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ORIGINAL PAPER

Market reaction to asymmetric cost behavior: the impact of long-term growth expectations

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Abstract
We investigate whether asymmetric cost behavior (also termed cost stickiness) and investors' assessment of asymmetric cost behavior are affected by firms' long-term growth expectations. Using a sample of US firms for the period 1990–2014, we first predict and find that cost stickiness, though a short-term phenomenon, is greater when firms have high rather than low long-term growth expectations. Second, we predict that unexpected cost stickiness is negatively evaluated by investors. Investigating cumulative abnormal returns surrounding earnings announcement dates, we find support for this prediction. Third, we investigate this finding in more detail, dependent on long-term growth. We argue that the reasons for cost asymmetry differ between firms with high versus low long-term growth expectations. We expect these differences to result in differing investor reactions. In line with this prediction, our results reveal that investors react more negatively to unexpected cost stickiness when a firm has low long-term growth opportunities. This finding supports the assumption that investors perceive agency motives as more likely to explain the unexpected cost stickiness for these firms.

Keywords Cost stickiness · Firm life cycle · Long-term growth expectations · Capital market · SG&A costs

JEL Classification M41 · G12

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1 Introduction

The traditional cost model in management accounting differentiates between variable and fixed costs, with variable costs changing proportionally and fixed costs not changing with the level of activity (Anderson et al. 2003). The traditional cost model predicts that if, for example, costs increase by 0.5% for a 1% increase in the level of activity, costs should decrease by 0.5% for a 1% decrease in the level of activity. However, empirical research generally confirms that costs increase more with increasing activity than they decrease with decreasing activity (e.g., Anderson et al. 2003; Balakrishnan et al. 2004). This asymmetric cost behavior is termed 'cost stickiness' (Anderson et al. 2003). Prior research argues that cost stickiness results from both value-oriented resource planning and non-value-oriented drivers, such as agency motives and behavioral implications (Banker and Byzalov 2014; Chen et al. 2012). However, no empirical research investigates whether stock returns react differently when investors have a stronger reason to believe that cost asymmetry results from one driver than from the other. This study intends to contribute by filling this gap.

We argue that the underlying drivers for cost stickiness and, hence, the capital market reaction to cost stickiness vary between firms with high versus low long-term growth expectations. Long-term growth expectations refer to the overall expected activity and profitability of a business and imply that, with high long-term growth expectations, a firm's sales, profits, investments, and borrowing increase (Dickinson 2011). More precisely, we examine whether cost stickiness depends on long-term growth prospects and whether investors assess cost asymmetry differently for firms with high versus low growth expectations, as cost asymmetry is likely the result of different drivers in these types of firms.

Our first hypothesis predicts that firms with higher long-term growth expectations exhibit a greater level of cost stickiness because the probability that sales will increase again after a period of low revenues is greater for these firms than for firms with low long-term growth expectations. The second hypothesis posits that—irrespective of long-term growth expectations—unexpected[1] cost stickiness is, on average, negatively evaluated by the capital market. We argue that investors perceive cost stickiness as a signal for agency motives or unexpected high adjustment costs, resulting in lower firm value. Finally, we examine whether the capital market reaction to cost stickiness differs between firms with high versus low long-term growth expectations. More precisely, our third hypothesis predicts that unexpected cost stickiness is more negatively evaluated by the capital market if a firm has lower long-term growth opportunities. This prediction is expected because of the higher probability that cost asymmetry in these firms is driven by agency rather than economic reasons.

To test our predictions, we employ a large sample of US[2] firms for the 1990–2014 period. Following prior research, we use firms' selling, general and

[1] Because the capital market will react only to new information, we focus on unexpected cost stickiness for this hypothesis, i.e., the portion of costs of idle capacity that is not expected by the capital market.

[2] We use US firms to ensure high data availability and comparability with prior studies.

administrative costs (SG&A) to measure cost stickiness (e.g., Anderson et al. 2003; Chen et al. 2012, 2013). To separate firm-quarter observations based on whether firms have low or high long-term growth expectations, we utilize the cash flow patterns suggested by Dickinson (2011). More precisely, firms assigned to the growth stage are used as typical examples of firms with high long-term growth expectations, while those belonging to the shakeout or decline stage have low long-term growth expectations.

Consistent with our first prediction, we find that firms with high long-term growth expectations exhibit higher levels of cost stickiness than firms with low long-term growth opportunities—even after controlling for alternative growth signals suggested by prior research. With respect to our second hypothesis, we find evidence that the capital market assessment of SG&A cost stickiness is negative on average. That is, investors react more negatively to earnings announcements from firms with unexpected sticky costs. In line with the third hypothesis, we confirm that this reaction is less negative for firms with high long-term growth expectations. This finding is consistent with investors assuming that a management decision to retain slack resources in firms with high long-term growth expectations is more likely driven by positive future expectations and less likely driven by empire-building incentives compared to what would be assumed for firms with low long-term growth expectations.

Our study contributes to the stream of research on cost stickiness in several respects. First, prior research aims to identify determinants of cost stickiness. We contribute to this stream of research by showing that a firm's fundamental long-term growth prospects drive cost stickiness. Previous studies in this field reveal that managers' expectations about future sales influence cost stickiness (Anderson et al. 2003; Banker et al. 2014). We complement the measures used by these studies, such as GDP and sales trends.[3] We predict that a firm's long-term prospects affect short-term sales expectations and thus short-term managerial decision making. Notably, although cost asymmetry is a short-term phenomenon, we provide evidence that long-term growth opportunities matter as an overarching driver. For example, management tends to react more sensitively in periods of declining sales if long-term growth expectations are low and thus retains less slack resources.

Second, our results shed light on the consequences of cost stickiness. Because cost stickiness can be consistent with both value-oriented resource planning and non-value-oriented empire building (Banker and Byzalov 2014; Chen et al. 2012), the effect of cost stickiness on firm value is particularly interesting. Previous studies in this field focus on the question of whether investors understand and consider cost stickiness when assessing firm value and yield mixed results (Anderson et al. 2007; Banker et al. 2013; Weiss 2010). Anderson et al. (2007) find that increases in the SG&A cost ratio when sales decline are misinterpreted by investors as evidence of poor cost control. Furthermore, Banker et al. (2013) observe that investors do not

[3] We find that our measure for long-term growth prospects provides information about future sales growth in addition to measures suggested by prior research.

fully incorporate the available information about cost stickiness into earnings expectations. However, Weiss (2010) concludes that cost stickiness is relevant in forming investors' beliefs regarding firm value because he finds a weaker market response to earnings surprises for firms with stickier cost behavior. We extend this line of research by arguing that investors do not treat unexpected cost asymmetry similarly for all types of firms; rather, investors understand that the motives for cost stickiness are likely to differ between firms with high and low long-term growth expectations. While unexpected cost stickiness in firms with high long-term growth expectations is more likely to be explained by rational resource planning, cost stickiness in firms with low long-term growth expectations is more susceptible to empire-building incentives. Thus, if the market evaluation of unexpected cost stickiness differs based on a firm's long-term growth expectations, this result would indicate that investors, at least partially, understand and consider cost stickiness. This finding is important for the following reasons: although we neither aim at nor can resolve the mixed findings in prior research on whether investors understand cost stickiness, this paper supports the respective stream of research (e.g., Weiss (2010)) predicting that cost stickiness affects investor assessment of firm value.

The remainder of this paper proceeds as follows. Section 2 provides a review of the cost stickiness literature and presents our hypotheses. Section 3 describes the sample and the research design, and Sect. 4 presents our results. Section 5 concludes the paper.

2 Literature review and hypothesis development

2.1 Asymmetric cost behavior and long-term growth opportunities

Empirical research regarding the existence of cost stickiness began with the seminal work of Anderson et al. (2003). These authors find that SG&A costs increase by 0.55% if sales increase by 1%, but costs decrease by only 0.35% if sales decrease by 1%, i.e., cost behavior is asymmetric. Anderson et al. (2003) argue that cost stickiness results from managers' short-term resource adjustment decisions. Due to forces that restrain or delay downward resource adjustments more than upward adjustments, costs are sticky. In periods of lower activity, this stickiness leads to greater holding costs of unused capacity.

Past studies identify three types of drivers for asymmetric cost behavior: economic, agency and behavioral explanations (Chen et al. 2012, 2013). Below, we elaborate on how these three reasons drive the cost stickiness of firms with high versus low long-term growth opportunities.

From an economic perspective, cost stickiness results from a trade-off between adjustment costs[4] and the costs of idle capacity (Anderson et al. 2003). If managers keep resources during a period of lower demand, costs of idle capacity arise.

[4] Adjustment costs are costs that a firm incurs to reduce committed resources and to replace those resources if demand is restored (Anderson et al. 2003).

At the same time, however, keeping resources avoids current and future adjustment costs resulting from resource cuts. Thus, cost stickiness increases if adjustment costs increase and decreases if the probability of rising sales decreases—leading to higher expected costs of idle capacity. Anderson et al. (2003) empirically show that higher adjustment costs lead to greater cost stickiness. For the costs of idle capacity, these authors find that stickiness is lower when managers assume a higher probability of a permanent decline in demand, that is, when they expect greater costs of idle capacity. Anderson et al. (2003) proxy managers' negative expectations with two consecutive periods of declining demand. Similarly, Banker et al. (2014) find that costs are sticky for managers' optimistic expectations and anti-sticky for pessimistic expectations, i.e., in the latter case, the cost decrease that occurs when activity falls is greater than the cost increase that occurs when activity rises. These authors assume that managers are optimistic if sales in the previous period increased and pessimistic if sales in the previous period decreased.

Differing long-term growth expectations are likely to affect the expected costs of idle capacity and thereby cost stickiness.[5] When the probability of rising sales is high (low), the risk of idle capacity is low (high). The result is different predictions for the level of cost stickiness, depending on whether firms have high or low long-term growth expectations: Firms with high long-term growth opportunities expect substantial increases in sales (Churchill and Lewis 1983; Flamholtz and Randle 2007; Miller and Friesen 1984) and usually continue making large investments (Spence 1977; 1979; 1981). Managers therefore have positive expectations about fundamental firm development in the long-term future and in the short-term future. These expectations make managers more reluctant to cut resources in times of temporary sales decreases, as they want to avoid adjustment costs when activity generally increases. In contrast, firms with low long-term growth opportunities suffer from saturated markets and declining growth rates, which lead to lower prices (Miller and Friesen 1984; Wernerfelt 1985). Hence, managers therefore have less positive long- and short-term expectations and are more likely to sell than to add resources (Dickinson 2011). Therefore, when short-term signals of decreasing sales appear, managers of firms with low long-term growth expectations are more willing to cut resources.

Taken together, economic reasons cause greater cost stickiness for firms that have high rather than low long-term growth opportunities. Notably, although cost asymmetry is a short-term phenomenon, long-term growth opportunities are important because longer-term expectations affect the probability that managers assign to sales increases/decreases in the next period. As we will discuss in more detail in the next section, short-term growth signals such as a prior-period sales change or broad measures such as a single-period GDP increase might lead to managerial optimism and motivate managers to retain slack resources (Anderson et al. 2003; Banker et al. 2014). However, we predict that the fundamental prospects of a firm

[5] While long-term growth expectations are likely to affect expected cost of idle capacity, there is no reason to believe that costs of the same adjustment (e.g., for hiring a new employee) will differ between low- and high-growth firms.

have an additional effect on managerial decision-making beyond the abovementioned signals. For example, a sudden prior-period sales decrease will have a more severe combined effect on slack resources if a firm has low rather than high long-term growth expectations.

As for agency explanations, such as empire building, prior research argues that managers avoid resource reductions—resulting in stickier costs—to maximize personal utility (Anderson et al. 2003; Chen et al. 2012). In accordance with Mueller's (1969) empire-building hypothesis, a manager's income is composed of salary, bonuses, promotions, reputation, and power and is thus positively related to firm size. Hence, managers have incentives to add resources too rapidly when demand increases, but they are reluctant to reduce resources when demand decreases (Chen et al. 2012). Chen et al. (2012) find that cost stickiness increases with greater empire-building incentives.[6] These authors also show that the extent to which agency and economic factors explain cost stickiness differs between stable firms with lower variation in sales in the previous 5 years and firms with a higher variation in sales. Whereas cost stickiness is lower for the first type of firms and more likely to be driven by agency motives, it is higher for firms with a greater variation in sales and more likely due to economic reasons. Assuming that firms with higher variation in sales in the past are more likely to grow in the future, these results are also in line with our reasoning that long-term growth opportunities are associated with greater cost stickiness.[7]

Evidence on how behavioral factors affect cost stickiness remains limited. Building on psychology research, previous research confirms that managerial overconfidence affects corporate decisions (Chen et al. 2013). Chen et al. (2013) argue that managers overestimate both the probability that demand is restored in the future and the accuracy of their assessment. Such managerial overestimation results in greater cost stickiness. Because we have no reason to believe that managerial overconfidence differs between firms with low and those with high long-term growth expectations, we build our hypothesis based on economic and agency reasons. In summary, we predict that cost stickiness is more pronounced for firms with high long-term growth expectations. H1 formally states this prediction.

H1 Firms with high long-term growth expectations exhibit a greater level of cost stickiness than firms with low long-term growth expectations.

[6] In contrast, Kama and Weiss (2013) and Dierynck et al. (2012) show that depending on motivations underlying managers' resource adjustments, agency-driven incentives can lead to inefficiently low cost stickiness. These authors show that when sales decrease, managers reduce costs more aggressively in the presence of incentives to meet earnings targets, thereby resulting in a lower degree of cost stickiness.

[7] We again refer to the different drivers of cost stickiness when developing H3. More precisely, we use the different drivers to explain how investors' evaluate cost stickiness, an implication not examined in Chen et al. (2012).

