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The impact of cost stickiness on financial reporting: evidence from income smoothing

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Abstract

This study investigates the impact of cost stickiness on income smoothing. Prior literature at the intersection between management and financial accounting has understood changes in cost behaviour as mere consequences of short-term earnings management incentives. By considering income smoothing as the more complex earnings management strategy, we argue that resource adjustment strategies underlying cost behaviour might also have an impact on long-term financial reporting choices. Specifically, asymmetric reactions of costs to sales changes should increase earnings volatility and thus restrict managers' capabilities to report smooth income streams, which is supported by our empirical results. Additional tests reveal that cost stickiness primarily restricts opportunistic income smoothing and that the relationship depends on other factors such as the level of adjustment costs.

Key words: Cost behaviour; Income smoothing; Managerial discretion; Earnings management; Resource adjustments

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1. Introduction

Managerial discretion and its underlying motives are a fruitful area of research in management and financial accounting. Our study combines two streams of research that are fundamentally based on managerial behaviour but have thus far been examined independent of each other: asymmetric cost behaviour and income smoothing.

Asymmetric cost behaviour, also referred to as cost stickiness, is a well-documented property of corporate costs based on managerial resource adjustment decisions. On average, costs seem to decrease less in response to reduced firm activity than they grow for an equivalent increase (e.g., Anderson *et al*., 2003). On one hand, asymmetric cost behaviour might arise because managers make economically rational trade-off decisions and compare the adjustment costs with the holding costs of committed resources. On the other hand, it is also plausible that opportunistic managers discretionarily refrain from cutting costs in periods of downturn to their own benefit (Anderson *et al*., 2003; Chen *et al*., 2012).

As costs are a fundamental component of accounting earnings, financial reporting decisions also have the potential to influence cost behaviour, and vice versa. Hence, prior research shows that managerial short-term incentives to increase reported earnings, such as avoiding losses or meeting analyst earnings targets, suppress motives for asymmetric cost behaviour (i.e., managers are sometimes more inclined to cut costs in order to increase short-term profits; Dierynck *et al*., 2012; Kama and Weiss, 2013). By focusing on income smoothing, which constitutes the most comprehensive and long-term form of accounting earnings management that consists of consecutive upward and downward earnings management activities, we argue that instead of understanding changes in cost behaviour as a mere consequence of financial accounting incentives, resource adjustment strategies might also have an impact on long-term financial reporting decisions and strategies.

Income smoothing refers to the deliberate moderation of fluctuations in earnings (e.g., Beidleman, 1973). Prior literature separates motives for reporting smoothed income into an 'informational' and 'garbling' component (Tucker and Zarowin, 2006). The informational role entails the provision of private information about the firm's economic stability and future performance (e.g., Sankar and Subramanyam, 2001; Kirschenheiter and Melumad, 2002). In contrast, the garbling role refers to managerial opportunism to achieve private benefits (e.g., DeFond and Park, 1997). More recent literature emphasises the

importance of distinguishing between the two roles of income smoothing (Cahan *et al.*, 2008; Dou *et al.*, 2013).

We conjecture that cost stickiness negatively affects income smoothing. Both phenomena are based on managerial motives to target specific objectives. As a prominent example, during the current COVID-19 pandemic, managers might be inclined to keep unutilised resources in order to avoid the costs of rebuilding capacity when demand is recovering after the crisis. Simultaneously, they might also be inclined to report a smooth income stream to reassure their stakeholders during the crisis and signalise moderate firm risk. However, an asymmetric reaction of costs to changes in activity induces a more volatile earnings path (e.g., Weiss, 2010). Specifically, not adapting unnecessary resources as a response to drops in demand results in even more decreased earnings in periods with reduced revenues. Thus, cost stickiness should counteract managerial ambitions to report smooth income streams.

We test our prediction by applying a firm-specific measure of cost stickiness (Weiss, 2010). To proxy for income smoothing behaviour, we adopt an aggregate smoothing score (Dou *et al.*, 2013). Employing the Compustat NA universe, we show that increased cost stickiness significantly mitigates the degree of income smoothing. Furthermore, we decompose aggregate income smoothing into its informational and garbling components (Dou *et al.*, 2013) and show that cost asymmetry only significantly affects the garbling role. Hence, instead of improving information transparency, managers rather seem to use income smoothing as a means to pursue opportunistic motives. Hence, opportunistic income smoothing is significantly restricted by delayed resource adjustments attributable to sticky cost behaviour.

We conduct several additional analyses to test the robustness of our results and to address endogeneity concerns. Furthermore, we conduct some cross-sectional analyses to enhance our understanding of the relationship between cost stickiness and income smoothing. For instance, we find that cost stickiness has a significantly negative impact on income smoothing only for firms with high adjustment costs and in times of high economic growth, which are both well-known drivers for managerial decisions to stick to unused resources. Our results also suggest that only able managers can handle both strategies simultaneously. Moreover, we show the reasonable pattern that for high (low) agency conflict firms, garbling (informational) smoothing plays the dominant role for the negative relationship. Again, these tests point to a complex, discretionary choice for managers to engage in cost stickiness and income smoothing.

Our study significantly contributes to the existing literature. In particular, we answer renewed calls for additional research that furthers our understanding of the interplay of management and financial accounting (Banker and Byzalov, 2014; Shust and Weiss, 2014; Banker *et al.*, 2018). While prior literature has only considered short-term upward earnings management and its effect on cost behaviour, we focus on income smoothing as the more complex and long-term

earnings management strategy that has so far been disregarded by the cost stickiness-related literature. More importantly, unlike prior literature that has understood changes in cost behaviour as a mere consequence of short-term earnings management incentives, we show that resource adjustment decisions also have an impact on long-term financial accounting behaviour. This perspective has been relatively neglected so far but should be of great interest for researchers, practitioners, and financial statement users, alike.

The remainder of this paper is organised as follows. Section 2 provides the theoretical background and develops the hypotheses. Section 3 explains our research design choices and describes the samples. Section 4 discusses our empirical findings. Section 5 concludes the paper.

2. Background, literature review and hypotheses

2.1. Income smoothing

A smooth income stream can appear naturally due to accrual reversals (Dechow, 1994) or an earnings-generating process that inherently produces a smooth income path (Eckel, 1981). However, in our study we emphasise income smoothing as the 'intentional dampening of fluctuations about some level of earnings that is currently considered to be normal for a firm' (Beidleman, 1973, p. 653). Accordingly, we investigate deliberate managerial decisions to manipulate earnings in order to achieve a smooth income stream. Unlike typical short-term earnings management methods that usually involve income-increasing activities, for instance to avoid small losses or earnings decreases (Burgstahler and Dichev, 1997), income smoothing is a more comprehensive concept that requires consecutive upward and downward earnings management activities over the long-term. Therefore, it arguably is the most complex earnings management strategy, which is corroborated by recent empirical evidence that in particular firms with more able managers exhibit a smooth income stream (Baik *et al*., 2020; Demerjian *et al*., 2020).

In his seminal paper, Gordon (1964) predicted theoretically that firms are inclined to report smooth income streams. A large amount of archival research provided the empirical evidence to this end (e.g., Beidleman, 1973; Barnea *et al*., 1976; Albrecht and Richardson, 1990; Leuz *et al*., 2003). Moreover, Graham *et al*. (2005) shed some light on the notion that managers deliberately try to smooth firm income. More specifically, their survey among top executives finds that 96.7 percent of respondents try to prevent pronounced earnings volatility.

There also is a fairly developed literature on the determinants and motives for income smoothing. One main motivation for income smoothing arises from the market perception that lower income variability reflects economic stability (Graham *et al*., 2005). Hence, managers might use income smoothing methods as a capital market communication tool in order to stabilise forward-looking

relationships with different stakeholders including analysts and investors (e.g., Trueman and Titman, 1988; Tucker and Zarowin, 2006), creditors (e.g., Gassen and Fülbier, 2015), rating agencies (e.g., Jung *et al*., 2013), employees (Hamm *et al*., 2018), as well as customers and suppliers (e.g., Dou *et al*., 2013).

However, income smoothing might also be motivated by opportunistic managerial incentives. In line with agency theory (e.g., Williamson, 1964; Jensen and Meckling, 1976), Gordon (1964) as well as Monsen and Downs (1965) have argued that self-serving managers use income smoothing as an instrument to maximise their own personal utility. Empirical research supports this assumption and finds that managers exploit their discretion to smooth income in order to protect their own jobs (DeFond and Park, 1997; Arya *et al*., 1998), secure high incumbency rents (Fudenberg and Tirole, 1995), and optimise their compensation by consistently meeting bonus targets (Grant *et al*., 2009).

In line with these different motives, it is still a much debated question whether income smoothing is beneficial or unfavourable to a firm and its stakeholders (Dechow *et al*., 2010; Chen *et al*., 2017). On the one hand, income smoothing might play an informational role; thus, managers primarily use income smoothing to provide additional private information about future earnings and cash flows for the recipients of financial reports (Demski, 1998; Sankar and Subramanyam, 2001; Kirschenheiter and Melumad, 2002; Tucker and Zarowin, 2006; Raman and Shahrur, 2008). On the other hand, in particular opportunistic income smoothing activities might result in 'garbled' financial information, which does not reflect a true and fair view of the firm's economic situation and can, therefore, likely be considered value-destroying (Tucker and Zarowin, 2006; Dou *et al*., 2013; Chen *et al*., 2017).

