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Corporate Strategy, Cost Stickiness and Analyst Forecasts

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Corporate Strategy, Cost Stickiness and Analyst Forecasts

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ABSTRACT

Prior literature (e.g. Weiss, 2010; Ciftci et al. 2016) identifies an association between asymmetric cost behaviour and the properties of analyst forecasts. Ciftci et al. (2016), in particular, present evidence that analyst earnings forecasts fail to efficiently incorporate information regarding firms' relative cost stickiness. We examine whether publicly available information regarding the ex ante likelihood of cost stickiness (proxied by firm strategic type) moderates the association between analyst forecasting efficiency (proxied by signed forecast errors) and the degree and incidence of sticky cost behaviour. We find that 'Prospector' firms are predictably associated with a higher degree of cost stickiness, and that when sticky costs are actually observed, analysts respond more efficiently to this form of cost behaviour. Conversely 'Defender' firms have lower cost stickiness than other firms (or greater anti-stickiness), and when cost stickiness is observed for Defenders, analysts are understandably more surprised by this behaviour and forecast errors magnified.

EARLY DRAFT: Please do not quote.

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I. Introduction

Prior literature (Weiss 2010; Ciftci et al. 2015) has documented an association between asymmetric cost behavior (i.e. the degree of 'cost stickiness' or 'cost anti-stickiness') and analyst forecast accuracy. Weiss (2010) shows that analyst forecast accuracy is decreasing in the degree of cost stickiness, and attributes this to the greater variability of earnings as cost stickiness increases. Ciftci et al. (2016) investigate the relation between earnings and sales forecast errors to examine the extent to which analysts appear to understand the impact of costs stickiness on the distribution of future earnings, and finds evidence that suggests that analysts understanding of asymmetric cost behavior is poor. Extending this literature, we investigate how corporate strategy (as proxied by Miles and Snow's 1979 strategic types) affects firms' asymmetric cost behaviour and in turn, examine whether and how analysts understanding of strategy choice and its association with cost behaviour impacts forecast bias and accuracy.

Cost stickiness occurs where the proportionate change in costs relative to the proportionate change in sales is smaller for periods where sales decrease than is the case when sales increase (Banker and Byzalov 2014). Prior literature (e.g. Anderson et al. 2003) suggests that cost stickiness may derive from strategic decisions by managers to sacrifice short-term profitability for greater expected long-term profitability, or from long-term investments in assets whose periodic costs are largely fixed (Balakrishnan et al. 2014). Regardless of it source, cost stickiness increases the variance of future earnings, which increases expected absolute forecast errors even if analysts have perfect understanding of the degree of asymmetric cost behaviour (Weiss 2010). While Citfici et al. (2016) develop a model that suggests that understanding asymmetric cost behaviour reduces expected absolute forecast errors, we show that such a conclusion depends on the assumed probability of future sales increases and decreases, and

thus variation in forecast accuracy is not an appealing metric with which to assess analysts understanding of cost stickiness.

Because the theoretical relationship between cost stickiness, analysts' understanding of cost stickiness and analysts' absolute forecast errors is highly conditional, we focus our attention on analyst forecast bias (i.e. signed forecast errors), and apply the Ciftci et al. model to show that superior analyst understanding of cost stickiness reduces excess forecast optimism regardless of the perceived probability of sales increases and decreases. To proxy for the likelihood that a firm's asymmetric cost behaviour should be more (or less) predictable by analysts, we identify firms who are more (or less) likely to tolerate short-term slack, and thus more likely to exhibit sticky costs. To this end, we apply Miles and Snow's (1978; 2003) strategic taxonomy to identify firms focussed on innovation ('Prospectors'), those with a stronger cost minimisation focus ('Defenders') and 'other firms' and gather empirical evidence on the observed cost behaviour of firms conforming to these strategic types. We then identify groupings of firms for which both theory and empirical evidence suggest an increased likelihood of sticky (anti-sticky) cost behaviour and test whether the sensitivity of analyst forecast bias to observed cost stickiness is reduced for these firms.

We employ a sample of 40,099 firm-quarters with available analyst forecasts and the data required to construct strategy measures (as per Bentley et al. 2013; Bentley-Goode et al. 2017) between 1993 and 2015. As predicted by our theoretical model, we find that forecast optimism is, on average, increasing in the degree of cost stickiness. Saliently, we also find evidence that analyst forecast bias for firms for which cost stickiness is most predictable ('Prospectors') are less sensitive to the incidence of cost stickiness than is the case for other firms, and that the opposite is true for firms for which cost stickiness is less likely to prevail ('Defenders'). We interpret these results as supporting the contention that analysts recognise cross-sectional

differences in the likelihood of sticky cost behaviour, and incorporate these expectations in their forecasts. Additional tests conducted in sub-samples partitioned according to the direction of prior period sales changes provide further support for our main findings. Our results are also robust to the inclusion of additional controls, including indicators of the firm life-cycle stage (Dickinson 2011) and their interactions with cost stickiness metrics.

It is important to note that we do not suggest that analysts use or attempt to use Miles and Snow's strategic taxonomy when formulating their earning forecasts. Rather, we simply argue that there are likely to be commonalities between this taxonomy and the factors that analysts consider when assessing firms' likely cost behaviour. In this sense, the strategic types may be thought of as indicators of differing cost structures.

Our study contributes to the literature and practice in several ways. First, we provide insight on the extent to which variation in cost stickiness affects analyst forecast bias, and the firm-specific circumstances in which this is most likely to occur. Second, we provide evidence regarding whether and how analysts use strategic information to improve their expectations of firms' cost behaviour, and potentially improve our understanding of the analyst forecasting process (Bradshaw 2011). Our study also has implications for investors dependent on analyst investment advice, by identifying circumstances in which analysts are more (less) efficient in processing information regarding cost behaviour.

The balance of our paper is structured as follows. Section II introduces the theory and literature underpinning our paper. Our methodology is detailed in Section III. Section IV described our sample selection, while Section V provides descriptive statistics for our samples. Our regression results are reported and analysed in Section VI. Section VII concludes our paper.

II. Theory

The literature has documented an association between cost stickiness and analyst forecast accuracy. Weiss (2010) shows that sticky costs increase the firms' ex-ante earnings variability. Firms with sticky costs experience lower cost savings than other firms when sales decrease, resulting in lower expected earnings. Assuming symmetric cost behaviour in cases of sales increases, and equal probabilities of sales increases and decreases, Weiss (2010) shows that sticky costs induce a greater variance in future earnings and thus a larger absolute forecast error if: a) analysts have some understanding of asymmetric cost behaviour, and b) analysts forecast the expected value of future earnings. Weiss then develops a firm-year measure of cost stickiness, reflecting the difference between the logarithms of the ratio of changes in costs to changes in to changes in sales when sales decrease, and the same ratio when sales increase. Weiss (2010) regresses analyst forecast accuracy on this cost stickiness measure and reports that analyst absolute forecast errors are indeed increasing with the degree of cost stickiness observed.

Weiss (2010), however, does not directly examine whether analysts understand firms' sticky cost behaviour.[1] Ciftci et al. (2016) use the ratio of analysts' consensus earnings forecast errors (EFE) to sales forecast errors (SFE), conditional on the level of variable costs and the degree of cost stickiness present, to examine the extent to which analysts understand cost behaviour. Centrally, they argue that if analysts perfectly understand firms' cost stickiness, the ratio of earnings forecast errors to sales forecast errors should be equal for positive and negative sales surprises of similar magnitude, regardless of the degree of cost stickiness present. However, using a dichotomous transformation of the Weiss (2010) stickiness measure, they find that the

[1] Weiss (2010) does report univariate tests of forecast bias (signed forecast errors) for firms with positive and negative cost stickiness, and finds that there is no significant difference in mean bias across each group, and interprets this as evidence that analysts have some understanding of asymmetric cost behaviour.

ratio of earning forecast errors to sales forecast errors when sales are unexpectedly low is significantly greater for firms with sticky costs, suggesting that analysts do not fully understand asymmetric cost behaviour (Ciftci et al. 2016, Tables 7 and 8).

While Ciftci et al.'s study provides evidence of a general association between cost stickiness manifested in current earnings and analyst forecast efficiency, there are a number of reasons why this may occur. A firm's observed cost stickiness may, for instance, change over time and thus analysts relying on historically observed cost behaviour may be understandably misled. More specifically, Banker et al. (2014) argue and show that the extent of asymmetry in firms' current period cost behaviour is conditioned by the sign of prior period sales changes; prior period sales declines are argued to be signals of future declines and to induce anti-sticky cost behaviour, while prior period sales increase are argued to signal stronger future prospects and a greater likelihood that managers retain slack to capitalise on future growth opportunities.

To investigate the efficiency of analysts' response to asymmetric cost behaviour more deeply, we seek to identify firms for which the degree of cost stickiness should be more easily predictable using historic information, and study the efficiency of analysts' response to observed cost behaviour in these firms. Thus we now proceed to examine the potential causes of cost stickiness identified in the literature.

What Causes Cost Stickiness?

The management accounting literature proposes two broad explanations for sticky cost behaviour: the 'cost structure' hypothesis and the 'management choice' hypothesis.

The cost structure hypothesis argues that observed cost stickiness in a given period is a product of the fixed-to-variable cost ratio resulting from investment in long-term assets that have a proportion of sunk costs (Balakrishnan et al. 2014). In the short-run, when the proportion of

fixed (uncontrollable) cost is high, the rate of increase (decrease) in sales relative to the rate of increase (decrease) in cost becomes larger (smaller) as demand increases (decreases)

The 'management choice' hypothesis has many specific variants, but each suggest that in cases of temporary decreases in demand, managers make short-run decisions to absorb higher current period costs to achieve superior future performance when demand increases (Anderson et al. 2003, Balakrishnan et al. 2004, Weiss 2010, Chen et al. 2012, Dierynck et al. 2012, Kama and Weiss 2013, Banker et al. 2013, 2014 and Cannon 2014). This results in the proportionate decline in costs being less than the proportionate decline in sales in the current period, and typically involves firms maintaining excess capacity in the current period.[2] However, maintaining excess capacity in the short-run may be efficient if the higher direct costs incurred in the current period are less than the expected costs of adjusting capacity to meet future increases in demand.

The literature also recognises that the likelihood that short-term management decisions will lead to asymmetric cost behaviour observable in a particular period(s) is affected by the direction of prior period sales changes, in addition to the direction of current period sales changes. The direction of prior period sales change affects both i) firm's production capacity at the beginning of the current period (Balakrishnan et al. 2004) and ii) management's expectation of future sales (Banker et al. 2014).

