1. Introduction

While considerable theoretical work exists in supply chain literature on the impact of information sharing between firms, the ability of the Internet to facilitate the integration of information across the extended enterprise has not received enough empirical validation. The ‘bull whip effect’ (e.g., Lee et al 1997) whereby supplier orders show greater variability than the variability in consumer demand results from coordination problem such as imperfect forecasting, rationing and order batching. In this paper, we argue that advances in information technology (IT) that improve coordinated information exchange between firms result in a significant impact on measures of operational efficiency such as time to market, inventory turnover, and order delivery cycle time.

Researchers have studied the impact of information sharing initiatives such as sharing point of sale data between manufacturer and retailers (e.g., Kulp et al 2004) and electronic data interchange (EDI) on operational performance including reduced cycle time and improved quality (e.g., Clemons et al. 1993). However, sophisticated information technology can create problems as well as gains in inter firm collaboration. Experimental evidence points to the fact that information sharing between firms is not necessarily beneficial (Steckel et al 2004). Information can become systematically distorted as it is passed along the supply chain (Lee et al 1997) due to imperfect coordination between buyers and sellers. In the absence of credible commitments between supply chain partners information sharing can hurt supply chain performance. Evidence reveals that lack of incentives to share information, and concerns about integration costs and loss of bargaining power (Barua et al, forthcoming) can stymie firms’ efforts to use electronic commerce. To align the incentives of suppliers and firms
to obtain the benefits from sharing information, we draw upon supply chain management literature in conceptualizing the collaboration practices between firms.

Our cross sectional dataset allows us to test whether sharing specific pieces of information, for instance, sharing information about defect rates, will impact different operational measures differently.

2. Hypotheses

Information sharing

Unlike traditional supply chains where the only information exchanged between participants are the orders, advances in IT make it possible for firms to exchange information on a variety of parameters such as demand and inventory related information, process quality information, feedback from customers etc. Information-gathering techniques such as efficient customer response provide visibility into consumer demand lessening the bullwhip effect (Lee et al 1997). Firms that coordinate information exchange with supply chain participants and rely on IT mediated supply chain arrangements such as just in time production (JIT) and vendor managed inventory (VMI) experience increased profits, lower costs and efficient operations (Kulp et al 2004). Forecast sharing and collaboration have been found to reduce inventories and improve resource utilization in the supply chain. Mukhopadhyay and Kekre (2002) provide evidence that electronic data interchange provides substantial operational and strategic benefits to both customer and suppliers.

HYPOTHESIS 1. Information sharing has a positive impact on operational performance measures

Since the design of a supply chain influences the variability of inventory orders (e.g., Cachon and Zipkin 1999), sharing information results in better performance only when
the supply chain design does not allow other mechanisms such as risk pooling (Moinzadeh 2002).

**HYPOTHESIS 2. Information sharing has a greater impact on operational performance the greater the order delivery time**

Sharing of information has differential impacts on different members of the supply chain. For instance, experimental studies have found that sharing information reduces order variability among upstream members of the supply chain (i.e., manufacturers and distributors) rather than at downstream levels (i.e., between retailers and their wholesalers) (e.g., Croson and Donohue 2003). The literature finds support for the notion that upstream members gain more from information sharing than downstream members (e.g., Cachon and Fisher 2000). Since our dependent variables depend on supplier ordering behavior we hypothesize that:

**HYPOTHESIS 3. Information Sharing has a greater impact on upstream firms in the supply chain (i.e., manufacturers) compared to downstream firms (retailers)**

**Collaboration**

Prior research highlights that isolated initiatives such as EDI may not lead to a significant advantage for firms. When a buyer shares forecast information without commitment, suppliers act conservatively when commencing orders and this undermines the effectiveness of the overall forecast sharing mechanism (Cohen et al 2003). The literature on EDI posits that firms can improve operational performance when business processes are changed along with the implementation of technology (Mukhopadhyay and Kekre 2002).

**HYPOTHESIS 4. Collaboration has a positive impact on operational performance**

**External Information Awareness**

Mendelson (2000) posits that in fast moving, information rich environments it is necessary for the organization to develop awareness about the external environments and assimilate knowledge of customer preferences within the organization. Rapid information assimilation of customer preferences improves the business value of electronic integration with suppliers (Barua et al, forthcoming; Kulp et al 2004) and increases the gains from information sharing.
HYPOTHESIS 5. *External information awareness when combined with information sharing has a positive impact on operational performance*

3. Empirical approach

For brevity, we leave out the details of our measure development and data collection. Details of the survey methodology and measure development are available from the authors upon request. Our empirical approach relies on analysis of information sharing at a disaggregated level (an approach similar to that used in the personnel economics literature, see Ichniowsk et al 1997, and Black and Lynch 2001). Our dataset offers a lot of detail into micro level variables within a firm, which allows us to control for firm level differences and the impacts on supply chain performance.

Our study makes three new contributions to the literature. While the theory suggests that information sharing is beneficial, evidence shows that this need not be the case (e.g. Steckel et al 2004). By focusing on a sample of manufacturers as well as retailers, we can analyze the differential impact of information sharing across the supply chain. Disaggregating the level of analysis allows us to test whether upstream and downstream participants in the supply chain weigh information differently. Previous research has posited that information exchange occurs when there is a high degree of collaboration between firms (Bensaou and Venkatraman 1995); we study the joint impact on operational performance. We find that information sharing on a number of dimensions such as product demand, inventory and capacity information, feedback and quality, etc has significant impact on operational performance measures when combined with coordination between supply chain partners. Our results provide support for theoretical models in supply chain management that sharing information alone cannot reduce the bullwhip effect (e.g., Gavirneni et al 1999).

Our study offers several opportunities for future research. Since our research looks at cross-sectional data, an extension would be to look at panel data to analyze how trust between partners impacts long term collaboration. Since the bullwhip effect can result from participants’ own cognitive limitations (Croson and Donohue 2003), future research can incorporate behavioral biases and the extent to which information sharing can mitigate some of these biases.

REFERENCES