2.2 Market reaction to cost stickiness

Banker and Byzalov (2014) argue that cost stickiness can be consistent with both value-oriented resource planning and non-value-oriented empire building. As a result, the question addressed by H2 is whether cost stickiness—irrespective of long-term growth expectations—is associated with positive or negative investor reactions. As investors will only react to new information, we focus on unexpected cost stickiness for this hypothesis (instead of general cost stickiness as in H1), i.e., the portion of costs of idle capacity that is not expected by the capital market.[8]

Prior research indicates that reasons beyond investors' interest in maximizing firm value can affect cost stickiness. For example, empire building is a frequently cited reason for managers' refusal to reduce resources, e.g., to increase their personal utility from compensation, reputation, or power (Mueller 1969). Furthermore, managers try to avoid difficult decisions, costly effort, and potential negative effects on their status associated with downsizing (Anderson et al. 2003; Bertrand and Mullainathan 2003; Chen et al. 2012). Anderson et al. (2003) argue that managers' intentions to avoid downsizing results in excess capacity and thus cost stickiness. Other studies provide direct results that managers' personal interests drive cost decisions, such as CEO tenure and compensation (Chen et al. 2012) or meeting earnings targets and benchmarks (Dierynck et al. 2012; Kama and Weiss 2013). To the extent that unexpected cost stickiness is driven by agency factors, a negative market evaluation is intuitive because empire-building or other managerial incentives are not in the interest of shareholders. However, some portion of unexpected cost stickiness may also be rooted in economic reasons, which requires more discussion.

With regard to economic reasons, management trades off adjustment costs and costs of idle capacity while taking into account earnings expectations. Unexpected sticky costs imply that the portion of costs of idle capacity in the current period is higher than expected. Anderson et al. (2007) argue that this situation could be the result of better sales expectations. These authors predict and find that increases in SG&A cost ratios in periods of declining sales are positively related to future earnings. Thus, as a signal of higher future earnings, unexpected cost stickiness should result in a more positive investor reaction. However, another reason for unexpected cost stickiness may be unexpectedly high adjustment costs that are not caused by higher sales expectations. If adjustment costs are higher than expected by the capital market, a negative market reaction will materialize. Even if managers increase cost stickiness to avoid higher adjustment costs and incur lower costs of idle capacity, the total costs are higher than expected, which decreases firm value.

Previous studies found that the capital market only partially incorporates available information about cost stickiness into earnings expectations. Weiss (2010) predicts and finds that the degree of cost stickiness affects earnings predictability and

[8] For our operationalization of unexpected cost stickiness, we argue that the capital market forms its expectation of the level of cost stickiness based on the level four quarters ago. In summary, therefore, unexpected cost stickiness is operationalized as the difference between current cost stickiness and cost stickiness one year earlier.

thus investor behavior, resulting in weaker market responses to earnings surprises for firms with stickier cost behavior. He argues that cost behavior is relevant to forming investors' beliefs regarding firm value. Ciftci et al. (2016) find evidence of an asymmetric association between analysts' sales forecast errors and earnings forecast errors. According to these authors, this effect results from analysts' failure to fully incorporate information on cost stickiness into their earnings forecasts. Anderson et al. (2007) show that abnormal positive returns may be obtained on portfolios constructed by taking a long position in firms with large increases in the SG&A cost ratio in revenue-declining periods and a short position in firms with small increases in the SG&A cost ratio. Thus, the expectations of market participants are consistent with a traditional assessment based on a proportional cost model rather than a model that incorporates sticky costs. Market participants seem to interpret cost stickiness initially as evidence of poor cost control and react negatively.

In summary, there is more reason to expect a negative than a positive capital market response to unexpected cost stickiness. First, agency factors and incomplete comprehension of cost stickiness by the capital market result in a negative capital market reaction. Second, from an economic perspective, there is also reason to expect a negative market reaction: unexpected high adjustment costs. Only unexpectedly high future sales expectations would constitute a positive association between unexpected cost stickiness and capital market reaction. Taken together, we predict, on average, a negative market evaluation of unexpected cost stickiness, as formally stated by H2:

H2 Unexpected cost stickiness is negatively evaluated by the capital market.

2.3 Market evaluation of cost stickiness dependent on long-term growth expectations

For H1, we argue that cost stickiness arises mainly for economic and/or agency reasons. H2 posits that unexpected cost stickiness leads to a negative market evaluation on average. In H3, we more closely examine the association between unexpected cost stickiness and market evaluation and predict that long-term growth expectations moderate this relationship. We argue that investors' evaluation of unexpected cost asymmetry will depend on the probabilities they assign to economic versus agency drivers. More precisely, we predict that market evaluation is more negative for firms with low long-term growth expectations.

Because of the more positive outlook, there is more economic reason for slack creation in firms with high long-term growth expectations. Consequently, we predict that investors assign a greater probability to economic reasons in firms with high long-term growth expectations. With respect to agency reasons for cost stickiness, Chen et al. (2012) predict and find that the agency problem, e.g., managerial empire building, is less pronounced for growth firms than for more stable firms. Managers may avoid divestments and resource reductions when sales decrease because their income and power are related to the size of the division they manage. Thus, we predict that investors assign a greater probability to agency reasons in firms with low long-term growth expectations.

In sum, we argue that investors partially understand and incorporate available information about cost stickiness into their evaluation of firm value. If a firm exhibits the same level of unexpected cost stickiness in periods with high long-term growth expectations and in periods with low long-term growth expectations, we expect a more negative market evaluation in periods with low long-term growth expectations. This evaluation is expected because of the higher probability that cost asymmetry in these firms is driven by agency rather than economic reasons. H3 formally states our hypothesis:

H3 Unexpected cost stickiness is more negatively evaluated by the capital market if a firm has low long-term growth opportunities than if it has high long-term growth opportunities.

3 Research design

Before presenting the models used to test our hypotheses in the subsections that follow, we first operationalize cost stickiness and long-term growth expectations. As a final step, we describe the sample selection process.

3.1 Measurement of cost stickiness

We test our predictions using the direct firm-level cost stickiness measure proposed by Weiss (2010).[9] The Weiss measure, which is based on quarterly data, estimates the difference between the change in SG&A costs and the change in sales for the two most recent quarters of decreasing and increasing sales:

$$STICKY_{i,t} = ln\left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,\underline{\tau}} - ln\left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,\bar{\tau}}$$

where $\underline{\tau}$ is the most recent of four fiscal quarters of firm i with decreases in both sales and SG&A costs and $\bar{\tau}$ the most recent of four fiscal quarters with increases in both sales and SG&A costs, $\Delta SALES_{i,t} = SALES_{i,t} - SALES_{i,t-1}$, $\Delta SG\&A_{i,t} = SG\&A_{i,t} - SG\&A_{i,t-1}$. If costs are sticky, they increase more when sales rise than they decrease when sales fall by the same amount, thereby resulting in a negative value for the variable $STICKY_{i,t}$. Hence, a lower value of $STICKY_{i,t}$ represents a higher degree of cost stickiness.

[9] Compared with the original method to detect cost stickiness suggested by Anderson et al. (2003), the Weiss measure can be used as an independent variable to examine the impact of cost stickiness on capital market evaluation. Many prior studies follow Anderson et al. (2003) and use a regression model to estimate cost stickiness at the industry or firm level, which results in an estimated regression function with one static regression coefficient that captures the degree of cost stickiness of the sample firms in the sample period. Thus, this measure is constant over time and/or is not firm specific. To analyze the market reaction to cost stickiness, we need a firm- and time-specific measure of cost stickiness. Thus, we use the cost stickiness measure suggested by Weiss (2010).

We follow prior research (e.g., Anderson et al. 2003; Chen et al. 2012, 2013) and use SG&A costs to calculate $STICKY_{i,t}$ for the following reasons: First, SG&A costs are a significant cost category for firms. In their seminal paper, Anderson et al. (2003) report that SG&A costs amount to 26.4% of sales in their sample. Second, SG&A costs capture most nonproduction overhead costs and are likely to contain slack resources (Chen et al. 2012; Williamson 1963). Thus, SG&A cost behavior is a good indicator for agency motives (Chen et al. 2012). Third, analysts and investors pay close attention to these costs, as they serve as an important signal for future profitability (Anderson et al. 2007; Lev and Thiagarajan 1993).

In H2 and H3, we analyze the capital market reaction to unexpected cost stickiness. To control for capital market expectations, we calculate $\Delta STICKY_{i,t}$, which is the difference between actual cost stickiness in the current period ($STICKY_{i,t}$) and the capital market expectation for cost stickiness ($LAGSTICKY_{i,t}$). We assume a seasonal random walk model and use cost stickiness of the same fiscal quarter one year ago ($STICKY_{i,t-4}$) as our proxy for the market's expectation.[10] That is, we assume that investors make a naïve forecast and assume cost stickiness to be the same as one year ago. Previous literature argues that investors do not immediately and fully incorporate available data on cost stickiness into their firm evaluation (Anderson et al. 2007; Banker et al. 2013; Ciftci et al. 2016). Thus, we additionally include the markets' expectation of cost stickiness ($LAGSTICKY_{i,t}$) as a control variable.

3.2 Measurement of long-term growth expectations

H1 and H3 make different predictions for cost stickiness and investor reactions when firms have high versus low long-term growth expectations. Prior research has mainly investigated short-term growth expectations based on, e.g., current sales changes, GDP growth, order backlog or similar measures (e.g., Banker et al. 2014). However, our focus is on examining the effect of long-term growth expectations that are more strongly related to firm-specific fundamental measures, such as the firm's life cycle, than to current GDP growth.[11] Dickinson (2011) suggests a new approach that resolves many of the issues when measuring a firm's life cycle stage. She argues that operating, investing, and financing cash flows represent a firm's operational and financial capability in addition to its resource allocation and therefore allows assigning firms to one of the following life cycle stages: introduction, growth, mature, shakeout, and decline. Notably, she does not rely on the value of the respective cash flow but only on the sign [positive (+) or negative (−)] of the cash flow.

[10] To minimize data loss, we use $STICKY_{i,t-8}$ to calculate $\Delta STICKY_{i,t}$ if data on cost stickiness for t-4 is missing. However, if we use only cost stickiness of $t-4$ to calculate $\Delta STICKY_{i,t}$, our results for H2 and H3 are inferentially identical. Further, our results are unchanged if we define $\Delta STICKY_{i,t}$ as the difference between cost stickiness in the current period and cost stickiness in the most recent of four fiscal quarters with available data.

[11] We decided to use a firm-based instead of an industry-based measure because we expect a firm-based measure to more precisely capture growth expectations. For example, an innovative firm in the transportation industry might expect (and have) higher growth rates than well-established and mature firms in that industry. Further, we believe a firm-based measure is better able to account for multi-segment firms.

Table 1 Dickinson's (2011) life cycle proxy

	Introduction	Growth	Mature	Shakeout			Decline	
Pattern	1	2	3	4	5	6	7	8
Cash flow from operating activities	–	+	+	–	+	+	–	–
Cash flow from investing activities	–	–	–	–	+	+	+	+
Cash flow from financing activities	+	+	–	–	+	–	+	–

For example, a positive (negative) investing cash flow implies that a firm divests (invests). Thus, Dickinson (2011) expects a positive sign for investing cash flow in the decline stage (disinvestments) and a negative sign (investments) in the growth stage. In the growth stage, she further expects a positive cash flow from financing activities (cash inflows from borrowing money) and a positive sign for the cash flow from operating activities (cash inflows from starting to earn money). Table 1 shows how Dickinson (2011) uses all possible combinations of different signs (positive or negative) of operating, investing, and financing cash flow to assign firms to a life cycle stage. We replicate this approach using cash flow data accumulated over the previous four fiscal quarters, including the current quarter for the operating, investing, and financing cash flows to assign firms to life cycle stages.

Dickinson (2011) provides theory and empirical findings for the behavior of firms in each of these five stages. Based on these arguments, firms assigned to the growth stage should have high long-term growth expectations, while firms assigned to the shakeout or decline stage are expected to have low long-term growth expectations. We use the dummy variable $LTGROWTH_{i,t}$, which equals 1 if a firm i in quarter t belongs to the growth stage (high long-term growth) and zero otherwise (low long-term growth). Firm observations that are associated with the introduction or mature stages are dropped in our main analysis (but considered in the robustness tests) because these two life cycle stages do not allow for clear predictions based on the arguments put forward by Dickinson (2011). Firms in the introduction stage are characterized by greater uncertainty (compared to growth firms) and less knowledge about revenues and costs (Jovanovic 1982). Thus, these firms will have less clear expectations than growth firms. We also lack theory for a clear prediction for mature firms. In the mature stage, sales growth slows and competition intensifies (Miller and Friesen 1984). Firms try to maximize profitability by focusing on cost reductions and resource management (Quinn and Cameron 1983). Taken together, these firms have more favorable expectations than decline or shakeout firms (but less than growth firms). Their high efficiency level, however, makes these firms less likely to waste resources by retaining slack capacity.

3.3 Model for testing H1

To test whether cost stickiness is greater for firms with high than with low long-term growth expectations (H1), we use panel data and estimate a cross-sectional model. To determine whether to use a fixed- or random-effects model, we employ the heteroscedasticity-robust version of the Hausman specification test (Arellano 1993; Hausman 1978; Schaffer and Stillman 2016), which rejects the random-effects model in favor of a fixed effects model. We include time and firm[12] fixed effects to address concerns about correlated omitted variables and endogeneity bias due to unobserved time-invariant firm characteristics. Furthermore, we use two-way cluster robust standard errors at the time and firm levels (Gaure 2011; Guimarães and Portugal 2010; Sergio 2014). To test H1, we estimate the following time and firm fixed effects model with two-way cluster robust standard errors (Model 1):

$$\begin{aligned} STICKY_{i,t} = {} & \gamma_0 + \gamma_1 LTGROWTH_{i,t} + \gamma_2 lnAINT_{i,t} + \gamma_3 lnEINT_{i,t} + \gamma_4 SUCCDEC_{i,t} \\ & + \gamma_5 SUCCINC_{i,t} + \gamma_6 \Delta GDP_{i,t} + TIME\ FIXED\ EFFECTS \\ & + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t} \end{aligned}$$

Our dependent variable is the Weiss (2010) cost asymmetry measure $STICKY_{i,t}$. Our main independent variable is $LTGROWTH_{i,t}$, which is a dummy variable for the high growth opportunities of firm i in quarter t. The firms with low long-term growth expectations serve as the baseline. Because H1 posits higher cost stickiness (i.e., a more negative value of $STICKY_{i,t}$) for firms with high long-term growth expectations, the hypothesis is supported if $\gamma_1 < 0$.

