SOX, Corporate Transparency, and the Cost of Debt

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Keywords: Sarbanes-Oxley, Corporate transparency, CDS pricing.

JEL number: G38, G33, G12

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Abstract

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1 Introduction

The enactment of the Sarbanes-Oxley (SOX) Act in July 2002 is arguably one of the most significant regulatory events in the recent history of US capital markets. Advocates of the Act claim its main objective was to "rebuild the public's trust in US capital markets", whose functioning had been undermined by the deteriorating quality of accounting information culminating in a series of accounting scandals (Cohen, Dey, and Lys, 2008; Jorion, Shi, and Zhang, 2007; Healy and Palepu, 2003). To that end, the Act contains several mandates aiming to increase corporate transparency through more reliable corporate reporting. According to Coates (2007), the two core components of such mandates are the creation of a quasi-public institution to supervise auditors, and the enlisting of auditors to enforce new disclosure rules giving firms incentives to tighten financial controls. The net benefits of the new legislation, if any, are still under debate[1].

The Sarbanes-Oxley Act imposes both direct and indirect costs on public firms. Direct out-of-pocket costs include internal compliance costs and increased audit fees (Illiev 2007), while indirect costs arise from sub-optimal disclosure under tighter constraints compared to laxer ones (Verrechhia 1983). The indirect costs of excessive disclosure may include competitive disadvantages in product markets; bargaining disadvantages with customers, suppliers, and employees; and increased risk exposure of top officers resulting in risk avoiding behavior (Hermalin and Weisbach 2007; Bargeron, Lehn, and Zutter, 2008).

In this paper we focus on an aspect of SOX that has received notably little attention: the effect of the Act on the cost of debt capital due to presumably higher reliability of corporate reporting. Admittedly we do not provide a full cost-benefit analysis of the Act, instead we attempt to shed light on a particular benefit of SOX that is arguably hard to measure. Our results indicate that the cost of debt decreased by 19 basis points per year for the typical firm in our sample due to an increase in corporate transparency as perceived by investors. This is an economically large effect, considering that the risk-free rate and the typical credit spread were respectively 330 and 112 basis points in the period immediately after the passage of the Act. In dollar terms, the perceived improvement in the quality of financial reporting translates into total savings of US$ 1.65 billion per year for the 250 firms in our sample. Consistent with previous studies, our evidence indicates that the effect of the Act depends on predictable firms characteristics (Chhaochharia and Grinstein 2007; Zhang 2008). Specifically, the reduction in opacity perceived by investors following SOX is larger for firms that: are less transparent according to the 2002 S&P Transparency and Disclosure

[1] See Bushee and Leuz (2005); Jain and Rezaee (2006); Chhaochharia and Grinstein (2007); Zhang (2007); Leuz (2007); Iliev (2007); Hostak et al. (2008); Ashbaugh-Skaife et al. (2008); and Bargeron et al. (2008), for analyses of the economic consequences of SOX.

Index, have lower earnings quality in the pre-SOX period, and are more likely to be affected by SOX according to the criteria in Chhaochharia and Grinstein (2007).

Recent research in finance underscores the importance of corporate transparency for the pricing of debt-related contracts. In their influential work, Duffie and Lando (2001) develop a model showing that corporations with less reliable financial reports have higher secondary market credit spreads due to the asymmetric nature of cash flows from debt contracts. This occurs even when investors are risk-neutral and symmetrically informed. The Duffie-Lando model is able to generate non-negligible short-term credit spreads for investment grade corporations, a robust empirical phenomenon that is hard to explain in a full information framework. Empirical research by Sengupta (1998), Yu (2005), Zhang (2008), Wittenberg-Moerman (2008), and Duarte, Young, and Yu (2008) corroborates the importance of corporate transparency for debt pricing. Ball, Robin, and Sadka (2008) provide evidence that the demand for timely and reliable financial reports arises primarily in debt markets rather than equity markets due to the existence of debt covenants. The latter are usually based on financial ratios calculated from balance sheet or income statement figures and their violation triggers additional contractual rights to debt holders.

A contemporaneous paper by DeFond, Hung, Karaoglu, and Zhang (2008) analyzes the impact of SOX on debt prices. Using cumulative "abnormal" changes in corporate bond spreads over 13 short-term windows surrounding events leading up to the passage of SOX, they conclude that the Act increased the cost of debt by 20 basis points. Our work differs from theirs in at least three important ways. First, our analysis relies on CDS spreads not corporate bond prices. The secondary market for corporate bonds is reportedly less liquid than that of CDS contracts, which may pose a challenge for an event-study analysis. Second, we calibrate a structural debt pricing model to isolate the effect of SOX on firms' financial reporting quality and its resulting impact on credit spread levels, whereas DeFond et al. use linear regressions to detect "abnormal" changes in spreads. Third, in the same spirit of Chhaochharia and Grinstein (2007), we use long pre- and post-SOX windows rather than price changes over few days around selected pre-enactment events.

The rest of the paper is organized as follows: in Section 2 we describe our methodology and data, and develop three hypotheses whose empirical tests are reported in Section 3. In Sections 4 and 5 we show our results are robust to plausible alternative explanations of our main findings and to sensible variations in our calibration procedure. Section 6 concludes the paper.

