Understanding Cost Management:
What Can We Learn from the Empirical Evidence on “Sticky Costs?”

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ABSTRACT

Anderson, Banker and Janakiraman [2003] find that the absolute change in SG&A cost associated with decreased sales activity is systematically less than that associated with increased sales activity (so-called “sticky” costs). They interpret this as evidence of overt cost management. We review theory, empirical tests and data employed in the sticky cost literature and argue that sticky cost behavior is not sufficient to discriminate between managerial and mechanical theories of cost management. We conclude that, using the empirical specification and data of prior studies, any observed cost behavior is consistent with cost management and focus instead on whether adjustment costs that are hypothesized to influence cost management decisions are associated with sticky cost behavior. We identify problems with an incomplete theory about adjustment costs (and assumed asymmetries) as well as problems in how plausible theories relate to the empirical test and aggregate financial accounting data used in these studies.
1. Introduction

Managers make decisions about real resource provision to maximize the value of the firm. At least in the short term, these decisions take demand, technology, capabilities and some constraints as exogenous. We refer to decisions about resource provision collectively as “cost management.” We focus on real resources, because these are the factors of production that managers control. The financial accounting system records the transactions of the firm, including, of course, payment for the resources that are managed by the manager. Investors, creditors, and accounting researchers rely on the financial reports to infer the decisions made by managers as well as the effect of these decisions on firm profitability. The purpose of this paper is to evaluate how well and under what circumstances inferences about cost behavior that are derived from common empirical tests and data from the financial accounting system can be used to draw conclusions about whether (or how) managers manage costs.

Understanding the theory and practice of cost management is important for accounting academics, because both managers and investors rely on accounting systems to make decisions. The financial accountant develops accounting models that allow (external) investors to assess profitability and efficiency of the organization. Similarly, the management accountant develops accounting models that help (internal) managers make decisions about resource provision and understand better the impact of these decisions on cost and profit. Cost accounting models represent relations among the activities of the firm, the inputs consumed in enacting these activities, and the costs of providing these inputs. Authors of cost accounting texts routinely note that the information from the financial accounting system is often inadequate or inappropriate for managerial decision-making. In this paper we argue that it also has significant limitations as a basis for inference about cost management.

In the traditional model of cost behavior depicted in textbooks, costs are characterized as either fixed or variable with respect to activity; thus changes in cost depend only on the change (magnitude) in activity, not on the direction of the change (whether activity is increasing or decreasing). However, many researchers argue that this characterization of cost behavior is inconsistent with the way that managers
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actually manage costs (e.g., Cooper and Kaplan [1998]; Noreen and Soderstrom [1997]). A central component of cost management is managers’ response to exogenous shocks to output demand. Exogenous shocks are posited to cause managers to revisit the relations between activity and input levels—and between revenues and costs—and to evaluate costly adjustments as compared to the status quo. Adjustment costs are typically ignored in traditional cost accounting. Cooper and Kaplan [1998] argue that cost management renders obsolete the traditional model of fixed and variable cost behavior.

Anderson, Banker, and Janakiraman [2003] (ABJ) provide the first large-sample evidence that changes in cost depend not only on the magnitude, but also on the direction of the change in activity. Using a broad sample of firms over a 20-year period, ABJ document that selling, general, and administrative (SG&A) costs exhibit a phenomenon they describe as “stickiness.” Specifically, they find that on average, SG&A costs fall less in response to given decline in sales revenue in the previous year than they increase in response to equivalent increase in revenue. This is inconsistent with costs being either fixed or variable when, as is typically assumed in managerial accounting, unit variable costs are constant over a range of activity. Consequently, ABJ conclude that their finding of a widespread, time-invariant, asymmetric relation between changes in SG&A costs and changes in sales levels provides evidence of active cost management. They argue that this evidence is sufficient to discriminate “between costs that move mechanistically with changes in volume and costs that are determined by the resources committed by managers (p. 48).” Combined with evidence that stickiness reverses over longer time periods and that the degree of stickiness is positively associated with adjustment costs that influence managers’ calculus of cost management, they conclude that their results allow us to reject the traditional theory of cost behavior. Thus, ABJ do more than simply document sticky cost behavior; they interpret the

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1 In the management accounting literature, “sticky” has taken on the meaning of asymmetric reactions to activity changes. In economics, “sticky” prices or wages are merely slow to adjust in either direction. Economists are concerned with the lag between new information and adjustments to the new information, while management accountants are concerned with how the rate of adjustment depends on the nature of the new information. Hamermesh and Pfann [1996, p. 1271] provide a comprehensive discussion of the econometric implications of asymmetric adjustment costs for production inputs. We use “sticky” throughout this paper in the sense of the management accounting literature; that is, sticky costs are those that respond asymmetrically to activity changes.
existence of sticky costs as evidence of active cost management. Follow-on studies accept this conclusion, focusing on identifying settings in which managers are more or less likely to engage in active cost management (Balakrishnan et al. [2004]; Steliaros et al. [2006]; Balakrishnan and Gruca [2008]) and on using the implied managerial actions that underpin sticky cost behavior as a basis for financial statement analysis (Banker and Chen [2006]; Anderson et al. [2007]).

This paper offers a critical review of the theory, empirical tests, and data employed by ABJ and others with an aim of stimulating further consideration of cost management and its relationship to cost behavior. Our critique centers on two issues: 1) whether the empirical specification employed in prior studies is suited to unambiguously discriminating between managerial action and ‘mechanistic’ changes in cost; and, 2) whether the empirical specification and accounting data are well-suited to testing whether adjustment costs are associated with realized cost behavior.

In response to the first question, we argue that the mechanical model of cost behavior is not a suitable theoretical benchmark for conclusively establishing the presence of managerial actions aimed at cost management. Logic suggests that if all decisions are taken by a manager in some time period, even a mechanical cost relation such as that associated with technical or engineering production specifications can be traced to past managerial decisions. Consequently, more structure on what defines cost management is needed if we are to distinguish a managerial model of cost management from some alternative. The problem is highlighted when the empirical tests of sticky costs are considered. In particular, it is not difficult to construct a thought experiment in which costs that exhibit sticky behavior are nonetheless the result of managerial decisions. Nor is it difficult to construct examples in which stickiness, as evidenced by the empirical tests, is not the result of short-term active cost management by managers. When managers make decisions (including decisions about resource utilization) that can produce a record of costs that is indistinguishable from that produced by “mechanical” cost management, we cannot empirically discriminate between these theories by examining observed cost behavior.

Indeed, although the title of the ABJ paper suggests that they simply document how costs behave, we believe that it is the connection to cost management that is of interest to most researchers.
Concluding that all cost behavior is necessarily the result of cost management, we turn to the question of whether cost management decisions and their determinants can be inferred from cost behavior. The theory that has motivated recent research is that adjustment costs drive cost management and explain sticky cost behavior. Again, we consider theory, empirical tests and data in our critique. Theories of production economics and adjustment costs are used to evaluate whether the widely used econometric specification of the sticky cost literature is suited to answering the research question. We further consider how the use of archival financial accounting data to proxy for real resource decisions affects inferences. Logical arguments point to several serious threats to inferences about cost management based on sticky cost behavior. However, the statistical regularity of stickiness that some studies have found suggests further inquiry.

Although we replicate the results of prior studies, we illustrate the fragility of sticky cost behavior with tests that derive from some of our critiques. For example, for other cost components that, like SG&A, are somewhat discretionary, consistent sticky cost behavior is not found. Moreover, although we find evidence of stickiness in labor costs, when we substitute a physical resource measure (e.g., number of employees) for the cost measure that confounds resource prices and usage (i.e., labor costs), we find no evidence of stickiness in labor resources. Finally, we consider the influence on ABJ’s aggregate results of a set of observations that exhibit the “unusual” characteristic that changes in SG&A cost move in the opposite direction (i.e., anti-stickiness) as changes in activity (i.e., sales). Positing that the underlying process generating these observations is different from what is theorized, we investigate whether these observations are influential and find that the magnitude and significance of sticky cost behavior are greatly diminished when these unusual observations are excluded. While the basic result of sticky cost behavior is present, it is troubling that the result is strongest when the relation between cost and activity is opposite that predicted by the cost management theory.

In sum, we present logical and empirical arguments that any observed cost behavior, in and of itself, is insufficient to draw inferences about cost management. We believe that researchers must move beyond documenting cost behavior that is of questionable value in addressing important questions about
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how and under what circumstances managers adjust resources and manage costs. Economic theories about decision-making under uncertainty and in the presence of adjustment costs are good candidates on which to base future inquiries (e.g., Hamermesh and Pfann [1996]; Blinder [1991], Blinder et al. [1998]) as are other theories about managerial decision-making from fields such as psychology and sociology; however, different research methods and data are needed. Our critique of the empirical tests for sticky cost behavior and related inferences is not unlike critiques of the accounting disclosure literature that led Graham, et al. [2005] to use field interviews and surveys to identify CFO motivations for reporting and disclosure. They chose this approach over statistical analyses of archival data for several reasons, but a central reason was that “… developing good empirical proxies for voluntary disclosure, and especially earnings management, is non-trivial (p. 8).” In research on labor cost adjustments, Hamermesh and Pfann [1996, p. 1279] report that no universal nonconvex or asymmetric specification describes adjustment of employment demand because in all likelihood firms are “distinguished by the skills of their workers and the nature of shocks to demand have underlying adjustment costs with different structures.” They suggest that firm-level analysis of costs and adjustment processes may be needed. In concluding this paper we argue that, just as difficult in developing good empirical proxies for voluntary disclosure and earnings management prompted Graham et al. to go to the decision-makers behind the data, the impossibility of inferring cost management from cost behavior requires researchers to get closer to managers who make resource provision decisions.

The paper proceeds as follows. In the next section, we briefly review the sticky cost literature, including papers that document sticky cost behavior and those that seek to explain differences in cost behavior using a theory of adjustment costs. Although there is ample evidence of sticky cost behavior and some evidence of association with adjustment costs, the results are neither universal nor found in several economically meaningful subsamples. In Section 3 we step back from the extant empirical research to revisit the economic theories of production and cost management in the presence of adjustment costs. Our aim is to make explicit the assumptions that are necessary to move from the theory to the extant empirical model and from the empirical results to inferences about cost management. In Section 4, we report
selected empirical results using the general sticky cost equation. Although we replicate some prior results, our primary aim is to assess the impact of some of the issues raised in Section 3 on the results. In Section 5, following the example of Graham et al. [2005], we return to the basic research question and consider how to improve research methods to better address questions about cost management. Recent economic research on sticky prices (Blinder [1991]) and on adjustment costs associated with changing input factors (Hamermesh [1995], Hamermesh and Pfann [1996]) is instructive in this endeavor. We discuss how future research in management accounting can advance our knowledge about when and how managers adjust resources. In particular we discuss the need for articulating distinct theories of cost management and using appropriate methods and data to determine which theories are most consistent with the data. We conclude in Section 6 with a summary of our findings and implications for future research.