We control for several factors that potentially confound our regression analysis. First, cost stickiness is positively associated with the amount of adjustment costs (Anderson et al. 2003). As a proxy for high adjustment costs, we use asset intensity ($lnAINT_{i,t}$), measured by the logarithm of the ratio of total assets to sales, and employee intensity ($lnEINT_{i,t}$), measured by the logarithm of the ratio of number of employees to sales.[13]

Second, we include the measures for short-term growth prospects used in prior studies, including historical sales changes and GDP growth. For the first control variable, $SUCCDEC_{i,t}$, Anderson et al. (2003) find that the degree of cost stickiness is lower in the current period if revenue declined over two consecutive periods. They argue that this variable captures managers' short-term expectations about the permanence of a sales decline. Thus, we add the dummy variable $SUCCDEC_{i,t}$, which equals 1 if sales decline not only in the fiscal quarter that was used to calculate $STICKY_{i,t}$ but also in the previous quarter and zero otherwise. Additionally, we control for the effect of two consecutive periods of increasing revenue (Banker et al. 2014) and include a dummy variable $SUCCINC_{i,t}$, which equals 1 if sales increase not only in the fiscal quarter used to calculate $STICKY_{i,t}$ but also in the previous quarter and zero otherwise. Furthermore, we use $\Delta GDP_{i,t}$, which is the GDP growth in the current fiscal quarter, to also capture managerial short-term expectations (optimism) about future sales. We predict that our proxy for long-term growth expectations has additional explanatory power over these growth measures from the

[12] If we use industry fixed effects instead of firm fixed effects, our results for H1, H2, and H3 are unchanged.

[13] Our results are inferentially identical if we use asset intensity and employee intensity without a logarithm.

prior literature for the following reason: current and historical sales growth measures, such as a measure for two periods with declining sales, are not designed to capture the firm's fundamental growth prospects. However, we argue that a firm's fundamental growth prospects matter because they facilitate the differentiation between an extraordinary drop in sales and a persistent sales decline that affects future periods. For example, in periods of declining sales, management will react more sensitively and retain less slack resources if long-term growth expectations are low than if they are high. Furthermore, unspecific measures such as current, single-period GDP growth do not reflect the firm-specific growth potential, and more informative measures such as analysts' sales forecasts and the growth of order backlog are often not available for investors.[14]

3.4 Models for testing H2 and H3

In H2 and H3, we focus on the market evaluation of unexpected cost stickiness. We measure market evaluation using *CAR[−1;1]*, which represents the cumulative abnormal returns for an event period of three days surrounding quarterly earnings announcements. We calculate the cumulative abnormal returns using the market model with a value-weight market return on all NYSE, AMEX, and NASDAQ stocks from CRSP. We use cumulative abnormal returns instead of raw returns or absolute market capitalization because we want to capture the capital market reaction to cost stickiness information. More precisely, we investigate the extent to which unexpected cost stickiness affects investors' evaluation of firm value.

For our test of H2, we estimate the following time and firm fixed[15] effects model with two-way cluster robust standard errors on the time- and firm-level (Model 2):

$$\begin{aligned} CAR[-1;1]_{i,t} = {} & \gamma_0 + \gamma_1 \Delta STICKY_{i,t} + \gamma_2 LAGSTICKY_{i,t} + \gamma_3 \Delta IB_{i,t} \\ & + \gamma_4 \Delta CAPEX_{i,t} + \gamma_5 \Delta SG_{i,t} + \gamma_6 \Delta ASSETS_{i,t} \\ & + \gamma_7 \Delta LEV_{i,t} + \gamma_8 \Delta RISK_{i,t} + TIME\ FIXED\ EFFECTS \\ & + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t} \end{aligned}$$

If $\gamma_1 > 0$, a higher degree of unexpected cost stickiness (i.e., a more negative value of $\Delta STICKY_{i,t}$) is associated with lower market evaluation, and thus, H2 is supported. To test H3, we use Model 3, which differs from Model 2 in that it includes the dummy variable for firms with high long-term growth expectations ($LTGROWTH_{i,t}$) and an interaction term between this variable and the level of unexpected cost stickiness ($\Delta STICKY_{i,t}$) and expected cost stickiness ($LAGSTICKY_{i,t}$). Furthermore, we include interactions of $LTGROWTH_{i,t}$ with the other control variables. We also add

[14] We include a robustness test using the growth of order backlog and analysts' sales forecasts. However, information on analysts' forecasts is missing for about 65% of the observations we use in our main analysis, and data on the growth of order backlog is not available for about 69% of our observations.

[15] A heteroscedasticity-robust version of the Hausman specification test (Arellano 1993; Hausman 1978; Schaffer and Stillman 2016) rejects the random-effects model in favor of a fixed effects model.

the alternative proxies from prior literature for managers' sales expectations from Model 1 and their interactions with $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$ to verify that our measure for long-term growth expectations has additional explanatory power.

Model 3:

$$\begin{aligned}
CAR[-1;1]_{i,t} = {} & \gamma_0 + \gamma_1 \Delta STICKY_{i,t} + \gamma_2 LAGSTICKY_{i,t} + \gamma_3 \Delta IB_{i,t} + \gamma_4 \Delta CAPEX_{i,t} + \gamma_5 \Delta SG_{i,t} \\
& + \gamma_6 \Delta ASSETS_{i,t} + \gamma_7 \Delta LEV_{i,t} + \gamma_8 \Delta RISK_{i,t} \\
& + LTGROWTH_{i,t} \times (\gamma_9 + \gamma_{10} \Delta STICKY_{i,t} + \gamma_{11} LAGSTICKY_{i,t} + \gamma_{12} \Delta IB_{i,t} \\
& + \gamma_{13} \Delta CAPEX_{i,t} + \gamma_{14} \Delta SG_{i,t} + \gamma_{15} \Delta ASSETS_{i,t} + \gamma_{16} \Delta LEV_{i,t} + \gamma_{17} \Delta RISK_{i,t}) \\
& + SUCCDEC_{i,t} \times \left(\gamma_{18} + \gamma_{19} \Delta STICKY_{i,t} + \gamma_{20} LAGSTICKY_{i,t}\right) \\
& + SUCCINC_{i,t} \times \left(\gamma_{21} + \gamma_{22} \Delta STICKY_{i,t} + \gamma_{23} LAGSTICKY_{i,t}\right) \\
& + \Delta GDP_{i,t} \times \left(\gamma_{24} + \gamma_{25} \Delta STICKY_{i,t} + \gamma_{26} LAGSTICKY_{i,t}\right) \\
& + TIME\ FIXED\ EFFECTS + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t}
\end{aligned}$$

If $\gamma_{10} < 0$, H3 is supported. In this case, the market evaluation of unexpected cost stickiness (i.e., of a negative value of $\Delta STICKY_{i,t}$) for a firm with high long-term growth expectations is less negative than that for a firm with low growth expectations.

We control for several factors that potentially confound our regression analyses. In Models 2 and 3, we add lagged cost stickiness ($LAGSTICKY_{i,t}$)—our measure of the market expectations of cost stickiness—because prior studies argue that investors do not immediately and fully include cost stickiness information in their evaluation of future earnings (Anderson et al. 2007; Banker et al. 2013; Ciftci et al. 2016) and thus firm value. Furthermore, the inclusion of $LAGSTICKY_{i,t}$ as a control variable also addresses potential endogeneity concerns.

Second, we add $\Delta IB_{i,t}$, $\Delta CAPEX_{i,t}$, and $\Delta SG_{i,t}$, following Anthony and Ramesh (1992). Prior studies provide compelling evidence of the association between earnings announcements and stock prices (Ball and Brown 1968; Beaver 1968). Hence, $\Delta IB_{i,t}$ controls for unexpected earnings that may affect market evaluation.[16] This variable is calculated as the change in net income before extraordinary items in the current quarter t compared with the same quarter one year prior, scaled by the market value of equity. Anthony and Ramesh (1992) argue that capital expenditure and sales growth signal a firm's strategic emphasis on growth versus cost trimming. Using $\Delta CAPEX_{i,t}$, we control for the effect of unexpected capital expenditures. $\Delta CAPEX_{i,t}$ equals the change in capital expenditures in the current quarter t compared with the same quarter 1 year prior, scaled by the market value of equity. $\Delta SG_{i,t}$ controls for unexpected sales growth and is calculated as the change in sales growth[17] in the current quarter t compared with the previous quarter. Additionally, we control for

[16] In an additional analysis, we also use analysts' forecast errors as a proxy for unexpected earnings.

[17] Sales growth is calculated as the difference between the sales of firm i in quarter t and its sales in the same quarter one year prior, scaled by the sales of firm i in the same quarter one year prior.

unexpected changes in systematic risk ($\Delta RISK_{i,t}$) in the current quarter t compared to the previous quarter. Systematic risk is estimated from the regression of monthly stock returns of firm i on a value-weighted market index over a 60-month estimation period prior to the end of a fiscal quarter and a minimum of ten returns. Using $\Delta ASSETS_{i,t}$ and $\Delta LEV_{i,t}$, we control for the effect of unexpected changes in firm size and financial leverage. $\Delta ASSETS_{i,t}$ corresponds to the change in total assets in the current quarter t compared with the same quarter 1 year prior, scaled by the market value of equity. $\Delta LEV_{i,t}$ equals the change in the financial leverage ratio compared to the previous quarter.

In Model 3, we additionally include $LTGROWTH_{i,t}$ and interactions of $LTGROWTH_{i,t}$ with $\Delta STICKY_{i,t}$, $LAGSTICKY_{i,t}$ and with the control variables $\Delta IB_{i,t}$, $\Delta CAPEX_{i,t}$, $\Delta SG_{i,t}$, $\Delta RISK_{i,t}$, $\Delta ASSETS_{i,t}$, and $\Delta LEV_{i,t}$. Thus, we control for the different effects of those variables for firms with high long-term growth expectations compared to firms with low long-term growth expectations. Furthermore, we use alternative short-term growth signals from prior literature ($SUCCDEC_{i,t}$, $SUCCINC_{i,t}$ and $\Delta GDP_{i,t}$). We also add interactions of these variables with unexpected cost stickiness and lagged cost stickiness. Finally, we include time and firm fixed effects in all regression models to control for unobserved time- and firm-specific components and to address potential endogeneity concerns.

3.5 Sample selection

Due to data availability and comparability to prior studies, we use US firms as our sample. Our initial sample includes all public, non-financial and non-utility firms[18] covered by CCM (CRSP/COMPUSTAT Merged) available through WRDS (Wharton Research Data Services, University of Pennsylvania) during the 1990–2014 period.[19] We include firm-quarter observations only for firms with high and low long-term growth opportunities because we focus on the difference between these two types of firms. As depicted in Table 2, these criteria[20] result in 172,113 firm-quarter observations. We eliminate observations with missing values for sales and SG&A costs or with values equal to or less than zero (23,824). We exclude 84,228 observations with missing values for $STICKY_{i,t}$.[21] To avoid biased results due to illiquid stocks, we exclude 641 observations with extremely low trading volumes

[18] We exclude financial firms (SIC codes 6000-6999) and utility firms (SIC codes 4900-4999) because the structure of their cash flows and financial statements differs substantially from those of all other industries.

[19] To calculate all variables, we require data for the five preceding fiscal quarters for every observation. Thus, we also gather data for the years 1988 and 1989 to calculate these variables.

[20] We also delete duplicate fiscal quarters (97) and 4488 observations for which a change in fiscal year occurred during the previous four quarters. These and the other criteria described in the text result in 172,113 firm-quarter observations.

[21] These missing values occur because sales and SG&A costs do not change in the same direction in the current period or because over the last four quarters, there was either no quarter with increasing sales and increasing SG&A costs or no quarter with decreasing sales and decreasing SG&A costs. In the additional analysis section, we provide a robustness check that uses an alternative measure for $STICKY_{i,t}$ to limit the loss of observations and rule out the possibility that our results are affected by a selection bias.

Table 2 Sample selection

# of Obs.			
Quarterly data for US non-financial and non-utility firms with high and low long-term growth opportunities (1990–2014)			172,113
- Deleting missing values for sales and SG&A costs or values equal to or below zero			23,824
- Deleting missing values for *STICKY*			84,228
- Deleting illiquid stocks (bottom 1% of trading volume)			641
Base sample			63,420
	# of Obs. H1	# of Obs. H2	# of Obs. H3
- Deleting missing values for regression variables	3313	25,279	25,306
- Deleting singleton observations	924	963	968
Testing sample	59,183	37,178	37,146

(bottom 1%), resulting in a base sample of 63,420 observations. Furthermore, we eliminate observations with missing values for control variables and singleton firm observations for each subsample. The final sample size is 59,183 observations for H1, 37,178 observations for H2, and 37,146 observations for H3.[22] Table 2 summarizes our sample selection process. To rule out the potential influence of outliers, we winsorize all continuous variables at the 1% level. As is evident from Table 2, the number of observations remaining for testing our hypotheses is heavily reduced by data restrictions, which is particularly true for H2 and H3. To rule out that our results are driven by sample selection biases, we present multiple robustness checks in the additional analyses. Among other things, we provide tests that use observations from all life cycle stages (instead of only observations from the growth, decline and shakeout stages), and we use a non-logarithmic computation approach when calculating cost stickiness to limit the number of missing values for this variable. While we discuss the details of these tests later, they all support our main test reported in the following sections.

4 Results

4.1 Validation and descriptive statistics

First, we verify the quality of our measure for long-term growth opportunities. Table 3, Panel A examines whether economic characteristics vary between firms with high and low long-term growth opportunities, as expected. By definition, current and especially future sales growth should be higher in firms with high growth

[22] For the analysis of H2 and H3, we must delete 20,906 firm-quarter observations due to missing values for $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$.