The bulk of the literature focuses on cross-sectional differences in cost behaviour when current sales decrease and typically assumes that the change in cost-to-sale ratio when sales increase is similar across firms (e.g. Anderson et al. 2003, Balakrishnan and Gruca 2008, Weiss 2010). However, (Banker et al. 2014) shows that cost behaviour in periods where sales increase may

[2] Cannon (2014) identifies temporary price reductions as an alternate response to temporary falls in demand, which avoids the development of excess capacity, but this strategy also imposes short-term costs on the firm.

affect observed cross-sectional differences in cost stickiness, because firms' behaviour may be conditioned by the sign of prior sales changes (which proxies for the expectation of future demand).

Banker et al. (2014) suggests two reasons why prior sales changes moderate the prediction of firms' cost behaviour. First, the direction of prior sales changes may impact managers' expectations of future demand, and this in turn affects investment in the current period. Prior period increases in sales may thus make it more likely that firms will invest in capacity in the current period. Conditional on a prior period increase in sales, if current period sales also increase, the firm will be more likely to expand capacity, while if current period sales decrease there will be a greater likelihood that the firm views this downturn as temporary, and allows excess capacity to remain. Prior period decreases in sales send the opposite message, and result in a greater likelihood that firms to disinvest in cases of current sales decreases, or fail to increase investment if current sales increase. The second impact of prior sales changes on observed cost behaviour is through the likely level of excess capacity at the beginning of the current period. The level of slack remaining at the end of the prior period is likely to be lower in the case of prior period sales increases. If this is the case, and sales increase in the current period, the firm is likely to need to increase capacity to meet demand (increasing costs closely in line with sales), whereas if sales decrease in the current period managers are more likely to be able to increase the amount of slack maintained, meaning that costs fall proportionately less than the change in sales (Balakrishnan et al. 2004, Weiss 2010).

Saliently, Banker et al. (2014) show that in cases of prior period sales decreases, the average firm is likely to exhibit *anti-sticky* cost behaviour in the current period (i.e. the proportionate change in costs relative sales is greater in cases of current sales decreases than in cases of current sales increases). This is particularly likely to be the case where a prior period sales

decrease is followed by a current period sales decrease. The greater likelihood of excess capacity following a prior period sales decrease, coupled with the economic signalling power of two consecutive falls in demand are likely to combine to induce firms to significantly reduce their investment in capacity, thereby reducing costs by a greater proportion than the reduction in sales. When a prior period decline in sales is followed by a current period increase in sales, the likely excess capacity at the beginning of the period, coupled with relatively cautious expectations of future demand imply that firms are likely to meet current demand by filling excess capacity, and consequently increasing costs by a lesser proportion than sales.

Thus, Banker et al.'s (2014) central finding is that, for the average firm, costs stickiness will be observed more commonly in periods following an increase in sales; whereas periods following a decline in sales will tend to be characterised by anti-sticky cost behaviour. However, it appears reasonable to expect that the likelihood that a particular firm demonstrates sticky cost behaviour varies with the relative importance of cost minimisation and innovation, and to this end we argue that the strategic typologies of Miles and Snow (1978, 2003), which have been adapted for use in empirical-archival research in the accounting literature (Ittner et al. 1977, Bentley et al. 2013, Bentley-Goode et al. 2017), can proxy for observable differences in the likelihood of asymmetric cost behaviour. If this is true, and analysts recognise these traits, then the impact of cost stickiness on forecast efficiency should be moderated. We develop these ideas in the section below.

Corporate Strategy and Firm's Cost Behaviour

Prior management literature argues that corporate strategy affects a firm's cost behaviour. Miles and Snow (1978, 2003) develop a strategic typology that identifies three viable strategic types ('Prospectors', 'Analyzers' and 'Defenders') and a fourth, inefficient type ('Reactors'). Within these, Prospectors and Defenders represent the opposite ends of a strategy continuum,

while Analyzers adopt a balanced position between the two extremes. We focus our discussion on the behaviour of Prospectors and Defenders, as it is these strategic types that have the clearest theoretical impact on cost stickiness.

The 'Prospector' strategy focuses on innovation, and requires the firm to be constantly engaged in a process of enacting and responding to their environment in an effort to maximise their chance of securing any first-mover advantage (Miles and Snow 2003). Prospectors' innovative focus implies means that such firms are more likely to invest in R&D, highly specialised labour and advertising for new product campaigns (Venieris et al. 2015), each of which are likely to be associated with long-term economic harm if reduced significantly when the firm faces a short-term decline in demand. Put simply, the short-term cost reductions implied by cutting R&D (for instance), are likely to impose greater long-term harm on firms with a particularly innovative focus. Thus we expect Prospectors to be abnormally reluctant to cut costs where a fall in demand follows an increase in demand, and to be particularly willing to increase investment where there are two consecutive increases in demand (to avoid losing their competitive advantage in innovation). If this predicted behaviour is descriptive of reality, sticky cost behaviour would be observed.

The implications of the Prospector strategy for observed cost stickiness in the period following a fall in demand are less clear. While Banker et al. (2014) predict that the average firm will exhibit anti-sticky costs in such circumstances the factors that drive this prediction may be less strong for Prospectors. Prospectors may be more likely than other firms to continue investment in innovative activities, because the long-term benefits of these activities are more crucial to their success than is the case with other firms.

'Defenders' invest heavily in production and/or distributive technology to enhance cost efficiency and maintain market share in a narrow product range (Miles and Snow 2003). While

Defenders' focus on cost efficiency implies that they are more likely to either adjust labour and SG&A investment (which are not core to a Defender's success) or selling price (Cannon 2014) when demand fluctuates, their abnormally large long-term investments in physical assets used to achieve production and distributive efficiencies will produce significant costs (e.g. depreciation) that are largely fixed in the short-run. Further, Defenders reluctance to induce future excess capacity may mean that they require relatively strong signals of future demand to induce them to invest in additional new capacity Whether the sticky-cost increasing effects of Defenders' investments in physical production and distributive technology dominate the sticky cost-reducing effects of increased importance of efficiencies in labour and SG&A expenses is an empirical question that we address later in this paper.

'Analyzers' possess some of the attributes of Defenders and Prospectors, and focus on achieving a balance between product efficiency for traditional products, while efficiently exploiting new opportunities after Prospectors open new markets (Miles and Snow 1978, 2003). Analyzers' efficiency focus motivates them to adjust variable labour and SG&A costs as demand changes, while arguably being more reluctant to invest in specific long-term production and distributive technology than Defenders. Analyzers will invest in innovation (advertising, R&D and specialised labour), but less intensively than Prospectors. The fourth type of strategy, Reactors, are firms whose pattern of adjustment to the environment is both inconsistent and unstable (Miles and Snow 2003). The flexible focus of Analyzers, and short-term orientation of Reactors, suggest that the cost behaviour of these firms is less likely to be driven by long-term investments in assets that produce fixed costs, and the imperative to retain capacity for future innovation is likely to be weaker than is the case for Prospectors. For these reasons, and because the empirical measures of strategy employed in the literature cannot distinguish Analyzers from Reactors, we hereafter refer to firms following these strategies as 'other firms'.

To sum up, Prospectors are expected to be associated with greater cost stickiness compared to 'other firms' and this difference should be most clearly noticeable when prior period sales changes are positive. The potential impacts of the Defender strategy on asymmetric cost behaviour are less certain, but if short-term capacity adjustment effects dominate those related to long-term cost structure effects, Defenders may have systematically lower cost stickiness (greater cost anti-stickiness).

Cost Stickiness, Strategy and Analyst Forecasting Efficiency

We now develop testable predictions regarding the extent to which analysts understand asymmetric cost behaviour and incorporate this in their forecasts, and the extent to which predictable variation in the degree of cost stickiness across firms conditions the association between forecast efficiency and cost stickiness. To achieve this, we focus on the association between asymmetric cost behaviour and analyst forecast bias (i.e. signed forecast errors), because the association between an analysts understanding of cost behaviour and analyst forecast accuracy (absolute forecast errors) is conditional on the probability of a sales increase or decrease. Indeed, given an equal probability of a sales increase or decrease, the expected absolute forecast error for an analyst with perfect understanding of asymmetric cost behaviour is identical to that of an analyst who assumes symmetric cost behaviour.

To illustrate this, we use the Ciftci et al. (2016) model of analysts' expectation of earnings ($\widehat{X}$), which assumes that analysts employ a simple fixed-variable cost model with an adjustment for asymmetric cost behaviour. In Equation (1) below, v represents the level of variable costs in proportion to sales and F_0 is the level of fixed costs. Analysts are assumed to estimate expected profit by predicting future sales and the change in costs in two possible future states: unfavourable (sales decrease, with sales = S_L) and favourable (sales increase, with sales = S_H) scenarios, which occur with probabilities α and $(1 - \alpha)$ respectively:

$$\widehat{X} = \alpha X_L + (1-\alpha)X_H = (1-v)\widehat{S} - F_0 + \alpha\beta(S_{-1} - S_L) \quad (1)$$

X_H represents the expected profit in the favourable scenario while X_L represents the expected profit in the unfavourable scenario. β indicates the level of sticky costs that a firm exhibits when costs decrease. Thus, $-\beta(S_{-1}-S_L)>0$ represents the additional costs incurred due to costs being sticky compared to costs under the traditional cost model, and this in turn, reduces the expected profits in the unfavourable scenario.[3] Equations (2) and (3) below represent analysts expected absolute and signed forecast errors.

$$E(AbsFE) = \alpha\left[abs\left(X_L - \widehat{X}\right)\right] + (1-\alpha)\left[abs\left(X_H - \widehat{X}\right)\right] \quad (2)$$

$$E(FE) = \alpha\left(X_L - \widehat{X}\right) + (1-\alpha)\left(X_H - \widehat{X}\right) \quad (3)$$

Substituting the data from Ciftci et al.'s footnote 3 (p. 59) into the equations above (S_H = 1100, S_L = 900, F = 100, v = 0.5) , and varying probability of a sales decrease (α = 0.5, 0.25, 0.75) and the level of sticky costs (B = -0.2 (sticky), 0.2 (anti-sticky)), generates the following association between the degree of cost stickiness and the expected forecast errors of a) an analyst with perfect understanding of asymmetric cost behaviour ('expert analyst') and b) an analyst who assumes that all firms exhibit symmetrical cost behaviour ('naïve analyst'). Detailed calculations are available in Appendix 1.

[3] Ciftici et al (2016) apply this model to an analysis of relative sales and earnings forecast errors. Such an approach is not practical for our purposes, because the combined data requirements of our strategy measure and that of sales forecast errors would cause severe sample attrition.