2. A Review of the Sticky Cost Literature

Interest in sticky cost behavior originated with the question of whether the traditional model of fixed and variable (with unit volume) cost is a sufficiently accurate representation of production economics to be useful as a basis for management decisions. In the 1980’s and 90’s, researchers articulated an alternative model (i.e., activity-based costing) that purported to more faithfully render the economics of modern manufacturing (Cooper and Kaplan [1998]) and to better support decision-making in that setting. A variety of studies ensued that compared the accuracy of the proposed functional form to the traditional model (e.g., Foster and Gupta [1990]; Noreen and Soderstrom [1994]; Anderson [1995]) and that explored the implications of differences on management decisions (Noreen and Soderstrom [1997]; Maher and Marais [1998]) with mixed results.

In the course of testing the predictive accuracy of the traditional cost model, Noreen and Soderstrom [1997] documented a curious pattern; some cost accounts exhibited a lower response to volume decreases than to volume increases. This finding was consistent with assertions in the activity based costing literature about how managers adjust costly resources in response to exogenous demand shifts (Cooper and Kaplan [1998]). Anderson, Banker and Janakiraman (ABJ) [2003] seized on this
observation to argue that if managers deliberately adjust resources committed to activities, then the “direction” of volume change will influence realized costs and the traditional model of fixed and variable costs does not hold. Their empirical test and inferences presume the converse; that is, if the traditional model does not hold (i.e., that sticky cost behavior is present), then active cost management must be present. In this section, we review the ABJ study and the sticky cost literature that it spawned to highlight four important elements: (1) the theory underlying the empirical tests; (2) the empirical model used to test the hypothesis; (3) the data used in the empirical tests; and, (4) the results various authors report.

2.1 The ABJ Theory of Sticky Costs

ABJ contrast two models of cost behavior. In the “traditional model of cost behavior”, costs are classified as either fixed or variable and “variable costs change proportionately with changes in the activity driver” (pp. 47-8). In the second model, “managers deliberately adjust resources in response to changes in volume” (p. 48). While efficient production specifies the optimal combination of inputs for a given level of output, several factors may intervene to preclude or limit resource adjustments. These factors are hypothesized to lead to “sticky” cost behavior in which costs adjust asymmetrically; more quickly for upward than for downward demand changes.

A key factor in determining whether adjustment occurs is the cost of adjustment itself. For example, increasing or decreasing labor inputs may require search, recruitment and training (increase) or severance payments (decrease). When adjustment costs are present, managers weigh the costs of releasing (adding) resources when activity decreases (increases) against the alternative of not adjusting. Adjustment occurs if the adjustment costs are more than compensated by incremental profits associated with producing efficiently at a new level of output. Adjustment costs have long figured in economic theory about production choices; however, this is a theory about stickiness in the economic sense (i.e., lagged response), not in the management accounting sense (i.e., asymmetric response to increased versus decreased demand). For stickiness in the management accounting sense to obtain, a theory about differences in upward and downward adjustment costs is needed. We have found no theory that suggests
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that firm-level adjustment costs are asymmetric, much less that downward revisions are systematically more costly than upward revisions (i.e., the hypothesis of ABJ).

Adjustment costs may be a property of the production function, as in the example of labor adjustments, or they may arise if managerial incentives diverge from those of the firm. For example, if an individual manager experiences loss (gain) of status or position when the number of his subordinates decreases (increases), his decisions about reducing (increasing) labor resources may be colored by private adjustment costs. In cases in which manager’s compensation, job satisfaction or other rewards are linked to span of resource control, agency theory predicts that private adjustment costs motivate managers to grow faster than they shrink. Thus, a theory (or theories) about individual adjustment costs could be used to motivate tests of asymmetric cost behavior. In that case, one basis for the null hypothesis would be that adequate management controls and appropriate competition within the firm for scarce resources prevent this influence of individual managers from being manifest in sticky (asymmetric) cost behavior for the firm.

Aside from the costs of adjustment, uncertainty about future events creates another impediment to adjustment. With certainty about the future level of demand, managers can easily calculate a payback period for recouping adjustment costs associated with re-establishing the optimal resource level for future output. Adjustment occurs when the new level of demand is expected to be sustained and/or adjustment costs are modest. With uncertainty about future demand this calculation becomes more difficult. In particular, while adjustment costs may be certain, the period in which they will be recovered is uncertain. Indeed, part of the uncertainty is that in the future, the need for new and different adjustments may be indicated. In many circumstances significant uncertainty favors the ‘do nothing’ alternative; however, it is important to note that this choice is itself cost management. Moreover, like firm-level adjustment costs, theory does not support the thesis that uncertainty is associated with asymmetric adjustment that favors upward versus downward activity changes.

Finally, no consideration of the effect of adjustment costs on cost management decisions is complete without considering how managers evaluate losses incurred from producing with a suboptimal
mix of resources. In a perfectly competitive market, failure to adjust would cause the firm to face higher costs than competitors who adjusted (or who entered the market with new, optimized production technology and capacity) while receiving identical (market) prices. However, with less-than-perfect competition, the motivation to adjust is attenuated by the ability to pass on costs of suboptimal production to customers through higher prices. The firm may fail to take necessary steps to update and maintain their market leadership position because doing so erodes current monopoly rents. While one can hypothesize that the degree of adjustment (i.e., cost behavior) is associated with competitive circumstances, one cannot argue that this association (or whether it exhibits asymmetry) is *prima facie* evidence of cost management. In the example given, failure to adjust is still a calculated approach to cost management.

### 2.2 The ABJ Sticky Cost Model and Basic Test

In the sticky cost literature, cost behavior is evaluated by correlating current growth in SG&A (or another cost component) with current revenue growth. ABJ test the sticky cost hypothesis by specifying SG&A costs (*SG&A*) as a function of sales revenue (*Revenue*). SG&A is selected for study because, as a discretionary expense it is thought to provide the strongest test of the relation between cost management and cost behavior. ABJ calculate the ratios of current SG&A costs (revenues) to previous period SG&A costs (revenues) and transform these variables by taking logarithms. To test for stickiness, they introduce an indicator variable (Decline_Dummy), which takes on the value “1” when current period revenues are lower than prior period revenues. The indicator variable is multiplied by the log of the ratio of current to previous period revenue; thus, the basic regression model is [ABJ, p. 52]:

\[
\log \left( \frac{SG & A_{i,t}}{SG & A_{i,t-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \beta_2 * Decrease \_ Dummy * \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \varepsilon_{i,t}
\]

This regression equation is used (at least as a starting point) by virtually all researchers evaluating the sticky cost hypothesis. In Section 3, we consider the theoretical basis of the empirical model.

As ABJ note, the change in SG&A costs associated with a 1% change in sales revenue is measured by the coefficient $\beta_1$ when sales have increased from the previous period and by $(\beta_1 + \beta_2)$ when
sales revenue has declined. Therefore, a negative value for $\beta_2$ indicates sticky costs, that is, costs that exhibit asymmetric adjustment with costs increasing more with volume increases than decreases. When (if) costs are found to be sticky, the hypothesized pattern of sticky costs is argued to be inconsistent with the traditional fixed and variable cost model. The authors go further to argue that rejection of the traditional (“mechanical”) model is evidence of active cost management.

ABJ estimate the sticky cost hypothesis using data for 7,629 firms over the period 1979 – 1998 from COMPUSTAT. The resulting sample includes 64,663 firm-years of observations. Descriptive data on the firms used in the analysis is reproduced in Table 1, Panel A. The results of the ABJ tests (reproduced in Table 1, Panel B) indicate that their sample is characterized by sticky SG&A costs that are economically and statistically significant. Additional tests that consider multiple periods, and the effect of industry and resource are conducted and overall, ABJ find that sticky SG&A costs are present. They hypothesize that a number of factors related to the presence of adjustment costs and demand uncertainty are associated with stickiness and report associations that are consistent with this premise.

2.3 Other Tests of Sticky Cost Behavior and its Antecedents

Subsequent studies have focused on identifying industries and cost categories in which sticky cost behavior is or is not present and on testing the relationship between sticky costs and adjustment costs. Balakrishnan et al [2004] use a field-based setting (hospitals) to extend the ABJ analysis of factors that “moderate the manager’s response to changing activity level” (p. 283). Thus they concur that sticky cost behavior is evidence of overt cost management and focus on exploring how adjustment costs and uncertainty influence the response. Specifically, they posit that the magnitude of the change (in addition to the direction of change) and current capacity utilization affect managers’ response. The assumption is that “lumpy” capacity investments and the possibility of brief periods of over-utilization (e.g., obtaining more output per unit input through, for example, overtime, deferring machine maintenance) creates flexibility in accommodating small adjustments and adjustments that occur during periods of excess capacity, but imposes high adjustment costs for large changes during periods of full utilization. For the full sample they document sticky cost behavior for staffing costs; however, they find no evidence of
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stickiness depending on the magnitude of activity change. When the magnitude of change is interacted with capacity utilization; however, they do find significant differences. They conclude that while costs are indeed sticky on average, “our findings suggest caution in applying Anderson et al.’s conclusion that costs are sticky.” In a related follow-on study, Balakrishnan and Gruca [2008] conjecture that managers’ willingness to adjust specific cost accounting categories (e.g., different resources) is related to the criticality of the resource to the firm. Consistent with that, they find evidence of stickiness in costs related to patient care but no evidence of stickiness in the operating costs of hospital support departments.

A number of current unpublished working papers continue in this vein of research. Banker, et al. [2008] focus on uncertainty as an explanation for differential responses to demand changes. Following the original ABJ focus on SG&A they use “changes in SG&A costs to infer how managers make capacity decisions in response to sales changes witnessed in current and prior periods.” Thus, they continue to posit that sticky cost behavior observed in archival accounting data is a sufficient basis for inferring how and why managers manage cost. In particular, they argue that time series realizations of demand (i.e., consecutive changes in the same direction, order backlogs) are associated with managerial optimism (or pessimism) about future demand and that certainty translates into action. They conclude that optimism about the future is associated with faster upward cost changes and slower downward changes (consistent with the original ABJ result), but that the original ABJ results is reversed when sales have declined (i.e., pessimism prevails) in prior periods.

Chen et al. [2008] focus on private managerial adjustment costs in their analysis of sticky SG&A costs. They conclude that stickiness of SG&A is positively associated with managers’ empire-building incentives, negatively associated with corporate governance and that the latter result is stronger in firms with greater vulnerability to managerial empire-building.

Banker and Chen [2006] document a positive association between adjustment costs related to labor markets and sticky operating costs in 19 countries with differing labor market conditions. Using Brazilian data, de Medeiros and de Souza Costa [2004] find that costs are stickier for Brazilian firms than for US firms. In ABJ, the magnitude of the sticky cost coefficient decreased over time, eventually
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becoming insignificant when four-year periods were aggregated. In a similar test, de Medeiros and de Souza Costa find the sticky coefficient increased with time aggregation.

