.132)
Asset specificity	0.436**	-0.0719
	(0.172)	(0.102)
Prior relations	0.212	-0.168
	(0.275)	(0.196)
Project team size	-0.00107	-0.00163
	(0.00349)	(0.00195)
Open procedures	-0.0879	0.189
	(0.196)	(0.142)
Price criteria	-0.574***	-0.0311
	(0.202)	(0.204)
Time since end	0.00208	-0.000961
	(0.00453)	(0.00359)
Perc. done	0.126	-0.233
	(0.590)	(0.443)
Contract value	-0.0505	-0.0258
	(0.0748)	(0.0807)
Supplier's experience	-0.000196	0.00215
	(0.00277)	(0.00222)
Market size	0.0348	-0.0383
	(0.0480)	(0.0399)
Type: Works (bin.)	0.370	0.401*
	(0.313)	(0.233)
Type: Supply (bin.)	-0.401	0.378
	(0.245)	(0.251)
Type: Services (bin.)	0	0
	(.)	(.)
Constant	2.990***	3.597***
	(0.198)	(0.115)
N	89	89
r2	0.295	0.325

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Chapter 5 - Conclusion

This dissertation explores the role of managerial meta-knowledge in mitigating coordination failures and other endogenous drivers of unforeseen contingencies. An overarching theme of the dissertation is that organizations are systems of distributed knowledge and that this distributed knowledge creates coordination challenges, leading to unforeseen contingencies and coordination failures. One way to mitigate such problems is for the manager to play an active role as coordinator of the distributed knowledge. A necessary condition for such managerial intervention is that the manager holds knowledge about the knowledge distributed among the employees being managed. In this dissertation, I conceptualize this kind of knowledge as managerial meta-knowledge. By affecting the ability to anticipate potential problems and to coordinate distributed knowledge, managerial meta-knowledge has an impact on firm's ability to efficiently govern transactions.

The dissertation contributes to ongoing scholarly debates about heterogeneous firm capabilities, and the interplay between transaction cost theory and firm capabilities (with a focus on knowledge-based resources), as well as to research on inter-organizational relations. In this regard, I identify team-level antecedents of unforeseen contingencies and develop a theoretical framework for understanding how imperfect managerial meta-knowledge is an opportunism-independent driver of transaction costs. I also note the implications of this theoretical framework for inter-organizational relations and test those implications using a unique empirical dataset.

The dissertation consists of three individual research papers, each of which explores a dimension of the research question—*What managerial challenges arise from having distributed knowledge within a firm and how does the manager's knowledge of this knowledge matter for economic organization?* The first paper (Chapter 2) argues that the academic interest in cooperation problems has overshadowed the interest in coordination problems, and that this has implications for

our understanding of unforeseen contingencies. Instead of construing such contingencies as primarily stemming from exogenous events and opportunistic actions, we need to consider the endogenous sources of unforeseen contingencies, such as coordination failures. The paper empirically examines a number of team-level antecedents of unforeseen contingencies, including specialized employees, project-development work, trust-based governance, and teams' coordination capabilities. This points to the importance of team and firm heterogeneity. There are several ways to mitigate the problem of coordination failure. The most common is for organizations to develop robust routines. This approach relies on past interactions to solve present coordination challenges. Another approach—one that does not directly depend on past interaction between employees—is the use of the manager's discretionary power. The efficiency of this approach depends on the manager's understanding of the problem at hand as well as his or her knowledge of the employees' knowledge.

In the second paper (Chapter 3), I develop a theoretical framework and falsifiable propositions about the implications of imperfect managerial meta-knowledge for economic organization. Managerial meta-knowledge affects both the ability to write contracts that fit the available capabilities as well as the ability to manage employees and adapt to unforeseen events *ex post*. An important implication is that imperfect managerial meta-knowledge is an opportunism-independent driver of transaction costs.

The third paper (Chapter 4) explores the effects of managerial meta-knowledge and strong inter-organizational relations on buyer satisfaction. Strong inter-organizational relations lead to more satisfied buyers by allowing firms to more easily exchange information in less costly ways, settle minor disagreements, and adapt to changing circumstances. This effect is dependent on two factors: the managerial meta-knowledge of the supplier and competitive pressure from the presence of alternative suppliers. Information exchange and adaption to changing circumstances require a

manager who knows the capabilities of the team being managed. In other words, these capabilities depend on managerial meta-knowledge.

