

# Managerial Overconfidence and Cost Stickiness

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January 2013

## Abstract

We propose managerial overconfidence as a behavioral explanation for SG&A cost stickiness. Building on the psychology literature, we predict that overconfident managers are more likely to overestimate future demand and therefore less likely to cut SG&A costs when sales decline. Using a sample of 14,568 S&P 1500 firm-years between 1992 and 2011, we document that SG&A cost stickiness increases in the degree of CEO overconfidence. We address key alternative explanations and document that our results are robust to different measures of managerial overconfidence and different model specifications. By focusing on a managerial characteristic, our results provide strong support for the role of managerial discretion in cost management.

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We thank Bart Dierynck, Hai Lu, Carsten Homburg and Stefan Thoenes for valuable comments.

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## 1. Introduction

It is well documented that selling, general and administrative costs (SG&A) as a variable component of total costs decrease less with a sales decrease than they increase with an equivalent sales increase (Anderson et al. (2003); Anderson et al. (2007); Balakrishnan et al. (2004); Noreen and Soderstrom (1997)). This asymmetric cost behavior has been labeled “cost stickiness”. In contrast to traditional cost models, which assume that variable costs *mechanically* follow activity changes, cost stickiness suggests an important role for managerial discretion in the resource adjustment process (Anderson et al. (2003)).

Prior literature focuses on economic and agency explanations for the cross-sectional variation in the degree of cost stickiness. The economic explanation suggests that the decision to cut or keep SG&A resources when sales decline depends on the trade-off between the manager’s expectations about the persistence of the demand decline and the magnitude of the adjustment costs associated with cutting SG&A resources in the short term and replacing such resources when demand is restored in the future. Managers will be more inclined to keep excess resources if they expect future demand to restore sufficiently fast and/or if adjustment costs related to cutting resources and restoring them when demand rebounds are sufficiently high (e.g., Anderson et al. (2003)). The agency explanation provides two predictions for the cross-sectional variation in the degree of SG&A cost

stickiness: On the one hand, empire-building incentives will motivate managers to keep excess SG&A resources, leading to greater cost stickiness (Chen et al. (2012)). On the other hand, earnings management incentives will motivate managers to cut excess SG&A resources to meet earnings targets, resulting in lower cost stickiness (Dierynck et al. (2012); Kama and Weiss (2012)).

We complement prior research by proposing managerial overconfidence as a behavioral explanation for cost stickiness. A large body of research in psychology shows that individuals tend to be overconfident (e.g., Weinstein (1980); Svenson (1981)). Overconfidence can arise through the *better-than-average effect* (when individuals overestimate their ability or skills *relative to others*) (Larwood and Whittaker (1977), Alicke (1985)) and *miscalibration* (when individuals overestimate themselves *without comparison to others*) (Moore (1977)). Drawing on the psychology literature, Malmendier and Tate (2005a) provide empirical evidence that overconfident managers overestimate the returns to their investment projects and consequently overinvest when they have more cash flows. Several follow up studies document the impact of overconfidence in different finance and accounting settings (e.g., Malmendier et al. (2011); Hirshleifer et al. (2012); Ahmed and Duellman (2012); Schrand and Zechman (2012)), Hribar and Yang (2011); Hilary and Hsu (2011); Libby and Rennekamp (2012)).

We expect managerial overconfidence to increase the degree of SG&A cost stickiness. The decision to cut or keep excess SG&A resources when sales decline depends in a large part on managers' expectations about future demand. We argue that both overconfidence mechanisms – the better-than-average effect and

miscalibration – should affect managers’ assessment of future demand. The better-than-average effect implies that overconfident managers will overestimate their positive impact on restoring sales demand. As a result, they will overestimate the likelihood of a sales rebound in the future, which will motivate them to retain excess SG&A resources. In addition, miscalibration implies that overconfident managers will overestimate the accuracy of their assessment of future demand, which will also increase the probability of keeping excess SG&A costs. Taken together, both behavioral mechanisms predict that holding adjustment costs constant overconfident managers will overestimate the likelihood of a future sales rebound. Hence, overconfident managers should be more likely to retain excess SG&A costs resulting in greater SG&A cost stickiness.

Following prior literature, we measure overconfidence based on CEOs’ option exercising behavior (Malmendier and Tate (2005a); Malmendier et al. (2011); Campbell et al. (2011); Hirshleifer et al. (2012) and Ahmed and Duellman (2012)). The rationale behind this measure is the following: CEOs are underdiversified because their human capital is fully invested in their firms, and they are often compensated with stocks and options of their firms. Since negative firm performance affects both CEOs’ company holdings and their labor market opportunities, underdiversified CEOs should have incentives to exercise deep-in-the-money options to reduce their exposure to the idiosyncratic risk of their firms (Hall and Murphy (2000), (2002)). Overconfident CEOs, however, overestimate the potential increase of their firms’ value, and consequently are more likely to delay

the option exercise. Therefore, the timing of CEOs' option exercise provides a way to measure the extent of CEO overconfidence (Malmendier and Tate (2005a)).

We test our hypothesis using a sample of 14,568 firm-years from the intersection of ExecuComp, CRSP, and Compustat over the period 1992-2011. Our primary measure of overconfidence is based on Malmendier and Tate (2005a) and Malmendier et al. (2011). We define a CEO as overconfident if the average intrinsic value of her options exceeds 67% of the average exercise price at least twice over the sample period (starting with the first time an option has been held too long). In our main analysis, we measure cost stickiness using the dummy interaction specification suggested by Anderson et al. (2003). We control for the economic and agency factors that have been documented to influence the degree of SG&A cost asymmetry in prior literature (Anderson et al. (2003) and Chen et al. (2012)) as well as year- and industry-fixed effects. As predicted, we find that SG&A cost stickiness increases in the degree of CEO overconfidence. In robustness checks, we document that our results remain unchanged when we use different measures of CEO overconfidence (Hirshleifer et al. (2012) and Campbell et al. (2011)) and different model specifications (e.g., Banker et al. (2012b)).

Next, we address alternative explanations. First, to empirically distinguish the overconfidence explanation from an explanation based on managers' rational expectations of future demand based on prior sales, we conduct an additional analysis using Banker et al. (2012b)'s extended cost stickiness model that incorporates signals such as prior sales changes. Our results remain robust to this alternative specification, suggesting that managerial overconfidence has an

incremental impact on SG&A cost stickiness above and beyond managers' rational demand expectations informed by signals such as prior sales changes.

Second, we address the potential problem that self-selection affects our results. The concern is that overconfident CEOs may self-select into firms that exhibit greater cost stickiness and/or cost sticky firms may prefer to hire overconfident CEOs. To alleviate this concern, we follow Hirshleifer et al. (2012) and estimate our main specification on a restricted sample that focuses on firm-years for which self-selection is less likely. The idea is that firm characteristics that may induce self-selection, such as growth opportunities, vary over time as the firm environment changes. In contrast, overconfidence is a persistent character trait that remains stable over time. Hence, we eliminate the first few years of each CEO's tenure because during the first few years CEOs are most likely to be selected by firms on the basis of these characteristics. Our results hold for that restricted sample, alleviating the self-selection concern.

In additional tests, we document that our main result remains unchanged after including industry-fixed effects and alternatively firm-fixed effects to control for time-invariant industry or firm characteristics that may drive self-selection (Campbell et al. (2011)), further alleviating the self-selection concern.