2 Methodology, Data, and Testable Hypotheses

We measure the cost of debt using credit spreads from Credit Default Swaps (CDS). A CDS is an over-the-counter insurance contract on debt. The buyer and seller of insurance agree on a reference bond and on a notional value for the contract, typically US$ 10 million. The buyer of insurance pays the quoted spread times the contract's notional value to the seller of insurance, typically on a quarterly basis. In return, the seller must pay the contract's notional value to the buyer of insurance in the event of default, and in exchange she receives the defaulted reference bonds from the buyer of insurance.

CDS and corporate bond spreads are closely related theoretically and empirically (Duffie 1999; Blanco et al. 2005), but there are several advantages in using CDS rather than bond spreads in our research. First, CDS spreads are quoted directly, as opposed to bond spreads that depend on the arbitrary choice of a default-free term structure of interest rates. Second, traded CDS spreads have a fixed maturity, so it is not necessary to control for changes in time to maturity. Third, the CDS market has become much more liquid than the secondary market for corporate bonds, therefore CDS market prices are in principle more reliable (Hull et al. 2004; Blanco et al. 2005). Finally, in contrast to corporate bonds, there is no reason to believe that illiquidity in the CDS market affects the average level of a firm's CDS spread because a CDS is a derivative contract not an asset (Longstaff et al. 2005).

2.1 CDS pricing model

Corporate transparency is only one of several determinants of credit spreads. In order to measure the change in spreads due a change in corporate reporting reliability, we need to control for changes in the other spread determinants. Controlling for other spread determinants using linear regressions could lead to misspecification, because structural debt pricing models indicate that the impact of credit spread determinants is highly non-linear and include important interactions among the determinants. For instance, the sensitivity of credit spreads to stock prices is much higher for high spread levels than for low spread levels (Schaefer and Strebulaev 2008). We address these difficulties by using a structural debt pricing model that explicitly incorporates the effect of accounting reliability, along with all the other credit spread determinants. We rely on the CreditGrades model, which delivers a simple, analytical debt pricing formula. The model was jointly developed by Goldman Sachs, JP Morgan and Deutsche Bank and is a popular debt pricing tool among practitioners. Attesting to the popularity of the model, Yu (2006) and Duarte, Longstaff, and Yu (2007) use the CreditGrades model in recent research.

In contrast to models of debt pricing under full information, the CreditGrades model explicitly incorporates a parameter representing uncertainty about the true level of a firm's liabilities. The logic underlying this extension is that the level of liabilities reported on the firm's balance sheet is potentially different from the level of liabilities that will drive a corporation to default. We refer to this uncertainty parameter as "corporate opacity". Our research strategy is to calibrate this parameter for each firm in the pre- and post-SOX periods by minimizing the sum of squared differences between market and model-implied prices. By using firm-level changes in calibrated corporate opacity, we control for all the other credit spread determinants in the model taking into account interactions between them and non-linear effects.

2.2 CDS pricing formula

The CreditGrades CDS pricing model requires eight inputs: time to expiration T; stock price S; equity volatility σ_S; recovery rate R; risk-free rate r; reported liabilities per equity share D; expected location of the default boundary as fraction of liabilities $\overline{L}$; and a parameter λ representing uncertainty about the location of the default boundary. Formally, λ is the standard deviation of the log of the default boundary as a fraction of liabilities. We interpret λ as a measure of corporate opacity because when reported liabilities are less reliable there is more uncertainty about the true level of liabilities that will drive the firm to default. The CreditGrades manual (2002) shows that the CDS spread can be well approximated by:

$$c(T) = r(1-R)\frac{1-q(0)+H(T)}{q(0)-q(T)e^{-rT}-H(T)} \tag{1}$$

The function $q(\cdot)$ is defined as

$$q(t) = \Phi\left(-\frac{A(t)}{2}+\frac{\ln(d)}{2}\right) - d\Phi\left(-\frac{A(t)}{2}-\frac{\ln(d)}{A(t)}\right), \tag{2}$$

where $\Phi(\cdot)$ is the standard normal c.d.f. and

$$d = \frac{S+\overline{L}D}{\overline{L}D}e^{\lambda^2}; \quad A(t) = \sqrt{\sigma^2 t+\lambda^2}; \quad \sigma = \sigma_S\frac{S}{S+\overline{L}D}.$$

Finally,

$$H(T) = e^{r\xi}\left(G(T+\xi)-G(\xi)\right), \tag{3}$$

where

$$G(t) = d^{z+\frac{1}{2}}\Phi\left(-\frac{\ln(d)}{\sigma\sqrt{t}}-z\sigma\sqrt{t}\right) + d^{-z+\frac{1}{2}}\Phi\left(-\frac{\ln(d)}{\sigma\sqrt{t}}+z\sigma\sqrt{t}\right), \tag{4}$$

and

$$\begin{aligned} \xi &= \frac{\lambda^2}{\sigma^2} \\ z &= \frac{1}{4}+\frac{2r}{\sigma^2}. \end{aligned} \tag{5}$$

2.3 Data sources and sample selection

Using daily CDS quotes, we calibrate a corporate opacity parameter λ for each firm by minimizing the sum of squared differences between market CDS spreads and model-implied CDS spreads. We calibrate separate parameters before and after the enactment of SOX for each firm in the sample. We define the pre-SOX period as January 1, 2001 to July 31, 2002, and the post-SOX period as August 1, 2002 to December 31, 2003. To perform the calibrations, we require each firm in the sample to have at least 30 CDS quotes in the pre-SOX period and 30 CDS quotes in the post-SOX period. We restrict the sample to non-financial firms and main entities, as opposed to subsidiaries.

