Nominal Rigidities, Earnings Manipulation, and Securities Regulation*

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Abstract

This paper documents a new fact: firms with sticky-output prices are more likely than firms with flexible prices to misreport earnings when securities regulation is lenient, and their misreporting drops significantly once regulation becomes stringent. Firms with sticky prices also face improved credit-market conditions following stricter regulations. To explore the theoretical underpinnings behind these findings, we build a model of earnings manipulation with endogenous manipulation costs, where product prices signal firms' private information about profits and mimicking firms must set a price identical to that set by mimicked firms. The model predicts that managers' incentives to manipulate earnings increase with price stickiness, as do the firms' borrowing costs, whereas regulatory punishment reduces such incentives. Our study suggests firms' stickiness in product pricing facilitates insiders' self-interested behavior, imposing agency costs on firms.

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1 Introduction

Textbook theory assumes sticky prices are costly to firms because managers maximize shareholder value under the constraints of infrequent product-price changes (e.g., Christiano et al., 2005). In this paper, we document a new fact: managers of firms with sticky-output prices are more likely than managers of firms with flexible-output prices to misreport earnings, but their difference in the likelihood of misreporting shrinks after securities regulation becomes stringent. Firms with sticky-output prices also incur higher borrowing costs in the credit markets when securities regulation is lenient, but they incur lower such costs once regulation becomes stringent. Because we observe this phenomenon under equilibrium contractual forms characterizing principle-agent relationships, our empirical results suggest that, in addition to the findings in recent studies (e.g., Weber, 2015; Gorodnichenko and Weber, 2016; D'Acunto et al., 2018), sticky prices might burden firms (and their shareholders) via channels other than cash-flow volatility and far beyond monetary-policy shocks. Our findings suggest firms' stickiness in product pricing facilitates insiders' self-interested behavior, imposing agency costs on firms.

To explore the theoretical underpinnings behind our causal inference, we first present a model with endogenous costs of earnings manipulation to explain why managers of sticky-price firms misreport earnings more often than those of flexible-price firms. In our model, managers privately observe the true productivity of their companies. Managers want to report high earnings to keep their firms' stock prices high in the short-term, and the level of managerial short-termism is exogenously given.[1] Because product price reveals firms' true productivity to the public, to conceal the low productivity

[1]Managers' motives to engage in earnings manipulation have been well documented in the literature with the following two stylized facts. First, CEO compensation packages not only contain salary, bonuses, and payouts from long-term incentive plans, but also restricted option and stock grants (e.g., Frydman and Jenter, 2010). Second, during the misreporting period, CEOs exercise a significantly larger fraction of exercisable stocks or options (e.g., Bergstresser and Philippon, 2006; Burns and Kedia, 2006; Kedia and Philippon, 2009).

of their firms, managers must not only manipulate earnings but also adjust product prices as if productivity were high. As such, real costs of manipulation arise endogenously because earnings manipulation distorts firms' pricing decisions.

Several predictions emerge. First, the model predicts that managers of firms with sticky-output prices have higher incentive to manipulate earnings upward. Because flexible-price firms can freely adjust prices to shocks, the requirements of signaling force managers of mimicking firms (i.e., lower-productivity firms) not only to misreport earnings but also to set prices identical to those of mimicked firms (i.e., higher-productivity firms). As such, earnings manipulation imposes real costs on flexible-price firms, due to price distortions. By contrast, because sticky-price firms are less able to adjust prices, managers of mimicking firms do not need to distort pricing decisions to misreport earnings. As such, the endogenous cost of earnings manipulation decreases with firms' price stickiness.

Second, the model predicts that the difference in the likelihood of upward earnings manipulation between sticky- and flexible-price firms shrinks when managers face higher expected costs of misreporting. In addition to the endogenous cost of manipulation, managers who misreport will be punished by regulators once caught, which serves as an external cost of earnings manipulation. This external cost has a larger negative impact on the likelihood of earnings manipulation for sticky-price firms because, unlike managers of flexible-price firms, regulatory punishment is the only cost that constrains managers of sticky-price firms from misreporting.

Third, lenders in the credit market rationally expect a higher probability of manipulation and, hence, more profit losses due to pricing distortions, for firms with sticky-output price, and thus impose a higher credit spread on loans to these firms. Similarly, the difference in credit spreads between sticky- and flexible-price firms reduces when regulatory punishments become harsher. Therefore, firms' price stickiness hurts shareholder value, due to higher managerial agency costs, which result in higher financing costs in credit markets.[2]

To perform our empirical analysis, we use a sample of S&P 1500 constituent firms. We match firms with output-price stickiness at the 6-digit level of the North American Industry Classification System (NAICS). We also employ datasets from both the Audit Analytics (AA) Restatement database and the SEC's Accounting and Auditing Enforcement Releases (AAER) to compile firm-year-quarter observations associated with earnings restatements likely caused by managers' intentional manipulation rather than by accounting errors. To be consistent with our model and to have restatements exacerbate credit-market frictions, we focus exclusively on overstatements (or downward restatements)—restatements with an adverse impact on previously reported accounting earnings (see Subsection 3.2 for detailed explanations).[3]

To test whether securities regulation curtails earnings manipulation, we exploit the passage and implementation of the Sarbanes-Oxley Act (SOX), which represents the most far-reaching securities legislation since the Securities Acts of 1933 and 1934. This legislation mandated individual certifications by managers of publicly listed firms regarding the accuracy of financial reporting, significantly increased penalties for fraudulent misreporting, and increased external auditors' independence in scrutinizing financial statements.[4] Because SOX was directly triggered by the Enron collapse in late 2001, our choice of this regulatory event as a focal point suggests the regulation may have been exogenous to both fundamental factors and the phenomenon of price stickiness for a majority of public

[2]Although this prediction is consistent with prior literature that suggests misreporting affects loan spreads (e.g., Graham et al., 2008; Costello and Wittenberg-Moerman, 2011), in our model, it is profit losses arising from borrowers' suboptimal pricing, rather than their manipulation per se, that increase the default rate as perceived by lenders.

[3]From the AA Restatement database, we observe that more than 83% of these filings state that the effect of restatement on firms' financial statements is "adverse." Similarly, from the AAER database, we find that 98% of these misstatements involve firms overstating accounting earnings.

[4]Notably, the sections of the bill cover the responsibilities of a public firm's board of directors, add criminal penalties for certain misconduct, and require the Securities and Exchange Commission (SEC) to create regulations defining how public firms must comply with the law.

firms not implicated in financial scandals or bankruptcies. Moreover, our empirical design, which involves selecting the most representative domestic firms and assigning higher weights to large firms, largely mitigates concerns that SOX imposed substantial costs on both foreign and small firms.[5]

Next, we estimate the effect of SOX on firms' upward earnings misreporting after partialling out firm-level characteristics, time-invariant unobservables, and time-varying sectoral unobservables. The picture that emerges is striking: relative to other managers, managers of firms with sticky-output prices refrained from overstating earnings following the passage and implementation of SOX. Notably, the attenuating effect of SOX on earnings misreporting became effective immediately after SOX and was long lasting. Over the period of 1997-2012, managers were about 2 percentage points more likely to restate earnings downward if output-price is a one-standard-deviation stickier, which is equivalent to 20% of the sample mean. However, the pre- and post-SOX scenarios sharply contrast each other: before July 2002, a one-standard-deviation increase in price stickiness increased the misreporting frequency by 5.5 percentage points; after July 2002, price stickiness barely correlated with misreporting.

Third, we provide evidence consistent with misreporting by sticky-price firms exacerbating credit-market frictions facing these firms.[6] Linking our model to empirical tests, because lenders remain largely uninformed about productivity shocks and, as a result, they demand a higher return on loans extended to sticky-price borrowers, especially when managers of borrowing firms have greater discretion over reporting. Specifically, we show the change in loan spreads paid by sticky-price borrowing

[5] For a comprehensive review of the firm-level costs associated with the implementation of SOX, please refer to Holmstrom and Kaplan (2003), Zhang (2007), Engel et al. (2007), Morosi and Marroud (2008), and Iliev (2010), among others.

[6] We focus on syndicated loans rather than public bonds for several reasons. First, compared with small firms, large firms rely more on bank debt (e.g., D'Acunto et al., 2018). Second, these large firms had infrequently issued bonds over the period of 1997-2012. Third, the sample period of secondary market transactions for U.S. corporate bonds from the TRACE Enhanced database starts in July 2002, and hence, we do not observe yield spreads before SOX.

firms before and after SOX is consistent with earnings misreporting increasing borrowing costs. Compared with otherwise similar firms, borrowing firms with sticky-output prices paid significantly lower loan spreads after SOX than before.

One potential concern with respect to the above test is that the nationwide implementation of SOX was accompanied by other major economic and political news (e.g., the impending war in Iraq or the creation of the Department of Homeland Security), which might confound our causal inference on the credit market (e.g., Leuz, 2007). As a refinement of our analysis, we exploit additional firm-level variation in borrower-side information quality. We show more opaque sticky-price firms experienced a significantly larger decrease in loan spreads after SOX than before, compared with less opaque firms with the same level of price stickiness. Our additional results support the notion that, given monitoring intensity and technology, lenders respond to improved borrower-side information quality by charging lower loan spreads.

Related Literature. Our paper adds to three strands of literature. First, a burgeoning literature shows price stickiness is costly to firms and equity holders bear such cost (e.g., Weber, 2015; Gorodnichenko and Weber, 2016; Xie, 2020). In particular, both D'Acunto et al. (2018) and Augustin et al. (2023) document that firms with sticky-output prices have lower leverage and higher costs of debt, primarily because such firms have higher cash-flow volatility. We share with these papers the implication of price stickiness for credit-market frictions. However, a distinct feature of our study is that we show price stickiness imposes agency costs on the firm; that is, outside shareholders pay higher borrowing costs due to insiders' earnings manipulation facilitated by output-price stickiness.

In another work, Gu and Xie (2024) find output-price stickiness reduces stock-market information efficiency, and a release of public information by regulators mitigates the problem. In their study, information asymmetry between firm insiders and outsiders arises because firms' inability to reset prices suppresses the revelation of cost shocks to the public, particularly when investors incur processing costs to obtain high-quality cost information from sources other than observing changes in product prices (e.g., Blankespoor et al., 2020; Sun et al., 2024). In our study, however, information asymmetry endogenously arises because privately informed managers manipulate earnings upward to maximize their personal wealth, and more stringent regulatory punishment mitigates this problem.

Second, our study establishes an endogenous link between two prominent channels concerning monetary-policy transmission — firms' price stickiness and their credit-market conditions through earnings manipulation. However, existing literature on the "bank lending channel" of monetary policy often assumes firms' stickiness in adjusting product prices does not limit their access to credit markets (Bernanke et al., 1999; Ottonello and Winberry, 2020). Departing from those studies, our research suggests price stickiness encourages managerial misreporting, which constitutes a significant source of financial friction that operates through the balance-sheet channel (e.g., Ozdagli, 2018; Armstrong et al., 2019; Li et al., 2022).

Third, our paper adds to a large theoretical literature that studies moral hazard problems with performance measure manipulation. Some of these models derive optimal executive equity-based compensation in response to manipulation (e.g., Goldman and Slezak, 2006; Crocker and Slemrod, 2007; Laux and Laux, 2009; Strobl, 2013; Bertomeu, 2013; Beyer et al., 2014; Gayle et al., 2022), whereas other models take the managerial incentives as given (e.g., Stein, 1989; Fischer and Verrecchia, 2000; Zakolyukina, 2018; Beyer et al., 2019; Luo, 2022). Our study mainly differs from these theoretical works by assuming that the signaling requirements force firms to distort their real actions to misreport earnings. Our model is thus related to Kedia and Philippon (2009) and Guttman et al. (2010). Kedia and Philippon (2009) show both theoretically and empirically that low-productivity firms hire and invest too much to pool with high-productivity firms. Guttman et al. (2010) analytically study the interplay between CEO short-termism, strategic pooling of dividends, and underinvestment.

Note that our study differs from the literature in which real activities management and earnings management are substitutes (e.g., Roychowdhury, 2006; Cohen et al., 2008). For example, Terry et al. (2023) estimate a dynamic equilibrium model to examine how eliminating earnings misreporting completely distorts firms' long-term investment, such as R&D, which reduces current profits. Terry (2023) builds a quantitative endogenous growth model in which, at the macro level, CEO short-termism reduces R&D, slows growth by 5 basis points yearly, and lowers social welfare by about 1%. Rather, the signaling requirements of our model imply that firms' real activities complement accounting information in assisting investors' decision-making. In a related study, Jiang (2016) analytically shows that, from the standpoint of social efficiency, the optimal bias in non-accounting information complements the bias in accounting information.

2 Model

This section develops a model to outline the basic intuition for why managers of sticky-price firms have more incentives to manipulate earnings upward and why such firms pay higher borrowing costs in the credit market. In particular, the model explains why stringent securities regulation mitigates the above problem.

The fundamental insight of our model lies in the signaling effect of product pricing. Specifically, in any signaling equilibria, because the product price reveals managers' private information about economic shocks they receive, firms' pricing strategy must be consistent with their self-reported earnings (Kedia and Philippon, 2009). Analytically, we show that in an environment with flexible prices, for managers of leveraged firms, manipulating earnings is more costly, because they also have to mimic the pricing strategy adopted by firms that they want to mimic. In contrast to the flexible-price scenario, we show sticky-price firms are more able to manipulate earnings without distorting product prices and therefore without losing extra profits, and hence, manipulation is less costly for these firms. However, manipulation increases firms' borrowing costs.

2.1 Model Setup

Figure 1 summarizes the timeline of model. The model has three time periods: $t = 0, 1, 2$. Many firms exist, and each firm is a monopolist. A firm sells at $t = 1$ and $t = 2$ and produces profits each period. At $t = 0$, each firm borrows B (exogenously given) units of loans that are scheduled to be repaid at $t = 2$ by the firm using two-period profits, with each unit having a face value of 1 and a price of q (to be endogenously determined).[7] Due to potential default, the price q may be smaller than one. We will show that sticky-price firms have a smaller price q. We assume each firm is liquidated at $t = 2$ and does not pay any dividends at $t = 1$.[8] We also assume that firm managers, shareholders, and lenders are all risk neutral and that the discount rate is zero.

For simplicity, we assume the firm has zero cost for production. To facilitate the mapping of the model to data on financial statements, we assume that each firm faces the following downward-sloping

[7]D'Acunto et al. (2018) and Augustin et al. (2023) find sticky-price firms have a lower long-term leverage ratio than flexible-price firms, and, in unreported tables, we verify their results in our data. However, we treat leverage as constant in our model for two reasons. First, our main purpose in considering debt is to derive the loan-spread differential between sticky- and flexible-price firms. (In real data, we regress loan spreads on price stickiness by holding the long-term leverage ratio constant.) Second, in the sample of S&P 1500 constituent firms, we find little evidence suggesting the difference in long-term leverage between sticky- and flexible-price firms changes before and after SOX. For models that study the joint determinants of capital structure and firms' accounting policies, see Bertomeu et al. (2011).

[8]We do not allow firms to pay cash dividends at $t = 1$ to shut down signaling mechanisms through dividend policies (Miller and Rock, 1985; Guttman et al., 2010).

demand curve:

$$Y = (2\sqrt{\mathcal{A}} - P), \tag{2.1}$$

where we denote P as product price. The firm's productivity, $\mathcal{A} \in \{\mathcal{A}_{\mathcal{H}}, \mathcal{A}_{\mathcal{L}}\}$, has a bilateral distribution with $\mathcal{A}_{\mathcal{H}} > \mathcal{A}_{\mathcal{L}}$. At $t = 1$, the manager privately observes a one-time signal indicating $\mathcal{A}$: with probability 1/2, $\mathcal{A} = \mathcal{A}_{\mathcal{H}}$, and with probability 1/2, $\mathcal{A} = \mathcal{A}_{\mathcal{L}}$. The random variable $\mathcal{A}$ is publicly revealed at $t = 2$.

