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## Inventory improvement and financial performance

Alan R. Cannon\*

The University of Texas at Arlington, Box 19437, 701 S. West Street, Arlington, TX 76019-0437, USA

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### ABSTRACT

This research reviews two contrasting views on the robustness of inventory improvement as an indicator of overall financial performance. These conceptual explorations lead to the testing of two hypotheses linking improved inventory performance with improved overall financial performance. Results indicate little or no relationship between inventory performance and overall financial performance.

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### 1. Introduction

Since at least the early 1980s, inventory reduction has been a prominent recipient of managerial attention. This is true whether inventory reduction is the primary target, as is often the case in just-in-time (JIT) or lean initiatives (Billesbach and Hayen, 1994; Huson and Nanda, 1995; Chang and Lee, 1995), or an enabler or by-product of other initiatives such as supply chain management (Kanet and Cannon, 2000) or total quality management (TQM) (Flynn et al., 1995). As inventory reduction has come to be associated with so many improvement initiatives, it has also been treated both theoretically (Schmenner and Swink, 1998) and anecdotally (Rajagopalan and Malhotra, 2001) as a solid indicator of improved organization performance, despite mixed empirical results.

Because performance measurement remains a surprisingly unsettled area in contemporary management (Neely et al., 2005; Ghalayini et al., 1997), inventory improvement's effect on performance merits empirical examination (Rajagopalan and Malhotra, 2001). Like many other performance measures, inventory performance is easily calculated, but over-reliance on such measures can lead to inappropriate responses to what are simply "false alarms"

(Schmenner and Vollman, 1994, p. 58). These reactions can be particularly inappropriate if they lead to reductions, however inadvertent, in the value of firm owners' investments (Fama and Miller, 1972; Anderson, 1982). This study, drawn to the possibility of just such an occurrence, investigates the relationship between inventory performance and broad metrics of firm performance. The primary research question pursued in this investigation was: Can inventory performance improvement be viewed as a robust indicator of improvement in overall firm performance?

In the remainder of this paper, inventory as a measure of performance is first reviewed critically. Two hypotheses are introduced, the first depicting inventory improvement as being associated with improved overall performance and the second treating capital intensity as an important consideration in the inventory–performance relationship. A detailed discussion of the methodology employed in testing these hypotheses follows, and this paper concludes with a discussion of the results and suggestions for further research.

### 2. Inventory and performance

Two distinct views on inventory and firm performance emerge from a broad research and practitioner literature. The first perspective treats inventory, while at times

\* Tel.: +1817 272 5746; fax: +1817 272 5801.

E-mail address: [acannon@uta.edu](mailto:acannon@uta.edu)

necessary, as fundamentally a driver of costs that manifest themselves in: (1) forgone investment opportunities as the result of tied-up capital; (2) ancillary costs incurred in moving, storing or otherwise simply handling inventory; or (3) unnoticed or unsolved process problems that are “covered up” by the inventory. In this view, systematic reductions in inventory would be viewed as evidence of successful management.

The second perspective on inventory and performance, however, treats inventory as merely a choice among many options available to balance capacity with demand and thus anticipates no fundamental relationship between inventory and firm performance. That is, in this view the systematic reduction of inventory would be interpreted as simply a shift in resource usage, with the firm choosing to confront its fundamental challenges with a different resource blend, of which inventory is only a part. Each view is explored more fully in the following sub-sections.

### *2.1. The case for inventory as a robust indicator of performance*

A vast literature on lot-sizing and related techniques has at its heart a fundamental view of inventory as a costly but necessary means of accommodating the realities of production environments. Such realities can include time-consuming or costly setups, or, in a similar vein, non-trivial ordering or shipment costs. Other challenges toward which inventory can be focused include uncertainty with regard to demand or supply, or variability in output among stages of production within the production system. These “irregularities” prevent the smooth, rapid flow of value through the production system and, by extension, lead naturally to inventory within the system (Schmenner and Swink, 1998).

In the case of non-trivial setup, ordering or transfer costs, when such costs do not vary with the production or order quantity there is an economic incentive to amortize them over some order quantity in excess of one unit. Early developments such as the Economic Order Quantity (Camp, 1922; Wilson and Mueller, 1927) were followed in later years by derivations that extended across a variety of production settings (Bahl et al., 1987). All of these incorporate the inherent cost of holding inventory—principally the return on those opportunities foregone by the choice to invest in inventory (Silver, 1981; Corbey and Jansen, 1993)—in finding an economically optimal order or batch quantity and, by extension, inventory level. Similarly, the cost of uncertainties up- or down-stream from the production system can be offset to some degree by the cost of holding safety stock in raw material or finished goods inventory (Schmitt, 1984). As is the case with regard to optimized lot sizes, the costs inherent in carrying inventory are seen as “necessary evils” given the realities of the production environment.

More contemporary views of inventory as an “evil,” however, do not accept it as necessary. Rather, both the JIT and TQM philosophies consider inventory as inherently wasteful since its cost is a consequence of problems that haven’t been solved (Davy et al., 1992; Flynn et al., 1995;

Lieberman and Demeester, 1999). Examples of such problems include burdensome setup times or costly ordering charges, or quality failures that encourage plenty of buffer inventory to maintain production (Flynn et al., 1995; Kim and Ha, 2003). Research and practice in supply chain management (SCM) extended this line of thinking across organizational boundaries (Gunasekaran et al., 2004); much of the inventory in supply chains, it has been argued, results simply because partners have failed to recognize and/or seize opportunities to eliminate the need for it (Clark and Hammond, 1997).

Whether inventory is inevitable or not, the “negative view” would tend to associate reductions in inventory with improved firm performance. This implication is reflected in the variety of empirical studies in operations management in which inventory performance—whether captured in perceptions or objective/archival data (Boyd et al., 1993)—has been used as a proxy for organizational performance. Intriguingly, however, empirical validation of this view is limited (Gaur et al., 2005). This can be seen in Table 1, which summarizes more than a decade’s worth of research aimed at exploring inventory’s role with regard to overall performance.

The most recent work in support of inventory as a robust indicator of performance was that of Swamidass (2007), who observed that across the US manufacturing sector, there was a general lowering of inventory (relative to sales) through most of the 1980s. Swamidass also observed that over that period firms in the bottom tier with regard to financial “health” tended to carry more inventory than did firms in the top tier. Earlier, Fullerton et al. (2003) found a positive relationship between improved inventory margin and three measures of financial performance, results echoing earlier (Fullerton and McWatters, 2001) work in which extensive adopters of JIT experienced both reduced work-in-process inventory levels and substantially improved profitability. Perhaps the strongest evidence in support of turnover’s robustness, however, was provided by Huson and Nanda (1995), who after controlling for firms’ industry averages both with regard to inventory turnover and profitability, found a significant association between improvements in turnover and improvements in per-share earnings.

In other studies, however, results were not as supportive of inventory’s robustness. Vastag and Whybark’s (2005) work, for example, found that controlling for firms’ manufacturing practices led to there being no relationship between turnover and overall performance. Similarly, Demeter (2003) noted that firms with clear manufacturing strategies tended to have higher financial performance, but that there did not appear to be a difference in inventory turnover between firms with clear manufacturing strategies and those without. Perhaps most intriguing were the findings of Balakrishnan et al. (1996), who studied both adopters and non-adopters of JIT and found that both groups reduced their inventory—adopters’ work-in-process improvements were particularly striking—but also found that superior turnover performance did not necessarily lead to superior financial performance.

Several of those studies with less-than-compelling results were potentially hampered by their measure of

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