Subramaniam and Weidenmeir [2003] consider the behavior of both SG&A and cost of goods sold (COGS) and find that on average both cost categories exhibit sticky behavior. When they separate the sample by the magnitude of the change in activity, costs are not sticky for “small” (i.e., < 10%) changes in activity. In addition, when they consider different industries, SG&A costs are sticky for manufacturing, merchandising, and service firms, but not for financial firms and COGS are sticky for manufacturing, merchandising, and financial firms, but not for service firms. Calleja, et al. [2005] consider cross-country differences in the stickiness of operating costs for firms in the US, UK, Germany, and France. Again, they find stickiness in the overall sample. In their tests, in contrast to the evidence of Subramaniam and Weidenmeir (2003), costs tend to be less sticky for greater changes in activity. It also varies by country, with costs less sticky in the U.S. and U.K. than in Germany and France, which Calleja et al. attribute to regulatory forces.

Continuing in the hospital setting, Balakrishnan and Soderstrom [2008] consider various factors that affect cost behavior including whether the activity is “core” to the hospital (as in Balakrishnan and Gruca 2008), whether there are differences for particular accounting cost categories (as Noreen and Soderstrom [1997] documented), and whether stickiness varies with the incentives of managers to manage costs (proxied by hospital ownership structure). On average they find sticky cost behavior; however, it is more prevalent in core activities, but not in certain expense categories. They conclude that the “evidence does not produce a strong or coherent picture [of cost stickiness]” [Abstract].

Overall, the extant empirical evidence on sticky cost behavior appears to be robust in aggregate samples, but less consistent as samples are disaggregated in economically meaningful ways (e.g., by industry and cost category). In the next section, we consider more closely the empirical model used to test the sticky cost hypotheses and some of the issues associated with the proxies used to measure variables. We use additional empirical tests to highlight our concerns with the model and with interpretation of the estimated parameters.
3. Developing an Empirical Model to Test a Cost Management Theory

The sticky cost literature has two important and related, but distinct, components. First, it addresses the question, “are costs sticky?” This is an empirical issue and addresses descriptive questions about cost behavior. The second question is, “why are costs sticky?” This is a question, in part, about cost management. Testing this second question requires researchers to undertake two tasks: developing testable (falsifiable) hypotheses, and obtaining data that are adequate proxies for the model variables. In this section, we provide a critical assessment of the sticky cost literature in terms of these two tasks. We step back from the empirical work on sticky costs to revisit economic theories of production, costs and cost management. By returning to first principles we make explicit the assumptions embedded (but often implicit) in the current tests. In some cases these assumptions are plausible descriptions of reality, and in other cases they are not. Where the stylized model does not fit well with reality (or with the accounting data that we employ to depict reality), it is important to determine whether misfit or measurement error jeopardize conclusions about the questions of interest. We start by developing the cost function that is the basis for the tests and discussing the assumptions that are needed in order to use the model to test theories how adjustment costs influence cost management. We then consider issues associated with using archival financial accounting records as the data source for the tests.

We begin with two defining characteristics of cost management that are explicit in ABJ and implicit in all other sticky cost papers. First, cost management is not the only explanation for observed cost behavior. If there is no alternative explanation, the theory of cost management is not falsifiable. That doesn’t mean that it wouldn’t have appeal as a description of management behavior; however, it would limit the scope for research. An alternative to active cost management for explaining cost behavior is that it is technologically determined (what ABJ term, “mechanical”). In other words, cost behavior that we observe is due to production functions that imply the relation between inputs and outputs. We will have more to say below about alternatives to cost management, but it is important to note here that if technology is the alternative, the researcher needs to specify the technological relation. Only then can
precise tests be formulated to discriminate between the two theories and to make possible the falsification of at least one of theories. Second, following ABJ and much of the subsequent literature, adjustment costs are the theorized source of “friction” that slows managerial actions to equilibrate resource provision and activity changes. ABJ describe it as follows:

When volume falls, managers must decide whether to maintain committed resources and bear the costs of operating with unutilized capacity or reduce committed resources and incur the adjustment costs of retrenching and, if volume is restored, replacing committed resources at a later date. (p. 49)

In the sections that follow, we relate economic theory of production to the development of an empirical test for the presence of active cost management in the presence of adjustment costs. We start with the development of a general model to estimate cost behavior. After the empirical cost function is developed, we discuss the explicit and implicit assumptions that are necessary to use this model to test theories about whether adjustment costs are associated with cost management.

3.1 An Economic Basis for the Empirical Cost Function

The empirical model for testing the sticky cost hypothesis in virtually all papers is:

$$\log \left( \frac{SG & A_j}{SG & A_{j-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{i,j}}{Revenue_{i,j-1}} \right) + \beta_2 * Decrease \_Dummy * \log \left( \frac{Revenue_{i,j}}{Revenue_{i,j-1}} \right) + \epsilon_{i,j}$$

Although the model has intuitive appeal, it is important to understand the principles of production economics on which it is based if we are to judge what can and cannot be inferred about cost management from its estimation. The cost function of a firm specifies how total cost, $C$, is related to output quantity, $q$, and factor prices (wage rates, cost of capital, etc.), $p_j$. The cost function is based on the production function and is derived by minimizing total costs (the sum of payments for factors of production) given that the firm produces a specified quantity of output. In competitive output markets, quantity and factor prices are exogenous and regression analysis can be used to estimate the cost function after a functional form is specified.

A common production function is the Cobb-Douglas production function, which for two factors of production, capital and labor for example, is:
\[ q = AK^\alpha L^\gamma. \]

The sum of \( \alpha + \gamma \) represents “returns to scale” of the production process. If \( \alpha + \gamma > 1 \), the process exhibits increasing returns to scale and if \( \alpha + \gamma < 1 \) the process exhibits decreasing returns to scale.

Assuming a Cobb-Douglas function is a convenient because, as is well-known, the corresponding cost function is of the same form as the production function. Specifically, the cost function can be written as:

\[ C = Bq^{1/(\alpha+\gamma)}(p_k^\alpha p_L^\gamma), \]  

(1)

where \( B \) is a function of the parameters, \( A, \alpha, \) and \( \beta \). If we want to study how costs change over time in response to changes in quantity, or activity, we can add time subscripts to the cost function (1) assuming the underlying scale parameters, \( \alpha, \) and \( \gamma, \) are time-invariant. (We will allow the constant, \( A, \) and hence, \( B, \) to vary over time.) Thus, at time \( t, \) total costs are equal to,

\[ C_t = B_t q_t^{1/(\alpha+\gamma)}(p_k^\alpha p_L^\gamma). \]  

(2)

It is clear from equation (2) that if we want to estimate a firm’s cost function using time series data, we need either to include data on factor prices or to assume that factor prices are constant over time. If we do not, the estimate will be biased because of the omitted variables. For this discussion, we assume that factor prices are constant over time. We make this assumption not because we view it as descriptive, but because it is implicit in the ABJ empirical model, which excludes factor prices. Given this assumption on factor prices, we can write the equation describing the one period growth in cost \((C_t/C_{t-1})\), as,

\[ \frac{C_t}{C_{t-1}} = \frac{B_t}{B_{t-1}} \left( \frac{q_t}{q_{t-1}} \right)^{1/(\alpha+\gamma)} \]  

(3)

Taking the logs of both sides of equation (3), we derive the basic estimating equation,

\[ \ln \left( \frac{C_t}{C_{t-1}} \right) = \beta_0 + \beta_1 \ln \left( \frac{q_t}{q_{t-1}} \right) \]  

(4)

where

\[ 3 \text{ For notational convenience, we omit the firm subscript and the error term.} \]
\[ \beta_0 = \ln \left( \frac{B_t}{B_{t-1}} \right) \text{ and } \beta_1 = \frac{1}{\alpha + \gamma}. \]

In sum, the relationship between the economic theory of the firm and the empirical test that characterizes the sticky cost literature depends on two properties of production theory and five assumptions that facilitate translation of the theory into the specific form of the empirical test:

1. The theory is a theory of total (economic) costs;
2. The theory relates cost to the (physical) quantity of activity;
3. The empirical test assumes specific properties of adjustment costs;
4. The empirical test assumes factor prices are constant;
5. The empirical test assumes that the product portfolio is constant over time;
6. The empirical test assumes competitive output markets;
7. The empirical test assumes a specific, common production function for all industries.

All empirical work requires compromises when translating the underlying theory into an empirical specification. Some of the compromises are related to data availability (e.g., if input prices aren’t available an assumption of constant prices allows tests to proceed) and some are related to making complexity more tractable (e.g., assuming the Cobb-Douglas production function holds and is applicable to all firms). In many cases, there is little the researcher can do other than note the assumption and the potential problems of interpreting results if the assumption is flawed. We return to first principles of production as a basis for evaluating what can be learned from the results of empirical tests of sticky costs because we are concerned that insufficient attention has been given to assumptions that critically influence inferences about cost management as compared to other theories of cost behavior. In particular, although we believe that assumptions 4 – 7 are likely to be violated in certain subsamples, it is less likely that they pose a significant threat to discriminating between cost management and other theories. In contrast, discrepancies between the firms and data that are used to evaluate sticky costs and the assumed properties of production functions and adjustment costs (Assumptions 1-3) pose significant threats to interpreting a statistical finding of “stickiness” and we discuss these further in the following section.
3.2 Translating Theory into an Empirical Model: Implications for Inferences

To move from theory to empirical tests requires the specification of a set of empirical proxies for the theoretical constructs (e.g., sales revenue as a proxy for business activity). In this section, we evaluate how the use of archival financial accounting data influences inferences about sticky costs. First we discuss assumptions about adjustment costs (point 3 above). This allows us to complete the specification of the estimation equation. We then discuss the theoretical properties of the production function in relation to variable measures (points 1 and 2 above). Our purpose is to assess whether measures that come from available data are sufficiently faithful to the underlying constructs to allow researchers to draw inferences about the theories of cost management that are implicit in the sticky cost literature.