We contribute to two streams of accounting literature. First, we extend the cost stickiness literature by providing a behavioral explanation for cost stickiness. This behavioral explanation differs fundamentally from the economic explanations suggested in prior studies. While economic explanations focus on managers' tradeoffs between costs and benefits associated with keeping excess SG&A

resources and assume unbiased managerial expectations, overconfidence reflects a persistent managerial characteristic that indicates a positive bias in the CEO's expectations. Our explanation also differs from the agency-based explanations documented in prior literature. While CEOs driven by agency considerations keep or cut excess resources for opportunistic reasons (to build empires or to manage earnings), overconfident CEOs keep excess resources because they believe that they are acting in the best interest of the shareholders. By focusing on a managerial characteristic, our results provide strong support for the role of managerial discretion in cost management as argued by prior literature.

Second, our study contributes to the accounting literature on overconfidence. Prior accounting studies have documented that overconfidence increases the likelihood of Accounting and Auditing Enforcement Releases (AAER) (Schrand and Zechman (2012)), the likelihood of issuing management forecasts and the optimistic bias in these forecasts (Hribar and Yang (2011); Hilary and Hsu (2011); Libby and Rennekamp (2012)), and accounting conservatism (Ahmed and Duellman (2012)). Our study extends this emerging literature by documenting the effect of overconfidence on cost behavior and cost management.

The remainder of the paper is organized as follows. In section 2 we review the literature and develop the hypothesis. In section 3 we discuss the sample selection, measures, and research design. In section 4 we present and discuss the results. We conclude in section 5.

## **2. Literature review and hypothesis development**

### **SG&A Cost Stickiness**

Prior empirical research documents that SG&A costs behave asymmetrically, i.e., they increase more rapidly when demand increases than they decline when demand decreases (Anderson et al. (2003)). This finding (also labeled “cost stickiness”) has received much attention in the accounting literature.

Prior studies on cost stickiness fall into two broad streams.<sup>1</sup> The first stream of studies has focused on the impact of economic factors on the degree of cost stickiness. The economic explanation assumes that in a sales downturn managers are trading off their future demand expectations and the level of adjustment costs to decide whether to cut or keep SG&A resources (see Anderson et al. (2003); Banker et al. (2012b)). A CEO will be more inclined to keep excess SG&A resources if he believes the sales decline is temporary and/or if adjustment costs related to cutting resources and building them up again when demand is restored are relatively high. For example, Balakrishnan and Gruca (2008) find that cost stickiness for the core functions of Ontario hospitals is more pronounced compared to that for the peripheral functions due to the greater adjustment costs associated with altering capacity of the core functions. Balakrishnan et al. (2011) examine the effect of cost structure on cost stickiness. Banker et al. (2012b) document the impact of prior period sales changes on cost stickiness and Banker et al. (2012a) examine the link between uncertainty of future demand and cost stickiness. This stream of literature

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<sup>1</sup> See Banker et al. (2011) for an in-depth review of this literature.



suggests that cost stickiness increases with the magnitude of adjustment costs and if managers expect demand to restore sufficiently fast.

The second stream of studies examines the impact of managerial incentives on cost stickiness. For example, Chen et al. (2012) provide evidence that empire building incentives as captured by free cash flows shift SG&A cost asymmetry away from its optimal level. Dierynck et al. (2012) and Kama and Weiss (2012) both show that managers' incentives to meet earnings targets reduce cost stickiness using data from private Belgian firms and public U.S. firms, respectively.

Our study complements the cost stickiness literature by proposing managerial overconfidence as a behavioral explanation of cost stickiness. By focusing on a managerial characteristic, we provide direct evidence on the role of managerial discretion in cost management.

### **Managerial Overconfidence**

Building on the psychology literature that shows prevalent overconfidence among individuals, a large number of studies in finance and accounting document the influence of managerial overconfidence on corporate and accounting decisions. For example, the finance literature provides evidence that overconfidence affects corporate policies such as capital expenditures (Malmendier and Tate (2005a); (2005b)), merger and acquisitions (Malmendier and Tate (2008)), dividends (Cordeiro (2009)), financing decisions (Malmendier et al. (2011)), CEO turnover (Campbell et al. (2011)), and R&D expenses (Hirshleifer et al. (2012)).

Similarly, recent accounting studies document that overconfidence affects Accounting and Auditing Enforcement Releases (AAER) (Schrand and Zechman

(2012)), management earnings forecasts (Hribar and Yang (2011); Hilary and Hsu (2011); Libby and Rennekamp (2012)), analyst earnings forecasts (e.g. Wong and Zhang (2009)), and accounting conservatism (Ahmed and Duellman (2012)). For example, using an abstract experiment and a survey of experienced financial managers, Libby and Rennekamp (2012) show overconfident managers are more likely to issue earnings forecasts because they are overly optimistic about firm performance and overconfident about their ability to predict future firm performance. Furthermore, Hribar and Yang (2011) provide empirical evidence that CEO overconfidence increases the likelihood of issuing a forecast, increases the amount of optimism in management forecasts, and increases the form and precision of forecasts.

### **Managerial Overconfidence and SG&A Cost Stickiness**

We propose managerial overconfidence as a behavioral explanation for SG&A cost stickiness. Managers' decisions to cut or keep SG&A resources when sales decline depend on the trade-off between the manager's expectations about the persistence of the demand decline and the magnitude of the adjustment costs associated with cutting SG&A resources in the short term and replacing such resources when demand is restored in the future. Managers will be more inclined to keep excess resources if they expect future demand to restore sufficiently fast and/or if adjustment costs related to cutting resources and restoring them when demand rebounds are sufficiently high (e.g., Anderson et al. (2003)). Holding adjustment costs constant, managers' expectations about the permanence of the demand decline are critical to this cost management decision.

Drawing on the psychology literature on overconfidence, we expect *miscalibration* and the *better-than-average* effect to affect SG&A cost stickiness by influencing managers' expectations about the permanence of the demand decline. If individuals overestimate their ability or skills *relative to others*, they are subject to the so called *better-than-average effect* (Larwood and Whittaker (1977), Alicke (1985)). For example, Svenson (1981) documents that most individuals assess their driving skills as above average. In contrast, when individuals overestimate themselves *without comparison to others*, they are said to be subject to *miscalibration* or to have narrow confidence intervals (Moore (1977)). The better-than-average effect implies that overconfident managers will be overly positive about their impact on restoring sales demand. Consequently, they will overestimate the likelihood of a sales rebound in the near future, which will motivate them to keep excess SG&A costs when sales decline, leading to greater cost stickiness. In addition, miscalibration implies that overconfident managers will overestimate the accuracy of their assessment of future demand, which will also increase the probability of keeping excess SG&A resources, resulting in greater cost stickiness.

Taken together, we expect that holding adjustment costs constant the better-than-average effect and miscalibration will bias managers' expectations about the likelihood of a future sales rebound upward. Therefore overconfident managers should be more likely to retain excess SG&A costs, which should result in greater SG&A cost stickiness.

Our overconfidence explanation is distinct from the economic explanations provided in prior studies. While the economic explanations for cost stickiness focus

on managers' tradeoffs between unbiased expectations about the permanence of a demand decline and adjustment costs, the overconfidence explanation reflects a positive bias in managers' expectations about future demand.

