

Contracts in Avoiding Unintended Knowledge Spillovers in Supply Chains

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ABSTRACT,

Entering into a collaborative innovation project with a supplier exposes focal firms for the risk of unintended knowledge spillovers. Firms use contracts to govern interorganisational relationships such as collaborative innovation projects with suppliers, however scholars have so far not given much attention to the effectiveness of specific contract designs in preventing unintended knowledge spillovers. This bachelor thesis aims to increase the understanding on the topic by answering the research question, which contractual clauses are used by firms to safeguard against unintended knowledge spillovers, to secure inbound knowledge spillovers, and how effective the contractual safeguards are as safeguards in terms of knowledge spillovers, by conducting a series of semi-structured interviews with managers participating in interfirm projects and analysing the qualitative data. The results show that despite the findings of previous studies noting the importance of adapting the contract design for the project, many managers tend to opt for more general contracts in terms of knowledge protection, and that some of them appear to fail to recognise the limitations of this type of contract design.

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Keywords

Knowledge spillover, collaborative innovation projects, contractual safeguards, contract design

1. INTRODUCTION: THE USE OF CONTRACTS IN AVOIDING KNOWLEDGE SPILLOVERS IN BUYER SUPPLIER RELATIONSHIPS

With the potential competitive advantages such as faster to market development and wider spread of project related risk many firms are pooling their resources in collaborative innovation projects with other firms in their supply chains (Zimmermann et al., 2016, p. 295) (Narasimhan & Narayanan, 2013, p. 38) (Patrucco et al., 2022, p. 209). Engaging in collaborative projects with suppliers does however pose the risk of unintended knowledge spillovers (Hoecht & Trott, 2006, p. 677) (Veer et al., 2016, p. 1120), as sensitive knowledge sometimes needs to be shared with the partner firm in order to maximise the performance of the collaboration (Jarvenpaa & Majchrzak, 2016, p. 23).

In order to mitigate the risk of unintended knowledge spillovers firms use contractual and relational safeguards in managing collaborative new product development projects (Mahapatra et al., 2010, p 539-540) (Poppo & Zenger, 2002, p. 721) (Poppo et al., 2008, p. 1212) (Jiang et al., 2013, p. 988), as well as Intellectual Property Rights to make sure the knowledge remains in the firm's control even when shared with external parties (Teece, 1986, p. 287) (Hertzfeld et al., 2006, p. 832). Some studies have aimed to find out the relationship between contractual and relational governance safeguards and the performance of the collaboration (Jiang et al., 2013, p. 984) (Cao & Lumineau, 2015, p 15-16) (Aagaard & Rezac, 2022, p 131-132). However, aside from Hofman et al. (2017, p. 740-741) research, which studied the configurations of contracts in collaborative New Product Development, relatively little is known about the details of the contractual governance methods in avoiding unintended outbound knowledge spillovers, securing inbound knowledge spillovers, and how firms use them in real life and whether they are effective in avoiding unintended knowledge spillovers in interorganisational relationships. The aim of the following study is to answer the following question, which contractual clauses are used by firms to safeguard against unintended knowledge spillovers, to secure inbound knowledge spillovers, and how effective the contractual safeguards are as safeguards in terms of knowledge spillovers by conducting a series of semi-structured interviews with managers of interorganisational relationship from both buying (purchasing managers) and supplying (sales managers) firms.

2. EXISTING LITERATURE ON KNOWLEDGE SPILLOVERS AND HOW TO AVOID THEM

2.1 Knowledge Spillovers: The Diffusion of Key Knowledge in The Supply Network

Knowledge spillovers, sometimes also referred to as competitive information leakages (Cox Pahnke et al., 2015, p 1335-1336), are when knowledge diffuses, or "spill over", among the network, for example from the focal firm through a supplier to a competitor of the focal firm (Hoecht & Trott, 2006, p. 677). The knowledge spillover effect can be both intentional, when intended knowledge is shared on purpose (Dyer & Singh, 1998, p. 675), or unintentional, when knowledge that is not intended for diffusion diffuses, to one or more external parties regardless (Walter et al., 2015, p. 959). Knowledge spillovers can also be outbound, and inbound depending on whether the focal firm gains or loses knowledge advantage in the diffusion process (Cassiman & Veugelers, 2002, p. 1169) (Yan et al., 2017, p 158-159). As unintended outbound knowledge spillovers occur