2.2. Cost stickiness

Traditional cost accounting theory has long postulated a simple mechanistic relationship between changes in sales activity and corporate costs (Noreen, 1991). Implicitly, it suggests that managerial discretion does not play a significant role in cost management. However, a growing body of evidence exhibits an asymmetric reaction of costs to changes in firm activity (e.g., Noreen and Soderstrom, 1997). In particular, Anderson *et al*. (2003) show that costs behave in a 'sticky' fashion: they increase more than they decrease for an equal change in sales revenue.[1] Researchers ascribe this phenomenon to

[1]Asymmetric cost behavior has been shown for different cost categories, including selling, general and administrative (SG&A) costs (Anderson *et al*., 2003), costs of goods sold (COGS; Subramanian and Weidenmier 2016), operating costs (OC; e.g., Calleja *et al*., 2006; Kama and Weiss, 2013; Hartlieb *et al*., 2020) or labour costs (Dierynck *et al*., 2012). Via and Perego (2014) provide evidence that small and medium sized companies also exhibit asymmetric cost behaviour. Bradbury and Scott (2018) investigate asymmetric cost behaviour in a municipal setting.

deliberate decisions by managers who pursue complex resource adjustment strategies, which are subject to various constraints, incentives, and psychological biases (Banker *et al*., 2018).

The first reason why managers might refrain from reducing idle capacity is adjustment costs (i.e., costs of reducing capacity and subsequently replacing resources when activity is restored). These costs are determined by monetary factors, such as selling costs of assets, severance payments or integration costs for new hires. However, especially in the long-term, non-pecuniary, indirect costs, such as lower morale among remaining staff, loss of reputation or specialist employees, can also be considered adjustment costs. In comparison, the holding costs of retaining capacity are primarily monetary and include, for instance, wages, rents or energy costs. As a consequence, asymmetric cost behaviour occurs when managers perceive adjustment costs to outweigh holding costs (e.g., Anderson *et al*., 2003; Guenther *et al*., 2014; Banker *et al*., 2018).

The interaction of managerial discretion and adjustment costs entails complex dynamics in the choice of resource levels (Lee *et al*., 2020), which is why resource adjustment decision can be considered complex, comprehensive, and forward-looking. Managers must not only consider current demand, but also past resource adjustments as they affect current adjustment costs. Moreover, resource adjustments require managers' prediction of future demand in order to evaluate future adjustment costs. For this reason, managerial expectations also play a crucial role in cost management (Banker *et al*., 2014; Chen *et al*., 2019; Hartlieb, in-press).

In addition to adjustment costs and expectations, personal considerations by self-interested managers (i.e., agency conflicts) are considered as another main reason for cost stickiness (e.g., Chen *et al*., 2012; Costa and Habib, 2021). These motives include empire building incentives (Chen *et al*., 2012), fear of job loss (e.g., following the revision of overambitious past investment decisions), or the anguish of dismissing familiar employees (Anderson *et al*., 2003; Guenther *et al*., 2014). These findings are in line with those of empirical studies that identify corporate governance mechanisms (Calleja *et al*., 2006; Chen *et al*., 2012; Loy and Hartlieb, 2021) or social norms (Hartlieb *et al*., 2020) as important moderators of the impact of managerial opportunism on cost behaviour.

2.3. The relationship between cost stickiness and income smoothing

Recent work at the intersection between financial and management accounting focuses on the relationship between asymmetric cost behaviour

and income-increasing short-term earnings management.[2] This line of literature has understood changes in cost behaviour as a mere consequence of financial accounting incentives. In other words: manipulating financial accounting properties also influences cost behaviour. As such, Dierynck *et al.* (2012) find that managerial incentives to avoid reporting losses are negatively associated with cost asymmetry. Executives facing such incentives seem to be more willing to cut labour costs when sales decrease. Similarly, Kama and Weiss (2013) find that motives to meet short-term earnings targets induce deliberate resource adjustments. Cumulatively, both papers show that short-term upward earnings management incentives foster more decisive cost cutting and, hence, reduce cost stickiness.

To enhance our understanding at the intersection of cost and financial accounting, we address the link to income smoothing, which has thus far been disregarded in the cost stickiness-related literature. In particular, we conjecture that deliberate (internal) resource adjustment decisions might also have an impact on (external) capital market communication in terms of income smoothing. While it should be manageable to make small adjustments in order to achieve specific short-term earnings targets such as meeting the zero-earnings-benchmark or analyst EPS projections, it is much more challenging to simultaneously handle two comprehensive long-term strategies such as resource adjustments and income smoothing.

Prior literature argues that executives weigh adjustment and holding costs as well as consider personal motives in periods of sales downturns in order to decide whether to cut or retain committed resources (Anderson *et al.*, 2003; Chen *et al.*, 2012). Since costs are a fundamental component of earnings (e.g., Banker and Byzalov, 2014), prior research suggests that earnings are more volatile for firms exhibiting higher levels of cost stickiness (e.g., Weiss, 2010). More precisely, Weiss (2010) argues that sticky cost behaviour results in smaller cost decreases when the activity level is decreasing, which leads to a greater decline in earnings. This greater decline in earnings when sales activity is decreasing ultimately increases the *ex ante* volatility of earnings (Weiss, 2010; Ciftci and Salama, 2018). In other words, not adapting unnecessary resources and cutting costs, results in even more decreased earnings in periods with reduced revenues. This heightens earnings volatility and thus reduces the possibility to report a smooth income path. This is also in line with empirical findings from Weiss (2010) that analysts' earnings forecasts are less accurate for firms with sticky cost behaviour, implicitly hinting at our point that cost

[2]Other examples for the limited literature on the association of cost stickiness with properties of financial accounting include Banker *et al.* (2016) who investigate the confounding effect of sticky costs on conditional conservatism. Furthermore, Li and Zheng (2020) find a significant association between resource adjustment decisions and rollover risk.

stickiness is associated with more volatile earnings that, as a result, are more difficult to predict.

In summary, this discussion suggests that managerial motives for resource adjustment strategies underlying a sticky cost structure and those for reporting a smooth income stream over a long period are incompatible and cannot be targeted simultaneously. Hence, unlike previous research, we argue that managerial resource adjustment decisions have an impact on financial reporting: A greater level of cost stickiness should be associated with less income smoothing, which culminates in our first and main hypothesis:

H1: Cost stickiness has a negative impact on income smoothing.

The debate underlying the development of our preceding hypothesis is that both income smoothing and cost stickiness are the result of deliberate managerial decisions. These decisions might be either economically motivated, in the interest of the firm and its stakeholders, or motivated by managers' self-interest. This raises the question of which motives are the underlying drivers for the impact of cost stickiness and income smoothing.

Research on income smoothing demonstrates the importance of differentiating between the informational (i.e., in the interest of the firm and its stakeholder) and garbling (i.e., managerial opportunism) role of income smoothing. For instance, it is well documented that a strong legal framework and stringent investor protection are negatively associated with the occurrence of income smoothing (Leuz *et al*., 2003; Burgstahler *et al*., 2006). This is in line with early evidence that income smoothing is more likely in management-controlled firms, characterised by severe agency conflicts (Kamin and Ronen, 1978).

Cahan *et al*. (2008) show explicitly that managers in strong investor protection countries are more likely to smooth earnings to convey private information, whereas managers in weak investor protection environments primarily exploit their discretion to report smoothing income streams for opportunistic reasons. Building on this more nuanced finding, Dou *et al*. (2013) present evidence that firms in jurisdictions with weak legal institutions with respect to contract enforceability use income smoothing to signal additional information about the firm's economic stability to their suppliers. Moreover, using the specific Japanese setting with the existence of extremely stable shareholdings, Shuto and Iwasaki (2014) show that the respective firms are more likely to use income smoothing to convey private information to their long-term shareholders.

We also seek to explore which of the two roles dominates in our setting in an effort to contribute to the discussion whether income smoothing primarily reflects the provision of private information or managerial opportunism (Dechow *et al*., 2010). While the earlier literature finds evidence for both motives, more recent papers suggest a dominant role of the latter. For instance, Chen *et al*. (2017) show that income smoothing is associated with higher stock

price crash risk. Furthermore, Yu *et al.* (2018) find higher bid-ask spreads for firms which are engaged in income smoothing, implying that investors perceive income smoothing as a discretionary earnings management tool rather than being informative about the future. Following this reasoning, we conjecture that deliberate resource adjustment decisions, which would induce sticky cost behaviour, and thus a bumpier earnings path, have a negative impact on garbling income smoothing activities. In other words, managers are likely unable to exploit their discretion to simultaneously pursue self-serving motives in cost management and financial accounting.

However, it is also reasonable to expect that resource adjustment decisions underlying sticky cost behaviour restrict managers in communicating private information through reporting smoothed earnings (e.g., Kirschenheiter and Melumad, 2002). Particularly in settings with little agency conflicts, informational smoothing should play the dominant role in financial reporting but could be mitigated by motives to stick to unutilised but costly resources in periods with sales downturns; for instance, to avoid losing reputation or specialised knowledge which in the long-run would be even more costly but in the short-run induces a more volatile earnings path.

In sum, depending on the underlying reason for managers' decision to report a smooth income stream, cost stickiness will either restrict garbling or informational income smoothing. For this reason, we formulate our second hypothesis in the following non-directional manner:

> H2: The negative impact of cost stickiness on income smoothing is either driven by the garbling or informational role of income smoothing.

3. Research design and samples

3.1. Aggregate income smoothing score

To proxy for income smoothing, we follow Dou *et al.* (2013) and create an aggregate score from three individual measures developed in prior studies. The first two are *EM*3 and *EM*4, adopted from Burgstahler *et al.* (2006), and the third is *IS*, developed by Tucker and Zarowin (2006). However, while Dou *et al.* (2013) calculate the variables at the country-industry level, we compute them both at the firm- and firm-year levels. For our main income smoothing model to examine H1, we employ annual (i.e., firm-year) measures. The following decomposition procedure for investigating H2, instead requires variables at the firm-level.

