ABSTRACT

In this paper, we highlight an aspect of supplier opportunism in the outsourcing paradox that has largely been ignored by extant research – the supplier as a direct competitor of the buyer firm. In light of this paradox, we offer a game-theoretic framework in which we identify conditions under which firms could alleviate or mitigate this outsourcing problem. Our results show that apart from transaction costs, firm-level capabilities (both ordinary and dynamic) play important roles in determining the make only, buy only, or make-and buy options a firm could exercise in countering the threat of the supplier as a potential competitor in the downstream marketplace.

Keywords: Outsourcing, supply chain management, supplier opportunism, game theory

1. INTRODUCTION

The conventional argument in favor of outsourcing proposes that by doing so, companies should be able to “improve their level of service, cut costs and free up time and capital to concentrate on what is most important – how they differentiate themselves and compete,” (Bendor-Samuel, 1999). Spiegel (1993) also suggested that by subcontracting production to a potential rival firm, the incumbent firm can lessen the incentive of the former to develop its own final product and enter the downstream market as a competitor. However, this suggestion on horizontal subcontracting is based on the premise that there is no cost asymmetry between the firms and so “subcontracting can always deter entry because it makes both the incumbent and the potential entrant better off,” (Spiegel, 1993, p.584). Recent market trends however show that supplier opportunism accruing from the supplier competing for a share of the buyer’s market after learning from the outsourcing experience is on the rise, especially where international outsourcing is involved. According to Doole and Lowe (2004), “in the 1980s a number of US businesses in many business sectors outsourced to Asian firms who subsequently opened up as competitors,” (p.156). For instance, Goldstar, Samsung, Kia, and Daewoo are some South Korean companies which managed to build up their product leadership in their respective areas through their early OEM-supply contracts with Western companies (Prahalad and

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Hamel, 1990). Although outsourcing allows these manufacturers to increase short-term return on assets, minimize fixed costs, and increase flexibility, the long-term cost could be the multinational’s inability to compete against the expanding number of local manufacturers in these markets due to its failure to take more direct control over sourcing, engineering, manufacturing, and marketing activities (Koudal, 2005). Hence, we are not optimistic that subcontracting or outsourcing could be effective in deterring market entry by the subcontractors. Instead, we deem that a firm faces a paradox in its outsourcing decision: cost efficiency gains in the short run versus the prospect of unknowingly nurturing its outsourcing suppliers to compete against itself in the long run. In the transaction cost economics (TCE) literature, the opportunistic behavior of the supplier has always been framed in terms of transferring or salvaging specific learning or assets from one buyer to another (e.g., Anderson and Weitz, 1986; Monteverde and Teece, 1982; Pisano, 1990), or in terms of the supplier’s ability to demand higher than market prices (Ngwenyama and Bryson, 1999). For instance, in the automobile industry, it has been pointed out that automakers dependent on suppliers’ engineering capabilities may lose some negotiation power (Pfeffer and Salancik, 1978; Porter, 1980), their basic design and styling ideas may leak to competitors through shared suppliers, and their lost of engineering expertise in core component areas can render them vulnerable in technological capability (Takeishi, 2002). In services, firms that outsourced their information systems run the risks of losing their competencies to the outsourcer and immediate control of their important value chain activities (Ngwenyama and Bryson, 1999), while e-commerce firms face the risk of unwittingly giving the competitors an advantage through defective performance by the supplier (Sharp, 2007). However, supplier opportunism has never been framed in terms of presenting itself as a direct competitor. Hence, mechanisms proposed by these researchers are designed either to safeguard the buyer against the supplier transferring specific asset or knowledge from one buyer to another (Stump and Heide, 1996; Anderson and Weitz, 1992; Klein et al., 1978; Klein and Leffler, 1981; Leavy, 1994; Wilson, 1994; Seshadri, et al., 1991; Seshadri, 1995; Williamson, 1983, 1984; Heide and John, 1988, 1990), or to develop better tools for buyers to analyze outsourcing risks, devise bidding strategies, and structure incentive contracts (Nam et al., 1995, Nicholson et al., 2004, Osei-Bryson and Ngwenyama, 2006; Sharp, 2007), but are not meant to deal with supplier opportunism in terms of market entry.

In this paper, we highlight an aspect of supplier opportunism in the outsourcing paradox that has largely been ignored by extant research – the supplier as a direct competitor of the buyer firm in the downstream marketplace, and we propose that this threat can be mitigated by the brand building efforts of the buyer. Using a game theoretic framework, we identified the conditions under which asset specificity and firm-level characteristics such as the rate of learning and the ability to deploy the brand
equity that the buyer has created for its product, interact to derive a set of prescriptive outsourcing strategies. Apart from make or buy we also propose a make-and-buy option which some researchers have criticized conventional TCE research for not addressing (Shelanski and Klein, 1995; Rindfleisch and Heide, 1997). We support our analysis with examples of industry practices that illustrate applications of the strategies identified.