Table 1

		α	β	E(AbsFE)		E(FE)	
				Expert	Naïve	Expert	Naïve
Equal probability of Sales Decrease or Increase	Sticky costs (per Footnote 3)	0.5	-0.2	60	60	0	-10
	Anti-sticky costs	0.5	0.2	40	40	0	10
Low P(Sales Decrease)	Sticky costs	0.25	-0.2	45	42.5	0	-5
	Anti-sticky costs	0.25	0.2	30	32.5	0	5
High P (Sales Decrease)	Sticky costs	0.75	-0.2	45	52.5	0	-15
	Anti-sticky costs	0.75	0.2	30	22.5	0	15

From Table 1, it can be seen that, given sticky costs, the 'expert' analyst only issues more accurate forecasts than the 'naïve' analyst when the probability of a sales decrease is greater than 50%. Where costs are anti-sticky, the 'expert' outperforms the 'naïve' analyst when the probability of a sales decrease is less than 50%. However, the 'expert' analyst issues forecasts with less optimistic bias than the 'naïve' analyst in the presence of cost stickiness regardless of the probability of a sales decrease. To the extent that analysts have imperfect knowledge of firms' future cost stickiness, forecast optimism should be increasing in the level of cost stickiness, leading our first hypothesis (H1):

H1: Forecast optimism is increasing with the level of cost stickiness.

However, if it is possible to use publicly available information, such as that underpinning the proxies for strategy types discussed above, to predict variation in the direction and strength of asymmetric cost behaviour, then one would expect at least some analysts to incorporate that information into their forecasts. Analysts who incorporate such information in their forecasts should exhibit a lesser degree of optimistic bias in their forecast errors (relative to analysts who assume a symmetric cost function). H2 is stated formally below:

H2: The association between forecast optimism and the cost stickiness is weaker (stronger) for strategy types that demonstrate abnormally strong (weak) cost stickiness.

For brevity, we state a single hypothesis in regard to the association between forecast optimism sticky costs. However, we test these hypotheses using multiple sub-samples defined by the sign of prior period and current period change in sales to examine the effects of strategy types incremental to those of prior sales changes. Prior to testing H2, we examine the empirical association between strategy types and the extent to which they are associated with different levels of cost stickiness (anti-stickiness).

III. Methodology

Measurement of Cost Stickiness and Corporate Strategy and Their Empirical Association

Our measure of cost stickiness is based on Weiss (2010)'s alternate measure of stickiness (M_STICKY), which reflects the difference in the logarithms of the ratio of changes in costs to changes in to changes in sales when sales decrease, and the same ratio when sales increase. We multiply our measure (STICKY) by -1 so that positive values indicate greater stickiness, and negative values indicate anti-stickiness, per Eqn (4) below:

$$STICKY = -1 \times \left[\log\left[AVE\left(\frac{\Delta C}{\Delta S}\right)_{i,\tau^*} \right] - \log\left[AVE\left(\frac{\Delta C}{\Delta S}\right)\right]_{i,\tau} \right] \quad (4)$$

Where ΔC is the percentage change in costs (estimated as the difference between sales and earnings) over a quarter, ΔS is the percentage change in sales over a quarter, and τ* indicates the each of any of the past eight quarters that experienced a sales decrease, while τ indicates each of any the past eight quarters that experience a sales increase. The measure of cost stickiness is effectively the inverse of the difference between the mean slopes for downwards adjustments (when sales decrease) and the upward adjustments (when sales increase) to capture

the average magnitude of firms' cost stickiness observed over the past eight quarters. Following Weiss (2010), our main tests focus on estimates of cost stickiness restricted to those of industrial firms (SIC Codes 2000-3999).

Following Ittner et al. (1997), Bentley et al. (2013) and Bentley-Goode (2017), we identify firms' strategic type by reference to ranges of scores within a discrete strategy measure estimated (STRATEGY) for each firm-year.

Six components are included in the STRATEGY score:

- The ratio of research and development (R&D) expenditure to sales
- The ratio of employees to sales
- The one-year percentage change in total sales as a historical growth measure $(SALES_t/SALES_{t-1}-1)*100$
- The ratio of sales, general and administrative (SG&A) expenses to sales
- The standard deviation of total employees over the past 5 years
- Net PPE scaled by total asset (inverse ranked)

Prospectors are expected to have higher observed values for each of the six measures above. All six measures are computed using five-year rolling averages. Next, firms in each two-digit SIC industry-year are ranked according to each of the six measures and assigned to quintiles. For each firm-year measure of the components listed above, those observations in the highest quintile are assigned a score of 5, and those in the lowest quintile a score of 1. The composite STRATEGY score is the sum of the six quintile rankings and, by construction, has a maximum possible value of 30 and a minimum possible value of 6.

Following prior literature, we identify the three strategy types described in Miles and Snow (1978, 2003) as: Prospectors - scores ranging from 24 to 30 inclusive; 'Other firms' – scores

ranging from 13 to 23 inclusive, and Defenders - scores ranging from 6 to 12 inclusive. Therefore, our two dichotomous test variables measuring strategic types are defined as follows: PROS is a dummy variable, equal to 1 if the discrete STRATEGY score is between 24 and 30, and otherwise 0; and DEF is a dummy variable, equal to 1 if the discrete STRATEGY score is between 6 and 12, otherwise 0. Each measure is lagged by one year to avoid look-ahead bias.

Hypothesis Testing

To test the association between cost stickiness and forecast bias, we regress analysts signed forecast errors against continuous and dichotomous measures of cost stickiness, as per Equation (2) below. To test whether corporate strategy moderates the relation between cost stickiness and forecast bias, we augment (2) adding indicator variables for each of Prospector and Defender status, and interactions between these and continuous and dichotomous measures of cost stickiness (as used in Ciftci et al. 2015). For brevity, year and industry subscripts have been omitted. All regressions are estimated using OLS and include untabulated quarter and industry fixed effects.

FE	=	$\beta_0 + \beta_3$STICKY (DSTICKY) + β_4PROS*DSTICKY + β_5DEF*DSTICKY + β_2MV+ β_3LOSS + β_4DOWN + β_5VSALE + β_6DISPERSON + β_7OPLEV + β_8SEASON +ε	(5)
FE	=	$\beta_0 + \beta_1$PROS + β_2DEF + β_3DSTICKY + β_4PROS*DSTICKY + β_5DEF*DSTICKY + β_2MV+ β_3LOSS + β_4DOWN + β_5VSALE + β_6DISPERSON + β_7OPLEV + β_8SEASON +ε	(6)
Where:			
FE	=	The consensus forecast error (forecast EPS - actual EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100. We estimate consensus manually using the I/B/E/S Detail History File.	
STICKY	=	an average measure of cost stickiness using the method of Weiss (2010). First, we compute the ratio of change in total costs to change in sales for the most recent eight quarters leading to the annual earnings announcement date (from time t-7 to time t). Then, we compute the difference between logarithms of the mean slopes for adjustments	

		observed when sales decrease and the adjustments that occur when sales increase to capture the average magnitude of cost stickiness for each firm-quarter. Finally, we invert the sign of the measure so that STICKY is an increasing measure of cost stickiness.
DSTICKY	=	A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0.
PROS	=	an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise.
DEF	=	an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise.
PROS* DSTICKY	=	The interaction between PROS and DUMSTICKY
DEF*DSTICKY	=	The interaction between DEF and DUMSTICKY
Controls:		
MV	=	log of market value of equity at quarter end using Compustat data (prccq*cshoq).
LOSS	=	an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise.
VSALE	=	sales volatility measured by the ratio of standard deviation to mean of sales over the four quarters from t-3 through t.
DISPERSON	=	the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter t −1 multiplied by 100.
OPLEV	=	the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised atvalue below 0 or above and 1 are winsorised.

Following Weiss (2010), we study analysts 'end-of-period' forecasts, comprising the forecasts of quarterly earnings per share outstanding immediately prior to the earnings announcement, and restrict the sample used to construct consensus to forecasts issued within 30 days of the earnings announcement. However, we base our analysis on signed, rather than unsigned, forecast errors, as per Equation (7):

FE	=	$\frac{\overline{\text{Forecast EPS}} - \overline{\text{Actual EPS}}}{\text{Price}} \text{ x } 100$	(7)

So that FE is increasing in optimistic bias, we reverse the order of its calculation relative to the measure described in Ciftici et al.'s model. We estimate two forms of Equation 5, in which the test variable is alternately the continuous stickiness measure (STICKY) as per Equation (4) or a dichotomous variable (DSTICKY) indicating positive values of cost stickiness (as per Ciftci et al. 2016). Because the presence of positive cost stickiness implies optimistic forecast errors if analysts cannot perfectly control for its effects, the predicted sign for STICKY is positive. In Equation 6 our test variables are the interactions between each of indicators of strategic type (PROS, DEF) and DSTICKY. If, for example, analysts recognise that Prospectors have higher cost stickiness than other firms in a given sample, we would expect the association between stickiness and forecast bias to be weaker, and thus would expect a negative interact term (PROS*DSTICKY).

Our models also include control variables, largely based on Weiss (2010). We control for firm size (MV), because prior literature suggests firm size has a positive association with the firm-specific disclosures available to analysts that affect analysts' forecast accuracy and bias (e.g. Atiase 1985, Collins et al. 1987). Firm size may also affect analysts' incentives to issue optimistic forecasts and recommendations. We also control for the potential impacts of loss-making firm-years (LOSS). Prior literature finds analysts' forecast are less accurate and more pessimistically biased when covered firms report a loss (Das et al. 1998; Gu and Wu 2003). Following Weiss (2010), we control for sales volatility (VSALE) and forecast dispersion (DISPERSION) each which are expected to are expected to be associated with larger absolute forecast errors, and which may in turn affect the size of any observed forecast bias. Prior literature finds that operating leverage is positively associated with forecast errors (Adar et al.

1988, Lev and Thiagarajan 1993). Firms' operating leverage is also potentially correlated with corporate strategy as Defenders are more likely to have costs in doing business (e.g. machinery and warehouses) and that leads to a low operating leverage. Finally, we control for the potential of unexpected contemporaneous seasonal shocks to earnings (SEASON). SEASON is an indicator variable that is equal to 1 if the change in earnings from the same quarter in the prior year is positive, and 0 otherwise. A positive relationship between unexpected change in earnings and forecast error as analysts may fail to predict the seasonal shock (Matsumoto 2002).

IV. Data and Sample Selection

All analyst-related data are obtained from the Institutional Brokers' Estimate System (I/B/E/S). The data for corporate strategy, cost stickiness and controls are obtained from Compustat Annual and Quarterly Fundamentals. Following Weiss (2010), our analysis focuses on firms from the industrial sectors (SIC code 2000 – 3999), because firms in these industries are more likely to face competitive markets, which may partially reduce errors in cost stickiness measure associated with price rather than volume movements (Weiss 2010, p. 1453).