In addition, the overconfidence explanation is also distinct from the agency explanations documented in prior literature. On the one hand, managers with empire building incentives will prefer to keep excess SG&A resources to maximize private benefits from size related to power, status and prestige (Jensen (1986)), resulting in greater cost stickiness (see Chen et al. (2012)). On the other hand, managers with earnings management incentives will cut excess SG&A resources too quickly in order to meet earnings benchmarks, leading to lower cost stickiness (Dierynck et al. (2012); Kama and Weiss (2012)). Overconfidence is distinct from the agency explanation of cost stickiness. Although both empire builders and overconfident CEOs have the tendency to avoid cutting excess SG&A resources, unlike empire builders who maintain excess resources for opportunistic reasons, overconfident CEOs believe they are acting in the best interest of the shareholders and therefore maintain excess resources. We hypothesize that:

**Hypothesis:** *SG&A cost stickiness increases with managerial overconfidence.*

### **3. Sample selection, variable measurement, and research design**

#### **3.1. Sample Selection**

Our sample is based on the intersection of ExecuComp, Compustat, and CRSP over the period 1992-2011. First, we merge ExecuComp with Compustat and construct the overconfidence and agency variables. Second, we use the merged

CRSP and Compustat database by WRDS and follow the sample selection procedure by Anderson et al. (2003) to construct the cost stickiness and economic variables. We drop (1) financial firms and utilities (sic codes 6000 to 6999 and 4900 to 4999), (2) firm-years with negative sales or negative SG&A costs, (3) observations for which SG&A costs are larger than sales, and (4) observations for which SG&A costs and sales move in opposite directions (Anderson and Lanen (2009)). Finally, we merge the ExecuComp-Compustat sample with the CRSP-Compustat sample. We winsorize the top and bottom 1% of the changes in sales and the changes in SG&A costs. The final sample comprises 14,568 firm-years.

### **3.2. Measures of Overconfidence**

The recent finance and accounting literature uses CEOs' option exercising behavior to measure overconfidence. These measures exploit that CEOs are underdiversified. To align the CEOs' interest with those of the shareholders, CEOs are typically compensated with stocks and options of their firms. In addition, the CEOs' human capital is invested in their firms. Hence, negative firm performance affects both the CEOs' direct holdings and the CEOs' labor market opportunities. Risk-averse and underdiversified CEOs, therefore, have incentives to exercise deep-in-the-money options in order to reduce their exposure to the idiosyncratic risk of their firms (Hall and Murphy (2000), (2002)). Malmendier and Tate (2005a) argue that overconfident CEOs overestimate the increase of their firms' value and as a consequence delay exercising options. Thus, CEOs' option exercising behavior should be indicative of CEOs' overconfidence.

We use three measures of overconfidence. For the main analysis, we follow Malmendier and Tate (2005a) and Malmendier et al. (2011) and define a CEO as overconfident (OverconfMal) if the average intrinsic value of his options exceeds 67%<sup>2</sup> of the average exercise price at least twice over the sample period starting with the first time an option has been held too long. As a robustness check, we use two related versions of the option exercise measure. First, we follow Hirshleifer et al. (2012) and define CEOs as overconfident (OverconfHirshl) if they once postpone the exercise of an option that is more than 67% in-the-money. Second, we follow Campbell et al. (2011) and use a semi-permanent measure of overconfidence also based on CEOs' option exercising behavior (OverconfCamp).<sup>3</sup>

One concern with these option-based measures is that they may reflect both insider information and signaling. In the insider information case, managers would delay the option exercise to gain abnormal returns resulting from the investment in cost stickiness. In the signaling case, managers would delay the option exercise to signal positive expectations about future performance and future demand. For a detailed analysis of both alternative explanations we refer to Malmendier and Tate (2005a), who present several test results indicating that the option based measure reflects overconfidence rather than signaling or insider information. We follow the literature that uses option-based measures of overconfidence and include a stock performance control to capture potential performance signaling effects.

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<sup>2</sup> Malmendier and Tate (2005a) justify the benchmark of 67% for the percentage in-the-money at or above which CEOs should exercise options in two ways. First, they use the theoretical model by Hall and Murphy (2002) to derive the benchmark. Second, they vary the threshold between 50% and 150% and show that the results remain qualitatively unchanged.

<sup>3</sup> See Campbell et al. (2011) for a precise definition and construction of the measure.

### 3.3. Measurement of Cost Stickiness

We use the dummy interaction specification suggested by Anderson et al. (2003) to measure cost stickiness.

$$\Delta \ln \text{SGA}_{i,t} = \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where  $i$  is a firm index and  $t$  a time index,  $\Delta \ln \text{SGA}_{it} = \ln(\text{SG\&A}_{it}/\text{SG\&A}_{it-1})$ ,  $\Delta \ln \text{Sales}_{it} = \ln(\text{Sales}_{it}/\text{Sales}_{it-1})$ , SG&A is selling, general and administrative costs [Compustat mnemonic XSGA], Sales is net sales [Compustat mnemonic SALE], DecrDum is one if sales in  $t$  are lower than sales in  $t-1$  and zero otherwise.

The coefficient  $\beta_1$  measures the percentage increase in SG&A costs with a 1% increase in sales. Since the value of DecrDum is 1 when revenue decreases, the sum of the coefficients  $(\beta_1 + \beta_2)$  measures the percentage decrease in SG&A costs with a 1% decrease in sales. A positive and significant coefficient  $\beta_1$  and a significantly negative coefficient  $\beta_2$  are consistent with cost stickiness, indicating a smaller cost reaction when sales decline.

### 3.4. Model Specification

To estimate the effect of overconfidence on cost stickiness, we expand equation (1) by including the overconfidence dummy measure based on Malmendier and Tate (2005a), Malmendier et al. (2011) (OverconfMal), the corresponding interaction term ( $\text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{OverconfMal}_{i,t}$ ) as well as economic and agency control variables known to affect cost stickiness (Anderson et al. (2003) and Chen et al. (2012)).

$$\begin{aligned}
\Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \\
& + \beta_3 \cdot \text{OverconfMal}_{i,t} + \beta_4 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{OverconfMal}_{i,t} \quad (2) \\
& + \sum_{c=5}^{10} \beta_c \cdot \text{Controls}_{i,t} + \sum_{c=11}^{16} \beta_c \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Controls}_{i,t} + \epsilon_{i,t}
\end{aligned}$$

We expect  $\beta_4$  to be negative if cost stickiness increases when CEOs are more overconfident relative to their peers. The control variables are explained below and summarized in the Appendix.

We report five specifications. In the first specification, we use the baseline cost stickiness model by Anderson et al. (2003) including overconfidence. In the second specification, we add economic control variables following Anderson et al. (2003). In the third specification we add agency control variables following Chen et al. (2012). In the fourth specification, we include year-fixed effects to control for potentially unobserved factors that change over time but affect all firms in a similar way such as macroeconomic changes that we do not capture with the economic control variables. In the fifth specification, we add industry-fixed effects to control for potentially unobserved industry specific factors that are constant over time. Industry-fixed effects help to rule out that overconfident CEOs are more likely to keep excess SG&A costs only because they happen to be overrepresented in industries with higher cost stickiness levels. In our main specification, industry fixed-effects are based on Fama-French 12 industry dummy variables. All standard errors are clustered at the firm level allowing for heteroskedasticity and arbitrary within-firm correlation (see Petersen (2008)).



### **3.5. Control Variables**

We follow Anderson et al. (2003) and Chen et al. (2012) and include two sets of control variables: Economic and agency variables. We control for four economic factors that may affect the SG&A cost asymmetry. First, we control for employee and asset intensity. As proxies for adjustment costs, both should increase the degree of SG&A cost stickiness (Anderson et al. (2003)). Employee intensity (EmplInt) is calculated as the number of employees divided by sales [Compustat mnemonics EMP and SALE], and asset intensity (AssetInt) is calculated as total assets divided by sales [Compustat mnemonics AT and SALE]. Second, we control for successive sales decreases because managers are more likely to consider a negative demand shock to be permanent when revenue decreases in two consecutive years. SuccessiveDecr is an indicator variable that equals one if sales in year t-1 are lower than in t-2, and zero otherwise. Finally, we control for stock performance (StockPerf), which is the natural logarithm of one plus the annual raw stock return measured at the beginning of the fiscal year. If higher stock performance reflects a more efficient cost control, it should have a negative effect on cost stickiness. If, however, higher stock performance signals positive expectations of future performance, it may have a positive effect on cost stickiness because managers may want to keep excess resources in anticipation of higher future capacity utilization. This control variable is also important to rule out the possibility that delayed option exercise reflects positive future performance expectations instead of overconfidence.