To study how managers manipulate earnings reports, we assume privately informed managers can decide whether to truthfully report earnings to describe what they observe at $t = 1$. We denote the reported profits as $\mathcal{Z} \in \{\pi_{\mathcal{H}}, \pi_{\mathcal{L}}\}$. As we will show in equation (2.4), the productivity signal $\mathcal{A}$ also indicates profits, and hence, the firm's reporting strategy $\mathcal{Z}$ concerns how to report its period-1 profit π at $t = 1$.

Before deriving the equilibrium, we consider the first-best pricing decision in a perfect-information case. This benchmark is useful to understand the effect of price stickiness on manipulation. With perfect information about $\mathcal{A}$, the firm sets its optimal price

$$P^* = \arg\max_P \left(2\sqrt{\mathcal{A}} - P\right) P. \tag{2.2}$$

The first-order condition yields

$$P^* = \sqrt{\mathcal{A}}, \tag{2.3}$$

and the firm's profit as a result of price setting is

$$\pi = \mathcal{A}. \tag{2.4}$$

Note that if the firms' true productivity is $\mathcal{A} = \mathcal{A}_{\mathcal{L}}$ but it sets price at $P = \sqrt{\mathcal{A}_{\mathcal{H}}} \neq P^*$, the firm makes profit $\pi = \mathcal{A}_{\mathcal{L}}(1-\tau^2)$, where $\tau = \sqrt{\frac{\mathcal{A}_{\mathcal{H}}}{\mathcal{A}_{\mathcal{L}}}} - 1$ captures the firm's profit loss by setting a "wrong" price. We assume $\tau < 1$ so that firms of lower type (i.e., firms realizing $\mathcal{A} = \mathcal{A}_{\mathcal{L}}$ at $t = 1$) still make positive profits even if they set $P = \sqrt{\mathcal{A}_{\mathcal{H}}}$.

2.2 Flexible-Price Firms

At $t = 1$, flexible-price firms can freely reset price to shocks in a state-contingent manner. (As with time-contingent pricing, the firm adjusts on a regular schedule without paying any costs (Ball and Mankiw, 1994).)

We use superscripts f and s to denote variables for flexible-price firms and sticky-price firms, respectively. We denote $V^f_{t=n}(\mathcal{A}, \mathcal{Z})$ $(n = 1, 2)$ as the valuation for flexible-price firms. Because information asymmetry concerning $\mathcal{A}$ exists at $t = 1$, $V^f_{t=1}(\mathcal{A}, \mathcal{Z})$ is the stock market's expectation of the firm's liquidation value at $t = 2$. Because all information is publicly known at $t = 2$, $V^f_{t=2}(\mathcal{A}, \mathcal{Z})$ is essentially the book value of shareholder equity upon liquidation.

Following Guttman et al. (2010), we assume that the manager is compensated based on both the stock price at $t = 1$ and the liquidating value at $t = 2$. The fact that some of this compensation vests at $t = 1$ gives rise to managerial myopia (Stein, 1989). As a result, instead of maximizing the firm's liquidation value, the manager chooses reporting strategy $\mathcal{Z}$ to maximize a weighted average of the liquidation value and the short-term market value.[9]

[9] Given the literature on mechanism design (e.g., Townsend, 1979; Gale and Hellwig, 1985; DeMarzo and Fishman, 2007; Beyer et al., 2014; Marinovic and Varas, 2019), a natural question is whether $\alpha > 0$ is optimal and whether the board directors could set $\alpha = 0$ to resolve agency problems. For example, Laux and Laux (2009) demonstrate that an increase in CEO equity incentives does not inherently lead to higher earnings management, as directors adjust their monitoring efforts in response to changes in CEO incentives. Given the ubiquitous use of short-term equity-based incentives ($\alpha > 0$), we follow prior studies to consider additional frictions, such as managerial risk aversion, job-market considerations, and the features of the market for corporate control, to rationalize the existence of $\alpha > 0$ (see Guttman et al. (2010) for a thoughtful discussion).

The utility of a manager putting α and $1-\alpha$ weights at $t=1$ and $t=2$, respectively, is then given by

$$U^f(\mathcal{A},\mathcal{Z}) = \alpha V^f_{t=1}(\mathcal{A},\mathcal{Z}) + (1-\alpha)V^f_{t=2}(\mathcal{A},\mathcal{Z}), \tag{2.5}$$

where α measures the degree of managerial short-termism.

In this case, a manager of firms realizing $\mathcal{A}=\mathcal{A}_{\mathcal{L}}$ would be tempted to report $\mathcal{Z}=\pi_{\mathcal{H}}$ to sell some vesting shares that are overvalued. However, misreporting not only carries a cost of profit loss caused by product-price distortion (i.e., a τ^2 fraction of $\mathcal{A}_{\mathcal{L}}$), but also the risk of detection and subsequent punishment by regulators at $t=2$, denoted by Φ, that is personally borne by the manager. In our context, Φ varies with regulatory regimes governing misreporting. This is especially the case when the SOX provision imposed criminal penalties on managers manipulating earnings (Coates and Srinivasan, 2014).

We first consider the case in which managers of flexible-price firms realizing $\mathcal{A}=\mathcal{A}_{\mathcal{H}}$ adopt an honest reporting strategy o. Under this strategy, they reset the product price at

$$P(\mathcal{A}_{\mathcal{H}},\pi_{\mathcal{H}}) = \sqrt{\mathcal{A}_{\mathcal{H}}}, \tag{2.6}$$

and the firm's single-period profit is

$$\pi(\mathcal{A}_{\mathcal{H}},\pi_{\mathcal{H}}) = \mathcal{A}_{\mathcal{H}}. \tag{2.7}$$

Now let us consider manipulation. If managers report $\mathcal{Z}=\pi_{\mathcal{L}}$, the stock market understands these firms' true productivity is $\mathcal{A}_{\mathcal{L}}$, because high-type firms do not have incentives to pretend to be low type. The reason is that, by misreporting $\mathcal{Z}=\pi_{\mathcal{L}}$, high-type firms are not only undervalued by stock markets and punished by regulators, but also incur profit loss due to product-price distortion. Thus, we only consider the case of manipulation in which unproductive firms pretend to be productive, not vice versa.

We denote λ as the fraction of unproductive firms that misreport (strategy m), and $1-\lambda$ as the fraction of unproductive firms that report honestly (strategy o). Because product price is publicly observable, to pretend to be productive, an unproductive firm manipulating its financial report must set price at $P(\mathcal{A}_{\mathcal{H}})$

$$P(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{H}}) = P(\mathcal{A}_{\mathcal{H}}) = \sqrt{\mathcal{A}_{\mathcal{H}}}, \tag{2.8}$$

and the firm's single-period profit becomes

$$\begin{aligned} \pi(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{H}}) &= \left(2\sqrt{\mathcal{A}_{\mathcal{L}}} - \sqrt{\mathcal{A}_{\mathcal{H}}}\right)\sqrt{\mathcal{A}_{\mathcal{H}}} \\ &= \mathcal{A}_{\mathcal{L}}(1-\tau^2). \end{aligned} \tag{2.9}$$

If firms realizing $\mathcal{A} = \mathcal{A}_{\mathcal{L}}$ report honestly, their single-period profit is

$$\pi(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{L}}) = \pi_{\mathcal{L}}.$$

Note that due to the signaling effect of product pricing, a profit loss of $\mathcal{A}_{\mathcal{L}}\tau^2$ occurs.

To map the model to data on financial statements, we analytically describe the extent of earnings inflation as the bias in earnings.[10] Following Stein (1989) and Kedia and Philippon (2009), we assume managers of a firm realizing $\mathcal{A}_{\mathcal{L}}$ report $\mathcal{Z} = \pi_{\mathcal{H}}$ by "borrowing" $\mathcal{A}_{\mathcal{H}} - \mathcal{A}_{\mathcal{L}}(1-\tau^2)$ against next period's earnings. To do so, the manager could either build up accruals by recognizing fictitious revenues based

[10] Other recent studies model the magnitude of manipulation using bias in book value under clean surplus accounting (e.g., Zakolyukina, 2018; Terry et al., 2023). In these models, because an optimistic bias in earnings leads to net assets being temporarily recorded at values higher than those based on a neutral application of GAAP, prior-period bias in book value acts as a constraint on earnings management (Barton and Simko, 2002).

on uncollectable receivables or defer the recognition of expenses and/or the impairment of certain assets into the future. Both of these schemes will lead to earnings reversals at $t = 2$ by an equal amount of $\mathcal{A}_{\mathcal{H}} - \mathcal{A}_{\mathcal{L}}(1-\tau^2)$. However, because earnings reversal does not affect the firm's equity value (i.e., the difference between the two-period cash flows and debt obligation), the misreporting firm's period-1 equity valuation is not directly affected by investors' expectation of future earnings reversal as in Kedia and Philippon (2009). Rather, the firm's period-1 valuation is reduced by a profit loss of $\mathcal{A}_{\mathcal{L}}\tau^2$ due to price distortion under the signaling requirements.[11]

We now consider equity valuation for firms reporting $\mathcal{Z} = \pi_{\mathcal{H}}$. The conditional distribution of $\mathcal{A}$ is given by

$$\Pr(\mathcal{A} = \mathcal{A}_{\mathcal{H}} | \mathcal{Z} = \pi_{\mathcal{H}}) = \frac{\frac{1}{2}}{\frac{1}{2} + \frac{1}{2}\lambda^f} = \frac{1}{1+\lambda^f}, \tag{2.10}$$

and

$$\Pr(\mathcal{A} = \mathcal{A}_{\mathcal{L}} | \mathcal{Z} = \pi_{\mathcal{H}}) = \frac{\lambda^f}{1+\lambda^f}. \tag{2.11}$$

Because firms use the total profits generated over two periods to repay debt, we assume B satisfies the following condition to illustrate how product-price distortion induces firm default:

$$2\mathcal{A}_{\mathcal{L}}(1-\tau^2) < B < 2\mathcal{A}_{\mathcal{L}}.$$

[11] We do not literally interpret the borrowed earnings as accrued revenues, because aside from revenue recognition issues, the Audit Analytic (AA) database reveals a variety of accounting schemes that could contribute to a firm's downward earnings restatements. These schemes include the valuation of intangibles, fixed assets, inventories, and depreciation errors.

Assuming an efficient stock market, equity valuation for flexible-price firms reporting $\mathcal{Z} = \pi_{\mathcal{H}}$ is

$$V^f_{t=1}(\mathcal{Z} = \pi_{\mathcal{H}}) = \frac{2\mathcal{A}_{\mathcal{H}} - B}{1+\lambda^f} + \frac{\lambda^f}{1+\lambda^f} \max\{2\mathcal{A}_{\mathcal{L}}(1-\tau^2) - B, 0\} \tag{2.12}$$

$$= \frac{2\mathcal{A}_{\mathcal{H}} - B}{1+\lambda^f}. \tag{2.13}$$

Because only low-type firms honestly report $\mathcal{Z} = \pi_{\mathcal{L}}$ (strategy o), these firms' equity valuation is

$$V^f_{t=1}(\mathcal{Z} = \pi_{\mathcal{L}}) = 2\mathcal{A}_{\mathcal{L}} - B. \tag{2.14}$$

The utility that managers of flexible-price firms derive from their misreporting strategy (strategy m) is

$$U^{f,m}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{H}}) = \alpha \left[\frac{2\mathcal{A}_{\mathcal{H}} - B}{1+\lambda^f} + \frac{\lambda^f}{1+\lambda^f} \max\{2\mathcal{A}_{\mathcal{L}}(1-\tau^2) - B, 0\} \right]$$
$$+ (1-\alpha) \max\{2\mathcal{A}_{\mathcal{L}}(1-\tau^2) - B, 0\} - \Phi$$
$$= \alpha \frac{2\mathcal{A}_{\mathcal{H}} - B}{1+\lambda^f} - \Phi, \tag{2.15}$$

and the utility that managers derive from honest reporting (strategy o) is

$$U^{f,o}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{L}}) = 2\mathcal{A}_{\mathcal{L}} - B. \tag{2.16}$$

The Perfect Bayesian Equilibria (PBE) are characterized by reporting strategy $\mathcal{Z}$, pricing strategy P, and market beliefs λ^f.[12] We first consider separating equilibria. In any such equilibria, managers

[12] In our setting, the market equilibrium belief about manipulation is an unconditional probability. In other settings, however, such a belief can be conditional upon investors' prior beliefs about the state of the economy (e.g., Povel et al., 2007; Wang et al., 2010).

of high-type firms report $\mathcal{Z} = \pi_{\mathcal{H}}$, managers of low-type firms report $\mathcal{Z} = \pi_{\mathcal{L}}$, and the stock-market's belief about λ^f is zero. This scenario is an equilibrium if and only if neither type of manager has an incentive to deviate.[13]

If managers of low-type firms misreport, the market's belief will continue to be the above and their utility is $U^{f,m}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{H}}) = \alpha \frac{2\mathcal{A}_{\mathcal{H}} - B}{1+\lambda^f} - \Phi = \alpha(2\mathcal{A}_{\mathcal{H}} - B) - \Phi$. If the following condition is satisfied, the manager does not have incentive to misreport and neither type of firm will default:

$$U^{f,m}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{H}}) < U^{f,o}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{L}}) \Leftrightarrow \alpha < \frac{2\mathcal{A}_{\mathcal{L}} - B + \Phi}{2\mathcal{A}_{\mathcal{H}} - B}. \tag{2.17}$$

Proposition 1 *If $\alpha < \frac{2\mathcal{A}_{\mathcal{L}} - B + \Phi}{2\mathcal{A}_{\mathcal{H}} - B}$, managers of flexible-price firms have no incentive to manipulate reports. In this case, the price per unit of debt is given by*

$$q^f = 1,$$

and hence, the loan spread is zero (no default occurs).

We now examine whether a partial pooling equilibrium exists if $\alpha \geq \frac{2\mathcal{A}_{\mathcal{L}} - B + \Phi}{2\mathcal{A}_{\mathcal{H}} - B}$. The equilibrium condition for $0 < \lambda^f < 1$ is

$$U^{f,m} = U^{f,o} \Leftrightarrow \alpha \frac{2\mathcal{A}_{\mathcal{H}} - B}{1 + \lambda_f} - \Phi = 2\mathcal{A}_{\mathcal{L}} - B, \tag{2.18}$$

which leads to

$$\lambda^f = \frac{\alpha(2\mathcal{A}_{\mathcal{H}} - B)}{2\mathcal{A}_{\mathcal{L}} - B + \Phi} - 1. \tag{2.19}$$

[13] Both types will follow the assigned strategy as long as the payoff it yields is at least as high as the payoff managers would get if they deviate.

In this case, because $2\mathcal{A}_{\mathcal{L}}(1-\tau^2) < B$, the price per unit of debt q^f is given by

$$
\begin{aligned}
q^f &= \frac{1}{2} + \frac{1-\lambda^f}{2} + \frac{\lambda^f}{2}\frac{2\mathcal{A}_{\mathcal{L}}(1-\tau^2)}{B} \\
&= \frac{1}{2}\{2 + \lambda^f[\frac{2\mathcal{A}_{\mathcal{L}}(1-\tau^2)}{B} - 1]\} < 1.
\end{aligned}
$$

Hence, flexible-price firms pay a positive credit spread because, they cannot commit at $t = 0$ not to misreport, which leads to default.

