Assessing the Objective Function of the SEC against Financial Misconduct:

A Structural Approach

Abstract

We examine the objective function of the SEC against financial misconduct by estimating a structural model of interactions between the SEC and a regulated firm. Identification exploits SOX as a shock to enforcement intensity. Four insights emerge from counterfactual analyses. First, the welfare perceived by the SEC is more sensitive to changes in marginal social costs than to changes in marginal enforcement costs. Second, the SEC's current enforcement mitigates earnings management to a level close to the first-best scenario. Third, a "hawkish" regulator who perceives high social costs of financial misconduct would impose excessive costs on society. Lastly, removing regulatory discretion would result in higher penalties and lower welfare, with little effect on earnings management.

Keywords: Financial Misconduct, SEC, Enforcement, Regulator Discretion, Regulator Preferences, Social Costs.

JEL Classifications: D78, G34, H41, K42, M42, M48

I. Introduction

The U.S. Securities and Exchange Commission (hereafter the SEC) plays an important role in the U.S. and the world economy. Section 21(a)(1) of the Exchange Act grants the SEC ample authority and discretion to investigate and sanction securities law violations, with the goal to "protect investors; maintain fair, orderly, and efficient markets; and facilitate capital formation." (SEC, 2013). Despite this *stated* objective, the SEC faces resource constraints and pressures from both the political and business spheres that might steer it away from the absolute fulfillment of its mission. In practice, the SEC can use its discretion to make choices concerning the allocation of its limited resources and prioritize enforcement efforts against some violations at the expense of others.

In this paper, we directly assess the SEC's actual objective function, as revealed by the observed SEC enforcement actions. Our study contributes to the understanding of securities markets in two important ways. First, we recover the key parameters that determine the enforcement of securities laws. Second, given an estimate of the SEC's objective function, we can evaluate how enforcement standards, accounting violations, and the welfare that the SEC perceives would fare in counterfactual scenarios. Our analyses thus offer insights into whether potential policy interventions would help the SEC achieve its stated goals, as well as into the social welfare involved in these interventions, insofar as the SEC's preferences approximate those of the social planner.

Voluminous empirical research studies SEC enforcement actions and the resulting impact on firms' financial misconduct (e.g., Kedia and Rajgopal, 2011; Correia, 2014; Holzman, Marshall, and Schmidt, 2024; Jia, 2024). We depart from these studies by using a structural approach, which allows us to recover unobservable parameters in the SEC's objective function and evaluate the relative importance of different cost components associated with securities regulation in shaping SEC enforcement decisions. In addition, and perhaps more importantly, we can conduct counterfactual analyses to evaluate the welfare impact of alternative policies. Specifically, we adopt the methodology in Kang and Silveira (2021, hereafter KS), which develop a general framework to estimate strategic interactions between a regulator and a regulatee. We analyze the SEC's enforcement actions against firms' financial reporting concerning the 13(b) provisions of the Exchange Act.[1]

Similar to KS, we adopted a variant of the model developed by Mookherjee and Png(1994), in which the SEC considers three types of costs when making enforcement decisions: (1) the SEC's perceived social costs of financial misconduct (associated, for example, with its impact on investors' confidence and trust), (2) the SEC's perceived enforcement costs (associated, among other things, with the political and administrative costs of conducting investigations and imposing penalties), and (3) the firms' expected benefits of committing financial misconduct (or, equivalently, the negative of the firms' costs of reducing financial misconduct). The first two costs relate to the SEC's private concerns and are referred to as "regulator preferences." We assume the benefits of financial misconduct are known to the firm but not to the regulator, so there is information asymmetry between the regulator and firms. The SEC's objective is to minimize the sum of the three aforementioned costs (equivalent to maximizing the welfare) by choosing an

[1] Although KS apply their framework to the study of environmental regulation enforcement, their methods suit the purpose of our study for two reasons. First, the objective function of the environmental regulator has a similar structure to that of the financial market regulator in that both consider the social costs, enforcement costs, and the regulatees' private benefits. Second, KS's framework allows for the assessment of the impact of regulatory discretion changes, which is one of the primary motivations of our study. Admittedly, there are also differences between the environment regulator in KS and the financial market regulator (i.e., the SEC) in our study. For example, the social costs that the environment regulator faces mainly comprise the harm to residents due to water treatment plants' pollutant discharges, whereas the social costs that the SEC faces involve the consequences of financial misconduct in weakening investors' confidence and trust in the capital markets. We are conscious about the differences and carefully select the empirical measures of these costs (see Section 5). More importantly, these differences are not critical for our choice of the KS framework.

enforcement schedule. Given such a schedule, the firm chooses the level of financial misconduct to maximize its net payoff.

We structurally estimate the above model, exploiting a shock to enforcement intensity due to the passage of the Sarbanes-Oxley Act (SOX) in 2002. The identification of the model requires a significant change in SEC enforcement intensity. Anecdotal evidence, prior research, and our own data suggest that the SEC strengthened enforcement against large firms, and firms' financial reporting quality improved post-SOX (Cox and Thomas, 2005; Chhaochharia and Grinstein, 2007; Cohen, Dey, and Lys, 2008). Based on these pieces of evidence, we focus our analysis on large firms, with a market capitalization above the median market capitalization in Compustat. In our estimation, the pre-SOX period spans from 1996 to 1999, and the post-SOX period ranges from 2002 to 2005. Among a few potential candidates for gauging a firm's financial misconduct (e.g., signed discretionary accruals and unsigned discretionary accruals) in prior literature, we choose unsigned discretionary accruals for three reasons.[2] First, they are used by the SEC to detect accounting irregularities, and thus the probability of enforcement is higher if the firm has a greater level of unsigned discretionary accruals, holding the firm and industry characteristics constant (SEC, 2012). Second, empirical studies show that unsigned discretionary accruals are associated with accounting misstatements (Dechow, Ge, Larson, and Sloan, 2011; Blackburne, 2014), and both positive and negative discretionary accruals significantly decline in absolute magnitude after SOX. Third, using unsigned discretionary accruals is, in essence, consistent with the theoretical argument in Fischer and Verrecchia (2000) that the market does not know the firm manager's

[2] We use the terms *earnings management* and *financial misconduct* interchangeably in this study.

reporting objective – leading to uncertainty about the sign and the magnitude of the reporting bias in accruals.

We measure SEC penalties using the one-day abnormal returns surrounding the initial public revelation of the financial misconduct and recover the objective functions of firms and the SEC using SOX as a shock to the SEC's enforcement intensity. Our estimation indicates an increase in the marginal social costs and a significant decrease in the marginal enforcement costs post-SOX. Additionally, the estimates exhibit substantial cross-sectional heterogeneity: the benefits of earnings management are much higher for smaller firms compared to larger firms, while the expected penalties are substantially lower. Furthermore, both the marginal enforcement costs and marginal social costs of small firms are considerably lower than those of large firms.

Leveraging the structural model estimates, we conduct several counterfactual analyses. We first evaluate the importance of enforcement costs to enforcement outcomes. We find that a 10% decrease in the marginal enforcement costs would lead to a 5.2% increase in the average penalties, a 0.7% decline in the average earnings management, and a $130.27 million increase in the SEC's welfare. The modest impact on earnings management suggests that expanding the SEC's budget might have a limited bearing on financial misconduct. Our first-best counterfactual analysis further sharpens this insight: even when marginal enforcement costs are set to zero, earnings management only declines by 11.0%, suggesting that the SEC's current enforcement mitigates earnings management to a level similar to those that would occur in the first-best scenario.

Next, we evaluate the importance of social costs to enforcement outcomes by increasing the marginal social costs by 10% of the baseline value. We find a 1.1% decrease in the average earnings management, a 7.0% increase in the average penalties and a $887.32 million decrease in the SEC's welfare. Examining a "hawkish" regulator scenario, in which we set the marginal social costs to the maximum across all firms, we find that the SEC's welfare would decrease by $36.82 billion, suggesting that such a regulator would place excessive financial burden on society.

Lastly, we analyze the one-size-fits-all policy by constraining the penalty schedule to be the same across all firms. We show that adopting such a policy would result in unambiguously undesirable outcomes, including higher enforcement costs and lower welfare but little effect on earnings management, relative to the baseline policy that involves discretion.

Our study makes several contributions. First, prior research (Jackson and Roe, 2009; Kedia and Rajgopal, 2011; Hutton, Shu, and Zheng, 2022; Holzman et al., 2024; Jia, 2024) suggests that the preferences of firms (e.g., shareholders' private enforcement) and the regulator (e.g., political pressures) are associated with the SEC's enforcement decisions against corporate fraud. To our knowledge, we are the first to comprehensively evaluate the objective function of the SEC in enforcement against financial misconduct – taking into consideration both the incentives of the firm and those of the regulator. Our model accounts for three types of costs in enforcement. This setup allows us to evaluate the relative importance of the SEC's cost components – a goal that has been elusive in previous research, due to the limitation of the reduced-form approach. Our study thus offers a unified framework for understanding the SEC's enforcement role in financial markets (Karpoff, Lee, and Martin, 2008; Dyck, Morse, and Zingales, 2010).

Second, the findings of our paper will be informative to policy makers. We show that the regulator's discretion improves enforcement outcomes, underscoring that the removal of discretion would result in higher enforcement costs with little impact on financial misconduct. Our evidence also reveals that the SEC's current enforcement mitigates earnings management to a level close to the first-best level, pointing to the limit of increasing the SEC's budget to curb financial misconduct. Taken together, these findings will inform the debate on whether the financial regulator should be given discretion and whether the SEC's budget represents a major constraint to creating a healthy financial market.

Third, our paper relates to several recent studies in finance and accounting that conduct structural analyses of regulatory models, such as Kang, Lowery, and Wardlaw (2015) and Alvero, Ando, and Xiao (2023) on bank regulators. Our study also relates to recent literature that studies earnings management using a structural approach (e.g., Zakolyukina, 2018, Beyer, Guttman, and Marinovic, 2019; Bertomeu, Cheynel, Li, and Liang, 2021).[3] We stand apart from these papers in that we focus on the regulator, while prior studies tend to treat regulatory penalties as exogenously given.