Following Chen et al. (2012), we control for two agency factors. First, we control for free cash flow (FCF), which is calculated as cash flow from operating activities

[Compustat mnemonic OANCF] less common and preferred dividends [Compustat mnemonics DVC and DVP] scaled by total assets [Compustat mnemonic AT]. High levels of FCF allow managers to overinvest in SG&A when demand increases and to postpone SG&A cost cuts when demand decreases. Hence, higher levels of FCF should increase cost stickiness (Chen et al. (2012)). Second, we control for CEO fixed pay because prior studies suggest that executive compensation affects managers' empire building incentives (Kannianen (2000)). We measure fixed pay (FixedPay) as the ratio of salary plus bonus divided by total compensation during year  $t$ , where total compensation consists of salary, bonus, value of restricted stocks and options, and all other annual payouts (Chen et al. (2012)).

We mean center the continuous variables used in the interaction terms before including them in the analysis to mitigate multicollinearity as well as to facilitate the interpretation of the main effects (Aiken and West (1991); Chen et al. (2012)).

## **4. Results**

### **4.1. Descriptive Statistics**

Table 1 provides descriptive statistics for all variables used in the regressions. The sample comprises 14,568 observations for the period between 1992-2011. The average annual percentage SG&A change is about 11.1% (median = 9.7%) and the average annual percentage sales change is about 11.1% (median = 10.2%). Regarding the economic variables, the average firm has 6.17 (median = 4.61) employees per million dollars of sales and \$1.17 million (median = \$0.96) assets per million dollars of sales. The median firm does not experience two consecutive sales

decreases (mean = 0.21) and the average raw stock return equals 0.08 (median = 0.10). Turning to the agency variables, the average free cash flow is about 10% of total assets (median = 0.09) and the average ratio of salary and bonus to CEO total compensation is about 44% (median = 38%). CEOs of around 44% of all firm-years meet the definition of our main measure of overconfidence, *OverconfMal*, defined based on Malmendier et al. (2011). This number increases slightly to an average of 54% when we follow the approach suggested by Hirshleifer et al. (2012), and decreases to an average of 32% when we follow the measure proposed by Campbell et al. (2011).

Table 2 presents Pearson correlation coefficients. Bold coefficients indicate significance at or below the 5% level. The correlations are of small magnitude, except for the correlations among the three overconfidence measures, which are high as expected.

## 4.2. Main Result

We start by replicating the basic cost stickiness model by Anderson et al. (2003), see equation (1). While the sample in Anderson et al. (2003) covers 20 years from 1979 to 1998, our sample is more recent, covering 20 years from 1992 to 2011. In untabulated results, we find that the asymmetric cost behavior for our sample period is somewhat less pronounced than in the sample period examined by Anderson et al. (2003) ( $\beta_2 = -0.11$ ,  $t = -6.84$  in our sample vs.  $\beta_2 = -0.19$ ,  $t = -26.14^4$  in Anderson et al.'s sample). Consistent with Anderson et al. (2003), we find that SG&A

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<sup>4</sup> Note that Anderson et al. (2003) do not cluster standard errors.

costs increase by 0.80% when sales increase by 1%, but decrease by only 0.69%=0.78%-0.11% ( $t=-6.84$ ) when sales decrease by 1%.

Table 3 presents results from estimating our main stickiness-overconfidence specification, see equation (2). We predict that the degree of SG&A cost asymmetry increases with managerial overconfidence. Thus, we expect a negative coefficient on the triple interaction with overconfidence indicating a smaller cost reaction for overconfident CEOs ( $\Delta \ln \text{Sales} * \text{DecrDum} * \text{OverconfMal}$ ).

In model (1), we expand the basic cost stickiness model by including  $\text{OverconfMal}$  (the overconfidence variable based on Malmendier et al. (2011)) and the corresponding interaction  $\Delta \ln \text{Sales} * \text{DecrDum} * \text{OverconfMal}$ . We find that SG&A costs increase 0.80% ( $t=80.03$ ) if sales increase by 1%. If sales decrease by 1%, SG&A costs of firms with less overconfident CEOs decrease by 0.74%=0.80%-0.06% ( $t=-3.06$ ), while for firms with overconfident CEOs SG&A costs decrease by 0.61%=0.80%-0.06%-0.13% ( $t=-5.34$ ). This result supports our hypothesis that firms with overconfident CEOs exhibit greater SG&A cost stickiness.

Next, we sequentially expand model (1) by including economic controls in model (2), agency controls in model (3), year-fixed effects in model (4) and industry-fixed effects in model (5).<sup>5</sup> The  $\Delta \ln \text{Sales}$  coefficient indicating the SG&A cost increase when sales increase by 1% drops a little from 0.80% ( $t=80.03$ ) in model (1) to 0.77 ( $t=71.8$ ) in model (5). The coefficient of our variable of interest  $\Delta \ln \text{Sales} * \text{DecrDum} * \text{OverconfMal}$  decreases in magnitude slightly from  $|-0.13|$  ( $t=-5.34$ ) in model (1) to  $|-0.12|$  ( $t=-4.85$ ) in model (5) where we control for economic

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<sup>5</sup> The industry-fixed effects are based on the Fama-French 12 industry definition.

and agency factors as well as year- and industry-fixed effects. Across all five models, the  $\Delta \ln \text{Sales} * \text{DecrDum} * \text{OverconfMal}$  coefficient is negative and significant, indicating that SG&A cost stickiness increases with managerial overconfidence.

In the following, we discuss the effect of the interacted control variables on cost stickiness. Both proxies for adjustment costs – employee and asset intensity – should increase cost stickiness. While asset intensity has the predicted effect across all models, employment intensity goes in the opposite direction. The successive sales decrease proxy controls for the increased likelihood that managers will cut SG&A resources when they perceive demand declines to be permanent, which should result in less stickiness. The coefficient of the interacted successive decrease variable has the predicted sign and is significant at the 10% level in model (5). The stock performance interaction coefficient is positive indicating less cost stickiness and the coefficient is significant at or below the 5% level in model (5). We control for agency incentives with the variables FCF and fixed pay. Both interaction terms are insignificant across all five model specifications.

Overall, the empirical analysis supports our hypothesis of a positive association between managerial overconfidence and SG&A cost stickiness.

### **4.3. Alternative explanations**

#### **4.3.1. The BCM framework**

In this section, we provide further evidence documenting that our behavioral explanation is conceptually different from economic explanations of cost stickiness. In addition to the economic controls in our main specification, we conduct a test that

controls for managerial demand expectations informed by rational signals such as prior sales changes (Banker et al. (2012b)). While economic explanations assume unbiased management demand expectations, overconfidence reflects a positive bias in managers' expectations, resulting in the overestimation of returns from keeping excess SG&A resources. We therefore expect managerial overconfidence to have an incremental impact on cost stickiness after controlling for rational demand expectations.

The analysis builds on the framework of Banker et al. (2012b) (hereafter "BCM"). BCM extend the cost stickiness model in Anderson et al. (2003) by focusing on managers' demand expectations.<sup>6</sup> BCM use directions of sales changes in consecutive periods as a proxy for managers' expectations of future demand. Managers observe a confirming signal if sales increase or decrease in both the prior and current period, while the signal is conflicting if sales increase in the prior but decrease in the current period or vice versa. BCM argue that the cost reaction following a conflicting signal should be smaller than the cost reaction following a confirming signal.