*EM*3 is calculated as the firm-level ratio of the cross-sectional standard deviations of operating income and operating cash flow, both scaled by lagged total assets. It captures the extent to which managers reduce earnings

variability through the use of accruals. Thus, a smaller standard deviation for income than for cash flow indicates accrual smoothing activities.[3] *EM*4 likewise captures accrual smoothing activities. It is defined as the firm-level Spearman correlation between the change in total accruals and the change in operating cash flows.[4] The measure is expected to be negative because a certain degree of earnings smoothing occurs naturally due to accrual reversals (Dechow, 1994). However, a strong negative correlation suggests that managers deliberately use accruals to counteract volatility in cash flows (e.g., Leuz *et al*., 2003). *IS* is the firm-level Spearman correlation between the change in discretionary accruals and the change in pre-managed income (i.e., net income minus discretionary accruals). Accordingly, Tucker and Zarowin (2006) assume a bumpier underlying pre-managed income series that managers try to smooth through discretionary accruals. Discretionary accruals are estimated employing the performance-adjusted cross-sectional Jones model (Kothari *et al*., 2005).[5] A more negative correlation between discretionary accruals and pre-managed income implies earnings smoothing.

To compute the firm-year level measures for our main model to investigate H1, we modify the presented variable generation processes. Consistent with Francis *et al*. (2004), $EM3_{it}$ is computed by calculating the standard deviations over a rolling five-year window.[6] Furthermore, $EM4_{it}$ and IS_{it} are equally calculated using observations over the recent rolling five-year window (Cahan *et al*., 2008; Tucker and Zarowin, 2006). To avoid potential confusion, we multiply all individual measures by minus one such that larger values imply greater income smoothing.

To obtain the aggregate income smoothing score (*ISAGG*), we follow Dou *et al*. (2013) and extract the first component of a principal component analysis

[3]Since extreme downward outliers are observed, *EM*3 is winsorized at the 1st percentile. To avoid data loss we refrain from truncating observations. The correlation-based variables *EM*4 and *IS* have natural limits (−1 and 1, respectively).

[4]Following Dechow *et al*. (1995), the accrual component of earnings is calculated as: $TACC = \Delta total\ current\ assets - \Delta cash - \Delta total\ current\ liabilities + \Delta short\text{-}term\ debt - depreciation\ expense$, where Δ signifies the change over the prior fiscal year. Cash flow from operations is calculated as operating income less total accruals (Dou *et al*., 2013). Directly measuring cash flow from operations (Compustat item *oancf*), as suggested by Hribar and Collins (2002), does not alter our main conclusions (untabulated).

[5]Consistent with Tucker and Zarowin (2006), we require at least 10 observations for each industry-year cross-section and we Winsorise the regression variables at three standard deviations for each year.

[6]Francis *et al*. (2004) deploy a rolling ten-year period. However, we employ a five-year period because of data restrictions and for consistency with the firm-year level calculation of *EM*4 and *IS* in Cahan *et al*. (2008) and Tucker and Zarowin (2006).

(PCA) of the individual measures.[7] Corresponding to the individual measures, a higher value of *ISAGG* indicates greater income smoothing. Moreover, the aggregate measure has the advantage of mitigating potential measurement errors in the individual scores.

3.2. Decomposition of income smoothing

In H2, we raise the question whether the relationship between cost stickiness and income smoothing is primarily driven by the garbling or informational role of income smoothing. To decompose the income smoothing measure into its garbling and informational components, we follow Dou *et al.* (2013). These authors modify an approach by Tucker and Zarowin (2006), which builds on the prices-lead-earnings framework (i.e., the extent of information about future earnings reflected in current stock returns).

Tucker and Zarowin (2006) analyse whether income smoothing enables investors to better predict future earnings. The underlying idea is that the informational role of income smoothing is to provide private, additional information about the firm's performance (e.g., Sankar and Subramanyam, 2001; Kirschenheiter and Melumad, 2002). Income smoothing in the current period is public information which investors will use to predict future earnings. However, when managers use garbling income smoothing for opportunistic reasons, they do not provide predictable, sustainable information about the future.

$$R_t = b_0 + b_1 X_{t\ 1} + b_2 X_t + b_{3P} Profit * X_{t3} + b_{3L} Loss * X_{t3} + b_4 R_{t3} + e_t. \quad (1)$$

To measure the extent to which prices lead earnings, we use the model of Lundholm and Myers (2002), which has been adopted by Tucker and Zarowin (2006) and modified by Dou *et al.* (2013). X_t and X_{t-1} are earnings per share (EPS) for years t and t–1 and X_{t3} is the sum of EPS for t+1 to t+3. All EPS variables are basic EPS excluding extraordinary items, adjusted for stock splits and stock dividends and scaled by lagged stock prices. R are buy-and-hold stock returns over the firm's fiscal year, adjusted for stock splits and dividends (Dou *et al.*, 2013). More precisely, R_{t3} denotes the aggregate stock return in years t+1 to t+3 with annual compounding, whereas R_t represents the current year's stock return. Assuming at least semi-strong market efficiency, stock returns incorporate all publicly available information. The current and past EPS control for unexpected earnings in the current period (Lundholm and Myers, 2002).

[7]The value of the Kaiser-Meyer-Olkin criterion exceeds 0.6 for every model indicating an acceptable implementation of the PCA. Furthermore, the extracted component explains approximately 60 per cent of the variance (eigenvalue > 1.7; uniqueness < 0.4), on average.

However, relevant for the decomposition are the future earnings response coefficients (FERC), separately for cumulative profits (b_{3P}) and losses (b_{3L}). For all firms in our sample, we estimate the prices-lead-earnings Equation (1) in order to obtain FERCs that measure revisions in investors' beliefs about future earnings.[8] Next, within each two-digit SIC industry with a minimum of 20 firms, we regress our aggregate income smoothing measure on the calculated FERCs. The predicted values of *ISAGG* proxy for the firm-level informational part of income smoothing (*IS_INFO*), while the residuals represent the corresponding garbling component (*IS_GARB*) and, thus, the portion of income smoothing that is independent from FERCs, or the provision of earnings information.

3.3. Cost stickiness measure

A major disadvantage of the cross-sectional regression model by Anderson *et al.* (2003), that has been used by the majority of prior literature at the intersection between cost stickiness and earnings management (e.g., Dierynck *et al.*, 2012; Kama and Weiss, 2013), is that it cannot serve as an explanatory variable to examine the implications of cost stickiness for financial reporting activities (Banker and Byzalov, 2014). However, such a variable is necessary to investigate our hypotheses on the effect of cost stickiness on income smoothing. Therefore, we employ a firm-specific measure of cost stickiness (Weiss, 2010). The variable is premised on quarterly data but conceptualised to generate annual firm observations. Equation (2) illustrates the firm-specific cost asymmetry measure:

$$STICKY_{it} = - \left[log \frac{\Delta COST}{\Delta SALE}_{i,\underline{\tau}} \quad log \frac{\Delta COST}{\Delta SALE}_{i,\overline{\tau}} \right] \underline{\tau}, \overline{\tau} \varepsilon \quad t_q, \cdots, t_q \quad 3 \ . \tag{2}$$

Working with quarterly t_q data, $\Delta SALE$ denotes change in sales revenue between two quarters ($SALE_{i,t_q}$ $SALE_{i,t_q\ 1}$) and $\Delta COST$ denotes the corresponding change in operating costs ($COST_{i,t_q}$ $COST_{i,t_q\ 1}$). Subscript τ signifies the most recent of the last four quarters in fiscal year t with a decrease in sales, and $\overline{\tau}$ is the most recent of the last four quarters with an increase in sales.

The variable compares the slope of a cost function between the two most recent quarters in fiscal year t, one with an increase and the other with a decrease in sales. If costs increase more when activity rises than they decrease when activity declines by an equivalent amount, they are 'sticky'. By definition,

[8]Following Dou *et al.* (2013), we require at least 10 firm-year observations for each regression.

the term in square brackets would exhibit a negative sign. For consistency with the income smoothing measure, we hence multiply the term by minus one and compute an annual measure based on the average level of cost stickiness over a rolling five-year window. Hence, higher values of *STICKY* imply more sticky cost behaviour over the recent 5 years.

The approach entails the disadvantage of a significant data loss. For example, we follow Weiss (2010) and restrict the quarterly sample to observations for which sales and costs move in the same direction. Moreover, the measure only identifies values for firm-years that entail both a quarterly increase and decrease in sales. Nevertheless, the benefits outweigh these data restrictions. As has been pointed out, it is possible to apply the proxy as an independent variable in order to examine the effects of cost stickiness. Furthermore, it provides a clear reference point of a linear cost function ($STICKY = 0$) to distinguish between (anti-)sticky firms. Based on this, we create a supplementary indicator (*STICKY_DUMMY*) that equals 1 if *STICKY* is positive, and 0 otherwise.

3.4. Main models

To investigate our main hypothesis H1, we employ a regression model with *ISAGG* as the dependent variable and *STICKY* as an explanatory variable. Furthermore, we include a variety of controls that previous literature has associated with income smoothing. We provide detailed definitions of the variables in Appendix I.[9]

Consistent with prior research (e.g., Dou *et al*., 2013; Gassen and Fülbier, 2015; Baik *et al*., 2020), we control for a number of firm characteristics that are considered to quasi-naturally affect the smoothness of a firm's earnings path. For instance, large, mature, and well-run firms are likely to have more stable and diversified operations. Hence, we include variables representing firm age (*AGE*), firm size (*SIZE*), sales growth (*GROWTH*), profitability (*ROA*), operating leverage (*OP_LEV*), and sales volatility (*SALES_VOL*).