Proposition 2 *If* $\alpha \geq \frac{2\mathcal{A}_{\mathcal{L}}-B+\Phi}{2\mathcal{A}_{\mathcal{H}}-B}$*, a unique equilibrium exists where the managers of flexible-price firms with* $\mathcal{A}_{\mathcal{H}}$ *report truthfully. This equilibrium is partially pooling. The fraction* λ^f *of managers misreporting decreases with the cost of manipulation* Φ *at a speed of* $\frac{d\lambda^f}{d\Phi} = -\frac{\alpha(2\mathcal{A}_{\mathcal{H}}-B)}{(2\mathcal{A}_{\mathcal{L}}-B+\Phi)^2}$*. In this case, the price for the debt is given by*

$$
q^f < 1,
$$

and hence the loan spread is positive (default occurs).

2.3 Sticky-Price Firms

We now analyze the incentive for managers of sticky-price firms to misreport. Sticky-price firms are not able to change price at $t = 1$, regardless of the realization of $\mathcal{A}$. These firms' product price is fixed at the initial level they set at $t = 0$.

We first assume that, regardless of their type realization, at $t = 0$ sticky-price firms set their initial price at $P^* = \sqrt{\mathcal{A}_{\mathcal{H}}}$. Sticky-price firm can always have the option to set product price equal to $P = \sqrt{\mathcal{A}_{\mathcal{L}}}$ so that in the bad state, the firm makes a profit of $\pi = \mathcal{A}_{\mathcal{L}}$. To introduce default, we need the debt level to be sufficiently high. We find $B > 2\mathcal{A}_{\mathcal{L}}(1 - \frac{\tau^2}{4})$ will induce them to default. To motivate this assumption, we propose the following proposition.

Proposition 3 *The amount of debt outstanding at* $t = 0$ *is large enough that* $B > 2\mathcal{A}_{\mathcal{L}}(1 - \frac{\tau^2}{4})$.

In Section A.1 of the Appendix, we show the optimal initial price for sticky-price firms is $\sqrt{\mathcal{A}_{\mathcal{H}}}$, if Proposition 3 holds.

For sticky-price firms setting an initial price $P^* = \sqrt{\mathcal{A}_{\mathcal{H}}}$ at $t = 0$, if they report truthfully, valuations at $t = 1$ for firms realizing $\mathcal{A}_{\mathcal{H}}$ and $\mathcal{A}_{\mathcal{L}}$ are the following

$$V^s_{t=1}(\mathcal{A}_{\mathcal{H}}, \pi_{\mathcal{H}}) = 2\mathcal{A}_{\mathcal{H}} - B > 0,\ V^s_{t=1}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{L}}) = 2\mathcal{A}_{\mathcal{L}}(1 - \tau^2) - B < 0.$$

If the stock market believes a fraction λ^s of sticky-price firms realizing $\mathcal{A} = \mathcal{A}_{\mathcal{L}}$ misreport their types, valuation conditioning on $\mathcal{Z} = \pi_{\mathcal{H}}$ is

$$V^s_{t=1}(\mathcal{Z} = \pi_{\mathcal{H}}) = \frac{2\mathcal{A}_{\mathcal{H}} - B}{1 + \lambda^s}.$$

After realizing $\mathcal{A}_{\mathcal{L}}$, the manager of sticky-price firms derives the following utility if she reports truthfully:

$$U^{s,o}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{L}}) = \max\{2\mathcal{A}_{\mathcal{L}}(1 - \tau^2) - B, 0\} = 0.$$

The manager of sticky-price firms derive the following utility by misreporting $\mathcal{Z} = \pi_{\mathcal{H}}$:

$$U^{s,m}(\mathcal{A}_{\mathcal{L}}, \pi_{\mathcal{H}}) = \alpha \frac{2\mathcal{A}_{\mathcal{H}} - B}{1 + \lambda^s} - \Phi.$$

Let us first check whether a separating equilibrium exists among sticky-price firms. When the equilibrium belief of λ^s is zero, if the following condition is satisfied, the manager does not have incentives to manipulate:

$$U^{s,m} < U^{s,o} \Leftrightarrow \alpha < \frac{\Phi}{2\mathcal{A}_{\mathcal{H}} - B}. \tag{2.20}$$

So, a separating equilibrium does exist among sticky-price firms. The condition for the existence of a partial pooling equilibrium for $0 < \lambda^s < 1$ is

$$U^{s,m} = U^{s,o} \Leftrightarrow \alpha \frac{2\mathcal{A}_{\mathcal{H}} - B}{1 + \lambda^s} - \Phi = 0, \tag{2.21}$$

which leads to

$$\lambda^s = \frac{\alpha(2\mathcal{A}_{\mathcal{H}} - B)}{\Phi} - 1. \tag{2.22}$$

And the loan spread q^s is given by

$$q^s = \frac{1}{2}\{2 + \lambda^s[\frac{2\mathcal{A}_{\mathcal{L}}(1 - \tau^2)}{B} - 1]\} < 1.$$

Based on these theoretical analysis, we have the following two propositions regarding sticky-price firms' misreporting behavior.

Proposition 4 *If* $\alpha \geq \frac{\Phi}{2\mathcal{A}_{\mathcal{H}} - B}$, *there exists a unique equilibrium where the managers of sticky-price firms with* $\mathcal{A}_{\mathcal{H}}$ *report truthfully. This equilibrium is partially pooling. The fraction* λ^s *of managers misreporting decreases with the cost of manipulation* Φ *at a speed of* $\frac{d\lambda^s}{d\Phi} = -\frac{\alpha(2\mathcal{A}_{\mathcal{H}} - B)}{\Phi^2}$. *In this case, the price for the debt is given by*

$$q^s < 1,$$

and hence the loan spread is positive (default occurs).

Proposition 5 *If* $\alpha < \frac{\Phi}{2\mathcal{A}_{\mathcal{H}} - B}$*, managers of sticky-price firms have no incentive to manipulate reports. In this case, the price per unit of debt is given by*

$$q^s = 1,$$

and hence the loan spread is zero (no default occurs).

Based on the above discussions, we summarize our model predictions regarding managerial incentive to misreport at $t = 1$ and the resulting borrowing cost at $t = 0$ as follows. Figure 2 also plots the likelihood of earnings manipulation for managers of sticky- and flexible-price firms as a function of managerial short-termism, which is the managers' weight (α) on stock price. The figure suggests that, as long as managerial short-termism is large enough (i.e., $\alpha > \frac{\Phi}{2\mathcal{A}_{\mathcal{H}} - B}$), managers of sticky-price firms are always more likely to manipulate earnings than managers of flexible-price firms.

1. If $\alpha < \frac{\Phi}{2\mathcal{A}_{\mathcal{H}} - B}$, no managers manipulate earnings, regardless of whether the product price is sticky. Loan spreads are zero for all firms.

2. If $\frac{\Phi}{2\mathcal{A}_{\mathcal{H}} - B} \leq \alpha < \frac{2\mathcal{A}_{\mathcal{L}} - B + \Phi}{2\mathcal{A}_{\mathcal{H}} - B}$, managers of sticky-price firms manipulate, but managers of flexible-price firms do not. Loan spreads for sticky- and flexible-price firms are positive and zero, respectively.

3. If $\alpha \geq \frac{2\mathcal{A}_{\mathcal{L}} - B + \Phi}{2\mathcal{A}_{\mathcal{H}} - B}$, managers of both sticky- and flexible-price firms manipulate. Loan spreads for both sticky- and flexible-price firms are positive.

Although applying these theoretical cutoffs of short-termism to real data involves subjective judgment, we only focus on the third scenario to derive our empirical predictions for two reasons. First, in data, both sticky- and flexible-price firms misstate financial statements (see Figure 4) and pay positive loan spreads. Second, existing academic research shows that equity-based compensation is mainly responsible for financial misreporting (e.g., Burns and Kedia, 2006; Bergstresser and Philippon, 2006; Efendi et al., 2007), and because of an increasing trend for equity-based CEO incentives for firms that are index constituents (Frydman and Jenter, 2010), it is natural to believe that short-termism is high among CEOs of S&P 1500 firms.[14] To validate our conjecture, we use the measure developed by Edmans et al. (2009) to quantify the CEO equity-based incentives of sample firms. We find that over our sample period, the median value for the dollar change in CEO wealth for a 100 percentage point change in firm value divided by annual pay is 6.8, suggesting that a 5% drop in firm value causes the CEO to lose 34% of her annual pay. More importantly, we fail to detect any economic and statistical difference between sticky- and flexible-price firms in terms of CEO short-termism.[15]

Proposition 6 *The differences in the misreporting likelihood and loan spread between sticky- and flexible-price firms decrease with* Φ *(i.e., the expected punishment).*

The proof follows from Propositions 2 and 4, which imply

$$\frac{\partial\left(\lambda^s-\lambda^f\right)}{\partial\Phi}=\frac{\alpha(2\mathcal{A}_{\mathcal{H}}-B)}{(2\mathcal{A}_{\mathcal{L}}-B+\Phi)^2}-\frac{\alpha(2\mathcal{A}_{\mathcal{H}}-B)}{\Phi^2}<0,$$

and thus

$$\frac{\partial\left[(1-q^s)-\left(1-q^f\right)\right]}{\partial\Phi}=-\frac{\partial\left(\lambda^s-\lambda^f\right)}{\partial\Phi}\left[\frac{2\mathcal{A}_{\mathcal{L}}(1-\tau^2)}{B}-1\right]<0$$

given $2\mathcal{A}_{\mathcal{L}}-B>0$ and $2\mathcal{A}_{\mathcal{L}}(1-\tau^2)-B<0$.

[14] An exception among these studies is Armstrong et al. (2010), where the authors do not find evidence of a positive association between CEO equity incentives and accounting irregularities, a proxy for accounting reports manipulation.

[15] The distribution of this CEO short-termism is highly skewed.: the mean, 25th, and 75th percentiles of the sample distribution are 96, 3.3, and 15.9, respectively.

3 Institutional Background and Data

This section introduces the institutional background and several raw datasets we use. Subsection 3.1 provides an introduction about the institutional background under which SOX was passed, as well as several important provisions provided by SOX. Subsection 3.2 describes the various sources of raw data that we use and the construction of sample firms.

3.1 The Sarbanes-Oxley Act

SOX was passed in Congress on July 25, 2002, in response to several high-profile financial scandals in corporate America, which resulted in billions of dollars of losses for investors. President George W. Bush signed the bill into law on July 30, 2002.[16] The Act has widely been considered the most far-reaching securities legislation since the Securities Acts of 1933 and 1934. The implementation of SOX started soon after its passage and the rulemaking activities continued in 2003. The SEC adopted rules on management report of internal controls on May 27. The Public Company Accounting Oversight Board (PCAOB) audit standard of internal controls was approved by the SEC in June 2004, which completed the major rulemaking activities directed by SOX.

SOX consists of 11 sections. Several key provisions are worth mentioning. First, Section 302 of the Act requires firm chief executive officers (CEOs) and chief finance officers (CFOs) to certify the veracity of firms' financial statements, and demands more timely and detailed disclosures. Second, the "real time issuer disclosure" mandate in Section 409 of the Act was intended to provide investors with better and faster disclosure of important material corporate events.[17] Third, Section 404 requires companies to put in place and periodically test procedures that monitor the internal control

[16] For institutional details, see H.R.3763 – Sarbanes-Oxley Act of 2002.

[17] "SEC Adopts Rules on Provisions of Sarbanes-Oxley Act" (U.S. Securities and Exchange Commission, January 15, 2003).

systems ensuring accurate financial reports. This section also requires that managers report their findings in a special management report; in addition, external auditors of the company must attest to management's evaluation. Fourth, SOX sets more stringent standards for audit-committee membership. All members of the audit committee must be independent, and firms must disclose whether at least one member is a financial expert.[18] Fifth, SOX requires CEOs and CFOs to disgorge bonus compensation and stock-sale profits during any 12-month period following a financial report that is subsequently restated due to their misconduct. Sixth, SOX defines some new criminal offenses (i.e., destruction of documents with intent to obstruct justice) and raises criminal penalties attached to existing offenses.[19]

3.2 Data

In this subsection, we describe several raw datasets used in the paper. We focus on U.S.-headquartered, S&P 1500 constituent firms. The S&P 1500 includes all stocks in the S&P 500, S&P 400 (mid-cap stocks), and S&P 600 (small-cap stocks). These firms capture approximately 90% of the available stock market capitalization in the U.S., thereby maintaining the representativeness of the whole economy in economic terms.

3.2.1 Misreporting

Karpoff et al. (2017) conduct a comprehensive analysis of financial misconduct, utilizing samples extracted from four widely used databases that identify restatements, securities class action lawsuits,

[18] "Final Rule: Management's Report on Internal Control Over Financial Reporting and Certification of Disclosure in Exchange Act Periodic Reports" (U.S. Securities and Exchange Commission, August 28, 2008).

[19] Executives who knowingly certify false financial reports are subject to a fine of $5 million, a 20-year prison term, or both. Criminal penalties are increased for mail fraud, violation of the Employee Retirement Income Security Act of 1974 (ERISA) reporting and disclosure rules, and violation of the Securities Exchange Act of 1934. "Attorney General August 1, 2002 Memorandum on the Sarbanes-Oxley Act of 2002" (U.S. Department of Justice, August 1, 2002).

and Accounting and Auditing Enforcement Releases (AAERs). The study reveals that the outcomes of empirical tests can vary depending on the specific database used. Those authors assert that the selection of a database for measuring restatements should be contingent upon the research questions.

We measure quarterly misreporting by combining two distinct datasets. First, we use the Audit Analytics (AA) database, a source that offers financial-statement restatements as an indicator of detected misstatements, specifically those correcting accounting errors. The restatement records are derived from either 8-Ks or periodic reports (e.g., 10-Ks or 10-Qs). Second, we incorporate data from the Securities and Exchange Commission's (SEC) Accounting and Auditing Enforcement Releases, most recently curated by the University of California, Berkeley's Center for Financial Reporting and Management (CFRM). Since 1982, the SEC has issued Accounting and Auditing Enforcement Releases (AAERs) during or at the conclusion of investigations against companies, auditors, or officers for alleged accounting and/or auditing misconduct.[20]

One concern regarding the AA database is that not all identified restatements address intentional manipulation or the so-called "irregularity" (e.g., Hennes et al., 2008). Distinguishing between irregularity (i.e., intentional misapplications of GAAP) and error (i.e., unintentional misapplications of GAAP) involves with some unavoidable direction. We share similar thoughts to Terry et al. (2023) that "the choice of any particular definition of an intentional restatement reflects a trade-off between the number of restatements and the likelihood that these restatements correct intentional

[20]Note we deliberately refrain from using the Government Accountability Office (GAO) database of restatement announcements, because, in terms of scope, the GAO database largely overlaps with the Audit Analytics (AA) database but includes fewer restatement announcements. In addition, the GAO database does not include period beginning and ending dates for which the registrant is restating. We also do not use securities class action lawsuit filings from the Stanford Securities Class Action Clearinghouse, because lawyers can abuse the class action system by bringing meritless lawsuits against firms. This perception has been influential enough to lead the U.S. Congress to enact the Private Securities Litigation Reform Act of 1995 and the Lawsuit Abuse Reduction Act of 2017 to prevent such abuses. In line with this perspective, Karpoff et al. (2017) find that, compared with the other three databases, the SCAC database performs the least effectively in capturing firm-value-relevant events related to financial misconduct.

misstatements."

Following Hennes et al. (2008) and Terry et al. (2023), we employ a systematic approach including several steps to exclude errors with no apparent intention to misreport. First, we categorize restatements of revenue-recognition errors as irregularities, given they elicit the largest negative stock-market reaction compared with other restatement types. Second, we manually read all textual narratives of AA restatements for three distinctive patterns: (1) the presence of terms such as "fraud" or "irregularity," (2) indications of SEC or Department of Justice investigations, and (3) discussions concerning independent investigations conducted by an audit committee or a special committee. Third, we flag restatements that coincide with auditors identifying "internal control weakness." Fourth, we identify restatements brought forth by the SEC based on whether a related AAER period to overlap with the restated periods. Fifth, we exclude lease restatements and option backdating restatements from the irregularity group, deeming them less likely to be intentional.