After a prior period's sales increase, Banker et al. (2012b) predict cost stickiness, i.e., an asymmetric cost reaction. If managers observe two consecutive sales increases, the cost reaction should be of larger extent than the cost reaction following an increase in the prior but a decrease in the current period, consistent with cost stickiness.

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<sup>6</sup> BCM also extend the cost stickiness model in Anderson et al. (2003) by allowing for anti-stickiness, i.e., SG&A costs decrease more when sales decrease, compared to the extent they increase when sales increase. Since we do not make predictions regarding the anti-stickiness case, we do not discuss it here.

To empirically distinguish overconfidence from BCM's explanation, we follow their model specification. They condition the Anderson et al. (2003) cost stickiness model (our main specification) on prior periods' sales changes as a proxy for managers' demand expectations (see Model (A) on p. 23 in Banker et al. (2012b)).

In Table 4, model (1), we first replicate the BCM specification:

$$\begin{aligned}\Delta \ln SG\&A_{i,t} = & \beta_0 + \beta_1 \cdot \text{IncrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \\ & + \beta_2 \cdot \text{IncrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \\ & + \beta_3 \cdot \text{DecrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \\ & + \beta_4 \cdot \text{DecrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} + \varepsilon_{i,t}\end{aligned}\tag{3}$$

where  $\Delta \ln SG\&A_{it}$  and  $\Delta \ln \text{Sales}_{it}$  are defined as in section 3.3. The dummy variable  $\text{IncrDum}_{i,t-1}$  equals one for a sales increase in period t-1. Similarly,  $\text{DecrDum}_{i,t}$  and  $\text{DecrDum}_{i,t-1}$  are dummy variables that equal one for sales declines in period t and t-1, respectively. We find that if sales increase 1% in both the prior and the current period, SG&A costs increase by 0.82% (t= 92.05). If sales increase in the prior but decline 1% in the current period, SG&A costs are reduced by 0.63% (0.82%-0.19%) (t=-9.9). This is consistent with the cost stickiness prediction by BCM.

To estimate the impact of overconfidence on cost stickiness beyond the BCM effect, in model (2) of Table 4 we include interactions<sup>7</sup> with our proxy for managerial overconfidence (*OverconfMal*) as follows:

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<sup>7</sup> Since we do not make predictions for the anti-stickiness case, we do not interact overconfidence with the anti-stickiness variables (however, we obtain qualitatively similar results when including the interactions).

$$\begin{aligned}
\Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \text{IncrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \\
& + \beta_2 \cdot \text{IncrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \\
& + \beta_3 \cdot \text{DecrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \\
& + \beta_4 \cdot \text{DecrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \\
& + \beta_5 \cdot \text{IncrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{OverconfMal}_{i,t} \\
& + \beta_6 \cdot \text{IncrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{OverconfMal}_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{4}$$

We predict that cost stickiness should increase in the degree of overconfidence after controlling for management demand expectations reflected in prior period sales. We find a significantly negative coefficient on the overconfidence interaction term (coefficient=-0.1,  $t=-3.04$ ). This coefficient is similar in magnitude to the coefficient in our main specification in Table 3 based on the original Anderson et al. (2003) model. The finding is consistent with a positive association between managerial overconfidence and SG&A cost stickiness. Finally, model (3) of Table 4 supports our results after controlling for Fama-French 12 industry-fixed effects.

Overall, our results remain robust to the BCM model specification, suggesting that managerial overconfidence has an impact on cost stickiness above and beyond rational managerial demand expectations reflected in prior sales.

#### 4.3.2. Addressing Self-Selection

In this section we address the possibility that the positive association between managerial overconfidence and cost stickiness may be affected by self-selection. If overconfident CEOs are more likely to self-select into or be hired by firms with certain characteristics, and firms with these characteristics have greater cost stickiness, then our result may be driven by self-selection.



We conduct several additional analyses to alleviate the self-selection concern. First, we follow Hirshleifer et al. (2012) and conduct a test based on CEO tenure. The test builds on the idea that those firm characteristics that may induce self-selection vary over time as the firm environment changes, such as growth opportunities. In contrast, overconfidence is a persistent character trait. Hirshleifer et al. (2012) suggest excluding the first years of each CEO's tenure as these years are most likely to reflect self-selection. The remaining sample should therefore be less affected by self-selection.

We rerun our main specification of cost stickiness on overconfidence by restricting the sample according to several tenure cut offs (3, 4, 5 and 6 years). We report the results for two cut offs that are representative for the rest: After 3 (i.e., tenure  $\geq 4$ ) and 5 years (i.e., tenure  $\geq 6$ ). To reduce survival bias from eliminating CEOs with short tenure, we choose the cutoffs to be below the median firm-specific CEO tenure in our sample, which is 6 years. The results are presented Table 5. For comparability, the first column reports the results of our main specification, model (5) in Table 3. The next two columns report results when we estimate the model on a restricted sample eliminating the first three years (column 2) and the first five years (column 3) of each CEO's tenure. We are interested in the coefficient of the triple interaction with overconfidence  $\Delta \ln \text{Sales} * \text{DecrDum} * \text{OverconfMal}$ . When we eliminate the first three years of a CEO's tenure, the effect of overconfidence on cost stickiness decreases slightly in magnitude and remains significant the 1% level. When we eliminate the first five years of a CEO's tenure, which is close to the median tenure in our sample, the sample size is additionally reduced, comprising

about a fourth of the original sample. The coefficient of  $\Delta \ln \text{Sales} * \text{DecrDum} * \text{OverconfMal}$  remains significant at the 5% level and comparable in magnitude to model (2). We interpret these results as evidence that our main result is not driven by sticky firms selecting overconfident CEOs or overconfident CEOs preferring positions at cost sticky firms.

Second, to the extent that self-selection is driven by characteristics that are constant across industries, we control for these factors with industry-fixed effects. Table 3 model (5), reports results using Fama-French 12 industry dummies and Table 8 reports results using two-digit SIC code industry dummies. In both specifications, we document a significantly positive association between managerial overconfidence and cost stickiness.

Third, we examine the possibility that time-constant firm characteristics affect the selection mechanisms following Campbell et al. (2011). Table 6 shows that our results remain qualitatively unchanged after controlling for firm-fixed effects.<sup>8</sup> However, while we control for constant unobservable industry and firm effects that may induce self-selection, we cannot rule out that time-varying unobservable factors affect our results.

#### **4.4. Robustness Checks**

First, we check the robustness of the main result by re-estimating model (5) of our main specification with two additional overconfidence measures. Table 8, model (1) shows the results using  $\text{OverconfHirshl}$  based on Hirshleifer et al. (2012) and

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<sup>8</sup> Note that, to identify the effect of overconfidence on cost stickiness, the firm-fixed effects estimation uses only within-firm variation, i.e. variation created by CEOs who switch firms during the sample period.

model (2) shows the results using OverconfCamp based on Campbell et al. (2011). Both variables are defined in the section “Measures of Overconfidence” (Section 3.2) and in the Appendix. Consistent with the results in Table 3, the results in Table 8 show a significantly negative coefficient on the overconfidence interaction term (coefficient=-0.1,  $t=-3.96$  for OverconfHirshl, coefficient=-0.1,  $t=-3.66$  for OverconfCamp), suggesting that our results are robust to these alternative measures of managerial overconfidence.

Second, we check the robustness of our results to alternative industry classifications. We construct industry dummies based on the two-digit SIC codes following Hirshleifer et al. (2012) instead of Fama-French 12 industries. Table 8 shows that the results are qualitatively similar.

Third, R&D and advertising expenses represent strategic investments that create long-term value and hence may be treated differently by managers than the other components of SG&A costs. Therefore, we exclude R&D and advertising expenses from SG&A costs and re-estimate our main specification.<sup>9</sup> We find that our results (untabulated) are slightly weaker but remain qualitatively unchanged, supporting our main conclusion.