Table 3 Descriptive statistics

Panel A Economic characteristics by fundamental growth prospects

Variable	High long-term growth expectations			Low long-term growth expectations			t test	Rank sum test
	n	Mean	Median	n	Mean	Median	p value	p value
$SG_{i,t}$	38,949	0.162	0.111	20,088	0.054	0.011	<0.001***	<0.001***
$SG_{i,t+1}$	38,834	0.158	0.107	19,849	0.064	0.015	<0.001***	<0.001***
SG_{it+4}	37,401	0.128	0.085	18,516	0.090	0.038	<0.001***	<0.001***
$NOAG_{i,t}$	38,077	0.246	0.157	19,432	−0.044	−0.068	<0.001***	<0.001***
$RD_{i,t}$	19,430	0.075	0.044	10,930	0.164	0.094	<0.001***	<0.001***
$CAPEXS_{i,t}$	38,512	0.111	0.042	19,793	0.049	0.021	<0.001***	<0.001***
$EPS_{i,t}$	39,038	0.179	0.150	20,136	0.023	0.010	<0.001***	<0.001***
$ROA_{i,t}$	39,043	0.007	0.011	20,136	−0.018	0.002	<0.001***	<0.001***
$PM_{i,t}$	39,043	0.009	0.036	20,136	−0.184	0.008	<0.001***	<0.001***
$LEV_{i,t}$	37,611	0.769	0.446	19,231	0.592	0.155	<0.001***	<0.001***

Panel B Actual future sales growth for growth signals from prior literature differentiated by fundamental growth prospects

Variable	High long-term growth expectations			Low long-term growth expectations			t test	Rank sum test
	n	Mean	Median	n	Mean	Median	p value	p value
$SG_{i,t+1}$								
$SUCCDEC_{i,t}$								
Yes	12,445	0.088	0.051	7841	−0.004	−0.040	<0.001***	<0.001***
No	26,389	0.191	0.131	12,008	0.108	0.050	<0.001***	<0.001***
$SUCCINC_{i,t}$								
Yes	21,432	0.201	0.139	9140	0.135	0.060	<0.001***	<0.001***
No	17,402	0.106	0.072	10,709	0.003	−0.020	<0.001***	<0.001***
$\Delta GDP_{i,t}$								
High	19,865	0.185	0.123	9262	0.087	0.029	<0.001***	<0.001***
Low	18,969	0.131	0.091	10,587	0.043	0.003	<0.001***	<0.001***
$SG_{i,t+4}$								
$SUCCDEC_{i,t}$								
Yes	11,929	0.126	0.075	7257	0.085	0.032	<0.001***	<0.001***
No	25,472	0.129	0.089	11,259	0.093	0.043	<0.001***	<0.001***
$SUCCINC_{i,t}$								
Yes	20,673	0.133	0.089	8570	0.102	0.050	<0.001***	<0.001***
No	16,728	0.122	0.080	9946	0.079	0.028	<0.001***	<0.001***
$\Delta GDP_{i,t}$								
High	19,076	0.153	0.100	8595	0.116	0.058	<0.001***	<0.001***
Low	18,325	0.102	0.068	9921	0.067	0.022	<0.001***	<0.001***

Panel C Descriptive statistics for continuous variables

Variable	n	Mean	1%	25%	Median	75%	99%	Std. dev.
$STICKY_{i,t}$	59,183	−0.015	−4.741	−0.986	−0.038	0.951	4.808	1.726

Table 3 (continued)

Panel C Descriptive statistics for continuous variables

Variable	n	Mean	1%	25%	Median	75%	99%	Std. dev.
$AINT_{i,t}$	59,183	5.246	0.908	2.530	3.697	5.847	31.378	5.100
$EINT_{i,t}$	59,183	0.030	0.001	0.013	0.022	0.035	0.178	0.029
$\Delta GDP_{i,t}$	59,183	2.661	−5.400	1.400	2.900	4.000	7.800	2.451
$CAR[-1;1]$	37,178	0.001	−0.265	−0.042	−0.001	0.044	0.296	0.090
$LAGSTICKY_{i,t}$	37,178	−0.023	−4.608	−0.913	−0.049	0.855	4.679	1.641
$\Delta STICKY_{i,t}$	37,178	−0.016	−6.190	−1.269	−0.017	1.245	6.133	2.251
$\Delta IB_{i,t}$	37,178	0.005	−0.277	−0.008	0.001	0.010	0.401	0.076
$\Delta CAPEX_{i,t}$	37,178	0.002	−0.115	−0.004	0.000	0.006	0.131	0.029
$\Delta SG_{i,t}$	37,178	−0.009	−0.930	−0.082	−0.002	0.073	0.837	0.250
$\Delta ASSETS_{i,t}$	37,178	0.092	−1.978	−0.024	0.089	0.218	2.028	0.504
$\Delta LEV_{i,t}$	37,178	0.024	−2.318	−0.021	0.000	0.018	2.911	0.606
$\Delta RISK_{i,t}$	37,178	−0.002	−0.682	−0.078	−0.001	0.075	0.690	0.205

Panel D Descriptive statistics for continuous variables differentiated by fundamental growth prospects

	Pooled (n=59,183)		High long-term growth expectations (n=39,045)		Low long-term growth expectations (n=20,138)		t test	Rank sum test
	Mean	Median	Mean	Median	Mean	Median	p value	p value
$STICKY_{i,t}$	−0.015	−0.038	−0.046	−0.067	0.046	0.025	<0.001***	<0.001***
$AINT_{i,t}$	5.246	3.697	4.907	3.577	5.904	3.983	<0.001***	<0.001***
$EINT_{i,t}$	0.030	0.022	0.029	0.022	0.030	0.021	0.109	0.012**
$\Delta GDP_{i,t}$	2.661	2.900	2.746	3.100	2.497	2.700	<0.001***	<0.001***
	Pooled (n=37,178)		High long-term growth expectations (n=25,078)		Low long-term growth expectations (n=12,100)		t test	Rank sum test
	Mean	Median	Mean	Median	Mean	Median	p value	p value
$CAR[-1;1]$	0.001	−0.001	0.001	0.000	0.001	−0.002	0.509	0.029**
$LAGSTICKY_{i,t}$	−0.023	−0.049	−0.022	−0.055	−0.023	−0.036	0.963	0.397
$\Delta STICKY_{i,t}$	−0.016	−0.017	−0.051	−0.031	0.056	0.021	<0.001***	<0.001***
$\Delta IB_{i,t}$	0.005	0.001	0.001	0.001	0.013	0.002	<0.001***	<0.001***
$\Delta CAPEX_{i,t}$	0.002	0.000	0.004	0.001	−0.003	0.000	<0.001***	<0.001***
$\Delta SG_{i,t}$	−0.009	−0.002	−0.008	−0.002	−0.010	−0.003	0.640	0.838
$\Delta ASSETS_{i,t}$	0.092	0.089	0.232	0.141	−0.198	−0.063	<0.001***	<0.001***
$\Delta LEV_{i,t}$	0.024	0.000	0.030	0.000	0.012	0.000	0.010***	<0.001***
$\Delta RISK_{i,t}$	−0.002	−0.001	0.000	0.000	−0.006	−0.003	0.016**	0.015**

Panel E Descriptive statistics for dichotomous independent variables by fundamental growth prospects

	Pooled (n=59,183)	High long-term growth expectations (n=39,045)	Low long-term growth expectations (n=20,138)	Pearson Chi squared test for independence
$SUCCDEC_{i,t}$				
%Yes	34.6	32.1	39.6	X^2=335.515
%No	65.4	67.9	60.4	p<0.001***

Table 3 (continued)

Panel E Descriptive statistics for dichotomous independent variables by fundamental growth prospects

	Pooled ($n = 59{,}183$)	High long-term growth expectations ($n = 39{,}045$)	Low long-term growth expectations ($n = 20{,}138$)	Pearson Chi squared test for independence
$SUCCINC_{i,t}$				
%Yes	52.0	55.1	46.0	$X^2 = 446.512$
%No	48.0	44.9	54.0	$p < 0.001$***
$LTGROWTH_{i,t}$				
%Yes	66.0	100.0	0.0	
%No	34.0	0.0	100.0	

Panel A shows the economic characteristics of firms with high and low long-term growth expectations. Panel B reports future sales growth ($SG_{i,t+1}$, $SG_{i,t+4}$) for short-term measures used in prior studies ($SUCCDEC_{i,t}$, $SUCCINC_{i,t}$ and $\Delta GDP_{i,t}$) differentiated by fundamental growth opportunities ($LTGROWTH_{i,t}$). Panel C reports the arithmetic mean (Mean), median (Median), standard deviation (Std. Dev.), minimum (Min.), maximum (Max.), and important percentiles (Q1, Q25, Q75, Q99) for the continuous variables. For the variables *lnEINT* and *lnAINT*, we show the descriptive statistics for the non-logarithmized value to facilitate interpretation. Panel D reports the mean and median for the continuous variables, distinguishing between firms with high and low long-term growth opportunities. Panel E shows the descriptive statistics for the dichotomous independent variables $SUCCDEC_{i,t}$, $SUCCINC_{i,t}$ and $LTGROWTH_{i,t}$, distinguishing between firms with high and low long-term growth opportunities. Group differences in Panels A, B, and D are tested for significance using a two-tailed *t* test and a Wilcoxon rank sum test. Group differences in Panel E are tested for significance using a Pearson Chi squared test for independence. The superscripts *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively

opportunities. Consistent with this argument, the mean and median sales growth are significantly larger for firms with high long-term growth expectations in the current quarter ($SG_{i,t}$), the next quarter ($SG_{i,t+1}$) and the same quarter one year ahead ($SG_{i,t+4}$). Furthermore, we expect and find that firms with better growth opportunities show higher capital expenditures scaled by sales ($CAPEXS_{i,t}$) and higher growth in net operating assets ($NOAG_{i,t}$). The negative mean $NOAG_{i,t}$ for firms with low long-term growth expectations is consistent with the liquidation of net operating assets by those firms. However, we find lower expenses for research and development (R&D) scaled by sales ($RD_{i,t}$) for firms with high long-term growth expectations. A potential reason for this finding is that because it takes some time to finish R&D projects and generate sales growth, firms with high fundamental growth prospects might have made significant R&D investments in the past and have already lowered their current expenses. Dickinson (2011) also finds low R&D expenses for growth firms and high R&D expenses for declining firms. She attributes this finding to turnaround attempts at the end of the firm life cycle and argues that for decline firms, revenues might decrease more quickly than R&D spending. Pecking order theory predicts that firms initially use debt and later use equity to finance investments (Dickinson 2011; Myers 1984). Thus, we find that financial leverage ($LEV_{i,t}$) is greater for firms with high long-term growth expectations, which are probably younger than firms with low long-term growth expectations. Profitability, as measured by earnings per share ($EPS_{i,t}$), return on assets ($ROA_{i,t}$), and profit margin ($PM_{i,t}$) are significantly higher for firms with high long-term growth expectations.

Table 3, Panel B examines whether our measure of future sales expectations ($LTGROWTH_{i,t}$) has additional informational value over measures from prior literature ($SUCCDEC_{i,t}$, $SUCCINC_{i,t}$ and $\Delta GDP_{i,t}$). We calculate mean and median future sales growth ($SG_{i,t+1}$ and $SG_{i,t+4}$) for observations with and without a successive sales decrease ($SUCCDEC_{i,t}$) or increase ($SUCCINC_{i,t}$) and for low and high values of $\Delta GDP_{i,t}$.[23] If we divide those subgroups into firm-quarter observations with low and high long-term growth prospects, we find significantly higher future sales growth for firms with high long-term growth opportunities in all subgroups. For example, if we look at firms with a successive sales decrease, sales growth in the next fiscal quarter is significantly lower for firms with low (mean: −0.004; median: −0.040) compared to high (mean: 0.088; median: 0.051) long-term growth opportunities. This finding implies that our measure for fundamental long-term growth prospects provides additional information regarding future sales growth. If we look at sales growth in the same quarter one year ahead, this phenomenon is even more obvious. While the absolute mean (median) difference between observations with and without a successive decrease is only 0.007 (0.016) (irrespective of whether long-term growth prospects are high or low), absolute mean (median) differences between observations with low and high long-term growth opportunities amount to 0.038 (0.048) (irrespective of whether or not there is a successive decrease).

In Table 3, Panel C we show descriptive statistics for all continuous variables used as independent variables in our regression models. For all variables used in Model 1, we use the H1 testing sample of 59,183 observations. For the variables additionally used in the other models, we use the H2 testing sample of 37,178 observations. The mean (median) value for $STICKY_{i,t}$ is −0.015 (−0.038). Consistent with the literature, the mean (median) value is significantly negative, with $p = 0.035$, two-tailed[24] ($p < 0.001$) (untabulated). Thus, on average, firms exhibit cost stickiness. The mean (median) value for unexpected cost stickiness ($\Delta STICKY_{i,t}$) is −0.016 (−0.017) and not significantly different from zero. Table 3, Panels D and E present descriptive data for $STICKY_{i,t}$ (mean and median values) and all other regression variables for firms with high versus low long-term growth opportunities. We find that 65.97% of the observations are classified as firms with high long-term growth expectations. As is evident from Panel D, $STICKY_{i,t}$ is negative (mean: −0.046, median: −0.067) for firms with high long-term growth expectations and positive (mean: 0.046, median: 0.025) for firms with low long-term growth expectations. We find the same pattern for unexpected cost stickiness ($\Delta STICKY_{i,t}$).

The descriptive statistics for the other continuous independent variables for firms with high and low long-term growth opportunities are listed in Table 3, Panel D, and the descriptive statistics for the dichotomous variables $SUCCDEC_{i,t}$, $SUCCINC_{i,t}$, and $LTGROWTH_{i,t}$ are presented in Table 3, Panel E.