The main contributions of our paper are three-fold. Firstly, using a dynamic game-theoretic framework, we are able to explicitly consider the strategic interactions between the buyer and the supplier over two periods and the impact on the optimal outsourcing strategy. This interactive framework is important as we need to consider the long term impact of the buyer’s initial outsourcing decision on the subsequent behavior of the supplier, particularly that of entry into the buyer’s downstream market. This subsequent behavior of the supplier cannot be ignored, especially for multinational buyers who outsource in the foreign markets in which they sell their products, as the earlier examples have shown. Indeed, a recent paper by Costa and Dierickx (2005) has addressed the strategic behavior of suppliers in outsourcing as a deployment of innovations decision. Secondly, our model shows how different combinations of a firm’s ordinary capability and dynamic capability intertwined to affect the optimal outsourcing strategy for the firm. In this aspect, our work extends beyond the traditional TCE literature of asset specificity and uncertainty and accounts for the complementary roles of transactional and capability considerations in the micro-analysis of firm decisions (Jacobides and Winter, 2005). Ordinary capability is captured in our model as the firm’s rate of learning. We define this rate of learning as the learning-by-doing effect, which is an efficiency gain from cumulative production (Irwin and Klenow, 1994). This effect is transaction specific (Hart and Moore, 1990; Klein et al., 1978; Shelanski and Klein, 1995; Monteverde, 1995, Tarakci et al., 2009) in that the supplier acquires specific knowledge in production only if it is awarded a supply contract in part or in full, and this knowledge may not necessarily be absolutely beneficial in other exchange relationships. Dynamic capability, on the other hand, can be defined as that which “operate[s] to extend, modify or create ordinary capabilities,” (Winter, 2003, p. 991) and typically involves long-term commitments to specialized resources. This definition is in line with Teece’s (1998) argument that “the competitive advantage of firms in today’s economy stems not from market position, but from difficult to replicate knowledge assets and the manner in which they are deployed. The deployment dimension – involving as it does both entrepreneurial and strategic elements - is where dynamic capabilities are especially important,” (Teece, 1998, p. 62-63). This dynamic capability can also be a source of competitive advantage that the buyer possesses (Teece et al., 1997), which acts as a buffer against competition from suppliers. In our framework, we represent this dynamic capability as the
ability to create value in the commercialization of products, commonly referred to in the marketing literature as creating brand equity, which can be defined in terms of the marketing effects that are uniquely attributable to a brand (Keller, 2003) and belongs to the category of knowledge assets which are often inherently difficult to copy (Teece, 1998). Companies are known to pay a huge price premium for brand equity. For example, Philip Morris bought Kraft for $12.9 billion, while RJR Nabisco was sold to a group of leveraged buy-out specialists for $30 billion (Keller, 2003). This price premium was often justified not only on the grounds of extra profits that could be extracted from these brands, but also the tremendous difficulty and expense of creating similar brands from scratch (Keller, 2003). In the marketing literature, brand equity has been found to influence manufacturer’s pricing, advertising, and product policies (Buday, 1989; Kekre and Srinivasan, 1990; Raju et al., 1990; Wernerfelt, 1991; Smith and Park, 1992; Sharp, 1993; Raju et al., 1995, Pita and Katsanis, 1995; Agrawal, 1996; Bayus and Putsis, 1999; Randall et al., 1998). Manufacturing processes and product designs could be easily duplicated by the outsourcing supplier, but marketing efforts that built lasting impressions of the brand on the minds of the consumers may not be that easily reproduced. Hence, in our model, the dynamic capability of the outsourcing firm to create and deploy brand equity may therefore provide it with some protection against the threat of potential market entry by the outsourcing supplier. It is interesting to note that our review of the extant outsourcing literature does not show any formal outsourcing decision framework that takes into account the effect of brand equity or the firm’s brand building capabilities. Thirdly, we go beyond the traditional view of vertical buyer-supplier relationship and examine a horizontal one whereby the buyer and supplier can compete on the same level as sellers in the same product market. As in Spiegel (1993), we establish the existence of plural forms which extant vertical integration literature has ignored (Rindfleisch and Heide, 1997). It has been observed that it is not unusual for firms to produce and outsource their requirements (Dutta et al., 1995). For instance, Walker (1988) cited the case of Fafco, a solar-heating system company which purchased and at the same time produced its own plastic panels despite the supplier’s lower cost of production, while many UK general medical services are known to have concurrently outsourced and insourced their call centre services (Sharp, 2007). In fact some researchers have suggested that instead of looking at governance forms in a binary mode, researchers could examine forms of governance conceptualized as hybrids on a continuum ranging from market exchange at one end to hierarchical integration at the other (Shelanski and Klein, 1995; Rindfleisch and Heide, 1997, Lee and Lim, 2003). Using a game theoretic framework, we are able to derive conditions under which a firm may pursue in-house production or outsource, or even adopt a combination of outsourcing and producing in-house, which could help to mitigate the impact of the supplier’s entry into the firm’s downstream market, or
even to deter the supplier from carrying out such an act. However, unlike Spiegel (1993), we allow for cost asymmetry between the buyer and the supplier when horizontal subcontracting is examined.

Our game theoretic outsourcing decision framework traces a buyer’s outsourcing decision from Period 1 when the first outsourcing decision is made and its impact on the long term decision. We model situations in which the buyer is contemplating to outsource its production function. The interactive effects of asset specificity, firm-level capabilities such as the rate of learning (ordinary capability) and the ability to create and deploy brand equity (dynamic capability), together with competitive effects in the marketplace will determine the optimal outsourcing decision for the buyer in the long run.

The rest of the paper is organized as follows. The next section describes the game theoretic model and Section 3 presents the results and the intuition for the results. Section 4 provides the discussion and conclusion.

2. THE MODEL

In this section, we outline the game theoretic framework. For ease of exposition, the term product is used liberally to refer to an expertise, a process or a critical function, which the supplier in its unique position may be able to acquire sufficient learning in order to imitate the buyer and thus compete in the downstream market subsequently. To allow for inter-temporal interactions, we consider a dynamic game of complete information over two periods (Figure 1) between $B$ (the firm considering its outsourcing option) and $S$ (the incumbent supplier). We assume that $B$ is currently enjoying a monopoly status in the market\(^2\). There are two stages in Period 1 and up to five stages in Period 2 due to potential entry into the market by $S$.

In Stage 1 of Period 1, $B$ determines the price $P_1$ in Period 1 and the proportion of demand $\alpha_1$ to produce in house ($(1- \alpha_1)$ will be outsourced to $S$). If $B$ decides not to outsource at all ($\alpha_1=0$), the game ends here\(^3\). Otherwise, we model the market of potential suppliers for $B$ as a competitive one such that $B$ pays $S$ the price $C_S(0)$ for performing the outsourcing function, where $C_S(0)$ is the marginal cost of production for a typical supplier in the competitive market. The demand for $B$’s product in this period is $(1- P_1)$. Hence the Period 1 payoff for $B$ is $\pi_B^1 = (P_1 - [(1 - \alpha_1)C_S(0) + \alpha_1C_S^B(0)])(1 - P_1)$, where $C_S^B(0)$ is the marginal cost of production for $B$ in Period 1. We assume that $C(. )$ is decreasing at a

\(^2\) As we shall see later, this assumption of a monopoly does not compromise the essence of our findings. Rather, it allows us to focus on $B$’s outsourcing decision and not be distracted by existing competitive forces at work otherwise.

\(^3\) In this case, there is no specific learning on the part of $S$, thus rendering it impossible for $S$ to enter and compete in the same market with $B$ subsequently.
diminishing rate\(^4\), i.e., the more a firm produces, the more intense the learning effect and this translates into a lower production cost. Without loss of generality, we further assume that \(C^S(0) \leq C^B(0)\) so that there is immediate benefit for \(B\) to adopt an outsourcing strategy if the decision is based solely on cost consideration. This is possible if \(S\) has prior experience in a similar (but not identical) production capacity\(^5\). This assumption is in no way restrictive. In fact, we will show that once long term consideration is taken, it may not necessarily be in \(B\)’s interest to outsource at all even with \(S\)’s initial cost advantage. The Period 1 payoff for \(S\) is 0 because of our assumption of a competitive market of potential suppliers for \(B\). We assume in our model that \(B\) chooses at most one supplier for outsourcing in Period 1. This is to ensure consistency in quality and to avoid any coordination problem should there be more than one supplier.