3.2.2 Output-Price Stickiness

Output-price stickiness is measured at the 6-digit NAICS sector level. We assume different firms in the same 6-digit NAICS sector are subject to the same degree of price stickiness. This assumption is reasonable because firms operating in the same granular sector are similar in many aspects, including product functions, inputs, labors, technologies, and other business conditions.

We use the data for frequency of price adjustment (FPA) provided by Pasten et al. (2017) to measure price stickiness. Using the confidential microdata underlying the Producer Price Index (PPI) from 2002 to 2012, the authors calculate the FPA at the goods level as the ratio of the number of price changes to the total number of sample months. For example, if an observed price path is $5 for three months and then $10 for another two months, one price change occurs during five months, and the frequency is 1/5. The authors then aggregate goods-based frequencies into 674 data points at the level of 6-digit NAICS sectors. FPA measures the mean fraction of months with price changes during the sample period à la Calvo (1983) and is time invariant. The data are consistent with the finding by Nakamura and Steinsson (2008) that a median duration of prices is between eight and 11 months.[21]

3.2.3 Other Data

The syndicated loan sample is a set of loan issuances from the Dealscan database provided by the Loan Pricing Corporation. We collapse a package with multiple facilities contracted on the same date into one observation. Loan spread is calculated as the sum of the amount across facilities, the average maturity, and the average all-in-drawn spread over the London Interbank Offered Rate (LIBOR).[22] We collect stock returns from the daily and monthly stock-return file from the Center for Research in Security Prices (CRSP). We obtain financial and balance-sheet variables from Compustat. We gather earnings restatements from the Audit Analytics Restatement database that covers all SEC registrants who have disclosed a financial-statement restatement in electronic filings since January 1, 1995.

Panels A and B of Table 1 present descriptive statistics on the Compustat and DealScan samples, respectively. The sample unit with the Compustat sample is at the firm-year-quarter level; the sample unit with the DealScan sample is at the loan-package level. The frequency of misreporting at the quarterly level is about 10.4%, which is more than twice the likelihood at the annual level

[21] We match FPA to Compustat firms based on the 6-digit NAICS sector codes. If Compustat firms' 6-digit NAICS codes are not matched with those in the adjustment-frequency data, we switch to using 5-digit codes. To minimize measurement errors, and to make the sector-level data as granular as possible, we stop this procedure at 5-digit codes.

[22] We match loans to Compustat via the August 2012 version of the Dealscan-Compustat linking table introduced by Chava and Roberts (2008).

(Zakolyukina, 2018). Price stickiness varies substantially across firms. A breakdown of the number reveals that 9.8% and 1.7% are attributable to restatements from Audit Analytics and AAERs, respectively. On average, a firm will keep prices constant for eight months. As Figure 3 shows, the distribution of FPA is positively skewed. The 28.6% monthly frequency of price adjustment implies a duration of 6.83 months for price spells.[23]

4 Empirical Findings

This section presents the main analyses and findings of the paper. Subsection 4.1 examines the association between price stickiness and financial misreporting by firms both before and after the passage of SOX. Subsection 4.2 shows sticky-price firms experienced reduced loan spreads after SOX than before SOX. Below, we summarize our predictions to guide our empirical exercises to be conducted in this section.

1. Sticky-price firms are more likely than flexible-price firms to misreport earnings.
2. The difference between the two types of firms in terms of the likelihood of misreporting is more pronounced when securities regulation is lenient, but less pronounced when regulation becomes stringent.
3. Sticky-price borrowing firms pay higher loan spreads than flexible-price firms, and this difference in load spreads decreases when regulation becomes more stringent.

[23] We use $-1/\log(\text{1-adjustment frequency})$ to calculate implied duration.

4.1 Misreporting

This section shows that firms with sticky-output prices engaged with more misreporting before SOX but refrained more from doing so afterwards.

4.1.1 Baseline Results

Although Audit Analytics has restatements from 1996, this early data is incomplete, and these data could be considered complete only after January 1, 1999.[24] Given that data suggest on average firms restate earnings two years after the beginning of misreporting, we choose to begin the sample in 1997Q1 to allow eight quarters to precede 1999Q1, thereby including possible misstatement periods corresponding to a complete set of restatement announcements starting at January 1, 1999. We choose to end the sample in 2012Q4, which corresponds to the end of the period during which Pasten et al. (2017) observe microdata underlying the PPI program.[25]

Figure 4 shows the novel stylized fact, which is the main result of the paper. We plot the quarterly likelihood of earnings misreporting with adverse effects on restating firms' previously reported accounting earnings, and we compare such likelihoods before and after SOX and across firms with different levels of output-price stickiness.[26] Specifically, we categorize firms into five equally sized groups based on increasing price stickiness. For each group, we calculate the assets-weighted fre-

[24] The earlier data in Audit Analytics relies on GAO restatements that included disclosed restatement magnitudes. As a result, this early collection of restatements is incomplete and primarily focuses on larger firms with disclosed restatement magnitudes. Therefore, any test using restatements data from before 1999 is based on incomplete, and thus, inaccurate data. AAER data cannot fill this gap as AAERs primarily capture relatively extreme and rare frauds investigated by regulators.

[25] Our estimates are similar if we begin the sample in either 1998Q1 or 1999Q1.

[26] To map the model's spirit to real data, we measure misreporting at the quarterly frequency for the following reason: because shocks could impact on reported corporate earnings at any random points during a fiscal year, managers may want to manipulate interim reports to maximize personal utility by boosting the public's perception of fiscal-year-end earnings. Although the market pays more attention to the annual numbers, managers still want to hide poor performance as soon as possible, even though quarterly errors can resolve themselves by the end of the fiscal year. As a result of this application, the likelihood of misreporting in our study is higher than what is documented in the prior literature (e.g., Zakolyukina, 2018).

quency with which managers restate accounting earnings downward.[27] The figure shows that before SOX, managers of firms with sticky-output prices more frequently engaged in earnings overstatement. Moving from firms with the most flexible prices to firms with the stickiest prices increases the likelihood of overstatement from 3% to 21%. In contrast to this pre-SOX scenario, the relationship between price stickiness and earnings overstatement becomes flattened after SOX.

We then employ the following DiD design to rigorously estimate the frequency with which firms *overstated* earnings before and after SOX across firms with differential price stickiness:

$$\begin{aligned} Overstatement_{i,s} = \alpha + \beta \times Sticky_j + \gamma \times Sticky_j \times Post_{i,s} + \delta \times Post_{i,s} \\ + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,s} + \epsilon_{i,s}, \end{aligned} \tag{4.1}$$

where i, j, k, s, and t index the firm, the 6-digit NAICS sector, the 1-digit SIC sector, year-quarter, and year, respectively. $Overstatement_{i,s}$ is a dummy variable that equals 1 if year-quarter s of firm i falls into the reporting periods that are either (1) alleged to be overstated according to the AAER database or (2) admitted by firm i to be overstated according to the AA database, and 0 otherwise. We exclude overstatements from the AA database that are identified as errors (see Subsection 3.2 for details). $Post_{i,s}$ is an indicator equal to 1 if year-quarter s is after 2002Q3, and 0 otherwise. A set of firm (η_i) (or 1-digit SIC industry à la Augustin et al. (2023) (η_k)) fixed effects absorb time-invariant characteristics that differ across firms (or industries).[28] In the most restrictive specification, we add

[27]The BLS samples establishments based on value of shipments. Thus, we assign higher weight to larger firms within the same industry to mitigate potential effects of measurement errors from using industry-level data. Our weighting approach also aligns with SEC guidance, which indicates a higher risk of financial-reporting misstatements in larger firms. Refer to SEC Release Nos. 33-8810 and 34-55929 for Commission guidance on management's report on internal control over financial reporting under Section 13(a) or 15(d) of the Securities Exchange Act of 1934, dated June 20, 2007.

[28]Because output-price stickiness is measured at the 6-digit NAICS industry level, we use industries under other classifications to control for industry fixed effects. Our results are not materially altered if we use Hoberg-Phillips text-based or Fama-French 48-industry classification.

a set of 1-digit-SIC × time fixed effects ($\eta_{k,s}$) to absorb time-varying shocks at the level of the broad industry category.

For two reasons, we follow Xie (2020) and Gu and Xie (2024) to estimate weighted least squares regressions in which observations are weighted by firm assets. First, the SEC's guidance and identification of firm characteristics (that help predict financial fraud) suggest the risk of financial misreporting is higher for larger firms.[29] Second, the BLS samples establishments based on the value of shipments. We assign higher weight to larger firms within the same industry to mitigate potential effects of measurement errors from using industry-level data on price stickiness. In Table A.1 of the Online Appendix, when we perform our OLS estimation among relatively larger firms (i.e., S&P 500 constituent firms), our baseline results still hold.[30]

Using the above regression, we compare the change in the frequency with which sticky-price firms overstated accounting earnings (or restated earnings downward) before and after SOX with the frequency with which flexible-price firms overstate before and after SOX. The regression coefficient γ captures the double difference. Table 2 presents the estimates of regression (4.1). We find that, unconditionally, managers of sticky-price firms are significantly more likely to overstate earnings (column (1)). A one-standard-deviation increase in price stickiness increases such a likelihood by 1.5 (0.17×0.09) percentage points, which is about 15% of the sample mean. More importantly, managers of sticky-price firms, overstated significantly less often after SOX than before SOX, with γ ranging from -0.32 to -0.41 depending on the specifications. For example, with the time fixed effect (column (2)), a one-standard-deviation increase in price stickiness increases the likelihood of

[29] Consistent with the SEC's view, Zakolyukina (2018) uses data on detected misstatements to structurally estimate the extent of undetected misstatements. She finds the incidence of manipulation is higher for larger firms.

[30] In unreported tables, we find the absolute value of residuals from the OLS estimation monotonically declines with firm assets, suggesting that smaller firms indeed suffer from higher levels of measurement noise. Our findings are also robust to alternative weighting schemes; for example, the results are similar when observations are weighted by firm sales. These results are available upon request. Similar discussions can be found in Gu and Xie (2024).

overstatement by 5.4 (0.17 × 0.32) percentage points before SOX, but by literally zero percentage points after SOX.

Although the economic magnitudes vary slightly across specifications, our estimates are robust to the inclusion of time- and industry-fixed effects (column (3)), industry-time effects (column (4)), and firm- and industry-time fixed effects (column (5)). We also add total volatility to check if the cash-flow-volatility channel plays a role here (e.g., Augustin et al., 2023). Our results suggest managerial misreporting is not driven by the volatility of firm cash flows (column (6)).

4.1.2 Parallel-Trends Assumption

A necessary condition for identification is the parallel-trends assumption, which states that the evolution of earnings overstatements by sticky- and flexible-price firms would have followed common trends before and after SOX, had the securities regulation not happened. We estimate the following regression over the period of 1997Q1-2012Q4 to assess this assumption:

$$Overstatement_{i,s} = \alpha + \sum_{s=1997Q2}^{2012Q4} \beta_s \times Sticky_j + \sum_{\tau=1997Q1}^{20012Q4} \gamma_s + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,s} + \epsilon_{i,s}, \tag{4.2}$$

where we drop the interactions with 1997Q1, which serves as the base period. Thus, the estimated β coefficients represent changes in the difference between sticky- and flexible-price firms between 1997Q1 and period s. The evidence in Figure 5 is striking — managers of sticky-price firms refrained from overstating accounting earnings immediately following the passage and implementation of SOX. Due to the coverage of the dataset, because misreporting was infrequently observed during the early years of our sample, the estimated coefficients indicating the difference between sticky- and flexible-price firms somewhat fluctuates around zero during 1997-2001. However, the trend between 1997 and

2002 is significantly positive (compared with the base period), suggesting sticky-price firms were more prone to misreporting than their flexible-price counterparts starting from 1997. The trend turned negative in the quarter (i.e., 2002Q3) during which Congress passed SOX.

During the post-SOX period, point estimates stayed statically well below zero until 2009 and slightly reversed afterwards. The findings suggest the provisions of SOX exert medium-run disciplining effects on misreporting behavior conducted by sticky-price firms. The aftermath of Enron's downfall, coupled with heightened penalties, likely prompted firm managers to reassess the likelihood of facing punishment, thereby disciplining their misconduct in either accounting or disclosure policies (e.g., D'Acunto et al., 2022, 2023; Konchitchki and Xie, 2023). However, misreporting reverted back following a series of events in which regulators reduced the legal binding of original SOX provisions. Notably, in response to criticisms of the associated costs borne by listed firms, the SEC, the PCAOB, and Congress undertook measures to relax SOX-related requirements, starting in 2006 (e.g., Coates and Srinivasan, 2014).[31] Another interpretation of the above pattern is that post-SOX, firms used more real earnings management to substitute accrual-based earnings management (e.g., Cohen et al., 2008).

4.1.3 Robustness

In Table 3, we perform several robust checks. One important concern is whether nominal rigidities are really the underlying mechanism or just a proxy for something more fundamental (e.g., market

[31] For example, in 2006, the SEC allowed firms to postpone the implementation of Section 404 for up to two years after going public, a period extended to five years in 2012 for all but the largest newly listed firms by Congress. Another example is the SEC deferring the implementation of Section 404 for firms with a market capitalization below $75 million, with this deferral extended multiple times until 2010, when Congress permanently enshrined it in the Dodd-Frank Act. Additionally, for firms subject to Section 404, the PCAOB adopted Audit Standard 5 in 2007 to relax attestation requirements from those initially established in Audit Standard 2 in 2004. In a comprehensive survey conducted by the SEC after these regulatory changes, most respondents reported substantial economic significance, with costs reduced by 25% or more per year (SEC, 2009).

competition). First and foremost, in Panels A-C of Table 3, we reestimate equation (4.1) by adding a full set of interactions of our baseline control variables with the dummy for the years after SOX. The idea is to differentiate our proposed mechanism from many other omitted variables that could drive the correlation, and to verify that time-varying controls at the firm level do not wash out the effect we attribute to firms' price stickiness. We find our baseline estimates are virtually unchanged.

Second, in Panels B and C of Table 3, we re-estimate equation (4.1) by partitioning the two databases — Audit Analytics and AAERs — to gauge overstatements. At the same time, we also interact our baseline control variables with *Post*. In Panel B, we define $\mathit{Overstatementi}, s$ as a dummy variable that equals 1 if the year-quarter s corresponds to the over-reporting periods identified by the AA database, and 0 otherwise. In Panel C, $\mathit{Overstatementi}, s$ is a dummy variable that equals 1 if the year-quarter s corresponds to the over-reporting periods identified by the AAER database, and 0 otherwise.

Third, in equation (4.1) we use repeated observations of the same unit over time for several periods both before and after 2002Q3, which could raise concerns about statistical inference and the identification of the local treatment effect. Our clustering of standard errors at the 6-digit NAICS sector level reduces the concern of incorrect statistical inference due to autocorrelation. To further address this concern, we estimate the specification proposed by Bertrand et al. (2004), in which we average all the variables in the regression analysis at the firm level before and after 2002Q3. This "collapsed sample" leaves us with at most two observations for each firm—one before and one after 2002Q3. We report our results in Panel D of Table 3.

Fourth, we drop Arthur Anderson's clients to check whether the change of misreporting was caused by firms that had to switch auditors after the demise of Author Anderson. Panel E of Table 3 suggests this modification does not materially alter our results.[32]

4.2 Loan Spreads

This section shows borrowing firms with sticky-output prices paid lower borrowing costs after SOX compared to before, and relative to borrowing firms with flexible-output prices.

4.2.1 Baseline Results

We estimate the following DiD design:

$$\begin{aligned} \mathit{LoanSprd}_{n,i,s} = \alpha + \beta \times \mathit{Sticky}_j + \gamma \times \mathit{Sticky}_j \times \mathit{Post}_{i,s} + \delta \times \mathit{Post}_{i,s} \\ + X'_{i,t-1} \times \theta + \eta_t + \eta_{k,t} + \epsilon_{n,i,s}. \end{aligned} \tag{4.3}$$

For each loan package n signed by firm i as of year-month s, $\mathit{LoanSprd}_{n,i,s}$ is the average all-in-drawn spreads (in basis point) over LIBOR. We collapse a package with multiple facilities contracted on the same date into one observation.