The initial sample consists of U.S Industrial firms in the Compustat Quarterly Fundamentals file between 1992 and 2015, comprising 339,452 firm-quarters. Consistent with Weiss (2010), we require costs move in the same direction as the sales reducing the available sample by 68,953. After matching to firms with available measures of STRATEGY, and available estimates of consensus forecast bias, the final available sample is 40,099 firm-quarter observations, comprising 12,654 cases of consecutive sales increases, 10,907 cases where a prior period sales is followed by a current sales decrease, 5,938 cases of consecutive sales decreases and 10,559 cases of prior period sales decreases followed by a current sales increase.

V. Descriptive Statistics and Correlation Matrix

Table 3 provides the descriptive statistics of the total available sample and for sub-samples portioned on the sign of the cost stickiness measure

(Insert Table 3)

Panel A of Table 3 presents the descriptive statistics for the sample of all firm-quarters. The statistics signed forecast errors are very similar to the ones in Weiss (2010)'s sample (allowing for the fact that ours are scaled by 100). Our measure of cost stickiness (STICKY) has greater variation that the equivalent measure in Weiss (2010), but this is understandable as our sample period extends through the global financial crisis of 2007-09. Prospectors and Defenders each comprise about 6-7% of our sample. In Panels B and C, it is apparent that mean forecast bias is more pessimistic (less optimistic) in cases of anti-sticky cost behaviour (DSTICKY =0) than for stick cost cases (DSTICKY = 1), and the difference in both means and medians (untabulated) are significant at the 99% confidence level.

The correlation matrix for the variables used in hypothesis testing are presented in Table 4 below.

(Insert Table 4)

Consistent with the mean results reported earlier, all strategy-related variables are significantly correlated with STICKY. Prospectors are associated with sticky costs and Defenders are associated with anti-sticky costs. Both the strategy indicators and cost stickiness are significantly correlated with signed forecast errors. Most of the control variables are significantly correlated with forecast errors, but no bivariate correlation exceeds 20%.

VI. Results

We begin by describing the empirical relationship between our cost stickiness measure and our proxies for firm strategic type in Table 5 below.

(Insert Table 5)

It can be seen from Panel A of Table 4, that Prospectors and 'Other Firms' on average demonstrate significant cost stickiness, and that the degree of cost stickiness is greater for Prospectors than for both 'Other Firms' and Defenders. Defenders' cost behaviour is, on average, symmetric, with the mean value of STICKY being insignificantly different to zero.

The association between STICKY and strategy types conditional on the direction of prior is provided in the remaining Panels. Panels B presents univariate statistics and comparisons across strategy types for cases where prior period sales increased. Across all cases with prior period sales increases (Panel B), all strategy types are associated with sticky cost behaviour, but the extent of such stickiness is greater for Prospectors than for both 'Other Firms' and Defenders, and Defenders have significantly lower cost stickiness than Other Firms. Untabulated analysis confirms that these patterns persist regardless of the sign of current period sales changes, although the contrasts are greater in cases of consecutive sales increases.

In Panel C, we report similar statistics for cases where there is a prior period sales decrease, where Banker et al. (2014) predict that firms should exhibit cost anti-stickiness. Results in Panel C, however, show that only Defenders have significant cost anti-stickiness, and that Prospectors average stickiness for these cases remains significant positive. Untabulated analysis suggests that Prospectors average cost stickiness derives large from behaviour in cases where the prior period sales decrease is followed by a current period sales increase, and that all

firms exhibit cost anti-stickiness in cases where there are two consecutive periods of sales declines.[4]

In summary, we find that Prospectors show the strongest and most consistent evidence of divergence in the degree and direction of asymmetric cost behaviour relative to 'other firms'. Prospectors have significant positive values of STICKY, and significantly more positive values of STICKY than other firms, in all samples other than the case of consecutive decreases in sales. We thus expect that, if analysts recognise the systematically different cost behaviour of firms with traits similar to Prospectors that we should observe a lower sensitivity of analyst forecast bias to cost stickiness in these cases. Defenders, exhibit significantly lower stickiness than other firms (and Prospectors) in the case of prior period sales increases, which may lead to greater forecast bias associated with the incidence of stickiness in those samples.

We now present and analyse the results of tests of the association between corporate strategy, cost stickiness and analyst forecasts bias.

Results for Regressions Using All Observations

Table 6 Panel A reports the results of OLS regressions of signed forecast errors against measures of cost stickiness, corporate strategy and their interactions. Corporate strategic types are indicated by the dichotomous variables PROS and DEF. We employ two proxies for cost stickiness, the continuous measure, STICKY (Columns 2 to 3) and a dummy variable, DSTICKY (Columns 4 to 5) indicating firms with positive values of STICKY. Corporate strategic types are indicated by the dichotomous variables PROS and DEF. To assist interpretation, we first present the results of regressions of separate regressions of forecast

[4] Extracting year and industry fixed effects from our analysis of mean stickiness, and differences in mean stickiness leads to similar conclusions to those discussed here. For simplicity, we focus on the simple differences in means and medians.

errors against strategy measure and cost stickiness (Columns 1, 2, and 4) before reporting the results of the fully specified models (Columns 3 and 5).

(Insert Table 6)

All models have an adjusted R^2 of approximately 6.7%, which is reasonable for models that do not include the size of the current period earnings change.[5] In Column 1 we report results of regressions against our strategy indicators and controls. Recall that our dependent variable, FE, is increasing in forecast optimism (i.e. a positive value of FE implies that forecast EPS was greater than actual EPS). The results suggest that Prospectors are, on average, associated with more pessimistic forecast errors (PROS: B = -0.0483, p = 0.008) relative to 'other firms', while forecast errors for Defenders are significantly more optimistic than those of other firms (DEF: B = 0.0374, p = 0.039). In Column 2 and 4 we report regression of forecast errors against STICKY and DSTICKY, respectively. Both coefficients are significantly positive, confirming the prediction in Hypothesis 1 that the degree (incidence) of cost stickiness is associated with forecast optimism if analysts are not able to fully understand past and future cost stickiness and incorporate this into their forecasts. In Columns 3 and 5, we examine the extent to which the impact of cost stickiness on forecast bias is moderated by corporate strategy. Recall from Table 5, that for the sample of all firm-quarters, Prospectors demonstrated significantly greater cost stickiness than other firms, who in turn demonstrated greater cost stickiness than Defenders. The average cost stickiness of Defenders is, indeed, insignificantly different to zero, and so when a Defender does demonstrate sticky costs this is less likely to be predictable than when 'other firms' or Prospectors do so. The results in Columns 3 and 5 are consistent with our contention that the impact of cost stickiness on forecast bias is reduced for strategic types where the occurrence of sticky cost should be more predictable. The coefficient for STICKY

[5] If we control for the change in earnings our adjusted-R2 statistics climb to over 30%, with no substantive effect on the coefficients for our test variables.

(DSTICKY), which measures the average effect of cost stickiness for 'other firms' is positive and significant for both stickiness measures. The interaction terms PROS*STICKY and PROS*DSTICKY are each negative and significant, consistent with the greater predictability of cost stickiness for Prospectors moderating the impact of cost stickiness on forecast errors when such stickiness occurs. In fact, the sum of the coefficients for STICK and PROS*STICKY (D*STICKY) is insignificantly different from zero, suggesting that for Prospectors, there is no average effect of cost stickiness on forecast bias. Conversely, the coefficients for the interaction terms involving Defenders are each positive and significant, suggesting that the incidence of cost stickiness on forecast errors is greater for Defenders than for other firms. Again, this is consistent with prediction, because Defenders are empirically less likely to exhibit positive cost stickiness than other firms. The contrast (untabulated) between DEF*STICKY and PROS*STICKY is also significantly positive with $p<0.001$.

In Panel B of Table 6, we report the results of regressions of forecast errors estimated within samples defined by strategy types. Again, the first three columns are based on the continuous measure of stickiness (STICKY) and the last three columns use the dichotomous measure of stickiness (DSTICKY). Once more, the coefficients for STICKY (DSTICKY) for Prospectors are insignificant and smaller than the equivalent coefficient for Defenders and Other Firms. Defenders, who have the lowest likelihood of demonstrating asymmetric cost behaviour, exhibit the strongest association between STICKY (DSTICKY). This is consistent with the incidence (level) of stickiness for these firms being relatively surprising.

Results from the Subsamples Conditioned by the Direction of Sales Changes

In Table 7, we report results of regressions on samples defined by the sign of the prior period sales change. Banker et al. (2014) predict and show that average cost stickiness is only positive in cases where the prior period sale change was positive, and that firms, on average, have anti-

sticky costs (i.e. –ve values of STICKY) when prior period sales changes are negative. For ease of interpretation and brevity, we tabulate results using the dichotomous indicator of the direction of observed cost stickiness (DSTICKY) only. Columns 1 to 3 (Columns 4 to 6) report regressions for the sub-sample of cases where prior period sales increased (decreased).

Turning initially to the regressions of forecast errors against strategy type (Columns 1 and 4), it is apparent that the average negative (positive) coefficients for Prospectors (Defenders) reported in our full sample tests, differ according to the sign of prior sales changes. Indeed, Prospectors are only significantly associated with relatively pessimistic errors in of prior sales increase, which Defenders are only significantly associated with optimistic errors in cases of prior sales decreases. The impact of cost stickiness on forecast errors (Columns 2 and 5), however, is barely (and insignificantly) different across the two samples.[6]

(Insert Table 7)

In Column 3 we report tests of the potential moderating effect of corporate strategy on the association between cost stickiness and forecast errors for cases of prior period sales increases. Recall, that for the sample of cases with prior period sales increases, Prospectors demonstrated an abnormally high degree of cost stickiness, and Defenders demonstrated an abnormally low degree of cost stickiness (Table 5, Panel B). The coefficient for DSTICKY is, once more, positive and significant (B = 0.581, p = <0.001), and while the coefficient on PROS*DSTICKY is not significant in a two-tailed test (B = -0.0547, p = 0.164), the aggregate effect of stickiness on forecast errors for Prospectors (DSTICKY + PROS*DSTICKY = 0.0034, p = 0.928) is insignificantly different to zero. Once more, the interaction between DSTICKY and Defender

[6] This is not inconsistent with Banker et al.'s findings. The coefficient for DSTICKY in the case of prior sales declines (when the average firm should exhibit anti-sticky costs) can be thought of as the inverse of a coefficient for a dummy variable indicating anti-stickiness. There is no reason why analysts should understand anti-stickiness any more thoroughly than they understand stickiness.

status is significantly positive; Defenders are less likely to exhibit sticky costs than 'other firms', so when Defenders do experience such cost behaviour it is more of a shock to analysts. Further, the contrast between the effect size of DSTICKY across Prospector and Defenders (untabulated) is also significant at the 99% confidence level.