Fourth, following Dierynck et al. (2012) and Kama and Weiss (2012), we add a two-way interaction between  $\Delta \ln \text{Sales}$  and overconfidence to our main model in equation (2). In untabulated tests, we find that our main results are robust to this alternative model specification, and that the two-way interaction effect is

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<sup>9</sup> Missing values of R&D and advertising expenses are set to zero following Chen et al. (2012).

insignificant at conventional levels, indicating no significant influence of managerial overconfidence on SG&A cost behavior when sales increase.

Finally, following Kama and Weiss (2012) and Dierynck et al. (2012), we split our sample into more vs. less overconfident managers and compare the degree of cost stickiness as estimated by the basic cost stickiness model (Anderson et al. (2003)) across the two subsamples. In untabulated results we find that the degree of SG&A cost stickiness is more pronounced in the subsample of more overconfident managers than in the subsample of less overconfident managers, corroborating our main result.

## **5. Conclusion**

Prior literature on cost stickiness focuses on economic and agency explanations. In this study, we propose managerial overconfidence as a behavioral explanation for cost stickiness. We predict that overconfident managers will overestimate the likelihood of a future sales rebound, which will motivate them to keep excess SG&A resources, leading to greater SG&A cost stickiness. Using a sample of 14,568 firm-years between 1992 and 2011, we document that cost stickiness increases in the degree of CEO overconfidence. We address key alternative explanations and document that our results are robust to different measures and different model specifications.

We extend the cost stickiness literature by documenting a new behavioral mechanism contributing to sticky costs. Overconfidence is distinct from economic and agency explanations of cost stickiness. While economic explanations assume

unbiased managerial expectations, overconfidence implies a positive bias. Overconfidence is also distinct from agency explanations of cost stickiness. Although both empire builders and overconfident managers are likely to avoid cutting SG&A resources when they should, they differ in that empire-building CEOs keep excess resources for opportunistic reasons, whereas overconfident CEOs keep excess resources because they believe that they are acting in the best interest of the shareholders. By providing a cost stickiness determinant at the executive level, our results provide strong support for the role of managerial discretion in cost management.

We acknowledge, however, that our inference is only as good as our proxies are valid and that we cannot rule out that our results are affected by unobservable time-varying factors correlated with both cost stickiness and overconfidence.

## Appendix

### Variable Definitions

Cost Stickiness Variables		
$\Delta \ln \text{SGA}_t$	$\ln(\text{XSGA}_t / \text{XSGA}_{t-1})$	XSGA = Selling, general and administrative costs
$\Delta \ln \text{Sales}_t$	$\ln(\text{SALE}_t / \text{SALE}_{t-1})$	SALE = sales
$\text{DecrDum}_t$	1 if $\text{SALE}_t < \text{SALE}_{t-1}$ , 0 otherwise	
Economic Variables		
$\text{EmplInt}_t$	$\text{EMP}_t / \text{SALE}_t$	EMP = Employees
$\text{AssetInt}_t$	$\text{AT}_t / \text{SALE}_t$	AT = Assets total
$\text{SuccessiveDecr}_t$	1 if $\text{SALE}_{t-1} < \text{SALE}_{t-2}$ , 0 otherwise	
$\text{StockPerf}_{t-1}$	$\ln(1 + \text{annual raw stock return in } t-1)$	RETX = raw stock return
Agency Variables		
$\text{FCF}_t$	$[\text{OANCF}_t - (\text{DVC}_t + \text{DVP}_t)] / \text{AT}_t$	OANCF = Cash flow from operating activities; DVC = Common dividends; DVP = Preferred dividends
$\text{FixedPay}_t$	$[\text{SALARY}_t + \text{BONUS}_t] / \text{TDC1}_t$	TDC1 = Total Compensation (Salary + Bonus + Other Annual + Restricted Stock Grants + LTI)
Overconfidence Measures		
$\text{OverconfMal}_t$	If a CEO fails to exercise options that are more than 67% in-the-money in two years of his tenure, this variable is set to one. The classification starts with the first time an option has been held too long and remains unchanged for the entire tenure. The variable equals zero otherwise (Malmendier et al. (2011)). We follow the approach of Campbell et al. (2011) to determine option moneyness (see page 700ff).	
$\text{OverconfHirshl}_t$	If a CEO once fails to exercise options that are more than 67% in-the-money, this variable is set to one for this and the following years. The variable is zero otherwise (Hirshleifer et al. (2012)).	
$\text{OverconfCamp}_t$	Campbell et al. (2011) define a semi-permanent measure of overconfidence. If a CEO fails to exercise options that are more than 100% in-the-money in two years of his tenure, this variable is set to one (from the first time on forward). However, this measure allows for reclassifications. If the CEO exercises options that are less than 30% in-the-money and if he does not hold any other exercisable options that are more than 30% in-the-money in two years of his tenure, the variable is reset to zero again (Campbell et al. (2011)).	
The BCM Framework		
$\text{IncrDum}_{t-1}$	1 if $\text{SALE}_{t-1} > \text{SALE}_{t-2}$ , 0 otherwise	
$\text{DecrDum}_{t-1}$	1 if $\text{SALE}_{t-1} < \text{SALE}_{t-2}$ , 0 otherwise	

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**Table 1**  
**Descriptive Statistics**

	Mean	Median	Std Dev
<b>Cost Stickiness</b>			
$\Delta \ln \text{SGA}$	0.111	0.097	0.187
$\Delta \ln \text{Sales}$	0.111	0.102	0.206
<b>Economic Variables</b>			
EmplInt	6.173	4.605	7.055
AssetInt	1.169	0.959	0.926
SuccessiveDecr	0.207	0	0.405
StockPerf	0.081	0.103	0.481
<b>Agency Variables</b>			
FCF	0.098	0.094	0.087
FixedPay	0.436	0.377	0.281
<b>Overconfidence Measures</b>			
OverconfMal	0.442	0	0.497
OverconfHirshl	0.542	1	0.498
OverconfCamp	0.319	0	0.466

The sample comprises 14568 firm-years between 1992-2011. All variables are defined in the Appendix.

**Table 2**  
**Correlations**

	V1	V2	V3	V4	V5	V6	V7	V8	V9
V1:ΔlnSales									
V2: EmplInt	0.0058								
V3: AssetInt	<b>0.045</b>	<b>-0.09</b>							
V4: SuccessiveDecr	<b>-0.2</b>	<b>-0.03</b>	<b>0.056</b>						
V5: StockPerf	<b>0.408</b>	<b>-0.02</b>	-0.016	<b>-0.16</b>					
V6: FCF	<b>0.123</b>	<b>0.042</b>	<b>-0.08</b>	<b>-0.15</b>	<b>0.135</b>				
V7: FixedPay	-0.011	<b>0.105</b>	<b>-0.14</b>	0.0081	<b>-0.03</b>	<b>-0.07</b>			
V8: OverconfMal	<b>0.064</b>	0.0074	<b>0.028</b>	<b>-0.08</b>	<b>0.065</b>	<b>0.085</b>	<b>-0.07</b>		
V9: OverconfHirshl	<b>0.07</b>	-0.01	<b>0.035</b>	<b>-0.08</b>	<b>0.068</b>	<b>0.067</b>	<b>-0.08</b>	<b>0.818</b>	
V10: OverconfCamp	<b>0.074</b>	<b>0.02</b>	<b>0.034</b>	<b>-0.08</b>	<b>0.066</b>	<b>0.087</b>	<b>-0.05</b>	<b>0.769</b>	<b>0.629</b>

This table displays Pearson correlation coefficients. Bold parameters are significant at the 5% level or below. All variables are defined in the Appendix.

