Suppliers Competition and Cost Reduction with Endogenous Information Asymmetry

Cuihong Li

School of Business, University of Connecticut, cuihong.li@uconn.edu

Manufacturers (buyers) often rely on suppliers for critical production activities and related improvements. Such supply chains face the fundamental hold-up problem: due to long leadtimes typically required in the improvement process, a supplier may need to invest resources long before the actual production and transaction happens. Yet, due to transaction costs, firms are not able to sign a binding contract—before the improvement effort takes place—to govern the trade in the future after the effort is taken. Limited to short-term contracts, firms thus negotiate after the investment is sunk. The post-investment negotiation enables opportunistic behavior of the buyer (non-investing party), preventing the supplier (investing party) from recovering the sunk investment cost or fully claiming the residual benefit of the investment. Foreseeing this outcome, suppliers would withhold their upfront investment, and the hold-up problem thus arises.

The information structure plays an important role in the hold-up problem. When a supplier’s variables (e.g., costs) are observable at the time of negotiation, the buyer, if possessing full bargaining power, can claim all benefit of the investment, leaving no rent for the supplier. In this case, without any protection of profit, a supplier will not make any upfront investment at all. In contrast, when a supplier is equipped with private information, information asymmetry will generate (ex post) information rent for the supplier in the contracting phase, which provides an incentive for upfront investment. Thus, even if information asymmetry does not exist ex ante, it may be in the interest of suppliers to create such information asymmetry with respect to the improvement effort in order to protect their profit. Note, however, that making the effort unobservable by the buyer does not necessarily lead to information asymmetry; when the buyer can fully anticipate a supplier’s effort choice as realized in a pure strategy equilibrium, an unobservability of effort does not ensue information asymmetry. Rather, such information asymmetry is preserved if suppliers randomize their unobservable effort choices, so that buyers cannot fully predict the choice. In other words, a supplier may adopt a mixed strategy to create endogenous information
asymmetry. Indeed, the hold-up literature has analyzed such a mixed-strategy equilibrium in a bilateral supply chain (between one buyer and one supplier) and shown that it induces positive supplier effort (e.g., Gul 2001).

As commonly practiced in sourcing, a buyer may consider multiple suppliers and engage them in competition for supply contracts. Supplier competition allows the buyer to select the best supplier and keep an upper hand in price negotiation. Nonetheless, facing competition, a supplier may be less willing to dedicate resources to improve the supply chain performance, as supplier competition reduces the return of such investment. While the effect of supplier competition has been closely studied in the sourcing literature, the existing research is based on exogenous information asymmetry with suppliers endowed with private types (e.g., Li and Wan 2017). Thus, we lack an understanding of the impact of supplier competition with endogenous information asymmetry generated with a mixed strategy.

We consider a buyer facing a number of ex ante identical suppliers. Suppliers can exert effort to reduce their production costs. Neither the effort nor the realized cost is observable by the buyer. The buyer designs a procurement mechanism to solicit suppliers’ bids and award contracts after suppliers invest in cost reduction. With the production cost determined for a given effort, a pure strategy equilibrium does not exist between the suppliers’ effort choices and the buyer’s procurement mechanism design. We analyze the mixed strategy equilibrium in which both the suppliers’ effort choices and the buyer’s procurement mechanism design are randomized.

The main findings are summarized as follows. (1) Compared to the case with observable effort that leads to zero effort, the endogenous information asymmetry improves effort efficiency (by inducing positive supplier effort) but introduces trade inefficiency (by causing possible trade failures). While supplier competition reduces the effort efficiency, it enhances the trade efficiency. (2) With a single supplier, the buyer never gains from the supplier’s cost-reduction effort because the trade inefficiency offsets the effort efficiency. With multiple suppliers, however, the buyer will benefit from supplier cost reduction, achieving a profit greater than the one with a single supplier. In other words, the buyer is always better off with supplier competition (multiple suppliers) than without such competition (single supplier). (3) Nevertheless, a greater number of suppliers does not necessarily lead to better
results. When the buyer’s revenue is high, a supply base with two suppliers achieves the best result for the buyer. However, when the revenue is low, the buyer is better off with a larger supply base with more suppliers.

Although the result for a single supplier is known in the hold-up literature based on a pricing game (Gul 2001), we contribute to this literature by generalizing the structure with multiple suppliers and an optimal mechanism design, thereby establishing the impact of supplier competition in the hold-up problem. With a single supplier, endogenous information asymmetry generates zero gain for the buyer with respect to supplier cost reduction, for its negative impact on trade efficiency cancels out its positive impact on effort efficiency. With multiple suppliers, however, we show that the benefit with respect to effort efficiency dominates the concern of trade inefficiency, resulting in positive gains for the buyer. Therefore, unlike the case with a single supplier, endogenous information asymmetry allows the buyer to benefit from positive supplier effort in the presence of supplier competition.

Our consideration of endogenous information asymmetry leads to new insights with respect to supply base design, complementing the ones based on exogenous information asymmetry. While the comparison of buyer profits between sole sourcing and dual sourcing can vary based on exogenous information asymmetry (Li and Wan 2017), we show that dual sourcing always dominates sole sourcing based on endogenous information asymmetry. Therefore, the source of information asymmetry, whether it is from uncertainty of effort outcomes or from uncertainty of effort decisions, has important implications to a firm’s sourcing strategy. Considering a general number of suppliers, we further establish a negative relationship between the supply base size (with at least two suppliers) and product margin. This finding echoes practical observations of sourcing strategies in different industries.

References