23 We conduct a median split and define GDP growth above 2.9% as high and GDP growth below or equal to 2.9% as low.

24 We report two-tailed tests throughout.

4.2 Univariate tests

Table 4 reports the results for the univariate analysis. H1 predicts greater cost stickiness for firms with high growth opportunities than for firms with low growth opportunities. Table 4, Panel A shows negative mean (–0.046) and median (−0.067) values for $STICKY_{i,t}$ for firms with high long-term growth expectations and positive values (mean: 0.046; median: 0.025) for firms with low long-term growth expectations. Consistent with H1, cost stickiness is significantly greater for firms with high long-term growth expectations (mean: $p<0.001$; median: $p<0.001$). Thus, firms with high long-term growth expectations are less likely to reduce resources when sales decline.

H2 predicts that unexpected cost stickiness negatively affects capital market reaction. In Table 4, Panel B, we present the mean and median cumulative abnormal returns *CAR[−1;1]* surrounding the quarterly earnings announcement date

Table 4 Univariate analysis

Panel A Univariate analysis of $STICKY_{i,t}$ (H1)

Variable	High long-term growth expectations ($n=39{,}045$)		Low long-term growth expectations ($n=20{,}138$)		*t* test	Rank sum test
	Mean	Median	Mean	Median	*p* value	*p* value
$STICKY_{i,t}$	−0.046	−0.067	0.046	0.025	<0.001***	<0.001***

Panel B Univariate analysis of the capital market reaction to $STICKY_{i,t}$ (H2)

Variable	$\Delta STICKY_{i,t}<0$ ($n=19{,}350$)		$\Delta STICKY_{i,t}\geq 0$ ($n=17{,}828$)		*t* test	Rank sum test
	Mean	Median	Mean	Median	*p* value	*p* value
$CAR[-1;1]_{i,t}$	−0.003	−0.003	0.005	0.002	<0.001***	<0.001***

Panel C Univariate analysis of the capital market reaction to *STICKY* differentiated by firms with high and low long-term growth opportunities (H3)

Variable	High long-term growth expectations ($n=25{,}063$)		Low long-term growth expectations ($n=12{,}083$)		*t* test	Rank sum test
$CAR[-1;1]_{i,t}$	Mean	Median	Mean	Median	*p* value	*p* value
$\Delta STICKY_{i,t}<0$	−0.002	−0.002	−0.005	−0.005	0.025**	0.001***
$\Delta STICKY_{i,t}\geq 0$	0.005	0.002	0.006	0.002	0.381	0.785

Panel A reports the mean and median *STICKY* values for firms with high and low long-term growth opportunities (for the subsample for H1). Panel B reports the mean and median cumulative abnormal returns *CAR[−1;1]* for firms with negative and positive or zero unexpected cost stickiness (for the subsample for H2). Panel C shows the mean and median cumulative abnormal returns *CAR[−1;1]* differentiating between firms with high and low long-term growth opportunities and between firms with negative and positive or zero unexpected cost stickiness (for the subsample of H3). Group differences are tested for significance using a two-tailed *t* test and a Wilcoxon rank sum test. The superscripts *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively separately for firms where the actual level of cost stickiness is greater than expected ($\Delta STICKY_{i,t} < 0$) and where it is lower than expected ($\Delta STICKY_{i,t} \geq 0$). Cumulative abnormal returns are negative (mean: -0.003, median: -0.003) for firms with $\Delta STICKY_{i,t} < 0$, but positive (mean: 0.005, median: 0.002) for firms with $\Delta STICKY_{i,t} \geq 0$. The capital market reaction is significantly more negative for firms with more cost stickiness than expected compared to firms with less cost stickiness than expected (mean: $p < 0.001$; median: $p < 0.001$). This finding lends initial support to H2.

H3 predicts that unexpected cost stickiness is more negatively evaluated by the capital market if a firm has low rather than high long-term growth opportunities. Table 4, Panel C, shows the mean and median abnormal returns for firm-quarter observations with positive or negative unexpected cost stickiness differentiated by long-term growth opportunities. Regarding firm-quarter observations with less cost stickiness than expected ($\Delta STICKY_{i,t} \geq 0$), we do not find significant differences in the capital market reaction between firms with low and high long-term growth expectations. However, cumulative abnormal returns for firm-quarter observations with more cost stickiness than expected ($\Delta STICKY_{i,t} < 0$) are more negative for firms with low long-term growth expectations (mean: -0.005, median: -0.005) than for firms with high long-term growth expectations (mean: -0.002, median: -0.002). The difference is significant at $p = 0.025$ (median: $p = 0.001$). Thus, the negative capital market reaction to unexpected cost stickiness is significantly greater when firms have low rather than high long-term growth expectations. This finding is in line with H3.

4.3 Multivariate hypotheses tests

To formally test our hypotheses, we estimate the multivariate models developed in Sect. 3. Overall, the regression models contribute to explaining cost stickiness and the market evaluation of unexpected cost stickiness (Table 5). All F-statistics are significant ($p < 0.001$), and the adjusted R^2-values range from 0.0487 to 0.1185.

H1 predicts that cost stickiness is greater for firms with high long-term growth expectations. Using Model 1, we find that the coefficient for firms with high long-term growth expectations (-0.0976) is negative and significant ($p < 0.001$). Hence, firms with high growth long-term expectations exhibit more cost stickiness. Therefore, H1 is supported.

Notably, in Model 1, fundamental growth prospects have additional explanatory power[25] over alternative growth measures in the prior literature ($\Delta GDP_{i,t}$, $SUCCDEC_{i,t}$, $SUCCINC_{i,t}$). This result is in line with our argument that managers of

[25] We find a significant negative coefficient for $LTGROWTH_{i,t}$ although we included alternative growth measures from prior literature in the regression model as control variables into the regression model. Further, adding our main dependent variable $LTGROWTH_{i,t}$ to the regression model leads to an increase of adjusted R-squared from 0.1180 (in Regression Model 1 excluding $LTGROWTH_{i,t}$) to 0.1185 (in Regression Model 1 including $LTGROWTH_{i,t}$).

Table 5 Regression analyses

Variable	Model 1	Model 2	Model 3
	$STICKY_{i,t}$	$CAR[-1;1]_{i,t}$	$CAR[-1;1]_{i,t}$
$LTGROWTH_{i,t}$	**−0.0976*** **		−0.0013
	(<0.001)		(0.368)
$\Delta STICKY_{i,t}$		**0.0025*** **	0.0038***
		(<0.001)	(<0.001)
$LAGSTICKY_{i,t}$		0.0022***	0.0037***
		(<0.001)	(0.001)
$\Delta STICKY_{i,t} \times LTGROWTH_{i,t}$			**−0.0017*** **
			(0.008)
$LAGSTICKY_{i,t} \times LTGROWTH_{i,t}$			−0.0029***
			(0.002)
$lnAINT_{i,t}$	−0.3879***		
	(<0.001)		
$lnEINT_{i,t}$	−0.2121***		
	(<0.001)		
$SUCCDEC_{i,t}$	0.3458***		−0.0004
	(<0.001)		(0.725)
$SUCCINC_{i,t}$	−0.1783***		0.0012
	(<0.001)		(0.247)
$\Delta GDP_{i,t}$	0.0089		−0.0010**
	(0.114)		(0.033)
$\Delta IB_{i,t}$		0.1132***	0.1002***
		(<0.001)	(<0.001)
$\Delta IB_{i,t} \times LTGROWTH_{i,t}$			0.0371*
			(0.080)
$\Delta CAPEX_{i,t}$		−0.0620***	−0.0585
		(0.002)	(0.185)
$\Delta CAPEX_{i,t} \times LTGROWTH_{i,t}$			−0.0056
			(0.900)
$\Delta SG_{i,t}$		0.0365***	0.0305***
		(<0.001)	(<0.001)
$\Delta SG_{i,t} \times LTGROWTH_{i,t}$			0.0103**
			(0.040)
$\Delta ASSETS_{i,t}$		−0.0025*	−0.0008
		(0.086)	(0.695)
$\Delta ASSETS_{i,t} \times LTGROWTH_{i,t}$			−0.0033
			(0.204)
$\Delta LEV_{i,t}$		−0.0004	−0.0003
		(0.677)	(0.862)
$\Delta LEV_{i,t} \times LTGROWTH_{i,t}$			0.0002
			(0.936)
$\Delta RISK_{i,t}$		−0.0021	0.0015

Table 5 (continued)

Variable	Model 1 $STICKY_{i,t}$	Model 2 $CAR[-1;1]_{i,t}$	Model 3 $CAR[-1;1]_{i,t}$
		(0.441)	(0.774)
$\Delta RISK_{i,t} \times LTGROWTH_{i,t}$			−0.0056
			(0.392)
$\Delta STICKY_{i,t} \times SUCCDEC_{i,t}$			0.0000
			(0.940)
$LAGSTICKY_{i,t} \times SUCCDEC_{i,t}$			−0.0010
			(0.282)
$\Delta STICKY_{i,t} \times SUCCINC_{i,t}$			0.0009
			(0.144)
$LAGSTICKY_{i,t} \times SUCCINC_{i,t}$			0.0022**
			(0.018)
$\Delta STICKY_{i,t} \times \Delta GDP_{i,t}$			−0.0003*
			(0.099)
$LAGSTICKY_{i,t} \times \Delta GDP_{i,t}$			−0.0001
			(0.667)
Time fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
n	59,183	37,178	37,146
Adj. R^2	0.1185	0.0487	0.0498
F-statistic (*p* value)	<0.001	<0.001	<0.001

This table presents the coefficients of the ordinary least squares regression with time and firm fixed effects for Models 1, 2, and 3. The superscripts *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively, based on two-tailed *t* tests, and *p* values are reported in parentheses below the coefficients. Main variables used to test the hypotheses are printed in bold. Distortion of the results due to multicollinearity is unlikely because the VIFs of all regression coefficients are less than the conventional threshold, with the exception of $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$.for Model 3. If we test H3 without the alternative growth variables (*SUCCDEC*, *SUCCINC*, ΔGDP) and their interactions with $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$, our results remain robust, and all VIFs are less than the conventional level

firms with high and low long-term growth opportunities react differently to such signals, as GDP growth or historical successive sales decreases/increases. Our findings for these signals are generally in line with prior research. Similar to prior studies, we find a significant negative effect for a successive decrease in sales ($SUCCDEC_{i,t}$) on cost stickiness (i.e., less cost stickiness). For a successive increase in sales ($SUCCINC_{i,t}$), we find the opposite. Thus, after a prior sales increase, managers are optimistic and are more willing to expand resources in response to a sales increase in the current period, which leads to a higher level of cost stickiness. However, for GDP growth ($\Delta GDP_{i,t}$), we find a significant positive regression coefficient and thus a negative effect on cost stickiness. High GDP growth should usually lead to managerial optimism and discourage capacity reduction. With respect to the other control variables, we find significantly negative coefficients for $lnAINT_{i,t}$ and $lnEINT_{i,t}$. This finding is again in line with prior research and suggests that high adjustment costs drive cost stickiness.

H2 predicts that unexpected cost stickiness negatively affects market evaluation. We employ Model 2 to test this hypothesis. Consistent with H2, we find that $\Delta STICKY_{i,t}$ is significantly positive ($p<0.001$). Because a negative value for $\Delta STICKY_{i,t}$ reflects more cost stickiness than expected, this result indicates that as unexpected cost stickiness increases, market evaluation becomes more negative, i.e., investors ‘punish’ unexpected cost stickiness with a negative market reaction. Investors revise their expectations downward if costs are more sticky than expected because either they do not understand cost stickiness or slack resources are due to unexpectedly high adjustment costs or are even detrimental to firm value when they result from agency motives. Thus, H2 is supported, and unexpected cost stickiness negatively affects market evaluation.

H3 predicts that this negative effect is more pronounced for firms with low long-term growth opportunities. The intuition underlying H3 is that investors are more likely to accept unexpected cost stickiness as consistent firm behavior when long-term growth expectations are high rather than low. We use Model 3 to test this hypothesis. Whereas $\Delta STICKY_{i,t}$ is again positive and significant, the interaction term $\Delta STICKY_{i,t} \times LTGROWTH_{i,t}$ is significantly negative ($p=0.008$). The combined effect of unexpected cost stickiness on capital market reaction for firms with high growth expectations ($\Delta STICKY_{i,t} + \Delta STICKY_{i,t} \times LTGROWTH_{i,t}$) amounts to 0.0021 and is significantly different from zero ($p=0.003$). Hence, we conclude that investors evaluate unexpected cost stickiness negatively for firms with high-long-term growth expectations but less negatively than for firms with low long-term growth expectations. To assess the economic significance of this finding, we calculated the abnormal shareholder value change for firms with low versus high long-term growth expectations for high unexpected cost stickiness (Q25 percentile of $\Delta STICKY_{i,t}$). We find that the abnormal shareholder value differential is -3.71 million \$ for firms with low versus high long-term growth prospects when unexpected cost stickiness is high. In other words, investors ‘punish’ unexpected cost stickiness more strongly when firms have low long-term growth expectations because there is less reason for investors to believe that unexpected cost stickiness results from value-maximizing motives. Hence, H3 is supported.

Turning to the most important control variables in Models 2 and 3, we find that lagged cost stickiness ($LAGSTICKY_{i,t}$) is significantly negatively evaluated by investors ($p<0.001$). This finding suggests that investors do not immediately incorporate all information on cost stickiness into their firm evaluations. This finding is in line with the findings of Anderson et al. (2007) and Banker et al. (2013). Notably, the effect of lagged cost stickiness on capital market reaction is less negative for firms with high long-term growth expectations ($p=0.002$). The coefficient of $LAGSTICKY_{i,t}$ (0.037) is almost completely compensated by the coefficient of the interaction $LTGROWTH \times LAGSTICKY_{i,t}$ (-0.029), and the combined effect is insignificant ($p=0.460$) for firms with high long-term growth expectations. Thus, investors seem to have fully incorporated information on cost stickiness in their evaluation of firm value for firms with high long-term growth prospects but not for firms with low long-term growth prospects. One reason for this finding could be that investors expect (do not expect) sticky costs for firms with high (low) long-term growth opportunities because there is (is no) economic reason for slack creation.