Together, the three papers argue that distributed knowledge is an endogenous source of unforeseen contingencies, that managerial meta-knowledge plays a key role in mitigating such problems, and that this affects the firm's ability to take advantage of good inter-organizational relations. Teams differ in their ability to coordinate, and having employees with specialized knowledge working together is a potential source of coordination failure (Chapter 2). This suggests that we ought to consider: (1) team and firm heterogeneity with regard to the ability to coordinate, as well as antecedents of that ability, and (2) the possibility that unforeseen contingencies can stem from processes endogenous to the organization (and not only from external events or opportunistic behavior, as often suggested in the literature). One way to coordinate employees' interdependent tasks is for the manager to interfere. The use of managerial fiat is based on managerial meta-knowledge. Imperfect managerial meta-knowledge is an opportunism-independent driver of transaction costs (Chapter 3), which has implications for firm-internal organization as well as inter-organizational relations. Even though no direct effect is found from managerial meta-knowledge on buyer satisfaction in buyer-supplier relations, the evidence suggests that it is a necessary condition if good inter-organizational relations are to have a positive effect on buyer satisfaction (Chapter 4). The overall argument of the dissertation is that managerial meta-knowledge affects the ability to anticipate potential problems and to coordinate interdependent tasks. This has implications for the firm's ability to coordinate internally and to avoid unforeseen contingencies, as well as for inter-organizational relations.

IMPLICATIONS FOR FUTURE RESEARCH

The dissertation offers a number of arguments that should be taken into consideration in future research. First, I agree with Heath and Staudenmayer (2000) that management research focuses too

little on coordination problems. This dissertation provides evidence regarding the impact of team heterogeneity when dealing with coordination problems. It is reasonable to expect the same to be true at the firm level. Such firm-level heterogeneity would be in line with capability-focused research about firms in volatile environments (i.e., dynamic capabilities; Teece, Pisano, & Shuen, 1997).

Second, accepting that firms differ in their abilities to efficiently coordinate implies that some firms will experience more unforeseen contingencies due to coordination breakdowns. This highlights the importance of thinking about the sources of unforeseen contingencies, which include not only external events and opportunism but also more mundane coordination problems. This in line with the little-used distinction among primary, secondary, and behavioral uncertainty (Koopmans, 1957; Williamson, 1985).

Third, the state and imperfection of managers' knowledge in general and managerial meta-knowledge in particular has implications for economic organization. Although there is a flourishing stream of research on managerial cognition (Csaszar & Levinthal, 2015; Eggers & Kaplan, 2013; Weber & Mayer, 2014), epistemic questions have largely been overlooked. This dissertation argues that managerial meta-knowledge affects managers' ability to coordinate, to judge the productive capabilities of their employees, to anticipate potential problems, and to adapt to changing circumstances. This argument is in line with other research attempting to synthesize knowledge- and capabilities-based arguments with transaction cost theory (Argyres & Zenger, 2012; Foss & Weber, 2016; Weber & Mayer, 2014).

Fourth, whereas the approach to measuring managerial meta-knowledge in this dissertation is based on modified items originally developed to measure transactive memory systems (Lewis, 2003), other approaches should be considered. For example, whether the multiple dimensions of managerial meta-knowledge are the same as those of transactive memory systems is a key consideration. As the

managerial focus is pivotal to this construct, it seems that there should be more focus on knowledge about the productive capabilities of the team and its value.

Fifth, future empirical research should more carefully explore the effect of managerial meta-knowledge at different stages of a project. As argued in Chapter 3, managerial meta-knowledge has an affect both ex ante and ex post contracting.

Sixth, the effect of managerial meta-knowledge on different kinds of tasks or projects should be considered more carefully. It seems likely that different kinds of tasks require more or less managerial coordination. An obvious starting point for such an endeavor would be problem decomposability (Nickerson & Zenger, 2004).

CONCLUDING REMARKS

This dissertation represents a first step in understanding the implications of imperfect managerial meta-knowledge. The approach is informed by the insight that firms are constituted by a myriad of messy processes that fail all too often. As a way of governing transactions and ensuring coordination, firms are only efficient in a relative sense. Another foundational idea of this research project is that the economic system is a system of distributed knowledge and division of labor. This is true of the economy as a whole and of the firm itself.[34] The concept of managerial meta-knowledge is my attempt to grasp some of the knowledge necessary to productively organize knowledge distributed within firms. The work needed to understand these processes is by no means complete. I hope that others will find the concept of managerial meta-knowledge useful and enlightening.

[34] Given that the firm exceeds a certain size.

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