2. Theoretical model

2.1. Model setup

We model the interactions between the SEC and a company in a static game, similar to the framework proposed by Mookherjee and Png (1994) and KS. As illustrated in Figure 1, at t=1, the SEC chooses a contingent penalty schedule $\tilde{e}(a, \varepsilon)$, which is a function of earnings management a and an idiosyncratic component denoted by ε. The term ε represents other information that might affect the penalties eventually imposed by the SEC.[4] In addition, ε may capture unexpected

[3] Zakolyukina (2018) uses a dynamic misreporting model to estimate the prevalence and price response of GAAP violations. Liang, Marinovic, and Varas (2018) examine managers' reputation concern and estimate its effects on firm value. Beyer et al. (2019) structurally estimate a dynamic model of costly misreporting and separately identify economics and reporting noise. Bird, Karolyi, and Ruchti (2019) use a regression discontinuity design to study incentives for earnings management around thresholds. Bertomeu et al. (2021) extend Fischer and Verrecchia (2000) to structurally estimate firms' earnings management by trading off managers' benefits and costs of reporting discretion.

[4] One example of ε is whistleblowing by employees due to their idiosyncratic attributes, such as personal responsibility, which is beyond the firm's control. Prior research (e.g., Gao and Brink, 2017) finds supportive evidence that individual factors, such as attitude, personal responsibility, and a sense of morality, are associated with the likelihood of whistleblowing. Other examples of ε include investigations by other federal agencies, which could

changes in the SEC's ex-post resource constraints; for example, these changes could occur in situations where the regulator needs to allocate resources to more urgent matters. In any case, the SEC does not have control over ε, nor does it know the realization of ε at the moment it decides on the schedule $\tilde{e}(a, \varepsilon)$. The penalty schedule takes the following Tobit functional form:

$$\tilde{e}(a, \varepsilon) = \begin{cases} \dot{e}(a) + \varepsilon & \text{if } \dot{e}(a) + \varepsilon > 0 \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

The penalty schedule $\tilde{e}(\cdot,\cdot)$ is a contingent plan, specifying the level of earnings management a and additional information ε upon which the SEC penalty will be based. $\dot{e}(a)$ is a function that reflects the magnitude of enforcement actions, based on the level of accruals, if any enforcement action takes place. The Tobit functional form conveniently accommodates the possibility that the SEC imposes no penalty against firms that have positive levels of a. That is, a given level of earnings management ($a > 0$) does not always lead to SEC enforcement. Additionally, the enforcement level can vary even for the same level of earnings management due to a different realization of ε.

Define $e(a)$ as the expectation of $\tilde{e}(a, \varepsilon)$ over ε. Therefore,

$$e(a) = \Phi\left(\frac{\dot{e}(a)}{\omega}\right)\left[\dot{e}(a) + \omega \frac{\phi\left(\frac{\dot{e}(a)}{\omega}\right)}{\Phi\left(\frac{\dot{e}(a)}{\omega}\right)}\right], \tag{2}$$

where ω is the variance of the distribution of ε. Then, at t =2, the firm observes the penalty schedule $\tilde{e}(\cdot,\cdot)$, and chooses the level of earnings management a. The firm does not choose nor control ε, nor does it know the realization of ε at this moment. Being risk-neutral, the firm decides on a based on the expected penalty $e(a) \equiv E_{\varepsilon}[\tilde{e}(a, \varepsilon)]$.

trigger SEC enforcement (Karpoff et al., 2008), and third-party disclosures from media and analysts that could also lead to SEC enforcement (Holzman et al., 2024). ε also includes the information revealed after the SEC's investigation.

At t =3, ε realizes. Upon observing a and ε, the SEC applies the penalty schedule $\widetilde{e}(a, \varepsilon)$. We model the SEC's design of penalty schedule at t =1 and the firm's choice of earnings management at t =2, respectively. In doing so, there is no decision to be made by any of the agents at t =3.

We assume that the firm's objective is to maximize the current stock price. Managing earnings not only increases share prices but also increases the likelihood of SEC enforcement and, consequently, penalties. Formally, the firm in our model sets the level of earnings management to maximize the expected net payoff, which consists of price appreciation minus the penalties imposed by the SEC. The benefits depend on the company's endowed type, θ, and the level of earnings management, a. We assume that firms can set the level of a and reap the gross private benefits of $\theta b(a)$.

We model earnings management consistent with the established literature in accounting (e.g., Fischer and Verrecchia, 2000, Dye and Sridhar 2004). Specifically, in Fischer and Verrecchia (2000), the firm manager faces a tradeoff between the benefits of biasing the report for stock price appreciation and the costs of misreporting (e.g., psychological costs and regulatory penalties). With a similar cost-benefit structure to Fischer and Verrecchia (2000), Dye and Sridhar (2004) study how an accounting aggregation procedure that combines the manager's soft information (i.e., manipulatable data) and hard information (i.e., unmanipulable data) affects reporting bias. We do not explicitly model the relationship between the reporting bias and the price response, as our focus is on the costs of SEC enforcement borne by the firm. However, our structural framework – including the theoretical model, the non-parametric identification argument, and the estimation procedure – imposes very few restrictions on the firm's net benefits of earnings management (refer to Assumption 1 in Section 2.2 for details). Thus, our approach is flexible enough to naturally accommodate different features of the relationship between the misreporting decisions and the price response. In addition, our model accommodates other non-pecuniary benefits (i.e., stable relationships with employees) that the firm may obtain from biasing the report.

The regulator imposes a penalty on the company based on a given schedule $\tilde{e}(\cdot,\cdot)$. We assume the value of θ is known to the firm but not to the regulator, so there is information asymmetry between the regulator and the firm. The regulator only knows that θ is a realization of a random variable Θ, which follows a strictly increasing and continuously differentiable distribution function $F(\cdot)$ with support $(0, \bar{\theta})$ and with an associated density denoted by $f(\cdot)$. Assuming that both the firm and the regulator are risk-neutral, we can restrict our attention to the expectation of the penalty schedule over ε, denoted by $e(a)$. Note that $e(a)$ reflects both direct and indirect penalties originating from the SEC's enforcement actions against the firm.[5] The expected payoff to a firm that chooses a certain level of earnings management a is then

$$\theta b(a) - e(a). \tag{3}$$

Since the firm sets its level of earnings management based on the realization of θ, we can define the payoff-maximizing level of earnings management as a function of θ, which we denote by $a(\theta)$. We define $a(\cdot)$ as *implemented* by $e(\cdot)$ if $a(\theta)$ maximizes (3) for all $\theta \in \Theta$. We assume $b(\cdot)$ is concave. In this case, if $a(\cdot)$ is implemented by $e(\cdot)$, we have

$$\theta b'[a(\theta)] = e'[a(\theta)], \tag{4}$$

whenever $a(\theta) > 0$. Given $e(\cdot)$, the regulator's expected costs are

$$\int_0^{\bar{\theta}} (h[a(\theta)] + \psi e[a(\theta)] - \theta b[a(\theta)])\, f(\theta) d\theta, \tag{5}$$

[5] Some examples of indirect penalties include internal turmoil, customer loss, reputational damage, and the risk of bankruptcy.

where $\psi > 0$ is the marginal costs of imposing a penalty, and $h(\cdot)$ is the regulator's perceived social costs (i.e., external costs) due to earnings management. In our paper, the enforcement costs, $\psi e[a(\theta)]$, consist of the SEC's administrative, political, and opportunity costs associated with enforcement actions against the company (Mehta and Zhao, 2020; Correia, 2014; Heese, 2019).

The regulator's problem is to minimize (5) by choosing $e(\cdot)$, subject to the constraint that the expected penalty for any a must be nonnegative and not exceed the company's current market value, w:

$$0 \leq e(a) \leq w \tag{6}$$

for any a.

2.2. Characterization of model solution

Assumption 1.

1) *$b(\cdot)$ and $h(\cdot)$ are continuously differentiable and strictly increasing.*
2) *$(1-\psi)\theta + \psi[1-F(\theta)]/f(\theta)$ is positive and strictly increasing in θ.*
3) *$h(\cdot)$ is convex, and $b(\cdot)$ is strictly concave (or $h(\cdot)$ is strictly convex, and $b(\cdot)$ is concave).*

Following KS, we constrain $h(\cdot)$ to be linear by assuming $h(a) = \gamma a$ to facilitate the interpretation of the empirical results. KS show that the above assumption is sufficient to guarantee that the earnings management schedule $a^*(\theta)$, which is characterized by the following first-order condition, is optimal and strictly increasing in θ for any $a^*(\theta) > 0$:

$$h'[a(\theta)] - b'[a(\theta)]\left\{(1-\psi)\theta + \frac{\psi[1-F(\theta)]}{f(\theta)}\right\} = 0. \tag{7}$$

2.3. Model interpretations

We consider three components in the SEC's cost function: (1) the social costs (i.e., external costs of earnings management), (2) the enforcement costs associated with assessing and imposing penalties, and (3) the firm's expected benefits. The first two components are related to regulators' private concerns, termed as "regulator preferences" by KS. Below we discuss the three components in detail.

2.3.1 Social Costs (γa)

The SEC's stated mission is to "protect investors; maintain fair, orderly, and efficient markets; and facilitate capital formation. The SEC strives to promote a market environment that is worthy of the public's trust" (SEC, 2014). Therefore, we assume that the SEC is concerned about the health of the financial markets and label the damage from financial frauds on the capital markets as social costs.[6]

2.3.2. Enforcement Costs ($\psi e(a)$)

Enforcement costs are the sum of administrative costs, opportunity costs, and political costs. Administrative costs are associated with time and resources devoted to the SEC's investigations. The Division of Enforcement incurs additional travel and other related costs when staff need to travel outside of their geographic areas. Administrative costs also depend on the effectiveness of internal coordination across different divisions and external coordination with other enforcement

[6] Prior literature shows that financial frauds result in investors' deviation from the optimal portfolio choice, and that investors financially suffer from it (Giannetti and Wang, 2016). Moreover, these frauds disrupt the order of the capital markets and have real effects on the economy (Beatty, Liao, and Yu, 2013; Durnev and Mangen, 2009; Files and Gurun, 2018).

agencies. In addition, resource constraints increase opportunity costs.[7] The application of advanced tools, such as data analytics for financial misconduct detection and investigation, can decrease investigation and enforcement costs. Despite the benefits of technological development, the SEC faces difficulties in obtaining additional funding to improve technological tools. Lastly, the SEC faces political costs and needs to showcase its enforcement actions to gain congressional support. For example, the SEC is more likely to investigate cases with higher media coverage (Kedia and Rajgopal, 2011), and its enforcement choices partially reflect the preferences of Congress, which sets the SEC's budget (e.g., Yu and Yu, 2011; Correia, 2014, Heese, 2019).