Table 4 presents the regression results. Unconditionally, firms paid a similar loan-spread amount over the 1990-2012 period (column (1)). However, when comparing flexible-price firms with sticky-price firms, the latter paid significantly lower loan spreads after SOX than during the pre-SOX period. Prior to SOX, a one-standard-deviation increase in price stickiness correlated with a 9.1-basis-point (0.19 × 47.7) rise in *LoanSprd*; post-SOX, the same increase in stickiness corresponded to a 3.3-basis-point (0.19 × (47.7-65)) decrease in *LoanSprd* (see column (2)). Expressed as percentages of the

[32] In addition, Engel et al. (2007) argue that the quarterly frequency of going-private transactions has increased since SOX, suggesting the regulation may deter firms from seeking financing in public equity markets. To prevent the decline in the number of listed firms post-SOX from affecting our inferences, we re-estimate our baseline regression by restricting the sample to a fairly balanced panel of S&P 1500 firms whose constituent status had been intact over the entire sample period. Although this restriction dramatically reduces the sample size, unreported results suggest our findings remain robust.

sample mean, these numbers denote a substantial change in the loan-spread value: 7.6% (9.1/120.3) before SOX and -2.7% (-3.3/120.3) after SOX. Importantly, these findings remain robust across different regression specifications (columns (3)-(5)), and even when controlling for the return-based measure of cash-flow volatility (see column (6)).

A potential concern is whether our results on loan spreads may be attributed to managers of sticky-price firms adopting a more risk-averse approach in the post-SOX period (e.g., Kang et al., 2010; Bargeron et al., 2010). However, our unreported table provides evidence that, following SOX, sticky-price firms did not cut capital investment more than their flexible-price counterparts. This finding suggests changes in risk-taking activities cannot entirely account for the observed reduction in loan spreads.[33]

4.2.2 Parallel-Trends Assumption and Discussion

Figure 6 proposes a visual assessment for whether the trends in loan spreads were parallel across sticky- and flexible-price firms in periods before SOX was implemented. The figure plots the estimates of β and the 95% confidence intervals from the following regression:

$$LoanSprd_{n,i,s} = \alpha + \sum_{\tau=-9}^{7} \beta_{\tau} \times Sticky_j + \sum_{\tau=-9}^{7} \gamma_s + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,t} + \epsilon_{n,i,s}, \tag{4.4}$$

where the excluded period is event year -9, and β_s is the change in the effect of price stickiness on loan spread from event year -9 to event year τ. Event year 0 does not exist in the figure because each time unit represents 12 months either before or after the event date (i.e., July 25, 2002). We fail to reject the null hypothesis that the effect of price stickiness is equal to that in the baseline year for

[33]The results are available upon request.

all years before the passage of SOX.

Both Table 4 and Figure 6 suggest that syndicated loan borrowers with sticky-output prices experienced even lower spreads especially during the Great Recession. By contrast, Augustin et al. (2023) report an increase in yield spreads for sticky-price bond issuers in response to the Lehman Brothers' bankruptcy in September 2008.

We reconcile these seemingly contradictory findings through the following two key distinctions. First, Augustin et al. (2023) use transaction data from the secondary bond market, enabling a comparison of spreads for the same bond before and after September 2008. In our study, we source data from the primary syndicated loan market, allowing the selection of different borrowers or the inclusion of the same borrower with different borrowing purposes in our sample.

Second, the heightened uncertainty observed in the case of traded bonds could be considerably attenuated in the context of newly issued syndicated loans, because lead lenders often acquire private or soft information from borrowers, potentially reducing uncertainty. Moreover, because the financial crisis was largely exogenous to the fundamental of a majority of non-banking sectors, all else equal, borrowing firms' product-market operations were not significantly changed.[34]

Another possibility is that, because many unobservable factors determining output-price stickiness vary at the 6-digit NAICS level and these factors might have offsetting effects on loan spreads, it is better to interpret the estimates by including firm-fixed effects (see columns (4) and (5)).[35]

[34] According to Ivashina and Scharfstein (2010), new lending for real investment (e.g., working capital and capital expenditures) only declined by 14% in the last quarter of 2008 relative to the prior quarter. By contrast, lending for restructuring purposes (e.g., LBOs, M&As, share repurchases) contracted by almost 80% relative to the peak of the credit boom, suggesting that the impact of the financial crisis varied across different types of borrowing activities.

[35] Reasons why firms adjust their output prices less frequently include coordination failure among industry peers (Blinder, 1994; Blinder et al., 1997), managerial inefficiency (Zbaracki et al., 2004), customer antagonization (Anderson and Simester, 2010), firms anchoring on reference prices and costs (Eichenbaum et al., 2011) and, more generally, menu costs (Anderson et al., 2015). Exploring the determinants of output-price stickiness is beyond the scope of this paper.

4.2.3 Triple-Differences Strategy

The results we have presented so far may give rise to concerns that the observed trends in loan spreads between sticky- and flexible-price firms around the implementation of SOX might be attributable to unobservable systematic differences rather than lenders' reactions to managerial misreporting. Notably, variations in these differences around the time of SOX could potentially explain the differential trends in loan spreads. Studies have documented that the nationwide implementation of SOX coincided with concurrent economic shocks (e.g., Leuz, 2007), introducing time-series variations in loan spreads through sticky-price firms' exposure to macroeconomic shocks unrelated to managers' misreporting incentives.

To address this crucial concern, we employ a triple-differences strategy. This approach, while holding price stickiness constant, leverages variation in borrowers' information quality to disentangle the effects of SOX from broader economic shocks. Specifically, we compare loan spreads before and after SOX, across sticky- and flexible-price borrowers, and across borrowers with different levels of information quality. To implement this strategy, we employ the following triple-interaction strategy:

$$\begin{aligned} LoanSprd_{n,i,s} = \alpha + \beta_1 \times Sticky_j \times Post_{i,s} \times Opaque_{i,t-1} + \beta_2 \times Sticky_j \times Post_{i,s} + \\ \beta_3 \times Post_{i,s} \times Opaque_{i,t-1} + \beta_4 \times Sticky_j \times Opaque_{i,t-1} + \beta_5 \times Sticky_j + \\ \beta_6 \times Opaque_{i,t-1} + \beta_7 \times Post_{i,s} + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,t} + \epsilon_{n,i,s}, \end{aligned} \tag{4.5}$$

where $\beta_1 + \beta_2$ and β_2 represent the double difference in the outcome across levels of price stickiness and before and after the implementation SOX. These differences are computed separately for firms categorized as opaque and transparent. The variable $Opaque_{i,t}$ is a dummy variable set to 1 if borrower i exhibits low information quality as of year $t-1$, indicating a greater need for intensive monitoring by lenders, and 0 otherwise.

We follow Sufi (2007) and Ozdagli (2018) to employ three commonly used measures of borrower-side opaqueness. Our first measure of borrower-side information opaqueness is based on the extent to which outsiders rely on accrual accounting to reconcile timing differences between when cash inflows/outflows arrive and when revenues/expenses are recognized. Because more accrued earnings are less persistent into future (e.g., Sloan, 1996), lenders may more intensively monitor borrowers characterized by higher levels of accruals.[36] Dechow et al. (2011) document that, among various accruals measures, the difference in $RRST$ accruals between misstated and normal years is the most pronounced. Moreover, $RRST$ accruals serve as a robust predictor of the likelihood that the SEC issues AAERs during or at the conclusion of an investigation against a company, an auditor, or an officer, particularly for alleged accounting and/or auditing misconduct.

Panel A of Table 5 presents our estimates. We define *Opaque* as a binary variable that takes the value of 1 if a firm's 6-digit-NAICS-sector-adjusted $RRST$ accruals exceed the 90th percentile of its sample distribution, and 0 otherwise. We first confirm that borrowers with exceptionally high accruals incur an additional 45 basis points in spread (see column (1)). Sticky-price borrowers with unusually high accruals experienced significantly lower spreads after the implementation of SOX than before it. By contrast, for sticky-price borrowers with lower accruals, the impact of SOX on loan spreads is modest. In economic terms, borrowers with exceptionally high accruals paid approximately

[36]Following Richardson et al. (2005), we measure firms' accounting accruals ($RSST$ accruals hereafter), which extends the definition of working-capital accruals to include changes in long-term operating assets and long-term operating liabilities. This measure is equal to the change in non-cash net operating assets. According to Richardson et al. (2005), $RSST$ accruals is constructed as $(\Delta\text{WC} + \Delta\text{NCO} + \Delta\text{FIN})$/Average total assets, where WC = [Current Assets (DATA 4) - Cash and Short-term Investments (DATA 1)] - [Current Liabilities (DATA 5)- Debt in Current Liabilities (DATA 34)]; NCO = [Total Assets (DATA 6) - Current Assets (DATA 4) - Investments and Advances (DATA 32)] - [Total Liabilities (DATA 181) - Current Liabilities (DATA 5) - Long-term Debt (DATA 9)]; FIN=[Short-term Investments (DATA 193)+Long-term Investments (DATA 32)-[Long-term Debt (DATA 9) + Debt in Current Liabilities (DATA 34) + Preferred Stock (DATA 130)].

60 basis points (0.19 × 315.9) less in loan spreads after SOX, provided their product price exhibited one-standard-deviation greater stickiness (see column (5)).

Our second measure of borrower-side information opaqueness is predicated on whether a borrowing firm has S&P long-term credit ratings. The variable *Opaque* is a binary indicator that takes the value of 1 if firm i does not have a long-term credit rating at the time of debt contracting, and 0 otherwise. In Panel B of Table 5, we first confirm that borrowers without an S&P 1500 long-term rating incur an additional 50 basis points (see column (1)). We then observe a notable and statistically significant reduction in spreads for lenders extending loans to stick-price borrowers without a credit rating. In contrast, the effect is moderate for sticky-price firms with a credit rating. More specifically, borrowers without a rating experienced a reduction of approximately 33 basis points ($0.19 \times (165.4 + 9.6)$) in spreads after the implementation of SOX in response to a one-standard-deviation increase in their product-price stickiness (see column (5)).

Our third measure for borrower-side information opaqueness is derived from the syndicate concentration. As documented by Sufi (2007), evidence shows that when borrowing firms deserve more rigorous due diligence and monitoring, the lead arranger (informed lender) tends to retain a larger share of the loan. Accordingly, we define *Opaque* as a binary variable that takes the value of 1 if the lead arranger is the sole lender and therefore claims 100% ownership of the loan, and 0 otherwise. Compared with loans with low ownership concentration, where the monitoring incentive for lenders is low, spreads for loans with high concentration are expected to be more responsive to changes in borrower-side misreporting. Panel C of Table 5 illustrates that sticky-price firms borrowing from a sole lender experienced a substantial 111-basis-point ($0.19 \times (567.8 + 20.7)$) reduction in spread if their product price was one-standard-deviation stickier.

5 Concluding Remarks

The evidence we document suggests that, although sticky-output prices increase firms' cash-flow volatility, they also exacerbate firms' credit-market friction because misreporting is less costly for managers. We show that, after the US Congress's passage and implementation of SOX — a significant legislative event triggered by unprecedented accounting scandals — firms with sticky prices refrained more from overstating accounting earnings and paid lower loan spreads in the credit market than firms with flexible prices and relative to before SOX. Following the call by Bertomeu et al. (2016), we draw the above causal evidence based on a static model of earnings manipulation with endogenous manipulation costs.

One limitation of our study is that, by inferring from detected misstatements (i.e., earnings restatements), we can only estimate the lower bound of misreporting. Admittedly, however, there is potential misreporting associated with undetected misstatements, which are unobservable in our data. Based on the observed frequency of restatements, Zakolyukina (2018) estimates a structural model and shows that the model-implied fraction of CEOs who violate GAAP by misstating earnings at least once is 60%. By exploiting the demise of Arthur Andersen, Dyck et al. (2024) find evidence suggesting that in normal times only one-third of corporate frauds are detected. Because we compare observed misstatements across time between two groups of firms whose actual misstatements might be equally underestimated, our conclusion can be extended to undetected manipulation, the verification of which, however, is beyond the scope of this paper.

The agency-cost channel we micro found, namely, that managers of firms with sticky-output prices have more incentives to manipulate earnings, can be applied to understand business cycles and macro policies not only in the U.S. but also in many other countries where securities regulation is less strict to curtail managerial misreporting. To further assess the importance of this microfoundation, examining how monetary-policy shocks affect aggregated growth and fluctuations would be interesting. This examination could be achieved by incorporating misreporting-induced financial frictions into a New Keynesian model with a financial accelerator. Indeed, two recent studies by Ozdagli (2018) and Armstrong et al. (2019) document novel and important reduced-form evidence suggesting that monetary-policy shocks affect the real economy through firm-level accounting quality. To further assess the importance of this issue, an examination of the social welfare effect of this channel would contribute to the accounting literature (e.g., Choi, 2021; Bertomeu and Cheynel, 2023; Ball, 2024). Resonating with this thought, Li et al. (2022) examine the impact of price stickiness, misreporting, and the transmission of monetary policy to the real economy in a general equilibrium framework.

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Figure 1: **Timeline of Events**

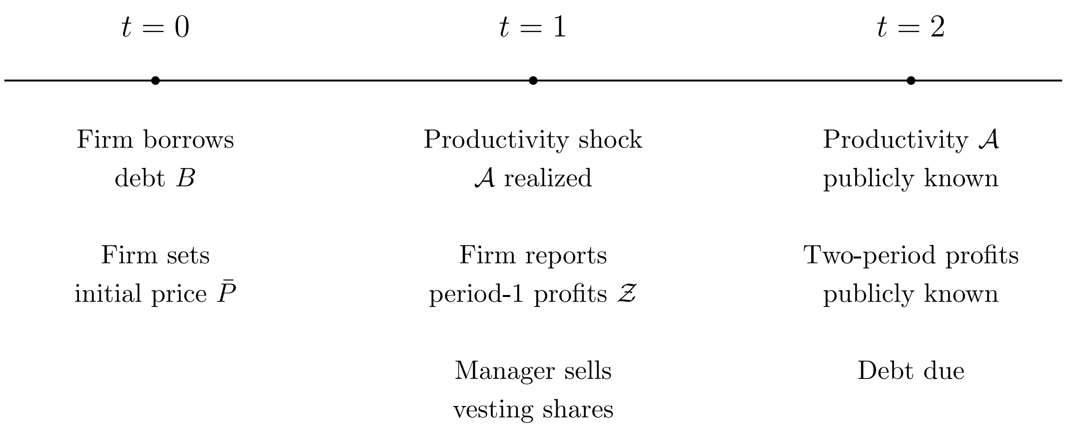

Figure 2: **Likelihood of Earnings Manipulation as a Function of Short-Termism: Sticky- vs. Flexible-Price Firms**

This figure plots the likelihood of earnings manipulation for managers of sticky- and flexible-price firms as a function of the managers' weight (α) on stock price at $t = 1$. The red dotted line and black solid line represent the cases for sticky- and flexible-price firms, respectively. The X-axis represents $\alpha \in [0, 1]$, and the Y-axis shows the likelihood of earnings manipulation for sticky-price firms (λ^s) and flexible-price firms (λ^f) when managers privately observe a signal indicating $\mathcal{A} = \mathcal{A}_{\mathcal{L}}$. The parameters are set as follows: $\mathcal{A}_{\mathcal{H}} = 3$, $\mathcal{A}_{\mathcal{L}} = 1$, $B = 1.01 \times 2\mathcal{A}_{\mathcal{L}}(1 - \frac{\tau^2}{4}) = 1.7494$, and $\Phi = 0.8$.

