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Production costs, scope economies, and multi-client outsourcing under quantity competition

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ABSTRACT

Two game models are developed based on production costs and scope economies to investigate the widely observed multi-client outsourcing (MCO) phenomenon. Analytical results demonstrate that outsourcers' high in-house production costs and the advantage of scope economies motivate firms to outsource collectively to an independent vendor. Under certain conditions, if both firms make their outsourcing decisions simultaneously, collective outsourcing is one of the two equilibria; if both firms make decisions sequentially, collective outsourcing becomes the unique equilibrium. Furthermore, the comparative statics of the critical degree of scope economies are examined for the occurrence of MCO with regard to diverse market parameters. Finally, it is proved that market prices decrease as the degree of scope economies increases when MCO occurs. This research helps explain some widely observed phenomena such as malls, supply chain cities, and the China price.

1. Introduction

A value chain can usually be divided into several components such as design, manufacturing and marketing departments, with each handling a special (operational) function. However, it is not necessary for a firm to own all these functional departments. Instead, the firm may outsource one or more of these functions to an outside vendor. When two or more firms outsource to a same vendor, MCO (one vendor vs multiple clients) is observed (Sharma and Yetton, 1996), which is sometimes referred to as co-sourcing (e.g. Gallivan and Oh, 1999). Without causing confusion, we always use "firms" to represent companies that seek potential outsourcing opportunities and let "vendor" denote the company that provides outsourcing services.

MCO is widely observed in this era of increasingly competitive and globalizing economies. For example, firms in different industries turn their information systems over to relatively few computer companies such as IBM (Dibbern et al., 2004), and more and more firms now outsource their logistics needs, resulting in the rapid growth of the third-party logistics business (Berglund et al., 1999; Stefansson, 2002). Recently, the newly observed supply chain cities, located in Guangdong, China, can also be viewed as an outcome of MCO where several world-renowned apparel companies such as Polo Ralph Lauren, Liz Claiborne and Dillard's, and Fast Retailing outsource their production functions to Luen Thai Holdings Ltd. (Kahn, 2004; Kusterbeck, 2005). Even at the macro level, the observation that many multi-national companies in developed countries are moving their manufacturing facilities to developing countries such as China can also be treated as MCO.

Academia, business professionals, and even government officials have been extensively discussing the increasing trend of outsourcing manufacturing to China.

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As a direct consequence, products labeled both "Made in China" and a western brand are widely available in the marketplace and usually sold at a much lower price. The lower price is coined as "the China price" by Engardio et al. (2004) in a Business Week's special report. The China price implies that US companies that manufacture in the United States must reduce their costs by at least 30 percent. Otherwise, they will lose their market to Chinese-made products.

Lower labor cost is considered as a classical account for the China price. However, Engardio et al. (2004) challenge this interpretation by pointing out that direct labor only contributes to less than 10% of total costs for sophisticated electronics. Nevertheless, Chinese-made products still hold a considerable competitive advantage. To investigate other possible factors, Bhattacharya et al. (2004) empirically cite lower capital-investment costs, lower domestic-sourcing costs, greater economies of scale, and government incentives. Wu et al. (2006) argue that lower labor costs by themselves are not necessarily transformed into lower product prices. Following the idea of industrial clusters (Porter, 1998), they propose that supply chain clusters play a central role in the transformation process, where most of the (vertically and/or horizontally) interrelated supply chain activities are geographically located nearby.

Porter (1998) claims that cluster members are entitled to utilize a "common glue" to realize extra economic values. The common glue takes the form of social networks (Porter, 1998; Gordon and McCann, 2000), integrated knowledge (Morosini, 2004), input resources, and innovation incentive mechanisms, to name a few. In short, a cluster creates a common platform that facilitates its members to improve productivity.

If the common platform is provided and owned by an economic agent, it is reasonable to argue that the firms in a cluster are factually outsourcing to the agent and the nature of the cluster is simply an outcome of MCO.

From an economics perspective, the improvement of productivity via MCO can be interpreted in terms of both scope and scale economies: sharing and jointly utilization of inputs (Panzar and Willig, 1977, 1981; Bailey and Friedlaender, 1982). However, as all functions are unlikely to increase or decrease proportionally, the concept of ray scale economies is not applicable in a strict sense. Instead, scope economies are a more appropriate vehicle as it does not require proportional change of inputs. Therefore, we will investigate how firms take advantage of scope economies to improve productivity and examine the impact of MCO on market prices.

Consider two competitors who seek potential outsourcing opportunities and a vendor that possesses a technology characterized by a parameter representing the degree of scope economies to perform outsourced functions. Following the same idea of Cachon and Harker (2002) and van Mieghem (1999), it is assumed that the vendor only provides outsourcing services and does not sell end-products to consumers directly. The vendor moves first to decide whether to offer an outsourcing service schedule to provide the contemplated outsourcing services.[1] Then the two firms move simultaneously (or sequentially) to make their outsourcing decisions of the make-or-buy type. Finally the two firms compete in a final market. In the game theory terminology, a three-stage (or four-stage) game model has been built and the concept of subgame perfect equilibrium will be employed to examine the game.

Following the line of transaction cost theory (TCT) (Coase, 1937; Williamson, 1975; Cheung, 1983; Grossman and Hart, 1986; Hart and Moore, 1990), researchers have focused on single-client (one vendor versus one client) outsourcing decisions modeled as make-or-buy problems,[2] which are typically treated as a cost–benefit analysis. The trade-offs between in-house production and outsourcing may theoretically be treated as comparison of agency costs among different information structures (Sridhar and Balachandran, 1997), of incentive effectiveness due to asset specificity (Chalos and Sung, 1998), or of transaction costs based on two-sided informational asymmetry (Whang, 1992). Osie-Bryson and Ngwenyama (2006) develop a system of practical methods and tools to quantify outsourcing risks and benefits and, then, to structure incentive contracts. To this end, the single-client framework has been well explored.

However, very few formal studies address MCO even if it has been widely observed and conceptually analyzed by some authors.[3] Cachon and Harker (2002), with a game model of two-firm full-price competition under scale economies, prove that collectively outsourcing (resulting in a constant marginal cost) mitigates price competition and, then, makes both firms better-off while in-house production with scale economies (resulting in a decreased average cost) raises price competition. They thus conclude that scale economies provide a strong motivation for outsourcing. Dube et al. (2007) examine a simpler version of Cachon and Harker (2002) where scale economies do not exist. They point out that the cost saving (the in-house production cost minus the outsourcing cost) drives firms to outsource.

Our model focuses on examining another motivation: the combination of high in-house production costs and the advantage of scope economies. We try to explain the occurrence of MCO and investigate its impact on market prices. This model is different from that in Cachon and Harker (2002) in three aspects: Firstly, firms here compete in the final market through *quantity* rather than *price*.[4] Secondly, firms here attempt to proactively *take advantage of* scope economies via MCO while, in Cachon and Harker (2002), firms tend to *avoid* their in-house scale economies by outsourcing to a vendor at a constant wholesale price so as to mitigate price competition. Thirdly, MCO leads to

[1] For simplification, we assume that the vendor's infrastructure is available for use and the setup cost is neglected.

[2] For a more detailed literature survey on outsourcing, see Dibbern et al. (2004).

[3] See, for example, Sharma and Yetton (1996) and Gallivan and Oh (1999).

[4] Competing on quantity or price is generally regarded as two alternative rules for market competitions. It is generally accepted that the latter is fiercer than the former. We take the milder one because it entitles us to explore more details about how MCO takes advantage of scope economies and leads to lower market prices.