As a result of learning from their respective production experiences in Period 1, both \(B\) and \(S\) would have achieved a lower production cost by Period 2 (Monteverde and Teece, 1982). This sets \(S\) apart from other potential suppliers in the competitive market as \(S\) is now able to produce at a comparatively lower cost. In addition, after producing for \(B\), \(S\) gains sufficient knowledge and learning (Monteverde and Teece, 1982) such that it can potentially enter and compete in the downstream market as \(B\) in subsequent periods\(^6\). Hence, in Stage 1 of Period 2, \(S\) decides whether to enter the downstream market as \(B\)\(^7\). The latter, upon observing the action of \(S\), determines the proportion of demand \(\alpha_2\) to produce in house ((1- \(\alpha_2\)) will be outsourced) in Stage 2 of Period 2. If \(B\) chooses to outsource at all (i.e., 1- \(\alpha_2 >0\)), \(S\) decides in Stage 3 of Period 2 if it will continue to produce for \(B\). If it does, \(B\) and \(S\) negotiate over the outsourcing price in Stage 4 of Period 2. We model this negotiated price as the Nash bargaining solution between \(B\) and \(S\), which we will elaborate further later. Finally, in Stage 5 of

\[^4\]_\frac{dC^j(q)}{dq} < 0, \frac{d^2C^j(q)}{dq^2} > 0, j = B, S.

\[^5\] For instance, \(S\) could be Samsung in the mid 70s who has been manufacturing semiconductors in Korea while \(B\) is a Western company such as Sears who outsourced its production of consumer electronics via OEM-supply contracts to Samsung because of the latter’s cost advantage in semiconductors.

\[^6\] A good example is Haier (a Mainland Chinese Electrical and Electronics Appliances Company) which started off in 1984 as an original equipment manufacturer (OEM) of refrigerators for foreign manufacturers using German technology. It has now grown to become a multinational company selling a wide range of electrical appliances in the world market (exporting some 15,100 varieties of household electrical product items to more than 100 countries) and has even set up headquarters in New York (see Haier’s Web site at www.haier.com). There are many companies like Haier that progressed successfully from being OEM to becoming OBM (original brand manufacturers) in Asia, some of the most famous being companies like LG and Samsung, which started off contract manufacturing color television sets, microwave ovens and VCRs for major U.S. retailers like Sears and Emerson (Johansson, 1997).

\[^7\] We thank an anonymous reviewer for highlighting that in reality, suppliers become downstream competitors only after several periods. Here, we can interpret Period 2 as the first time when the option of entry is viable and when supplier threat cannot be handled effectively through contracting. In reality, contracts are deemed to be incomplete and not re-negotiation proof (Williamson, 1979; Richmond et al., 1992).
Period 2, \( j \) decides on the market prices \( P_{2j}, j = B \) if \( S \) does not enter the downstream market as \( B \) and \( j = B, S \) otherwise.

Suppose \( S \) does not enter the downstream market as \( B \) in Period 2. Then if \( B \) were to outsource to \( S \) in Period 2, \( B \) has to pay \( S \) a price that is equals to the Nash bargaining outcome. More specifically, this negotiated price can be written as \((1-\rho)C^S(q\tilde{q}) + \rho C^S(0)\), which is simply a weighted sum of \( S \)'s minimum price \( C^S(q\tilde{q}) \) \( (q\tilde{q} = \gamma(1- \alpha_j)(1-P_j)) \) and the maximum that \( B \) has to pay by seeking an alternative supplier, which is \( C^S(0) \). \( \rho \) is the bargaining power of \( S \) and \( \gamma \) is the degree of asset specificity of \( S \)'s learning in Period 1. By the definition of asset specificity, \( S \) is able to redeploy the learning acquired in Period 1 to produce for other buyers at a cost of \( q\tilde{q} = \gamma(1- \alpha_j)(1-P_j) \) \( ^8 \). For instance, if the learning acquired by \( S \) is highly specific such that none of the learning can be redeployed to produce for other buyers, then \( q\tilde{q} = 0 \) (since \( \gamma = 0 \)). However, if the specificity is low such that all the learning acquired can be applied to producing for another buyer, \( q\tilde{q} = (1- \alpha_j)(1-P_j) \) (since \( \gamma = 1 \)) \( ^9 \). Hence, \( C^S(q\tilde{q}) \) serves as the minimum price that \( S \) can demand from \( B \) in Period 2. In particular, when \( S \) has a high bargaining power \( (\rho = 1) \), the Nash bargaining outcome is \( C^S(0) \).

Technically, this is the same as if \( B \) were to outsource to another supplier in the open market which has no prior experience for producing for \( B \). Thus the Period 2 payoff for \( B \) is:

\[
\pi_{B,NE}^2 = (P_{2B}^2) - [\alpha_2 C^B(u) + (1-\alpha_2)((1-\rho)C^S(q\tilde{q}) + \rho C^S(0))](1-P_2),
\]

where \( C^S(u) \) \( (u = \alpha_j(1-P_j)) \) is the cost of production for \( B \) in Period 2 as a result of learning in Period 1. We shall see in the analysis later that when \( S \) does not enter the downstream market as \( B \) in Period 2 and if \( B \) were to choose to outsource to \( S \), the latter will not reject the option at the equilibrium. Hence, the Period 2 payoff for \( S \) is:

\[
\pi_{S,NE}^2 = (1-\alpha_2)(1-P_2)[((1-\rho)C^S(q\tilde{q}) + \rho C^S(0) - C^S(w)],
\]

where \( C^S(w) = C^S((1- \alpha_j)(1-P_j)) \) is the actual cost of production for \( S \) in Period 2 if it were to produce for \( B \) in Period 2, as a result of learning in Period 1. In the case where \( S \) enters the downstream market as \( B \) in Period 2, we define the respective demands as follows: Demand of \( B = Q_B = k_B(1-P_{2B} - \chi(P_{2B} - P_{2S})) \); Demand of \( S = Q_S = k_S(1-P_{2S} - \chi(P_{2S} - P_{2B})) \), \( k_B + k_S = 1 \), where \( \chi \) is the cross price elasticity \( ^{10} \). \( k_B \), \( k_S \) refer to the brand

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\( ^8 \) As we shall see later, the degree of specificity plays an important role in the choice of \( B \)'s outsourcing strategy.

