



# The antecedents and consequences of plant closing announcements<sup>☆</sup>



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## ABSTRACT

Plant closure marks an important episode in the life of a firm. We investigate 222 plant closing announcements spanning a period of seven years, to identify antecedents and consequences of plant closures, as reflected by financial measures of operating performance available on COMPUSTAT. We find that a firm's decision to close a plant hinges on dynamics in industry performance and on firm's size and age of capital. We provide new evidence that large firms start closing plants first, while small firms resist longer and experience median control-adjusted decreases in sales and return on assets of 8.24% and 12.96%, respectively, over the last two years prior to closure. We find that, relative to a benchmark of industry peers, recovery after closure is generally slow, suggesting that sample firms may be faced with deeper problems that have not been fully addressed by the decision to close a plant.

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## 1. Introduction

Organizations are frequently faced with the need to add, repurpose, move, or close facilities in an effort to stay competitive, maintain profitability, and adapt to an ever-changing environment. Such decisions represent important aspects of facilitates planning, which seek to maximize the extent to which an organization's tangible assets contribute to the mission and objectives of that organization (Tompkins, 2010). Considering the significant cost commitment entailed by, and long-term implications of, facilitates planning decisions, such decisions require a particular focus on adaptability and flexibility and can define the success or failure of an organization (Tompkins, 2010).

In the context of facilities planning, plant-closings mark important events in the life of a firm, both because of the likely significant impact on the firm's profitability and goodwill, and the disruptive effects on workers and local communities, as echoed, for instance, in Cleveland (2009): "it's always concerning when you hear of another plant closing". The decision to close a plant is likely to have wide-ranging ramifications on a firm's operations –affecting production capacity, production planning and scheduling, inventory management, the cost structure,

personnel policies, logistics, etc. –, and a critical role in a firm's ability to benefit from future growth opportunities. For these reasons, plant closings have generated constant interest among both academicians and practitioners seeking ways to better understand and cope with the implications of such decisions.

In spite of the significance of plant closings and the extensive literature on capacity planning and management, there exists relatively little empirical research that quantifies the implications of plant closing decisions on a firm's operational and financial performance during the period around the closure. A significant stream of related research focuses on examining stock market reactions to plant closing, project termination, or downsizing announcements, with little attention given to the firm's operational performance around the time of the event (e.g., Blackwell et al., 1990; Capelle-Blancard and Couderc, 2006; Clinebell and Clinebell, 1994; Kalra and Henderson, 1994; Statman and Sepe, 1989; Tsetsekos and Gombola, 1992). Other related studies investigate the financial implications of corporate downsizing and asset sales, or seek to understand how firms respond to poor performance (e.g., Denis and Shome, 2005; John et al., 1992; John and Ofek, 1995; Ofek, 1993). A different literature stream relies on normative game-theoretic models to analyze how firm characteristics, such as size and cost structure, determine the sequence of exits or capacity reductions in declining industries (e.g., Fudenberg and Tirole, 1986; Ghemawat and Nalebuff, 1985, 1990; Londregan, 1990; Reynolds, 1988; Whinston, 1988), while other researchers perform empirical studies to gain insight into firm exit behavior (see, for example, Deily (1988, 1991); Dunne et al. (1988, 1989); Lieberman (1989, 1990)).

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The extant literature provides mixed evidence on whether the implications of plant closings are positive – a plant closing is seen as an efficient means of firm restructuring or a source of positive net present value (Kalra and Deibler, 1992; Kalra and Henderson, 1994; Statman and Sepe, 1989) – or negative – a plant closing sends a signal of downward spiraling cash flows and generates a negative market reaction (Blackwell et al., 1990; Gombola and Tsetsekos, 1992). In addition, a firm's size can represent an ambivalent factor influencing plant closing behavior. For example, on one hand, large, multi-plant firms could be more likely to close facilities early since such events would have a relatively lower impact on their performance (Ghemawat and Nalebuff, 1990). On the other hand, large organizations enjoy economies of scale and would, therefore, close a plant as late as possible, as they also have the flexibility to shift resources within their manufacturing network – all plants provide an operational hedge and the firms are better off maintaining the plant as a real option (Kogut and Kulatilaka, 1994; Lieberman, 1990). Similarly, large, multinational corporations could be less likely to close a plant, as they seek to maintain their global presence and can shift resources within the firm, and, yet, more likely to close a plant in response to changing local conditions or arbitrage opportunities (Bernard and Jensen, 2007; Tsetsekos and Gombola, 1992).