without the intention of the primary knowledge holder the phenomenon of knowledge leakage is closely related to unintended outbound knowledge spillovers (Frishammar et al., 2015, p. 77). Opposed to knowledge sharing, which is when expected knowledge is transferred to external parties, knowledge leakage is an undesired effect when the knowledge that is intended to be kept out of reach of external parties becomes available to external parties (Ritala et al., 2015, p. 21), damaging the competitiveness of the focal firm (Frishammar et al., 2015, p 81-82). Although knowledge leakages have primarily researched from the dyadic relationship perspective (Frishammar et al., 2015, p. 84), they can nevertheless be considered as a precondition for unintended outbound knowledge spillover to occur, as unintended knowledge spillover cannot occur if knowledge remains in control of the focal firm (Laursen & Salter, 2013, p. 869), possibly causing the terms to sometimes being used nearly interchangeably in literature (Ritala et al., 2015, p. 23) (Veer et al., 2016, p. 1114).

The phenomenon of knowledge spillover is closely related to the Knowledge Based View (Frishammar et al., 2015, p. 76). According to the Knowledge Based View, the source of a firm's competitive advantage is the knowledge it holds, the knowledge being particularly important when the firm innovates (Grant, 1996, p. 120) (Kogut & Zander, 1992, p. 385) (Kogut & Zander, 1996, p 510-511). With this it can be expected that the loss of control of sensitive knowledge weakens the focal firm's competitive position (Norman, 2002, p. 196). However, with collaborative relationships becoming increasingly common in innovation projects (Zimmermann et al., 2016, p. 295), sharing of knowledge to collaboration partners has also become a key in firms' innovation performance (Ritala et al., 2015, p. 27).

Unintended knowledge spillovers occur due to, for example, opportunistic partner behaviour (Estrada et al., 2016, p. 58). Various aspects affect whether a partner acts opportunistically, for example cultural distance, regulatory uncertainty (Jia et al., 2020, p 332-333), and distrust (Ghoshal & Moran, 1996, p 24-25). In collaborative projects opportunistic behaviour includes for example misappropriation of proprietary knowledge (Estrada et al., 2016, p. 58) (Jiang et al., 2013, p. 984), sometimes also referred to as poaching (Aron et al., 2005, p. 42). Yet not all occurred knowledge leakages are intentional, they can also occur accidentally (Jiang et al., 2013, p. 984), also affecting how firms react to them (Ried et al., 2021, p. 294).

Collaborative partnerships expose firms to unintended knowledge spillovers (Hoecht & Trott, 2006, p. 677) (Veer et al., 2016, p. 1120), and as it is also important for the focal firm to prevent core proprietary knowledge from becoming available to unauthorised external parties (Frishammar et al., 2015, p. 67), or to make sure that if it does, it cannot be utilised by an external party at the expense of the focal firm (Teece, 1986, p. 288). Collaborative innovation is particularly risky, as due to the uncertainties related to innovation mean that the required knowledge may not be known to the firms at the beginning of the collaboration (Faems et al., 2010, p. 15), often resulting in sensitive knowledge being required for optimal value-creation (Jarvenpaa & Majchrzak, 2016, p. 19). Further complexity is caused by ambiguities in what is considered sensitive knowledge, as different individuals engaged in the collaboration may have a different view on what is considered sensitive knowledge (Jarvenpaa & Majchrzak, 2016, p. 10). However, as sharing too little knowledge is associated with reduced innovation performance (Ritala et al., 2015, p. 27), managing knowledge exchange together with the knowledge protection becomes an important part of managing collaborative innovation projects (Oxley & Sampson, 2004, p 745-746).

2.2 Contractual and Relational Cooperation Governance: Substitutional or Complementary?

The relationship between the use of contractual (also known as formal) and relational governance safeguards in collaborative relationships between firms has received some attention from scholars in the past (Jiang et al., 2013, p. 984) (Cao & Lumineau, 2015, p 15-16) (Aagaard & Rezac, 2022, p 131-132). With the contractual meaning legally enforceable written expectations of results of the collaboration and the penalties that would be incurred if there is evidence of non-compliance (Lyons & Mehta, 1997, p. 252) (Poppo & Zenger, 2002, p. 708) (Williamson, 1985, p 20-21). And the relational meaning primarily informal, socially controlled, governance methods (Poppo & Zenger, 2002, p 709-710) (Li et al., 2010, p 334-335) (Poppo et al., 2008, p. 1197), often established as “handshake” agreements (Macaulay, 1963, p. 58).

