



An empirical study of manufacturing flexibility of exporting firms in China: How do strategic and organizational contexts matter?

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Abstract

Using evidence from exporting firms in China, this research aims to determine the conditions that foster manufacturing flexibility and the way in which firms support it. The contingency perspective and the competence and capability theory are utilized to develop a framework to enhance the knowledge of internal competence, external flexibility, and manufacturing performance, and the understanding of the moderating roles of strategic and organizational choice on the competence–flexibility and flexibility–performance relationships. Empirical evidence from a sample of 222 export product/market ventures confirmed the main effect that manufacturing, assembly outsourcing, and marketing competencies support a firm's manufacturing flexibility and in turn enhance manufacturing performance. Several notable moderating effects were also identified. Although a strategic emphasis on low-cost manufacturing and long-term contracting *weakens* a firm's transformation of core competencies into flexible capabilities, specific organizational choices regarding private ownership and direct exporting *strengthen* the conversion of manufacturing flexibility to superior manufacturing performance.

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1. Introduction

Since China's accession to the World Trade Organization in 2001, there has been a rapid inflow of foreign direct investment into the country, and multinational enterprises have been eager to establish production bases in China to serve regional and world markets. These phenomena have not only earned China the status of "factory of the world," but have also led the country to become the world's third largest exporter (WTO, 2005). However, in addition to macro development in the manufacturing sector, it is vital that individual manufacturing firms in China have the ability to compete on cost, quality, and flexibility. In general, manufacturers face an increasingly uncertain external environment as the rate of change in customer expectations, global competition, and technology accelerates (Claycomb, Droege, & Germain, 2005). Manufacturing managers contend that *manufacturing flexibility* is the strategic imperative that enables firms

to cope with uncertainty and maintain high performance (Gerwin, 1993a,b; Matthysse, Pauwels, & Vandebemt, 2005; Slack, 2005). However, marketing researchers have not explored the impact of manufacturing flexibility on the performance of exporting firms in China.

Manufacturing flexibility, which is the focus of this study, refers to the ability to meet increasingly varied customer expectations without incurring excessive costs, time, organizational disruption, or loss of performance. Two themes in the literature on manufacturing flexibility are of particular relevance to this research: knowledge of the antecedents of manufacturing flexibility and the conclusions that have so far been drawn about the impact of manufacturing flexibility on manufacturing performance.

In terms of the former, although key structural and infrastructural influences such as advanced manufacturing technology and labor (Boyer, Leong, Ward, & Krajewski, 1997; McDermott, Greis, & Fischer, 1997; Safizadeh, Ritzman, Sharma, & Wood, 1996; Upton, 1995, 1997) have been identified as antecedents of manufacturing flexibility, few

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studies have looked beyond advanced manufacturing technology to investigate the antecedents of manufacturing flexibility (Narasimhan, Talluri, & Das, 2004). It has been suggested that future studies should consider using more broadly measured structural attributes to account for manufacturing flexibility (Vokurka & O'Leary-Kelly, 2000). Using the competence and capability theory (Prahalad & Hamel, 1990; Stalk, Evans, & Shulman, 1992; Teece, Pisano, & Shuen, 1997) as a basis, Zhang, Vonderembse, and Lim (2003) reported a significant relationship between internal manufacturing competencies and external flexibility capabilities. This study aims to extend their framework to examine the relationship between manufacturing flexibility and various internal competencies, namely, manufacturing, assembly outsourcing, and marketing competencies.

The holistic framework of Gerwin (1987, 1993a,b) posits a direct line of causation between external or operational uncertainties and manufacturing flexibility. However, this study suggests that Gerwin's framework may not work for all firms, because companies do not and cannot obtain identical degrees of flexibility by adopting the same competencies. This study instead proposes a model that utilizes strategic positioning constructs as moderating effects in a causal model of the relationship between internal competencies and manufacturing flexibility. According to Narasimhan et al. (2004), an important step toward a more fulsome understanding of internal competencies would be a detailed examination of the facilitating effects of moderating variables on the internal competence-manufacturing flexibility relationship. This study serves to develop such an understanding with particular regard to the requirements for manufacturing flexibility that are imposed by the strategic choices of a firm.

