



Using information asymmetry to mitigate hold-ups in supply chains



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ABSTRACT

Realizing the maximum benefits from an inter-firm relationship often requires a level of cooperation that can be difficult to establish. We study how to encourage one party, herein the seller, to make a cooperative, relation-specific investment that will increase the trade profits to be shared by the buyer and seller (i.e., surplus). The seller, fearing he will be held up by a self-interested buyer, often refrains from investing or attempts to protect himself with costly, and sometimes ineffective, protection mechanisms such as vertical integration and contracts. We propose that information asymmetry, controlled by the seller, can help reduce the risk that the seller will be worse off after making the investment than before and, accordingly, encourages seller investment. Although self-interested behavior is usually assumed by extant hold-up research and is the crux of the hold-up problem, fair purchasing practices have also been documented. Accordingly, we examine the effectiveness of information asymmetry controlling for the non-investor purchasing practices and investigate whether trade offers expected by the sellers mediate the relationship between information asymmetry and the relation-specific investment.

To test our hypotheses, we conduct an experiment and find that aggregating the seller's investment and production costs encourages the seller to invest in relation-specific cooperative investments. Moreover, when buyers are expected to follow self-interested purchasing practices, the seller expects higher buyer offers when buyers possess aggregated seller's investment and production cost information than when they possess disaggregated information. Those expectations in turn impact sellers' decision of whether to make a cooperative investment. Finally, supplemental analysis shows that aggregating seller's cost information does not reduce trade efficiency; thus confirming that information asymmetry can help mitigate hold-ups in the supply chain.

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1. Introduction

Many business relationships require one party to make a relation-specific investment that, by definition, has little or no value outside the relationship. For instance, in the automotive industry, original equipment manufacturers (OEMs) often require suppliers to invest in expensive dies or other equipment to produce the parts they need. Once purchased by the suppliers, these dies or equipment cannot be used to fill orders of other OEMs. Similarly, principals might ask agents to invest in skills that are not transferable to other employers. Such investments are often socially optimal, meaning the investment increases the total surplus generated within the relationship (i.e., the trade profits to be shared by a buyer and a seller). However, the relation-specific investment also creates a bilateral monopoly whereby the investor risks losing the cost of his investment should trade not occur, while the non-

investor incurs no risk or cost. In other words, bargaining power resides with the non-investor once the investment has been made, creating a setting ripe for opportunistic behavior. Knowing the investment is a sunk cost of the investor, the non-investor has no inherent incentive to cover its cost during ex post trade offers. In the absence of a commitment from his counterpart to not appropriate the surplus that will be generated, the investor generally will not make the socially optimal relation-specific investment. This represents the classic hold-up problem (Klein et al., 1978; Williamson, 1975). In sum, the hold-up problem has two dimensions. The first lies with the non-investor who will likely appropriate the surplus created by any relation-specific investment. The second lies with the party who is considering making the investment: since he fears that he will be held-up during trade, he refrains from making this socially optimal investment. Thus, mitigating hold-ups encompasses both limiting the ability of the non-investor to hold the investor up during trade and encouraging investment in relation-specific assets.

Numerous investigations have sought remedies to the hold-up problem. Those remedies range from establishing formal gov-

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ernance structures that limit the risk of ex post opportunism (e.g., vertical integration, mutual exchanges of hostages, contracts (Shelanski and Klein, 1995)) to informal protection mechanisms such as controlling the flow of investment-related information (Gul, 2001). Not only are those remedies costly, they are also not always effective. Their effectiveness is particularly limited when investments are cooperative (i.e., investments that benefit the investor's trading partner) because such investments increase the bargaining power of the non-investor. Specifically, although incomplete contracts can be effective with selfish relation-specific investments (i.e., investments that benefit the investor, for instance by reducing the cost of the intermediary product manufactured by the seller), they are ineffective when investments are cooperative and parties have difficulty committing not to renegotiate (Baiman and Rajan, 2002a; Che and Hausch, 1999). Thus, the search for solutions continues (for a review see Coeurderoy and Quélin, 1997; Miller, 2012; Rindfleisch and Heide, 1997; Shelanski and Klein, 1995).

In this paper, we examine the hold-up problem associated with a cooperative investment in a supply chain setting. The cooperative investment involves a seller that must decide whether to make a relation-specific investment that will benefit a specific buyer. Common examples of cooperative investments include R&D efforts to enhance the quality of a customer-specific product, tailoring inventory systems, production equipment, or transportation systems to the buyer's needs, and customization of parts for specific customers. Baiman and Rajan (2002a) suggest that the compensation received by the seller might depend on the extent to which R&D work is successful, likely resulting in the buyer being unable to commit to paying a specific price and the contract being incomplete. Thus, cooperative investments not only increase the power of the non-investor (i.e., the buyer) relative to the investor (i.e., the seller), but they are also especially difficult to protect and encourage when price cannot be determined with certainty. As a result, they render the investor more vulnerable to opportunism by the non-investor.