2.3.3. Firms' Benefits from Earnings Management ($\theta[b(a)]$)

The last component we consider in the SEC's utility function is the firm's benefits from earnings management. Following the regulatory economics literature (e.g., Baron and Myerson, 1982; Laffont and Tirole, 1993), the firm's benefits enter the SEC's utility function in a positive way. That is, the SEC perceives lower costs when the regulated firm derives higher net benefits from earnings management, holding constant other types of costs. The firm's benefits represent the net benefits the manager and current shareholders enjoy in the absence of SEC enforcement. That is, this term in our model comprises the benefits net of any costs that are not determined (directly or indirectly) by the SEC's enforcement actions. Such costs involve complying with accounting rules and maintaining effective accounting systems to reduce earnings management,

[7] According to a 2007 report by the General Accounting Office (GAO), the "SEC's Chairman, officials from his office and the Office of the Executive Director and enforcement officials said that the division has not always been able to prioritize or ensure an efficient allocation of limited investigation staff resources." Similarly, in 2017, the SEC faced a significant shortage of staff due to tight budgetary constraints and a hiring freeze. Consequently, the level of enforcement actions decreased by 13%, from 868 enforcement actions in 2016 to 754 in 2017. See "SEC hiring freeze hits enforcement staff hard" (Bloomberg Law, September 4, 2018).

which prior studies (Chen, Cheng, Chow, and Liu, 2021; Chychyla, Leone, and Minutti-Meza, 2019) show to be costly.

3. Model identification strategy

3.1. Data-generating process

The market consists of many companies, indexed by i, and one regulator (i.e., the SEC). We observe the market over various periods, indexed by t. Every period t, company i has a cost type $\Theta_{i,t}$ and faces an expected penalty schedule $e_{i,t}(\cdot)$. Given $\Theta_{i,t}$ and $e_{i,t}(\cdot)$, the company sets its optimal level of earnings management for period t. As it is a function of $\Theta_{i,t}$, the level of earnings management of company i in period t is a random variable, with distribution function $G_{i,t}$.

The model primitives include four elements: (1) the distribution of company cost types, $F_{i,t}$; (2) the company's baseline benefits function, $b_{i,t}(\cdot)$; (3) the SEC's perceived marginal social costs, $\gamma_{i,t}$; and (4) the SEC's marginal enforcement costs, $\psi_{i,t}$. The observables include: (1) the level of earnings management; (2) the SEC's enforcement level; and (3) the companies' characteristics $x_{i,t}$, which include both firm-specific characteristics such as firm size, and industry characteristics such as industry growth.

In our model, the primitives are heterogeneous across companies and time regimes. In other words, we allow each company to have different model primitives in different time periods. However, we assume that the heterogeneity in model primitives is mediated through the observable characteristics $x_{i,t}$. Formally, we have $F_{i,t}(\cdot) = F_t(\cdot \,|x_{i,t})$, $b_{i,t}(\cdot) = b_t(\cdot \,|x_{i,t})$, $\gamma_{i,t}(\cdot) = \gamma_t(\cdot \,|x_{i,t})$, and $\psi_{i,t}(\cdot) = \psi_t(\cdot \,|x_{i,t})$. Accordingly, we have $e_{i,t}(\cdot) = e_t(\cdot \,|x_{i,t})$ and $G_{i,t}(\cdot) = G_t(\cdot \,|x_{i,t})$. The key identification assumption is that, conditional on the companies' characteristics

$x_{i,t}$, neither the distribution of the company cost types nor the cost functions change over time. Formally:

Assumption 2. $F_t(\cdot\,|x_{i,t}) = F\,(\cdot\,|x_{i,t})$ *and* $b_t(\cdot\,|x_{i,t}) = b(\cdot\,|x_{i,t})$.

In this paper, we explore the Sarbanes-Oxley Act as an exogenous shift to the SEC's enforcement standards. Section 3.3 provides details of the institutional setting, especially how provisions in SOX affect the regulator's preferences. We consider two regimes of the SEC's enforcement schedule ($e(\cdot)$) – before and after the passage of SOX in 2002. Specifically, the "pre" regime spans the period from 1996 to 1999, whereas the "post" regime ranges from 2002 to 2005. We assume that the SEC's marginal enforcement costs and marginal social costs of violations can change after SOX, and thus the penalty schedules can also change after SOX. However, conditional on the characteristics $x_{i,t}$, regulatory preferences do not change within each regime. Formally, we have that $\psi_t(\cdot\,|x_{i,t}) = \psi_{pre}(\cdot\,|x_{i,t})$ and $\gamma_t(\cdot\,|x_{i,t}) = \gamma_{pre}(\cdot\,|x_{i,t})$ for t from 1996-1999; and $\psi_t(\cdot\,|x_{i,t}) = \psi_{post}(\cdot\,|x_{i,t})$ and $\gamma_t(\cdot\,|x_{i,t}) = \gamma_{post}(\cdot\,|x_{i,t})$ for t from 2002-2005. These assumptions, along with Assumption 2, imply that there are two regimes for the expected penalty set by the SEC in equilibrium, conditional on $x_{i,t}$: $e_t(\cdot\,|x_{i,t}) = e_{pre}(\cdot\,|x_{i,t})$ for t in 1996-1999 and $e_t(\cdot\,|x_{i,t}) = e_{post}(\cdot\,|x_{i,t})$ for t in 2002-2005.

3.2. Identification

In a nutshell, our identification strategy largely follows KS, which relates to d'Haultfoeuille and Février (2020) and Luo, Perrigne, and Vuong (2018). The strategy proceeds in three steps. In the first step, we obtain the distribution of earnings management levels set by each company in each period from our data sample. In the second step, we partially identify the firm type (θ)

distribution and the marginal benefits function ($b'(\cdot)$), exploiting the passage of SOX as a source of exogenous change in the SEC's marginal enforcement costs and marginal social costs. In the third step, we recover the marginal social costs of earnings management (γ) and marginal enforcement costs (ψ), using the restrictions imposed by the first-order conditions of the SEC. That is, we identify γ and ψ as the parameters that rationalize the enforcement standards observed in the data – before and after the changes in the penalty schedule. Lastly, with some additional assumptions that will be discussed later, we can obtain full identification of the distribution of firm types and the benefits function. Below we describe each step in more detail.

Step 1. We identify the distributions of earnings management levels and the penalty schedules, before and after SOX. Since the levels of abnormal accruals and the enforcement actions are directly observed in our data, this step is straightforward using reduced-form methods.

Step 2. This step provides the partial identification of $F(\cdot)$ and $b'(\cdot)$. We begin by making the following assumption:

Assumption 3. $e'_{post}\left(a\middle|x_{i,t}\right) > e'_{pre}\left(a\middle|x_{i,t}\right)$ *for any* $a > 0$ *and* $x_{i,t}$.

This assumption requires that, conditional on firm characteristics $x_{i,t}$, the enforcement is, in expectation, stricter in the post-SOX period. Given our assumptions on the model primitives stated in Section 3.1, such a change in enforcement standards is driven solely by the variation in the SEC's preference (i.e., social costs or enforcement costs). That is, we can consider it as an exogenous shock, which only affects the firms' behavior through changes in the SEC's enforcement schedule.

We now argue that, given Assumption 3, we can tackle the partial identification of $F(\cdot)$ and $b'(\cdot)$. For ease of notation, in the remainder of our discussion of the identification strategy, we omit the dependency of the model primitives and observables from the companies' characteristics $x_{i,t}$. Our estimation procedure, to be described in Section 5, allows all objects of the model to depend on these characteristics.

Let $a(\theta, pre)$ and $a(\theta, post)$ denote the equilibrium level of earnings management set by a firm with type θ in the pre-SOX and post-SOX periods, respectively. We are ready to state the following proposition:

Proposition 1. *Given a normalization of θ_0 and a_0, recursively define $a_l = G_{pre}^{-1}\left[G_{post}(a_{l-1})\right]$ and $\theta_l = \left[e'_{post}(a_l)/e'_{pre}(a_l)\right]\theta_{l-1}$. If Assumptions 1-3 hold, for any $l \in \{0,1,2,\dots,L\}$ and period $j \in \{pre, post\}$, the following elements are identified: (1) the equilibrium earnings management level $a(\theta_l, j)$, (2) the distribution of firm types $F(\theta_l)$, and (3) the derivative of the firm benefits function $b'\big(a(\theta_l, j)\big)$.*

We provide a brief discussion and some intuition of the proof here. As mentioned above, $G_{pre/post}(a)$ and $e'_{pre/post}(a)$ are directly identified from our data. Given these objects, and starting from a normalization point of θ, we can recursively obtain $\theta_{l\in\{0,1,2,\dots,L\}}$ and the corresponding $a(\theta_l, pre)$ and $a(\theta_l, post)$. For every pair of $a(\theta_l, j)$ and θ_l, we obtain $b'\big(a(\theta_l, j)\big) = e'\big(a(\theta_l, j)\big)/\theta_l$ using (7), the first-order condition of the firm's problem. Furthermore, under Assumptions 1 and 2, there is a one-to-one mapping between θ_l and $a(\theta_l, j)$. Employing such a mapping, we can obtain $F(\theta_l) = G_j\big(a(\theta_l, j)\big)$.[8] Note that the identification provided by Proposition 1 is partial, in that we only recover the distribution function of types evaluated at the discrete set $\theta_{l\in\{0,1,2,\dots,L\}}$. Similarly, we only identify the marginal benefits function

[8] See page 11 in the Online Appendix of KS for a detailed proof of Proposition 1.

evaluated at the set of $a(\theta_l, pre)$ and $a(\theta_l, post)$ corresponding to $\theta_{l\in\{0,1,2,\ldots,L\}}$. Nonetheless, these partially identified model primitives are useful inputs in the next identification step. Internet Appendix 1 contains an example that illustrates the intuition of Proposition 1, by demonstrating how the transformations $a_l = G_{pre}^{-1}\left[G_{post}(a_{l-1})\right]$ and $\theta_l = \left[e'_{post}(a_l)/e'_{pre}(a_l)\right]\theta_{l-1}$ provide partial identification of the model.

Step 3. We obtain the complete model identification, making the following additional assumption:

Assumption 4. *There is an interval* $U \in \mathbb{R}_+$ *such that the functions* $e'_{post}(a)/e'_{pre}(a)$ *and* $a^r/e'_j(a)$ *for all* $r \in \{1,2,\ldots,R\}$ *are strictly monotone in* $a \in U$.

Assumption 4 is a technical assumption to guarantee that we can recover γ and ψ from the first-order condition of the SEC's problem.

Proposition 2. *If Assumptions 1-4 hold and* $L \geq 1$, *given some normalization level of* θ_0, *the following elements are identified: (1) the distribution of firm types* $F(\cdot)$; *(2) the firm benefits function* $b(a)$; *and (3) the marginal social costs* γ_j *and marginal enforcement costs* ψ_j, *for* $j \in \{pre, post\}$.