Moreover, we include controls which proxy for managerial motives and possibilities to discretionarily smooth earnings (e.g., Matsumoto, 2002; Chung *et al*., 2005; Dou *et al*., 2013; Lee *et al*., 2015; Baik *et al*., 2020). For instance, managers of firms with high growth opportunities, as proxied by the book-to-market ratio (*BM*), might be subject to greater pressure from debt- and shareholders to smooth earnings in order to secure funding for future growth. Prior research also shows that firms with higher leverage (*LEV*) are more likely to report smooth(ed) income to meet creditors' expectations and avoid debt covenant violations (e.g., DeFond and Jiambalvo, 1994; Gassen and Fülbier, 2015). Next, we include a measure for free cash flow (*FCF*) as a proxy for agency costs (e.g., Chung *et al*., 2005). We also include a measure for

[9]All continuous annual measures are winsorized at 1 percent tails.

managerial ability, based on Demerjian *et al.* (2012), because income smoothing is complex and firms with more able managers are more likely to exhibit a smooth income path (Baik *et al.*, 2020; Demerjian *et al.*, 2020).[10] Finally, we consider industry-level litigation risk which might influence managers' inclination to smooth earnings because it might either put greater pressure on managers to manage earnings or it might prevent them from engaging in income smoothing because it also increases their risk of being sued for these activities (e.g., Matsumoto, 2002).

We control for remaining industry-fixed effects (through Fama/French 48 industry classification) and also include year-fixed effects. Furthermore, in all regression models we employ standard errors that are robust to autocorrelation and heteroscedasticity. For the firm-year models, standard errors are also clustered by firm.[11] Summing up, we estimate the following model (3):

$$\begin{aligned} ISAGG_{it} = {} & \gamma_0 + \gamma_1 STICKY_{it} + \gamma_2 SIZE_{it} + \gamma_3 LEV_{it} + \gamma_4 GROWTH_{it} \\ & + \gamma_5 BM_{it} + \gamma_6 LITIND_{it} + \gamma_7 ROA_{it} + \gamma_8 AGE_{it} + \gamma_9 OP\_LEV_{it} \\ & + \gamma_{10} SALES\_VOL_{it} + \gamma_{11} ABILITY_{it} + \gamma_{12} FCF_{it} \\ & + industry\_dummies + year\_dummies + \omega_{it}. \end{aligned} \tag{3}$$

To investigate H2, we substitute the decomposed parts *IS_GARB* and *IS_INFO* for our aggregate income smoothing measure. Because the decomposition procedure results in firm-level income smoothing measures, our next model (4) includes time-invariant variables. These firm-level measures represent medians of the metric variables, in line with Dou *et al.* (2013):

$$\begin{aligned} IS\_GARB_i \, or \, IS\_INFO_i = {} & \gamma_0 + \gamma_1 STICKY_i + \gamma_2 SIZE_i + \gamma_3 LEV_i \\ & + \gamma_4 GROWTH_i + \gamma_5 BM_i + \gamma_6 LITIND_i + \gamma_7 ROA_i \\ & + \gamma_8 AGE_i + \gamma_9 OP\_LEV_i + \gamma_{10} SALES\_VOL_i \\ & + \gamma_{11} ABILITY_i + \gamma_{12} FCF_i \\ & + industry\_dummies + \omega_i. \end{aligned} \tag{4}$$

[10]We thank Peter Demerjian for making the data on the managerial ability score publicly available.

[11]The decomposed income smoothing model is estimated at the firm-level which is why it is not necessary to cluster the standard errors by firm. Alternatively, clustering standard errors at the industry-level does not significantly change our results. Furthermore, running a firm-year model (i.e., with 7,575 annual observations but with firm-level variables) and clustering observations by firm leads to similar estimates.

3.5. Data and sample

We extract data from Compustat NA and Compustat Quarterly for fiscal years 1980 through 2019. In order to investigate our two hypotheses, we require distinct sample selection processes as particularly the decomposition procedure of our aggregate income smoothing measure requires more stringent restrictions. The samples are consistently designed to span the period 1980–2016 but because of data restrictions for some control variables, our sample period starts in 1987. Table 1 summarises the sample selection procedure.

Panel A describes sample selection for the aggregate income smoothing model. We exclude all financial and public utility firms. In addition, we merge the annual data with the firm-level cost stickiness measure, based on quarterly data. For the remaining intersection, we require data availability to compute the smoothing variables and other model variables. The final sample comprises 25,507 firm-year observations for 3,964 distinct firms.

Sample selection for the decomposed income smoothing model, shown in Panel B, is similar but requires even more stringent restrictions. In particular, we require three years of additional data through 2019 to compute cumulative EPS and stock returns which ultimately also results in a sample period ending in 2016. We further delete observations in the top and bottom 1 percent of the EPS and stock return distributions to minimise the effect of outliers on Equation (1) (Tucker and Zarowin, 2006). We exclude firms with less than 10 and industries with less than 100 observations because firm-level results based on fewer observations would be rather unrepresentative (Dou *et al.*, 2013). Moreover, we additionally lose firms or industries with insufficient observations to perform the decomposition. For example, this is the case if firms have no loss observations to estimate the prices-lead-earnings Equation (1). After requiring data availability for the other model variables, the remaining number of firms is 520 (based on 7,575 firm-year observations).

Table 2, Panel A shows the industry distribution by sample. For parsimony, we summarise the observations by Fama and French's (1997) 12 industry classification, while we employ the 48 industry classification for our industry fixed-effect estimations. Panel B presents the distribution of firm-year observations over our final sample period from 1987 to 2016.

4. Results and discussion

4.1. Descriptive statistics

Table 3 presents distributional properties of our model variables. Panel A refers to univariate statistics of model (3) with our aggregate income smoothing measure. Although computed at the firm-year level, the aggregate income smoothing score *ISAGG* and underlying individual smoothing variables differ only insignificantly from firm-level values (Panel B), or even country-industry

Table 1
Sample selection

	Firm-Years	Firms
Panel A: aggregate income smoothing model		
All observations from Compustat NA in the period 1980–2016 excluding financial firms and public utilities	277,426	25,466
Merge annual data with Weiss' (2010) cost stickiness measure based on quarterly data by CUSIP and firm-year	164,927	20,874
Data available for calculating income smoothing variables	30,736	4,754
Final Sample: Data available for other model variables	25,507	3,964
Panel B: decomposed income smoothing model		
All observations from Compustat NA in the period 1980–2019 excluding financial firms and public utilities	295,501	26,094
Merge annual data with Weiss' (2010) cost stickiness measure based on quarterly data by CUSIP and firm-year	174,557	21,531
Data available for calculating income smoothing variables and EPS and return variables for estimating regression (1)	37,791	5,752
Trim top and bottom (1.0 percent) of all EPS and stock return variables	34,160	5,358
Require each firm to have at least 10 firm-year observations and each industry at least 100 observations	19,100	1,185
Sufficient Data available to decompose the aggregate income smoothing variable (e.g., loss-observations)	8,194	521
Final Sample: Data available for other model variables	7,575	520

Table 2
Sample characteristics

	(1) Aggregate IS model		(2) Decomposed IS model	
	Freq.	%	Freq.	%
Panel A: Industry distribution (Fama/French 12 Industry Classification)				
Consumer Non-durables	3,460	13.56	1,115	14.72
Consumer durables	1,304	5.11	473	6.24
Manufacturing	4,824	18.91	1,727	22.80
Energy	716	2.81	–	–
Chemicals	1,123	4.40	310	4.09
Business equipment	3,460	13.56	1,262	16.66
Telecommunication	562	2.20	–	–
Shops	5,664	22.21	1,870	24.69
Healthcare	1,462	5.73	414	5.47
Other	2,932	11.49	222	2.93
Total	25,507	100.00	7,575	100.00

Sample year	(1) %	(2) %	Sample Year	(1) %	(2) %
Panel B: firm-year distribution					
1987	0.28	1.89	2002	3.89	3.79
1988	1.54	1.95	2003	3.78	3.89
1989	1.71	2.23	2004	3.60	3.97
1990	1.83	3.06	2005	3.54	3.63
1991	2.03	3.22	2006	3.42	3.84
1992	2.32	3.29	2007	3.44	3.87
1993	2.78	3.54	2008	3.36	3.29
1994	4.10	3.76	2009	3.63	3.23
1995	4.51	3.95	2010	3.56	3.23
1996	4.41	3.93	2011	3.69	3.27
1997	4.32	4.12	2012	3.71	3.02
1998	4.23	4.13	2013	3.81	2.90
1999	4.06	4.15	2014	3.81	2.51
2000	3.74	4.04	2015	3.65	2.35
2001	3.85	3.83	2016	3.39	2.10
			Total	100.00	100.00

scores in prior literature (Dou *et al.*, 2013). Firm-level cost stickiness (*STICKY*) yields a positive mean (median) of 0.115 (0.078). As previously assumed, our sample firms on average pursue resource adjustment strategies which induce a sticky cost structure. In fact, *STICKY_DUMMY* indicates that a considerable majority of sample firms (62.2 percent) exhibit cost stickiness, which is in line with findings in the literature (e.g., Anderson *et al.*, 2003; Weiss, 2010). The

