Cooperation Strategy under Asymmetric Partnership: Game Theoretic Approach to Relationship between Large firm and SMEs

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Abstract: This study uses game theory to examine cooperation strategy within the business ecosystem. To gain a better understanding of the effects of cooperation strategy, unilateral demand and acceptable relationships rather than coexistence of large firms and small and medium enterprises (SMEs) should be the focus of scholarly attention. To this end, game theory was employed to simulate cooperative relationships between large firms and SMEs as asymmetric partners. This research classifies normal cooperative and asymmetric relationships and shows balance through optimizing cooperative profits in microeconomic situations with game theory as a theoretical basis. Primarily, this research aims to resolve the collective Prisoner’s Dilemma of SMEs in Korea. In relationships with large firm(s) and the government, small-and medium-sized firms are forced to lower prices to compete rather than being encouraged to build competence for the future. From the standpoint of large firms, harsh price competition in the market may force them to pass the burden to the SMEs as supplier(s). Moreover, large firms use their power over SMEs to exploit the margin in the value chain. This exploitation strategy might be efficient in the short-term because of reduced transaction costs; however, this exploitative strategy is ineffective at building competence along the value chain. From the perspective of the SMEs, this exploitative behavior on the part of large firms ruins the margin for future investment and erodes their trust in the large partners. For this reason, cooperation strategy can be an alternative for a large firm that occupies a position of power in transaction and development. If we assume that the relationship between the large firm and SMEs represents a coordination game, this dilemmatic situation can be analyzed and explained. Or, at the very least, we can use the data to propose a method for improving the situation.

This research is grounded in the theoretical research on altruistic behavior and cooperative strategy or activity. This phenomenon has been studied in diverse disciplines from social science to game theory in economics (Bshary and Bergmüller, 2008). In this study, we have combined a socio-cognitive approach with game theory to reveal the mechanism behind exploitation vs. cooperation. This research is distinctive in the body of literature related to game theory because few studies on the asymmetric relations between transactions as part of the Prisoner’s dilemma exist. Although it is a coordination game between two players, the

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decisions and pay-offs becoming increasingly complicated in this dilemmatic situation.
This research expects cooperative behaviors like sharing profits and joint investments in development will bring higher pay-offs to the partnerships between asymmetric players because a stream of research suggests this possibility (e.g., Axelrod and Hamilton, 1981; Kreps et al., 1982). Yet we question the effectiveness of the exploitative strategy. Many large firms are locked in a myopic vision of short-term pay-offs that prove detrimental in the long-term. Moreover, developing a reciprocal relationship enables each partner to receive direct and indirect benefits over time (cf. Nowak and Sigmund, 2005; Fosco and Mengel, 2007).
The logic is that large companies can improve their own profits by treating the weak partners well. This research can be extended to real world decision-making on how much to invest in the co-development of competence with SMEs. This study can accommodate the role of institutions like regulatory agencies, which have the power to move to the optimal point in transactions. Furthermore, this research can contribute to improved quality of relationships between firms, especially from the SME side. The game-theory approach offers concrete principles of relationships between large firms and SMEs. Moreover, this research context is particularly anew in prisoner’s dilemma game so that this research can be meaningful in game theory in return.

Using modeling and analysis, this study arrives at four conclusions: (1) “Although large firms can have competitive advantage with cooperative relationship with SMEs, there comes asymmetric relationships between large firms; that is, one firm uses market strategy and the other use supply chain strategy if difference between the cost of relation building and the future benefit is not significant.” (2) “When quantity of SMEs’ supply is smaller than the demand of the large firm, the product price of large firm is influenced by market price, when quantity of SMEs’ supply is larger than the demand of the large firm, the product price of the large firm is influenced by supply price of SMEs.” (3) “If demand for the product decreases in recession, support to supplier can be strategic choice considering the future benefit from it. That is, there needs more cooperative relationship in more recessive economy.” (4) “From a large firm’s perspective, technological support to SME is an effective strategy when the level of SME’s technology is relatively high.”

This research interprets the optimum level of cooperative strategy and demonstrates its practical implications. Through this research, four implications about cooperative relationships with the medium-sized firms were part of the preliminary results. Followed by the supply price of the market, the supply cost of medium-sized firms, and market scale, the different results are presented. Moreover, because some SMEs have powerful technology, large firms have incentives for choosing beneficial cooperative strategies with SMEs during a recession. This result will lead us to find the optimum level of coordination for large firms and SMEs in more practical stands through game theory. This paper addresses cooperation between large firm and SMEs with game theory. A critical problem occurs when a partner reduces investment resulting in lack of information and rationality with opportunity loss. In the long-term, making an investment in relationship-specific assets will have numerous benefits and enhance competitive advantage for both players. However, both players are usually focused on short-term market strategy and are unable to consider the benefits and advantages in the long-term. This is framed by the cost and amount of production, business cycle, and level of competence. Our analytic approach has shed light on players’ decision-making processes related to cooperation, especially in light of the market volatility during a recession. Finally, we propose alternative cooperation strategies between large firms and SMEs as well as how to successfully implement these strategies. Directions for future legislation and coordination are also suggested.

[Keywords] Asymmetric Relationship, Game theory, Cooperative Strategy, Coordination Policy