Individually, both have been identified to reduce opportunism and unintended knowledge spillovers (Jiang et al., 2013, p. 987) (Henttonen et al., 2015, p. 152), but both are also known to have their limitations (Aagaard & Rezac, 2022, p 133-134). Contractual governance may be limited by for instance bounded rationality (Hart, 1988, p 122-123), while relational governance may blind partners from the other’s opportunism (Poppo et al., 2008, p. 1197). The results of the literature on the interplay between the two appear to be somewhat inconclusive (Benítez-Ávila et al., 2018, p. 430), with some arguing that relational governance acts as a substitution for contractual governance (Ghoshal & Moran, 1996, p 41-42) (Jiang et al., 2013, p. 988) (Dyer & Singh, 1998, p. 671), while others see them as complementary (Poppo & Zenger, 2002, p 719-721) (Li et al., 2010, p. 340) (Seepana et al., 2022, p 670-672). The former have, for example, argued that contracts are inflexible and costly (Dyer & Singh, 1998, p. 670) and that they signal distrust and as such may damage the relationships with partner firm (Ghoshal & Moran, 1996, p. 24), the latter that contracts can be used to build trust by reducing information asymmetry in the collaboration (Liu et al., 2009, p 306-307).

Zobel and Hagedoorn (2018, p. 417) suggested that in order to benefit the most from collaborations the contracts used by firms should be designed in a way that supports relational governance. There’s also evidence that whether the contract is used to control or to coordinate the relationship influences how they work in combination with relational governance (Roehrich et al., 2020, p. 458). Bahemia and Roehrich (2023, p. 26-27) meanwhile found that the project type also influences whether relational and contractual governance act as complementary or as substitutes. It has also been noted that the governance mechanisms on project and firm level need to aligned (Ahlfänger et al., 2022, p 105-106).

2.3 Appropriability Regime and IP-Rights: The Ownership of Knowledge

To benefit from any innovation a firm needs to find ways to prevent the competition from imitating said innovation. The strength of the appropriability regime is related to how easy it is to avoid the imitation of the innovation (Teece, 1986, p 287-288). Appropriability mechanisms are those measures available for the innovator to maintain control of the innovation (Hurmelinna-Laukkanen et al., 2008, p 280-281). Two dimensions determine the strength of the appropriability regime, legal or formal, which consists of IP-rights, and technological, or informal, which consists of factors that may otherwise make imitation difficult, such as secrecy, which some firms also enforce using legal instruments such as confidentiality clauses in contracts or non-

disclosure agreements (NDA) (Zobel et al., 2017, p. 44), complexity, and how tacit the knowledge is for the technology (Teece, 1986, p. 287). Earlier literature has mostly considered the formal and informal mechanisms as mutually exclusive (Lee et al., 2017, p 321-322), but some have also researched the interplay between different mechanisms within and between the dimensions (Gallié & Legros, 2012, p 780-781). The findings have supported complementarity within the dimensions (Gallié & Legros, 2012, p. 786) (Lee et al., 2017, p. 328) and substitutional relationship between (Gallié & Legros, 2012, p. 786) (Amara et al., 2008, p. 1543). Others have however argued that the use of mechanisms from both dimensions is necessary (Teece, 1986, p. 290) (Arundel, 2001, p. 622), that combinations of mechanisms increase firm performance (Hall & Sena, 2017, p. 59), and that there isn’t a clear relationship between mechanisms of the different dimensions (Lee et al., 2017, p. 328).

The importance of appropriability regime for profiting from innovation was identified by Teece (1986, p. 290), however little attention was paid to IP strategies until later (Teece, 2006, p. 1134). Since then, IP strategy has been identified to have an impact on a firms’ competitiveness (Pisano, 2006, p. 1128) (Teece, 2006, p. 1142) (Pisano & Teece, 2007, p. 294)

IP-rights, such as copyrights, and patents, nevertheless have their limitations. Patents and copyrights are costly to set up (Hall et al., 2013, p. 607), can only protect explicit, documented, knowledge (Ritala et al., 2015, p. 24), can be easily circumventable, and are dependent on the legal environment (Norman, 2001, p. 53) (Teece, 1986, p. 287), which may not be supportive of the focal firm in some countries (Skowronski & Benton Jr, 2018, p. 532). Regardless, firms often use patents even when they find the patent system ineffective (Teece, 2018, p 1368, 1379-1380) (Barros, 2021, p. 7).