In terms of the impact of manufacturing flexibility on manufacturing performance, two competing models have emerged: those that suggest a direct relationship and those that propose a moderated relationship (Vokurka & O'Leary-Kelly, 2000). Although some studies (Swamidass & Newell, 1987; Vickery, Droke, & Markland, 1997) have found a significant positive relationship between production flexibility and financial performance, others (Fiegenbaum & Karnani, 1991) have found the flexibility-financial performance relationship to be moderated by firm size. Gupta and Somers (1996) reported a direct relationship between flexibility and growth performance, whereas Parthasarthy and Seith (1993) found the flexibility-growth performance relationship to be moderated by several variables of strategy (such as those involving scope, quality, and cost) and structure (such as skill specialization and the use of teams). This conflicting evidence highlights the need for more research in this area. Accordingly, this study aims to determine whether the relationship between manufacturing flexibility and performance in China is contingent upon structural context, that is, state-owned versus private-owned enterprises, and market entry strategy, that is, domestic agency versus foreign agency.

The main objective of this study is to investigate the direct effect of internal core competencies on manufacturing flexibility. A second objective is to determine the contingency effect of strategic positioning on the competence-flexibility relationship, and a third objective is to examine whether some firms are more effective than

others in converting their flexibility into higher levels of performance. The outcomes of these objectives will have important implications for managers who are tasked with identifying the drivers that assist firms to better leverage their capabilities.

The remainder of this paper is organized as follows. Section 2 reviews the literature on conceptualizations of manufacturing flexibility. The conceptual model is proposed and described in Section 3. The data collection and analyses are discussed in Sections 4 and 5, and the managerial and research implications are presented in Section 6.

2. Review of conceptualizations of manufacturing flexibility

Manufacturing flexibility is a complex, multidimensional concept that has evolved over time. Many classifications of flexibility types have emerged, which can be distinguished by whether they classify flexibility according to the ability to change operations management activities, or by its nature (Slack, 2005). The literature appears to be split between researchers from the engineering school, who tend to focus on the flexibility of alternative process technologies or the arrangements of technology, and those from the business school, who tend to focus on flexibility to meet customer needs, or customer-facing capabilities. For instance, the most widely recognized typologies for the classification of different dimensions of manufacturing flexibility (Browne, Dubois, Rathmill, Seith, & Stecke, 1984; Gupta & Somers, 1992; Seith & Seith, 1990) all define manufacturing flexibility as the ability of an organization to change operations management activities both economically and effectively given a certain capacity (such as machine flexibility, materials handling flexibility, routing flexibility, product variety flexibility, and production volume flexibility). In contrast, business researchers have classified manufacturing flexibility by value-enhancing offerings that can be appreciated by customers. Slack (1987), for instance, identified range flexibility and response flexibility, Upton (1994) distinguished levels of flexibility by the number of products produced (range flexibility) and the amount of time required (mobility flexibility), and Zhang et al. (2003) emphasized the external customer-facing capabilities of product mix flexibility and production volume flexibility.

In an attempt to synthesize the literature, business researchers have built a conceptualization of manufacturing flexibility that is based on Grant's capability theory (1991), in which manufacturing flexibility is conceived as "the capability for a team of resources to perform some task or activity" (Grant, 1991). As an extension of the conceptualization of manufacturing flexibility as a kind of internal resource or capability, business researchers have adopted the core competence theory of Prahalad and Hamel (1990), which holds that manufacturing flexibility embodies "the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies...that should make a significant contribution to the perceived customer benefits of the end product" (Prahalad & Hamel, 1990).

This study adopts a comprehensive business perspective, rather than a partial engineering perspective, of manufacturing

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