\( ^9 \) Even though \( B \) is a monopoly, \( S \) may have prior experience in a similar (but not identical) production capacity that \( B \) and other buyers (in other markets) may be able to make use of. For instance, Honda uses its core competency in engines to develop a variety of products from lawn mowers and snow blowers to trucks and automobiles (Prahalad and Hamel, 1990). Hence, in our model, \( S \) could be a supplier like Honda which possesses production experience and capacity that allows it to serve different buyers who are monopolies in their respective product categories/industries.

\( ^{10} \) Our demand functions follow that of Raju et al. (1995) and the classic paper by McGuire and Staelin (1983). More specifically, a demand function that contains a term for own price effect and another term that captures the effect of the
equity construct for \( B \) and \( S \) respectively as discussed earlier, which encompasses all the non-price marketing effects that are attributable to the brand alone\(^{11}\). We assume that this market is a mature one in the sense that the upper limit of the market demand for the product has been reached such that there is little room for expanding the size of the overall market demand for the product. This is to ensure that we can focus on the full impact of \( S \)'s entry on the profitability of the buyer without having to consider the case when the size of the total market demand can be increased as a result of \( S \)'s entry, in which case, the full impact on the buyer would be mitigated. Examples abound for outsourcing companies which are operating in similar situations whereby the potential for expanding the size of the overall market demand is limited: in the personal computers market we have companies like IBM outsourcing entire products in the 1980s to SCI Systems (The Economist, February, 12, 2000); in the telecommunications industry we have firms like Ericsson outsourcing its manufacturing function (The Economist, February, 12, 2000); and in the car industry we have BMW reportedly buying as much as 80 percent of every car’s component (The Economist, March 5, 1994).

We assume that brand is an important attribute in the consumer’s purchase decision for \( B \)'s product. This is reasonable considering the fact that research shows that “Over 70 percent of customers want to use a brand to guide their purchase decision and over 50 percent of purchases are actually brand driven,” and that “72 percent of customers say they will pay a 20 percent premium for their brand of choice, relative to the closest competitive brand,” (Davis, 2002, p. 5). We represent the brand equity parameters \( (k_B, k_S) \) as multipliers in our model, following the approach by Interbrand (Mottram, 1994; Keller, 2003). For ease of exposition, we re-scale this multiplier to range from zero to one in our model. Hence, the Period 2 payoffs for \( B \) and \( S \) are

\[
\pi_{B,E}^2 = (P_{2B} - [\alpha_2 C^B(u) + (1 - \alpha_2)\psi])Q_B; \quad \text{where}
\]

\[
\psi = \begin{cases} 
C^S(0) & \text{if } S \text{ does not produce for } B \text{ and } B \text{ has to engage another supplier in the market,} \\
((1 - \rho)C^S(\tilde{q}) + \rho C^S(0)) & \text{if } S \text{ produces for } B.
\end{cases}
\]

and

\[
\pi_{S,E}^2 = (P_{2S} - C^S((1 - \alpha_1)(1 - \beta P_1)))Q_S + (1 - \alpha_2)Q_B[(1 - \rho)C^S(\tilde{q}) + \rho C^S(0) - C^S(w)].
\]

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\(^{11}\) These demand functions are chosen such that if the same price \( P_1 \) (as chosen by \( B \) in Period 1) has been chosen by \( B \) and \( S \) in Period 2, the total demand in Period 2 remains the same as that in Period 1, i.e., if \( P_{2B} = P_{2S} = P_1 \), total demand = \( Q_B + Q_S = k_B(1-P_{2B}) + k_S(1-P_{2S}) + (k_B + k_S)(P_{2B} - P_{2S}) = (k_B + k_S)(1-P_1) = (1-P_1). \) This assumption is also consistent with the approach adopted in Raju et al. (1995, page 960).
The first term is the payoff from selling in the downstream market while the second term is that from producing for \( B \). In the next section, we present the results and provide the intuitive argument for them.

3. RESULTS

Using backward induction, we will first examine \( S \)’s production decision for \( B \) in Period 2\(^{12} \). Since the objective of this paper is to establish a decision framework for outsourcing strategies, we will only focus on the outsourcing decision variables in this section, although the technical analysis does take into consideration the product pricing interactions.

**\( S \)’s production decision for \( B \) in Period 2**

Firstly, we note that if \( S \) does not enter the downstream market as \( B \) in Period 2, it will always produce for \( B \) if offered, for otherwise, \( S \) has zero payoff.

Next, we examine if \( S \) should continue to produce for \( B \) (if so required by \( B \)) in Period 2 if it decides to enter the downstream market in Period 2. Intuitively, it seems that when the \( S \) decides to compete with \( B \) in the market, it should stop supplying \( B \) in order to further capitalize on its cost competitiveness. However, whether \( S \) will continue to supply \( B \) in Period 2 is a more complex issue and depends on the brand equity of \( B \) and \( S \) respectively. We attempt to rationalize the decision of \( S \) by analyzing the impact of supporting the outsourcing function for \( B \) on \( S \)’s total demand and its profit margin. Firstly, we note that the total demand for \( S \) in Period 2 when it produces for \( B \) is always larger than when it does not produce for the buyer. This is not unexpected since if \( S \) does not produce for \( B \) (though \( B \) so desires), the latter has to incur a higher production cost either by producing in-house, or by engaging another supplier from the competitive market of suppliers who has no prior experience in producing for this buyer, thereby increasing the overall equilibrium price in the market and as a result, decreasing the total demand. Secondly, we observe that whether the equilibrium price of \( S \) when it does not produce for \( B \) is higher than when it does produce for \( B \) depends on the brand equity of \( B \). When the brand equity of \( B \) is high (and thus the brand equity of the supplier is relatively low), any increase in \( S \)’s price has a lower impact on the market demand for its product. Thus any increase in profit margin due to the higher price is more than compensated for by the decrease in demand.

Combining the above two observations on the market demand and profit margin of \( S \), we conclude that when the brand equity of \( B \) is high, \( S \) has a higher equilibrium price and a higher market demand when producing for \( B \) than if it does not. As a result, \( S \) will always produce for \( B \). On the contrary, when the brand equity of \( B \) is low, the opposite holds, i.e., although \( S \) still maintains a higher

\(^{12}\) All technical proofs are given in the supplementary material available online.
market demand by producing for $B$, the increase in demand is comparatively lower. Furthermore, its equilibrium price also decreases. Hence, if the profit obtained for producing for $B$ cannot compensate for the reduction in $S$’s own demand in the market and its profit margin, $S$ will choose not to produce for $B$ in Period 2. This result is summarized in Proposition 1.