While lack of experience with different appropriability mechanisms can cause firms to use mechanisms which aren’t optimal for the project (Hall et al., 2013, p. 627) in most cases firms aim to emphasise the most effective appropriability mechanisms depending on the environment and the knowledge they’re protecting (Laursen & Salter, 2013, p. 873) (Zobel et al., 2017, p. 50). Factors which influence the effectiveness of different appropriability mechanisms include, for example, the industry (Cohen et al., 2000, p. 28) (Yang & Hurmelinna-Laukkanen, 2022, p. 11), and firm size (Hall et al., 2013, p. 627). Studies have also noted the potential of more varied use of appropriability mechanisms (Hurmelinna-Laukkanen, 2009, p. 286) (Barros, 2021, p. 7), questioning the earlier protection-oriented role of these mechanisms (Laursen & Salter, 2013, p. 871). Whether the firm uses them as barriers for competition (Heger & Zaby, 2018, p 180, 183) or to enable information flows beyond the focal firm through, for example, cross-licensing agreements or selective revealing (Henkel, 2006, p. 966) (Chesbrough, 2003, p. 53) is also found to influence the effectiveness of different appropriability mechanisms (Grimaldi et al., 2021, p. 161). Moreover both the optimal IP strategy and the focal firm’s ability to operate without being blocked by a another firm’s IP-rights is dependent on not only the focal firm’s own IP strategy but also other firms’ IP strategies (Bessen & Maskin, 2009, p. 628) (Holgersson & Wallin, 2017, p. 1091) Nevertheless, no appropriability mechanism is by itself effective when used without other complementary appropriability mechanisms (Yang & Hurmelinna-Laukkanen, 2022, p. 11).

Some scholars have pointed out that strong appropriability regime can also enhance a firm’s collaborative innovation performance with external partners, particularly in terms of radical innovation (Ritala & Hurmelinna-Laukkanen, 2013, p. 165) (Zobel et al., 2017, p. 50). According to Ritala and

Hurmelinna-Laukkanen (2013, p. 166) the improvement in the collaborative project performance could be related to firms considering themselves better protected, both in terms of the ongoing innovation project, but also in terms of securing existing assets, when sharing sensitive information when the IP-rights are strong, supporting the complementary view of the contractual and relational governance methods. And that the use of some mechanisms in fact signal that the focal firm has expertise on the technology (Hsu & Ziedonis, 2013, p. 762) (Hagedoorn & Zobel, 2015, p. 1057) and is open for knowledge sharing (Chesbrough, 2003, p 50-51) (Pisano, 2006, p. 1129). Others have however suggested that the signal is in fact the opposite, and that particularly the use of mechanisms in the legal dimension, reduces the focal firm's ability to attract partners (Wang et al., 2017, p. 264).

2.4 Formal Contracts: The Legal Dimension of Cooperative Relationships

The use of legally binding written agreements to govern an interorganisational relationship is referred to as contractual safeguard, or formal contracts (Poppo & Zenger, 2002, p. 708). They are used as safeguards against wrongdoings, by enabling sanctions and penalties for violations (Williamson, 1985, p. 32), and to coordinate resources in interorganisational relationships (Poppo & Zenger, 2002, p. 709) (Lumineau & Henderson, 2012, p. 385), through clearly establishing the rights, obligations, and the responsibilities of the participating parties (Poppo & Zenger, 2002, p. 708) (Sheng et al., 2018, p 1015-1016). Yet, not all written contracts are legally enforceable, those contracts are considered as part of relational governance (Hassanzadegan & Mooi, 2023, p. 224), opposed to relational contracts, which while flexible and open-ended, leaving room for future adaptation, (Williamson, 1985, p 68-71), are nevertheless considered to be formal contracts due to being written down and legally enforceable (Roehrich et al., 2020, p. 457).

Traditionally, literature on contracts has been based on Transaction Cost Economics (TCE) (Liu et al., 2009, p. 305) (Cao & Lumineau, 2015, p. 17). Based on this view, contracts act primarily as a safeguard against opportunistic behaviour (Williamson, 1985, p 32-33). The more recent literature has approached contractual governance from more varied viewpoints (Schepker et al., 2014, p 211-212).

In knowledge protection, contracts can define the scope of knowledge exchange, the knowledge isolation measures, and the channels of information sharing (Norman, 2001, p. 53). NDAs forbid any sharing of knowledge to external parties, however other contractual clauses also exist regarding knowledge exchange between firms regarding, for example, what information is to be shared, and what information is considered proprietary, as well as the penalties that can be incurred if the partner firm attempt to access the information in violation of the contract (Norman, 2001, p 53-54).