Intuitively, the proof of Proposition 2 works as follows: by considering the first-order condition of the SEC's problem, evaluated at the discrete values $\theta_{l\in\{0,1,2,\ldots,L\}}$ identified from Proposition 1, we set up a system of linear equations in terms of γ_j and ψ_j. Under Assumption 4, such a system has a unique solution, allowing us to recover γ_j and ψ_j, for $j \in \{pre, post\}$. Having identified γ_j and ψ_j, we can recover $\hat{a}(\theta, j)$ for all θ using the first-order condition of the SEC's problem again.

Given $\hat{a}(\theta, j)$, we obtain the full identification of $F(\cdot)$ and $b'(\cdot)$, following methods similar to those described in Proposition 1.[9]

3.3. Institutional changes – the Sarbanes-Oxley Act

SOX was passed on July 25, 2002, as a result of a number of major accounting scandals, including the collapse of Enron in late 2001. The large accounting scandals significantly undermined investors' trust in the capital markets. Using poll data, Romano (2004) demonstrates that only 20% of the public had "either a great deal or quite a lot of confidence in big business in 2002," the lowest level recorded since the great depression. The low market confidence increased the SEC's marginal social costs and pressed it to step up its level of enforcement and restore trust in the capital markets. SOX contains eleven sections, intending to increase auditor independence, internal controls, and endorse the SEC to make rules to implement the law. The five key provisions, which we discuss in Appendix A, likely reduced the marginal enforcement costs. For example, SOX Sections 101-109 established the PCAOB to oversee auditors of SEC-registered companies. While PCAOB's oversight significantly improved firms' reporting quality as evidenced in prior research (Gipper, Leuz, and Maffett, 2020), its budget is not funded by the SEC. Thus, SOX, by establishing PCAOB, reduces the SEC's burden in regulating the audit market, leading to reduced enforcement costs. In addition, the increased disclosure requirements (e.g., Section 302) shifts the costs from the SEC to firms, which also likely lowers the SEC's enforcement costs.

3.4. SEC enforcement over time

[9] See the detailed proof of Proposition 2 on pages 11-12 in the Online Appendix of KS.

As SOX increases the SEC's perceived social costs and reduces enforcement costs, the number of SEC enforcement activities substantially rises following SOX (Coates and Srinivasan, 2014; Cox and Thomas, 2005). Figure 2 shows the total number of enforcement actions related to 13(b) violations over time, plotted based on the terminal year of violations. There are 22 enforcement actions ending in 1999, and the number increases to 57 in 2002, the year SOX was enacted. Partitioning the sample into large versus small firms based on the median market capitalization of all public firms in Compustat each year, we present the number of SEC enforcement actions separately for large (solid line) and small firms (dotted line) over time in Figure 3. The total number of enforcement actions is 14 in 1999 for large firms, and it jumps to 40 in 2002. In contrast, the total number of enforcement actions for small firms remains fairly stable, without exhibiting any time trend. The evidence suggests the aggregate increase in the number of enforcement activities is driven by large firms, consistent with the findings of Cox and Thomas (2005). The identification of the model described in Propositions 1 and 2 above relies on a significant shift in the SEC's enforcement intensity after SOX. Therefore, we focus on large firms for the remaining analysis and exclude small firms, which did not experience substantial changes in the penalty schedule.

4. Descriptive Statistics

4.1. Data sources and variables

We obtain our data from three sources for the period from 1996 and 2005. First, the SEC enforcement data used in Call, Martin, Sharp, and Wilde (2018) is from the *Journal of Accounting Research* online supplements and datasheets. We further complement this data by hand collecting the starting and ending quarters of each misconduct by reading through the relevant SEC's complaints. Based on the end date of the violations and the initial regulatory proceeding date, we classify each case into either the pre-SOX or post-SOX period.[10] We focus on litigations related to financial reporting, which must include a violation of one or more of the 13(b) provisions of the Exchange Act and associated regulations.[11] Second, the data on class actions is obtained from Cornerstone Research (2009) and the Stanford Law School. Finally, we obtain the financial data from Compustat.

Table 1 presents the summary statistics of the variables used in our analysis. There are 11,719 firm-year observations in the pre-SOX period and 9,268 firm-year observations in the post-SOX period. There are 23 (122) enforcement actions against large firms with non-missing data in the pre-SOX (post-SOX) period. We also observe a significant negative market reaction to the initial announcement of misconduct in both the pre- and post-SOX periods, although reactions in the former period have a larger absolute magnitude.[12]

5. Structural estimation

5.1. Measure of earnings management

As discussed previously, we use unsigned abnormal accruals computed from the Jones (1991) model to capture the level of earnings management. Abnormal accruals are computed by estimating the following model for each two-digit SIC-year grouping:

$$\frac{TA_{it}}{Assets_{it-1}} = \beta_1 \frac{1}{Assets_{it-1}} + \beta_2 \frac{\Delta Sales_{it}}{Assets_{it-1}} + \beta_3 \frac{PPE_{it}}{Assets_{it-1}} + \varepsilon_{it}, \qquad (8)$$

[10] We exclude 14 cases of violations that occurred in the pre-SOX period but were enforced in the post-SOX period.
[11] See page 137 of Karpoff, Koester, Lee, and Martin (2017) for details on each provision.
[12] A possible explanation for this result is that, due to the SEC's expanded enforcement effort in the post-SOX period, firms become more compliant, and the cases of accounting violations are less severe.

where *TA* represents the total assets, *ΔSales* represents the change in sales from the prior year, and *PPE* represents the gross value of property, plant, and equipment. The coefficient estimates obtained from Equation (8) are used to estimate the firm-specific normal accruals. The absolute value of the difference between the actual *TA* and the estimated normal accruals is the abnormal accruals (*DA*), serving as the measure for the level of earnings management, with higher values indicating more severe earnings management. Prior studies suggest that *DA* is correlated with some inherent firm characteristics such as firm size and growth opportunities (Dechow and Dichev, 2002; Collins, Pungaliya, and Vijh, 2017). Therefore, we control for these firm and industry characteristics to mitigate the concern. As *DA* is estimated from each industry-year, it captures the extent to which firm's accruals differ from its industry peers for a given year.

5.2. Construction of expected penalty

SEC enforcement typically results in monetary and/or non-monetary penalties for violators. The actual monetary penalties can significantly understate the total SEC penalties, as the SEC incurs costs for investigations and litigations, even in cases with zero monetary penalties.[13,14] To mitigate this concern, we rely on a return-implied measure to gauge the total SEC penalties.

We measure the expected SEC penalties (*AbRet*) using the one-day value-weighted market-adjusted return around the initial public disclosure of the alleged financial misconduct. We have three considerations in mind when constructing this measure. First, short-window returns around identifiable event dates have a higher signal-to-noise ratio compared to long-window returns.

[13] Karpoff et al. (2008) conclude that "non-monetary sanctions are common" while "monetary penalties are less common" when discussing Table 7.

[14] For example, non-monetary penalties can be injunction orders, which can only be issued by courts. Therefore, the SEC must spend resources to gather evidence to form strong legal arguments, and to file a complaint with a court to seek non-monetary penalties.

Second, we have two possible event-date candidates for the initial public disclosure: the initial announcement of the misconduct (i.e., trigger event) and the initial announcement of the regulatory proceeding. We choose the former because the latter is nosier. The SEC commonly spends a long time investigating a case before the initial announcement of the regulatory proceeding, and much market reaction occurs before that. However, we acknowledge that our measure is not noise-free, because it includes both the readjustment effect (i.e., the share value decreases because investors previously used inaccurate information in valuation) and the expected SEC penalties. Ideally, we would exclude the former; however, if the readjustment effect is a constant proportion of the expected SEC penalties across firms, our counterfactual results are still valid because they are based on the *changes* in enforcement costs.[15] Third, in addition to the direct SEC penalties, the market-based measure also captures the market's anticipation of turmoil within the fraudulent firm. These indirect penalties align well with the model, wherein the marginal enforcement costs encompass political costs.

We estimate the SEC's penalty schedule using the following Tobit regression based on all firms-year observations in our sample:

$$AbRet_{ijt} = \alpha_1 + \beta_1 \mu_{ijt} + \beta_2 z_{jt} + \beta_3 PreSox_t + \exp(\alpha_2 + \beta_4 \mu_{ijt}) * \exp(DA_{ijt}) + \varepsilon_{ijt}, \quad (9)$$

where the subscripts *i*, *j*, and *t* index the firm, industry, and year. In our sample, some violations span multiple years. When this happens, we set *AbRet* as described earlier if *t* is the final year of the violation period; for years other than the final, as well as for years not associated with any violation, we set *AbRet* to zero.

[15] We acknowledge that the readjustment effect can have a non-linear relationship with SEC penalties, for example, as in the setup of Fischer and Verrecchia (2000).

For company attributes (x_{ijt}), we include firm-specific attributes (μ_{ijt}) and industry-specific characteristics (z_{jt}). The flowchart in Internet Appendix 3 illustrates the rationale for our choice of x_{ijt}. As shown in the flowchart, there are three channels via which observed firm characteristics can affect the SEC's equilibrium penalty function: social costs, the SEC's enforcement costs, and the firm's benefits of earnings management. Thus, any firm and/or industry characteristic that affects the distribution of the earnings management benefits ultimately affects the penalty schedule. Similarly, because the firm's choice of earnings management depends on the penalty schedule set by the SEC, any firm and/or industry characteristic that affects the penalty schedule ends up affecting the equilibrium level of earnings management as well.

This interdependency between the SEC's penalty schedule and the firm's benefits of earnings management affects our selection of $x_{ijt.}$ Specifically, we control for firm-specific attributes, including size (market capitalization), capital structure (leverage ratio), profitability (return-on-asset ratio), and growth potential (market-to-book ratio). Industry-specific characteristics (z_{jt}) can also be correlated with the level of earnings management and regulatory scrutiny. To account for this, we control for the industry median of profitability (*IndROA*) and the industry median of growth (*IndMTB*). We include *ClassAction*, which is the percentage of public firms in a given two-digit SIC industry that face class-action lawsuits in a year, to capture the intensity of private enforcement. *PreSox* equals one for observations from 1996 to 1999 and zero for observations from 2002 to 2005.