Markit Partners provided us with the CDS data[2]. Markit collects OTC dealer quotes on different CDS tenors on a daily basis. Until recently, volume in the CDS market was concentrated in 5-year contracts. Since we want liquid market quotes in our model calibration, we focus on the 5-year contract, as do other researchers. Also following the literature, we focus on US dollar denominated senior unsecured CDS contracts with the modified restructuring clause (e.g. Jorion and Zhang, 2007).

In addition to the corporate opacity parameter λ, there are seven additional inputs required to price the CDS as evidenced by Equations (1) to (6). The time to expiration is fixed at T=5 years. The stock price S is the common stock closing prices from CRSP. Following Hull, Predescu and White (2004), the risk-free rate r is the 5-year swap rate minus 10 basis points. Liabilities per share D is total liabilities minus minority interest and deferred taxes divided by the number of shares outstanding. Balance sheet information is from COMPUSTAT, based on the most recent annual statement available to investors at the time the market prices are quoted. The recovery rate R is from the Markit database. Along with CDS quotes, Markit also collects a daily firm-specific estimate of the recovery value on a defaulted bond referenced by the CDS contract, provided by the quoting CDS dealers. Equity volatility σ_S is the five-year forecast from a GARCH(1,1) model fit on the full sample period[3]. The CreditGrades Technical Manual (2002) suggests using an expected default boundary $\overline{L} = \frac{1}{2}$ for all firms. However, different industries may have different expected default boundaries due the nature of their businesses. For example, firms with less tangible assets and in more competitive environments may have higher $\overline{L}$'s. Therefore, we calibrate a different $\overline{L}$ for each industry, using the Fama-French 10-industry classification. For each industry we choose $\overline{L}$ to maximize the fraction of time that market CDS spreads are within the range delivered by the CreditGrades model for all meaningful values of λ. We use $\overline{L} = \frac{1}{2}$ as a robustness check. After calibrating $\overline{L}$ for each industry, we calibrate λ for each firm-period so as to minimize the sum of

[2]The Markit database starts in January 2001, which limits our flexibility to define the pre-SOX period.

[3]See pages 471-474 of Hull (2006). In contrast, the CreditGrades Technical Manual (2002) recommends using 5-year moving averages, which, in our view, are too insentive to changes in market conditions.

squared differences between market and model spreads. Appendix A provides additional details on the CreditGrades model and its calibration.

2.4 Data overview

After merging the Markit database with CRSP and COMPUSTAT, excluding financial firms and subsidiaries, and requiring at least 30 quotes per firm in each period, our sample includes 250 firms. Table 1 contains summary statistics for the spread and its determinants in the pre- and post-SOX periods. The reported means and standard deviations are cross-sectional summary statistics based on firm-specific time-series averages of the corresponding variable. In the table, one minus leverage is the stock price divided by the sum of the stock price and liabilities per share. Spreads are reported in basis points.

TABLE 1

The mean spread is $119.3 - 112.8 = 6.5$ basis points lower in the post-SOX period. As the CreditGrade pricing formula shows, the CDS spread is a complex function of the model's eight inputs. Thus, increased reliability in corporate reporting may not necessarily be the driver of the decrease in spreads following SOX. Equity volatility and risk-free rates decrease in the post-SOX period, which reduces credit spreads, holding other factors constant. However, average leverage increases and recovery rates decrease in the post-SOX period, which increases spreads, holding other factors constant. The mean number of time-series observations in the earlier period is lower than in the post-SOX period, while its standard deviation is higher. This is because the number of firms in the Markit database has increased over time: not all 250 firms in our sample were part of the Markit database as of January 1, 2001. Each firm, however, has at least 30 observations in both the pre-SOX and post-SOX periods.

2.5 Hypotheses

Below we state the three hypotheses whose empirical validity we aim to assess. Throughout, corporate opacity refers to the uncertainty parameter λ calibrated from market prices using the CDS pricing model described earlier.

Hypothesis 1: Corporate opacity is lower for firms that have higher earnings quality, are perceived to be more transparent and to have better corporate governance.

This can be seen as external validation of the corporate opacity parameter λ. The calibrated parameter presumably measures uncertainty about a firm's true leverage as perceived by investors. We expect this uncertainty to be inversely related to quantitative measures of financial reporting quality, in particular: accrual quality (Dechow and Dichev 2002; Ashbaugh-Skaife, Collins, Kinney, and LaFond, 2008), abnormal accruals (Teoh, Welch, and Wong, 1998a, 1998b; Ashbaugh-Skaife et al. 2008), earnings conservativeness (Zhang 2008), and smoothness (Francis, LaFond, Olsson, and Schipper, 2004). We also expect the opacity parameter to be negatively related to measures of corporate transparency that are based on expert judgement, such as the publicly available S&P Transparency and Disclosure Ratings of Pattel and Dallas (2002). Finally, we expect the calibrated opacity parameter to be negatively related to measures of corporate governance that attribute a large weight to the disclosure dimension of governance (Anderson, Mansi, and Reeb, 2004; Pittman and Fortin 2004). The KLD and ISS corporate governance ratings are examples of such measures. For the purposes of our analysis, some other measures of corporate governance (e.g., Gompers, Ishii, and Metrick, 2003) focus too much on anti-takeover provisions or shareholders' voice and not enough on disclosure quality[4].