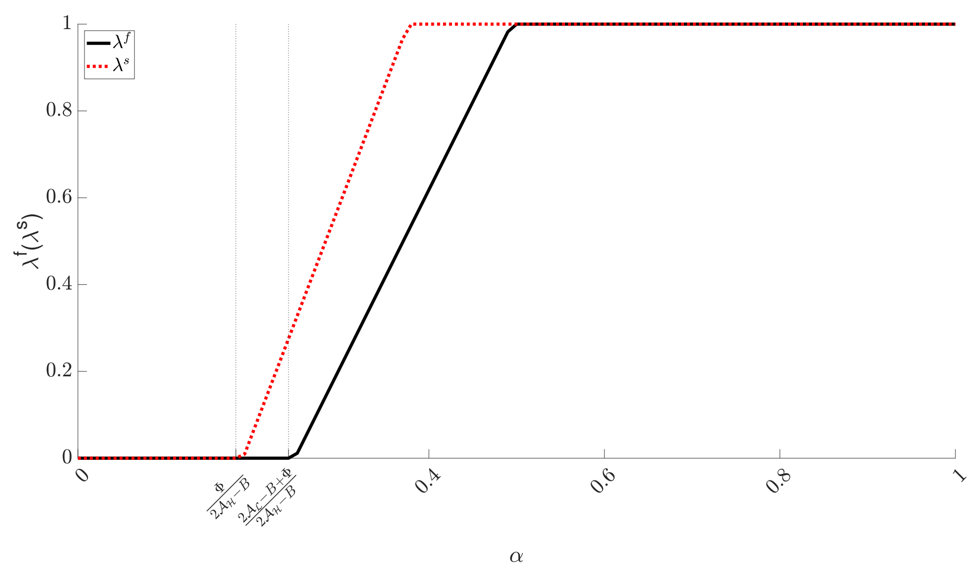

Figure 3: **Distribution of Monthly Frequency of Price Adjustment**

The figure plots the distribution of the monthly frequency of price adjustment (FPA). The samples are restricted to S&P 1500 constituent firms headquartered in the U.S. The sample period is 1997Q1-2012Q4. Utilities and Financial sectors are excluded. In the sample period of 2002-2012, the FPA at NAICS sectors of different granularities is calculated by Pasten et al. (2017). Equal-weighted probabilities of price adjustments at the goods level are calculated using the micro-data underlying the Producer Price Index constructed by the BLS. The granularity for FPA is at the 6-digit level.

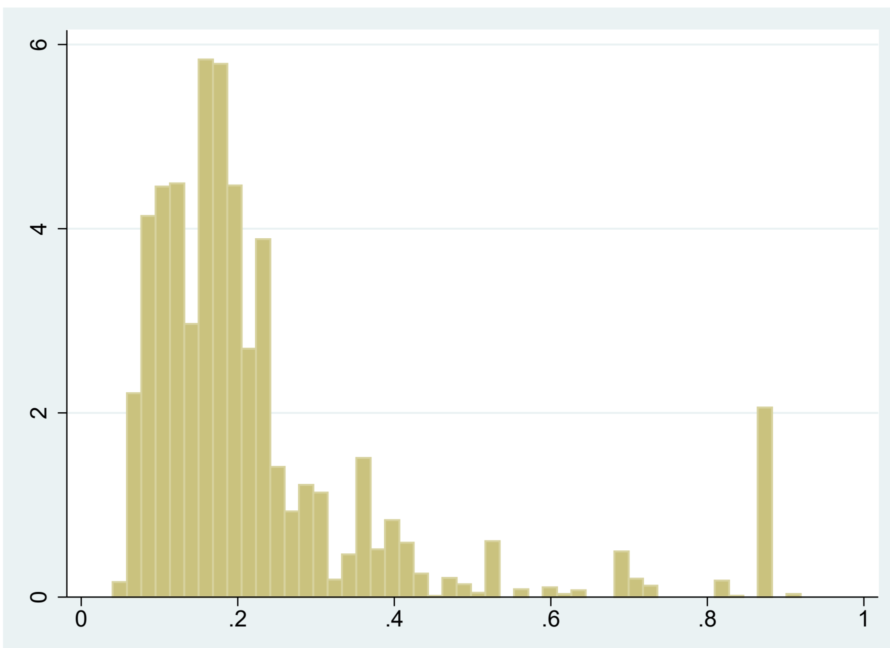

Figure 4: **Price Stickiness and Firms' Overstatement of Accounting Earnings**

The figure plots the probability of firm managers restating accounting performance downward across firms with increasing levels of output-price stickiness. $Overstatement_{i,s}$ (y-axis) is a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods identified as allegedly overstated either by the Accounting and Auditing Enforcement Releases (AAERs) database or by the Audit Analytics (AA) database; otherwise, it is set to 0. In each bin, we calculate the mean of *Overstatement* across firms, weighted by firm assets. The dataset includes firms listed in the S&P 1500 index with headquarters in the U.S., excluding those in the Utilities and Financial sectors. Price stickiness is measured as the frequency of price adjustment (FPA) multiplied by -1. In the sample period of 2002-2012, FPA at the 6-digit NAICS sector level is calculated by Pasten et al. (2017).

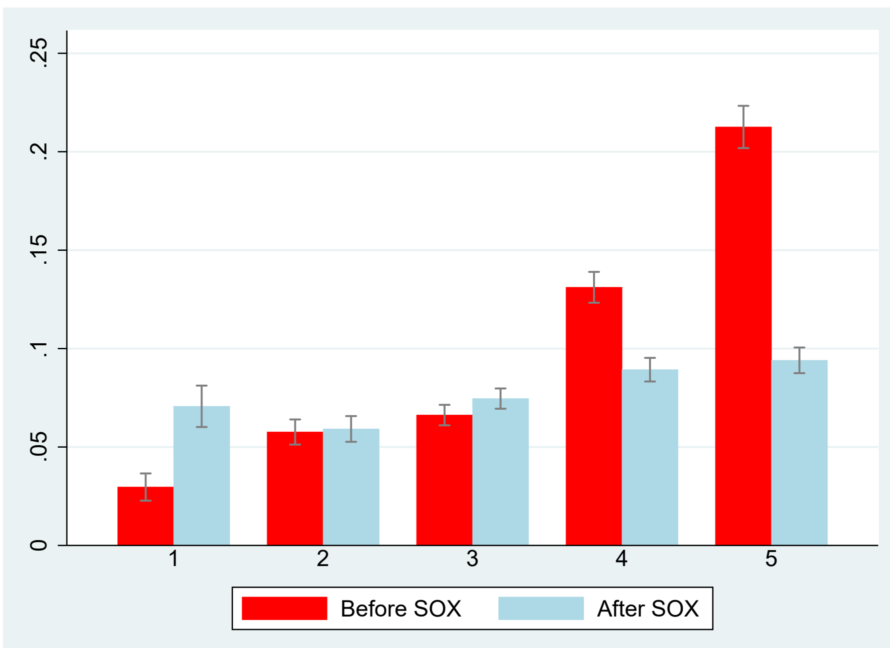

Figure 5: **Pre-Trends Assumption: Earnings Overstatement**

The figure plots the estimates of β and the 95% confidence intervals from following weighted least squares equation in which observations are weighted by firm assets:

$$Overstatement_{i,s} = \alpha + \sum_{\tau=1997Q2}^{2012Q4} \beta_s \times Sticky_j + \sum_{\tau=1997Q1}^{20012Q4} \gamma_s + X'_{i,t-1} \times \theta + \eta_{j'} + \eta_i + \eta_{k,s} + \epsilon_{i,s},$$

which includes a set of interactions between price stickiness (Sticky) and year-quarter fixed effects for the quarters before and after 2002Q3. The excluded quarter is 1997Q1. $Overstatement_{i,s}$ is a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods identified either as allegedly overstated according to the AAER database or as acknowledged by firm i to be overstated according to the AA database; otherwise, it is set to 0. Overstatements from the AA database identified as errors are excluded (refer to Subsection 3.2 for detailed explanations). The reference event year, denoted as year 0, is 2002, during the third quarter of which the U.S. Congress passed and implemented the Sarbanes-Oxley Act (SOX). X' is a set of control variables (see Table 1 for detailed descriptions). All continuous variables are winsorized at the 1% and 99% levels. η_i and $\eta_{k,s}$ indicate a full set of firm- and industry-year fixed effects. Industry is measured at the level of 1-digit SIC industry codes. Standard errors are clustered at the level of 6-digit NAICS sectors.

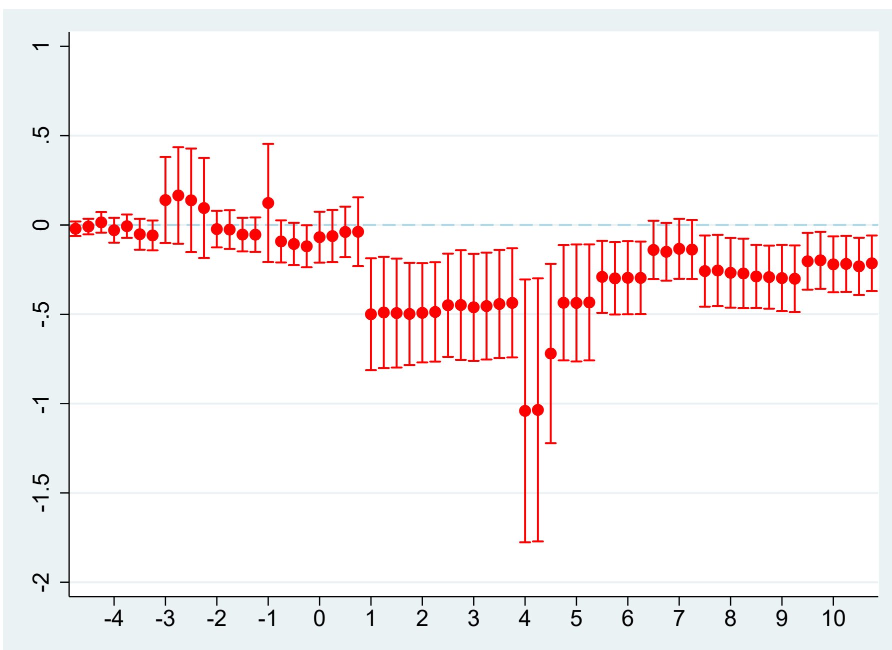

Figure 6: **Dynamics of Loan Spread**

The figure plots the estimates of β and the 95% confidence intervals from the following weighted-least-squares regression in which observations are weighted by firm assets:

$$LoanSprd_{n,i,s} = \alpha + \sum_{\tau=-9}^{7} \beta_s \times Sticky_j + \sum_{\tau=-9}^{7} \gamma_s + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,s} + \epsilon_{n,i,s},$$

which includes a set of interactions between output-price stickiness (Sticky) and event-year fixed effects for the time periods both preceding and succeeding July 25, 2002. For each loan package n executed by firm i in year s, $LoanSprdn, i, s$ (in basis points) represents the average all-in-drawn spreads over the London Interbank Offered Rate. The variable *Sticky* denotes the frequency of price adjustment multiplied by -1. The range $-9 \leq \tau \leq 7$ signifies the τ-th event year (12 months) relative to the event date (July 25, 2002). Event year 0 indicates 12 months before July 25, 2002. The excluded event year is -9. X' is a set of control variables (see Table 1 for detailed descriptions). All continuous variables are winsorized at the 1% and 99% levels. η_i and $\eta_{k,s}$ indicate a full set of firm- and industry-year fixed effects. Industry is measured at the level of 1-digit SIC industry codes. Standard errors are clustered at the level of 6-digit NAICS sectors.