**Table 3**  
**The Effect of Managerial Overconfidence on Cost Stickiness**

	Main Variables (1)	+ Economic Controls (2)	+ Agency Controls (3)	+ Year-Fixed Effects (4)	+ Ind.-Fixed Effects (5)
<b>Economic Controls</b>					
EmplInt		0.001*** (4.24)	0.001*** (4.25)	0.001*** (3.76)	0.000** (2.53)
AssetInt		0.006*** (2.93)	0.006*** (2.81)	0.006*** (2.88)	0.007*** (3.12)
SuccessiveDecr		-0.036*** (-13.36)	-0.037*** (-13.36)	-0.032*** (-11.36)	-0.030*** (-10.58)
StockPerf		0.006*** (2.65)	0.007*** (2.72)	0.010*** (3.73)	0.010*** (3.91)
$\Delta \ln \text{Sales} * \text{DecrDum} * \text{EmplInt}$		0.007*** (5.45)	0.007*** (5.39)	0.007*** (5.15)	0.007*** (4.75)
$\Delta \ln \text{Sales} * \text{DecrDum} * \text{AssetInt}$		-0.014 (-1.35)	-0.015 (-1.45)	-0.014 (-1.42)	-0.015 (-1.45)
$\Delta \ln \text{Sales} * \text{DecrDum} * \text{SuccessiveDecr}$		0.025 (1.06)	0.028 (1.19)	0.032 (1.35)	0.042* (1.73)
$\Delta \ln \text{Sales} * \text{DecrDum} * \text{StockPerf}$		0.058*** (3.23)	0.052*** (2.76)	0.061*** (3.22)	0.063*** (3.33)
<b>Agency Controls</b>					
FCF			-0.027* (-1.94)	-0.025* (-1.82)	-0.022 (-1.57)
FixedPay			0.002 (0.57)	-0.004 (-1.09)	-0.003 (-0.91)
$\Delta \ln \text{Sales} * \text{DecrDum} * \text{FCF}$			0.141 (1.54)	0.128 (1.38)	0.12 (1.28)
$\Delta \ln \text{Sales} * \text{DecrDum} * \text{FixedPay}$			0.055 (1.43)	0.048 (1.26)	0.051 (1.33)

*(continued)*

**Table 3---continued**

**The Effect of Managerial Overconfidence on Cost Stickiness**

	Main Variables		+ Economic Controls		+ Agency Controls		+ Year-Fixed Effects		+ Ind.-Fixed Effects	
	(1)		(2)		(3)		(4)		(5)	
<b>Main Variables</b>										
OverconfMal	-0.002	(-0.84)	-0.004**	(-2.11)	-0.004*	(-1.95)	-0.003	(-1.49)	-0.002	(-1.36)
ΔlnSales	0.802***	(80.03)	0.779***	(73.26)	0.778***	(73.20)	0.771***	(72.66)	0.773***	(71.80)
ΔlnSales*DecrDum	-0.060***	(-3.06)	-0.031	(-1.25)	-0.022	(-0.86)	-0.013	(-0.52)	-0.024	(-0.95)
ΔlnSales*DecrDum*OverconfMal	-0.133***	(-5.34)	-0.115***	(-4.75)	-0.119***	(-4.91)	-0.118***	(-4.84)	-0.119***	(-4.85)
Constant	0.019***	(11.19)	0.019***	(6.94)	0.021***	(5.63)	0.025***	(3.27)	0.030***	(3.70)
Year-Fixed Effects	No		No		No		Yes		Yes	
FF 12 Ind.-Fixed Effects	No		No		No		No		Yes	
N	14568		14568		14568		14568		14568	
R2	0.7159		0.7245		0.7249		0.7284		0.7299	
R2adj	0.7158		0.7242		0.7246		0.7278		0.7291	

The models are estimated using pooled OLS and – if indicated – using fixed effects regressions. All variables are defined in the Appendix. Standard errors are clustered at the firm level. T-statistics are in parentheses. \*, \*\*, \*\*\* represent significance at the 10%, 5% and 1% level.

$$\begin{aligned}
 \Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \\
 & + \beta_3 \cdot \text{OverconfMal}_{i,t} + \beta_4 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{OverconfMal}_{i,t} \\
 & + \sum_{c=5}^{10} \beta_c \cdot \text{Controls}_{i,t} + \sum_{c=11}^{16} \beta_c \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Controls}_{i,t} + \epsilon_{i,t}
 \end{aligned}$$

**Table 4**  
**Estimating the Effect of Managerial Overconfidence on Cost Stickiness Using**  
**the BCM Framework**

	(1)	(2)	(3)
<b>BCM</b>			
$\Delta \ln \text{Sales}_t \cdot \text{IncrDum}_{t-1}$	0.819*** (92.05)	0.823*** (78.98)	0.819*** (76.78)
$\Delta \ln \text{Sales}_t \cdot \text{IncrDum}_{t-1} \cdot \text{DecrDum}_t$	-0.188*** (-9.86)	-0.148*** (-6.27)	-0.149*** (-6.22)
$\Delta \ln \text{Sales}_t \cdot \text{DecrDum}_{t-1}$	0.601*** (23.78)	0.601*** (23.78)	0.608*** (23.76)
$\Delta \ln \text{Sales}_t \cdot \text{DecrDum}_{t-1} \cdot \text{DecrDum}_t$	0.197*** (6.41)	0.197*** (6.42)	0.188*** (6.02)
<b>Interaction with Overconfidence</b>			
$\Delta \ln \text{Sales}_t \cdot \text{IncrDum}_{t-1}$		-0.01 (-0.80)	-0.008 (-0.68)
$\Delta \ln \text{Sales}_t \cdot \text{IncrDum}_{t-1} \cdot \text{DecrDum}_t$		-0.096*** (-3.04)	-0.100*** (-3.15)
Constant	0.019*** (3.81)	0.019*** (3.74)	0.020*** (3.59)
Year-Fixed Effects	Yes	Yes	Yes
FF 12 Ind.-Fixed Effects	No	No	Yes
N	14865	14865	14865
R2	0.7287	0.7292	0.7304
R2adj	0.7282	0.7287	0.7298

The models are estimated using pooled OLS and – if indicated – using fixed effects regressions. All variables are defined in the Appendix. Standard errors are clustered at the firm level. T-statistics are in parentheses. \*, \*\*, \*\*\* represent significance at the 10%, 5% and 1% level.

$$\begin{aligned}
 \Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \text{IncrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \\
 & + \beta_2 \cdot \text{IncrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \\
 & + \beta_3 \cdot \text{DecrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \\
 & + \beta_4 \cdot \text{DecrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \\
 & + \beta_5 \cdot \text{IncrDum}_{i,t-1} \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{OverconfMal}_{i,t} \\
 & + \beta_6 \cdot \text{IncrDum}_{i,t-1} \cdot \text{DecrDum}_{i,t} \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{OverconfMal}_{i,t} + \varepsilon_{i,t}
 \end{aligned}$$

**Table 5**  
**Addressing Self-Selection With a Test Based on CEO Tenure**

	Full Sample (1)	Tenure >= 4 (2)	Tenure >= 6 (3)
<b>Main Variables</b>			
OverconfMal	-0.002 (-1.36)	0 (0.01)	-0.008** (-2.35)
$\Delta \ln \text{Sales}$	0.773*** (71.80)	0.758*** (51.14)	0.734*** (37.72)
$\Delta \ln \text{Sales} \cdot \text{DecrDum}$	-0.024 (-0.95)	-0.083** (-2.47)	-0.062 (-1.20)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{OverconfMal}$	-0.119*** (-4.85)	-0.083*** (-2.79)	-0.088** (-1.99)
Constant	0.030*** (3.70)	0.037*** (3.51)	0.039*** (3.65)
<b>Control Variables</b>			
EconControls	Yes	Yes	Yes
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{EconControls}$	Yes	Yes	Yes
AgencyControls	Yes	Yes	Yes
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{AgencyControls}$	Yes	Yes	Yes
Year-Fixed Effects	Yes	Yes	Yes
FF 12 Ind.-Fixed Effects	Yes	Yes	Yes
N	14568	6842	3573
R2	0.7299	0.7272	0.7215
R2adj	0.7291	0.7256	0.7184