Hypothesis 2: Corporate opacity decreases after the enactment of Sarbanes-Oxley.

Existing research provides evidence that corporate reporting has become more reliable after SOX (Lobo and Zhou 2006; Ashbaugh-Skaife et al. 2008, Cohen et al. 2008; Dyck, Morse, and Zingales, 2007; Hutton, Marcus, and Tehranian, 2008). Recent surveys confirm research evidence. The majority of 274 finance officers surveyed by the Financial Executives Research Foundation (2006) believe that SOX increased investors' confidence in financial reports. For large firms, with more than \$25 billion revenues, 83% of executives in the survey agree that investors are more confident in reported numbers as a result of SOX. Furthermore, 82% of audit committee members surveyed by the Center for Audit Quality (2008) think that audit quality has improved in recent years, while 65% of committee members believe that investors have more confidence in capital markets as a result of SOX. Given the research and survey evidence, we conjecture that CDS market participants are less uncertain about the true level of corporate leverage and, thus, that corporate transparency as perceived by investors has increased after SOX.

Hypothesis 3: After the enactment of SOX, corporate opacity decreases more for firms that are more likely to be affected by the Act..

Firms whose reports are more reliable prior to SOX presumably already have better internal con-

[4]Cremers, Nair, and Wei (2007) document that shareholder control is associated with higher credit spreads if the firm is exposed to takeovers. Duarte, Young, and Yu (2008) conjecture that managers that are insulated from the threat of takeovers may be willing to take on longer-term projects and disclose short-term outcomes more truthfully.

trols, more detailed disclosure, or more reliable auditing before the Act, which makes them less likely to be affected by the new legislation. Consistent with this notion, Chhaochharia and Grinstein (2007) show that the net benefits of the new legislation are higher for firms that are less compliant with the Act in the pre-SOX period. By the same logic, if the new regulation does indeed affect corporate opacity, we expect its impact to vary with firms' pre-SOX characteristics. Specifically, we predict that the decrease in opacity should be more pronounced for firms that: are less transparent and have lower earnings quality in the pre-SOX period, and are more likely to be affected by SOX according to the criteria in Chhaochharia and Grinstein (2007).

3 Empirical Analysis

As explained earlier, we calibrate a corporate opacity parameter before and after the enactment of SOX. We then use this measure to estimate the impact that a change in the reliability of corporate reporting has had on credit spreads. Figure 1 presents the time-series of the median observed spread and the median model-implied spread, calculated with the calibrated parameters. Model-implied spreads are based on firm-specific parameters calibrated separately in the pre-SOX and post-SOX periods. There is a pronounced decrease in model spreads at the boundary between the pre-SOX and the post-SOX periods. This is consistent with the idea that the corporate opacity parameter may have decreased in the post-SOX period for the typical firm in our sample. To determine if the model implied spreads decrease due to a decrease in opacity, however, we must control for the other determinants of credit spreads.

FIGURE 1

There are cases in which the model over predicts spreads even when the opacity parameter λ is zero. This implies that, conditional on the firms asset volatility and leverage, and the level of the risk-free rate, model spreads are too high relative to observed spreads. This occurs for 26 firms in the pre-SOX period and 42 in the post-SOX one. On the other hand, there are situations in which observed spreads are larger than the maximum spread generated by the model for all meaningful levels of the opacity parameter λ, also generating corner solutions in the calibration. This occurs for 44 firms in the pre-SOX period and 21 firms in the post-SOX period one. We provide further details about the calibration procedure in Appendix A.

3.1 Testing hypotheses

In this section we discuss the empirical results of testing the three hypotheses presented earlier.

Hypothesis 1 Table 2 Panel A shows the relation between the calibrated opacity parameter λ and proxies of financial reporting quality. We use Tobit regressions in columns 1 through 5 because λ, being a standard deviation, is bounded below by zero. The total number of observations is below 250 because we require a firm to have at least seven consecutive years of accounting information to compute each of the earnings' quality measures. We define earnings conservativeness as in Basu (1997) and Zhang (1998). The accruals quality measure follows Dechow and Dichev (2002) and Francis et al. (2004), and earnings smoothness is based on Francis et al. (2004). Discretionary accruals are estimated using the modified-Jones model of Dechow et al. (1995), with total accruals defined as in Collins and Hribar (2002). Following Kothari, Leone, and Wasley (2005), we estimate the accrual model by industry and year and compute performance-matched abnormal accruals for each firm. Similar to Hutton et al. (2008), we use the absolute performance-matched abnormal accruals averaged over three years.

The results in Panel A confirm that corporations with more conservative earnings, higher accrual quality, smoother earnings, and lower discretionary accruals tend to have lower opacity. The sign of all regression coefficients in models 1 through 4 is consistent with our hypothesis and all estimates are at least two standard errors from zero. When we include all measures in one multiple regression, the signs remain unchanged and three of the four are significantly different from zero at conventional significance levels. The median regression in Column 6 shows that the results are not driven by outliers. The evidence in Panel A of Table 2 is consistent with the notion that firms with lower quality earnings tend to have higher calibrated opacity λ and therefore have higher cost of debt, *ceteris paribus*.