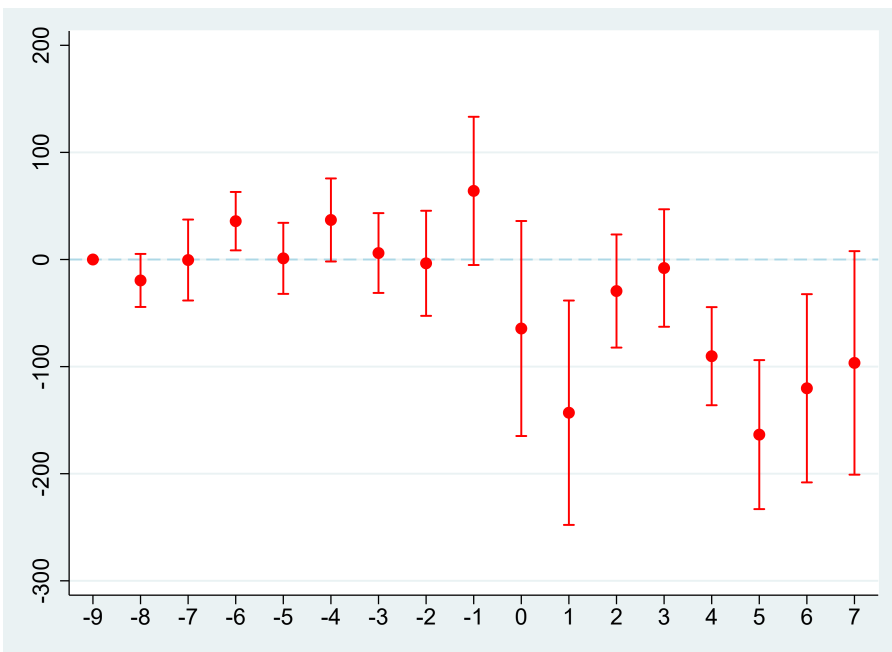

Table 1: **Descriptive Statistics**

The samples are restricted to S&P 1500 constituent firms headquartered in the U.S. The sample period is 1997Q1–2012Q4 and 1990Q1–2012Q4 for Panel A and Panel B, respectively. Utilities and Financial sectors are excluded. *Post* is an indicator equal to 1 if year-quarter s is after 2002Q3, and 0 otherwise. *Overstatement* is a dummy variable set to 1 if the year-quarter observations for a firm falls within reporting periods identified either as allegedly overstated according to the AAER database or as acknowledged by the firm to have been overstated according to the AA database; otherwise, it is set to 0. Overstatements from the AA database identified as errors are excluded (refer to Subsection 3.2 for detailed explanations). *Overstatement*(AA) is a dummy variable set to 1 if the year-quarter observations for a firm fall within reporting periods as acknowledged by the firm to have overstated according to the AA database; otherwise, it is set to 0. *Overstatement*(AAER) is a dummy variable set to 1 if the year-quarter observations for a firm fall within reporting periods as allegedly overstated according to the AAER database; otherwise, it is set to 0. *Sticky* is the frequency of price adjustment (FPA) multiplied by -1. In the sample period of 2002-2012, the FPA at NAICS sectors of different granularities is calculated by Pasten et al. (2017). Equal-weighted probabilities of price adjustments at the goods level are calculated using the micro-data underlying the Producer Price Index constructed by the BLS. The granularity for FPA is at the 6-digit level. *Total Vol* is the standard deviation of raw daily returns over quarter s. *Leverage* is debt maturing in more than two years to total assets. *Profitability* is operating income over total assets. *Assets* is the total assets (in millions). *Size* is the logarithm of sales (in millions). *B-M ratio* is the book equity for the fiscal year ending in calendar year t-1 over the market equity as of December t-1. *Intangibility* is intangible assets defined as total assets minus the sum of net property, plant, and equipment; cash and short-term investments; total receivables; and total inventories to total assets. *PCM* is the price-to-cost margin. *HHI* is the Herfindahl-Hirschman Index based on sales of Compustat firms. *LoanSprd* is the average all-in-drawn spreads (in basis points) over the London Interbank Offered Rate.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8)	(9)
	Panel A. Compustat Sample									
	Mean	Std	P1	P10	P25	P50	P75	P90	P99	N
Overstatement	0.103	0.304	0.000	0.000	0.000	0.000	0.000	1.000	1.000	52,920
Overstatement (AA)	0.096	0.295	0.000	0.000	0.000	0.000	0.000	0.000	1.000	52,920
Overstatement (AEER)	0.017	0.130	0.000	0.000	0.000	0.000	0.000	0.000	1.000	52,920
Sticky	-0.224	0.173	-0.875	-0.391	-0.238	-0.182	-0.122	-0.088	-0.062	52,920
Post	0.624	0.484	0.000	0.000	0.000	1.000	1.000	1.000	1.000	52,920
Total Vol	0.448	0.218	0.157	0.234	0.301	0.397	0.537	0.731	1.200	52,109
Leverage	0.173	0.151	0.000	0.000	0.018	0.158	0.277	0.379	0.587	52,920
Profitability	0.101	0.096	-0.199	0.016	0.061	0.100	0.148	0.202	0.353	52,920
Assets	6650	21586	90	259	539	1414	4294	14440	91540	52,920
Size	7.191	1.581	3.825	5.277	6.123	7.090	8.180	9.357	11.033	52,920
B-M ratio	0.522	0.413	0.048	0.156	0.266	0.431	0.659	0.965	1.990	52,920
Intangibility	0.286	0.188	0.017	0.065	0.133	0.253	0.407	0.554	0.793	52,920
PCM	0.395	0.331	0.020	0.167	0.260	0.378	0.539	0.702	0.909	52,920
HHI	0.081	0.064	0.031	0.036	0.042	0.059	0.089	0.144	0.341	52,920
	Panel B. DealScan Sample									
	Mean	Std	P1	P10	P25	P50	P75	P90	P99	N
Sticky	-0.247	0.187	-0.875	-0.428	-0.285	-0.194	-0.132	-0.094	-0.062	8,006
Post	0.488	0.500	0.000	0.000	0.000	0.000	1.000	1.000	1.000	8,006
LoanSprd	120	106	15	25	40	88	175	255	450	8,006
Post	0.488	0.500	0.000	0.000	0.000	0.000	1.000	1.000	1.000	8,006
Total Vol	0.026	0.012	0.010	0.014	0.018	0.023	0.030	0.040	0.068	6,905
Leverage	0.210	0.142	0.000	0.010	0.103	0.202	0.303	0.396	0.584	8,006
Profitability	0.106	0.074	-0.087	0.033	0.065	0.100	0.142	0.192	0.339	8,006
Assets	8555	25681	122	373	805	2071	6754	18266	107949	8,006
Size	7.783	1.492	4.642	5.960	6.720	7.673	8.792	9.789	11.419	8,006
B-M ratio	0.527	0.412	0.049	0.167	0.273	0.435	0.659	0.972	1.978	8,006
Intangibility	0.289	0.186	0.021	0.067	0.138	0.259	0.406	0.559	0.780	8,006
PCM	0.357	0.217	0.044	0.142	0.225	0.332	0.469	0.614	0.862	8,006
HHI	0.060	0.041	0.012	0.029	0.034	0.048	0.065	0.109	0.217	8,006

Table 2: **Price Stickiness and Earnings Overstatement**

This table reports the results for estimating the following weighted-least-squares regression on S&P 1500 constituent firms headquartered in the U.S. over the sample period of 1997Q1-2012Q4. Observations are weighted by firm assets. Utilities and Financial sectors are excluded:

$$Overstatement_{i,s} = \alpha + \beta \times Sticky_j + \gamma \times Sticky_j \times Post_{i,s} + \delta \times Post_{i,s} + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,s} + \epsilon_{i,s},$$

where $Overstatement_{i,s}$ is a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods identified either as allegedly overstated according to the AAER database or as acknowledged by firm i to have been overstated according to the AA database; otherwise, it is set to 0. Overstatements from the AA database identified as errors are excluded (refer to Subsection 3.2 for detailed explanations). $Post_{i,s}$ is an indicator equal to 1 if year-quarter s for firm i is after 2002Q3, and 0 otherwise. The variable *Sticky* denotes the frequency of price adjustment multiplied by -1. X' is a set of control variables (see table 1 for detailed descriptions). i, j, k, s, and t index the firm, the 6-digit NAICS sector, the 1-digit SIC industry, year-quarter, and year, respectively. *Time* is measured at the year-quarter level. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the level of 6-digit NAICS sectors.

	(1)	(2)	(3)	(4)	(5)	(6)
Sticky	0.09**	0.32***	0.25**	0.24***		
	(2.07)	(3.22)	(2.00)	(3.01)		
Sticky × Post		-0.32**	-0.37**	-0.40***	-0.41***	-0.40***
		(-2.43)	(-2.45)	(-4.16)	(-3.88)	(-3.65)
Total Vol						0.06
						(0.99)
Leverage	0.21*	0.22**	0.22**	0.20**	0.21**	0.20**
	(1.82)	(2.01)	(2.26)	(2.53)	(2.51)	(2.32)
Profitability	-0.13	-0.21*	-0.14	-0.14	0.04	0.04
	(-1.41)	(-1.76)	(-1.49)	(-1.44)	(0.33)	(0.29)
Size	0.00	0.00	-0.00	-0.00	0.03	0.03
	(0.16)	(0.24)	(-0.37)	(-0.68)	(1.20)	(1.24)
B-M ratio	0.05	0.04	0.04	0.04	0.03	0.03
	(1.55)	(1.35)	(1.35)	(1.58)	(0.97)	(0.81)
Intangibility	-0.08	-0.08	-0.04	-0.02	-0.01	0.00
	(-1.60)	(-1.62)	(-0.94)	(-0.60)	(-0.11)	(0.07)
PCM	0.01	0.01	0.04	0.04	0.03	0.03
	(0.30)	(0.25)	(1.21)	(1.32)	(0.60)	(0.57)
HHI	-0.03	-0.02	-0.09	-0.08	0.09	0.07
	(-0.24)	(-0.15)	(-0.76)	(-0.69)	(0.24)	(0.19)
Constant	0.06	0.06	0.04	0.05	-0.41	-0.44
	(0.54)	(0.56)	(0.50)	(0.64)	(-1.58)	(-1.64)
Time FE	Yes	Yes	Yes	No	No	No
SIC1 FE	No	No	Yes	No	No	No
SIC1 × Time FE	No	No	No	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes
N	52,919	52,919	52,919	52,919	52,919	52,108
Adjusted R^2	0.06	0.07	0.09	0.14	0.39	0.39

standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 3: **Price Stickiness and Earnings Overstatement: Robustness Checks**

This table reports the results for estimating the following weighted-least-squares regression on S&P 1500 constituent firms headquartered in the U.S. over the sample period of 1997Q1-2012Q4. Observations are weighted by firm assets. Utilities and Financial sectors are excluded:

$$Overstatement_{i,s} = \alpha + \beta \times Sticky_j + \gamma \times Sticky_j \times Post_{i,s} + \delta \times Post_{i,s} + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,s} + \epsilon_{i,s},$$

where $Overstatement_{i,s}$ is a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods identified either as allegedly overstated according to the AAER database or as acknowledged by firm i to have been overstated according to the AA database; otherwise, it is set to 0. Overstatements from the AA database identified as errors are excluded (refer to Subsection 3.2 for detailed explanations). $Post_{i,s}$ is an indicator equal to 1 if year-quarter s for firm i is after 2002Q3, and 0 otherwise. The variable *Sticky* denotes the frequency of price adjustment multiplied by -1. X' is a set of control variables (see Table 1 for detailed descriptions). i, j, k, s, and t index the firm, the 6-digit NAICS sector, the 1-digit SIC industry, year-quarter, and year, respectively. *Time* is measured at the year-quarter level. In Panels A-C, we add a full set of interactions of control variables with $Post_{i,s}$. In Panel B, we redefine $Overstatement_{i,s}$ as a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods as acknowledged by firm i to have been overstated according to the AA database; otherwise, it is set to 0. In Panel C, we redefine $Overstatement_{i,s}$ as a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods as allegedly overstated according to the AAER database; otherwise, it is set to 0. In Panel D, we average all the variables in the regression analysis at the firm level before and after 2002Q3. In this collapsed specification, each individual firm i only has two data points, with one before 2002Q3 and one after 2002Q3. In Panel E, firms audited by clients of Arthur Andersen as of 2001 are omitted from the sample. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the 6-digit NAICS sector level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. Full Set Interactions Controls					
Sticky	0.09**	0.27***	0.19	0.24**		
	(2.05)	(2.91)	(1.61)	(2.37)		
Sticky × Post		-0.24*	-0.30**	-0.39***	-0.33***	-0.32***
		(-1.93)	(-2.19)	(-3.30)	(-3.44)	(-3.41)
N	52,919	52,919	52,919	52,919	52,919	52,108
Adjusted R^2	0.08	0.08	0.11	0.14	0.40	0.39
	Panel B. Full Set Interactions Controls: AA					
Sticky	0.08**	0.26***	0.19*	0.22**		
	(2.12)	(2.93)	(1.78)	(2.33)		
Sticky × Post		-0.24**	-0.28**	-0.34***	-0.23**	-0.23***
		(-2.08)	(-2.28)	(-3.10)	(-2.56)	(-2.62)
N	52,919	52,919	52,919	52,919	52,919	52,108
Adjusted R^2	0.06	0.07	0.09	0.12	0.40	0.39
	Panel C. Full Set Interactions Controls: AAER					
Sticky	0.06***	0.16***	0.15**	0.18***		
	(2.96)	(2.69)	(2.33)	(2.89)		
Sticky × Post		-0.14**	-0.15**	-0.20***	-0.16***	-0.15***
		(-2.20)	(-2.29)	(-3.17)	(-2.74)	(-2.60)
N	52,919	52,919	52,919	52,919	52,919	52,108
Adjusted R^2	0.06	0.07	0.07	0.10	0.42	0.40
	Panel D. Collapsed Sample					
Sticky	0.13***	0.33***	0.23**	0.24***		
	(2.78)	(3.68)	(2.22)	(3.36)		
Sticky × Post		-0.33**	-0.37**	-0.42***	-0.41***	-0.36***
		(-2.09)	(-2.21)	(-3.95)	(-3.26)	(-3.17)
N	2,596	2,596	2,596	2,596	2,596	2,576
Adjusted R^2	0.05	0.09	0.14	0.17	0.36	0.38
	Panel E. Excluding Arthur Anderson's Clients					
Sticky	0.10**	0.31***	0.23**	0.21***		
	(2.34)	(3.52)	(2.11)	(2.87)		
Sticky × Post		-0.30**	-0.36**	-0.37***	-0.43***	-0.42***
		(-2.46)	(-2.55)	(-4.02)	(-4.16)	(-3.91)
N	43,486	43,486	43,486	43,486	43,486	42,796
Adjusted R^2	0.07	0.08	0.11	0.15	0.38	0.38
Controlling *Total Vol*?	No	No	No	No	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	No	No	No
SIC1 FE	No	No	Yes	No	No	No
SIC1 × Time FE	No	No	No	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes

standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 4: **Price Stickiness and Loan Spread**

This table reports the results for estimating the following weighted-least-squares regressions on S&P 1500 constituent firms headquartered in the U.S. over the sample period of 1990–2012. Observations are weighted by firm assets. Utilities and Financial sectors are excluded:

$$LoanSprd_{n,i,s} = \alpha + \beta \times Sticky_j + \gamma \times Sticky_j \times Post_{i,s} + \delta \times Post_{i,s} + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,t} + \epsilon_{n,i,s}.$$

For each loan package n signed by firm i in year-month s, $LoanSprd_{n,i,s}$ represents the average all-in-drawn spreads over the London Interbank Offered Rate (in basis points). The variable *Sticky* denotes the frequency of price adjustment, multiplied by -1. i, j, k, s, and t index the firm, the 6-digit NAICS sector, the 1-digit SIC industry, year-month, and year, respectively. $Post_{i,s}$ is an indicator equal to 1 if year-quarter s for firm i is after 2002Q3, and 0 otherwise. X' is a set of control variables (see Table 1 for detailed descriptions). *Time* is measured at the level of years. All variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the level of 6-digit NAICS sectors.

	(1)	(2)	(3)	(4)	(5)	(6)
Sticky	11.16	47.74***	26.36*	20.49*		
	(0.77)	(4.18)	(1.72)	(1.66)		
Sticky × Post		-64.98**	-82.20***	-67.05***	-89.64***	-65.69***
		(-2.20)	(-3.00)	(-4.23)	(-4.40)	(-3.04)
Post		40.83	36.45	38.62	35.83	31.15
		(1.32)	(1.21)	(1.38)	(1.20)	(1.06)
Total Vol						143.07***
						(5.90)
Leverage	151.21***	150.90***	137.16***	129.03***	86.74***	84.85***
	(5.83)	(6.06)	(6.08)	(5.92)	(3.81)	(4.28)
Profitability	-232.87***	-227.05***	-191.26***	-162.27***	-9.07	-38.13
	(-4.04)	(-4.37)	(-4.34)	(-3.75)	(-0.19)	(-0.90)
Size	-12.02***	-11.89***	-14.69***	-16.11***	-26.94***	-25.66***
	(-5.74)	(-5.63)	(-9.28)	(-12.94)	(-6.20)	(-7.68)
B-M ratio	37.04***	35.48***	34.36***	38.94***	29.91***	30.16***
	(6.63)	(6.76)	(7.32)	(7.24)	(5.35)	(8.02)
Intangibility	2.63	1.59	2.95	-1.99	52.78**	31.04*
	(0.17)	(0.11)	(0.17)	(-0.11)	(2.48)	(1.72)
PCM	-16.01	-21.22*	-11.64	-10.56	-59.53*	-65.66*
	(-1.34)	(-1.70)	(-0.90)	(-0.90)	(-1.65)	(-1.92)
HHI	36.68	48.05	63.00	68.80	15.13	11.08
	(0.52)	(0.65)	(0.68)	(0.76)	(0.12)	(0.11)
Constant	177.51***	155.57***	143.60***	182.61***	284.99***	242.83***
	(7.81)	(6.02)	(5.63)	(8.80)	(5.50)	(6.01)
Time FE	Yes	Yes	Yes	No	No	No
SIC1 FE	No	No	Yes	No	No	No
SIC1 × Time FE	No	No	No	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes
N	8,006	8,006	8,006	8,006	8,006	7,891
Adjusted R^2	0.39	0.40	0.41	0.45	0.52	0.56

standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 5: **Price Stickiness and Loan Spread: Triple-Interaction Strategies**

This table reports the results for estimating the following weighted-least-squares regressions on S&P 1500 constituent firms headquartered in the U.S. over the sample period of 1990-2012. Observations are weighted by firm assets. Utilities and Financial sectors are excluded:

$$\begin{aligned} LoanSprd_{n,i,s} = \alpha &+ \beta_1 \times Sticky_j \times Post_{i,s} \times Opaque_{i,t-1} + \beta_2 \times Sticky_j \times Post_{i,s} + \\ &\beta_3 \times Post_{i,s} \times Opaque_{i,t-1} + \beta_4 \times Sticky_j \times Opaque_{i,t-1} + \beta_5 \times Sticky_j + \\ &\beta_6 \times Opaque_{i,t-1} + \beta_7 \times Post_{i,s} + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,t} + \epsilon_{n,i,s}. \end{aligned}$$

For each loan package n signed by firm i in year-month s, $LoanSprd_{n,i,s}$ represents the average all-in-drawn spreads over the London Interbank Offered Rate (in basis points). The variable *Sticky* denotes the frequency of price adjustment, multiplied by -1. $Post_{i,s}$ is an indicator equal to 1 if year-month s is after 2002Q3, and 0 otherwise. In Panel A, $Opaque_{i,t-1}$ is a binary variable that takes the value of 1 if firm i's 6-digit NAICS industry-adjusted accruals in the preceding year $(t-1)$ are above the 90th percentile of its sample distribution, and zero otherwise. In Panel B, $Opaque_{i,t-1}$ is a binary variable set to 1 if firm i lacks a long-term credit rating at the time of debt contracting, and 0 otherwise. In Panel C, $Opaque_{i,t-1}$ is a binary variable set to 1 if a loan is provided by a single lender, and 0 otherwise. X' is a set of control variables (see Table 1 for detailed descriptions). i, j, k, s, and t index the firm, the 6-digit NAICS sector, the 1-digit SIC industry, year-quarter, and year, respectively. *Time* is measured at the level of years. All variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the level of 6-digit NAICS sectors.