Furthermore, the control variables for unexpected earnings ($\Delta IB_{i,t}$) and unexpected sales growth ($\Delta SG_{i,t}$) are positively associated with market evaluation, whereas unexpected capital expenditures ($\Delta CAPEX_{i,t}$) are negatively valued. Consistent with Anthony and Ramesh (1992), we find a significantly more positive capital market reaction for unexpected earnings and unexpected sales growth for firms with high long-term growth expectations. Regarding the alternative proxies for growth signals, we find that investors evaluate unexpected cost stickiness less negatively in periods of high GDP growth ($\Delta STICKY_{i,t} \times \Delta GDP_{i,t}$). However, we do not find a significant coefficient for ($\Delta STICKY_{i,t} \times SUCCDEC_{i,t}$) or ($\Delta STICKY_{i,t} \times SUCCINC_{i,t}$). Thus, on average, investors do not punish firms for unexpected cost stickiness when they have a successive decrease or increase in sales.

4.4 Additional analyses

To confirm the robustness of our results, we conduct eight additional analyses. The first three analyses use different measurements for the main variables of interest, that is, $STICKY_{i,t}$, $LTGROWTH_{i,t}$, and $CAR[-1;1]_{i,t}$. In the fourth and fifth additional analyses, we do not reduce our sample to firms with either low or high long-term prospects to avoid selection bias and look at firms in the introduction stage. The sixth and seventh robustness checks are more fundamental checks and test our hypotheses using alternative models suggested by other studies. Finally, while our main test for H2 and H3 employs a short-term perspective around the earnings announcement date, we also investigate longer-term market evaluation. As discussed in more detail below, these robustness checks confirm the results of our main analysis.

First, when calculating the Weiss (2010) cost asymmetry measure, a substantial number of observations are deleted because each time sales and SG&A costs do not change in the same direction in the current or prior periods, the log value for this measure cannot be computed. Banker and Byzalov (2014) argue that this action might lead to biased estimates. Thus, we also calculate the Weiss (2010) measure without log values to include observations with sales and SG&A costs moving in different directions. The "Appendix" contains a detailed description of how this variable and all other variables discussed are calculated. As a result, we need to delete fewer observations, and the sample size increases from 37,146–59,183 observations in the main analysis to 92,737–112,161 observations in the robustness test (untabulated). Using the modified measures $STICKY2_{i,t}$, $LAGSTICKY2_{i,t}$, and $\Delta STICKY2_{i,t}$, H1 and H2 are again supported. For H3, the coefficient of $\Delta STICKY2_{i,t} \times GROWTH_{i,t}$ is negative, as predicted; however, the p value is slightly above conventional levels ($p = 0.116$). In an adjusted regression model, we test H3 without considering the alternative growth signals and their interactions with $LAGSTICKY2_{i,t}$, and $\Delta STICKY2_{i,t}$. We then find a significant difference in the capital market reactions of unexpected cost stickiness for firms with high long-term growth expectations ($p = 0.049$). Thus, we find weak support for H3.

Second, we choose a stricter approach to differentiate between firms with high and low long-term growth opportunities. We use a firm life cycle concept to classify firms with high and low long-term growth opportunities, but firms do not necessarily undergo all possible stages in a predefined order. For example, unsuccessful growth firms may directly move to the shakeout or decline stage. Conversely, firms with low long-term growth expectations may successfully manage a turnaround move to one of the more promising early life cycle stages. To increase the validity of our classification, we now require that a firm remains in the growth stage or the shakeout or decline stage, respectively, for at least two consecutive periods. Using this stricter classification, we obtain inferentially identical results for H1, H2, and H3 (untabulated). The firm life cycle is a complex concept and might capture not only long-term growth perspectives but also agency problems. Thus, we add financial slack ($FINSLACK_{i,t}$) as a control variable (in our tests for H1 and H3) to capture the degree of agency problems. Our results for H1, H2 and H3 (untabulated) remain unchanged. Furthermore, we find a more negative capital market reaction to unexpected cost stickiness for firms with higher financial slack (as proxy for higher agency problems).

Third, we test the robustness of our dependent variable $CAR[-1;1]_{i,t}$ (which is used to test H2 and H3) and use the Fama–French (1993) model, including the momentum factor (Carhart 1997), as an alternative model to calculate abnormal returns. Again, H2 and H3 are supported (untabulated).

Fourth, we do not reduce our sample to firm observations with either high or low long-term prospects but also use observations from the other life cycle stages (introduction, mature) to avoid sample selection bias. For our hypotheses tests of H1 and H3, we include two dummy variables for high and low long-term growth expectations and test the differences between those coefficients (and for the coefficients of their interactions with $\Delta STICKY_{i,t}$ for H3) for significance. We again find support for H1, H2 and H3 (untabulated).

Fifth, we take a closer look at firms in the introduction stage, which are also characterized by high growth rates. As in the previous robustness test, we include observations from all life cycle stages in the analysis. If we define firms in the introduction and growth stages as firms with high long-term growth prospects, we still find support for H1, H2 and H3. If we examine introduction firms separately, with regard to H1, we find a slightly lower coefficient (higher cost stickiness) for introduction firms than for firms with low growth expectations (shakeout or decline stage). However, the difference is not significant. We also test whether the capital market reaction to unexpected cost stickiness differs between firms in the introduction stage and firms with low long-term growth expectations. We find a less negative capital market reaction to unexpected cost stickiness for introduction firms than for firms with low long-term growth expectations. This difference is also not significant. Because firms in the introduction stage are characterized by great uncertainty, those firms have less clear expectations than growth firms. This might be the reason why managers contain less slack resources in periods of decreasing sales than in growth firms and why the capital market does not react more favorably to unexpected cost stickiness than in firms with low growth expectations.

Sixth, we focus on alternative growth signals from prior literature and include them as independent variables in Model 1 and Model 3. Banker et al. (2014) rely mainly on prior sales changes as a signal for future sales but also consider other indicators, such as GDP growth (already included in our main analysis), the log change in order backlog, and the log ratio of mean sales forecast for the next period compared to actual sales in the current period. Following Banker et al. (2014), we add the yearly[26] log change in order backlog ($ln\Delta OB$) and a growth signal based on quarterly analysts' sales forecasts from I/B/E/S ($ln\Delta AF$). Data availability for both variables is limited, especially for order backlog. To address this issue, we manually set the value for order backlog growth to one (0% growth) if data for the current and previous year are missing (or if both are zero), thus assuming that data on order backlog is missing because a firm has no order backlog. To catch a potential systematic effect of missing data, we add a dummy variable ($MISSING\Delta OB$), which is one if the order backlog variable was manually set to one. If we add $ln\Delta AF$, $ln\Delta OB$ and $MISSING\Delta OB$ to Model 1, the results still support H1 (untabulated). Furthermore, we find a significantly negative coefficient for $ln\Delta AF$. Thus, positive future sales forecasts are associated with higher cost stickiness, which is in line with our argumentation for H1 and the results of Banker et al. (2014). For order backlog growth, we do not find a significant negative effect on cost stickiness. We also add $ln\Delta AF$, $ln\Delta OB$ and $MISSING\Delta OB$ and interactions with $LAGSTICKY_{i,t-}$ and $\Delta STICKY_{i,t}$ to Model 3. The results again support H3 (untabulated); however, we find no significant effect of these growth signals on the capital market evaluation of unexpected cost stickiness.[27]

Seventh, we focus on our independent variables in Models 2 and 3. These models are based on Anthony and Ramesh (1992). However, other studies use different sets of independent variables. Thus, we perform a profound robustness test to rule out that the choice of control variables or important omitted variables influence our results. First, we keep the regression model of our main analysis but use financial analysts' forecast errors ($FE_{i,t}$) as a proxy for unexpected earnings instead of $\Delta IB_{i,t}$. The untabulated results are similar to our main analysis, and H2 and H3 are again supported. Second, we rely on a regression model adapted from Banker et al. (2013) following Rajgopal et al. (2003) and Jegadeesh and Livnat (2006). Compared to our main tests, this analysis includes four additional independent variables. First, $SUE_{i,t}$ is a measure of standardized unexpected earnings for firm i in quarter t (Jegadeesh and Livnat 2006):

$$\frac{EPS_{i,t} - E\left(EPS_{i,t}\right)}{\sigma_{i,t}},$$

where $EPS_{i,t}$ is the quarterly earnings per share, $E(EPS_{i,t})$ is the expected quarterly earnings per share prior to earnings announcement, and $\sigma_{i,t}$ is the standard error of

[26] We use yearly values for order backlog because of limited data availability for quarterly values.

[27] However, the results should be regarded with caution because, due to data limitations, we use yearly data for order backlog, which reflects the current fiscal quarter less accurately than quarterly data. Further, sample size is reduced by about 65% because of missing data for analyst forecasts. In addition, high variance inflation factors for $ln\Delta OB$ and $MISSING\Delta OB$ indicate that the results might be biased due to multicollinearity.

quarterly earnings growth. We assume that $EPS_{i,t}$ follows a random walk with drift $D_{i,t}$. Second, $lnBM_{i,t}$ is the log book value of common equity divided by the market value of common equity of firm i measured at the end of quarter t. Third, we control for firm size ($lnSIZE_{i,t}$), calculated as the log market value of common equity of firm i at the end of quarter t. Forth, we add systematic risk ($RISK_{i,t}$), which is estimated from the regression of monthly stock returns of firm i on a value-weighted market index over a 60-month estimation period prior to the end of a fiscal quarter and a minimum of ten returns. Finally, we control for cost variability using *lnVAR*, which is calculated as the logarithm of the change in SG&A costs compared to the change in sales for quarter t (Banker et al. 2013).

As a robustness test for H2, we estimate the following time and firm fixed effects model with two-way clustered standard errors at the time and firm levels (Model 2a):

$$\begin{aligned} CAR[-1;1]_{i,t} = {} & \gamma_0 + \gamma_1 \Delta STICKY_{i,t} + \gamma_2 LAGSTICKY_{i,t} + \gamma_3 SUE_{i,t} \\ & + \gamma_4 lnBM_{i,t} + \gamma_5 lnSIZE_{i,t} + \gamma_6 RISK_{i,t} + \gamma_7 lnVAR_{i,t} \\ & + TIME\ FIXED\ EFFECTS + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t} \end{aligned}$$

If $\gamma_1 > 0$, a higher degree of unexpected cost stickiness (i.e., a more negative value of $\Delta STICKY_{i,,t}$) is associated with a more negative market evaluation, and H2 is supported. To test H3, we use Model 3a. This model differs from Model 2a in that it also includes the measures for growth opportunities ($LTGROWTH_{i,t}$, $\Delta GDP_{i,t}$, $SUCCDEC_{i,t}$ and $SUCCINC_{i,t}$) and their interactions with $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$. H3 is supported if $\gamma_9 < 0$ in Model 3a.

$$\begin{aligned} CAR[-1;1]_{i,t} = {} & \gamma_0 + \gamma_1 \Delta STICKY_{i,t} + \gamma_2 LAGSTICKY_{i,t} + \gamma_3 SUE_{i,t} + \gamma_4 lnBM_{i,t} \\ & + \gamma_5 lnSIZE_{i,t} + \gamma_6 RISK_{i,t} + \gamma_7 lnVAR_{i,t} + LTGROWTH_{i,t} \\ & \times (\gamma_8 + \gamma_9 \Delta STICKY_{i,t} + \gamma_{10} LAGSTICKY_{i,t}) + SUCCDEC_{i,t} \\ & \times (\gamma_{11} + \gamma_{12} \Delta STICKY_{i,t} + \gamma_{13} LAGSTICKY_{i,t}) + SUCCINC_{i,t} \\ & \times (\gamma_{14} + \gamma_{15} \Delta STICKY_{i,t} + \gamma_{16} LAGSTICKY_{i,t}) + \Delta GDP_{i,t} \\ & \times (\gamma_{17} + \gamma_{18} \Delta STICKY_{i,t} + \gamma_{19} LAGSTICKY_{i,t}) + TIME\ FIXED\ EFFECTS \\ & + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t} \end{aligned}$$

Using Model 2a and Model 3a, we find results (Table 6) similar to those in our main analysis; hence, H2 and H3 are again supported.

Furthermore, we use another alternative regression model building on Anderson et al. (2007), including fundamental signals following Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997). Compared to our main analysis, this analysis employs eight new independent variables. Because those studies analyze annual data, we adapt their variables for quarterly data.[28] Thus, all these variables represent

[28] For the fundamental signals earnings quality and audit qualification, quarterly data are not available. Thus, we do not include those variables.