TABLE 2

Table 2 Panel B shows how the corporate opacity parameter λ relates to third-party ratings of corporate transparency and governance. The break down of high versus low transparency and better versus worse governance is chosen so that the numbers of firms in each bin are as similar as possible. As shown in the table, the mean (median) corporate opacity is higher for less transparent firms according to the S&P Transparency and Disclosure Index. The differences are statistically significant at conventional levels, supporting rejection of the null hypothesis that the mean (median) information opacity is the same across firms with high and low disclosure ratings according to

S&P. This evidence supports the idea that the opacity parameter calibrated from CDS spreads is indeed related to firms' disclosure policies. Sorting firms by governance quality confirms our earlier inference. For the KLD rating, means and medians of the corporate opacity measure are higher for lower rated firms, both in the pre- and post-SOX periods. The results based on ISS 2003 governance ratings confirm that worse governance is associated with higher opacity.

Hypothesis 2 Table 3 Panel A contains statistics on the calibrated opacity parameter λ in the pre- and post-SOX periods. The post-SOX opacity parameters are less than or equal to the pre-SOX parameters at each percentile. In fact, this is true for all percentile levels, before averaging quantile percentile buckets. In other words, the empirical distribution of pre-SOX corporate opacity first-order stochastically dominates the empirical distribution of post-SOX opacity. As shown by the scatter plot in Figure 2, the overwhelming majority of firms in our sample experience a decrease in the calibrated opacity measure following SOX. The mass of calibrated parameters that equal zero corresponds to corner solutions in the calibration (see Appendix A for details). Untabulated results show that the correlation between pre- and post-SOX opacity parameters is 0.816, while the Spearman rank-correlation is 0.808. This suggests that λ is associated with intrinsic firm characteristics (other than the remaining inputs of the pricing model) rather than with noise in CDS spreads.

TABLE 3

Figure 2

Table 3 Panel B provides formal tests of the hypothesis that pre- and post-SOX corporate opacity are drawn from distributions having the same mean or median. The mean (median) opacity parameter is 0.6819 (0.5388) in the pre-SOX period and decreases to 0.4982 (0.4087) following enactment of SOX, a 27% (24%) reduction. The differences in means and medians across sub-periods are significant at a 1% probability level, providing strong statistical support for the hypothesis that the distribution of the corporate opacity parameter shifts after SOX. Similarly, the non-parametric binomial probability test supports rejection of the hypothesis that positive and negative changes in corporate opacity following SOX are equally likely, p-value$<$1%.

Yet, it is difficult to gauge the economic relevance of this evidence. Although a one quarter decrease in the opacity parameter appears to be substantial, its economic significance needs to be assessed in light of its effect on model-implied CDS spreads. In the next section, we provide a more detailed discussion of the economic significance of the evidence discussed here.

Hypothesis 3 Panels A and B of Table 4 contain results of our tests of Hypothesis 3. Overall, the evidence in the table indicates that the reduction in the opacity parameter λ following SOX is indeed larger for firms more likely to be affected by the new legislation. Panel A reports mean and median changes in the opacity measure for various subsamples obtained by segmenting firms based on pre-SOX characteristics. Consistent with Hypothesis 3, firms with less conservative earnings, lower accrual quality, and less smooth earnings tend to experience a larger reduction of calibrated opacity following SOX. The difference in means between high and low earnings smoothness and accrual quality are more than two standard errors from zero. Firms with poor disclosure quality according to the S&P rating also experience a more pronounced drop in opacity following SOX. The mean and median difference between high and low disclosure groups are both statistically different from zero in a one- and two-sided test respectively.

Panel A also segments the sample according to the criteria adopted in Chhaochharia and Grinstein (2007). The authors argue that firms with incidences of insider trading, restatements, and related party-transactions in the pre-SOX period should be more affected by the passage of SOX because those events are manifestations of poor governance structures[5]. The results in Panel A show that less compliant firms according to the three criteria of Chhaochharia and Grinstein (2007) display larger reductions in corporate opacity λ. When the three individual criteria are merged into one single pre-SOX governance dummy, the results show a large difference in the mean and median reduction in opacity, which we are able to reject being due to chance.

TABLE 4

Panel B of Table 4 contains results for regressions of changes in opacity around SOX on both earnings quality variables and the pre-SOX governance dummy. The indicator variables for high pre-SOX earnings quality are expected to have a positive coefficient. We control for the pre-sox corporate governance dummy of Chhaocharia and Grinstein (2007) to determine whether its effect is subsumed by the other measures, and vice versa. The intercept is negative along with the governance dummy in all specifications. This supports the notion that firms typically experienced a decrease in opacity after SOX and this reduction was significantly larger for firms with lower quality governance and financial reporting before the Act. All estimated coefficients on the earnings quality indicator variables display the expected sign. Regardless of the specific metric, firms with higher earnings quality in the pre-SOX period experience a smaller reduction in the calibrated opacity measure, and all but the earnings conservatism's estimated coefficient are significantly different

[5] We are grateful to Vidhi Chhaoccharia and Yaniv Grinstein for generously providing us with their data. The data includes a fourth dummy variable, audit services, which was zero for all 250 firms in our sample.

from zero. When we use S&P ratings instead of the pre-SOX earnings quality indicators, the results are confirmed. Firms with lower quality disclosure prior to SOX experience a significantly larger decrease in the opacity perceived by investors following the passage of the Act. Overall, the results provide strong support to Hypothesis 3.