	(1)	(2)	(3)	(4)	(5)
	Panel A: Abnormal Accruals ≥ 90 pctl				
Sticky × Post × Opaque	-325.73***	-280.08**	-294.66**	-327.13**	-315.90**
	(-2.66)	(-2.28)	(-2.23)	(-2.52)	(-2.42)
Sticky × Post	-10.04	-14.08	-25.21	-10.80	3.61
	(-0.45)	(-0.64)	(-1.29)	(-0.44)	(0.14)
N	4,387	4,387	4,387	4,387	4,319
Adjusted R^2	0.47	0.48	0.50	0.62	0.64
	Panel B: No S&P Long-Term Rating				
Sticky × Post × Opaque	-132.21***	-109.71***	-137.35***	-173.58***	-165.38***
	(-5.31)	(-3.71)	(-5.55)	(-7.56)	(-6.58)
Sticky × Post	-8.80	-29.09***	-21.38*	-19.91*	-9.63
	(-0.85)	(-2.96)	(-1.84)	(-1.90)	(-1.03)
N	6,217	6,217	6,217	6,217	6,121
Adjusted R^2	0.41	0.42	0.47	0.54	0.55
	Panel C: Sole Lender				
Sticky × Post × Opaque	-529.31**	-570.33**	-574.96**	-587.02**	-567.84**
	(-2.27)	(-2.43)	(-2.57)	(-2.30)	(-2.21)
Sticky × Post	-21.58**	-43.15***	-34.88***	-30.13***	-20.74**
	(-2.04)	(-4.68)	(-3.07)	(-2.83)	(-2.18)
N	6,216	6,216	6,216	6,216	6,120
Adjusted R^2	0.44	0.46	0.51	0.58	0.59
Controlling *Total Vol*?	No	No	No	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	No	No	No
SIC1 FE	No	Yes	No	No	No
SIC1 × Time FE	No	No	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes

standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$

Online Appendix: Nominal Rigidities, Earnings Manipulation, and Securities Regulation

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A.1 Model Proofs

At $t = 0$, managers of a sticky-price firm set initial price to maximize her expected utility:[1]

$$\begin{aligned}\max_P \mathbb{E}[U^s(P)] &= \max_P [\frac{1}{2}U^{s,o}(\mathcal{A}_\mathcal{H}, \pi_\mathcal{H}, P) + \frac{\lambda^s}{2}U^{s,m}(\mathcal{A}_\mathcal{L}, \pi_\mathcal{H}, P) + \frac{1-\lambda^s}{2}U^{s,o}(\mathcal{A}_\mathcal{L}, \pi_\mathcal{L}, P)] \\ &= \max_P [\frac{1}{2}U^{s,o}(\mathcal{A}_\mathcal{H}, \pi_\mathcal{H}, P) + \frac{1}{2}U^{s,o}(\mathcal{A}_\mathcal{L}, \pi_\mathcal{L}, P)], \end{aligned} \tag{A.1}$$

where $U^{s,o}(\mathcal{A}_\mathcal{L}, \pi_\mathcal{L}, P) = U^{s,m}(\mathcal{A}_\mathcal{L}, \pi_\mathcal{H}, P)$ because λ^s is the equilibrium belief under which managers realizing $\mathcal{A}_\mathcal{L}$ are indifferent between misreporting and honest reporting. Because managerial utilities derived from truthful reporting under the states of $\mathcal{A}_\mathcal{H}$ and $\mathcal{A}_\mathcal{L}$, respectively, can be expressed as

$$U^{s,o}(\mathcal{A}_\mathcal{H}, \pi_\mathcal{H}, P) = \alpha[2\pi^s(\mathcal{A}_\mathcal{H}, P) - B] + (1-\alpha)[2\pi^s(\mathcal{A}_\mathcal{H}, P) - B] = 2\pi^s(\mathcal{A}_\mathcal{H}, P) - B$$

and

$$U^{s,o}(\mathcal{A}_\mathcal{L}, \pi_\mathcal{L}, P) = \alpha[\max\{2\pi^s(\mathcal{A}_\mathcal{L}, P) - B, 0\}] + (1-\alpha)[\max\{2\pi^s(\mathcal{A}_\mathcal{L}, P) - B, 0\}] = \max\{2\pi^s(\mathcal{A}_\mathcal{L}, P) - B, 0\},$$

we can thus rewrite the time-0 expected utility for managers of a sticky-price firm as follows

$$\begin{aligned}\mathbb{E}[U^s(P)] &= \frac{\alpha}{2}[2\pi^s(\mathcal{A}_\mathcal{H}, P) - B + \max\{2\pi^s(\mathcal{A}_\mathcal{L}, P) - B, 0\}] \\ &+ \frac{1-\alpha}{2}[2\pi^s(\mathcal{A}_\mathcal{H}, P) - B + \max\{2\pi^s(\mathcal{A}_\mathcal{L}, P) - B, 0\}] \\ &= \pi^s(\mathcal{A}_\mathcal{H}, P) - \frac{B}{2} + \max\{\pi^s(\mathcal{A}_\mathcal{L}, P) - \frac{B}{2}, 0\}. \end{aligned} \tag{A.2}$$

Note the manager's payoff when the firm realizes $\mathcal{A}_\mathcal{L}$ is

$$\max\{\pi^s(\mathcal{A}_\mathcal{L}, P) - \frac{B}{2}, 0\} = \left\{ \begin{array}{cc} \left(2\sqrt{\mathcal{A}_\mathcal{L}} - P\right)P - \frac{B}{2} & \text{if } \sqrt{\mathcal{A}_\mathcal{L}} - \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}} \le P \le \sqrt{\mathcal{A}_\mathcal{L}} + \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}} \\ 0 & \text{otherwise} \end{array} \right\}.$$

For optimal price, we only need to consider $\sqrt{\mathcal{A}_\mathcal{L}} - \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}} \le P \le \sqrt{\mathcal{A}_\mathcal{H}} + \sqrt{\mathcal{A}_\mathcal{H} - \frac{B}{2}}$. Note that

[1] In equation (A.1), the stock market takes λ^f into account, but because under equilibrium belief, the fraction λ^f of firms misreporting and the fraction of $1 - \lambda^f$ reporting truth have the same payoffs, λ^f does not enter into the equation.

$\mathbb{E}[U^s(P)]$ now has become

$$\mathbb{E}[U^s(P)] = \left\{ \begin{array}{cc} \tilde{U}^s(P) & \text{if } P \le \sqrt{\mathcal{A}_\mathcal{L}} + \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}} \equiv \underline{P}^s \\ \pi^s(\mathcal{A}_\mathcal{H}, P) - \frac{B}{2} & \text{if } \sqrt{\mathcal{A}_\mathcal{L}} + \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}} < P \le \sqrt{\mathcal{A}_\mathcal{H}} + \sqrt{\mathcal{A}_\mathcal{H} - \frac{B}{2}} \end{array} \right\},$$

where $\mathbb{E}[\tilde{U}^s(P)] = \pi^s(\mathcal{A}_\mathcal{H}, P) + \pi^s(\mathcal{A}_\mathcal{L}, P) - B$ attains its maximum at $\tilde{P}^* = \frac{\sqrt{\mathcal{A}_\mathcal{L}}+\sqrt{\mathcal{A}_\mathcal{H}}}{2}$. The optimal price then depends on the comparison between $\tilde{P}^*$ and the cutoff price $\underline{P}^s \equiv \sqrt{\mathcal{A}_\mathcal{L}} + \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}}$. If

$$\tilde{P}^* > \underline{P}^s,$$

we have $\tilde{U}^s(P)$ that is always increasing in P for $P \le \underline{P}^s$. Note the term $\pi^s(\mathcal{A}_\mathcal{H}, P) - \frac{B}{2}$ is also increasing in P until P reaches at $\sqrt{\mathcal{A}_\mathcal{H}}$. Figure A.1 of the Online Appendix illustrates the relationship between P and $\mathbb{E}[U^s(P)]$. The condition $\tilde{P}^* > \underline{P}^s$ is equivalent to

$$\frac{\sqrt{\mathcal{A}_\mathcal{L}} + \sqrt{\mathcal{A}_\mathcal{H}}}{2} > \sqrt{\mathcal{A}_\mathcal{L}} + \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}},$$

or

$$\frac{\tau\sqrt{\mathcal{A}_\mathcal{L}}}{2} > \sqrt{\mathcal{A}_\mathcal{L} - \frac{B}{2}},$$

or

$$B > 2\mathcal{A}_\mathcal{L}(1 - \frac{\tau^2}{4}).$$

Then the optimal solution in equation (A.1) is

$$P^* = \sqrt{\mathcal{A}_\mathcal{H}}. \tag{A.3}$$

Note the firm is able to set $P = \sqrt{\mathcal{A}_\mathcal{L}}$. In this case, the firm will not face a default problem. However, the firm has no incentive to do so. If $B < 2\mathcal{A}_\mathcal{L}(1 - \frac{\tau^2}{4})$, the optimal price is $\frac{\sqrt{\mathcal{A}_\mathcal{L}}+\sqrt{\mathcal{A}_\mathcal{H}}}{2}$. In this case, the firm can always pay off its debt obligation, and hence $q = 1$, which is less interesting.

Figure A.1: **Manager's Expected Utility as a Function of Product Price (Sticky-Price Firm)**

This figure shows the expected utility for a manager of a sticky-price firm as a function of product price P. The black solid, red dashed, and blue dotted lines represent the manager's expected utility at $t = 0$ ($\mathbb{E}[U^s(P)]$), expected utility at $t = 1$ when she privately observes a signal indicating $\mathcal{A}_{\mathcal{H}}$ and $\mathcal{A}_{\mathcal{L}}$, respectively. The X-axis represents product price P, and the Y-axis represents the manager's expected utility at $t = 0$ ($\mathbb{E}[U^s(P)]$). The parameters are set as follows: $\mathcal{A}_{\mathcal{H}} = 3$, $\mathcal{A}_{\mathcal{L}} = 1$, $B = 1.01 \times 2\mathcal{A}_{\mathcal{L}}(1 - \frac{\tau^2}{4}) = 1.7494$, and $\Phi = 0.8$.

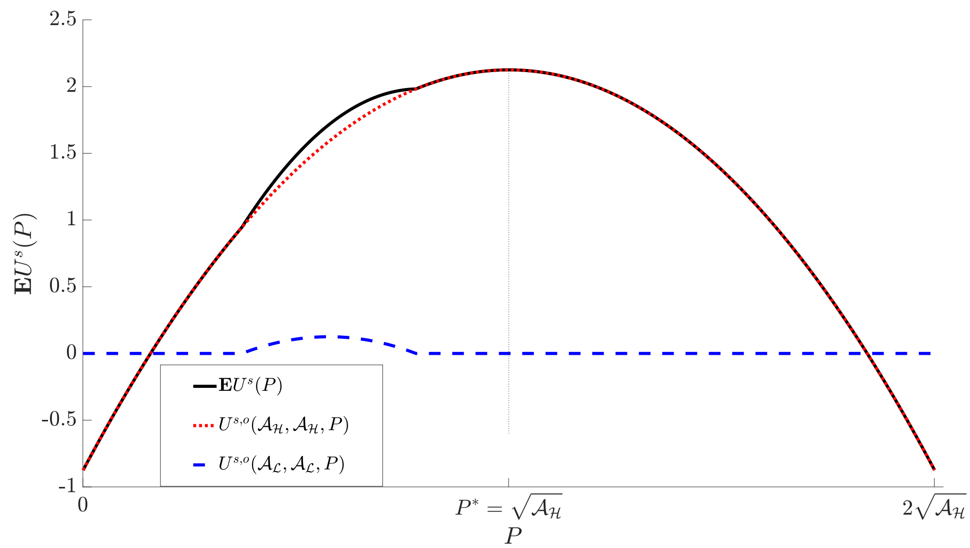

Table A.1: **Price Stickiness and Earnings Overstatement: OLS, S&P 500 Firms**

This table reports the results for estimating the following ordinary-least-squares regression on S&P 500 constituent firms headquartered in the U.S. over the sample period of 1997Q1-2012Q4. Utilities and Financial sectors are excluded:

$$Overstatement_{i,s} = \alpha + \beta \times Sticky_j + \gamma \times Sticky_j \times Post_{i,s} + \delta \times Post_{i,s} + X'_{i,t-1} \times \theta + \eta_i + \eta_{k,s} + \epsilon_{i,s},$$

where $Overstatement_{i,s}$ is a dummy variable set to 1 if the year-quarter s of firm i falls within reporting periods identified either as allegedly overstated according to the AAER database or as acknowledged by firm i to have been overstated according to the AA database; otherwise, it is set to 0. Overstatements from the AA database identified as errors are excluded (refer to Subsection 3.2 for detailed explanations). $Post_{i,s}$ is an indicator equal to 1 if year-quarter s for firm i is after 2002Q3, and 0 otherwise. The variable *Sticky* denotes the frequency of price adjustment multiplied by -1. X' is a set of control variables (see Table 1 for detailed descriptions). i, j, k, s, and t index the firm, the 6-digit NAICS sector, the 1-digit SIC industry, year-quarter, and year, respectively. *Time* is measured at the year-quarter level. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the level of 6-digit NAICS sectors.

	(1)	(2)	(3)	(4)	(5)	(6)
Sticky	0.09*	0.17**	0.09	0.12*		
	(1.71)	(2.05)	(1.15)	(1.66)		
Sticky × Post		-0.12	-0.12	-0.18**	-0.19*	-0.17*
		(-1.52)	(-1.47)	(-2.42)	(-1.80)	(-1.67)
Total Vol						0.06
						(1.23)
Leverage	0.00	0.01	0.04	0.04	0.07	0.07
	(0.08)	(0.15)	(0.56)	(0.52)	(1.12)	(1.02)
Profitability	-0.27**	-0.29**	-0.23**	-0.23**	0.09	0.09
	(-2.53)	(-2.57)	(-2.36)	(-2.11)	(0.82)	(0.77)
Size	-0.01	-0.01	-0.00	-0.00	0.01	0.01
	(-0.60)	(-0.65)	(-0.53)	(-0.50)	(0.22)	(0.26)
B-M ratio	-0.00	-0.01	-0.00	-0.00	0.01	0.01
	(-0.16)	(-0.29)	(-0.04)	(-0.15)	(0.25)	(0.26)
Intangibility	-0.03	-0.03	-0.00	0.00	0.14**	0.15**
	(-0.77)	(-0.70)	(-0.11)	(0.12)	(2.11)	(2.15)
PCM	0.02	0.02	0.03	0.04	-0.01	-0.01
	(0.37)	(0.36)	(0.88)	(0.96)	(-0.11)	(-0.06)
HHI	-0.19*	-0.19*	-0.13	-0.15	0.37	0.35
	(-1.94)	(-1.96)	(-1.21)	(-1.44)	(1.28)	(1.23)
Constant	0.19**	0.20**	0.13*	0.13*	-0.11	-0.14
	(2.39)	(2.45)	(1.67)	(1.70)	(-0.47)	(-0.58)
Time FE	Yes	Yes	Yes	No	No	No
SIC1 FE	No	No	Yes	No	No	No
SIC1 × Time FE	No	No	No	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes
N	17,504	17,504	17,504	17,504	17,504	17,304
Adjusted R^2	0.04	0.04	0.06	0.06	0.43	0.44

standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$