While contractual governance is used to safeguard against opportunism, also known as the control function of contracts (Schepker et al., 2014, p 206, 209), more recent literature has noted that they're also used as a coordination mechanism in collaborations enabling better defined roles for the firms in the partnership (Malhotra & Lumineau, 2011, p 986-987). According to Hagedoorn and Zobel (2015, p. 1062) most firms emphasise the control function of their formal contracts in their collaborative innovation projects. However, Wang et al. (2021, p. 121) found that the coordination function is more effective in reducing opportunistic behaviour, and that the utilisation of the control function is optimal primarily in noncompliance situations. Moreover, the control function is considered to signal

lack of trust, thus damaging the relationship (Weber & Mayer, 2011, p. 63) (Malhotra & Lumineau, 2011, p. 990). Hofman et al. (2017, p. 741) go further and distinguish between contract breach and intellectual property misappropriation safeguarding functions for contracts along with the coordination function, also noting that the effectiveness of the safeguard and the coordination combination depended not only on the project type, but also how whether the firms have collaborated previously.

Contract complexity is defined as how well the formal contract addresses "roles and responsibilities, specifies procedures for monitoring and penalties for noncompliance and, most importantly, determine outcomes or outputs to be delivered" (Poppo & Zenger, 2002, p. 708). Contracts used in the context of collaborative innovation projects are likely to be complex due to the complex and risky nature of these projects (Yan et al., 2017, p. 156) (Poppo & Zenger, 2002, p. 719). Jia et al. (2020, p. 330) found that cultural distance also affects how detailed the contracts are, with higher cultural distance resulting in higher contract complexity. Higher contract complexity has been identified to improve the performance of the relationship (van der Valk et al., 2016, p 273-274) (Seepana et al., 2022, p. 670), and to reduce opportunism (Henttonen et al., 2015, p 152-153). More detailed contract can also establish expectations and reduce misunderstandings between firms during the negotiation phase (Wang et al., 2022, p. 2038). Nevertheless, it has been pointed out that it is difficult to plan for every possible contingency before the start of a collaboration (Wuyts & Geyskens, 2005, p. 106) due to bounded rationality (Hart, 1988, p 122-123), that more complex contracts are often more expensive create (Klakegg et al., 2021, p. 14) (Wuyts & Geyskens, 2005, p. 106), and according to some scholars, may signal distrust to partner firm (Ghoshal & Moran, 1996, p. 24) (Mooi & Gilliland, 2013, p 403-404). Moreover, as with IP-rights (Teece, 1986, p. 287), formal contracts are also contingent on the legal system (Wang et al., 2022, p. 2043), as more complete legal systems reduce the uncertainties in the contract environment (Jia et al., 2020, p. 325). With weaker legal system often resulting in firms emphasising relational governance in managing the collaboration (Skowronski & Benton Jr, 2018, p. 538). It has also been identified that with contract effectiveness being also contingent on factors such as the relationship characteristics, external factors, and technological turbulence (Wang et al., 2022, p. 2043) (Weber & Mayer, 2011, p. 70), and that the contract should be adjusted accordingly if these factors change (Mayer & Argyres, 2004, p. 402) (Zhang et al., 2018, p 221-222), with flexibility in the contract becoming increasingly important as the length of the relationship covered by the contract increases (Cao & Lumineau, 2015, p 31-32). Similarly, Hofman et al. (2017, p. 752) notice that the optimal contract design depends on not only the project type, but also on how much the firms had worked together previously.

Contract application refers to the use of legal element of the contract, by for example imposing penalties in case of breaches or disputes, to enforce the contract (Faems et al., 2008, p. 1069) (Huo et al., 2015, p. 162). Contract enforcement has also been found to reduce opportunistic behaviour through increased monitoring (Faems et al., 2008, p. 1065), but also to increase the related monitoring costs (Luo, 2006, p. 126), particularly when cultural distance or regulatory uncertainty are high (Jia et al., 2020, p. 330).

Recently, some scholars have suggested that from a project perspective the more detailed formal contracts can in fact reduce unintended knowledge spillovers, without a noticeable effect on the innovation performance of the project (Ahlfänger et al., 2022, p. 113) (Bahemia & Roehrich, 2023, p. 27).

3. SEMI-STRUCTURED INTERVIEWS AS THE METHOD OF RESEARCH

To analyse the topic in more detail 15 purchasing, sales, higher, and development managers from 15 different firms who engage in knowledge exchange between buying and supplying firms were interviewed. 7 purchasing managers, 4 sales managers, 2 upper management, along with an R&D and a project manager from 11 Dutch, 3 Finnish, and 1 German firms of varying sizes from small and medium sized enterprises (SME) to globally operating in various industries such as automotive, electronics, technology, and rail were asked questions regarding the way their firms construct contracts to govern knowledge exchange between the buying and supplying firms. The used interview protocol can be found in the Appendix 1. Three additional purchasing managers from three different Dutch public and non-profit organisations were also interviewed, however due to the nature of these organisations these responses were not considered in the empirical analysis.