In Column 6, we report the results of similar tests for the subsample of prior sales decreases. The coefficient for STICKY is positive and significant (B = 0.0586; $p < 0.001$). While Banker et al. (2014) predicted that the average firm will exhibit cost anti-stickiness in such cases, our mean comparisons reported in Table 5 reveal that Prospectors, on average, have sticky costs in these cases, and that their costs are significantly more sticky than 'other firms' and Defenders. Consistent with analysts recognising this trait, the coefficient for the PROS*STICKY is positive and significant for this sample. Once more, Defenders have a significantly lower level of cost stickiness (and indeed significant anti-stickiness), and thus the incidence of positive cost stickiness should be relatively surprising to the market. Consistent with this proposition, the interaction between DEF and DSTICKY (B = 0.1767, p = 0.002) is once more positive and significant.

In Table 8, we present the results of regressions conditioned on both the sign of the prior period sales change and the sign of the current period sales changes. For brevity we report only the fully specified models, and include but do not tabulate the control variables. In all sub-samples, the coefficient for DUMSTICKY is positive and significant, consistent with prediction. Column 1 provides results regressions estimated on cases of prior and current sales increases. In this sample the difference between Prospectors cost stickiness and that of 'Other firms' and Defenders is at its greatest. The coefficient for PROS*DSTICKY is positive and significant (β= -0.1023, p=0.035) consistent with analysts recognising the greater expected level of stickiness for Prospectors in these cases. Unlike the full sample, the cost stickiness exhibited

by Defenders in cases of consecutive sales increases is not significantly different to that of 'other firms', and thus it would seem less likely that Defender status would condition the analyst response to cost stickiness. Consistent with this conjecture, the coefficient for DEF*DSTICKY is insignificant.

Column 2 reports results for cases of prior sales increases followed by a current sales decrease. Although Prospectors have significantly greater mean cost stickiness than 'other firms' in this sample, the difference is much smaller than that in the consecutive sales increase subsample. We find no evidence that the association between DSTICKY and forecast errors is weaker for Prospectors. This may reflect the smaller abnormal cost stickiness for these firms, analyst error in forecasting the change in sales, or imperfections in analysts' ability to deal with cost stickiness for Prospectors in this context. For Defenders, the results from the prior sales increase and current sales decrease subsample are consistent with the findings in the pooled sample. The coefficient on DEF*DSTICKY is positive and significant (β= 0.1755, p = 0.004). Defender's mean cost stickiness is lower than that of other firms in this sample, and this difference would be significant in a one-tailed test (two-tailed p = 0.1560).

The regressions in Column 3 are estimated on cases of prior sales decrease and current sales increase. While the coefficient for PROS*DSTICKY is insignificant (β= -0.0901 p = 0.199), the aggregate coefficient for DSTICKY + PROS*DSTICKY is insignificantly different from zero. For Defenders, the coefficient for DEF*DSTICKY is positive and significant (β= 0.1837, p<0.001). This is consistent with the incidence of sticky costs for Defenders being more likely to surprise analysts. The contrast across the incremental effects of Prospector and Defender status on the association between stickiness and forecast errors is negative and significant (PROS*DSTICKY – DEF*DSTICKY = -0.2739, p = 0.003).

Finally, Column 4 presents results of regressions results estimated on cases of consecutive sales decreases. Within this sample, all strategic types demonstrate anti-sticky costs on average (untabulated), and the only differences across groups concern Defenders and 'other firms'. The coefficient for DEF*DSTICKY is once more positive and significant (β= 0.2121, p=0.047), consistent with incidence of sticky costs being a greater shock to analysts in this sample.

Additional Tests

Strategy and Firm Life-Cycle

While Miles and Snow's (2003) original taxonomy largely views strategic types as long-term attributes of firms, it appears plausible that the incidence of strategic types may be correlated with stages in firms' life-cycle. In particular, Prospectors may be over-represented in the early stages of firm life-cycle, and Defenders over-represented in the later stages of life-cycle. Further, it appears plausible that expected cost stickiness may vary with life-cycle stages. To investigate these conjectures and their impact on our main results we applied Dickinson's (2011) firm life-cycle taxonomy to classify all firms as being in either the Introduction, Growth, Mature, Shakeout or Decline phases of life-cycle, and prepared a cross-tabulation of this classification with our strategic types.[7] This cross-tabulation, including expected frequencies and Chi-square contributions, is reported in Table 9 Panel A. From this table it is apparent that Prospectors are over-represented in the sample of firms in the Introduction phase, and under-represented in both the Maturity and Decline phases. There are less stark associations between

[7] Dickinson (2011) classifies firms into life-cycle stages according to the signs on operating, investing and financing cash flows. Firms with negative net operating and investing cash flows and positive net financing cash flows are identified as being in the INTRODUCTION stage. Firms with positive operating cash flows, negative investing cash flows and positive financing cash flows are identified as being in the GROWTH stage. MATURE firms are identified by positive operating cash flows and negative investing and financing cash flows. Firms with negative operating cash flows and positive investing cash flows are identified as being in the DECLINE phase. Other cash flow combinations are identified as firms in the SHAKE-OUT stage.

Defender status and life-cycle stages, but Defenders are over-represented in the sub-sample of Mature firms and under-represented in Decline firms.

To examine the impact of life-cycle stage on our main results, in Table 9 Panel B we report the regressions of forecast optimism against DSTICKY, indicators of life-cycle stage and the interactions between DSTICKY and life-cycle stage (Columns 1 to 3), and then of regressions in which we also add our indicators of strategy and their interactions with DSTICKY (Columns 4 to 6). The coefficient for DSTICKY measures the association between this variable and forecast optimism for firms in the Introduction stage, and is significantly positive for the full sample (Column 1) and prior sales decrease sample (Column 3), but is insignificant in the prior sales increase sample (Column 2). In both the full sample and prior sales declines sample forecasts for both Mature and Decline firms exhibit significantly lower sensitivity to cost stickiness, and this is also the case for Growth firms in periods following a sales decline. In both the full and prior sales increase samples, the total effect size (aggregate of coefficients for main effect and interaction) for DSTICKY is significantly positive for all life-cycles stages other than Decline (untabulated). For the prior sales decrease sample, DSTICKY is positive associated with forecast optimism only for Introduction and Shakeout firms (though Mature firms would have significant aggregate coefficient in a one-tailed test). In Columns 4 to 6 we add our indicators of strategy type and their interactions with DSTICKY. The interactions terms are similar magnitude and significance to those tabulated in the equivalent tests in Tables 6 and 7. Thus, while there is some evidence of an association between firm life-cycle and analysts' response to cost stickiness, this effect appears to be separate that involving strategy.

Alternate and Additional Controls

The tenor of our results is unaffected by the exclusion of controls that are a function of current period outcomes (SEASON), or the addition of a controls for the magnitude of current period

sales change, the change in earnings, Zmijiewski's Z-SCORE, lagged ROA, lagged book-to-market and analyst following. Our results are also similar if we re-define LOSS to reflect prior-period earnings, or to identify negative in earnings in either of the last two quarters. Our tabulated models follow Ciftici et al. (2016) and included year fixed effects. Substituting year fixed-effects as per Weiss (2010) has no substantive impact on the tabulated results.

Firm Fixed-Effect Regressions

We re-estimated each of our tabulated regressions with the inclusion of firm fixed effects. Despite the fact that the within firm variation in our strategy measures is modest, all significant results for Defender firms hold under this specification. While test coefficients for Prospectors become insignificant under firm fixed effects regressions, the contrast across the interactions involving Defenders and those involving Prospectors remain significant.

VII. Conclusion

Our study provides evidence on the extent to which corporate strategy (as proxied by Miles and Snow's strategic types) is associated with asymmetric cost behaviour, and the extent to which historic trends in the strategy-cost behavior relationship are associated with more efficient analyst response to the level and incidence of sticky cost in earnings. We show that Prospectors are generally associated with more sticky costs than both Defenders and 'other firms'. Defenders, on the other hand have a lesser degree and incidence of cost stickiness than 'other firms'. Regressions of analyst signed forecast errors against measures of cost stickiness show a significant negative relation (i.e. stickiness induces excess optimism), consistent with analysts being unable to perfectly incorporate realized cost stickiness in their earnings forecasts. However, we show that for strategic types with a greater (lesser) likelihood of demonstrating sticky cost behaviour, that the association between signed forecast errors and the degree or incidence of cost stickiness is reduced (increased). Our findings are consistent

with analysts recognizing differences in the likelihood of sticky cost behaviour across firms according to fundamental attributes. In our additional tests we demonstrate that another indicator of likely cost structure, firm life-cycle, also appears to condition analysts' response to cost stickiness. Future research may seek to elaborate on this association.

The findings have implications for our understanding of analyst behavior. While earlier research (Ciftci et al. 2016) cast severe doubt on analysts' ability to adjust their forecasts to accommodate future asymmetric cost behavior, we show that in circumstance where future cost behavior should be more predictable, that analyst forecast errors associated with stickiness appear to be reduced, consistent with analysts having an understanding of asymmetric cost behavior. We emphasise that there is a difference between analysts' understanding the principles of asymmetric cost behavior and being able to predict when such behavior will impact expected earnings, because the impact on predicted earnings is conditional on expectations of future demand.

References

ADAR, Z., BARNEA, A. & LEV, B. 1977. A comprehensive cost-volume-profit analysis under uncertainty. *Accounting Review*, 137-149.

ANDERSON, M. C., BANKER, R. D. & JANAKIRAMAN, S. N. 2003. Are selling, general, and administrative costs "sticky"? *Journal of Accounting Research,* 41, 47-63.

ANDERSON, S. W. & LANEN, W. N. 2007. Understanding Cost Management: What Can We Learn from the Evidence on'Sticky Costs'?

BALAKRISHNAN, R. & GRUCA, T. S. 2008. Cost stickiness and core competency: A note. *Contemporary Accounting Research,* 25, 993-1006.

BALAKRISHNAN, R., LABRO, E. & SODERSTROM, N. 2014. Cost structure and sticky costs. *Journal of management accounting research,* 26, 91-116.

BALAKRISHNAN, R., PETERSEN, M. J. & SODERSTROM, N. S. 2004. Does capacity utilization affect the "stickiness" of cost? *Journal of Accounting, Auditing & Finance,* 19, 283-300.

BANKER, R. D., BASU, S., BYZALOV, D. & CHEN, J. Y. 2016. The confounding effect of cost stickiness on conservatism estimates. *Journal of Accounting and Economics,* 61, 203-220.

BANKER, R. D., BYZALOV, D., CIFTCI, M. & R. MASHRUWALA, 2014. The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behaviour. *Journal of Management Accounting Research,* 26, 221-42.

BANKER, R. D., BYZALOV, D. & CHEN, L. T. 2013. Employment protection legislation, adjustment costs and cross-country differences in cost behavior. *Journal of Accounting and Economics,* 55, 111-127.

BARRON, O. E., KIM, O., LIM, S. C. & STEVENS, D. E. 1998. Using analysts' forecasts to measure properties of analysts' information environment. *Accounting Review*, 421-433.