The empirical test assumes specific properties of adjustment costs

A common characterization of adjustment processes is that when activity changes, the firm shifts to a different cost function. Adjustment costs create “friction” that slow managers’ response to activity changes. If there is uncertainty about future demand or if the losses associated with suboptimal “fit” between existing resources and demand are modest, managers may prefer modest losses to incurring adjustment costs. The theory of adjustment costs translates into predictions of the conditions under which managers will and will not “adjust.” However, it does not translate into a theory of managers adjusting more to upward demand changes than to downward demand chances (i.e., the “sticky” cost prediction). To obtain this prediction one needs additional theory (or assumptions) about how the expected (i.e., impounding potentially differing uncertainties) marginal cost of adjustment differs with “direction” of change. ABJ provide a number of arguments and examples of adjustment costs, but offer no theory for why downward adjustment costs systematically exceed upward adjustment costs. However, once such a prediction is accepted, the differential effect of upward and downward adjustment costs on resource costs

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4 An alternative is to assume that the cost function is the same, but that the relative factor prices change; in other words, that the resource prices differ when resource usage changes. This characterization of adjustment processes is not common in empirical testing, perhaps because it precipitates significant data requirements for factor prices.
when activity changes in different directions can be modeled empirically by estimating different coefficients when activity increases or decreases:

$$\ln\left(\frac{C_t}{C_{t-1}}\right) = \beta_0 + \gamma \text{Decline} + \beta_1 \ln\left(\frac{q_t}{q_{t-1}}\right) + \beta_2 \text{Decline} \times \ln\left(\frac{q_t}{q_{t-1}}\right) + \epsilon_t$$ (5)

$\text{Decline}$ is an indicator variable taking on the value “1” when sales decrease and is set to zero otherwise.

Virtually all empirical research testing for sticky costs uses a regression model that is very close to the one shown in equation (5). Before making the last assumption to get to the regression used by ABJ, we make one last observation about testing this equation. Without some theory or assumptions about how adjustment costs lead managers to manage resources (costs) in specific ways, we cannot make predictions about the expected signs of $\gamma$ or $\beta_2$. The best we can do is to describe observed cost behavior. In other words, if $\beta_2 < 0$, we can say that costs are sticky (i.e., less likely to be adjusted downward than upward), but not why they are sticky. In particular, we cannot claim that because costs are sticky, we have evidence of active cost management. Indeed, the theory of adjustment costs is just as likely to predict “no change” as an outcome of active cost management as it is to predict “adjustment.” The tipping point depends critically on environmental and technical factors (e.g., uncertainty and volatility of demand, losses associated with suboptimal fit between current production function and the “best” production function, competitive pressure that determines whether these losses are borne by the firm or the customer), but reaching the tipping point does not distinguish managerial activism related to cost management. Only if the tipping point is clearly reached and managers don’t react do we have falsification of adjustment cost theory as an explanation of active cost management.

The final assumption that we need to arrive at the usual empirical model for testing sticky costs is that the impact of adjustment costs on decisions (and on the cost function) only affects the activity term and does not affect the estimated constant term. Given this assumption, we get to the regression equation used in the sticky cost literature:

$$\ln\left(\frac{C_t}{C_{t-1}}\right) = \beta_0 + \beta_1 \ln\left(\frac{q_t}{q_{t-1}}\right) + \beta_2 \text{Decline} \times \ln\left(\frac{q_t}{q_{t-1}}\right) + \epsilon_t$$ (6)
In sum, we can use equation (6) to describe cost behavior, but we need more structure on the theory and its translation into an empirical test in order to say something about cost management. If adjustment costs are the basis for the tradeoffs managers make when considering whether to change resource usage when activity changes, we need to assume something about these adjustment costs in order to make predictions about the estimated signs of the regression coefficients. If we believe that adjustment costs are symmetric, for example because training costs are roughly equal to severance costs, we would expect that \( \beta_2 \) would not be significantly different from zero.\(^5\) This is one reason why demonstrating that SG&A costs are sticky is not equivalent to saying that managers are managing costs in the face of adjustment costs. Even if we believe that some adjustment costs are asymmetric (different when activity increases or decreases), it is not clear that we should expect this asymmetry to be in the same direction for a majority of resources or firms. Therefore, without this additional structure, finding that \( \beta_2 \) is negative is consistent with cost management in the presence of adjustment costs, but so is a finding that \( \beta_2 \) is positive or that \( \beta_2 \) is not significantly different from zero.

The theory is a theory of total (economic) costs

The cost function (6) expresses total cost as a function of activity. In virtually all of the sticky cost literature, however, researchers tend to focus on a specific (possibly broad) category of cost. The cost associated with any resource is determined by, first, choosing resource levels to minimize costs and then multiplying the resource usage by the resource unit price. Because of the form of the assumed underlying production function, the relative usage of different resources could differ as activity changes. To avoid this, the researcher must assume that the cost function is homothetic. This is not a strong assumption and so we do not find it to be a serious problem.

\(^5\) Interestingly, when discussing labor and cost stickiness (p. 52), ABJ do not consider the adjustment costs associated with adding new employees, yet Pettus (2003) and others provide ample evidence that growth entails significant costs of adjustment. Of course it is the difference between adjustment costs associated with growth versus decline that would give rise to hypothesized asymmetries in optimal resource adjustments following a change in activity.
A more serious problem with using one cost component from the accounting system for analyzing cost behavior is that the usage for many resources (hence, the classification of their costs) is itself open to managerial discretion. By substituting a single component of cost for total costs in equation (6), we implicitly assume that resources are employed in a specific (e.g., SG&A) task or are unemployed (unutilized). The following (simplistic) example highlights the problem with this assumption.

Suppose a firm employs a single resource (one unit of labor) in addition to the manager, to produce and sell a product. The cost of the labor ($1) is completely fixed by contract. Demand for the resource is either one unit, which can be produced by one unit of labor, or zero. The manager assigns labor to production when demand is one unit and to sales when demand is zero. Costs, in this example, are technologically fixed. However, in the accounting system, SG&A is reported as $1 when demand is zero and $0 (manufacturing costs are $1) when demand is one unit. Thus, when activity falls, SG&A increases. Over time, based on the results of regression (6), it would appear as if costs are “sticky,” when, in fact, they are contractually (“mechanically”) determined and invariant to activity.

The theory relates cost to the (physical) quantity of activity

A second issue in empirical tests of cost management using archival financial accounting information is that by design, such data reports nominal (financial) measures of activities and resource usage. However, as shown in equation (6), the “driver” of cost is the quantity produced. This is a physical volume measure. ABJ recognize the physical nature of the factor that causes costs to be incurred, using the terms “activity” and “volume” throughout. Thus (ABJ, p. 48):

The behavior of SG&A costs can be meaningfully studied in relation to revenue activity because sales volume drives many of the components of SG&A (Cooper and Kaplan [1998, p.341]). In its annual SG&A survey, CFO Magazine performs extensive analyses of SG&A costs in relation to sales revenue (Mintz [1999]).

In footnote 2 to this passage, ABJ note,

We use sales revenue as an imperfect proxy for sales volume because sales volume is not directly observable.

The problem is that growth in activity, when activity is measured by sales revenue, can occur because of changes in prices, changes in volume, or both. The cost function, which is the basis of the
regression equation for the tests of stickiness, assumes activity (quantity) is exogenous. If the activity measure is not exogenous, then the regression is misspecified.\footnote{If the activity measure is not exogenous, then it is possible to evaluate the properties of the production function by estimating the associated profit function, which expresses profits as a function of input and output prices only. Of course, there are also measurement problems with constructs such as profit.}

We recognize that many empirical tests of cost behavior, both in the accounting and economics literature, rely on revenues as an imperfect proxy for sales volume. The issue is whether this assumption is likely to be important given the theory being tested. We believe it is a problem for investigating cost management, because the purpose of the tests is to identify if managers are exercising discretion over costs. But managers also make choices about sales prices, which in turn influence sales volume. Thus, inferences about managerial decisions on cost management are tied to managerial decisions about pricing. Specifically, we cannot be sure that when we observe declines in sales revenue, that there has been a decline in sales quantity or volume (activity).

*The theory is a theory of trading offs: adjustment costs versus suboptimal production*

The discussion above is about the outputs. In terms of cost management, the concern with real versus nominal measures of activity and resource usage is that managers manage costs by making decisions about real resources (inputs), not costs. In periods of sales declines, managers decide whether to retain or release resources and, in most cases, we, as researchers, look to reported costs to infer the decisions made. Depending on the theory being tested, costs might be a reasonable proxy for decisions about real resources. In the case of cost management, where the manager is trading off adjustment costs with resource cost, we need to be able to separate one from the other. Unfortunately, in most cases archival financial data do not distinguish adjustment costs from resource costs. Moreover, in cases where adjustment costs are recorded separately (e.g., employee severance costs or training costs), it is often impossible to link these special charges to the broad categories of spending (e.g., SG&A) that are studied for evidence of “sticky” cost behavior.
The following example illustrates the problem a researcher will have using archival financial data. Consider two firms in the same industry. Both firms rely on a number of employees for their activities. Both firms have severance agreements with their employees, which, for the sake of illustration, we will assume requires the firms to pay one year of salary in the event the employee is laid-off. Both firms experience a sales decline and some employees will become redundant, but managers in the two firms make different decisions. One manager decides to avoid the adjustment cost and retains the employees (perhaps hoping for renewed demand for the company’s service). The other manager, a pessimist, dismisses the redundant workers and pays them their severance package.

In designing empirical tests of theories of cost management, we would like our tests to distinguish between these decisions. Unfortunately, if we use publicly available archival financial data, we will not be able to design such a test. Both firms will appear to have incurred exactly the same costs post-sales decline. The data do not allow us to see what the money was used for – adjustment costs or salaries.

3.3 Summary

We have identified several assumptions, implicit and explicit, in the sticky cost literature that raise questions about the ability to draw inferences about cost management from observed cost behavior. Of course all empirical tests rely on assumptions about how good selected proxies are for the underlying construct. The basic problem in the sticky cost literature, however, is that neither the form of the empirical test nor the data used to make the test operational allow us to identify as cost management the empirical finding that managers “adjust” resources more in the face of activity declines than they do for activity increases. Nor can we identify as cost management a finding that managers adjust (and incur adjustment costs) from a finding that they don’t adjust (and avoid adjustment costs but incur losses from having excess resources as compared to what are strictly needed to meet demand). The impossibility of inferring anything about cost management stems both from shortcomings of the empirical test and the accounting data in relation to production and adjustment cost theory.
4. **Selected Empirical Evidence on Sticky Costs and Cost Management**

In the previous section, we raised several issues associated with developing and testing an empirical model of cost management. In this section we replicate the results of prior studies and illustrate the fragility of sticky cost behavior with tests that derive from some of our critiques.

4.1 **The Sample**

We use an updated sample that is similar to that used by ABJ. Specifically, the data are from the Compustat Annual Industrial Tapes for 2006 as maintained by Wharton Research Data Services (WRDS). We first collect data on Sales Revenue (Compustat Data Item #12) and SG&A (Compustat Data Item #189) for the period 1978 – 2005 for all active and inactive firms. Thus, our sample includes one year prior to and seven years subsequent to the sample employed by ABJ. Our primary motivation for extending the already-sizeable sample employed by ABJ is that more current time periods have been characterized by volatile demand in many industries. Unexpected national events of 2001 interjected large, primarily downward exogenous shifts of demand that should enhance our ability to detect sticky cost behavior. Following ABJ’s description of sample construction, we screen our data as follows:

1. We delete firms with duplicate issues (same CNUM, different CICs).
2. Next, we delete observations that are missing data on either sales revenue or SG&A costs for the current year or the previous year.
3. Next, we drop observations where SG&A costs are greater than sales revenue in the current or previous year.
4. Our next step, not explicitly mentioned by ABJ, but required for the log transformation, is to delete observations with non-positive amounts for either sales revenue or SG&A.
5. The final step, completed after the descriptive statistics are computed, but before the regression is estimated, is to trim the top and bottom 0.5% of the estimation sample. Specifically, after completing steps 1 – 5 above, the 0.5% of the observations with the highest and lowest values of each of the three variables in the regression are identified and removed (concurrently) from the sample remaining after step 5.\(^7\)

Table 2 summarizes these sequential screening steps and documents the impact on the estimation sample.