**Proposition 1**
Suppose $S$ enters the downstream market as $B$ in Period 2. (i) If the brand equity for $B$ is high, $S$ will always produce for $B$; (ii) if the brand equity for $B$ is sufficiently small, $S$ will not produce for $B$ once it enters the market in Period 2.

The above proposition implies that brand equity is a useful tool to ensure that $B$ will not be forsaken by $S$ once the latter enters the downstream market and refuses to produce for $B$.

**Outsourcing decision for $B$ in Period 2**
$B$’s outsourcing decision in Period 2 is straightforward: $B$ chooses $\alpha_2^* = 1$ (make in-house) if it is more cost efficient to do so, i.e., $C^B (u) < (1 - \rho)C^S (\tilde{q}) + \rho C^S (0) < C^S (0))$. This occurs when the rate of learning of $B$ as a result of production in Period 1 is sufficiently large such that it can achieve better cost efficiency than $S$ by Period 2. If however, the rate of learning of $B$ is moderate, i.e.,

$$(1 - \rho)C^S (\tilde{q}) + \rho C^S (0) < C^B (u) < C^S (0),$$

$B$ prefers to outsource to $S$, but if rejected by $S$, will produce in-house instead. Finally, if $C^S (\tilde{q}) + \rho C^S (0) < C^S (0) < C^B (u),$ $B$ prefers to outsource to $S$, but if rejected will outsource to a new supplier from the open market.

Combining these observations with Proposition 1, we obtain Proposition 2.

**Proposition 2**
$B$’s outsourcing decision in Period 2 is dependent on both the rate of learning and its brand equity and is summarized in the table below.

<table>
<thead>
<tr>
<th>$B$’s Rate of Learning</th>
<th>$B$’s Brand Equity $k_B$ is High</th>
<th>$B$’s Brand Equity $k_B$ is Low</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td>$C^B (u) &lt; (1 - \rho)C^S (\tilde{q}) + \rho C^S (0) &lt; C^S (0))$</td>
<td>$B$ makes everything in-house in Period 2 ($\alpha_2^* = 1$).</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>$(1 - \rho)C^S (\tilde{q}) + \rho C^S (0) &lt; C^B (u) &lt; C^S (0)$</td>
<td>$B$ will outsource to $S$ but if $S$ rejects then it will make in-house in Period 2 ($\alpha_2^* = 0$).</td>
</tr>
<tr>
<td></td>
<td>$B$ will make everything in-house in Period 2 ($\alpha_2^* = 1$).</td>
<td></td>
</tr>
</tbody>
</table>
**Low**  
\((1 - \rho)C^S(\tilde{q}) + \rho C^S(0) < C^S(0) < C^B(u)\)  

| B will outsource to S in Period 2 (\(\alpha_2^* = 0\)). | B will outsource to another new supplier if S rejects the offer in Period 2 (\(\alpha_2^* = 0\)). |

**S’s entry strategy in Period 2**

Whether \(S\) should enter and compete in the downstream market as \(B\) in Period 2 depends on whether there is profit to be made by competing directly and how entry affects its outsourcing function for \(B\). As such, \(S\)’s decision pivots on the extent to which \(B\) has acquired learning from its production experience in Period 1. We consider two cases.

**Case 1:**  
\(C^B(u) < (1-\rho) C^S(\tilde{q}) + \rho C^S(0)\), i.e., B’s rate of learning is high

In this case, \(B\) does not outsource to \(S\) at all in Period 2. Hence, if \(S\) does not enter the downstream market as \(B\) in Period 2, \(S\) will have zero payoff in Period 2. In other words, \(S\) will surely enter the market if it can secure a positive payoff. After some algebraic manipulations, we obtain Proposition 3(i).

**Case 2:**  
\(C^B(u) > (1-\rho) C^S(\tilde{q}) + \rho C^S(0)\), i.e., B’s rate of learning is either moderate or low

In this case, \(B\) will want to outsource to \(S\) entirely in Period 2. Then \(S\) has two sources of income of it chooses to enter the downstream market a \(B\), namely, one from producing for \(B\) and the other from selling in the same market as \(B\). Clearly, the profit margin for the latter is higher than the former since \(B\) has to price at a level higher than what it pays to \(S\). Also, competition in the same market reduces prices, thus increases the total demand. In other words, by choosing to enter the same market as \(B\), \(S\) produces at least the same as the case where it does not enter the market and a portion of which that is sold directly by \(S\) in the market commands a higher profit margin. Hence, \(S\) will always enter the downstream market. This is given in Proposition 3(ii).

**Proposition 3**

(i) If \(B\)’s rate of learning is high, \(S\) enters the downstream market in Period 2 if and only if it can obtain a positive profit margin, or equivalently,

\[
C^S((1-\alpha_i)(1-P_i)) < \frac{1 + \frac{\chi}{2(1+\chi)} + \frac{\chi}{2} C^B(\alpha_i(1-P_i))}{(1+\chi) - \frac{\chi^2}{2(1+\chi)}}.
\]

(ii) If \(B\)’s rate of learning is moderate or low, \(S\) always enters the downstream market in Period 2.
The condition in Proposition 3(i) can be interpreted as the cost of production for \( S \) in Period 2 (after acquiring learning effects in Period 1) has to be sufficiently low for entry in Period 2 to be optimal.

**Outsourcing Paradox Faced By the Buyer**

From the above analysis, we note that although \( B \) can benefit from cost savings in Period 1 (and maybe even in Period 2) by outsourcing to a supplier, it faces several risks in doing so. Firstly, there is the danger that \( S \) will acquire sufficient learning to be able to compete effectively in the downstream market with \( B \) in Period 2, thereby eroding the long-term profit and market share of \( B \) (Propositions 3 and 4). Secondly, and with an equally detrimental effect if not more, \( S \) may eventually cease producing for \( B \) in Period 2 (Proposition 1). In this case, \( B \) will have to outsource to another supplier, or produce in-house and thus does not benefit from whatever learning acquired by \( S \) in Period 1.

Therefore, \( B \) in deciding on its outsourcing strategy faces a paradox: although \( B \) gains from cost savings in Period 1, outsourcing also increases the risk of having \( S \) as a new competitor in the downstream market subsequently, and this supplier may even cease to be \( B \)’s supplier upon entry.

Our analysis thus far spells out another instance of supplier opportunism which is in the form of entry into the downstream market, and taking up the market share of the buyer. This complements the traditional notion of supplier opportunism described in the TCE literature (Anderson and Weitz, 1986; Monteverde and Teece, 1982; Pisano, 1990).