Table 3
Distributional properties

Variables	Mean	SD	P1	P25	P50	P75	P99
Panel A: aggregate smoothing model (N = 25,507 firm-year observations)							
$ISAGG_{it}$	0.013	0.966	−1.369	−0.424	0.276	0.720	0.978
$EM3_{it}$	−0.726	0.482	−1.331	−0.942	−0.625	−0.380	−0.231
$EM4_{it}$	0.757	0.309	0.300	0.700	0.900	1.000	1.000
IS_{it}	0.782	0.290	0.400	0.700	0.900	1.000	1.000
$STICKY_{it}$	0.115	0.448	−0.403	−0.114	0.078	0.338	0.678
$STICKY\_DUMMY_{it}$	0.622	0.485	0.000	0.000	1.000	1.000	1.000
$SIZE_{it}$	5.859	2.259	2.885	4.224	5.819	7.442	8.906
LEV_{it}	0.280	0.293	0.000	0.016	0.223	0.428	0.641
$GROWTH_{it}$	0.058	0.185	−0.131	−0.029	0.047	0.130	0.249
BM_{it}	0.767	0.328	0.362	0.529	0.745	0.969	1.177
$LITIND_{it}$	0.303	0.459	0.000	0.000	0.000	1.000	1.000
ROA_{it}	0.033	0.323	−0.069	0.007	0.047	0.090	0.138
AGE_{it}	24.092	14.059	9.000	13.000	20.000	33.000	46.000
OP_LEV_{it}	0.280	0.201	0.059	0.126	0.234	0.384	0.585
$SALES\_VOL_{it}$	0.430	1.191	0.003	0.012	0.054	0.245	0.973
$ABILITY_{it}$	0.001	0.117	−0.127	−0.071	−0.013	0.058	0.149
FCF_{it}	0.068	0.091	−0.032	0.028	0.073	0.118	0.169
Panel B: decomposed smoothing model (N = 520 firm observations)							
IS_GARB_i	−0.330	1.100	−3.550	−0.949	−0.132	0.420	1.448
IS_INFO_i	0.088	0.114	−0.163	0.053	0.078	0.113	0.520
$EM3_i$	−0.795	0.300	−1.556	−0.988	−0.784	−0.577	−0.229
$EM4_i$	0.789	0.177	0.217	0.716	0.846	0.916	0.988
IS_i	0.815	0.162	0.209	0.757	0.864	0.928	0.988
$STICKY_i$	0.058	0.154	−0.354	−0.022	0.034	0.126	0.545
$SIZE_i$	5.530	2.068	1.509	4.052	5.344	6.749	10.949
LEV_i	0.239	0.213	0.000	0.038	0.203	0.386	0.801
$GROWTH_i$	0.053	0.052	−0.065	0.024	0.048	0.080	0.201
BM_i	0.814	0.230	0.226	0.674	0.816	0.949	1.493
$LITIND_i$	0.352	0.478	0.000	0.000	0.000	1.000	1.000
ROA_i	0.041	0.037	−0.060	0.022	0.040	0.059	0.130
AGE_i	21.928	11.822	8.000	13.000	17.500	28.500	50.000
OP_LEV_i	0.235	0.152	0.028	0.128	0.206	0.304	0.768
$SALES\_VOL_i$	1.307	3.388	0.002	0.036	0.174	0.709	19.313
$ABILITY_i$	−0.005	0.068	−0.141	−0.049	−0.014	0.030	0.209
FCF_i	0.060	0.042	−0.056	0.038	0.061	0.085	0.163

Variables are defined in Appendix I. All continuous annual variables are winsorised at 1 percent tails.

average firm in our sample has a debt ratio of 28.0 percent, is growing and profitable. A book-to-market ratio below one suggests growth opportunities. Furthermore, 30.3 percent of firms are subject to increased litigation risk.

Panel B documents distributional statistics for the firm-level decomposed smoothing model. Again, both the individual smoothing variables and the

decomposed variables (*IS_GARB* and *IS_INFO*) have the expected distributions that are consistent with prior research (e.g., Dou *et al.*, 2013; Shuto and Iwasaki, 2014). Furthermore, we generally do not find large difference for the distributions of the firm-level variables compared to our larger firm-year sample presented in Panel A.

Table 4 reports the correlation matrix for our models. The majority of correlations are significant but small. As such, collinearity should not be a major concern. Moreover, variance inflation factors (VIFs) for all variables are below critical textbook levels for our regression models (i.e., all VIFs are consistently below 5). The Pearson (Spearman) correlation coefficient between *ISAGG* and *STICKY* amounts to −0.03 (−0.04) and is highly significant at the 0.01 level. This supports our discussion culminating in H1 that cost stickiness and income smoothing are negatively associated. With respect to the decomposition (H2), the correlations are significantly negative for the garbling component only, suggesting that cost stickiness primarily restricts managers in pursuing opportunistic income smoothing motives. Moreover, *IS_INFO* is significantly associated with factors that naturally affect a firm's earnings smoothness, such as operational leverage and profitability. *IS_GARB*, in turn, exhibits significant correlations with variables proxying for managerial incentives to smooth earnings, such as leverage, the book-to-market ratio, litigation risk, and free cash flow. The Spearman correlations both for *IS_GARB* and *IS_INFO* are positive and significant with the aggregate income smoothing score *ISAGG*, but the correlation is much stronger for the garbling component (0.99 vs. 0.07). With the Pearson approach, the correlation between *IS_INFO* and *ISAGG* is even not statistically different from zero. This pattern is in accordance with prior literature using the same decomposition procedure (Shuto and Iwasaki, 2014) and implies that most of the income smoothing activities of the firms in our sample can be explained by opportunistic motives instead of the intention to provide additional information.

4.2. Main results

4.2.1. Aggregate income smoothing model

To test our main hypothesis H1 on the effect of cost stickiness on income smoothing, we estimate the multivariate regression model (3) and report the results in Table 5. We find that the coefficient on the cost stickiness measure *STICKY*, as our variable of interest, is negative and significant. This result confirms our prediction that a more pronounced degree of cost asymmetry seems to mitigate income smoothing since cost stickiness induces more volatile earnings. Hence, managers seemingly have difficulties to simultaneously balance motives for a smooth earnings path and a sticky cost structure.

Table 4
Correlations

Variables	A	B	C	D	E	F	G	H
Part I								
A: *ISAGG*		**−0.04**	**0.10**	0.00	**0.09**	**−0.01**	0.00	**0.11**
B: *STICKY*	**−0.03**		0.01	**0.05**	**−0.03**	**0.04**	**−0.02**	**−0.13**
C: *SIZE*	**0.12**	0.01		**0.35**	**0.05**	**−0.24**	0.01	**0.19**
D: *LEV*	−0.01	**0.05**	**0.25**		**−0.01**	**0.08**	**−0.09**	**−0.20**
E: *GROWTH*	**0.05**	**−0.03**	**0.02**	**−0.02**		**−0.26**	0.01	**0.39**
F: *BM*	**−0.02**	**0.04**	**−0.24**	**−0.02**	**−0.21**		**−0.05**	**−0.53**
G: *LITIND*	0.00	**−0.02**	**0.02**	**−0.07**	0.01	**−0.04**		**−0.02**
H: *ROA*	**0.04**	**−0.05**	**0.10**	**−0.04**	**0.10**	**−0.08**	**−0.01**	
I: *AGE*	**0.06**	**−0.02**	**0.37**	**0.09**	**−0.08**	**−0.09**	**−0.09**	**0.03**
J: *OP_LEV*	**−0.06**	**0.04**	**0.12**	**0.21**	0.00	**0.04**	−0.01	0.01
K: *SALES_VOL*	**0.03**	**−0.02**	**0.56**	**0.09**	0.01	**−0.10**	**0.10**	**0.03**
L: *ABILITY*	**0.03**	**0.06**	**0.03**	**−0.10**	**0.11**	**−0.20**	**0.04**	**0.08**
M: *FCF*	**0.04**	**−0.05**	**0.21**	**−0.05**	**0.09**	**−0.20**	**0.03**	**0.23**
N: *IS_GARB*	**0.99**	**−0.13**	−0.01	**0.11**	0.02	**0.13**	**−0.10**	−0.02
O: *IS_INFO*	0.01	−0.03	−0.02	**−0.07**	**−0.12**	−0.04	0.07	**−0.23**

Variables	I	J	K	L	M	N	O
Part II							
A: *ISAGG*	**0.07**	**−0.06**	**0.09**	**0.04**	**0.02**	**0.99**	**0.07**
B: *STICKY*	**−0.04**	**0.04**	0.00	**0.07**	**−0.05**	**−0.14**	0.06
C: *SIZE*	**0.33**	**0.16**	**0.92**	0.00	**0.18**	0.02	0.00
D: *LEV*	**0.10**	**0.27**	**0.31**	**−0.14**	**−0.06**	**0.11**	−0.04
E: *GROWTH*	**−0.07**	0.00	**0.08**	**0.13**	**0.13**	0.00	−0.07
F: *BM*	**−0.07**	**0.04**	**−0.25**	**−0.21**	**−0.29**	**0.16**	0.04
G: *LITIND*	**−0.09**	0.00	**0.06**	**0.05**	**0.05**	**−0.08**	0.00
H: *ROA*	**0.10**	0.00	**0.19**	**0.28**	**0.49**	−0.06	**−0.10**
I: *AGE*		**0.03**	**0.27**	**0.05**	**0.03**	0.00	−0.06
J: *OP_LEV*	−0.01		**0.11**	**−0.15**	**0.20**	**−0.07**	**0.09**
K: *SALES_VOL*	**0.20**	**0.04**		**0.05**	**0.17**	0.02	−0.05
L: *ABILITY*	**0.04**	**−0.15**	**0.11**		**0.14**	−0.02	−0.02
M: *FCF*	**0.03**	**0.18**	**0.07**	**0.12**		**0.17**	0.03
N: *IS_GARB*	0.01	−0.03	−0.07	−0.02	**0.12**		−0.05
O: *IS_INFO*	−0.05	0.01	−0.04	−0.07	**−0.11**	**−0.11**	

Spearman (Pearson) correlations are presented above (below) the diagonal. Bold font indicates significance at the 0.1 level. For parsimony, the matrix combines the annual aggregate and firm−level decomposed model. Hence, all variables except the decomposed smoothing variables have dual functions. When correlated among each other, they represent the aggregate model (N = 25,507 firm−yeas). Correlated to the decomposed variables *IS_GARB* or *IS_INFO*, they represent the decomposed model (N = 520 firms). Variables are defined in Appendix I.

