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Contents lists available at ScienceDirect

Int. J. Production Economics

journal homepage: www.elsevier.com/locate/ijpe

Managing sales surprise: The role of operational slack and volume flexibility



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ARTICLE INFO

Article history:

Received 30 January 2015

Received in revised form

30 March 2016

Accepted 24 May 2016

Available online 26 May 2016

Keywords:

Compustat

Volume flexibility

Operational slack

Unexpected positive demand

ABSTRACT

Investors use sales surprise or revenue surprise (the degree to which actual sales exceed expected sales) as an important component of firm valuation. Rapidly scaling operations in the short-run to meet higher than expected demand, however, could increase adjustment costs and lower efficiency, thereby lowering performance. Operational slack (excess capacity internally in the firm and longer cash-conversion cycles externally in the supply chain) and volume flexibility could help mitigate the negative effect of sales surprise on firm performance. Based on a sample of 1286 firms representing 38,473 firm-quarter observations from 2003 to 2013, and using fixed-effects regression, the proposed relationships, except for mitigating effects of internal operational slack (or, excess capacity measured as standardized industry-adjusted Sales to PPE ratio) are supported for short-term performance (ROA). Findings are robust to long-term firm performance outcomes (Tobin's Q and market-to-book ratio), to controlling for autoregressive effects of past sales surprise, alternate proxies for firm size, squared-term specification for slack, an alternate forecasting method for sales surprise, and controlling for inventory efficiency.

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1. Introduction

Revenue surprise, as referred to in accounting literature, or sales surprise, as referred to in operations management literature, is the extent to which firm revenues exceed expected revenues. Given investor reliance on revenue forecasts have increased steadily (e.g., Lev and Zarowin, 1999) – analyst revenue forecasts in IBES increased from 85 in 1995 to 5862 in 2007 (Edmonds et al., 2013) – assessing whether sales surprise leads to higher performance is particularly salient in the accounting literature. Although investors are increasingly using revenue surprise as an additional cue in evaluating the potency of earnings (Chandra and Ro, 2008; Ertimur et al., 2003; Jegadeesh and Livnat, 2006b; Rees and Sivaramakrishnan, 2007), performance gains from sales surprise may be conditional on how a firm's operations adapts to higher costs from sales surprise.

Operations could provide an important cue to investors in evaluating whether sales surprise would lead to higher performance. Facing sales surprise, operations must maintain reliability and quality despite demand pressures and mitigate increase in costs. Sales surprise, or higher than expected demand, is different

from backorders, which are common in certain industries such as commercial aircraft assembly or for ventures such as Tesla. However, in most industries lead times exceeding a few months are very rare (De Treville et al., 2004) and customers expect on-time fulfillment as they have too many alternatives.

To meet higher than expected demand, firms could maintain slack internally by having more than desired capacity or maintain slack externally in the supply chain by having longer cash conversion cycles (Hendricks et al., 2009; Kovach et al., 2015). Alternatively, firms could invest in volume flexibility to have operations systems vary output without significant penalties (Jack and Raturi, 2003). We focus on the value of these two operations strategies – holding higher operational slack (internal or external) and having greater volume flexibility – in mitigating lower performance under sales surprise. For readability we use internal operational slack or excess capacity and external operational slack or cash conversion cycles interchangeably.

Holding operational slack internally (through greater operational capacity) or externally in the supply chain (through longer cash conversion cycles) (Hendricks et al., 2009; Johnson and Soenen, 2003; Kovach et al., 2015; Özbayrak and Akgün, 2006) could help overcome 'ramp-up' costs and lower costs of variable inputs to production (e.g. adding shifts, hiring more workers) (Ertimur et al., 2003; Gaur et al., 2005). Limited short-term production capacity from lower internal operational slack could stretch existing operational resources, that in turn, increases

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inefficiencies, overloads workers and machines, and lowers delivery reliability. We measure internal operational slack as excess capacity using the operationalization in [Modi and Mishra \(2011\)](#), who measured capacity slack as the standardized industry-adjusted ratio of sales to production, plant, and equipment. Greater external supply chain slack, or longer cash conversion cycles, is an indicator of supply chain buffers necessary to manage demand surge. Volume flexibility, a constitutive capability of multiple types of manufacturing flexibilities, refers to the ability to vary output, with fewer penalties, in response to changing demand ([Jack and Raturi, 2002, 2003](#)). Compared to internal or external operational slack that focuses on developing buffers, volume flexibility focuses on development of system capabilities to meet sales surprise.

Using a sample of 1286 manufacturing firms representing 38,473 firm-quarter observations from 2003 to 2013, we find that external operations slack (longer cash-conversion cycles) and volume flexibility mitigate decline in performance from higher sales surprise, however, holding excess capacity (internal operations slack) is not related to performance. As a proxy for performance we use ROA, an overall indicator of how efficiently a firm has managed costs from sales surprise.