3.2 Economic significance

Is the decrease in the cost of debt implied by the reduction of corporate opacity following SOX economically substantial? To answer this question we compute model-implied spreads in the post-SOX period using the pre-SOX calibrated opacity parameters. For each of the 250 firms in our sample, we compare the time-series of post-SOX model spreads calculated using the post-SOX λ to the time-series of post-SOX model spreads calculated using the pre-SOX λ. By keeping all the other seven inputs of the CDS pricing formula unchanged, we are able to calculate the change in model-implied spreads that is due to the reduction of corporate opacity. For each firm we compute the time-series median difference in spreads and then the cross-sectional median. For the median firm in our sample, the decrease in CDS spreads implied by the reduction of corporate opacity following SOX is 19 basis points per year. Given that the median spread in the post-SOX period is 112.8 basis points, the implied decline in the cost of debt is relatively substantial.

To better gauge the economic consequences of the increased transparency perceived by investors following SOX, we compute the dollar savings that result from the implied decline in the cost of debt for the median firm in our sample. In carrying out this exercise, we obtain from COMPUSTAT the total amount of (interest-bearing) debt for each firm in our sample throughout the post-SOX period. We then multiply the spread difference for each firm on each day by the corresponding level of debt. Taking the median across firms of the time-series median of the product of spread change multiplied by the amount of outstanding debt, we estimate that the implied savings related to the cost of debt amount to \$3.5 million per year for the typical firm in our sample. Summing the dollar savings across the 250 firms, we estimate that the passage of SOX is associated with a total reduction in the cost of debt of \$1.65 billion per year for our sample firms as a result of enhanced transparency.

4 Alternative explanations

In the following two sections we perform two kinds of robustness checks. First, we explore the validity of other plausible explanations for the results presented before and then we assess the

robustness of our main findings to changes in the calibration of the CDS pricing model.

4.1 Systematic risk

The CreditGrades model does not accommodate for differences in CDS spreads due to differences in systematic risk. It is possible that, for the same expected loss, firms whose value process is more correlated with the overall state of the economy display higher spreads because such firms tend to default in bad times. Therefore, one could conjecture that the corporate opacity parameter λ simply proxies for a premium for bearing systematic risk. In the cross-section, we address this concern by comparing the calibrated λ's to the (equity) CAPM beta and the Fama-French (equity) factor loadings. Table 5 contains the results of this analysis.

TABLE 5

The first four columns of Table 5 report univariate test statistics for differences in means and medians of opacity across subsamples of firms that have high versus low (equity) risk-factor loadings, both before (columns 1 and 2) and after SOX (columns 3 and 4). Contrary to the systematic risk-based explanation, the evidence shows that in both periods calibrated opacity is lower for subsamples with higher loadings, if anything. Interestingly, the loading on the book-to-market factor seems to be related to opacity, but in the opposite direction of a risk based explanation. Untabulated results based on multiple regressions of the opacity measure on the level of the risk-factor loadings are consistent with the univariate findings. Therefore, to the extent that loadings on CAPM and Fama-French factors are good proxies of exposure to systematic risk, a systematic risk explanation of our results does not hold in the cross-section for the level of opacity and quantity of risk.

We also examine the impact of changes in systematic risk over time. If firms' systematic risk levels decreased after SOX, this may be causing the decrease in opacity. Columns 5 and 6 of Table 5 report univariate test statistics for differences in mean and median changes in opacity across subsamples of firms that have high versus low changes in (equity) risk-factor loadings around the enactment of SOX. Assuming the price of risk remained relatively constant around the passage of the Act, the evidence in the last two columns of the table does not support the idea that the decline in the calibrated opacity measure is capturing a reduction in risk loadings around the passage of the Act. In fact, the results show that the firms with the largest increase in risk loadings experienced a smaller decrease in opacity after SOX and this result is statistically different from zero for the HML loading.

One may still argue that a systematic risk explanation cannot be discarded because CAPM beta and Fama-French factor loadings are bad proxies for systematic risk and the price of risk faced by all firms may have decreased in the post-SOX period. For constant risk loadings (not proxied by CAPM betas or Fama-French factor loadings), this would have caused a decrease in systematic risk premia for all firms, which we would capture in the form of lower opacity parameters. To address this concern, we investigate the systematic risk explanation in the time series by calibrating the opacity parameter λ for the 2004 and 2005 periods too. The cross-sectional average of λ is 0.470 for 2004 and 0.491 for 2005. In both 2004 and 2005 the average parameters are close to the post-SOX average of 0.4982 and much lower than the pre-SOX average of 0.6819, both reported in Table 3. The stability of the parameter across years in the post-SOX period provides no support to the alternative explanation based on time-varying risk-premia.

4.2 Ratings and liability structure

The CreditGrades model does not differentiate between types of liabilities or incorporate non-public information about liabilities available to rating analysts and incorporated in credit ratings. Perhaps we feed the model an overly coarse measure of liabilities, while the market takes a much more nuanced look at the liability side of a firm's balance sheet. For example, while we ignore differences between short- and long-term liabilities, or interest bearing and non-interest bearing liabilities, these differences may affect CDS spreads and impact our calibrated opacity parameter. Moreover, rating agencies reportedly have access to non-public information and incorporate such information in the rating process. Therefore, CDS spreads may reflect not only public balance sheet information but also non-public information conveyed by credit ratings. In this case, our measures of opacity could simply be proxying for the structure of a firm's liabilities and for the special information conveyed by ratings. We examine this possibility by comparing our opacity parameters across subsamples segmented by credit ratings and ratios reflecting different types of liability structures. The results are contained in table 6.