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\(^7\) An alternative is trimming the sample one variable at a time (sequentially). We note this because when reviewing Table 2, the trimming operation reduces the sample by more than 1% in total, but not by 1% for each variable.
Descriptive statistics for our sample are shown in Table 3. Panel A of Table 3 provides comparative data on the sizes of the current sample and the ABJ sample. Our sample is slightly more than twice the size of the ABJ sample both in firm-years and individual firms covered. Selected descriptive statistics from the original ABJ article (ABJ, Table 1) are reproduced in Table 3. Comparing the descriptive statistics of the current sample in Panel B with those of the ABJ sample, our sample is characterized by larger (non-inflation adjusted) firms (median sales of $99 million compared to $88 million in ABJ) that have higher SG&A costs (median costs of $20 million compared to $17 million in ABJ). The distribution of the ratio of SG&A costs to sales revenue is very similar in the two samples with the current sample showing a slightly higher ratio.

The two samples are also similar in terms of the number of years in which sales revenue and/or SG&A decline as can be seen by comparing the results shown in Panel C of Table 3. Our sample shows slightly higher frequency of sales declines (29% versus 27% in ABJ) and SG&A declines (26% versus 25% in ABJ). Given a sales decline, however, the median amount of the decline is essentially the same in both samples (10.5% versus 11.0% in ABJ). These comparisons suggest that the characteristics of the two samples are broadly similar. This is reasonable, because although there is a significant difference in the size of the samples, there is considerable overlap in the years covered.

### 4.2 Sticky Cost Estimation Results for the Current Sample

Table 4 reports the results of estimating the basic ABJ regression model with our estimation sample. Comparing our results with those of ABJ, we find a negative and significant $\beta_2$ indicating that our sample is also characterized by sticky SG&A costs as defined by ABJ. Our coefficient estimate for $\beta_0$, the intercept, is lower (0.0283 versus 0.0481 in ABJ) and $\beta_1$, the estimate of the change in SG&A cost that follows increased sales revenue, is larger than that reported in ABJ (0.6883 compared to 0.5459 in ABJ). Our coefficient estimate for $\beta_2$, the estimated change in SG&A costs that follows a decline in sales revenue, is actually a bit higher in absolute value than that of ABJ (-0.2105 compared to -0.1914 in ABJ). Thus, although we did not set out to replicate the ABJ results on a larger sample, we find very similar
relations between changes in SG&A costs and changes in revenues.\(^8\) We also find, but do not tabulate, sticky cost behavior in every year (save one) and, consistent with the evidence in Subramaniam and Weidenmier (2003), that the degree of stickiness, and whether costs are sticky at all, varies by industry.\(^9\)

4.3 Sticky Cost Estimation Results for Total Costs and Selected Cost Categories

The regression equation in (6) of Section 3 is based on total costs. In Table 5, we report the results of estimating the basic ABJ regression model on “total costs,” which we compute as the sum of cost of goods sold and SG&A. What we see in Table 5 is that total costs exhibit sticky cost behavior, although the degree of stickiness is much lower (\(\beta_2 = -0.0877\) compared to \(-0.2105\) for SG&A costs).

Although economic theory is the basis for using total costs, it might be possible to increase the power of tests of cost management if we believe that managers have greater discretion over some costs than others. Most tests of sticky cost behavior are based on one component of cost, SG&A costs. If managerial discretion is the mechanism that facilitates SG&A cost stickiness, and we are interested in a general theory of cost management rather than in the management of SG&A per se, we should expect to see other discretionary costs exhibit sticky cost behavior. Indeed, Noreen and Soderstrom (1997) find weak evidence of asymmetric cost response in 12 of the 16 hospital overhead cost categories that they study. If the costs that are most likely to be sticky are those that are subject to managerial discretion, then obvious cost categories to investigate are advertising expenses (COMPUSTAT Item # 45), which is a component of SG&A, research and development (R&D) costs (COMPUSTAT Item #46), labor costs (COMPUSTAT Item # 42), and property plant and equipment costs (COMPUSTAT Item # 30).

We estimate the basic model substituting advertising costs for SG&A costs. The results of estimating regression of Model (1) with advertising costs indicate that advertising costs do not exhibit

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\(^8\) Restricting the sample to the same period studied by ABJ (1979 – 1998) does not change our results qualitatively from those for the full sample (1978 – 2005). Our results for the ABJ period differ because the firms included in COMPUSTAT have changed (our sample includes more firms for the 1979-1998 period. Again, we are not trying to replicate the ABJ results; we take their empirical results as a starting point for evaluating their analysis of cost management.

\(^9\) Our industry tests differ from those in ABJ. We test each industry separately, essentially allowing all coefficients to differ. This is consistent with each industry having a different cost function and is, therefore, somewhat more general.
stickiness (Table 6). The coefficient on the sticky cost variable is positive and significant. This differs from the results ABJ reported (p. 58). Although we find a similar estimate for \( \beta_1 \) in the full sample (0.6018 versus 0.6298 in ABJ), the estimate for \( \beta_2 \) is not only positive, but also relatively large (0.1590).

We repeat the analysis using R&D costs. Here, we find evidence of sticky cost behavior with an estimate of \( \beta_2 \) of -0.1099. Table 6 reports results for two other cost categories, labor costs and expenditures on property, plant, and equipment (PP&E). From Table 6, we see that labor costs are sticky and PP&E costs are not. Thus, there does not appear to be consistent evidence of sticky cost behavior when we consider alternative cost components where we might reasonably expect manager to exercise discretion. Of course, all of these results are really a joint test of the cost management and adjustment costs being, on average, greater for resource reductions than for resource additions.

4.4 Sticky Cost Estimation Results for a Physical Resource Measure

We reported above that labor costs were sticky. In Section 3, we devoted considerable space to arguing that financial measures are potentially poor proxies of physical resource quantity. Although we do not have data on physical activity (sales quantity), we do have data from COMPUSTAT on the number of employees. We repeated the test of Section 4.3 using the number of employees in place of labor costs. ABJ in fact hypothesize that adjustments are slower in labor-intensive industries and consider whether labor intensity has a moderating effect on the stickiness of SG&A costs:

“Dismissing employees is costly because employers must pay severance costs… lose investments made in firm-specific training… and experience productivity losses because morale declines when employees are laid off, and they may experience more turnover because employee loyalty is eroded (p. 52)”

The result of our test using the number of employees is shown in Table 7. We find no evidence of stickiness when we measure resource use by the number of employees. This measure would seem to be a natural proxy for the manager’s control over resources. The estimated coefficient is negative, but insignificant. The combined evidence on labor costs and employees is consistent with managers hiring and firing employees as activity changes, but, in periods of sales declines, retaining those with higher labor costs. This might be the result of seniority rules or some other contractual commitment.
Combining the results of testing for stickiness in labor costs and in the number of employees illustrates nicely the importance of specifying the theory of cost management explicitly. In the labor example, we can think of seniority rules as imposing adjustment costs with respect to labor decisions for a subset of employees. Therefore, when we observe a manager laying off more junior employees instead of selecting employees at random, we would agree that the manager is, indeed, making cost management decisions and basing his or her decision on adjustment costs. Alternatively, if we interpret the theory to say that the manager has decided to pay for unutilized capacity because of adjustment costs, the evidence in Table 7 would suggest that this is not the case.

4.5 “Unusual” Observations

One assumption that is important to assess, especially when using data over a relatively long time period, is that the process generating the data is stationary. The theory of cost management being tested in the sticky cost literature is one where the variable changing is the activity or volume. Implicit in this is that products and markets remain constant for the firm. If this is not correct, the costs (even real resources) may change even though measured activity (sales) does not. Under the adjustment cost theory, what should we observe in cost data when activity changes? We will here assume that adjustment costs are greater when “firing” resources than when hiring resources. Suppose a manager observes a sales decline. He or she considers, among other things, the cost associated with paying for unused capacity or paying the adjustment costs. Ignoring longer-term considerations, such as the likelihood of subsequent increases in activity, the manager chooses the lower cost option. Whatever the choice, if the decision is made for the purpose of cost management, we expect to see costs decline in periods of activity declines.

Suppose we observe a firm where sales decline, but resource cost increases. If the manager is managing costs, there are two possibilities. First, the manager has decided to retain the resource. Observing higher costs would be caused by higher factor prices. But this means that costs are not a good proxy for real resources and calls into question what we can infer about other observations. Alternatively, the manager has decided to release the resources and pay the adjustment costs and the adjustment costs are higher than the resource costs. It might also be the case that the manager is hiring new resources for
some reason other than cost management (the new products or markets suggested above). Determining the actual reason using archival financial data is, of course, not possible. In most discussions of cost management, finding that costs increase when activity declines would seem anomalous. For example, in discussing the motivation behind cost management, ABJ say,

\[
\text{costs are sticky if the magnitude of the increase in costs associated with an increase in volume is greater than the magnitude of the decrease in costs associated with an equivalent decrease in volume. (p. 48, emphasis added)}
\]

Because observations with this type of behavior appear to be “unusual” in a cost management setting and because we cannot identify observations where something fundamental in the firm has changed, it would be useful to determine if these observations are influential. This is a common practice in empirical work, including the sticky cost literature, where data sets are routinely trimmed or windsorized to eliminate “extreme” observations.