Table 1. Interviewed companies.

Company location			
Germany	Finland	The Netherlands	
1	3	11	
6,6%	20%	73,3%	
Interviewee function			
Purchasing	Sales	R&D / Projects	Higher Management
7	4	2	2
46,6%	26,6%	13,3%	13,3%
Industry			
Automotive	Technology	Rail	Other
2,5	4	2,5	6
16,6%	26,6%	16,6%	40%
Company size			
Under 400 employees or unknown	Over 400 and under 1 500 employees	Over 5 000 and under 20 000 employees	Over 100 000 employees
7	4	2	1
46,6%	26,6%	13,3%	6,6%

One of the firms operated as a supplier in both automotive and rail.

The interviews, conducted in languages of English, Dutch, and Finnish, took between 20 to 50 minutes consisting of questions also regarding other knowledge spillover related topics such as opportunism and relational governance, were recorded and transcribed utilising transcription software Amberscript, and if necessary, translated to English utilising the translation software DeepL.

The final analysis was based on the complete interviews, as responses relating to contractual governance were also given to questions regarding the other knowledge spillover related topics, by determining which contractual elements were most common among the interview answers, and whether the interviewees considered the elements effective or not.

4. EMPIRICAL ANALYSIS

4.1 Research

Majority of the firms (93,3%) used contracts in governing interfirm knowledge exchange, with only one of the 15 firms reporting to having no contracts between itself and its suppliers.

The most prominent answer among the interviewees was the use of NDAs. 14 out of the 15 interviewed firms mentioned the use of NDAs in governing their buyer supplier knowledge exchange, additionally 6 interviewees (40%) said that the NDA was a prerequisite for any interfirm knowledge exchange, 3 interviewees mentioned the use of both individual and organisational level NDAs, and another 3 mentioned that they would change the NDA accordingly if sharing of information to an external party was considered necessary. 4 interviewees reported to having longer term frame contracts in which the terms of individual orders and projects would be negotiated accordingly. 3 interviewees also used clauses to distribute IP-rights within the partnership, determining which party owns the knowledge created during the partnership. Non-competition clauses, prohibiting suppliers from working with a competitor during the tenure of the contract or even after a specified time period after the end of the contract, sub-supplier information clauses, monitoring the supplier's suppliers, and specific information requirement clauses, specifically for quality control purposes, were also mentioned, but not frequently enough for them to be considered common in practice (6,6% for each). One firm also reported to having clauses in their contracts against suppliers sharing external parties' intellectual property with them, prohibiting inbound knowledge spillovers, another reported that their NDAs also covered intra-firm knowledge sharing. Nevertheless, 5 interviewees (33,3%) were unable to mention clauses in their contracts regarding knowledge exchange beyond NDAs.

Table 2. Firms using contractual governance.

	Firms	Percentage
Firms total	15	100%
Firms using contracts in knowledge exchange	14	93,3%
Firms using NDAs in knowledge protection	14	93,3%
Firms requiring NDAs before any knowledge exchange	6	40%
Firms using only NDAs in their contracts regarding knowledge exchange	5	33,3%

Firms using other contractual elements	7	46,6%
Firms using IP-Rights distribution	3	20%
Firms using longer term frame contracts	4	26,6%
Firms using non-competition clauses	1	6,6%
Firms using clauses requiring sub-supplier information	1	6,6%

The responses regarding the effectiveness of contractual governance in preventing undesired knowledge spillovers were somewhat mixed, with 6 interviewees (40%) reporting to considering the use of contracts as effective, 4 (26.6%) either finding the assessment of the effectiveness too difficult to give a conclusive answer or considering the effectiveness intermediate and dependent on other factors such as how the relational governance is organised, and 2 (13,3%) considering contracts as ineffective in knowledge protection, and the final 3 (20%) giving inconsistent answers to the question of effectiveness. Additional points regarding the difficulty to provide proof of violations regarding NDAs, and that the NDA can only cover direct disclosure, with some information being available to be obtained indirectly were also made. Difficulty of monitoring was also mentioned. 4 firms emphasised the importance of clear and appropriate penalties for contract violations in terms of contractual governance effectiveness. IP-rights distribution was considered the most effective clause in knowledge protection by 2 interviewees, with the 3rd firm that used them also considering them important.