Table 5
Effect of cost stickiness on aggregate income smoothing

		Main model	
Dep. Var.: *ISAGG*	Exp. Sign	Coefficient	*t*-statistics
γ_0: *Intercept*		−0.338***	(−2.69)
γ_1: *STICKY*	−	−0.050**	(−2.15)
γ_2: *SIZE*	+	0.080***	(10.56)
γ_3: *LEV*	+	−0.130***	(−3.45)
γ_4: *GROWTH*	+	0.268***	(6.54)
γ_5: *BM*	+	0.137***	(3.77)
γ_6: *LITIND*	+/−	−0.100*	(−1.92)
γ_7: *ROA*	+	0.045	(1.30)
γ_8: *AGE*	+	0.002*	(1.94)
γ_9: *OP_LEV*	−	−0.413***	(−5.03)
γ_{10}: *SALES_VOL*	−	−0.037***	(−3.62)
γ_{11}: *ABILITY*	+	0.065	(0.71)
γ_{12}: *FCF*	+	0.199**	(1.97)
Industry/Year Fixed Effects		Yes	
N (#Firm-Years)		25,507	
Adj. R^2		0.063	

This table presents regression results of the aggregate income smoothing model (3). ***, **, and * indicate two-sided significance at the 0.01, 0.05 and 0.1 levels, respectively. Robust *t*-statistics, clustered at the firm-level, are presented in parentheses. Variables are defined in Appendix I.

To facilitate the interpretation of the economic impact of cost stickiness on income smoothing, we follow Demerjian *et al.* (2020) and adjust our main model (3) by including the indicator variable *STICKY_DUMMY* instead of the continuous measure and by using the decile rank of *ISAGG* as dependent variable (untabulated). We find a significant coefficient for *STICKY_DUMMY* which amounts to −0.089 suggesting that, *ceteris paribus*, a sticky cost structure reduces the rank of the firm's income smoothing by almost one decile.[12] As a reference point, if we include an indicator variable for managerial ability, which recent literature has associated with income smoothing (e.g., Baik *et al.*, 2020; Demerjian *et al.*, 2020), we find a significantly positive impact but the coefficient is smaller (0.066) implying that able managers affect the degree of income smoothing relatively less than deliberate resource adjustment decisions.

[12]The economic impact is even more pronounced when we consider a one-year lagged indicator of cost stickiness. The estimate amounts to −0.113, or more than one decile rank. The impact of managerial decisions on cost stickiness and income smoothing might not be immediate, which is why we possibly find a stronger impact for this one-year lagged measure.

The coefficients for the control variables generally comply with our predictions and recent literature (e.g., Dou *et al*., 2013; Lee *et al*., 2015; Hamm *et al*., 2018; Baik *et al*., 2020). As an exception, we do not find the anticipated positive impact for *LEV*. However, the significantly negative association is in line with results by Dou *et al*. (2013) who use a similar research design. Moreover, the estimate on *ABILITY* is not statistically different from zero, which is not in accordance with recent evidence (Baik *et al*., 2020; Demerjian *et al*., 2020). However, using an ability indicator variable, we find a significant impact at the 0.1 level, which points to a small but economically meaningful association.

4.2.2. Decomposed income smoothing model

So far, our results provide evidence that cost stickiness is negatively associated with income smoothing, but they do not allow us to draw conclusions about which motives are the underlying reason. In particular, recent research discusses that income smoothing can play an informational or garbling role. Whereas the former provides private information to stakeholders, the latter exploits discretion in order to pursue opportunistic motives. Hence, we also investigate whether cost stickiness particularly reduces garbling or informational income smoothing (H2). To examine H2, we employ the same multivariate regression as for the aggregate model (3), but with the garbling and informational income smoothing measures as dependent variables (model (4)).

The results, presented in Table 6, indicate that cost stickiness particularly constrains garbling income smoothing. More specifically, for the garbling component (*IS_GARB*) in Panel A, the coefficient γ_1 on *STICKY* is negative and significant. By comparison, the effect of *STICKY* on the informational component (*IS_INFO*) is not statistically different from zero, suggesting that the negative effect of asymmetric cost behaviour on income smoothing is focused on the garbling component. This implies that the income smoothing activities of our sample firms primarily reflect opportunistic motives rather than the provision of additional information about the firm's true economic conditions, in line with recent evidence (e.g., Chen *et al*., 2017). Both income smoothing and cost stickiness are phenomena based on managerial discretion. It seems that managers particularly exploit their discretion to pursue personal motives causing the negative relationship (i.e., trade-off) between (garbling) income smoothing and cost stickiness. With respect to the non-discretionary, informative part, this portion of income smoothing likely stems from the business model and accrual reversals and, thus, occurs quasi-naturally.

Table 6
Effect of cost stickiness on decomposed income smoothing components

	IS_GARB		*IS_INFO*	
Dep. Var.:	Coefficient	*t*-statistics	Coefficient	*t*-statistics
γ_0: *Intercept*	−1.108**	(−2.33)	0.227***	(2.88)
γ_1: *STICKY*	−0.844**	(−2.24)	−0.016	(−0.30)
γ_2: *SIZE*	0.069*	(1.84)	0.006*	(1.73)
γ_3: *LEV*	0.753**	(2.44)	−0.128***	(−3.02)
γ_4: *GROWTH*	1.503	(1.44)	−0.180	(−1.31)
γ_5: *BM*	0.809***	(2.65)	−0.088*	(−1.74)
γ_6: *LITIND*	−0.147	(−0.60)	0.028	(0.88)
γ_7: *ROA*	3.617*	(1.72)	−1.191***	(−2.88)
γ_8: *AGE*	−0.001	(−0.31)	−0.000	(−0.43)
γ_9: *OP_LEV*	−0.888	(−1.62)	0.040	(0.71)
γ_{10}: *SALES_VOL*	−0.037*	(−1.74)	−0.003**	(−1.99)
γ_{11}: *ABILITY*	−0.019	(−0.03)	0.075	(0.98)
γ_{12}: *FCF*	2.836	(1.38)	0.127	(0.62)
Industry fixed effects	Yes		Yes	
N (#Firms)	520		520	
Adj.R^2	0.078		0.089	

This table presents regression results of the decomposed income smoothing model (4). ***, **, and * indicate two-sided significance at the 0.01, 0.05 and 0.1 levels, respectively. Robust *t*-statistics are presented in parentheses. Variables are defined in Appendix I.

4.2.3. Sensitivity analyses and endogeneity concerns

We perform several additional analyses to ensure the robustness of our main results. In our first three robustness tests, we re-estimate regressions (3) and (4) after substituting the three individual income smoothing measures *EM*3, *EM*4, and *IS* for the aggregate score *ISAGG*. As such, we examine if our conclusions also hold for the individual income smoothing measures. Next, we adjust our aggregate income smoothing score by using individual smoothing measures *EM*4 and *IS* that are computed with Pearson instead of Spearman correlations. Applying Spearman correlations in our main results, we follow Dou *et al.* (2013), whereas Tucker and Zarowin (2006) originally employ Pearson correlations. The remaining sensitivity tests focus on the decomposed income smoothing model (4) where we use firm-level variables. For our main tests, we use median scores to calculate firm-level measures of our independent variables. While median values are less prone to outliers, we now test whether our inferences also hold for the use of means. Finally, we modify the decomposition procedure. More precisely, we employ the original Tucker and Zarowin (2006) prices-lead-earnings equation which omits the separation into profitable and nonprofitable cumulative three-year EPS. This decreases data requirements

because the aggregate smoothing score can now also be decomposed for firms without losses, resulting in a larger sample of 969 firm observations.

Panel A of Table 7 summarises the results for these robustness tests. Except for the single smoothing measure *EM*4, our main results remain robust for all modifications. We continue to find support for our hypotheses that cost stickiness negatively affects income smoothing. Furthermore, we consistently find that *STICKY* only has a negative association with the garbling component of income smoothing, with the exception of the test in which we use *IS* as the smoothing variable underlying the decomposition.

In Panel B of Table 7 we report results for two additional tests which address potential endogeneity concerns. We acknowledge that the relation between income smoothing and cost stickiness is somewhat mechanical, since a sticky cost structure induces a bumpier earnings path. For this reason, we first repeat our main model (3) with a lagged cost stickiness measure. Hence, instead of focusing on the resource adjustment strategy over the recent five years, we consider the cost structure over years *t*–9 to *t*–5. In other words, it seems rather far-fetched that the 'stickiness regime' from (more than) five years ago should have a direct, mechanical association with contemporaneous income smoothing. Taking this one step further, since both cost stickiness and income smoothing are long-term strategies that should not fluctuate significantly year-over-year, we perform an 'out-of-sample' analysis. As such, we treat the first 15 years of our sample period (1987–2001) as our estimation period to predict the resource adjustment strategy. Then, we re-run model (3) for the remaining period (2002–2016) building on this 'forecast' cost stickiness variable. For both tests, which relieve the seemingly mechanical constraint, we continue to find negative and statistically significant estimates for our adjusted *STICKY* measure.