TABLE 6

Contrary to the arguments outlined above, the univariate tests in Table 6 show that the calibrated opacity is actually higher for firms with credit ratings above the median. However, the remaining evidence suggests that some of the variables describing the liability structure, especially the ratio of current liabilities divided by total liabilities, may somewhat contaminate our measure of corporate opacity. Untabulated mutiple regression results are consistent with the difference in means tests. As with the systematic risk explanation, changes in liabilities structure should be associated with

changes in opacity, if this is driving some of our results. The change in opacity, however, is not significantly different across subsamples obtained after segmenting firms based on the change in their liabilities' structure. Thus, the univariate evidence in the last two columns of Table 6 for the effect of changes in firms' liabilities structure around the enactment of SOX provides no indication that these may explain the typical changes in the calibrated opacity parameter.

4.3 Supply of default insurance in the CDS market and the introduction of TRACE

The CreditGrades model does not accommodate potential demand and supply shifts in the market for default insurance that could affect spreads if financial markets are not frictionless. For example, suppose CDS dealers had some degree of monopoly power in the pre-SOX period and they were net sellers of insurance in the CDS market, while being net buyers of insurance in equity and option markets (they should in principle be hedged overall). One could argue that dealers extracted rents from buyers of insurance by charging high spreads early in our sample period and that more dealers later entered the CDS market eroding the pre-SOX rents. In this case our calibrated opacity may be proxying for the degree of competition in the CDS market. To examine this possibility, we use the average number of dealers providing daily quotes as a firm-level proxy of the degree of competition in the CDS market in the pre- and post-SOX periods. If the decline in calibrated opacity is due to increased competition in the CDS market, the decrease in opacity should be larger for firms with a larger increase in the number of dealers providing quotes following SOX. Table 7 displays the results of the univariate analysis.

TABLE 7

The subperiod evidence in columns 1-4 is consistent with the idea that greater competition may be associated with lower spreads and a lower calibrated opacity parameter. However, most importantly for us, the changes-on-changes univariate evidence does not support the conjecture that the increase in competition, as proxied by the change in the number of quoting dealers, is driving the change in calibrated opacity. In fact, the results in columns 5 and 6 show the opposite effect. Firms with a larger increase in the number of brokers experienced a smaller decrease in the opacity parameter, although the differences across subsamples are not statistically significant.

In addition to assuming a perfectly competitive market, the CreditGrades model does not incorporate market microstructure effects that may influence security prices. One could argue that the

July 2002 introduction of TRACE in the corporate bond market and the associated increase in market transparency is responsible for the reduction of credit spreads (in excess of traditional spread determinants) we document. Indeed, Goldstein, Hotchkiss, and Sirri (2007) provide some evidence that credit spreads decrease for bonds whose trading becomes more transparent with TRACE. It is possible that such reduction is transmitted to the CDS market by arbitrage. We investigate one cross-sectional implication of such alternative explanation.

The introduction of TRACE was gradual and most firms did not have bonds in the system until much later than July 2002. This allows us to test whether the effect we document is at least partly driven by increased transparency in the bond market. We compute the fraction of the post-SOX period (August 2002 to December 2003) in which each firm in our sample has bonds on TRACE, and label this fraction "time in TRACE". For example, time in TRACE is one for companies with bonds in TRACE since July 2002, 0.5 for companies with bonds first added to TRACE at the mid-point of the post-SOX period (April 2002), and 0 if no bonds were added by the end of 2003. Since our calibration uses spreads throughout the entire post-SOX period, the alternative explanation examined here implies that there should be a larger reduction in opacity for firms with higher time in TRACE. Table 7 shows that this conjecture is not supported by the evidence. The mean decrease in opacity is very close for high and low time in TRACE firms, whereas the median reduction in opacity is smaller for firms with high time in TRACE.

4.4 Effect of reporting and governance quality, controlling for alternative explanations

The univariate evidence in Tables 5 to 7 does not provide support for the alternative explanations of our results. In closing this section, we investigate whether our earlier conclusions concerning Hypotheses 2 and 3 hold after controlling for the alternative explanations in one multiple regression. In particular, we augment the model estimated in Table 4 Panel B as follows:

$$\Delta\lambda_i = \alpha + \beta(\textit{CG Pre-SOX Governance})_i + \gamma(\textit{Pre-SOX Reporting Quality})_i + \Sigma_j \theta_j(\Delta_i \textit{Control}_j) + \varepsilon_i,$$

where $\Delta\lambda_i$ is the change in the opacity measure of firm i, *CG Pre-SOX Governance* is the pre-SOX Chhaochharia and Grinstein (2007) governance indicator variable, *Pre-SOX Reporting Quality* is one of the pre-SOX measures of reporting quality defined earlier, and $\Delta_i \textit{Control}_j$ is the change in control variable j for firm i. Table 8 below reports OLS and Median estimates of the coefficients in the equation above.