Table 8, Panel A reports the number of firm-years where we observe this phenomenon. About 20% of the firms-year observations are for cases where SG&A costs increase in years in which sales decline or where SG&A costs decline in years when sales increase. To assess the impact of these observations on the sticky costs results, we repeat the basic empirical analysis with two variants. First, we exclude any observations where the change in SG&A costs is “inconsistent” (in the opposite direction of) the change in sales costs. As shown in Table 8, Panel B, SG&A costs still appear sticky, but the estimated coefficient is only -0.0139 (compared to a coefficient of -0.2105 when these observations are included). The t-statistic is also much lower (-2.86 compared to -39.51). This suggests that these unusual observations have a large influence in tests of sticky costs. Using a second approach, we control for these observations using indicator variables. That is, we allow the sticky cost effect to be different for the “usual” and the “unusual” observations. The results of this test are reported in Table 8, Panel C. As shown there, the sticky coefficient for the usual observations is now positive and significant and the sticky coefficient for the unusual observations is negative, very large (in absolute value), and significant. Again, these results indicate that these observations are influential.
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Of course, identifying “unusual” observations by their values is subject to measurement error as well. It might be that for “small” changes in either sales or SG&A, measurement error or other factors might be causing us to classify these observations as “unusual” when, in fact, they are valid observations (meaning that they are the result of the cost management behavior we are attempting to investigate). To determine whether it is these small change observations that are causing the large change in the estimated sticky coefficient, we repeat the tests excluding only “large” change, unusual observations. Our process is illustrated in Figure 1. The observations are mapped on a two-dimensional grid based on the change in sales (the horizontal axis) and SG&A costs (the vertical axis). Unusual observations are in the upper left quadrant and the lower right quadrant. We then identify a percentage cutoff of both sales and SG&A costs increases and decreases, labeled “p” that represent measurement error. We run the sticky cost test for observations that are “unusual” and have both sales and SG&A costs that exceed “p” in absolute terms. These observations fall in the two areas labeled “A” and “B.” For selected values of “p”, the results are reported in Table 9. Here we see that these “unusual” observations are influential even when we do not exclude small, inconsistent changes. In sum, it appears that these observations might represent something other than cost management motivated by the costs of adjusting resources either up or down.

4.6 Summary

Although we find evidence of sticky costs in aggregate data, the effect is much lower than that reported by prior studies. Moreover, stickiness is rejected in many important sub-samples. In the only test where we have data on physical volumes, we find no evidence of sticky costs.

5. Developing Data to Study Cost Behavior and Cost Management

5.1 Theories of Cost Management

We conclude from our investigation that no single model of cost behavior prevails. In some settings cost stickiness is the norm while in others it is not. (In fact, in some cases, results that might be termed consistent with “anti-stickiness,” costs declining faster than sales declines, are observed.) We further conclude that even when cost stickiness is observed, we can infer very little about management
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decision-making or cost management from accounting data and measures of activity that confound price and volume effects. In sum, we are in a position not unlike that described by Blinder (1991, p. 89), who surveyed research on sticky prices and concluded:

[economists] attach great importance to the phenomena of wage and/or price "stickiness"… Yet, more than a half-century after Keynes published *The General Theory*, the phenomenon itself [wage and price stickiness] remains poorly understood. Just why are wages or prices sticky? It is not that economists have ignored these questions. One could literally fill many volumes with good empirical studies of wage and price stickiness, and many more with clever theories purporting to explain these phenomena. Yet, despite all this work, the range of admissible theories is wider than ever, and new theories continue to crop up faster than old ones are rejected.

Like economists, accounting researchers understand the importance of cost behavior and of theories of cost management, and have a range of plausible theories for why managers might take decisions that would lead to incomplete, lagged or asymmetric cost reactions to activity changes. Nonetheless, the answer to the question, why costs are (or are not) sticky, has eluded us. Blinder (1991, pp. 89-90) argues that the main reason for the failure to make progress on the question of why wages and prices are sticky:

…is that most of the theories are *empty* in the following specific sense: Either they involve unobservable variables in an essential way, or they carry no real implications other than that prices are “sluggish” in some unmeasurable sense, or both… All of the theories share exactly the same prediction: that prices are sticky… So how are we to discriminate among them? (emphasis original)

As we have done in this paper, Blinder identifies econometric and theoretical issues that are unlikely to make prior research approaches fruitful before concluding:

This lack of scientific progress makes one wonder about the basic strategy that economists have been pursuing. Is there a better way? … If it really matters which theory is correct, but conventional modes of economic inquiry cannot adjudicate the dispute, economic science would appear to be in deep trouble. Fortunately, one other common characteristic of the theories suggests a way out: Virtually every theory of price rigidity describes a chain of reasoning which allegedly leads the firm to conclude that a change in price is inadvisable… (emphasis original, p. 89-90)

10 Recall from our earlier note that economists use this term to refer to the delayed reaction of wages and prices to changes in activity, not per se to asymmetric reactions to increases and decreases in activity.
Blinder argues separately that it does matter which theory is correct, both for “the value of economics as a descriptive science” and as an important determinant of optimal macroeconomic policy.

The parallels to accounting research on sticky costs are striking. ABJ, Cooper and Kaplan [1998], and Noreen and Soderstrom [1997] describe in detail the chain of reasoning that might cause managers to adjust (or not to adjust) the level and mix of resources. For example, ABJ posit that:

When volume falls, managers must decide whether to maintain committed resources and bear the costs of operating with unutilized capacity or reduce committed resources and incur the adjustment costs of retrenching and, if volume is restored, replacing committed resources at a later date… When demand increases, managers increase committed resources to the extent necessary to accommodate additional sales. When volume falls, however, some committed resources will not be utilized unless managers make the deliberate decision to remove them… managers must evaluate the likelihood that a drop in demand is temporary when deciding whether to adjust committed resources downward.

Manager decisions to maintain unutilized resources may also be caused by personal considerations and result in a form of agency costs… Managers may retain unutilized resources to avoid personal consequences of retrenchment, such as loss of status when a division is downsized or the anguish of dismissing familiar employees… (p. 49)

In this discussion, several factors are hypothesized to influence managers’ response to changes in demand. First, managers consider the costs of adjusting the level and mix of resources to bring about a new equilibrium relation between inputs and demand as compared to maintaining existing resources and incurring costs of excess resources (decreased demand), or of peak utilization of resources or foregone demand (increased demand). Adjustment costs take two forms: costs that are borne by the firm and costs

11 The economics literature on input factor adjustment costs is extensive. Lucas [1967] provides an early discussion of capital adjustment processes. Hamermesh [1995] and Hamermesh and Pfann [1996] provide contemporary reviews of the literature and discuss sources of adjustment costs. On the issue of asymmetric response to changes in activity, Hamermesh and Pfann [1996] conclude that, “The vast literature on dynamic factor demand has been organized around the concept of costs of adjustment. The standard assumption has been that these costs are convex and symmetric… The assumption is not supported by microeconomic data: on a variety of data sets a rapidly growing body of economic research has demonstrated that other functional forms describe the technology of adjustment of individual inputs into production better. No doubt some firms’ behavior may be described as symmetric quadratic costs; but on every one of the sets of microeconomic data in which it has been examined this standard assumption is dominated by some alternative… (emphasis original, pp. 1287-8).” The authors argue that research is needed to identify characteristics of firms, industries, and input factor markets that are associated with different patterns of adjustment cost. They recommend field-based research: “By expanding our direct observation of what businesses do and how managers’ thought processes condition those actions, we should be able to gain additional industry insight to the nature of adjustment costs. This approach means combining the accounting studies… with the powerful organizing ability of economic theory to provide information on the size of adjustment costs and their implications for economic behavior. (emphasis added, p. 1289)”
Understanding Cost Management

that are borne by the manager. After evaluating the costs of adjusting resources to match the new level of demand, managers consider the *transitory or permanent nature* of the demand shift. The permanence of the demand shift affects the adjustment decision through its influence on the expected value of future savings associated with rebalancing inputs to match demand and on the likelihood of incurring future adjustment costs. Although ABJ consider cost management only in relation to exogenous shifts in demand, the above arguments also extend to other exogenous shifts that precipitate managers’ reconsidering the level and mix of resources, for example, shifts in input prices or availability.¹²

Economics provides additional candidate theories about how managers respond to changes in demand. We have already mentioned the need to consider prior discretionary *technology choices* in crafting an appropriate response to demand changes. Firms that select flexible technologies in prior periods have in effect already incorporated the real option value of being capable to produce efficiently a wide range of output and, perhaps, a broad mix of products (Marschak and Nelson [1962], Moel and Tufano [2002], Kallapur and Eldenburg [2005]). Although these technology decisions are “sunk” with respect to current period demand shifts, a given level of demand change would be associated with different adjustment costs for different technology choices. Another avenue of theorizing that draws on the economics of industrial organization might consider the source of the demand change as a factor in optimal cost management behavior. For example, we might expect managers to respond differently if demand decreases are the result of a competitor’s increased market share rather than an overall decline in total demand. Indeed, a vigorous counter attack in the former case might be predicted to lead to costs that *increase* with demand *decreases*. There is precedent for considering how competition affects cost structure (e.g., Banker and Johnston [1993]); thus, it seems reasonable to hypothesize that variables that influence cost structure might also influence cost adjustments.

¹² Throughout the paper, we, like ABJ, focus on a narrow range of “cost management.” That is, we analyze how managers react to a change in sales activity (changes in the demand side of the market). We are silent about how managers react to changes in the supply side. For example, we ignore through much of the discussion how managers cope with changes in input prices or supply disruptions. If researchers are to understand cost management better, however, it is clear that we need to consider how managers might respond differently to exogenous shocks that arise in the input versus the output markets.
ABJ discuss (but do not test) the theory that managerial incentives might diverge from the interests of the firm. In this respect, they continue to use economic theory to explain managerial decision-making. Although one must consider carefully whether the individual manager is the appropriate unit of analysis in relation to firm-level costs, another potentially fruitful line of theorizing about cost management decisions derives from the behavioral literature that examines cognitive factors affecting managerial judgment and decision-making. For example, cognitive theory has proved useful in explaining why managers incorporate irrelevant “sunk” costs, disregard relevant opportunity costs, and respond differently to a given economic event under alternative accounting treatments (e.g., Lipe [1993], Vera-Munoz [1998], Luft and Shields [2001]).

In sum, there are a number of plausible theories, both economic and behavioral, for how managers respond to exogenous shocks that create an imbalance in the relation between input resources and output. The challenge is designing research programs to explore the contextual settings in which these theories apply and the relative power of these theories to explain cost behavior.

5.2 Research Methods for Studying Cost Management

In considering alternative approaches for testing theories of price rigidity, Blinder focuses on the “chain of reasoning which allegedly leads the firm to conclude that a change in price is inadvisable…”, concluding that “If actual decision makers really think the way one of these theories says, they ought to know that they do (p. 90).” To that end, he proposed a new (for economists) mode of inquiry in which managers are interviewed to shed light on the relative descriptive validity of twelve competing theories for explaining the speed of price adjustment in that managers’ firm. A similar approach could be fruitful for creating a more systematic understanding of cost management and the resultant cost behavior.