The above proposition also implies that outsourcing decision is a complex one and that a firm needs to examine carefully the tradeoffs between cost and benefit. The short-term cost benefit is straightforward. However, the long-term cost is less obvious although the effect may be more detrimental to the long-term profitability and competitiveness of the firm – \( S \) can potentially become a competitor of \( B \) in the downstream market and eventually threaten the market position of \( B \). We show that \( B \) can mitigate any long-term negative effect from outsourcing by enhancing its brand equity (Proposition 1). This result finds support from previous research which has shown that “25 percent of customers state that price does not matter if they are buying a brand that owns their loyalty,” (Davis, 2002, p.5). In fact, if \( B \) is able to cultivate a strong brand equity for its product, it can even price its product higher and earn higher margins. The Lincoln Navigator Starbucks represents an example of a strong brand driving a price premium over its competitor the Ford Expedition although both share the same popular SUV platform (Davis, 2002).

**Outsourcing Decision of \( B \) in Period 1**
Intuitively, one expects \( B \) to outsource completely from Period 1 onwards if it is more cost effective to do so. However, faced with the outsourcing paradox, \( B \) may actually be better off in the long run if it were to produce in-house (at least partially) from Period 1 so as to benefit from any learning, provided that the rate of learning is sufficiently substantial. In this case, any risk of increased competition and thus profit erosion in Period 2 can be partially eliminated. In fact, if the rate of learning is very high, \( B \) will actually find it beneficial from a long-term perspective not to outsource at all (despite the cost advantage in Period 1). This is because the long-term cost efficiency that can be achieved by Period 2 as a result of the amount of learning in Period 1 from producing in-house entirely far outweighs any short-term cost savings in Period 1. We summarized the foregoing in the proposition below.

**Proposition 4**

If \( B \)’s rate of learning is very high, \( B \) produces everything in-house from Period 1 and does not adopt any outsourcing strategy at all. \( B \) is eventually able to achieve greater cost efficiency than outsourcing by Period 2.

From the above proposition, we therefore deduce that if \( B \) is able to achieve a very high rate of learning, then brand equity does not play any direct role in the outsourcing strategy of \( B \), unlike the cases which we will see below, when the rate of learning is not very high.

When \( B \)’s rate of learning is not very high to warrant complete in-house production from Period 1 but nonetheless high enough, then \( B \) may find it beneficial to adopt a partial outsourcing strategy in Period 1, i.e., \( B \) chooses to outsource a portion of the demand while produces the remaining portion in-house. For example, Proctor & Gamble outsourced only about a third of its innovation functions to outside parties (Nitin, 2005). This strategy allows \( B \) to take advantage of the cost savings from outsourcing on the one hand, and to mitigate the risk of future competition from outsourcing on the other. This is because while producing in-house, \( B \) is able to achieve some learning, which in turn reduces its production cost in Period 2. In adopting such a “mixed” strategy of make-and-buy, \( B \) chooses an optimum portion to produce in-house such that the learning achieved will enable \( B \) to be more cost effective than \( S \) in Period 2, thus adopting a pure in-house production in Period 2. Together with Proposition 1, we have the following result.

**Proposition 5**

If \( B \)’s rate of learning is high, \( B \) will combine outsourcing and in-house production in Period 1. The amount of in-house production in Period 1 is chosen such that \( B \) will be more cost efficient than \( S \) in Period 2, so there is no outsourcing in Period 2.
The above proposition is an illustration of how a plural form strategy of make-and-buy can be optimum for $B$. This is in contrast to prevailing literature that has so far concentrated on make or buy. One can gamely interpret the make-and-buy strategy as an interim one, whereby $B$ benefits from the cost efficiency of the supplier on the one hand, and on the other hand, has an opportunity to acquire sufficient learning by producing in-house in Period 1. The latter motivation is no doubt to build up its production capability, with the eventual aim of switching to producing in-house eventually.

However, as we have seen earlier, adopting an outsourcing strategy in Period 1 opens up the possibility of downstream market entry by $S$ in Period 2 to compete with $B$ directly. For example, Canon used to provide the cartridges for Hewlett-Packard’s very successful laser printers (Johansson, 1997). Without this amount of substantial learning by doing, Cannon may not subsequently be able to market its own printers with success and compete in the same downstream market as Hewlett-Packard. Perhaps if Hewlett-Packard had realized the long term impact of such learning, it might not have outsourced to Cannon in the first instance. In order to reduce this potential threat, $B$ will have to improve on its brand equity to ensure that even if $S$ can obtain a positive profit margin in the market, the loss in market share (and thus profitability) will not be significant. Perhaps this explains why Proctor & Gamble (who outsourced a third of its innovation functions) is able to hold its market share against its competitors given its heavy investments in building up its brands into “Billion Dollar” brands. It is reported that to-date it has 12 “Billion Dollar” brands in its portfolio representing more than half of its annual sales and earnings (see Proctor & Gamble’s Web site at www.pg.com.). In other words, although the brand equity of $B$ plays no direct role in the outsourcing strategy of $B$ when the rate of learning is high (Proposition 5), it does however provide a cushion against potential entry by $S$.

When $B$’s rate of learning is moderate such that the learning acquired from its production in Period 1 is insufficient for $B$ to become more cost efficient than $S$ by Period 2 but is sufficient for $B$ to be more cost efficient than any new supplier in the open market, $B$’s production decision depends on its brand equity. This is because in this case $S$ will always enter the downstream market in Period 2 (Proposition 1). If the brand equity is high, $B$ will outsource in both periods and $S$ will continue to produce for $B$ in Period 2. For instance, after Colgate established itself as a premium brand of toothpaste in China, it later became the top oral care company in China by cutting costs through outsourcing its toothpaste production to local manufacturers (Chen and Vijay, 2005). However, if the brand equity is low, $B$ will want to produce a portion of the demand in Period 1 in-house so as to improve its cost efficiency by Period 2 as $S$ will not continue to supply $B$ then as stated in Proposition 2. Summarizing, we have the following results.

**Proposition 6**
If $B$’s rate of learning is moderate, $S$ always enters the downstream market in Period 2. (i) If the brand equity is high, $B$ will outsource in both periods and $S$ continues to produce for $B$ in Period 2; (ii) If the brand equity is low, $B$ will combine outsourcing and in-house production in Period 1. The amount produced in-house in Period 1 is such that $B$ though remains less cost efficient than $S$ in Period 2 is more cost efficient than any new supplier so that $B$ produces in-house entirely in Period 2 as $S$ will not produce for $B$ by then.