We exclude the years 2000 and 2001, as salient events during this period, such as AOL's (now Time Warner) accounting scandal in 2000 and Enron's accounting scandal in 2001, might have changed the SEC's enforcement preferences. Lastly, *DA* is the abnormal accruals computed based on Equation (8), as explained in the previous section. For the estimation of penalty schedules, we include the exponential terms of firm-specific attributes (μ_{ijt}) to allow for heterogeneity in the effect of earnings management on enforcement, while ensuring that the coefficients are positive. Meanwhile, the exponential term of *DA* can capture the concave relationship between enforcement and earnings management. Appendix B provides a detailed description of each variable. We construct the expected penalty ($e(a)$) using the estimates from Equation (9) for each company at various levels of earnings management in both the pre- and post-SOX periods. Appendix C shows the results from estimating Equation (9) to obtain penalty schedules. This variable serves as the input for our structural estimation.

5.3. Estimation of earnings management distribution

We assume that abnormal accruals (*DA*), representing the level of earnings management, follow an exponential distribution[16] with the mean (μ) given by:

$$\mu(DA)_{ijt} = \beta_1 \mu_{ijt} + \beta_2 z_{jt} + \beta_3 PreSox_t + \beta_4 Time_t + \beta_5 \, PreSox_t * Time_t. \quad (10)$$

We estimate the parameters of Equation (10) by MLE using data from the pre-SOX period (1996-1999) and post-SOX period (2002-2005). Both firm-specific variables (μ_{ijt}) and industry characteristics (z_{jt}) variables are used to estimate the distribution of abnormal accruals (*DA*).

In addition, we include *Time* and *PreSox*Time* to detrend abnormal accruals because there is an upward trend in *DA* before SOX, as shown in Figure 4.[17] *Time* equals the difference between a given fiscal year and 1999 (i.e., the last year of pre-SOX) for the pre-SOX period and the difference

[16] We assume that the distribution of unsigned abnormal accruals follows an exponential distribution because: (1) all of the unsigned abnormal accruals are positive, and (2) the histogram generated from raw data resembles an exponential distribution. Specifically, the frequency of smaller values (i.e., less severe earnings management) is much higher than that of greater values (i.e., more severe earnings management).
[17] The steady upward trend is also observed in prior studies, such as Cohen et al. (2008).

between a given fiscal year and 2002 (i.e., the first year of post-SOX) for the post-SOX period. *PreSox*Time* is the interaction between *PreSox* and *Time.*

5.4. Estimation of model primitives

The estimation of model primitives follows the identification strategy discussed in the previous section. The model primitives for any given observables $x_{i,t}$ are the distribution of firm types, $F(\cdot\,|x_{i,t})$; the firm benefits function, $b(\cdot\,|x_{i,t})$; the SEC's perceived marginal social costs, $\gamma_{pre}(x_{i,t})$ and $\gamma_{post}(x_{i,t})$; and the SEC's marginal enforcement costs, $\psi_{pre}(x_{i,t})$ and $\psi_{post}(x_{i,t})$. This step takes the estimated earnings management distribution and expected penalty as inputs. We recover the model primitives separately for each firm pre and post SOX.[18] For detailed steps of the estimation, refer to Internet Appendix 2.

6. Results

6.1. Model fit

We present the estimated model fit in Table 2. In Panel A, we first compare the cumulative distribution of abnormal accruals (*DA*) observed in the data with that estimated by the fitted model for each range of *DA*. The estimated model fits the data well for both the pre-SOX and post-SOX periods, as evidenced by the small differences between the two. The average penalties estimated by the fitted model also have a good fit to the data. In Panel B, we further compare the average penalties predicted by the first-stage estimates (i.e., data) with those estimated by the fitted model

[18] Model primitives are estimated for each of the 3,039 firms active in 1997, and the control variables are measured as of 1997 as well.

for each range of *DA* and find that the model performs well again. In summary, the evidence provides confidence in the model fit.

6.2. Estimated model primitives

Table 3 shows the summary statistics of the estimates of the regulator preference parameters (ψ and γ) and the marginal benefits of earnings management. In our model setup, each firm has a distribution of types – and the benefits of earnings management are specified as the product of the firm's type θ and the baseline function $b(a)$, evaluated at the endogenous earnings management level a. The marginal firm benefit is the derivative of the firm benefit function for a given level of θ and a, representing the change in firm benefit for a unit change of earnings management (*DA*). It is measured in the same unit as the penalties (*AbRet*), which is in the percentage of change in market capitalization. For expositional simplicity, we report the firm benefits for the median firm type, given the earnings management level equals the median value across all firms in the pre-SOX period ($\bar{a}$ = 0.046).[19] [20]

The marginal social costs of earnings management (γ), measured in the same unit as the penalties (*AbRet*), are the damages perceived by the SEC if the firm increases earnings management (*DA*) by one unit. To minimize the damages of earnings management to the capital markets, we expect that a higher γ will increase the SEC's enforcement intensity. Table 3 shows an increase in γ (233%), rising from 0.003 in the pre-SOX period to 0.010 in the post-SOX

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[19] To be precise, the statistics on the marginal firm benefits reported in Table 3 are computed as follows: For each firm with firm characteristics x, we take the derivative of the firm benefit function, $\theta\, b'(a)$, evaluated at the median level of firm type ($\theta = F^{-1}(0.5|x)$ and the median level of earning management across all firms (a= (1/n)$\Sigma_i a_{pre}[F^{-1}(0.5|x), x]$ = 0.046). Then, we calculate the 25th, the 50th, and the 75th percentiles of these values across all firms.

[20] The median value of earnings management ($\bar{a}$ =0.046) is comparable to prior studies. For example, the "ExecuComp Sample" in Cohen et al. (2008), which consists of S&P 1500 firms (i.e., large firms), has an average of 0.07 and a median of 0.04 for abnormal accruals from 1992 to 2005.

period.[21] This increase is consistent with our argument that SOX raises the regulator's perceived social costs.

The marginal enforcement costs (ψ) is a unitless parameter, representing the change in enforcement costs for a unit change in penalties (*Abret*). To minimize the overall enforcement costs, we expect that a higher ψ will reduce the SEC's enforcement intensity *ceteris paribus*. Table 3 shows that ψ significantly decreases by 42%, from 0.554 before SOX to 0.324 after SOX. This drop is consistent with our argument that SOX represents the culmination of political concerns arising from a series of accounting scandals. The resulting political pressure for stronger enforcement and a larger SEC budget likely leads to the reduction in ψ.[22] The decrease in the marginal enforcement costs is also consistent with the observed increase in enforcement intensity post-SOX, as illustrated in Figure 2.

Next, we make a comparison among the three marginal cost components. To ensure comparability with γ and the marginal firm benefit, both of which are computed with respect to a unit change in earnings management (*DA*), we adjust ψ to $\psi * e'[a(\theta)]$, representing the marginal enforcement cost weighted by the marginal penalty. Due to the small average values of marginal penalties (a mean of 0.06% in the pre-SOX period and 0.32% in the post-SOX period), the weighted marginal enforcement costs $\psi * e'[a(\theta)]$ are much smaller than ψ. Among the three cost components, social costs and firm benefits clearly play a relatively more important role than

[21] Our discussion focuses on the economic significance of the results in the structural estimations (Bertomeu, 2023). We acknowledge that the changes in the marginal social costs and marginal firm benefits are not significant at the conventional level. We leave the interpretation of our results to the readers.

[22] A larger budget allows the SEC to hire more employees. In a testimony on the implementation of SOX, Chairman Donaldson said that he planned to use part of the funds to hire 842 new employees. As a result, the average number of employees at the SEC increases by 22%, from 2,770 in the pre-SOX period to 3,367 in the post-SOX period. See https://www.sec.gov/foia/docs/fulltimes.htm.

enforcement costs in the SEC's regulatory preferences. In Internet Appendix 4, we further illustrate the relative economic importance of the three cost components.

6.3. The determinants of regulator preferences

To shed light on the cross-sectional variation in the estimated SEC preferences (ψ and γ) and firm benefits, we next investigate how and to what extent these estimates vary with firm and industry characteristics.[23] Following KS, we provide both robust standard errors and bootstrap standard errors for the rest of regression analyses.[24] Table 4 shows the results from the OLS regressions of the logarithm of the estimated ψ (columns (1)), γ (columns (2)), and the marginal firm benefits of earnings management (columns (3)) for the post-SOX period. The pre-SOX results, which are similar, are tabulated in Internet Appendix 6.

We focus our discussion on the relationship between the estimated primitives and firm size, given the importance of the latter in threshold-based regulation. Both columns (1) and (2) show positive coefficients on *Size*, suggesting that the SEC perceives higher marginal enforcement costs (ψ) and higher marginal social costs (γ) when enforcing against large firms. These results may stem from the SEC perceiving higher administrative and political costs, in addition to the large firms playing an important role in economic activities, such as higher employment and investor attraction. The significantly negative coefficient on *Size* in column (3) suggests that managers of large firms extract lower benefits from earnings management, possibly due to better monitoring

[23] The control variables included in the regressions are measured as of 1997, which, as explained in Section 5.4, is the same period of measurement of the control variables used in the estimation of the model primitives.

[24] Robust standard errors assume the estimated parameters are measured without error, while bootstrap standard errors relax this assumption. To generate the bootstrapped confidence intervals, we use a standard approach of bootstrapping with replacement. We randomly sample the 20,987 firm-year observations with replacements for 100 times. Then we estimate the entire structural model and obtain the parameter estimates for each of the 100 samples. Finally, we compute the bootstrapped confidence intervals of each point estimate presented in the paper—including the counterfactual results—based on these 100 bootstrapped parameters.

and more effective corporate governance mechanisms by the boards of directors (Gompers, Ishii, and Metrick, 2003). To refine the above inferences on firm size, we provide numerical examples comparing the estimated model primitives for a small firm versus a large firm in Internet Appendix 7.

7. Counterfactual analyses

One key advantage of our structural approach is its ability to evaluate the economic impact of counterfactual policies. We are particularly interested in three alternative scenarios: zero enforcement costs, maximum perceived social costs, and a homogenous penalty schedule. We are also interested in the sensitivity of enforcement outcomes to the marginal enforcement and social costs. The results from these exercises can shed light on how each policy affects enforcement outcomes and the associated welfare. In each counterfactual analysis (other than the uniform penalty scenario, which we discuss in more details in Section 7.3 below), we first set a new cost structure by changing ψ, γ, or both.[25] The new cost structure leads to new equilibrium levels of *a* and *e(a)* for each firm. Based on these new values, we then compute the SEC's welfare (negative of total costs) for each respective firm.