Table 3. Assessment of effectiveness

	Answers	Percentage
Contracts considered effective	6	40%
Unable to assess or dependent on other factors	4	26,6%
Contracts considered ineffective	2	13,3%

The interviewee function in their organisations appears to have a relatively low effect on the interviewees' views on the effectiveness of contracts. With 3 purchasing managers considering contractual governance effective and 4 purchasing managers giving more mixed answers, and the rest of the interviewees responding with 3 considering contracts effective, 2 ineffective, and the remaining 2 giving inconclusive answers.

Company location also appeared to have relatively little impact on whether the interviewee considered contractual governance effective or not. 4 of the 11 Dutch firm interviewees considered contracts effective, with 2 considering them ineffective and the remaining 5 responding either intermediate effectiveness or gave an inconclusive answer. Similarly of the 4 non-Dutch firms, 2 considered contracts effective, and the other 2 were either unable to give a conclusive answer or considered contracts to be somewhat useful but not highly effective.

For contract negotiations the results were also mixed. Purchasing was the most common mentioned, second being legal department with 4 mentions, with sales and finance also being brought up more than once. Sales being the more common on the supplying side. Engineering and R&D were also mentioned by some interviewees. Generally, however, larger firms mentioned more departments being involved with higher department variety, with one interviewee from a globally operating firm mentioning local purchasing offices being in charge when the partner firm is located abroad, and another mentioning it being dependent on the end customer business line.

5. DISCUSSION AND CONCLUSIONS

5.1 Theoretical implications

While the existing literature has found NDAs to be considered less effective than other contractual elements (Norman, 2001, p. 57) they were nevertheless considered to effective enough legal knowledge protection mechanism by the sample interviewees that less than half the interviewees reported to include other contractual elements in their contracts to protect their knowledge.

The findings support the complementary view on the contractual and relational governance interplay (Poppo & Zenger, 2002, p 719-721), as most of the interviewees responded that they were more likely to trust the partner with information following the signing of a contract, and one of the interviewees clearly stating that contracts are only effective in combination with relational mechanisms such as trust. They also support the previous findings of Hofman et al. (2017, p. 752-753) that the optimal contract design depends on factors such as project type, and the breath and length of the relationship, but also Wuyts and Geyskens (2005, p. 106) point regarding the more complex contracts being more costly to draft, in the sense that larger firms, which have more legal resources for negotiations, reported more complexity in their contracting with more open-ended long-term contracts covering the more simple aspects of buyer-supplier relationships.

5.2 Managerial implications

Even though coordination function of contracts has been identified to be more effective in maintaining relational aspects and to reduce partner opportunism (Wang et al., 2021, p. 121), many firms still appear to primarily approach contractual governance from the traditional TCE perspective (Williamson, 1985, p 32-33) (Cao & Lumineau, 2015, p. 17) emphasising the control function of contracts potentially resulting in suboptimal relationship performance (Wang et al., 2021, p. 122), with one firm even including contracts limiting intraorganizational knowledge sharing, which is known to limit firm's absorptive capacity and thus innovation performance (Zahra & George, 2002, p 195-196). Additionally, only some interviewees recognised the limitations of individual contract clauses such as NDAs (Norman, 2001, p. 57), possibly resulting in overconfident sharing of knowledge. At the other end, while several interviewees reported to having also longer-term coordination function (Schepker et al., 2014, p. 205) related contracts, many of them were also unable to give clear answers regarding their assessment of the effectiveness of their chosen contract strategy.

Moreover, only some appeared to be aware that the contract design has an effect on not only unintended knowledge spillovers but also the partner firm opportunism (Henttonen et al., 2015, p. 152-153) (Ahlfänger et al., 2022, p. 113), with many opting for standardised contracts including NDAs over more detailed contract negotiations, possibly due to the implied costs of detailed contract negotiations (Wuyts & Geyskens, 2005, p. 106).

5.3 Limitations

It needs to be acknowledged that while the variability of the interviewees in terms of company location, size, industry, and the interviewee function could have provided a more detailed analysis in the differences of each, the final number of interviews considered from each individual group was relatively low, reducing the accuracy of the results in terms of variation analysis. The qualitative nature of the data also limits the potential for such analysis. No questions regarding project type, an aspect which has been found to influence how effective both contractual and relational governance are (Bahemia & Roehrich, 2023, p. 27) (Ahlfänger et al., 2022, p. 113), were asked either, which can potentially reduce the quality of the analysis. It also needs to be pointed out that the sample interviews were conducted by more than one person in 3 different languages (English, Dutch, and Finnish) potentially causing variability in the way the questions were asked and answered.