In the context outlined above, this research seeks to contribute to the literature new evidence and added clarity on potential firm- and industry-level determinants of plant closure and the implications of closure on firm performance. To this end, we employ regression analysis and the event study methodology (e.g., Barber and Lyon, 1996) to examine the pre- and post-closure performance of 222 publicly traded companies that made plant-closing announcements during 1997–2003. This work thus represents one of the first to utilize plant closing announcements to investigate a firm's operational performance both before and after plant closure, an approach that allows us to assemble a dataset representing 34 industries. Using annual financial reports available on COMPUSTAT, our analysis reveals that downtrends in industry and firm operating performance over a two-year window prior to closure are strongly associated with the decision to close a plant. The small sample firms exhibit large control-adjusted declines in performance prior to plant closure, whereas the pre-closure decrease in performance is more muted for the overall sample. This result underscores the strong role played by firm size in the decision to close a plant. Our analysis also provides a direct link between a firm's average age of assets and firm performance before and after plant closure. These findings can extend the literature on the role of firm attributes on closure, as prior studies that have mostly focused on metrics at a lower level of granularity such as plant age or plant size.

This work also contributes a better understanding of how the performance of firms that closed plants is affected by closure, considering that most prior studies that investigated plant closure have focused on antecedents, at the expense of consequences. Our analysis indicates that the decision to close a plant appears to help sample firms stop the decline in certain control-adjusted measures of performance such as return on assets or sales over assets, however, over a two-year period after closure sample firms continue to experience control-adjusted reductions in sales and assets, regardless of firm size. This result seems to suggest that, while closing a plant can help a firm keep costs in line with declining sales and stabilize metrics such as return on assets, sample firms continue to lag industry peers after closure, a sign of potentially deeper problems that plant closure was unable to fully address.

The next section discusses our expectations regarding the operating performance of firms that close plants, and presents our main hypotheses. Section 3 describes the data collection procedure while Section 4 presents the methodology used in this

research. Section 5 contains our analysis and main results and Appendix concludes the paper with a summary of key results and directions for further investigation.

## 2. Background and hypothesis development

The strong connection between facilities decisions and firm performance has been emphasized repeatedly in the operations management literature. For example, Hayes and Wheelwright (1984) present a cogent argument for the attention given to facilities strategy: irreversibility. They argue that short term, myopic and piecemeal decisions create a network of disparate and non-strategic plants and, therefore, firms may not be able to leverage available assets. Schmenner (1979, 1983) advocates that, for example, plant relocation decisions should be predicated on the impact of such choices on operations performance, as echoed by Richard T. Whitehead, a senior project manager at ABB Lummus Global Inc., who estimates that the cost (time) needed to design and build a new petrochemical plant is 35–65% (30–80) higher than that of relocating a used plant (Chemical Marketing Reporter, 1996). Stafford (1991) indicates that plant closing decisions typically entail two levels of analysis: (i) whether to close a plant, and subsequently, (ii) which plant to close. Stafford (1991) focuses mostly on factors that determine (ii) (such as location, technology, labor and efficiency issues, etc.), while our study deals primarily with the conditions under which a firm answers (i).

The above references point to a common need in research – the identification of the specific operational conditions under which firms make plant closing choices. As such, our analysis seeks to identify early warning signals that a company's financial statements might send in anticipation of a plant closing announcement, as well as track post-closure performance. Such insights would be of significant practical value to organizations contemplating the decision to close a plant, as they would be better informed about the timing and the expected outcomes associated with their decision.

### 2.1. Antecedents of plant closing announcements

In a study of 202 Ontario firms, MacLachlan (1992) identifies declining sales and production rationalization (i.e., efforts to lower capacity in line with customer demand) as the major reasons for plant closings. High inventory levels and cash flow problems are contributors to this event as well. Rubenstein (1987) analyzes the case of a plant closing at General Motors and finds excess capacity to be the primary reason for the closing, while location factors do not appear to play a role. Thus, declining sales due to shrinking customer demand or intense competition often trigger plant closings.

Earlier research has shown that firm size can affect plant closing decisions, with large firms being more likely to close plants first (Ghemawat and Nalebuff, 1985). In the context of a declining industry, large firms continue to reduce their capacity until they have shrunk to the size of their smaller rivals (Ghemawat and Nalebuff, 1990). These findings can be intuitively illustrated by the following example. Consider two firms: one large, with 10 plants of 10 units of production capacity each, and one small, with a single plant of 10 units. It is further assumed that each firm runs its facilities at 100% utilization. Thus, it is intuitive to envision that a 10% decline in industry-wide demand will prompt the large firm to optimize operations performance by closing one plant. However, this is not an option for the small firm: it either operates its single plant at 90% utilization or closes it altogether. Therefore, small firms are likely to wait longer, and thus incur larger declines in sales, before they decide to close a plant.

Conversely, we expect sales to decline (proportionately) less in large firms that experience plant closures, since large firms wait

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