BENTLEY, K. A., OMER, T. C. & SHARP, N. Y. 2013. Business strategy, financial reporting irregularities, and audit effort. *Contemporary Accounting Research,* 30, 780-817.

BENTLEY-GOODE, K. A., OMER, T. C. & TWEDT, B. J. 2017. Does Business Strategy Impact a Firm's Information Environment?. *Journal of Accounting, Auditing and Finance,* forthcoming.

BERTRAND, M. & MULLAINATHAN, S. 2003. Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of political Economy,* 111, 1043-1075.

BRADSHAW, M. T. 2011. Analysts' forecasts: what do we know after decades of work?

CANNON, J. N. 2014. Determinants of "sticky costs": An analysis of cost behavior using United States air transportation industry data. *The Accounting Review,* 89, 1645-1672.

CHEN, C., GORES, T. & NASEV, J. 2013. Managerial overconfidence and cost stickiness.

CHEN, C. X., LU, H. & SOUGIANNIS, T. 2012. The agency problem, corporate governance, and the asymmetrical behavior of selling, general, and administrative costs. *Contemporary Accounting Research,* 29, 252-282.

CIFTCI, M., MASHRUWALA, R. & WEISS, D. 2016. Implications of cost behavior for analysts' earnings forecasts. *Journal of Management Accounting Research,* 28, 57-80.

CLEMENT, M. B. 1999. Analyst forecast accuracy: Do ability, resources, and portfolio complexity matter? *Journal of Accounting and Economics,* 27, 285-303.

DATTA, D. K., GUTHRIE, J. P., BASUIL, D. & PANDEY, A. 2010. Causes and effects of employee downsizing: A review and synthesis. *Journal of Management,* 36, 281-348.

DICKINSON, V. 2011. Cash flow patterns as a proxy for firm life cycle. *The Accounting Review, 86,* 1969-1994.

DIERYNCK, B., LANDSMAN, W. R. & RENDERS, A. 2012. Do managerial incentives drive cost behavior? Evidence about the role of the zero earnings benchmark for labor cost behavior in private Belgian firms. *The Accounting Review,* 87**,** 1219-1246.

DRAKE, M. S. & MYERS, L. A. 2011. Analysts' accrual-related over-optimism: do analyst characteristics play a role? *Review of Accounting Studies,* 16**,** 59-88.

GRAHAM, J. R. 1999. Herding among investment newsletters: Theory and evidence. *The Journal of Finance,* 54**,** 237-268.

ITTNER, C. D., LARCKER, D. F. & RAJAN, M. V. 1997. The choice of performance measures in annual bonus contracts. *Accounting Review***,** 231-255.

KAMA, I. & WEISS, D. 2013. Do earnings targets and managerial incentives affect sticky costs? *Journal of Accounting Research,* 51**,** 201-224.

LEV, B. & THIAGARAJAN, S. R. 1993. Fundamental information analysis. *Journal of Accounting research***,** 190-215.

MATSUMOTO, D. A. 2002. Management's incentives to avoid negative earnings surprises. *The Accounting Review,* 77**,** 483-514.

MILES, R. E. & SNOW, C. C. 2003. Organisational Strategy, Structure, and Process. *Standford Business Classics*.

MILES, R. E., SNOW, C. C., MEYER, A. D. & COLEMAN, H. J. 1978. Organizational strategy, structure, and process. *Academy of management review,* 3**,** 546-562.

PHILBRICK, D. R. & RICKS, W. E. 1991. Using value line and IBES analyst forecasts in accounting research. *Journal of Accounting Research***,** 397-417.

VENIERIS, G., NAOUM, V. C. & VLISMAS, O. 2015. Organisation capital and sticky behaviour of selling, general and administrative expenses. *Management Accounting Research,* 26**,** 54-82.

WEISS, D. 2010. Cost behavior and analysts' earnings forecasts. *The Accounting Review,* 85**,** 1441-1471.

WELCH, I. 2000. Herding among security analysts. *Journal of Financial economics,* 58**,** 369-396.

Appendix 1 Calculation of the Absolute and Signed Forecast Errors

$$\widehat{X} = \alpha X_L + (1-\alpha)X_H = (1-v)\hat{S} - F_0 - \alpha\beta(S_{-1} - S_L) \quad (1)$$

$$E(AbsFE) = \alpha\left[abs\left(X_L - \widehat{X}\right)\right] + (1-\alpha)\left[abs\left(X_H - \widehat{X}\right)\right] \quad (2)$$

$$E(FE) = \alpha\left(X_L - \widehat{X}\right) + (1-\alpha)\left(X_H - \widehat{X}\right) \quad (3)$$

From Ciftci et al.'s (2016) footnote 3 (p.59):

- S_H = 1100, S_L = 900, F = 100, v = 0.5, S_{-1}=1000
- Probability of a sales decrease (α = 0.5)
- The level of sticky costs (β = -0.2).

The calculation of the absolute and signed forecast errors for 'expert' analysts:

$\hat{S}$ = 0.5*900 + (1-0.5)*1100 = 1000

$X_L = S_L - C_L$ = 900 – [100 + 0.5*900 – *0.2*(900-1000)*] = 900 – 570 = 330

$X_H = S_H - C_H$ = 1100 – [100 + (1- 0.5)*1100] = 1100 – 650 = 450

$\widehat{X}$ = (1 – 0.5)*330 – 0.5*450 or (1-0.5)*1000 -100 - *0.5*0.2(1000 - 900)* = **390**

E(AbsFE) = 0.5*[abs (330 – 390)] + (1 - 0.5)*[abs (450 – 390)] = 0.5*60 + 0.5*60 = **60**

E(FE) = 0.5*(330 – 390) + (1 – 0.5)*(450 – 390) = 0.5*-60 + 0.5*60 = **0**

The calculation of the absolute and signed forecast errors for 'naive' analysts (who forecast asymmetric costs):

$X_L = S_L - C_L$ = 900 – [100 + 0.5*900] = 900 – 570 = 350, X_H = 450

$\widehat{X}$ = (1 – 0.5)*350 – 0.5*450 or (1-0.5)*1000 -100 = **400**

However, the true expected profits are still X_L =330 and X_H=450. Thus,

E(AbsFE) = 0.5*[abs (330– 400)] + (1 - 0.5)*[abs (450 – 400)] = 0.5*70 + 0.5*50 = **60**

E(FE) = 0.5*(330 – 400) + (1 – 0.5)*(450 – 400) = 0.5*-70 + 0.5*50 = **-10**

Appendix 2 – Variable Definitions

FE	=	The consensus forecast error (forecast EPS - actual EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100. We estimate consensus manually using the I/B/E/S Detail History File.
STICKY	=	an average measure of cost stickiness using the method of Weiss (2010). First, we compute the ratio of change in total costs to change in sales for the most recent eight quarters leading to the annual earnings announcement date (from time t-7 to time t). Then, we compute the difference between logarithms of the mean slopes for adjustments observed when sales decrease and the adjustments that occur when sales increase to capture the average magnitude of cost stickiness for each firm-quarter. Finally, we invert the sign of the measure so that STICKY is an increasing measure of cost stickiness.
DSTICKY	=	A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0.
PROS	=	an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise.
DEF	=	an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise.
PROS* DUM_STICKY	=	an interaction variable of the Prospector dummy and dummy variable of M_STICKY to capture how Prospector strategy modify the impact of cost stickiness on forecast accuracy.the interaction between PROS and DSTICKY
DEF*DUM_STICKY	=	an interaction variable of the Defender dummy and dummy variable of M_STICKY to capture how Defender strategy modify the impact of cost stickiness on forecast accuracy.the interaction between DEF and DSTICKY
Controls:		
MV	=	log of market value of equity at quarter end using Compustat data (prccq*cshoq).
LOSS	=	an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise.
DOWN	=	an indicator variable, equal to 1 if there is a negative earnings surprise corresponding to the consensus analyst forecast, and 0 otherwise.
VSALE	=	sales volatility measured by the ratio of standard deviation to mean of sales over the four quarters from t-3 through t.
DISPERSON	=	the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings

		announcement, deflated by stock price at the end of quarter t −1 multiplied by 100.
OPLEV	=	the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised atvalue below 0 or above and 1 are winsorised.

Table 1 – Absolute and Signed Forecast Errors and Cost Stickiness

		α	β	E(AbsFE)		E(FE)	
				Expert	Naïve	Expert	Naïve
Equal probability	Sticky costs (per Footnote 3)	0.5	-0.2	60	60	0	-10
	Anti-sticky costs	0.5	0.2	40	40	0	10
Low P(Sales Decrease)	Sticky costs	0.25	-0.2	45	42.5	0	-5
	Anti-sticky costs	0.25	0.2	30	32.5	0	5
High P (Sales Decrease)	Sticky costs	0.75	-0.2	45	52.5	0	-15
	Anti-sticky costs	0.75	0.2	30	22.5	0	15

Table 2 - Sample Selection

Panel A: Full Sample

From Compustat:	
Compustat quarterly earnings data for years 1992 and 2015 for all industrial firms (SIC 2000-3999 only)	339,452
Less: Data for M-STICKY measure unavailable	(68,953)
Less: Data for STRATEGY measure unavailable	(138,264)
Total firm-quarter observations	132,235
From I/B/E/S:	
Firm-quarters with earnings forecasts in the 30-day window prior to earnings announcement (1992-2015)	270,949
Matching data from I/B/E/S to Compustat:	
Number of observations from Compustat	132,235
Less: Firms with no analyst following during forecast window	(73,297)
Total Observations with both M-STICKY and STRATEGY measures	58,938
Less: Missing values for control variables	(18,839)
Final Sample available for hypothesis testing (firm-quarters)	40,099

Panel B: Subsamples Conditional on Prior and Current Sales Changes	
Subsample of observations with prior sales increase and current sales increase	12,654
Subsample of observations with prior sales increase and current sales decrease	10,907
Subsample of observations with prior sales decrease and current sales increase	10,559
Subsample of observations with prior sales decrease and current sales decrease	5,938

Table 3 - Descriptive Statistics

Panel A: All Firm-Quarters

N= 40,099

Variable	Mean	SD	25%	Median	75%
FE	0.046	0.876	-0.034	0.049	0.198
STRATEGY	17.780	3.646	15.000	18.000	20.000
PROSPECTOR	0.064	0.245	0.000	0.000	0.000
DEFENDER	0.067	0.250	0.000	0.000	0.000
STICKY	0.023	0.487	-0.144	0.016	0.192
MV	7.554	1.765	6.305	7.424	8.685
LOSS	0.213	0.409	0.000	0.000	0.000
DOWN	0.431	0.495	0.000	0.000	1.000
VSALE	0.117	0.118	0.050	0.082	0.139
DISPERSON	0.198	0.406	0.035	0.078	0.183
OPLEV	0.430	0.202	0.280	0.410	0.570
SEASON	0.602	0.490	0.000	1.000	1.000