Similar to the Blinder study, the purpose of structured interviews would be to understand what events precipitate managers’ considering a change to the level or mix of resources (e.g., demand changes, input price or availability changes, competitive changes). Then, given that such a change is under

\[\text{\textsuperscript{13}}\text{Blinder (1991) provides preliminary evidence from this study. Complete research results as well as interview protocols and a discussion of the research design and data collection are found in Blinder et al. (1998).}\]
consideration, the interviewer would explore the relative descriptive validity of alternative theories on the nature and extent of adjustment that is undertaken. The latter question includes consideration of whether adjustment processes are symmetric with respect to increases and decreases in demand as well as the factors associated with any asymmetric response. Important questions in the area of judgment and decision making related to cost management that could be explored in interviews include: 1) how do managers’ assessments of adjustment costs compare with those of the firm; 2) which costs are (and are not) candidates for adjustment and why; and, 3) how are alternatives to adjustment identified and valued? Finally, taking an information systems perspective, it would be useful to investigate how management accounting information is implicated in the analysis of alternatives and whether important management control systems (e.g., decision rights, reward systems) moderate managers’ response to exogenous changes in demand. As Blinder notes, because it is likely that managers will have a large (and complex) set of reasons for their actions, it is important that the interviewers be able to deviate from the interview protocol to record the thought process.

Although, interview data would provide important insight into the cost management process, combining interviews with other research methods of both a qualitative and quantitative natures, (e.g., field-based observation, analysis of archival cost data (Anderson and Widener [2006])) would provide important corroborating evidence and a stronger basis for testing theory (e.g., Hamermesh and Pfann [1996]). Structured interviews and field-based research are appropriate in early stages of understanding managerial behavior; however, later inquiries should employ cost-effective means of standardized data collection (e.g., surveys). Indeed, our critique of the empirical tests for sticky cost behavior and related inferences is similar to critiques of the accounting disclosure literature that led Graham, et al. [2005] to use field interviews and surveys to study CFO motivations for reporting and disclosure. They chose this approach over statistical analyses of archival data for several reasons, but a central reason was that “… developing good empirical proxies for voluntary disclosure, and especially earnings management, is non-trivial (p. 8).” In conclusion, just as difficult in developing good empirical proxies for voluntary disclosure and earnings management prompted Graham et al. to go to the decision-makers behind the
data, the impossibility of inferring cost management from cost behavior requires researchers to get closer to managers who make resource decisions.

6. Conclusion

The extensive literature on sticky cost behavior addresses two issues: (1) the behavior of costs as a function of activity and (2) the reason for the cost behavior that we observe. Observing that costs are sticky empirically, ABJ and others conclude that this is evidence of active cost management. In this paper we reconsider whether results of tests of cost behavior using archival financial accounting data are a sufficient basis for this conclusion. Our concerns arise from two sources. First, tests of a theory of cost management where the manager considers the costs of adjusting resources in response to changes in activities requires additional theory or assumptions to specify a priori how cost management will be reflected in cost behavior. Second, aggregate financial accounting data, such as that in large-scale databases, is too aggregated to allow researchers to determine the resources for which the costs were incurred.

Although we also find evidence of sticky cost behavior in our own (overlapping) sample, we find no consistent mode of cost behavior when we explore the premise of sticky cost behavior for other types of costs that are also subject to managerial discretion, including: advertising, labor wages, research and development, and property, plant and equipment. For some costs, we see sticky behavior for other costs we see evidence that costs are significantly “anti-sticky,” they increase faster when activity increases than they decrease when activity decreases. These findings do not lead us to reject the hypothesis of adjustment cost based cost management, because this result is equally plausible. Thus, the documented cost behavior is uninformative with respect to cost management without additional structure. Further, we find no evidence of stickiness when we look at the number of employees, a real resource that the manager is likely to use when adjusting resources. We also identify a sizeable proportion of observations that raise questions about whether there is behavior other than that posited in adjustment cost theory that might be generating observations that are influential in their impact on the estimated coefficients.
Although we critique the theory, tests, and data of prior studies, we believe that the research questions that have been raised, namely, what explains cost behavior and the role of the manager in controlling costs, are central to the field of management accounting. Consequently, we consider in the latter part of the paper how future research might more meaningfully address these very important questions. We find meaningful parallels in economic studies of price and input adjustment processes and in financial accounting studies of disclosure, and we argue that the conclusion of these studies – that the research must get closer to the data generating process to be able to distinguish among a variety of theories – also holds for management accounting research on cost management.

Cost management practices of firms are a legitimate, yet long-neglected area of study for management accountants. Although there are many studies about cost accounting systems and their potential for improved decision-making, there are few studies about how managers use these or other information systems to decide what steps to take to control costs. We believe that field-based evidence collected both from interviews with key managers who have authority and responsibility for cost management and from firms’ archival accounting records, should be used to probe more deeply into cost management practices. A few well-designed, field-based inquiries could then be used to inform the construction of instruments to collect data on a wider scale, such as through mail or web-based surveys.

In sum, the conjectures made in the literature about adjustment costs and cost management are reasonable and we are not arguing that adjustment costs are not asymmetric or that managerial actions are unlikely to generate asymmetric changes in cost in association with changes in production activity. Rather, we argue that the definition of cost management and the theory that predicts asymmetric response to changes in demand is not sufficiently advanced to produce meaningful tests using public accounting data on costs. We agree that a better understanding of costs and cost management practices by firms is an area of research that has been neglected by management accounting researchers and is a worthwhile endeavor. By returning to the field to develop more precise theory about conditions that are likely to generate different cost management behavior we will be in a better position at a later date to construct better large sample tests of the theory.
References


Figure 1
Identifying Sample of “Unusual” Observations

<table>
<thead>
<tr>
<th>Sales Changes</th>
<th>Increases</th>
<th>Decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td>+p SG&amp;A Changes</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-p</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A = Increases in Sales with Decreases in SG&A
B = Decreases in Sales with Increases in SG&A
Understanding Cost Management

Table 1

Summary of ABJ Evidence on Sticky Costs

Panel A – Descriptive Statistics for the ABJ Sample:

<table>
<thead>
<tr>
<th>Sample Size</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations:</td>
<td>64,663</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of firms:</td>
<td>7,629</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Median</th>
<th>Lower Quartile</th>
<th>Upper Quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue (millions)</td>
<td>$1,277.09</td>
<td>$5,983.43</td>
<td>$87.53</td>
<td>$17.51</td>
<td>$447.75</td>
</tr>
<tr>
<td>SG&amp;A costs (millions)</td>
<td>$229.45</td>
<td>$1,042.49</td>
<td>$17.49</td>
<td>$4.56</td>
<td>$79.12</td>
</tr>
<tr>
<td>SG&amp;A costs as a % of sales</td>
<td>26.41%</td>
<td>17.79%</td>
<td>22.62%</td>
<td>13.66%</td>
<td>34.31%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Firm-Years with Negative Change from Previous Period</th>
<th>Mean Percentage Decrease Across Periods</th>
<th>Standard Deviation of Percentage Decreases Across Periods</th>
<th>Median Percentage Decreases Across Periods</th>
<th>Upper Quartile of Percentage Decreases Across Periods</th>
<th>Lower Quartile of Percentage Decreases Across Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>27.01%</td>
<td>17.45%</td>
<td>18.64%</td>
<td>10.99%</td>
<td>23.76%</td>
<td>4.38%</td>
</tr>
<tr>
<td>SG&amp;A costs</td>
<td>24.98%</td>
<td>15.67%</td>
<td>16.40%</td>
<td>10.07%</td>
<td>21.63%</td>
<td>3.94%</td>
</tr>
</tbody>
</table>

* Source: ABJ Table 1, Panel A

Panel B – Regression specification is for ABJ’s Model (1):

$$\log \left[ \frac{SG \& A_{i,t}}{SG \& A_{i,t-1}} \right] = \beta_0 + \beta_1 \log \left[ \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right] + \beta_2 \times Decrease_{Dummy} \times \log \left[ \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right] + \epsilon_{i,t}$$

<table>
<thead>
<tr>
<th></th>
<th>(\beta_0) (Intercept)</th>
<th>(\beta_1) (Direct Effect)</th>
<th>(\beta_2) (Sticky Measure)</th>
<th>Adj. (R^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>0.0481</td>
<td>0.5459</td>
<td>-0.1914</td>
<td>0.3663</td>
<td>63,958</td>
</tr>
<tr>
<td>(t-statistic)</td>
<td>(39.88)</td>
<td>(164.11)</td>
<td>(-26.14)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Source: ABJ Table 2
Table 2

Steps Taken to Arrive at the Sample and the Number of Observations Dropped at Each Step

<table>
<thead>
<tr>
<th>Step</th>
<th>Observations (Firm-Years) Deleted</th>
<th>Observations (Firm-Years) Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning raw sample (1978 – 2004)</td>
<td></td>
<td>554,589</td>
</tr>
<tr>
<td>1. Delete duplicate issues</td>
<td>7,375</td>
<td>547,214</td>
</tr>
<tr>
<td>2. Delete observations that are missing data on either sales revenue or SG&amp;A costs for the current or preceding year</td>
<td>385,256</td>
<td>161,958</td>
</tr>
<tr>
<td>3. Delete observations with SG&amp;A &gt; Sales for the current year</td>
<td>17,668</td>
<td>144,290</td>
</tr>
<tr>
<td>4. Delete observations where Sales or SG&amp;A are non positive for the current or preceding year</td>
<td>432</td>
<td>143,858*</td>
</tr>
<tr>
<td>5. Delete observations that exhibit extreme values of the regression variables (i.e., in the top and bottom 0.5% of the distribution)</td>
<td>2,264</td>
<td>141,594**</td>
</tr>
</tbody>
</table>

* Used for the descriptive statistics reported in Table 3.
** Used for the regression analysis reported in Table 4.
Table 3

Comparison of Descriptive Statistics from the Current 27-Year Sample and from the ABJ 20-Year Sample

Panel A – Comparative Sample Sizes of the Current Sample and the ABJ Sample:

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>Current Sample</th>
<th>ABJ Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations:</td>
<td>143,858</td>
<td>64,663</td>
</tr>
<tr>
<td>Number of firms:</td>
<td>17,271</td>
<td>7,629</td>
</tr>
</tbody>
</table>

Panel B – Descriptive Statistics:

**Descriptive Statistics from the Current Sample**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Median</th>
<th>Lower Quartile</th>
<th>Upper Quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue (millions)</td>
<td>$1,307.51</td>
<td>$6,817.97</td>
<td>$99.19</td>
<td>$23.01</td>
<td>$465.07</td>
</tr>
<tr>
<td>SG&amp;A costs (millions)</td>
<td>$237.10</td>
<td>$1,158.60</td>
<td>$20.14</td>
<td>$5.24</td>
<td>$85.01</td>
</tr>
<tr>
<td>SG&amp;A costs as a % of sales</td>
<td>26.46%</td>
<td>17.49%</td>
<td>22.79%</td>
<td>13.89%</td>
<td>34.49%</td>
</tr>
</tbody>
</table>

**Descriptive Statistics Reported by ABJ***

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Median</th>
<th>Lower Quartile</th>
<th>Upper Quartile</th>
</tr>
</thead>
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<td>$4.56</td>
<td>$79.12</td>
</tr>
<tr>
<td>SG&amp;A costs as a % of sales</td>
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<td>17.79%</td>
<td>22.62%</td>
<td>13.66%</td>
<td>34.31%</td>
</tr>
</tbody>
</table>