As before, the make-and-buy strategy in Period 1 in Proposition 6(ii) allows $B$ to benefit from cost efficiency of the supplier on the one hand, and on the other the opportunity to acquire sufficient learning by producing in-house.

Finally, we consider the case when $B$ has a low rate of learning such that not only is it not able to achieve a similar level of cost efficiency like $S$ in Period 2, it remains less cost efficient than any new supplier in the open market. Under such circumstances, $S$ will always enter the downstream market in Period 2 (Proposition 1). If the brand equity is high, $B$ will outsource from Period 1 and $S$ will continue to produce for $B$ in Period 2. One good example is Coca Cola in China, who outsourced from day one its manufacturing and bottling totally to local bottlers in China to cut its production, marketing and distribution costs so as to compete with the low cost local brands (Chen and Vijay, 2005).

However, in view of the outsourcing paradox that $B$ faces, $B$ will have to improve on its brand equity to minimize any entry threat by $S$. According to the same report, Coca Cola now sells more than 20 different drinks in China at prices slightly higher than local brands, its flagship Coke brand sells for 10 to 15% more than the most popular brands of cola in China, and Coke sells more than half of all carbonated soft drinks in China generating more than $2 billion revenue in 2003 (Chen and Vijay, 2005). That Coca Cola is able to achieve this could largely be due to its investment in the brand, which is now valued at more than $47 billion (Davies, 2002).

If however, the brand equity is low, then we know from Proposition 1 that $S$ will not produce for $B$ in Period 2 once it enters the downstream market. Thus $B$’s production decision in Period 1 depends on the rate of learning of $S$ as the latter is a potential competitor in Period 2. If $S$’s rate of learning is high, $B$ adopts a mixture of outsourcing and producing in-house in Period 1 but will outsource to a new supplier in Period 2. This is to ensure that $S$ will not be too cost competitive once it enters the downstream market in Period 2 as a competitor. If $S$’s rate of learning is low, $B$ will outsource entirely in both periods, albeit to different suppliers. This is because the threat of entry by $S$ is deemed to be weak by $B$. We summarize the results in the following proposition.

**Proposition 7**
If B’s rate of learning is low, S always enters the downstream market in Period 2. (i) If the brand equity is high, B will outsource in both periods while S continues to produce for B in Period 2; (ii) If the brand equity is low, S will not continue to produce for B in Period 2 and B needs to outsource to a new supplier. Furthermore, if S’s rate of learning is high, B combines outsourcing and in-house production in Period 1, and if S’s rate of learning is low, B will outsource from Period 1.

Propositions 6 and 7 also imply that the brand equity, as a firm-level dynamic capability (Winter, 2003) plays an important role in the outsourcing decision of B. There are two aspects to this: When the rate of learning of B is at best moderate, a high brand equity allows B to maintain a relatively large market share in Period 2 despite entry by S and further ensures that S will continue to produce for B even if it decides to enter the downstream market in Period 2. In this way, B is able to benefit from the learning achieved by S in Period 1.

We can see from our results so far that brand equity plays an important role in the formulation of the buyer’s outsourcing strategy. More specifically, these results imply that strong brand equity serves as a safeguard against supplier opportunism in terms of downstream market entry. Much as the value of brand equity has been extensively studied in the literature (for example, Aaker (1991), Aaker and Keller (1990), Agrawal (1996), Broniarczyk and Alba (1994), Farquhar (1989,1990), Feldwick (1996), Keller (1993), Loken and Roedder-John (1993), Park et al. (1991), Raju et al. (1990), Randall et al. (1998), and Wernerfelt (1991) have written extensively about the concept of brand equity and about how to build, manage, and extend it), this is the first paper that explicitly highlights the role of brand equity in a firm’s outsourcing strategy.

Finally, as we have seen in all our results above, the buyer’s rate of learning is an important parameter in the formulation of its outsourcing strategy. This is in line with existing literature (e.g., Conner and Prahalad (1996), Kogut and Zander (1992), (1996), Poppo and Zenger (1998)), which expounds that firm-specific knowledge plays a valuable role in integration decisions. A summary of the equilibrium outsourcing strategies is given in Figure 2.

[Insert Figure 2 Here]

4. DISCUSSION AND CONCLUSION
This article presents an alternative perspective on supplier opportunism in outsourcing by proposing that the supplier could present itself as a direct competitor once sufficient learning has been achieved. To the best of our knowledge, this is the first instance where supplier opportunism has been portrayed in this form. Such consideration suggests that a firm needs to adopt a long-term perspective when
considering its outsourcing strategy lest the supplier eventually decides (optimally) to bite the hand (the buyer) that used to feed it.

Along with traditional TCE literature, our results showed that ordinary capability modeled as the rate of learning is an important factor in determining one’s outsourcing strategy. More specifically, a firm with a very high rate of learning should trade off short term cost advantage that comes with outsourcing to build up its long term cost advantage as soon as possible. In this instance, there is no outsourcing at all and the firm produces everything in-house. Alternatively, a firm with a high rate of learning can capitalize on the benefit of the outsourcing opportunity by adopting a plural form strategy of make and buy with the view to improve on its cost efficiency along the way. In these instances, the supplier poses no threat as a direct competitor as the buyer as the buyer can achieve cost efficiency in a short time.

However, our work extends beyond the traditional TCE literature by illustrating that dynamic capability expressed as brand equity in our model complements ordinary capability in the determination of a firm’s outsourcing strategy. Our results showed that when the buyer’s rate of learning is moderate or low, the supplier always enters the same downstream market at some point in the future to compete directly with the buyer. The negative effect of the supplier’s entry can be mitigated if the buyer has a high brand equity in that the supplier will continue to supply the buyer despite its entry as its market share in the downstream market is limited due to the high brand equity of the buyer.

Although we consider a 2-period model in our analysis, the results can be generalized to a multi-period one, where Period 1 can be interpreted as the initial period while Period 2 is the final period, where long-term stability has been achieved. The above results can also be generalized to situations in which the buyer is not a monopoly initially. For simplicity of exposition, we have also assumed complete information in our game model. This assumption does not in any way compromise the essence of our results. Clearly, our theoretical model has some limitations. In our model, we assume that the buyer chooses at most one supplier for outsourcing in each period. Although multiple outsourcing suppliers are possible, it has been highlighted that goal differences, lack of proper relationship management, and failure to arrive at a common understanding about quality standards are common problems hindering successful outsourcing (Weidenbaum, 2004). These problems will be magnified in the case of multiple outsourcing suppliers. Hence, for ease of exposition, we have considered the case of one supplier. How multiple outsourcing partners with their associated coordination issues can change the overall outsourcing strategy is thus beyond the scope of this
research. Finally, our model has provided some directions for hypotheses development and testing regarding the outsourcing strategies of firms.