7.1. The sensitivity of enforcement outcomes to marginal enforcement costs

To assess the sensitivity of enforcement outcomes to marginal enforcement costs, we begin by increasing the marginal enforcement costs by 10% of the baseline value for all firms

[25] In conducting counterfactual analyses, we take the benefit function *b(.)* as exogenous as we do not explicitly model the relationship between earnings management and price response. In fact, we identify the benefit function *b(.)* non-parametrically (see Section 2.1). We acknowledge that potential policy changes in our counterfactuals may also affect *b(.)*. However, such effects are beyond the scope of our current model, as our paper focuses on regulatory preference (i.e., ψ and γ).

($\psi_{Counterfactual}$ = 1.1* $\psi_{Baseline}$ and $\gamma_{Counterfactual} = \gamma_{Baseline}$). The results in row (1) of Table 5 show that the change in the level of expected penalties is -0.0013, representing a 7.6% reduction in expected penalties relative to the baseline scenario. Meanwhile, the level of earnings management increases by 0.0005, accounting for 0.7% of the baseline level of earnings management.[26] The SEC's welfare for the entire market decreases by $85.15 million. Conversely, a 10% decrease in the marginal enforcement costs ($\psi_{Counterfactual}$ = 0.9* $\psi_{Baseline}$ and $\gamma_{Counterfactual} = \gamma_{Baseline}$) has the following effects: the expected penalties increase by 5.2%, the level of earnings management decreases by 0.7%, and the SEC's welfare changes to a larger extent compared to the increase in enforcement costs ($130.27 million).

Next, we analyze an extreme scenario with costless enforcement, dubbed "first best." As discussed in Section 2.1, information asymmetry exists between the regulator and the firm. The interaction between costly enforcement and asymmetric information gives rise to inefficiencies. To see why such an interaction is necessary for a departure from the first best, consider a scenario where asymmetric information exists but the regulator does not have any enforcement costs (i.e., $\psi = 0$); in such a scenario, the regulator can set a penalty schedule to induce the firm to choose the first-best level of earnings management so that the firm bears all the social costs. Similarly, under the scenario of no asymmetric information but costly enforcement, KS shows that the regulator can set a penalty schedule under which the firm's optimal response is to choose the first-best level of earnings management (see Lemma A1 in Appendix B of KS). Therefore, the equilibrium level of earnings management deviates from the first best only when both asymmetric information and costly enforcement are present.

[26] In the post-SOX period, the baseline level of expected penalties is 0.0166 and the baseline level of earnings management is 0.0648.

We estimate the changes in the level of earnings management and penalties by setting the marginal enforcement costs to zero for all firm ($\psi_{Counterfactual}$ = 0 and $\gamma_{Counterfactual} = \gamma_{Baseline}$). Row (3) of Table 5 shows that removing enforcement costs increases penalties by 0.0375 in the post-SOX period, corresponding to 2.3 times the baseline penalties, and decreases earnings management by -0.0071, accounting for about 11.0% of the baseline level of earnings management. The SEC's welfare increases by $1,691.82 million in the first-best scenario. The evidence suggests that removing enforcement costs generates a modest impact on earnings management, especially when compared to the large increase in penalties in the first-best scenario. These results provide an upper bound for the potential gains of increasing the SEC budget. Importantly, these findings also reveal that levels of earnings management under the SEC's current enforcement are close to those in the first-best scenario.

7.2. The sensitivity of enforcement outcomes to marginal social costs

To assess the sensitivity of enforcement outcomes to marginal social costs, we increase the marginal social costs by 10% relative to the baseline value ($\psi_{Counterfactual} = \psi_{Baseline}$ and $\gamma_{Counterfactual} = 1.1 * \gamma_{Baseline}$). Table 5, row (4) shows that expected penalties increase by 0.0012, representing 7.0 % of the baseline level, and earnings management decreases by 0.0007, representing 1.1% of the baseline level. The SEC's welfare decreases by $887.32 million. Comparing the changes in welfare in rows (1) and (2) with those in rows (4) and (5), we find that the welfare is much more sensitive to marginal social costs than to marginal enforcement costs. This is primarily due to the relatively smaller magnitude of enforcement costs; social costs are, on average, nine times larger than enforcement costs in the post-SOX period (untabulated).

Next, we consider another extreme scenario, in which the regulator perceives excessively high social costs of financial misconduct, dubbed the "hawkish" regulator." We conduct this counterfactual analysis by setting the marginal social costs of each firm to the maximum value across all firms, 0.129 (approximately 13 times the median of 0.010 reported in Table 3), whereas the marginal enforcement cost of each firm remains as in the baseline scenario. Formally, $\gamma_{Counterfactual}$ = max $(\gamma_{Baseline})$ and $\psi_{Counterfactual} = \psi_{Baseline}$. The results in row (6) of Table 5 indicate that a "hawkish" regulator would decrease earnings management by 0.0274 but decrease the SEC's welfare by $36,821.04 million. This finding highlights that, compared to the first-best scenario, a "hawkish" regulator would entail substantial firm compliance costs and be overly costly to society.

7.3. One-size-fits-all policy

The failure of the SEC to prevent damaging financial misconduct has generated significant negative sentiments. Media, politicians, and legal scholars have long criticized the SEC for favoring certain groups of market participants (e.g., Eavis and Protess, 2015; Stein, 2015). The criticism warrants an assessment of the merit of the SEC's discretionary enforcement. To this end, we conduct a counterfactual analysis under a uniform penalty schedule, where the SEC imposes the same penalty schedule across all firms while maintaining heterogeneous preferences. This contrasts with the baseline scenario in which the regulator is free to set a different penalty schedule for each firm. In computing the optimal uniform schedule, for computational convenience, we follow KS and restrict our attention to polynomial functions of degree three. Specifically, we assume that the regulator chooses $\widetilde{\tau} \equiv \{\tau_1, \tau_2, \tau_3\}$, and the penalty schedule for any given firm with the level of earnings management of a is

$$\tau(a,\tilde{\tau}) = \begin{cases} \tau_1 a + \tau_2 a^2 + \tau_3 a^3 & \text{if } a > 0 \\ 0 & \text{otherwise.} \end{cases} \quad (11)$$

Taking the expectation of (5) over the observable firm characteristics x, the regulator's objective function becomes

$$\mathbb{E}_x\left[\mathbb{E}_{\Theta|x}\left[-\theta\hat{b}(a(\theta,x,\tilde{\tau});x) + \widehat{\gamma_j}(x)a(\theta,x,\tilde{\tau}) + \widehat{\psi_j}(x)e(a(\theta,x,\tilde{\tau});\tilde{\tau})|x\right]\right] \quad (12)$$

$j \in \{pre, post\}$. The regulator then selects the τ vector to maximize this objective function.[27]

As row (7) of Table 5 shows, under the uniform policy, firms, on average, bear significantly higher penalties with no significant change in the level of earnings management. Furthermore, the SEC also perceives significantly lower welfare – amounting to \$103.91 billion. Taken together, restricting the SEC's enforcement discretion in penalty schedules can lead to worse outcomes, which provides the rationale for implementing size-based regulations and risk-based models.

8. Conclusion

This study examines the objective function of the SEC in enforcing securities laws against financial misconduct. Using SOX as a shock to the SEC's enforcement intensity, we employ a structural estimation to recover the objective functions of both the regulated firms and the SEC. In our model, we focus on three components of the SEC's perceived cost function: (1) the social costs, (2) the SEC's enforcement costs, and (3) the firms' benefits of earnings management. The counterfactual analyses deliver four novel insights. First, welfare (the negative of total costs) is less sensitive to marginal enforcement costs compared to marginal social costs. Second, the level of earnings management under the current regulatory regime deviates modestly from the first-best

[27] Online Appendix D.1. of KS provides further details on the implementation of the counterfactual analysis under a uniform penalty schedule.

scenario. Third, a "hawkish" regulator who perceives excessively high marginal social costs of financial misconduct would be overly costly to society. Lastly, imposing a one-size-fits-all policy in the penalty schedule generates undesirable outcomes, as evidenced by a large increase in penalties and a decrease in welfare, but only weakly higher earnings management.

Collectively, our study highlights that a regulatory intervention of removing the SEC's discretion in enforcement can lead to unwanted outcomes, and thus, informs the policy debate of whether financial regulators should be granted discretion. Our findings also shed light on the efficacy of expanding the SEC's budget and the costs involved in having a "hawkish" regulator in financial fraud prevention.

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Appendix A: Effect of SOX on Regulator Preferences

SOX Sections 101-109 created the PCAOB to inspect auditors of SEC-registered companies. The establishment of the PCAOB reduces the SEC's marginal enforcement costs in two ways. First, the PCAOB is composed of audit experts and industry practitioners with specialized knowledge in regulating the audit market. The PCAOB performs annual inspections for PCAOB-registered public accounting firms and provides inspection reports. The regulatory work performed by the PCAOB reduces the SEC's burden to regulate the audit market, lowering the SEC's opportunity costs and enabling increased allocation of resources to non-audit cases. Second, the SEC has oversight authority over the approval of the PCAOB's budget, while the source of the PCAOB's budget is independent of the SEC.[28] One can consider the PCAOB's budget as an indirect increase to the SEC's budget. Expenses that should have been borne by the SEC are now covered by the PCAOB, reducing the SEC's opportunity costs of enforcement.

SOX Section 404 (SOX 404) requires large firms to file an Internal Control Report and their external auditors to attest to the accuracy of assertions made by the management. SOX 404 likely reduces the SEC's marginal enforcement costs. For example, an internal control system is similar to the "internal police" that the SEC deploys inside the firm, reducing the costs of the SEC to pursue violations against internal control weakness (e.g., Section 13(b)(2)(B) of the Exchange Act). Prior studies suggest that SOX 404 is effective in improving financial reporting quality (Iliev, 2010; Feng, Li, and McVay, 2009) Furthermore, SOX Section 806, also known as the whistleblower-protection provision, can strengthen the protection for whistleblowers against retaliatory actions – which in turn increases the probability of the SEC receiving tips from whistleblowers, reducing

[28] The majority of the PCAOB's funding comes from the "accounting support fee" collected from issuers and brokers and dealers whose financial statements are audited by the PCAOB-registered public accounting firm. See https://pcaobus.org/about/accounting-support-fee for more information.

investigation costs. Consistent with this argument, Call et al. (2018) show that the SEC responds more quickly to whistleblower tips with enforcement proceedings, and the information provided by whistleblowers allows the SEC to build a stronger case.

Some SOX provisions, such as SOX Section 302, increase the legal liability for executives. This provision mandates the CEO and CFO to review and certify all financial reports and senior executives to be responsible for the accuracy of such financial reports, making it easier for the SEC to demonstrate executive involvement in violations. Therefore, marginal costs of enforcement for the SEC to prove the senior executives' participation in earnings management decrease.