4.3. Additional cross-sectional analyses

Our previous tests provide robust evidence that cost stickiness mitigates the smoothness of a firm's earnings path and that this effect is primarily driven by the garbling role of income smoothing. Hence, the underlying motives to make resource adjustments decisions in such a manner that they result in a sticky cost structure seem to restrict managers in simultaneously pursuing self-serving motives for reporting a smooth income stream. In Table 8, we conduct additional subsample tests which are supposed to enhance our understanding of the relationship between cost stickiness and income smoothing.[13]

[13]Additionally to the subsample tests reported here, we have also distinguished between periods of high and low sales volatility because Banker and Chen (2006) have reported that earnings are more sensitive to sales decreases than increases when costs are sticky. However, we do not find a significant difference in the effect of cost stickiness on income smoothing for both subsamples (untabulated).

Table 7
Sensitivity and endogeneity tests

	(1) Single smoothing variable: *EM*3			(2) Single smoothing variable: *EM*4		
Dep. Var.:	*ISAGG*	*IS_GARB*	*IS_INFO*	*ISAGG*	*IS_GARB*	*IS_INFO*
Panel A: sensitivity tests						
γ_1: *STICKY*	−0.023**	−0.204**	−0.009	−0.010	−0.117*	−0.010
	(−2.18)	(−2.31)	(−1.36)	(−1.37)	(−1.71)	(−0.26)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	No	No	Yes	No	No
N	25,507 (Firm−Years)	520 (Firms)	520 (Firms)	25,507 (Firm−Years)	520 (Firms)	520 (Firms)
Adj.R^2	0.040	0.064	0.080	0.049	0.119	0.111
	(3) Single smoothing variable: ***ISI***			(4) Pearson correlation		
γ_1: *STICKY*	−0.013*	−0.151	−0.002	−0.041*	−0.835**	0.012
	(−1.66)	(−0.62)	(−0.12)	(−1.71)	(−2.11)	(0.11)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

(continued)

Table 7 (continued)

	(3) Single smoothing variable: ***ISI***			(4) Pearson correlation		
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	No	No	Yes	No	No
N	25,507 (Firm−Years)	520 (Firms)	520 (Firms)	25,507 (Firm−Years)	520 (Firms)	520 (Firms)
Adj.R^2	0.051	0.046	0.070	0.067	0.041	0.067

	(5) Mean values		(6) Alternative decomposition procedure	
Dep. Var.:	*IS_GARB*	*IS_INFO*	*IS_GARB*	*IS_INFO*
γ_1: *STICKY*	−0.433*	0.008	−0.714***	−0.031
	(−1.84)	(0.36)	(−2.85)	(−1.41)
Control variables	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No
N	520 (Firms)	520 (Firms)	969 (Firms)	969 (Firms)
Adj.R^2	0.044	0.062	0.053	0.096

	(1) Lagged cost stickiness variable	(2) Out-of-sample approach
Dep. Var.:	*ISAGG*	*ISAGG*
Panel B: tests addressing endogeneity		
γ_1: *STICKY*	−0.101***	−0.076*
	(−3.29)	(−1.66)
Control variables	Yes	Yes

(continued)

Table 7 (continued)

Dep. Var.:	(1) Lagged cost stickiness variable *ISAGG*	(2) Out-of-sample approach *ISAGG*
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	16,776 (Firm–Years)	12,617 (Firm–Years)
Adj.R^2	0.062	0.064

This table presents regression results for different additional robustness tests for our main models (3) and (4). ***, **, and * indicate two-sided significance at the 0.01, 0.05 and 0.1 levels, respectively. Robust *t*-statistics, clustered at the firm-level for the annual model (3), are presented in parentheses. For parsimony, only the coefficients for the variable of interest *STICKY* are reported. Variables are defined in Appendix I.

Panel A of Table 8 reports three subsample tests on the general relationship between cost stickiness and income smoothing. More precisely, with these tests we aim at exploring in which situations cost stickiness has a significant impact on aggregate income smoothing. In the first two columns, we differentiate between firms regarding their levels of adjustment costs. Adjustment costs have been identified as a key reason for managers not to adjust resources as a response to a sales decline (e.g., Anderson *et al*., 2003; Banker *et al*., 2018). Hence, particularly managers in firms with high levels of adjustment costs should be more likely to stick to unitised resources in periods of sales downturns, which restricts their ability to report smooth income streams. Using a median split on employee intensity as a well-accepted proxy for firms' adjustment costs (e.g., Anderson *et al*., 2003), our test indeed shows that cost stickiness has a significantly negative impact on income smoothing for the high adjustment cost subsample only, with the difference in the coefficients γ_1 also being statistically significant.[14]

Next, we investigate the role of managerial expectations for the relationship between cost stickiness and income smoothing. Managerial optimism is considered as a key driver for managerial decisions to retain unused resources in periods with a decline in sales (Anderson *et al*., 2003; Banker *et al*., 2014; Chen *et al*., 2019). We follow prior literature and use GDP growth as a proxy for managerial optimism (e.g., Anderson *et al*., 2003; Dierynck *et al*., 2012). In times of greater economic upswing, managers are expected to be more optimistic about future demand conditions which is why they should be less likely to cut costs even if firm-specific sales are decreasing, which ultimately restrains them to simultaneously report a smooth income stream over the long term. In line with these considerations, we find that cost stickiness has a significant impact on income smoothing for the high GDP growth subsample only (based on a median split), and the difference between the coefficients γ_1 is also significant.

In the last two columns of Panel A, we investigate the moderating role of managerial ability on the relationship between cost stickiness and income smoothing. Both cost stickiness and income smoothing are the outcome of complex resource adjustment or financial accounting strategies, which is why managerial ability should play a crucial role for both activities, as reported by recent literature (Choi *et al*., 2019; Baik *et al*., 2020; Demerjian *et al*., 2020). We find a significant trade-off for the low ability subsample, but there is no statistically significant association between cost stickiness and income smoothing for firms with more able managers (again based on a median split). This might suggest that able managers can handle both strategies simultaneously while others need to trade-off the underlying incentives for a sticky cost structure and a smooth income stream. However, we acknowledge that the difference in the coefficients is not statistically significant ($p = 0.16$).

[14]In line with prior literature (e.g., Kama and Weiss, 2013; Lee *et al*., 2020), we test for the equality of the coefficients across subsamples by estimating a fully-interacted model. Alternatively calculating z-values as in Holzhacker *et al*. (2015) leads to similar results.

In Panel B, we explore in which situations the decomposed income smoothing variables *IS_GARB* and *IS_INFO* play the dominant role by differentiating between firms with greater and lower agency conflicts based on a median split on *FCF* as a well-accepted proxy for the level of agency conflicts (e.g., Chung *et al*., 2005; Chen *et al*., 2012). When there are greater agency conflicts, *STICKY* is significantly negatively associated with the garbling component *IS_GARB*. However, there is no significant effect of cost stickiness on garbling income smoothing when agency conflicts are low. This suggests that opportunistic, garbling income smoothing does play a subordinate role in low agency conflict settings. For *IS_INFO* as dependent variable, we do not find a significant coefficient γ_1 on *STICKY* for neither of the agency conflict subsamples. However, γ_1 is only negative for the low agency conflict subsample and the coefficients are statistically significantly different between the two subsamples, which provides weak evidence that in this situation cost stickiness does not primarily restrict managerial opportunism leading to a smooth income stream, but seemingly decreases the ambition to signal additional information to the capital market. In sum, this test suggests that the underlying reason for the trade-off between cost stickiness and income smoothing significantly depends on the level of agency conflicts.

5. Conclusion

This study contributes to the literature on cost stickiness as well as income smoothing. Employing a firm-specific measure of cost stickiness (Weiss, 2010), we show that an asymmetric reaction of cost to sales changes (i.e., cost stickiness) has a negative impact on income smoothing. We further decompose our aggregate income smoothing measure into its informational and garbling components (Dou *et al*., 2013) and provide evidence that cost stickiness only has a significantly negative influence on the garbling part, which reflects discretionary actions by self-serving managers. This finding suggests that the negative relation is based on an inherent trade-off between seemingly conflicting discretionary managerial motives. Additional analyses show that this trade-off is more pronounced in specific settings in which managers are more likely to retain unused resources (e.g., high adjustment costs) and that able managers can seemingly better simultaneously handle both complex strategies.

Since our research touches on both, the financial and management accounting literature, our findings have implications for a wide range of recipients. For instance, for researchers our findings demonstrate the importance of considering the implications of internal cost choices for the feasibility of long-term (discretionary) accounting income smoothing, while prior literature has primarily focused on the implications of short-term financial accounting choices for cost behaviour (Dierynck *et al*., 2012; Kama and Weiss, 2013). We thus provide a more generalised framework which hopefully stimulates additional research at the intersection of managerial and financial

accounting. Furthermore, the results should also have implications for practitioners. In particular, shareholders must consider the reported interdependencies between managerial behaviour in cost and financial accounting in order to create more efficient incentive schemes.

Although we include a wide range of controls and perform numerous robustness tests, our findings are subject to certain caveats. First, we acknowledge that the documented statistical associations do not necessarily imply causality. Second, like most of the empirical evidence on cost behaviour, our findings pertain to larger, publicly traded firms in North America. Hence, the results are not necessarily generalisable to other (e.g., private and/or non-US) firms. For instance, the results might differ for private firms, which are characterised by certain peculiarities such as stronger ownership concentration and little agency problems (e.g., Burgstahler *et al*., 2006). Moreover, because of the stringent data requirements for our model variables, which in particular result in a fairly small sample for the analyses with the decomposed smoothing measures, we acknowledge that these findings cannot necessarily be generalised. Third, although we adopt proxies for cost stickiness and income smoothing from established prior research, we cannot fully rule out measurement error as an alternative explanation.