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8. APPENDICES

8.1 Appendix 1. Interview Protocol

Dear participant,

Thank you very much for being my interview partner as part of my qualitative data collection for my bachelor thesis at the University of Twente.

To have the chance to recap everything that was exchanged during this interview, I would like to audio record this interview.

Therefore, as I would like you to read this document (Informed consent for interviews), mark the fields and sign it.

Afterwards we are able to do the interview.

If you feel uncomfortable at any point of time during the interview or like to withdraw, there is always the chance to do it. You should know that everything you do is 100% independent and voluntary.

All personal and company data will be anonymized before publishing process.

Introduction and script for the interviews:

We are interested in buyer-supplier knowledge exchange and how this exchange affects the relationship. Therefore, we would like know more about how your company exchanges information with your suppliers and how this affects the relationship between your company and your suppliers.

Interview protocol:

General questions (“break the ice”) get to know your interviewee:

Could you please tell me something about you?

(Name, age, where are you from, current function in the company)?

Could you please tell me more about the company and the industry you are working in?

(Company name and size (employees, turnover, global/local), Sector the company is operating, Status of the company in the market, Number of suppliers)

Questions about examples:

I am highly interested in the topic of buyer-supplier knowledge exchange:

Could you tell me how this works in your company?

How do you collaborate with suppliers and which type of knowledge exchange do you have with your suppliers? (+ *could you provide some examples; do you also share sensitive knowledge?*)

Could you please tell me positive examples of knowledge exchange with your suppliers? (*i.e. market advantages, etc*)

Could you please tell me negative examples (knowledge leakage) of knowledge exchange with your suppliers?

Do you allow your suppliers to share your exchanged knowledge also with other customers? (*If no: how do you prevent this?; If yes: how do you do this?*)

Which departments in your company are involved in the knowledge exchange with your suppliers? (*what kind of knowledge to they transfer? E.g., R&D*)

Do you have examples of the other way around: in which you received valuable knowledge from a supplier about the market or perhaps other competitors? (*Which kind of knowledge was this specifically?*)

Could you please tell me some explicit examples of suppliers using knowledge for other customers?

Questions about implications:

Thank you for these examples, now I would like to know something more about the implications out of these examples.

Please tell me which kind of knowledge do the different departments of your company share with the supplier i.e. your department or for example R&D and what is the implication out of this? (*positive implications? Negative implications? Can you provide specific examples?*)

What is your vision on suppliers sharing knowledge from your firm (i.e. your purchasers or R&D) with other customers?

What mistakes did your company make when your company sees these negative implications as supplier opportunism

What negative impact does this behavior have on access to supplier knowledge?

Which conclusions did your company make from these negative examples (stop relationship/ try to resolve the problem, nothing)?

What are the implications of suppliers using knowledge for other customers?

Questions about contracts:

Now, I would like to talk about contracts between your company and your suppliers.

In what way do your contracts deal with knowledge exchange?

Which specific clauses in the contracts are about knowledge exchange between your company and your supplier?

Do your contracts allow or prohibit the supplier using your knowledge with other firms? What clauses or phrases in the contract address this specifically?

Which **clauses** did you consider to be particularly effective or ineffective? Which absolutely need to be included?

Do you include project management requirements / rules in your innovation contracts?

In general, how would you reflect on the use of contracts to govern knowledge exchange with suppliers?

Which parties of your company are involved in these contract negotiations and which ones from the supplier side?

Questions about relational safeguards:

I would like to focus now on relational connection between your company and your suppliers.

How would you describe the relationships with your best suppliers which you exchange knowledge with?

How important is relational experience with that supplier?

What is the motivation from you to share your knowledge with that supplier and do you share it with other suppliers as well(*or why not?*)? (*and what is the motivation for the supplier?*)

How do you decide to select a specific supplier for your project? (*other than financial reasons*)

How would you describe the relationship with this selected supplier? How did it impact how your firms exchange information?

Which influence has the relationship to the supplier to accept knowledge exchange to the supplier? (*give an example, make specific*)

Trust, social safeguards (flexibility, environment, informal contact)

So, thank you very much for taking the time and doing this very interesting interview with me. In fact, we are doing around twenty of these interviews for my Bachelor thesis.

If you wish, I can later present to you the outcomes of my study as soon as my thesis is defended at the UT.

Would it be possible to recap some questions at a later point of time – there might be some misunderstandings on my side during the transcription of our interview and I might need your further explanation.

Once again thank you very much.