The political sentiment against financial frauds culminated during the passage of SOX. Therefore, the political costs for SEC enforcement decreased. In his 2003 speech on the implementation of SOX, former Commissioner Atkins said that: "Last year, in fact, the market decline and large corporate failures led to just such a general sense that politicians should 'do something.' Because these corporate failures stemmed from lax accounting and corporate governance practices, 'Corporate Responsibility' became an important political issue in the United States, for the first time in perhaps 70 years." The politician's objective to restore investor confidence by reducing the incidence of accounting fraud led them to support increased SEC enforcement, as evidenced by an increase of 39.4% in the SEC's budget from 2002 to 2003. This large increase is in stark contrast to the pre-SOX period: the budget only increases slightly by 8.4%, from 1998 to 1999 and 1.3% from 1997 to 1998. Taken together, SOX likely reduces marginal enforcement costs and increases marginal social costs, as perceived by the SEC.

Appendix B: Variable Definitions

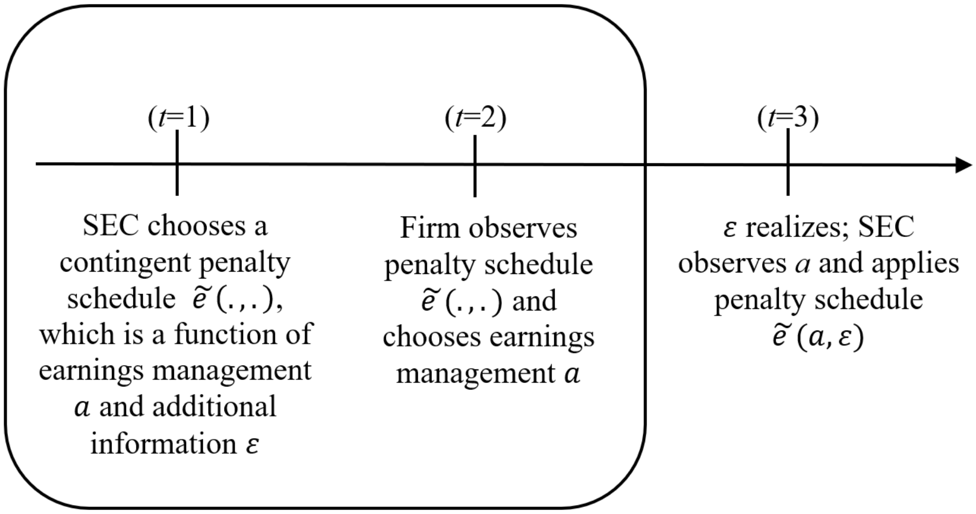
Variable	Definition
Firm Control Variables	
Lev	Long-term debt divided by total assets.
Loss	An indicator variable set to one if net income is less than zero.
MTB	Market value of equity divided by book value of equity.
ROA	Income before extraordinary items divided by total assets in the prior year.
Size	Natural log of market capitalization.
Industry Control Variables	
ClassAction	The number of class actions in each two-digit SIC-year divided by the total number of public firms in each two-digit SIC-year
Ind_MTB	Industry median of *MTB* based on 2-digit SIC
Ind_ROA	Industry median of *ROA* based on 2-digit SIC

Appendix C: Tobit Estimation of Penalty Schedules

	(1) Linear Terms			(2) Exponential Terms		
VARIABLES			*-AbRet*			
Lev		0.029			-0.034	
	[-0.074		0.14]	[-0.451		0.67]
MTB		-0.007			0.007	
	[-0.017		-0.001]	[-0.357		0.068]
Size		0.042			0.026	
	[0.018		0.122]	[-3.639		0.098]
ROA		0.291			-1.634	
	[-0.289		0.498]	[-4.005		0.757]
Loss		0.745			-20.766	
	[0.126		1.034]	[-24.98		-0.106]
Ind_MTB		0.017				
	[-0.019		0.056]			
Ind_ROA		0.515				
	[-0.548		1.242]			
ClassAction		1.123				
	[-0.359		2.441]			
PreSOX		-0.279				
	[-0.354		-0.229]			
Constant		-2.119			-0.709	
	[-2.641		-1.47]	[-5.432		1.482]
Log likelihood			-699.3			
Observations			20,987			

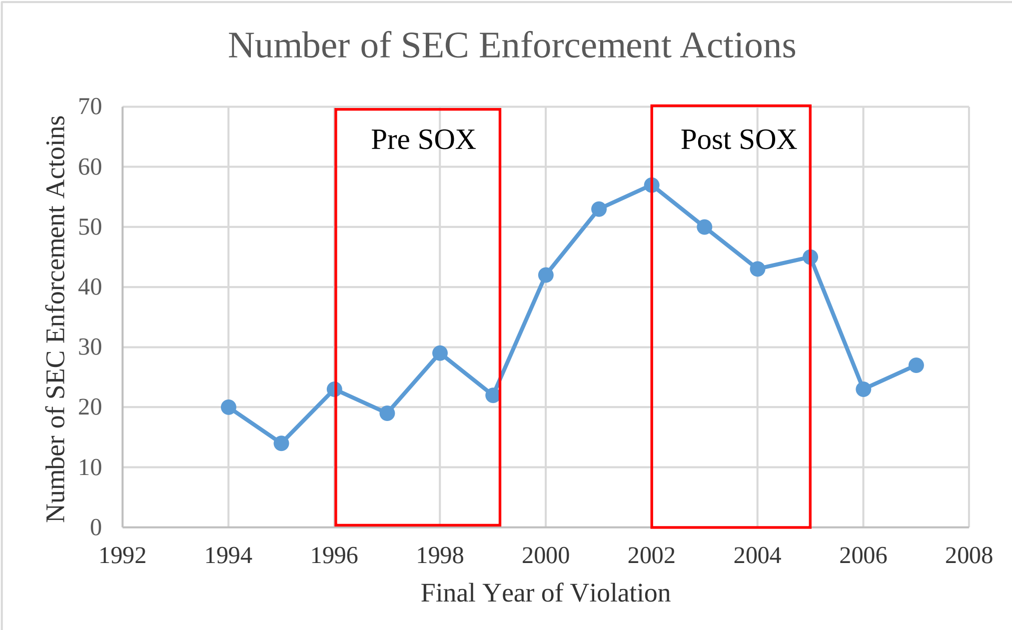
This table presents the Tobit estimation of Equation (9). The regression is estimated for 20,987 firm-year observations before and after SOX. The dependent variable, *AbRet*, is multiplied by -1 to present penalties as positive numbers. Bootstrap 90% confidence intervals are presented in brackets.

Figure 1: Model Timeline



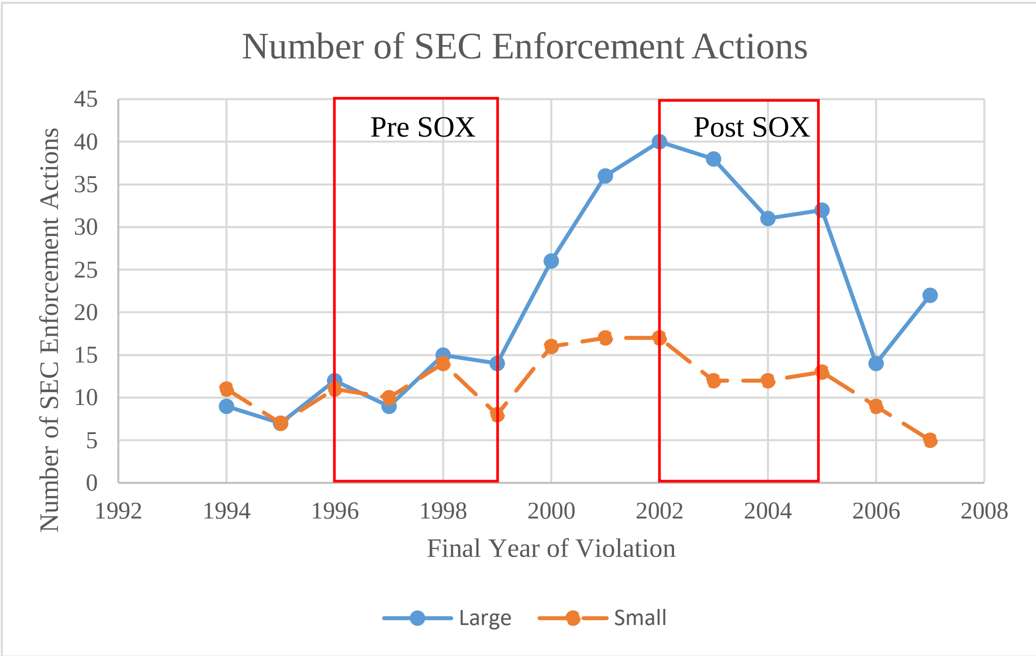
This figure depicts the timeline of events concerning the SEC's design of a penalty schedule, information arrival, the firm's earning management decision, and the SEC's enforcement. The time periods modeled in the paper are circled. In t=1 and t=2, neither the SEC nor the firm knows the realization of ε.

Figure 2: Number of SEC Enforcement Actions over Time



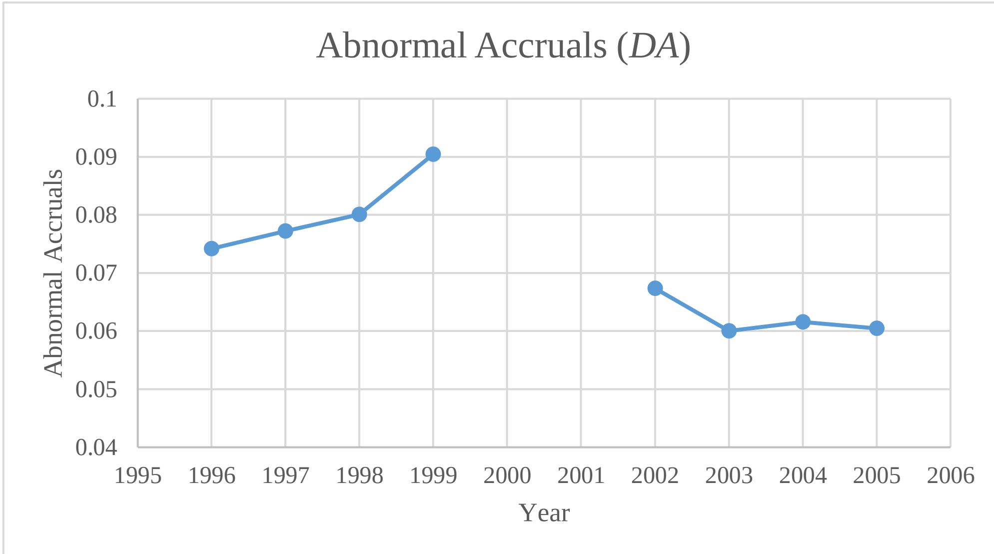
This figure shows the total number of SEC enforcement actions related to 13(b) violations from 1994 to 2007, plotted based on the final year of violation. The pre-SOX period spans 1996 to 1999, and the post-SOX period spans 2002 to 2005.