Table 6 Regression results for alternative regression models

Variable	Model 2a $CAR\ [-1;1]_{i,t}$	Model 2b $CAR\ [-1;1]_{i,t}$	Model 3a $CAR\ [-1;1]_{i,t}$	Model 3b $CAR\ [-1;1]_{i,t}$
$LTGROWTH_{i,t}$			0.0016	−0.0039***
			(0.264)	(0.006)
$\Delta STICKY_{i,t}$	**0.0024*** **	**0.0026*** **	0.0039***	0.0040***
	(<0.001)	**(<0.001)**	(<0.001)	(<0.001)
$LAGSTICKY_{i,t}$	0.0019***	0.0022***	0.0035***	0.0029**
	(0.001)	(<0.001)	(0.009)	(0.022)
$\Delta STICKY_{i,t} \times LTGROWTH_{i,t}$			**−0.0020*** **	**−0.0016** **
			(0.010)	**(0.023)**
$LAGSTICKY_{i,t} \times LTGROWTH_{i,t}$			−0.0028**	−0.0024**
			(0.011)	(0.019)
$SUE_{i,t}$	0.0034***		0.0034***	
	(<0.001)		(<0.001)	
$lnBM_{i,t}$	0.0076***		0.0074***	
	(<0.001)		(<0.001)	
$lnSIZE_{i,t}$	−0.0105***		−0.0106***	
	(<0.001)		(<0.001)	
$RISK_{i,t}$	−0.0019		−0.0019	
	(0.185)		(0.189)	
$lnVAR$	−0.0005		−0.0006	
	(0.274)		(0.254)	
$CHGEPS_{i,t}$		0.0212*		0.0298*
		(0.065)		(0.051)
$CHGEPS_{i,t} \times LTGROWTH_{i,t}$				−0.0180
				(0.350)
$\Delta INVT_{i,t}$		−0.0197***		−0.0139***
		(<0.001)		(0.001)
$\Delta INVT_{i,t} \times LTGROWTH_{i,t}$				−0.0137
				(0.042)
$\Delta RECT_{i,t}$		0.0015		−0.0005
		(0.607)		(0.901)
$\Delta RECT_{i,t} \times LTGROWTH_{i,t}$				0.0045
				(0.454)
$\Delta CAPEX2_{i,t}$		−0.0895***		−0.0813
		(0.007)		(0.249)
$\Delta CAPEX2_{i,t} \times LTGROWTH_{i,t}$				−0.0083
				(0.910)
$\Delta GM_{i,t}$		−0.0539***		−0.0456***
		(<0.001)		(<0.001)
$\Delta GM_{i,t} \times LTGROWTH_{i,t}$				−0.0184
				(0.174)
$\Delta TAX_{i,t}$		−0.0179		−0.0224
		(0.353)		(0.454)
$\Delta TAX_{i,t} \times LTGROWTH_{i,t}$				0.0110
				(0.833)

Table 6 (continued)

Variable	Model 2a $CAR\,[-1;1]_{i,t}$	Model 2b $CAR\,[-1;1]_{i,t}$	Model 3a $CAR\,[-1;1]_{i,t}$	Model 3b $CAR\,[-1;1]_{i,t}$
$\Delta LF_{i,t}$		−0.0056***		−0.0047
		(0.010)		(0.193)
$\Delta LF_{i,t} \times LTGROWTH_{i,t}$				−0.0022
				(0.612)
$\Delta LEV2_{i,t}$		0.0004		0.0006
		(0.252)		(0.379)
$\Delta LEV2_{i,t} \times LTGROWTH_{i,t}$				−0.0002
				(0.790)
$\Delta SG_{i,t}$		0.0334***		0.0278***
		(< 0.001)		(< 0.001)
$\Delta SG_{i,t} \times GROWTH_{i,t}$				0.0087*
				(0.099)
$SUCCDEC_{i,t}$			0.0017	0.0012
			(0.197)	(0.340)
$SUCCINC_{i,t}$			−0.0001	0.0008
			(0.912)	(0.432)
$\Delta GDP_{i,t}$			−0.0007	−0.0010**
			(0.161)	(0.044)
$\Delta STICKY_{i,t} \times SUCCDEC_{i,t}$			0.0005	0.0001
			(0.492)	(0.889)
$LAGSTICKY_{i,t} \times SUCCDEC_{i,t}$			0.0000	−0.0011
			(0.967)	(0.251)
$\Delta STICKY_{i,t} \times SUCCINC_{i,t}$			0.0009	0.0006
			(0.220)	(0.379)
$LAGSTICKY_{i,t} \times SUCCINC_{i,t}$			0.0017	0.0023**
			(0.122)	(0.023)
$\Delta STICKY_{i,t} \times \Delta GDP_{i,t}$			−0.0003	−0.0003
			(0.111)	(0.102)
$LAGSTICKY_{i,t} \times \Delta GDP_{i,t}$			−0.0002	0.0000
			(0.335)	(0.852)
Time fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
n	28,819	33,325	28,811	33,298
Adj. R^2	0.0532	0.0449	0.0535	0.0466
F-statistic (*p* value)	< 0.001	< 0.001	< 0.001	< 0.001

Table 6 presents the coefficients of the ordinary least squares regression with time and firm fixed effects. Main variables used to test the hypotheses are printed in bold. In Models 2a and 3a, we use alternative independent variables following the regression approach of Banker et al. (2013). In Models 2b and 3b, we use alternative independent variables following the regression approach of Anderson et al. (2007). Distortion of the results due to multicollinearity is unlikely because the VIFs of all regression coefficients are less than the conventional threshold, with the exception of $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$ for Model 3a and Model 3b. If we test H3a and H3b without the alternative growth variables ($SUCCDEC_{i,t}$, $SUCCINC_{i,t}$, $\Delta GDP_{i,t}$) and their interactions with $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$, our results remain robust, and all VIFs are less than the conventional level

The superscripts *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively, based on two-tailed *t* tests, and *p* values are reported in parentheses below the coefficients changes in fundamental signals in the current quarter compared to the signals in the same quarter one year prior.

First, $CHGEPS_{i,t}$ measures unexpected earnings as the change in quarterly earnings scaled by stock price. Additionally, we include the change in inventories scaled by sales ($\Delta INVT_{i,t}$), the change in accounts receivable scaled by sales ($\Delta RECT_{i,t}$), and the change in quarterly capital expenditures scaled by industry capital expenditures ($\Delta CAPEX2_{i,t}$). Additionally, we add the change in the gross margin scaled by sales ($\Delta GM_{i,t}$) and the change in the effective tax rate ($\Delta TAX_{i,t}$). Finally, the change in the labor force ($\Delta LF_{i,t}$)[29] and the change in the leverage ratio ($\Delta LEV2_{i,t}$) are used as control variables. A detailed description of the calculation of those variables can be found in the "Appendix".

As a robustness test for H2, we estimate the following time and firm fixed effects model with two-way clustered standard errors at the time and firm levels (Model 2b):

$$\begin{aligned} CAR[-1;1]_{i,t} = {} & \gamma_0 + \gamma_1 \Delta STICKY_{i,t} + \gamma_2 LAGSTICKY_{i,t} + \gamma_3 CHGEPS_{i,t} \\ & + \gamma_4 \Delta INVT_{i,t} + \gamma_5 \Delta RECT_{i,t} + \gamma_6 \Delta CAPEX2_{i,t} + \gamma_7 \Delta GM_{i,t} \\ & + \gamma_8 \Delta TAX_{i,t} + \gamma_9 \Delta LF_{i,t} + \gamma_{10} \Delta LEV2_{i,t} + \gamma_{11} \Delta SG_{i,t} \\ & + TIME\ FIXED\ EFFECTS + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t} \end{aligned}$$

If $\gamma_1 > 0$, a higher degree of unexpected cost stickiness (i.e., a more negative value of $\Delta STICKY_{i,t}$) is associated with lower market evaluation, and thus, H2 is supported. To test H3, we use Model 3b. This model differs from Model 2b in that it also includes the measures for growth opportunities ($LTGROWTH_{i,t}$, $\Delta GDP_{i,t}$, $SUCCDEC_{i,t}$ and $SUCCINC_{i,t}$) and their interactions with $\Delta STICKY_{i,t}$ and $LAGSTICKY_{i,t}$. H3 is supported if $\gamma_{13} < 0$ in the following Model 3b.

$$\begin{aligned} CAR[-1;1]_{i,t} = {} & \gamma_0 + \gamma_1 \Delta STICKY_{i,t} + \gamma_2 LAGSTICKY_{i,t} + \gamma_3 CHGEPS_{i,t} \\ & + \gamma_4 \Delta INVT_{i,t} + \gamma_5 \Delta RECT_{i,t} + \gamma_6 \Delta CAPEX2_{i,t} + \gamma_7 \Delta GM_{i,t} + \gamma_8 \Delta TAX_{i,t} \\ & + \gamma_9 \Delta LF_{i,t} + \gamma_{10} \Delta LEV2_{i,t} + \gamma_{11} \Delta SG_{i,t} + LTGROWTH_{i,t} \\ & \times (\gamma_{12} + \gamma_{13} \Delta STICKY_{i,t} + \gamma_{14} LAGSTICKY_{i,t} + \gamma_{15} CHGEPS_{i,t} \\ & + \gamma_{16} \Delta INVT_{i,t} + \gamma_{17} \Delta RECT_{i,t} + \gamma_{18} \Delta CAPEX2_{i,t} + \gamma_{19} \Delta GM_{i,t} \\ & + \gamma_{20} \Delta TAX_{i,t} + \gamma_{21} \Delta LF_{i,t} + \gamma_{22} \Delta LEV2_{i,t} + \gamma_{23} \Delta SG_{i,t}) + SUCCDEC_{i,t} \\ & \times \left(\gamma_{24} + \gamma_{25} \Delta STICKY_{i,t} + \gamma_{26} LAGSTICKY_{i,t}\right) + SUCCINC_{i,t} \times (\gamma_{27} + \gamma_{28} \Delta STICKY_{i,t} \\ & + \gamma_{29} LAGSTICKY_{i,t}) + \Delta GDP_{i,t} \times \left(\gamma_{30} + \gamma_{31} \Delta STICKY_{i,t} + \gamma_{32} LAGSTICKY_{i,t}\right) \\ & + TIME\ FIXED\ EFFECTS + FIRM\ FIXED\ EFFECTS + \epsilon_{i,t} \end{aligned}$$

Using these alternative regression models, we again find similar results (Table 6). H2 and H3 are again supported.

[29] Because we do not have quarterly data on the number of employees, we use the number of employees at the next fiscal year end after quarter t.

Finally, Banker et al. (2013) find that cost stickiness slows stock price reactions to earnings. Thus, our short-term measure $CAR[-1;1]_{i,t}$ might not capture the full investor reaction. To remedy such concerns, we analyze the capital market reaction to cost stickiness over the longer term. For our longer-term stock performance measure, we use buy-and-hold abnormal returns for 1 day before until 60 trading days after the earnings announcement date (*BHAR[−1;60]*). We find a significantly positive association of unexpected cost stickiness and buy-and-hold abnormal returns (untabulated), which signals that investors negatively evaluate unexpected cost stickiness. The regression coefficient for the interaction of $LTGROWTH_{i,t}$ and $\Delta STICKY_{i,t}$ is significantly negative, suggesting that the capital market reaction to unexpected cost stickiness is less negative for firms with high long-term growth expectations and, thus, more negative for firms with low long-term growth expectations. Therefore, H2 and H3 are again confirmed.

5 Conclusion

This study investigates asymmetric cost behavior for firms with high and low long-term growth opportunities and differences in the capital market assessment of those firms' unexpected cost stickiness. We argue that cost stickiness is more likely to be driven by economic motives for firms with high long-term growth expectations than for those with low long-term growth expectations. Firms that expect higher future growth rates tend to undertake larger investments and have a lower risk of idle capacity, and such firms should thus exhibit a higher degree of cost stickiness. In firms with low long-term growth expectations, however, agency motives are more likely to drive cost stickiness. Thus, for a given level of unexpected cost stickiness, we predict a more negative market evaluation for the firm if it has low growth opportunities than if it has high growth opportunities.

Using a large sample of US firms for the 1990–2014 period, we find that cost stickiness is higher for firms with high long-term growth expectations. Whereas the capital market assessment of unexpected cost stickiness is negative on average, the reaction is less negative for firms with high long-term growth expectations than for those with low long-term growth expectations. We attribute these findings to the fact that unexpected cost stickiness in firms with high long-term growth expectations is more likely to represent rational resource planning that contributes to shareholder value and is less likely to result from agency motives.

Our analysis is subject to important limitations. First, we acknowledge that other approaches exist to identify fundamental future growth opportunities than the one used in this paper. However, the descriptive statistics lend support to the categorization approach employed. Second, to calculate the Weiss (2010) firm-level cost asymmetry measure, we needed to eliminate a substantial number of observations. To minimize data loss, we calculate the sticky measure as early as possible in the sample selection procedure. Furthermore, we conduct a robustness test with a modified cost asymmetry measure to minimize data loss. Third, we use the capital market reaction to analyze the effect of unexpected cost stickiness on shareholder value. Although this approach allows for a preliminary statement about the performance effects of a firm's cost behavior, market reactions do not perfectly predict the long-term implications of cost behavior.

Fruitful avenues for future research remain. For example, future research could analyze the market evaluation of other drivers of cost stickiness. Future studies can, e.g., analyze in more detail whether unexpected cost stickiness driven by managerial incentives is evaluated more negatively by investors. Moreover, building on our findings, it appears promising to investigate how cost stickiness affects earnings multiples and thereby the forecast error in the relative valuation of firms with high and low long-term growth opportunities.