The proposed framework makes the following contributions. First, it highlights, longer cash conversion cycle and volume flexibility as two operational defenses in the face of sales surprise ([Irvani et al., 2005](#)). For sales surprise to be a positive cue of firm value to the stock market, operations could play a pivotal role in mitigating possible decline in performance resulting from sales surprise. Second, we extend past work in operations management that has focused on sales surprise in the retail sector ([Edmonds et al., 2013](#); [Ertimur et al., 2003](#); [Gaur et al., 2005](#); [Gaur and Kesavan, 2009](#); [Kolias et al., 2011](#)) and in China ([Shan and Zhu, 2013](#)), by explaining how firms can mitigate performance decline from sales surprise. [Gaur et al. \(2005\)](#) and others (e.g., [Rajagopalan, 2013](#)) have focused on the predictors of sales surprise or its effect on inventory efficiency in the retail sector. We extend these works by explaining the effects of sales surprise on a firm's financial performance, and operational characteristics that help mitigate the negative effects of sales surprise on firm performance. Third, contributing to finance and accounting literature that has shown that markets react positively to sales surprise when there is a limited indication of earnings management ([Cheng and Warfield, 2005](#)), we find that sales surprise actually lowers firm performance – both accounting (ROA) and market (Tobin's Q and market-to-book) – and operations could be a contributing factor to mitigate these declines.

Overall, sales surprise posits a duality for firms as higher than expected sales means more revenues, but also results in greater 'stress' on operational resources. The proposed framework suggests that sales surprise leads to lower performance; however, this decline in performance could be mitigated for firms with higher levels of external operational slack (i.e. longer cash conversion cycles) and greater volume flexibility.

2. Theory development and hypotheses

Since the formalization of operations in the late 1800s, forecasting has been an important precursor to allocating operations resources ([Johnson and Montgomery, 1974](#)). Greater forecast accuracy allows firms to efficaciously allocate resources, lower inventory, increase capacity utilization, and improve delivery reliability ([Diebold and Mariano, 2002](#); [Stevenson and Hojati, 2007](#)). Sales forecast include expected factors such as seasonality or cyclicalities, espoused strategic expectations related to changing customer tastes and preferences and expected competitive dynamics ([Harrison, 1967](#); [Mentzer and Cox, 1984](#)). However, at times,

unexpected changes in the industry such as entry of a highly innovative firm or development of novel products or process innovation could also lead to variations in demands. The variation in demands from expected and unexpected factors creates significant challenges for the firm and has implications for cost, quality and reliability, and thereby overall firm performance.

There are two types of forecast errors – overforecasting (actual demand lower than forecasted demand) or underforecasting (actual demand higher than forecasted demand). Overforecasting results in excess inventory and holding costs and is an error of commission. As the forecasted demand falls short of actual sales, inventory holding costs increase and operations resources are not efficiently utilized. Underforecasting results in a shortage of materials and capacity and is an error of omission. Traditionally, to mitigate the risk of underforecasting practitioners have taken a 'safety-first' approach and focused on maintaining inventory stocks and operational buffers to meet higher than expected demand. Underforecasting is referred to as sales surprise. We discuss sales surprise as studied in accounting and operations literature.

2.1. Sales surprise in accounting literature

Firms are also increasingly using revenue forecasts to signal strength of earnings, and in the wake of corporate scandals, relative to costs, revenues are increasingly a reliable indicator of firm value ([Jegadeesh and Livnat, 2006b](#)). Higher than expected sales, or sales surprise, is an important component of earnings announcements by firms ([Ertimur et al., 2003](#); [Jegadeesh and Livnat, 2006b](#)). According to [Rees and Sivaramakrishnan \(2007\)](#), the market penalizes missed revenue forecasts, but for higher than expected revenue forecasts the results are mixed ([Keung, 2010](#); [McInnis and Collins, 2011](#)).

Sales surprise is increasingly an important cue for investors in reacting to earnings announcements. Not only are sales surprises more persistent and less subject to manipulation ([Ertimur et al., 2003](#); [Stubben, 2010](#)), but the market values sales surprise differently from cost reductions ([Jegadeesh and Livnat, 2006a](#)). [Ghosh et al. \(2005\)](#) propose that firms are less likely to engage in earnings manipulation when there are revenues surprises, and sales surprises indicate the direction of change in firm prospects. Further, [Ertimur et al. \(2003\)](#) state that "our results indicate that investors react significantly more strongly to a dollar of sales surprise than to a dollar of cost savings" (page 186). [Rees and Sivaramakrishnan \(2007\)](#), state that when "when the earnings and revenue signals are contradictory, the decision maker must determine which signal is stronger and which signal to discount or whether both signals are equally valid" (page 262).

The above discussion shows that revenue surprise is an important area of study in accounting. The accounting literature on revenue surprise, however, has potentially overlooked costs associated with sales surprise. Sales surprise significantly increases resource demands in the firms, and the gains from revenues above expectations could be tempered by increased costs. A firm's ability to buffer against negative consequences of sales surprise is central to improving firm performance and valuation expectations.

2.2. Sales surprise in operations management

Antecedents of sales surprise have been explored through the lens of operations management, mostly for retail sector. Sales surprise could have negative consequences for operations performance. Sales surprise may increase costs, waste, and opportunity costs of operational resources. If excess production covers up "unnoticed or unresolved" problems ([Cannon, 2008](#), page 582), sales surprise uncovers ability of the operations to respond to upside demand and exposes potential threat-rigidity in adapting

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