* Source: ABJ Table 1, Panel A
Table 3 (continued)

Comparison of Descriptive Statistics from the Current 27-Year Sample and from the ABJ 20-Year Sample

Panel C – Periodic Fluctuations in Revenue and SG&A Costs:

Observations from the Current Sample

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Firm-Years with Negative Change from Previous Period</th>
<th>Mean Percentage Decrease Across Periods</th>
<th>Standard Deviation of Percentage Decreases Across Periods</th>
<th>Median Percentage Decreases Across Periods</th>
<th>Upper Quartile of Percentage Decreases Across Periods</th>
<th>Lower Quartile of Percentage Decreases Across Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>28.89%</td>
<td>16.03%</td>
<td>16.42%</td>
<td>10.53%</td>
<td>22.24%</td>
<td>4.28%</td>
</tr>
<tr>
<td>SG&amp;A costs</td>
<td>26.39%</td>
<td>15.34%</td>
<td>15.82%</td>
<td>10.04%</td>
<td>21.26%</td>
<td>4.03%</td>
</tr>
</tbody>
</table>

Reported by ABJ*

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Firm-Years with Negative Change from Previous Period</th>
<th>Mean Percentage Decrease Across Periods</th>
<th>Standard Deviation of Percentage Decreases Across Periods</th>
<th>Median Percentage Decreases Across Periods</th>
<th>Upper Quartile of Percentage Decreases Across Periods</th>
<th>Lower Quartile of Percentage Decreases Across Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>27.01%</td>
<td>17.45%</td>
<td>18.64%</td>
<td>10.99%</td>
<td>23.76%</td>
<td>4.38%</td>
</tr>
<tr>
<td>SG&amp;A costs</td>
<td>24.98%</td>
<td>15.67%</td>
<td>16.40%</td>
<td>10.07%</td>
<td>21.63%</td>
<td>3.94%</td>
</tr>
</tbody>
</table>

* Source: ABJ Table 1, Panel B
Table 4

Comparison of the Basic Regression Model (Model (I)) Results from the Current Sample and from the ABJ Sample

Regression specification is for ABJ’s Model (1):

\[
\log \left( \frac{SG & A_{t,j}}{SG & A_{t,j-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{t,j}}{Revenue_{t,j-1}} \right) + \beta_2 * Decrease_{Dummy} * \log \left( \frac{Revenue_{t,j}}{Revenue_{t,j-1}} \right) + \epsilon_{i,j}
\]

Observations from the Current Sample (1978 – 2005):

<table>
<thead>
<tr>
<th></th>
<th>( \beta_0 ) (Intercept)</th>
<th>( \beta_1 ) (Direct Effect)</th>
<th>( \beta_2 ) (Sticky Measure)</th>
<th>Adj. R(^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>0.0283</td>
<td>0.6883</td>
<td>-0.2105</td>
<td>0.4475</td>
<td>141,594</td>
</tr>
<tr>
<td>t-statistic</td>
<td>(39.51)</td>
<td>(270.92)</td>
<td>(-39.51)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported by ABJ*:

<table>
<thead>
<tr>
<th></th>
<th>( \beta_0 ) (Intercept)</th>
<th>( \beta_1 ) (Direct Effect)</th>
<th>( \beta_2 ) (Sticky Measure)</th>
<th>Adj. R(^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>0.0481</td>
<td>0.5459</td>
<td>-0.1914</td>
<td>0.3663</td>
<td>63,958</td>
</tr>
<tr>
<td>(t-statistic)</td>
<td>(39.88)</td>
<td>(164.11)</td>
<td>(-26.14)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Source: ABJ Table 2

Table 5

Results of the Basic Regression Model (Model (I)) for “Total Cost” (Cost of Goods Sold Plus SG&A)

Regression specification is the same as ABJ’s Model (1):

\[
\log \left( \frac{Cost_{t,j}}{Cost_{t,j-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{t,j}}{Revenue_{t,j-1}} \right) + \beta_2 * Decrease_{Dummy} * \log \left( \frac{Revenue_{t,j}}{Revenue_{t,j-1}} \right) + \epsilon_{i,j}
\]

<table>
<thead>
<tr>
<th></th>
<th>( \beta_0 ) (Intercept)</th>
<th>( \beta_1 ) (Direct Effect)</th>
<th>( \beta_2 ) (Sticky Measure)</th>
<th>Adj. R(^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>0.0055</td>
<td>0.9390</td>
<td>-0.0877</td>
<td>0.8636</td>
<td>114,407</td>
</tr>
<tr>
<td>t-statistic</td>
<td>(15.60)</td>
<td>(692.21)</td>
<td>(-23.43)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6

Results of the Basic Regression Model (Model (I)) for Various Cost Categories

Regression specification is the same as ABJ’s Model (1):

\[
\log \left( \frac{Cost_{i,t}}{Cost_{i,t-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \beta_2 * Decrease \_ Dummy * \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \epsilon_{i,t}
\]

<table>
<thead>
<tr>
<th></th>
<th>Advertising Costs</th>
<th>R&amp;D Costs</th>
<th>Labor Costs</th>
<th>PP&amp;E Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>0.0161 (5.13)</td>
<td>0.0318 (12.96)</td>
<td>0.0297 (27.12)</td>
<td>-0.0195 (-7.03)</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>0.6018 (64.04)</td>
<td>0.5161 (67.74)</td>
<td>0.7005 (146.00)</td>
<td>0.7676 (89.93)</td>
</tr>
<tr>
<td>( \beta_2 )</td>
<td>0.1590 (7.64)</td>
<td>-0.1099 (-6.68)</td>
<td>-0.2102 (-17.95)</td>
<td>0.0998 (5.76)</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>49,932</td>
<td>60,692</td>
<td>33,664</td>
<td>157,952</td>
</tr>
<tr>
<td>Adjusted R(^2)</td>
<td>0.1404</td>
<td>0.1097</td>
<td>0.4695</td>
<td>0.0941</td>
</tr>
</tbody>
</table>

Table 7

Results of the Basic Regression Model (Model (I)) for Number of Employees

Regression specification is the same as ABJ’s Model (1):

\[
\log \left( \frac{Cost_{i,t}}{Cost_{i,t-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \beta_2 * Decrease \_ Dummy * \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \epsilon_{i,t}
\]

<table>
<thead>
<tr>
<th></th>
<th>( \beta_0 ) (Intercept)</th>
<th>( \beta_1 ) (Direct Effect)</th>
<th>( \beta_2 ) (Sticky Measure)</th>
<th>Adj. R(^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>-0.0033</td>
<td>0.3902</td>
<td>-0.0036</td>
<td>0.2191</td>
<td>165,719</td>
</tr>
<tr>
<td>t-statistic</td>
<td>(-3.96)</td>
<td>(158.37)</td>
<td>(-0.74)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Understanding Cost Management

Table 8

The Effects of “Unusual” Observations Where SG&A Costs and Sales Move in Opposite Directions
(i.e., SG&A costs increase when sales decline or SG&A costs decrease when sales increase)

Panel A – Number of Firm-Years

<table>
<thead>
<tr>
<th></th>
<th>Observations</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full sample size (before trimming)</td>
<td>143,858</td>
<td>100.0%</td>
</tr>
<tr>
<td>less SG&amp;A increases following Sales decline</td>
<td>16,744</td>
<td>11.6%</td>
</tr>
<tr>
<td>less SG&amp;A decreases following Sales increase</td>
<td>13,160</td>
<td>9.2%</td>
</tr>
<tr>
<td>Restricted sample size (before trimming)</td>
<td>113,954</td>
<td>79.2%</td>
</tr>
</tbody>
</table>

Panel B – Regression Results: “Unusual” Observations Excluded:

Regression specification is for ABJ’s Model (1):

\[
\log \left( \frac{Cost_{i,t}}{Cost_{i,t-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \beta_2 \times \text{Decrease Dummy} \times \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \epsilon_{i,t}
\]

<table>
<thead>
<tr>
<th></th>
<th>(\beta_0) (Intercept)</th>
<th>(\beta_1) (Direct Effect)</th>
<th>(\beta_2) (Sticky Measure)</th>
<th>Adj. (R^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>0.0331</td>
<td>0.7591</td>
<td>-0.0139</td>
<td>0.6523</td>
<td>112,196</td>
</tr>
<tr>
<td>t-statistic</td>
<td>(48.03)</td>
<td>(339.86)</td>
<td>(-2.86)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel C – Regression Results: Indicator Variable for “Unusual” Observations:

Regression specification is based on ABJ’s Model (1):

\[
\log \left( \frac{Cost_{i,t}}{Cost_{i,t-1}} \right) = \beta_0 + \beta_1 \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \beta_2 \times \text{Decrease Dummy} \times \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \\
\beta_3 \times \text{Unusual} \times \text{Decrease Dummy} \times \log \left( \frac{Revenue_{i,t}}{Revenue_{i,t-1}} \right) + \epsilon_{i,t}
\]

<table>
<thead>
<tr>
<th></th>
<th>(\beta_0) (Intercept)</th>
<th>(\beta_1) (Direct Effect)</th>
<th>(\beta_2) (Sticky Measure)</th>
<th>(\beta_3) (“Unusual” Sticky Measure)</th>
<th>Adj. (R^2)</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient estimate</td>
<td>0.0212</td>
<td>0.7045</td>
<td>0.0182</td>
<td>-1.1851</td>
<td>0.5177</td>
<td>141,594</td>
</tr>
<tr>
<td>t-statistic</td>
<td>(31.57)</td>
<td>(296.47)</td>
<td>(3.44)</td>
<td>(-143.60)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 9

Results of the Sticky Cost Hypothesis When “Unusual” Observations With Large Absolute Changes in SG&A and Sales Are Excluded ("p" is the percentile cutoff for both SG&A and Sales Changes – See Figure 1)

<table>
<thead>
<tr>
<th>“p”</th>
<th>Number of Observations</th>
<th>Sticky Coefficient (t-stat)</th>
<th>Adjusted R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>112,196</td>
<td>-0.0139 (-2.86)</td>
<td>0.6523</td>
</tr>
<tr>
<td>(Table 8, Panel B)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1%</td>
<td>113,430</td>
<td>-0.0238 (-4.86)</td>
<td>0.6442</td>
</tr>
<tr>
<td>5%</td>
<td>117,334</td>
<td>-0.0487 (-9.78)</td>
<td>0.6155</td>
</tr>
<tr>
<td>10%</td>
<td>121,008</td>
<td>-0.0780 (-15.44)</td>
<td>0.5310</td>
</tr>
<tr>
<td>25%</td>
<td>128,382</td>
<td>-0.1275 (-24.42)</td>
<td>0.5310</td>
</tr>
<tr>
<td>100%</td>
<td>141,594</td>
<td>-0.2105 (-39.51)</td>
<td>0.4475</td>
</tr>
<tr>
<td>(Table 4)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>