Next, in our study we focus on the effect of cost stickiness on income smoothing because this longer-term perspective is new to the literature. Having said that, one could also investigate the reverse effect of income smoothing on cost behaviour in greater detail. Furthermore, our income smoothing variables capture only artificial (i.e., accrual) income smoothing. However, managers may also apply real smoothing activities (i.e., shifting real transactions) to pursue their goals. This distinction is important since cost stickiness, fundamentally, is a cost accounting phenomenon based on (real) managerial resource adjustment decisions. As such, primarily cash flow-related real smoothing measures should be related to cost behaviour. Nevertheless, managerial cost behaviour choices and the implied cost asymmetry are proxied employing financial accounting data. As a consequence, they are also associated with accrual smoothing decisions, turning cost stickiness also into a fundamental financial accounting issue (for in-depth theoretical discussions on the financial accounting implications of cost behaviour, we refer the reader to Banker and Byzalov, 2014; Banker *et al*., 2018; Shust and Weiss, 2014).

Finally, our results suggest a trade-off between underlying managerial motives for cost stickiness and income smoothing. We follow Dou *et al*. (2013) to generate a variable specifically representing opportunistic managerial behaviour in income smoothing. However, to our knowledge, there is no reliable procedure to empirically decompose cost stickiness into its 'good' (i.e., the portion of cost asymmetry that is driven by economic considerations in the interest of the firm) and 'bad' (i.e., the portion caused by opportunistic managerial discretion) components. Despite our research design to test the prediction by comparing the influence of cost stickiness on the garbling and

Table 8
Subsample tests

	(1) Adjustment costs		(2) Optimism		(3) Managerial ability	
Dep. Var.: *ISAGG*	High *EI*	Low *EI*	High *GDP_G*	Low *GDP_G*	High *ABILITY*	Low *ABILITY*
Panel A: role of adjustment costs, optimism, and managerial ability for the relationship between cost stickiness and income smoothing						
γ_1: *STICKY*	−0.095***	0.005	−0.078***	−0.008	−0.016	−0.073**
	(−2.90)	(0.17)	(−2.81)	(−0.27)	(−0.52)	(−2.45)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
p-value for difference in γ_1	0.02		0.03		0.16	
N	12,457 (Firm−Years)	12,457 (Firm−Years)	13,399 (Firm−Years)	12,108 (Firm−Years)	12,753 (Firm−Years)	12,754 (Firm−Years)
Adj.R^2	0.073	0.070	0.060	0.072	0.065	0.066

	IS_GARB		*IS_INFO*	
Dep. Var.:	High *FCF*	Low *FCF*	High *FCF*	Low *FCF*
Panel B: role of agency conflicts for the effect of cost stickiness on decomposed smoothing variables				
γ_1: *STICKY*	−2.177***	0.106	0.055	−0.113
	(−3.88)	(0.22)	(1.34)	(−1.40)
Control variables	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No
p-value for difference in γ_1	0.00		0.06	

(continued)

Table 8 (continued)

	IS_GARB		*IS_INFO*	
Dep. Var.:	High *FCF*	Low *FCF*	High *FCF*	Low *FCF*
N	260 (Firms)	260 (Firms)	260 (Firms)	260 (Firms)
Adj.R^2	0.118	0.054	0.040	0.091

This table presents regression results for different subsample tests for our main models (3) and (4). ***, **, and * indicate two-sided significance at the 0.01, 0.05 and 0.1 levels, respectively. Robust *t*-statistics, clustered at the firm-level for the annual model (3), are presented in parentheses. For parsimony, only the coefficients for the variable of interest *STICKY* are reported. Variables are defined in Appendix I.

informational role of income smoothing, along with the additional subsample tests, this limits our inferences. We hope that our study motivates future research to explore means to separate the economic from the discretionary component of cost stickiness.

Conflict of interest

No potential conflict of interest was reported by the author(s).

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Appendix

Variable definitions

Variable	Definition
Underlying variables for the generation of the income smoothing variables	
TA	Total assets (*at*)
OI	Operating income after depreciation (*oiadp*)
TAC	Total accruals of firm *i* in year *t*, calculated as the change in current assets (*act*) – the change in cash (*ch*) – the change in current liabilities (*lct*) + the change in short-term debt (*dlc*) – depreciation (*dp*)
CFO	Cash flow from operations, calculated as operating income (*oiadp*) minus total accruals (*TAC*)
DAC	Discretionary accruals, calculated as the residuals from modified Jones' (1991) model (see equation (1) in Tucker and Zarowin (2006)): total accruals (*TAC*), change in sales (Δ*sales* (*sale*)) and gross property, plant and equipment (*ppe* (*ppegt*)) are scaled by lagged total assets ($ta_{t\ 1}$. (*at*)); *roa* is net income (*ni*) scaled by lagged total assets (*at*)
NDAC	Non-discretionary accruals, calculated as the fitted values from modified Jones' (1991) model (see equation (1) in Tucker and Zarowin (2006)
PDI	Pre-managed income, calculed as net income (*ni*) scaled by lagged total assets (*at*) minus discretionary accruals (*DAC*)

(continued)

Appendix (continued)

Variable	Definition
R_t	Annual stock return, calculated as holding period return over the firm's fiscal year (*prcc*), adjusted for stock splits (*ajex*) and dividends (*dvpsx*)
R_{t3}	Aggregate stock return in years $t+1$ to $t+3$ with annual compounding
EPS_t	Basic earnings per share excluding extraordinary items (*epspx*), adjusted for stock splits and stock dividends and scaled by lagged stock prices (*prcc*)
$EPS_{t\ 1}$	Past year's (t 1)*EPS*
EPS_{t3}	Sum of *EPS* for $t+1$ to $t+3$
Profit	Indicator variable that equals 1 if firm's cumulative three-year *EPS* is positive, and 0 otherwise
Income smoothing variables	
ISAGG	First component from principal component analysis of $EM3_i$, $EM4_i$ and IS_i (Dou *et al.*, 2013).
*EM*3	Standard deviation of operating income (*oiadp*) and cash flow from operations (*CFO*), both scaled by lagged total assets (*at*), multiplied by −1. For the firm-year aggregate income smoothing model, the measure is calculated annually over a rolling 5-year window. For the firm-level decomposed income smoothing model, it calculated for the whole sample period for each firm
*EM*4	Spearman correlation of the change in total accruals (*TAC*) and the change in in cash flow from operations (*CFO*), multiplied by −1. For the firm-year aggregate income smoothing model, the measure is calculated annually over a rolling 5-year window. For the firm-level decomposed income smoothing model, it calculated for the whole sample period for each firm
IS	Spearman correlation of the change in discretionary accruals (*DAC*) and the change in pre-managed income (*PDI*), multiplied by −1. For the firm-year aggregate income smoothing model, the measure is calculated annually over a rolling 5-year window. For the firm-level decomposed income smoothing model, it calculated for the whole sample period for each firm
IS_GARB	Garbling component of income smoothing, calculated as the residuals from regressing within each two-digit SIC industry the firm level *ISAGG* on the Future Earnings Response Coefficients (FERC) (see equation (2) in Dou *et al.* (2013). FERCs are obtained by estimating the prices-lead-earnings equation (1) adopted from Tucker and Zarowin (2006)
IS_INFO	Informational component of income smoothing, calculated as the predicted value from regressing within each two-digit SIC industry the firm level *ISAGG* on the Future Earnings Response Coefficients (FERC) (see equation (2) in Dou *et al.* (2013). FERCs are obtained by estimating the prices-lead-earnings equation (1) adopted from Tucker and Zarowin (2006)
Cost stickiness variables	
$SALE_{i,t_q}$	Quarterly sales revenue (*saleq*)

(continued)

Appendix (continued)

Variable	Definition
$COST_{i,t_q}$	Quarterly operating costs, calculated as quarterly sales revenue (*saleq*) less income before extraordinary items (*ibq*)
STICKY	Difference between the cost function slopes of the most recent quarters t_q in fiscal years t, one with growth in sales and the other with a downturn (Weiss, 2010), multiplied by −1 (see equation (2)). For the firm-year aggregate income smoothing model, the measure is calculated annually by considering the average cost stickiness level over a rolling 5-year window. For the firm-level decomposed income smoothing model, it calculated for the whole sample period for each firm by using the median
STICKY_DUMMY	Indicator variable that equals 1 if *STICKY* is positive, and 0 otherwise
Control Variables (for the firm-level decomposed income smoothing variable, firm median values are used)	
SIZE	Natural logarithm of total assets (*at*)
LEV	Ratio of the long-term debt (*dltt*) to the sum of long-term debt and book value of equity (*ceq*)
GROWTH	Annual percentage change in revenue (*sale*)
BM	Book (*at*) to market (total assets (*at*) – total common equity (*ceq*) + closing price (*prcc*) * common shares outstanding (*csho*)) ratio
LITIND	Indicator variable that equals 1 if a firm operates in a high litigation risk industry (four-digit SIC codes of 2,833-2,836, 3,570-3,577, 3,600-3,674, 5,200–5,961, and 7,370–7,374, see Francis *et al*., 1994), and 0 otherwise
ROA	Net income (*ni*) divided by lagged total assets (*at*)
AGE	Number of years since the listing year
OP_LEV	Operational leverage, measured as net property, plant, and equipment (*ppent*) divided by total assets (*at*)
SALES_VOL	Sales volatility, measured as the standard deviation of net sales (*sales*), divided by1,000. For the annual model, it is calculated over a rolling 5-year-window and for the decomposed model is calculated at firm-level
ABILITY	Managerial ability as computed by Demerjian *et al*. (2012)
FCF	Free cash flow, measured as cash flow from operating activities (*oancf*) – common (*dvc*) and preferred dividend (*dpv*) payments, scaled by total assets (at)
Variables used in additional subsample tests	
EI	Employee intensity, calculated as the natural logarithm of the number of employees divided by sales
GDP_G	Annual growth in GDP

Compustat mnemonics are presented in parentheses.