Theoretically, this paper contributes to the outsourcing literature by providing an alternative framework that incorporates both traditional TCE considerations and firm-level capabilities. In particular, our consideration of a firm’s dynamic capability in terms of its ability to create and deploy brand equity is in line with Williamson’s (1999) call to examine governance choice by taking into consideration a firm’s pre-existing core-competencies and disabilities. Our game theoretic framework which examines the firm’s outsourcing decision in a multi-period time frame also addresses the criticism that extant literature focused only on relatively short time spans (Jacobides and Winter, 2005).

We can derive several managerial implications from this research. Our research shows that firms should adopt a long term perspective towards outsourcing and not focus only on the short term cost saving benefits. It was reported that a survey of large firms worldwide showed only 10% of them are satisfied with the cost savings arising from outsourcing and only 6% are highly satisfied with outsourcing overall, and this low level of satisfaction had been attributed to the fact that companies had been making sourcing decisions on a piecemeal basis and did not develop a comprehensive sourcing strategy (Gottfredson et al., 2005). This long term perspective requires the firm to take into consideration factors shown in our outsourcing strategies framework (see Figure 2). It has been said that “[f]inding more qualified partners to provide critical functions usually allows companies to enhance core capabilities that drive competitive advantages in their industries,” (Gottfredson et al., 2005). An example given was American Express which outsourced its transaction processing function which is its strategic capability (you need reliable and efficient processing capability to make money in the credit card business) and for which it enjoys considerable scale economies (Gottfredson et al., 2005). Such a move was said to give American Express additional scale advantages ability to focus on the other aspects of the credit card business and enhance its other core competencies. Our research supports this call for strategic outsourcing by showing that it can be optimum, under certain conditions, for a firm to adopt a complete outsourcing strategy. For instance, as shown in Figure 2, if the buyer’s rate of learning is low but it is able to create a high brand equity in its favor, the buyer would be able to outsource completely eventually even if $S$ enters the downstream market. Our outsourcing strategies framework also shows that firms could adopt a flexible outsourcing approach: the possibility of in-house production and partial outsourcing initially followed by either in-house production or outsourcing eventually. As shown in Figure 2, if the buyer’s rate of learning is high, the buyer could adopt a strategy consisting of a combination of outsourcing and producing in-house simultaneously initially. In this case, the amount produced in-house initially should be that which enables the buyer to
produce in-house only subsequently because it has then become more cost efficient than S. The
Harley-Davidson case is a good example of this strategy. It was reported that new production
techniques and just-in-time stock control has made Harley-Davidson so efficient that many of the
components that it formerly subcontracted are now once again made in-house (The Economist,
November 25, 1995). Harley-Davidson would not be able to revert to in-house production if it has not
been performing some of the outsourced function simultaneously and if there is no learning taking
place. The flexible outsourcing strategy alternative derived in our framework is in line with what the
Bain consultants proposed as “dynamic sourcing” (Gottfredson et al., 2005). By adopting a sourcing
strategy that takes into account future alternative scenarios (which our interactive framework allows a
company to do so) firms will be able to pursue sourcing opportunities that might not be highly
attractive based on current numbers but could offer dramatic benefits in the longer term. This also
means that firms may negotiate short-term sourcing contracts to keep options open rather than enter
into long term relationships.

While extant literature has proposed that monitoring, pledges, reputation, multiple outsourcing
and relationship commitments could be used to safeguard against supplier opportunism in terms of
transferring or salvaging specific learning or assets from one buyer to another, these measures cannot
adequately address the form of supplier opportunism in terms of downstream market entry highlighted
in this paper. Our framework suggests that building a strong brand equity could be used to safeguard
as well as to mitigate this particular form of supplier opportunism. Another important managerial
implication of our work lies in the recognition that outsourcing cannot be treated as a stand-alone
decision but is an integral part of a firm’s business strategies, particularly its marketing strategy of
which branding is a major consideration. Brand equity is about meeting customers’ expectations and is
an important way to differentiate one’s product. Outsourcing to a supplier may dilute a firm’s brand
equity through the loss of product differentiation arising from opportunistic downstream market entry
by the supplier. Brand building is therefore an important activity that the buyer should invest in as it
gives the buyer the ability to produce a preference structure in favor of its product in the market place.
This favorable preference structure in terms of strong brand equity may help to insulate the buyer’s
brand from me-too brands, and therefore successfully defend against the incumbent supplier’s entry
into its downstream market as a result of buyer’s outsourcing strategy. Hence, the ability of the firm in
building up brand equity is important in the outsourcing decision.

In conclusion, we suggest here that outsourcing can be a viable option for a company. However,
it is important that the buyer fully understands and mitigates the long term cost of outsourcing in terms
of the threat of downstream market competition from the supplier as a result of its outsourcing
experience. In short, the outsourcing option should be exercised with the same caution as when one is dealing with a dog that bites the hand that feeds.

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### Figure 1

**Schematic Representation of Outsourcing Model**

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Stage 2</td>
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</table>

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buyer (B) determines price of product $P_1$ and outsourcing strategy $\alpha_1$.</td>
<td>B and Supplier (S) negotiate over price for outsourcing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S decides whether or not to enter the downstream market where B sells to.</td>
<td>B decides on outsourcing strategy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>S decides whether to continue outsourcing service for B.</td>
<td>B and S negotiate over price for outsourcing.</td>
<td>If S had decided to enter the market in Stage 1, B and S determine price of product in the downstream market. If S had decided not to enter the market in Stage 1, B determines price of product in the downstream market.</td>
</tr>
</tbody>
</table>

### Figure 2

**Summary of Outsourcing Strategies**

<table>
<thead>
<tr>
<th>High Brand Equity</th>
<th>Low Brand Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very High Rate of Learning</strong></td>
<td>Produce in-house only from the beginning.</td>
</tr>
<tr>
<td><strong>High Rate of Learning</strong></td>
<td>Produce in-house and outsource at the same time initially; Produce in-house only eventually; Incumbent supplier enters the market subsequently if profit margin is positive.</td>
</tr>
<tr>
<td><strong>Moderate Rate of Learning</strong></td>
<td>Outsource from the beginning; Incumbent supplier enters the market subsequently but continues to produce for the buyer.</td>
</tr>
<tr>
<td><strong>Low Rate of Learning</strong></td>
<td>Outsource only from the beginning; Incumbent supplier enters the market subsequently but continues to produce for the buyer.</td>
</tr>
</tbody>
</table>