Figure 3: Number of SEC Enforcement Actions over Time for Large and Small Firms



This figure shows the number of SEC enforcement actions related to 13(b) violations for large and small firms from 1994 to 2007, plotted based on the final year of violation. Large firms are represented by the solid line, and small firms are represented by the dotted line. The pre-SOX period spans 1996 to 1999, and the post-SOX period spans 2002 to 2005.

Figure 4: Abnormal Accruals (*DA)*



This figure plots the time series of the average value of abnormal accruals (*DA*) for the pre-SOX period (1996-1999) and post-SOX period (2002-2005). *DA* is computed using the Jones (1991) model estimated for each two-digit SIC-year grouping.

Table 1. Descriptive Statistics

	Pre-SOX (1996-1999)				Post-SOX (2002-2005)			
Variables	N	Mean	Median	Std. Dev.	N	Mean	Median	Std. Dev.
DA	11,719	0.081	0.049	0.100	9,268	0.063	0.043	0.074
Lev	11,719	0.315	0.250	0.325	9,268	0.262	0.227	0.255
MTB	11,719	3.874	2.565	4.991	9,268	3.128	2.300	3.849
TA	11,719	3,365	650	8,539	9,268	6,546	1,515	12,645
MktCap	11,719	3,385	666	8,376	9,268	5,583	1,480	10,674
Size	11,719	6.814	6.501	1.445	9,268	7.563	7.300	1.368
ROA	11,719	0.135	0.146	0.149	9,268	0.129	0.127	0.118
Loss	11,719	0.192	0.000	0.394	9,268	0.186	0.000	0.389
Ind_ROA	11,719	0.107	0.118	0.036	9,268	0.093	0.099	0.042
Ind_MTB	11,719	2.100	1.898	0.608	9,268	1.993	1.916	0.587
ClassAction	11,719	0.021	0.022	0.013	9,268	0.033	0.031	0.020
AbRet	23	-0.116	-0.059	0.156	122	-0.068	-0.017	0.117

This table provides descriptive statistics for variables used in the analyses for both the pre-SOX period and post-SOX period. *DA* represents the unsigned abnormal accruals computed using the Jones (1991) model presented in Equation (8). *TA* is total assets in millions. *MktCap* is market capitalization in millions. *AbRet* is the value-weighted market-adjusted return, computed based on 23 SEC enforcement actions in the pre-SOX period and 122 SEC enforcement actions in the post-SOX period. Firm and industry control variables are defined in Appendix B. All variables are winsorized at the 1% and 99% levels.

Table 2. Model Fit

Panel A: Model Fit for *DA* and Penalties

	Pre-SOX		Post-SOX	
	Data	Model	Data	Model
DA				
(0,0.01]	12.279%	12.580%	12.387%	14.610%
(0,0.02]	23.782%	23.660%	25.281%	27.130%
(0,0.03]	34.047%	33.250%	36.729%	37.680%
(0,0.04]	42.930%	41.540%	47.076%	46.610%
(0,0.05]	50.508%	48.720%	56.193%	54.150%
(0,0.06]	56.976%	54.970%	63.088%	60.550%
Penalties				
Average Penalties	0.023%	0.017%	0.089%	0.086%

This table presents the cumulative distributions of abnormal accruals (*DA*) and average penalties, as observed in the data and estimated by the fitted model. The data consists of firm-year observations in both the pre-SOX and post-SOX periods.

Panel B: Model Fit for Penalties with Respect to *DA*

		Pre-SOX		Post-SOX	
DA		Penalties			
		Data	Model	Data	Model
(0.010	0.030]	0.001%	0.001%	0.010%	0.010%
(0.030	0.094]	0.003%	0.003%	0.020%	0.020%
(0.094	0.150]	0.007%	0.007%	0.040%	0.040%
(0.150	0.342]	0.021%	0.020%	0.110%	0.100%

This table presents the average penalties for each range of *DA*, as predicted by the first-stage estimates (i.e., data) and as predicted by the fitted model (i.e., model). The data consists of firm-year observations in both the pre-SOX and post-SOX periods. For each bin, we present the average penalties estimated using 1997 for the pre-SOX period and 2003 for the post-SOX period.

Table 3. Model Primitive Estimates: Summary Statistics

	Median	p25	p75
Firm Primitives			
Marginal benefits of earnings management			
Pre-SOX	0.007	0.003	0.019
	[0.000 0.144]	[0.000 0.027]	[0.000 0.756]
Post-SOX	0.017	0.007	0.043
	[0.000 0.399]	[0.000 0.071]	[0.000 2.062]
Regulator Primitives			
Marginal enforcement costs (ψ)			
Pre-SOX	0.554	0.435	0.622
	[0.051 1.011]	[0.045 0.867]	[0.060 1.167]
Post-SOX	0.324	0.257	0.375
	[0.046 0.558]	[0.041 0.472]	[0.054 0.608]
Difference before and after SOX	-0.230	-0.178	-0.247
	[-0.488 -0.005]	[-0.364 -0.005]	[-0.593 -0.006]
Marginal social cost (γ)			
Pre-SOX	0.003	0.001	0.005
	[0.000 0.009]	[0.000 0.005]	[0.000 0.012]
Post-SOX	0.010	0.006	0.016
	[0.000 0.022]	[0.000 0.012]	[0.000 0.032]
Difference before and after SOX	0.007	0.004	0.011
	[0.000 0.014]	[0.000 0.010]	[0.000 0.020]

This table provides the summary statistics of the marginal benefits of earnings management estimated at the median value of earnings management, the marginal enforcement costs (ψ), and the marginal social costs (γ) for both the pre-SOX and post-SOX periods. Bootstrap 90% confidence intervals are presented in brackets.

Table 4. Explaining Benefits of Earnings Management and SEC Preferences

VARIABLES	(1) log(ψ)		(2) log(γ)		(3) log(*Benefit*)	
Lev	-0.054***		0.252***		1.909***	
	(-4.127)		(10.120)		(70.771)	
	[-0.248	0.167]	[-0.440	1.109]	[1.253	3.869]
MTB	-0.003**		-0.009		0.183***	
	(-1.974)		(-1.031)		(28.382)	
	[-0.019	0.025]	[-0.439	0.072]	[-0.177	0.494]
Size	0.066***		0.277***		-0.536***	
	(40.205)		(84.971)		(-63.395)	
	[-0.180	0.138]	[-3.383	0.388]	[-4.092	-0.338]
ROA	-0.757***		-2.628***		-1.155***	
	(-14.299)		(-6.933)		(-5.211)	
	[-1.066	0.131]	[-4.320	1.143]	[-3.665	3.059]
Loss	-1.948***		-20.696***		-19.269***	
	(-169.132)		(-399.421)		(-409.409)	
	[-2.329	0.025]	[-24.458	1.192]	[-23.915	2.527]
Ind_MTB	-0.095***		-0.028		0.788***	
	(-12.478)		(-1.265)		(34.636)	
	[-0.128	0.006]	[-0.164	0.188]	[0.519	1.044]
Ind_ROA	0.569***		1.193***		-12.169***	
	(5.787)		(5.066)		(-56.503)	
	[-0.235	1.774]	[-3.419	5.320]	[-21.608	-8.270]
ClassAction	-2.277***		5.007***		11.958***	
	(-9.220)		(6.971)		(19.763)	
	[-3.112	-0.755]	[-2.159	12.208]	[2.031	17.221]
Constant	-1.198***		-6.097***		-1.435***	
	(-52.037)		(-114.319)		(-16.464)	
	[-3.859	-0.046]	[-11.684	-1.943]	[-7.643	5.995]
Adjusted R-squared	0.970		0.997		0.997	

This panel presents the OLS regressions of the logarithm of the marginal benefits of earnings management estimated at the median value of earnings management (*Benefit*), marginal enforcement costs (ψ), and marginal social costs (γ) on firm and industry attributes in the post-SOX period. The regressions are estimated for each of the 3,039 firms active in 1997. *t* -statistics based on robust standard errors are reported in parentheses. Bootstrap 90% confidence intervals are presented in brackets. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively, on a two-tailed basis using robust standard errors.

Table 5: Counterfactual Analyses

	Earnings Management		Penalties		Welfare	
(1) High enforcement costs	0.0005		-0.0013		-85.15	
	[0.0002	0.0006]	[-0.0025	-0.0000]	[-192.24	0.00]
(2) Low enforcement costs	-0.0005		0.0009		130.27	
	[-0.0006	-0.0002]	[0.0000	0.0014]	[0.00	283.02]
(3) Zero enforcement costs	-0.0071		0.0375		1,691.82	
	[-0.0098	-0.0019]	[0.0000	0.1016]	[0.00	7,101.44]
(4) High social costs	-0.0007		0.0012		-887.32	
	[-0.0009	-0.0005]	[0.0000	0.0020]	[-1,585.26	-0.00]
(5) Low social costs	0.0008		-0.0017		941.02	
	[0.0006	0.0010]	[-0.0032	-0.0000]	[0.00	1,673.61]
(6) Maximum social costs	-0.0274		0.1149		-36,821.04	
	[-0.0526	-0.0196]	[0.0000	2.6066]	[-402,890.79	-0.00]
(7) Uniform penalty	0.0621		0.7500		-103,912.66	
	[-0.0625	0.0763]	[0.0005	4.0640]	[-127,610.45	-45.77]

This panel presents results of seven counterfactual scenarios based on the estimates from the post-SOX period. The changes, compared to the baseline scenarios, for the means of earnings management, penalties (in percentage points), and welfare (in millions) are reported. Welfare is the negative of total costs, where total costs are calculated as the sum of the social costs and enforcement costs, minus firm benefits. We measure changes in penalties in terms of percentage points of firm market value and changes in welfare in millions of dollars. In row (1), the marginal enforcement costs increase by 10%. In row (2), the marginal enforcement costs decrease by 10%. In row (3), the marginal enforcement costs are set to zero for all firms. In row (4), the marginal social costs increase by 10%. In row (5), the marginal social costs decrease by 10%. In row (6), the marginal social costs are set to be the maximum across all firms. In row (7), the SEC imposes the same penalty schedule across all firms. Bootstrap 90% confidence intervals are presented in brackets.