Panel B: Firm-Quarters where DSTICKY = 1 (Sticky Costs)

N= 21,575

Variable	Mean	SD	25%	Median	75%
FE	0.004	0.915	-0.053	0.039	0.174
STRATEGY	17.868	3.624	15.000	18.000	20.000
PROSPECTOR	0.068	0.252	0.000	0.000	0.000
DEFENDER	0.063	0.242	0.000	0.000	0.000
MV	7.484	1.746	6.265	7.354	8.564
LOSS	0.244	0.429	0.000	0.000	0.000
DOWN	0.466	0.499	0.000	0.000	1.000
VSALE	0.121	0.120	0.052	0.086	0.147
DISPERSON	0.205	0.419	0.035	0.080	0.191
OPLEV	0.431	0.202	0.281	0.415	0.575
SEASON	0.628	0.483	0.000	1.000	1.000

Panel C: Firm Quarters where DSTICKY = 0 (Anti-Sticky Costs)

N= 18,524

Variable	Mean	SD	25%	Median	75%
FE	0.094	0.825	-0.015	0.061	0.226
STRATEGY	17.678	3.668	15.000	18.000	20.000
PROSPECTOR	0.060	0.238	0.000	0.000	0.000
DEFENDER	0.072	0.259	0.000	0.000	0.000
MV	7.636	1.785	6.346	7.503	8.814
LOSS	0.177	0.381	0.000	0.000	0.000
DOWN	0.391	0.488	0.000	0.000	1.000
VSALE	0.112	0.115	0.048	0.077	0.132

DISPERSON	0.189	0.391	0.034	0.076	0.175
OPLEV	0.428	0.201	0.280	0.404	0.564
SEASON	0.571	0.495	0.000	1.000	1.000

Panel D: Key Variables for Prospectors and Defenders

Prospectors					
N= 2,581					
Variable	Mean	SD	25%	Median	75%
FE	0.009	1.116	-0.100	0.042	0.251
STICKY	0.097	0.698	-0.234	0.062	0.393
Defenders					
N= 2,692					
Variable	Mean	SD	25%	Median	75%
FE	-0.044	1.198	-0.110	0.043	0.238
STICKY	-0.007	0.454	-0.174	0.000	0.167

Where FE = The consensus forecast error (actual EPS – forecast EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100, STICKY = the negative of the difference between the logarithms of the mean slopes of cost adjustments when sales decrease and those when sales increase, observed over the past 8 quarters, DSTICKY = A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0. PROS = an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise, DEF = an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise, MV = log of market value of equity at quarter end using Compustat data (prccq*cshoq), LOSS = an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise, DOWN = an indicator variable, equal to 1 if there is a negative earnings surprise, and 0 otherwise, VSALE = sales volatility measured by the ratio of standard deviation to mean of sales over the four quarters from t-3 through t, DISPERSION = the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter t −1 multiplied by 100, and OPLEV = the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised at 0 and 1.

Table 4 - Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	FE	1											
(2)	STRATEGY	0.007	1										
(3)	PROS	-0.011	0.544	1									
(4)	DEF	-0.027	-0.496	-0.071	1								
(5)	STICKY	0.048	-0.048	-0.04	0.016	1							
(6)	MV	0.071	-0.077	-0.105	-0.03	0.039	1						
(7)	LOSS	-0.175	0.185	0.191	-0.013	-0.097	-0.328	1					
(8)	DOWN	-0.066	-0.03	-0.016	0.017	-0.06	-0.046	0.147	1				
(9)	VSALE	-0.035	0.175	0.152	-0.048	-0.036	-0.209	0.277	0.001	1			
(10)	DISPERSON	-0.185	0.014	0.053	0.055	-0.022	-0.266	0.348	0.059	0.201	1		
(11)	OPLEV	0.08	0.337	0.087	-0.212	-0.011	0.125	-0.1	-0.07	-0.078	-0.174	1	
(12)	SEASON	0.004	0.064	0.028	-0.03	-0.06	0.014	-0.065	-0.278	-0.015	-0.027	0.062	1

Where FE = The consensus forecast error (actual EPS – forecast EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100, STICKY = the negative of the difference between the logarithms of the mean slopes of cost adjustments when sales decrease and those when sales increase, observed over the past 8 quarters, DSTICKY = A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0, PROS = an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise, DEF = an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise, MV = log of market value of equity at quarter end using Compustat data (prccq*cshoq), LOSS = an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise, DOWN = an indicator variable, equal to 1 if there is a negative earnings surprise, and 0 otherwise, VSALE = sales volatility measured by the ratio of standard deviation to mean of sales over the four quarters from t-3 through t, DISPERSION = the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter t −1 multiplied by 100, and OPLEV = the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised at 0 and 1.

Table 5 - Mean and Median Values of STICKY for Prospectors, Defenders and Other Firms

Panel A:All Observations

				Differences		
	PROSPECTOR	DEFENDER	Other Firms	PROS vs DEF	PROS vs OTHERS	DEF vs OTHERS
Mean	0.0974***	-0.0065	0.0192***	0.1039***	0.0782***	-0.0257***
Median	0.0619	0.0004	0.0160	0.0615***	0.0459***	-0.0156***
% +ve	0.569***	0.502	0.538***	0.067***	0.031***	-0.036***
N	2,581	2,692	34,826	Total	40,099	

Panel B: Prior Sales Increase

				Differences		
	PROSPECTOR	DEFENDER	Other Firms	PROS vs DEF	PROS vs OTHERS	DEF vs OTHERS
Mean	0.1310***	0.0176*	0.0369***	0.1135***	0.0941***	-0.0237***
Median	0.0867	0.0151	0.0233	0.0716***	0.0634**	-0.0082
% +ve	0.591***	0.533***	0.554***	0.058***	0.037***	-0.021
N	1,610	1,454	20,505			

Panel C: Prior Sales Decrease

				Differences		
	PROSPECTOR	DEFENDER	Other Firms	PROS vs DEF	PROS vs OTHERS	DEF vs OTHERS
Mean	0.0415*	-0.0341***	-0.0061	0.0753***	0.0476***	-0.0278**
Median	0.0280	-0.0146	0.0063	0.0426***	0.0217	-0.0209***
% +ve	0.534**	0.467**	0.517***	0.067***	0.017	-0.048***
N	969	1,234	14,304			

Table 6 - Regressions of Signed Forecast Errors
Panel A: Interaction Models

VARIABLES	Pred. Sign	(1)	(2)	(3)	(1)	(2)	(3)
		Using Continuous STICKY			Using Dummy DSTICKY		
PROS	?	-0.0483***		-0.0461**	-0.0483***		-0.0007
		(0.008)		(0.011)	(0.008)		(0.979)
DEF	?	0.0375**		0.0392**	0.0375**		-0.0265
		(0.039)		(0.031)	(0.039)		(0.288)
STICKY (DSTICKY)	-		0.0551***	0.0559***		0.0618***	0.0582***
			(0.000)	(0.000)		(0.000)	(0.000)
PROS*STICKY (DSTICKY)	+			-0.0428*			-0.0827**
				(0.098)			(0.018)
DEF*STICKY (DSTICKY)	-			0.0923**			0.1311***
				(0.013)			(0.000)
MV		0.0131***	0.0133***	0.0133***	0.0131***	0.0135***	0.0135***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOSS		0.3064***	0.2936***	0.3000***	0.3064***	0.2942***	0.3006***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
VSALE		-0.1826***	-0.2043***	-0.1839***	-0.1826***	-0.2056***	-0.1842***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DISPERSON		31.6947***	31.8950***	31.7502***	31.6947***	31.8673***	31.7063***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
w_OPLEV		-0.2038***	-0.2282***	-0.2048***	-0.2038***	-0.2272***	-0.2045***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SEASON		0.0139	0.0088	0.0100	0.0139	0.0084	0.0099
		(0.129)	(0.337)	(0.277)	(0.129)	(0.361)	(0.284)
Constant		-0.1712***	-0.1564***	-0.1695***	-0.1712***	-0.1895***	-0.2013***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	40,099	40,099	40,099	40,099	40,099	40,099
R-squared	0.067	0.067	0.068	0.067	0.067	0.068

Panel B: Regressions Within Strategy Types

	(1)	(2)	(3)	(4)	(5)	(6)
	Using Continuous STICKY			Using Dummy DSTICKY		
VARIABLES	Prospectors	Defenders	Other Firms	Prospectors	Defenders	Other Firms
STICKY (DSTICKY)	0.0268	0.1335***	0.0576***	-0.0212	0.1711***	0.0598***
	(0.407)	(0.004)	(0.000)	(0.646)	(0.000)	(0.000)
Constant	-0.1325	-0.2122	-0.1227***	-0.1382	-0.2995**	-0.1548***
	(0.425)	(0.123)	(0.000)	(0.405)	(0.031)	(0.000)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,581	2,692	34,826	2,581	2,692	34,826
R-squared	0.091	0.269	0.057	0.091	0.272	0.057

Two-tailed p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. FE = The consensus forecast error (actual EPS – forecast EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100, STICKY = the negative of the difference between the logarithms of the mean slopes of cost adjustments when sales decrease and those when sales increase, observed over the past 8 quarters, DSTICKY = A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0, PROS = an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise, DEF = an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise, MV = log of market value of equity at quarter end using Compustat data (prccq*cshoq), LOSS = an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise, VSALE = sales volatility measured by the ratio of standard

deviation to mean of sales over the four quarters from t-3 through t, DISPERSION = the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter t −1 multiplied by 100, and OPLEV = the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised at 0 and 1.