The models are estimated using pooled OLS and – if indicated – using fixed effects regressions. EconControls denote the following control variables: EmplInt, AssetInt, SuccessiveDecr and StockPerf. AgencyControls denote the following control variables: FCF and FixedPay. All variables are defined in the Appendix. Standard errors are clustered at the firm level. T-statistics are in parentheses. \*, \*\*, \*\*\* represent significance at the 10%, 5% and 1% level.

$$\begin{aligned}
 \Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \\
 & + \beta_3 \cdot \text{OverconfMal}_{i,t} + \beta_4 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{OverconfMal}_{i,t} \\
 & + \sum_{c=5}^{10} \beta_c \cdot \text{Controls}_{i,t} + \sum_{c=11}^{16} \beta_c \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Controls}_{i,t} + \epsilon_{i,t}
 \end{aligned}$$

**Table 6**

**Addressing Self-Selection using Firm-Fixed Effects**

<b>Economic Controls</b>		
EmplInt	0.001	(1.43)
AssetInt	0.016***	(4.28)
SuccessiveDecr	-0.021***	(-6.92)
StockPerf	0.011***	(4.32)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{EmplInt}$	0.007***	(4.15)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{AssetInt}$	-0.009	(-0.82)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{SuccessiveDecr}$	0.037	(1.40)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{StockPerf}$	0.060***	(2.90)
<b>Agency Controls</b>		
FCF	-0.077***	(-3.56)
FixedPay	-0.003	(-0.79)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{FCF}$	0.06	(0.46)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{FixedPay}$	0.056	(1.28)
<b>Main Variables</b>		
OverconfMal	0	(-0.21)
$\Delta \ln \text{Sales}$	0.746***	(57.89)
$\Delta \ln \text{Sales} \cdot \text{DecrDum}$	-0.001	(-0.05)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{OverconfMal}$	-0.111***	(-3.92)
Constant	0.035***	(3.76)
Year-Fixed Effects	Yes	
Firm-Fixed Effects	Yes	
N	14568	
Within R2	0.7003	

This table presents regression results using firm- and year-fixed effects. All variables are defined in the Appendix. Standard errors are clustered at the firm level. T-statistics are in parentheses. \*, \*\*, \*\*\* represent significance at the 10%, 5% and 1% level.

$$\begin{aligned}
 \Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \\
 & + \beta_3 \cdot \text{OverconfMal}_{i,t} + \beta_4 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{OverconfMal}_{i,t} \\
 & + \sum_{c=5}^{10} \beta_c \cdot \text{Controls}_{i,t} + \sum_{c=11}^{16} \beta_c \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Controls}_{i,t} + \epsilon_{i,t}
 \end{aligned}$$



**Table 7**  
**The Effect of Alternative Managerial Overconfidence Measures on**  
**Cost Stickiness**

	Hirshleifer (1)	Campbell (2)
<b>Main Variables</b>		
OverconfHirshl	0 (0.11)	
$\Delta \ln \text{Sales}$	0.773*** (71.77)	
$\Delta \ln \text{Sales} \cdot \text{DecrDum}$	-0.023 (-0.90)	
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{OverconfHirshl}$	-0.096*** (-3.96)	
OverconfCamp		-0.002 (-1.21)
$\Delta \ln \text{Sales}$		0.773*** (71.89)
$\Delta \ln \text{Sales} \cdot \text{DecrDum}$		-0.046* (-1.94)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{OverconfCamp}$		-0.099*** (-3.66)
<b>Control Variables</b>		
EconControls	Yes	Yes
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{EconControls}$	Yes	Yes
AgencyControls	Yes	Yes
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{AgencyControls}$	Yes	Yes
Year-Fixed Effects	Yes	Yes
FF 12 Ind.-Fixed Effects	Yes	Yes
N	14568	14568
R2	0.7297	0.7295
R2adj	0.7289	0.7287

In model (1), we follow Hirshleifer et al. (2012) and in model (2), we follow Campbell et al. (2011) regarding the overconfidence measure. EconControls denote the following control variables: EmplInt, AssetInt, SuccessiveDecr and StockPerf. AgencyControls denote the following control variables: FCF and FixedPay. The models are estimated using pooled OLS and – if indicated – using fixed effects regressions. All variables are defined in the Appendix. Standard errors are clustered at the firm level. T-statistics are in parentheses. \*, \*\*, \*\*\* represent significance at the 10%, 5% and 1% level.

$$\begin{aligned}
 \Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \\
 & + \beta_3 \cdot \text{Overconf}_{i,t} + \beta_4 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Overconf}_{i,t} \\
 & + \sum_{c=5}^{10} \beta_c \cdot \text{Controls}_{i,t} + \sum_{c=11}^{16} \beta_c \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Controls}_{i,t} + \epsilon_{i,t}
 \end{aligned}$$

**Table 8**  
**The Effect of Managerial Overconfidence on Cost Stickiness**  
**using an Alternative Industry Measurement**

<b>Economic Controls</b>		
EmplInt	0.000*	(1.92)
AssetInt	0.009***	(3.72)
SuccessiveDecr	-0.030***	(-10.57)
StockPerf	0.010***	(3.88)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{EmplInt}$	0.006***	(4.63)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{AssetInt}$	-0.014	(-1.32)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{SuccessiveDecr}$	0.046*	(1.88)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{StockPerf}$	0.063***	(3.31)
<b>Agency Controls</b>		
FCF	-0.021	(-1.49)
FixedPay	-0.004	(-1.12)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{FCF}$	0.137	(1.44)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{FixedPay}$	0.051	(1.31)
<b>Main Variables</b>		
OverconfMal	-0.002	(-1.19)
$\Delta \ln \text{Sales}$	0.772***	(72.08)
$\Delta \ln \text{Sales} \cdot \text{DecrDum}$	-0.023	(-0.90)
$\Delta \ln \text{Sales} \cdot \text{DecrDum} \cdot \text{OverconfMal}$	-0.120***	(-4.86)
Constant	0.016	(1.26)
Year-Fixed Effects	Yes	
Two-digit SIC Ind.-Fixed Effects	Yes	
N	14568	
R2	0.7311	
R2adj	0.7294	

This table presents regression results using two-digit SIC codes instead of Fama-French 12 industry dummy variables. All variables are defined in the Appendix. Standard errors are clustered at the firm level. T-statistics are in parentheses. \*, \*\*, \*\*\* represent significance at the 10%, 5% and 1% level.

$$\begin{aligned}
 \Delta \ln \text{SGA}_{i,t} = & \beta_0 + \beta_1 \cdot \Delta \ln \text{Sales}_{i,t} + \beta_2 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \\
 & + \beta_3 \cdot \text{OverconfMal}_{i,t} + \beta_4 \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{OverconfMal}_{i,t} \\
 & + \sum_{c=5}^{10} \beta_c \cdot \text{Controls}_{i,t} + \sum_{c=11}^{16} \beta_c \cdot \Delta \ln \text{Sales}_{i,t} \cdot \text{DecrDum}_{i,t} \cdot \text{Controls}_{i,t} + \epsilon_{i,t}
 \end{aligned}$$