We examine how sellers might protect themselves against buyers' potential opportunism. Specifically, building on Gul (2001), we propose that the seller can use information asymmetry to increase their bargaining power and thereby guard against the buyer's potentially opportunistic behavior ex post. Information asymmetry in the form of aggregated production and investment costs renders the buyer unable to identify the seller's marginal production costs and thereby makes it difficult for the buyer to reimburse only those costs. At the same time, aggregation of production and investment costs provides sufficient information for the buyer to calculate the total trade surplus. Being able to calculate the trade surplus is important because in the absence of such information, buyers do not have sufficient information to determine what represents a reasonable trade offer and trade inefficiency is likely to ensue. Should the seller consider making a cooperative relation-specific investment, we predict that using aggregated cost information will reduce the buyer's ability to make low offers, thus raising the trade offers sellers can expect to receive post investment and, as a result, encouraging sellers to make relation-specific cooperative investments. Furthermore, although hold-up problems stem from the non-investors' self-interest (Williamson, 1995), fair purchasing practices have also been documented (cf. Carr and Ng, 1995; Dekker, 2003). Buyers who follow fair purchasing practices allow sellers to earn a reasonable profit even if, theoretically, the buyer could extract more. Accordingly, we examine whether aggregation of cost information is an effective remedy to hold-ups controlling for the non-investor purchasing practices (self-interested or fair) and investigate the process by which this occurs.

To investigate the effectiveness of aggregation of cost information as a protection mechanism against hold-ups, we conduct an

experiment that focuses on the seller's decision of whether to make a cooperative investment in a relation-specific asset. We examine this decision under two forms of the seller's investment and production costs (i.e., disaggregated and aggregated) and two types of buyer purchasing practices (i.e., self-interested and fair). When controlling for the buyer's purchasing practices, we find that aggregating the seller's investment and production costs encourages the seller to make a relation-specific cooperative investment. Furthermore, we show that this positive relationship can be explained by the fact that aggregated cost information increases the amount sellers expect to obtain from trade when buyers are expected to follow self-interested purchasing practices, while not having any negative impact on trade expectations when buyers are expected to follow fair purchasing practices. A follow-up experiment, focusing on trade efficiency, examines the buyer's offer once the seller has made the relation-specific cooperative investment. This second experiment discussed in Section 4.4 of this manuscript shows that trade is efficient when buyers are provided aggregated cost information.

This paper not only addresses the important economic problem of hold-ups, but also makes three contributions to accounting research. First, we build on previous accounting research that investigates complex supply chain relationships (e.g., Gosman and Kohlbeck, 2009) and demonstrates that sharing of information offers both benefits and risks (e.g., Baiman and Rajan, 2002b; Cooper and Slagmulder, 2004; Drake and Haka, 2008). Information sharing can improve efficiency, but can also make the party doing the sharing vulnerable to the non-sharing party's misappropriation of that information. By investigating information asymmetry as a mitigating mechanism to hold-ups, we add to the existing research on improving performance and reducing appropriation concerns via informal control mechanisms such as trust, social norms, reputation, and trade partner selection (cf., Dekker, 2004; Dekker and Van den Abbeele, 2010).

Second, whereas most previous investigations have pursued solutions to hold-ups in the form of governance mechanisms such as vertical integration or contracts, we focus on how information asymmetry might alleviate hold-ups that are especially difficult to mitigate because they are associated with cooperative investments. That is, we not only add to the growing literature on this subject (cf. Gul, 2001; Sloof et al., 2007), but also introduce accounting information and its control as a potential remedy to the hold-up problem.

Third, the information asymmetry remedy we propose lies within the investor's control and does not hinder trade. The information loss that comes with the aggregation of the seller's cost information makes it impossible for the buyer to exploit their bargaining power for the purpose of misappropriating the surplus. However, unlike with the more extreme forms of information asymmetry that have been proposed (cf. Gul, 2001), there is still sufficient information for the buyer to determine the size of the surplus and for trade to take place. Overall, the aggregation of the seller's cost information reduces the odds that the seller will be taken advantage of, while still providing enough information for buyers to make offers to sellers that are likely to be acceptable.

The remainder of this paper is organized into four sections. Following this introduction, we analyze findings from relevant literature to propose hypotheses related to the seller's investment decision and the buyer's trade (i.e., offer) decision. In the third section, we introduce our experimental design and present our experimental materials. In the fourth section, we analyze the results of our experiment on the investment decision and present supplemental analysis related to the trade decision. In the fifth section, we present our discussion and conclusion.

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