Table 7 - Regressions of Forecast Errors Conditional on Sign of Prior Period Sales Change

		Prior Sales Incr			Prior Sales Decr	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	FE	FE	FE	FE	FE	FE
PROS	-0.0686***		-0.0358	-0.0237		0.0561
	(0.001)		(0.244)	(0.481)		(0.245)
DEF	0.0215		-0.0347	0.0611**		-0.0181
	(0.321)		(0.257)	(0.048)		(0.661)
DSTICKY		0.0612***	0.0581***		0.0628***	0.0586***
		(0.000)	(0.000)		(0.000)	(0.000)
PROS*DSTICKY			-0.0547			-0.1467**
			(0.164)			(0.024)
DEF*DSTICKY			0.1068***			0.1767***
			(0.008)			(0.002)
MV	0.0149***	0.0158***	0.0153***	0.0094*	0.0090*	0.0097*
	(0.000)	(0.000)	(0.000)	(0.069)	(0.079)	(0.059)
LOSS	0.3462***	0.3306***	0.3401***	0.2665***	0.2558***	0.2602***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
VSALE	-0.2147***	-0.2433***	-0.2161***	-0.1600**	-0.1776**	-0.1635**
	(0.000)	(0.000)	(0.000)	(0.024)	(0.012)	(0.021)
DISPERSION	18.1147***	18.2387***	18.0183***	41.5044***	41.7067***	41.6236***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
OPLEV	-0.1491***	-0.1719***	-0.1502***	-0.2992***	-0.3242***	-0.2972***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SEASON	0.0128	0.0068	0.0088	0.0217	0.0150	0.0161
	(0.215)	(0.507)	(0.394)	(0.210)	(0.389)	(0.355)

Constant	-0.1833***	-0.2084***	-0.2144***	-0.1313***	-0.1382***	-0.1594***
	(0.000)	(0.000)	(0.000)	(0.006)	(0.003)	(0.001)
Observations	23,569	23,569	23,569	16,507	16,507	16,507
R-squared	0.060	0.061	0.061	0.083	0.083	0.084

Panel B: Regressions Within Strategy Types

		Prior Sales Incr			Prior Sales Dec	
	(1)	(2)	(3)	(4)	(5)	(6)
	Using Continuous STICKY			Using Dummy DSTICKY		
VARIABLES	Prospectors	Defenders	Other Firms	Prospectors	Defenders	Other Firms
STICKY (DSTICKY)	0.0075	0.0976*	0.0394***	0.0233	0.2620***	0.0882***
	(0.849)	(0.100)	(0.000)	(0.749)	(0.001)	(0.000)
Constant	-0.2103	-0.3168*	-0.1441***	0.2329	-0.1623	-0.0886*
	(0.257)	(0.062)	(0.000)	(0.455)	(0.468)	(0.067)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,607	1,451	20,507	962	1,231	14,297
R-squared	0.123	0.210	0.060	0.189	0.400	0.062

Two-tailed p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. FE = The consensus forecast error (forecast EPS - actual EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100, STICKY = the negative of the difference between the logarithms of the mean slopes of cost adjustments when sales decrease and those when sales increase, observed over the past 8 quarters, DSTICKY = A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0, PROS = an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise, DEF = an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise, MV = log of market value of equity at quarter end using Compustat data (prccq*cshoq), LOSS = an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise, VSALE = sales volatility measured by the ratio of standard

deviation to mean of sales over the four quarters from t-3 through t, DISPERSION = the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter t −1 multiplied by 100, and OPLEV = the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, winsorised at 0 and 1.

Table 8 Regressions of Forecast Errors Conditional on Both Prior and Current Sales Changes

VARIABLES	(3) Prior Inc/ Curr Inc	(4) Prior Inc/ Curr Dec	(3) Prior Dec/ Curr Inc	(3) Prior Dec/ Curr Dec
PROS	0.0610	-0.1429***	0.0251	0.1287
	(0.118)	(0.003)	(0.643)	(0.149)
DEF	-0.0558	-0.0199	-0.0256	-0.0420
	(0.179)	(0.655)	(0.592)	(0.566)
DSTICKY	0.0505***	0.0724***	0.0671***	0.0686**
	(0.000)	(0.000)	(0.000)	(0.038)
DSTICKY*PROS	-0.1023**	0.0208	-0.0901	-0.1594
	(0.035)	(0.742)	(0.199)	(0.219)
DSTICKY*DEF	0.0527	0.1755***	0.1837***	0.2121**
	(0.327)	(0.004)	(0.005)	(0.047)
Constant	-0.3527***	-0.0970**	-0.2959***	0.0827
	(0.000)	(0.044)	(0.000)	(0.376)
Controls	Included	Included	Included	Included
Quarter fixed effect	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes
Observations	12,654	10,907	10,559	5,938
R-squared	0.053	0.103	0.048	0.162

Two-tailed p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. FE = The consensus forecast error (forecast EPS - actual EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100, STICKY = the negative of the difference between the logarithms of the mean slopes of cost adjustments when sales decrease and those when sales increase, observed over the past 8 quarters, DSTICKY = A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0, PROS = an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise, DEF = an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise, MV = log of market value of equity at quarter end using Compustat data (prccq*cshoq), LOSS = an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise, VSALE = sales volatility measured by the ratio of standard deviation to mean of sales over the four quarters from t-3 through t, DISPERSION = the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter t −1 multiplied by 100, and OPLEV = the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised at 0 and 1.

Table 9 – Strategy, Firm Life-Cycle and Cost Stickiness

Panel A – Life-Cycle Stages v Strategy Types **LIFE-CYCLE STAGE (Dickinson 2011)**

		INTRO	GROWTH	MATURE	SHAKEOUT	DECLINE	Total
	Freq.	571	641	548	271	548	2,579
PROS	Exp. Freq	274.9	685	1,098.40	367.5	153.2	2,579.00
	Chi2 Contribution	319	2.8	275.8	25.3	1017.1	1640.1
	Freq.	3,428	9,396	15,165	5,096	1,736	34,821
OTHERS	Exp. Freq	3,711.20	9,248.90	14,830.10	4,961.90	2,068.80	34,821.00
	Chi2 Contribution	21.6	2.3	7.6	3.6	53.5	88.7
	Freq.	274	612	1,362	346	98	2,692
DEF	Exp. Freq	286.9	715	1,146.50	383.6	159.9	2,692.00
	Chi2 Contribution	0.6	14.8	40.5	3.7	24	83.6
Total	Freq.	4,273	10,649	17,075	5,713	2,382	40,092
	Exp. Freq	4,273.00	10,649.00	17,075.00	5,713.00	2,382.00	40,092.00
	Chi2 Contribution	341.2	20	323.9	32.6	1094.6	1812.4

Panel B – Regressions of Forecast Optimism Against Cost Stickiness, Life-Cycle and Strategy Indicators

VARIABLES	(1) ALL	(2) Prior Sales Inc	(3) Prior Sales Dec	(4) ALL	(5) Prior Sales Inc	(6) Prior Sales Dec
1.DSTICKY	0.0910***	0.0331	0.1620***	0.0933***	0.0339	0.1669***
	(0.001)	(0.294)	(0.000)	(0.001)	(0.292)	(0.000)
1.GROWTH	-0.0039	-0.0500*	0.0486	-0.0046	-0.0532*	0.0502
	(0.871)	(0.081)	(0.245)	(0.849)	(0.064)	(0.230)
1.DSTICKY#1.GROWTH	-0.0285	0.0478	-0.1307**	-0.0336	0.0445	-0.1391**
	(0.356)	(0.189)	(0.016)	(0.278)	(0.223)	(0.010)
1.MATURE	-0.0014	-0.0427	0.0437	-0.0005	-0.0446	0.0472
	(0.951)	(0.126)	(0.266)	(0.983)	(0.112)	(0.231)
1.DSTICKY#1.MATURE	-0.0517*	0.0090	-0.1269**	-0.0628**	0.0004	-0.1419***
	(0.077)	(0.796)	(0.011)	(0.033)	(0.991)	(0.005)
1.SHAKEOUT	-0.0935***	-0.1220***	-0.0641	-0.0942***	-0.1249***	-0.0635
	(0.001)	(0.000)	(0.159)	(0.001)	(0.000)	(0.163)
1.DSTICKY#1.SHAKEOUT	0.0374	0.0579	0.0195	0.0299	0.0530	0.0075
	(0.291)	(0.169)	(0.747)	(0.400)	(0.210)	(0.901)
1.DECLINE	-0.0756**	-0.1140***	-0.0290	-0.0780**	-0.1130***	-0.0370
	(0.023)	(0.006)	(0.595)	(0.020)	(0.006)	(0.499)
1.DSTICKY#1.DECLINE	-0.1067**	0.0110	-0.2426***	-0.0964**	0.0166	-0.2234***
	(0.014)	(0.834)	(0.001)	(0.027)	(0.753)	(0.002)
1.PROSPECTOR				0.0059	-0.0367	0.0710
				(0.828)	(0.243)	(0.141)
1.DSTICKY#1.PROSPECTOR				-0.0788**	-0.0478	-0.1465**
				(0.027)	(0.235)	(0.026)
1.DEFENDER				-0.0316	-0.0431	-0.0164

				(0.204)	(0.160)	(0.689)
1.DSTICKY#1.DEFENDER				0.1366***	0.1163***	0.1739***
				(0.000)	(0.004)	(0.003)
Constant	-0.1731***	-0.1566***	-0.1597***	-0.1846***	-0.1600***	-0.1837***
	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.001)
Controls	Included	Included	Included	Included	Included	Included
Quarter and Industry Fixed Effects	Included	Included	Included	Included	Included	Included
Observations	39,386	23,170	16,194	39,386	23,170	16,194
R-squared	0.069	0.062	0.084	0.069	0.063	0.085

Two-tailed p-values in parentheses, *** p<0.01, ** p<0.05, * p<0.1. FE = The consensus forecast error (forecast EPS - actual EPS) deflated by lagged stock price, for all analysts covering the firm within the 30-day window leading up to the quarterly earnings announcement, multiplied by 100, STICKY = the negative of the difference between the logarithms of the mean slopes of cost adjustments when sales decrease and those when sales increase, observed over the past 8 quarters, DSTICKY = A dichotomous variable indicating positive values of STICKY (as calculated above) where it equals to 1 if the firms' change in cost to sales ratio is equal or smaller than 0, otherwise 0. INTRO firms (the base case) have negative operating and investing cash flows, and positive financing cash flows. GROWTH = 1 if the firm has positive operating cash flows, negative investing cash flows and positive financing cash flows, 0 otherwise. MATURE = 1 if the firm has positive operating cash flows and negative investing and financing cash flows, otherwise 0. DECLINE = 1 if the firm has negative operating cash flows and positive investing cash flow, otherwise. SHAKEOUT = 1 if the firm has any cash flow combination other than those of INTRO, GROWTH, MATURE or DECLINE firms, otherwise 0. PROS = an indicator variable for Prospector firm-years, equal to 1 if the STRATEGY score is between 24 and 30, and 0 otherwise, DEF = an indicator variable for Defender firm-years, equal to 1 if the STRATEGY score is between 6 and 12, and 0 otherwise, MV = log of market value of equity at quarter end using Compustat data (prccq*cshoq), LOSS = an indicator variable, equal to 1 if the income before extraordinary items in the current quarter (COMPUSTAT: ibq) is negative for the covered firm, and 0 otherwise, VSALE = sales volatility measured by the ratio of standard deviation to mean of sales over the four quarters from t-3 through t, DISPERSION = the standard deviation of the analysts' forecasts announced for firm i in quarter t in the month immediately preceding that of the earnings announcement, deflated by stock price at the end of quarter $t-1$ multiplied by 100, and OPLEV = the ratio between SALE (COMPUSTAT: saleq) minus COGS (COMPUSTAT: cogsq) and SALE, where winsorised at 0 and 1.