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Appendix

Variable	Description
$CAR[-1;1]_{i,t}$	Cumulative abnormal returns for an event period of 3 days surrounding the announcement day of quarterly earnings of firm *i* and quarter *t*, calculated using the market model with an estimation period of 250 days with a minimum number of 100 returns and a 90-day gap between the estimation and event window. The market return is calculated as the value-weighted return on all NYSE, AMEX, and NASDAQ stocks from CRSP
$BHAR[-1;60]_{i,t}$	Buy-and-hold abnormal returns for an event period of 1 day before until 60 days after the announcement day of the quarterly earnings of firm *i* and quarter *t*, calculated with an estimation period of 250 days with a minimum number of 100 returns and a 90-day gap between the estimation and event window. The market return is calculated as the value-weighted return on all NYSE, AMEX, and NASDAQ stocks from CRSP
$STICKY_{i,t}$	$ln\left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,\underline{\tau}} - ln\left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,\bar{\tau}}$ where $\underline{\tau}$ is the most recent of four fiscal quarters of firm *i* with a decrease in sales and $\bar{\tau}$ is the most recent of four fiscal quarters with an increase in sales
$LAGSTICKY_{i,t}$	Cost stickiness for the same quarter one year ago ($STICKY_{i,t-4}$) or if $STICKY_{i,t-4}$ is missing for two years ago ($STICKY_{i,t-8}$)
$\Delta STICKY_{i,t}$	$STICKY_{i,t}-LAGSTICKY_{i,t}$ where $LAGSTICKY_{i,t}$ is equal to $STICKY_{i,t-4}$ (or if $STICKY_{i,t-4}$ is missing equal to $STICKY_{i,t-8}$)
$\Delta SG\&A_{i,t}$	Difference between the SG&A costs (Compustat item *XSGAQ*) of firm *i* in quarter *t* and its SG&A costs in quarter *t*–1
$\Delta SALES_{i,t}$	Difference between the sales (Compustat item *SALEQ*) of firm *i* in quarter *t* and its sales in quarter *t*–1

Variable	Description
$LTGROWTH_{i,t}$	Dummy variable equal to 1 if the current life cycle stage of firm i in quarter t is the growth stage and zero otherwise. The current firm life cycle stage of firm i in quarter t equals the growth stage if the accumulated cash flow data of firm i over the last four fiscal quarters ($t-3$ to t) corresponds to the following pattern: Cash flow from operating activities ($\sum_{n=0}^{3} OANCFQ_{i,t-n}$) is positive, cash flow from investing activities ($\sum_{n=0}^{3} IVNCFQ_{i,t-n}$) is negative, and cash flow from financing activities ($\sum_{n=0}^{3} FINCFQ_{i,t-n}$) is positive
$OANCFQ_{i,t}$	For the first fiscal quarter, the quarterly cash flow from operating activities $OANCFQ_{i,t}$ equals the year-to-date net cash flow from operating activities (Compustat item *OANCFY*). For the second, third and fourth fiscal quarters, *OANCFQ* equals $OANCFY_{i,t} - OANCFY_{i,t-1}$
$IVNCFQ_{i,t}$	For the first fiscal quarter, the quarterly cash flow from investing activities $IVNCFQ_{i,t}$ equals the year-to-date net cash flow from investing activities (Compustat item *IVNCFY*). For the second, third and fourth fiscal quarters, *IVNCFQ* equals $IVNCFY_{i,t} - IVNCFY_{i,t-1}$
$FINCFQ_{i,t}$	For the first fiscal quarter, the quarterly cash flow from financing activities $FINCFQ_{i,t}$ equals the year-to-date net cash flow from financing activities (Compustat item *FINCFY*). For the second, third and fourth fiscal quarters, *FINCFQ* equals $FINCFY_{i,t} - FINCFY_{i,t-1}$
$lnAINT_{i,t}$	Logarithm of the ratio of total assets (Compustat item *ATQ*) to sales (Compustat item *SALEQ*) of firm i in quarter t
$lnEINT_{i,t}$	Logarithm of the ratio of number of employees (Compustat item *EMP*) at the next fiscal year end after quarter t to sales (Compustat item *SALEQ*) of firm i in quarter t
$SUCCDEC_{i,t}$	Dummy variable that equals 1 if sales (Compustat item *SALEQ*) declined not only in the fiscal quarter, which was used to calculate $STICKY_{i,t}$, but also in the previous fiscal quarter, and zero otherwise
$SUCCINC_{i,t}$	Dummy variable that equals 1 if sales (Compustat item *SALEQ*) increased not only in the fiscal quarter, which was used to calculate $STICKY_{i,t}$, but also in the previous fiscal quarter, and zero otherwise
$\Delta GDP_{i,t}$	GDP growth (as percentage) in the current fiscal quarter. Source: http://www.bea.gov/briefrm/gdp.htm.
$\Delta IB_{i,t}$	Difference between net income before extraordinary items (Compustat item *IBQ*) of firm i in quarter t and net income before extraordinary items of firm i in quarter $t-4$, scaled by the market value of equity (Compustat items $PRCCQ \cdot CSHOQ$) in quarter t–4
$\Delta CAPEX_{i,t}$	Difference between capital expenditures of firm i in quarter t ($CAPEX_{i,t}$) and capital expenditures of firm i in quarter $t-4$, scaled by the market value of equity (Compustat items $PRCCQ \cdot CSHOQ$) in quarter $t-4$
$CAPEX_{i,t}$	Quarterly capital expenditure for firm i in quarter t is calculated as the year-to-date capital expenditure (Compustat item *CAXY)* for the first fiscal quarter and $CAXY_{i,t} - CAXY_{i,t-1}$ for the second, third and fourth fiscal quarters
$\Delta SG_{i,t}$	Difference between the sales growth of firm i in quarter t ($SG_{i,t}$) and its sales growth in quarter $t-1$
$SG_{i,t}$	Sales growth is calculated as the difference between the sales (Compustat item *SALEQ*) of firm i in quarter t and its sales in quarter $t-4$, scaled by the sales of firm i in quarter $t-4$
$\Delta RISK_{i,t}$	Difference between the systematic risk of firm i in quarter t ($RISK_{i,t}$) and the systematic risk in quarter $t-1$
$RISK_{i,t}$	Systematic risk estimated from a regression of the monthly stock returns of firm i on a value-weighted market index over a 60-month estimation period prior to the end of a fiscal quarter and a minimum of ten returns

Variable	Description
$\Delta ASSETS_{i,t}$	Difference between total assets (Compustat item *ATQ*) of firm i in quarter t and total assets of firm i in quarter $t-4$, scaled by the market value of equity (Compustat items *PRCCQ·CSHOQ*) in quarter $t-4$
$\Delta LEV_{i,t}$	Difference between the leverage ratio ($LEV_{i,t}$) of firm i in quarter t and the leverage ratio of firm i in quarter $t-1$
$LEV_{i,t}$	Leverage ratio is defined as long-term debt (Compustat item *DLTTQ*) divided by the book value of common equity (Compustat item *CEQQ*)
$CAPEXS_{i,t}$	Quarterly capital expenditure ($CAPEX_{i,t}$) scaled by sales for firm i in quarter t
$NOAG_{i,t}$	Growth of net operating assets, calculated as the difference between the net operating assets (Compustat item *NOAQ*) of firm i in quarter t and its net operating assets in quarter $t-4$, scaled by the net operating assets of firm i in quarter $t-4$
$RD_{i,t}$	Research and development expenses (Compustat item *XRDQ*) of firm i in quarter t, scaled by its sales (Compustat item *SALEQ*) in quarter t
$EPS_{i,t}$	$EPS_{i,t}$ (Compustat item *EPSPXQ)* is the quarterly earnings per share
$ROA_{i,t}$	Average return on assets over the last four quarters, calculated as the sum of net income for quarter $t-3$ to quarter t for firm i, scaled by the average total assets of firm i for quarter t and quarter $t-4$
$PM_{i,t}$	Profit margin calculated as the net income (Compustat item *NIQ*) of firm i in quarter t, scaled by the sales (Compustat item *SALEQ*) of firm i in quarter t
$STICKY2_{i,t}$	$\left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,\underline{\tau}} - \left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,\bar{\tau}}$ where $\underline{\tau}$ is the most recent of four fiscal quarters of firm i with a decrease in sales and $\bar{\tau}$ is the most recent of four fiscal quarters with an increase in sales
$LAGSTICKY2_{i,t}$	Cost stickiness for the same quarter one year ago ($STICKY2_{i,t-4}$) or if $STICKY2_{i,t-4}$ is missing for two years ago ($STICKY2_{i,t-8}$).
$\Delta STICKY2_{i,t}$	$STICKY2_{i,t}-LAGSTICKY2_{i,t}$ where $LAGSTICKY2_{i,t}$ is equal to $STICKY2_{i,t-4}$ (or if $STICKY2_{i,t-4}$ is missing equal to $STICKY2_{i,t-8}$)
$FINSLACK_{i,t}$	Financial slack, calculated as the ratio of cash and short-term investments (Compustat item *CHEQ*) to total assets (Compustat item *ATQ*)
$SUE_{i,t}$	$\frac{EPS_{i,t}-E(EPS_{i,t})}{\sigma_{i,t}}$ Standardized unexpected earnings for firm i in quarter t, where $EPS_{i,t}$ (Compustat item *EPSPXQ*) is the quarterly earnings per share, $E(EPS_{i,t})$ is the expected quarterly earnings per share prior to the earnings announcement, and $\sigma_{i,t}$ is the standard error of quarterly earnings growth: $E(EPS_{i,t}) = EPS_{i,t-4} + \frac{1}{8}\sum_{j=1}^{8}\left(EPS_{i,t-j} - EPS_{i,t-j-4}\right)$ $\sigma_{i,t} = \frac{1}{7}\sqrt{\sum_{j=1}^{8}\left(EPS_{i,t-j} - E(EPS)_{i,t-j}\right)^2}.$
$lnBM_{i,t}$	Logarithm of the book-to-market ratio of firm i in quarter t, which is calculated as the book value of common equity (Compustat item *CEQQ*) of firm i in quarter t divided by the market value of common equity (Compustat items *PRCCQ·CSHOQ*) of firm i at the end of quarter t. When the book value of common equity is negative, we replace the *lnBM* variable with the lowest number of the distribution of the logarithm of the book-to-market ratio.
$lnSIZE_{i,t}$	Logarithm of the market value of equity (Compustat items *PRCCQ · CSHOQ*) of firm i at the end of quarter t
$lnVAR_{i,t}$	$ln\left(\frac{\Delta SG\&A}{\Delta SALES}\right)_{i,t}$ $lnVAR_{i,t}$ captures the proportion of the SG&A cost response to a change in sales. A greater value of *lnVAR* indicates greater cost variability

Variable	Description
$CHGEPS_{i,t}$	$\frac{EPS_{i,t}-EPS_{i,t-4}}{P_{i,t-4}}$ Difference between the earnings per share (Compustat item *EPSPXQ*) of firm i in quarter t and the earnings per share of firm i in quarter $t-4$, scaled by the stock price (Compustat item *PRCCQ*) of firm i at the end of quarter $t-4$
$\Delta INVT_{i,t}$	$\frac{Inventories_{i,t}}{SALES_{i,t}} - \frac{Inventories_{i,t-4}}{SALES_{i,t-4}}$ Difference between total inventories (Compustat item *INVTQ*) scaled by the sales (Compustat item *SALEQ*) of firm i in quarter t and total inventories scaled by the sales of firm i in quarter $t-4$
$\Delta RECT_{i,t}$	$\frac{Accountsreceivable_{i,t}}{SALES_{i,t}} - \frac{Accountsreceivable_{i,t-4}}{SALES_{i,t-4}}$ Difference between receivables (Compustat item *RECTQ*) scaled by the sales of firm i in quarter t and receivables scaled by the sales (Compustat item *SALEQ*) of firm i in quarter $t-4$
$\Delta CAPEX2_{i,t}$	$\frac{FirmCapitalExpenditures_{i,t}}{IndustryCapitalExpenditure_{i,t}} - \frac{FirmCapitalExpenditures_{i,t-4}}{IndustryCapitalExpenditure_{i,t-4}}$ Difference between firm capital expenditure scaled by the industry capital expenditure of firm i in quarter t and firm capital expenditure scaled by the industry (defined by four-digit SIC codes) capital expenditure of firm i in quarter $t-4$. Quarterly capital expenditure for firm i in quarter t is calculated as the year-to-date capital expenditure (Compustat item *CAXY)* for the first fiscal quarter and $CAXY_{i,t}- CAXY_{i,t-1}$ for the second, third and fourth fiscal quarters.
$\Delta GM_{i,t}$	$\frac{GrossMargin_{i,t-4}}{SALES_{i,t-4}} - \frac{GrossMargin_{i,t}}{SALES_{i,t}}$ Difference between the gross margin scaled by the sales (Compustat item *SALEQ*) of firm i in quarter $t-4$ and the gross margin scaled by the sales of firm i in quarter t. Gross margin of firm i in quarter t is calculated as difference between the sales (Compustat item *SALEQ*) and cost of goods sold (Compustat item *COGSQ*) of firm i in quarter t.
$\Delta TAX_{i,t}$	$\left(\left(\frac{1}{12}\sum_{j=1}^{12}\frac{TXT_{i,t-j}}{PI_{i,t-j}}\right) - \frac{TXT_{i,t}}{PI_{i,t}}\right) \cdot \frac{EPS_{i,t}-EPS_{i,t-4}}{P_{i,t}}$ where $TXT_{i,t}$ is total income taxes (Compustat item *TXTQ*), $PI_{i,t}$ is pretax income (Compustat item *PIQ*), $EPS_{i,t}$ is the quarterly earnings per share (Compustat item *EPSPXQ*) and $P_{i,t}$ is the closing price (Compustat item *PRCCQ*) of firm i in quarter t
$\Delta LF_{i,t}$	$\frac{\frac{SALES_{i,t-4}}{Employees_{i,t-4}} - \frac{SALES_{i,t}}{Employees_{i,t}}}{\frac{SALES_{i,t-4}}{Employees_{i,t-4}}}$ where $SALES_{i,t}$ is the sales (Compustat item *SALEQ*) of firm i in quarter t and $Employees_{i,t}$ is the number of employees (Compustat item *EMP*) of firm i at the next fiscal year end after quarter t
$\Delta LEV2_{i,t}$	$\frac{Long-term\ Debt_{i,t}}{Equity_{i,t}} - \frac{Long-term\ Debt_{i,t-4}}{Equity_{i,t-4}}$ Difference between the leverage ratio ($LEV_{i,t}$) of firm i in quarter t and the leverage ratio of firm i in quarter $t-4$
$ln\Delta AF_{i,t}$	Logarithm of the ratio of mean sales forecast (I/B/E/S item: *SALI1MN*) for quarter $t+1$ to actual sales (I/B/E/S item: *I0SAL*) in quarter t
$ln\Delta OB_{i,t}$	Logarithm of $\Delta OB_{i,t}$. $\Delta OB_{i,t}$ is order backlog (Compustat item *OB*) at the next fiscal year end after quarter t divided by order backlog at the previous fiscal year end before quarter t. We manually set the value for order backlog growth to one (0% growth) if data for the current and previous year were missing (and also if both are zero), thus assuming that data on order backlog is missing because a firm has no order backlog.
$MISSING\Delta OB_{i,t}$	Dummy variable that is one if the ΔOB is manually set to one

Variable	Description
$FE_{i,t}$	$\frac{ActualEPS_{i,t} - analystconsensusforecast_{i,t}}{Price_{i,t-1}}$ *Actual EPS*$_{i,t}$ (I/B/E/S item: *I0EPS*) is actual earnings per share for firm i in quarter t. *Analyst consensus forecast*$_{i,t}$ (I/B/E/S item: *EPSI1MN*) is analysts' consensus forecast for firm i in quarter t. *Price*$_{i,t}$ is the stock price of firm i at the end of quarter t (Compustat item: *PRCCQ*)

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