TABLE 8

The evidence in Table 8 supports Hypotheses 2 and 3, even after controlling for the additional factors that may explain changes in the calibrated opacity measure around the enactment of SOX. The estimated intercept is negative and significant in all but one of the 8 specifcations, i.e. that in the median regression reported in column (8). Therefore, controlling for changes in risk loadings, the composition of firms' liabilities structure, competition in the CDS market, and inclusion in the TRACE bond price reporting system, typically firms experience a statistically significant decrease in the market-based measure of information opacity implied by CDS spreads. Furthermore, firms for which SOX is likely to have a larger effect as measured by their pre-SOX governance and financial reporting quality typically experience a significantly larger improvement in corporate transparency, which is associated with an incremental reduction in the cost of debt, ceteris paribus.

5 Alternative calibration

5.1 Unique expected default boundary for all firms

In our baseline results we calibrate a different expected default boundary $\overline{L}$ for each industry using Fama and French's 10-industry classification before we calibrate the corporate opacity λ for each firm-period. In contrast, the CreditGrades Technical Manual (2002) suggests of $\overline{L} = \frac{1}{2}$ for all firms. Table A.2 in the Appendix shows that all our results hold when we use the same $\overline{L} = \frac{1}{2}$ for all firms.

5.2 Discarding corner solutions of the calibration process

Our baseline results use the calibrated opacity parameters of all 250 firms in our sample. Here we use a restricted sample with only the 162 firms for which there is an interior solution for the calibrated opacity parameter both in the pre-SOX and post-SOX periods[6]. Table A.3 of the Appendix shows that all our results hold when only interior solutions are used.

[6] We had $\widehat{\lambda} = 0$ for 26 firms in the pre-SOX period and 42 in the post-SOX period.And we had $\widehat{\lambda} = \lambda^*$ (parameter λ associated to the maximum spread) for 44 firms in the pre-SOX period and 21 firms in the post-SOX one.

6 Conclusion

Following a mounting number of high-profile corporate scandals, the US Congress passed the Sarbanes-Oxley Act in July 2002 in an attempt to restore the public's trust in US capital markets. The legislation aims to improve corporate transparency by altering governance, disclosure, internal control, and auditing practices of publicly traded companies. In this study we analyze the impact of such changes on the cost of debt capital.

Using daily CDS spreads and a structural CDS pricing model, we calibrate a corporate opacity parameter for 250 firms in two time periods: pre-SOX (January 2001 to July 2002), and post-SOX (August 2002 to December 2003). First, we show that the calibrated opacity parameter is significantly associated with measures of earnings quality, corporate disclosure, and governance quality. Firms with higher CDS-calibrated opacity tend to have lower quality accruals, higher discretionary accruals, less conservative and less smooth earnings, as well as lower S&P Transparency and Disclosure and corporate governance ratings. Second, we show that the typical corporate opacity parameter is substantially lower in the post-SOX than in the pre-SOX period. Third, the typical increase in transparency is larger for firms more likely to be affected by the new legislation: firms that in the pre-SOX era have lower earnings quality, lower S&P Transparency and Disclosure ratings, and are less compliant with SOX according to Chhaochharia' and Grinstein's (2007) criteria.

Our results support the argument that the passage of SOX is associated with a substantial decline in the cost of debt due to increased corporate transparency. We estimate that the reduction of opacity following SOX implies a 19 bp decrease in the 5-year CDS spread of the typical firm in our sample. Furthermore, we document that our results are robust to changes in our calibration procedure, and show that the data does not support plausible alternative explanations for our findings.

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Appendix A: Model and Calibration Details

Total firm value per equity share is a Geometric Brownian Motion with zero drift and volatility σ. Reported liabilities per equity share is constant at D. Default happens the first time the value process hits an uncertain default boundary given by LD, where L is lognormally distributed and independent of the value process V_t. The expected value of L is $\overline{L}$, and the standard deviation of the log of L is λ. If the firm defaults before the expiration of the CDS contract, the seller of protection stops receiving spread payments and has to make a lump-sum payment pay of $(1 - R)$ Given these assumptions, the CreditGrades manual (2002) shows that the fair CDS spread is well approximated by the closed-form formula in Section 2.1.

It is important to mention that the credit spread is not a monotonic function of the uncertainty parameter λ. Given the other seven inputs of the CDS pricing formula, there is a λ^* such that the function $c(T, \lambda)$ reaches a maximum spread. This is the only critical point of the function $c(T, \lambda)$: the function is monotonically increasing for $0 < \lambda < \lambda^*$, and monotonically decreasing in $\lambda > \lambda^*$. This is an unpleasant feature of the model, and a consequence of simplifying assumptions such as exogenous recovery. We address this issue by performing a constrained optimization: we minimize the sum of squared differences between market and model spreads under the constraint that the calibrated $\widehat{\lambda}$ for a given firm-period has to be in the interval $[0, \overline{\lambda^*}]$, where $\overline{\lambda^*}$ is calculated at each observation at the firm-period level. This implies that there can be corner solutions both on the low side, when market spreads tend to be below the model spread at $\lambda = 0$; and on the high side, when market spreads tend to be above the model spread when $\lambda = \overline{\lambda^*}$.

In our baseline results, we first calibrate $\overline{L}$ for all firms in a given industry before we obtain $\widehat{\lambda}$ for each firm-period. For each industry, we choose the $\overline{L}$ that maximizes the proportion of time that market spreads are within the range of model spreads. This increases the likelihood of interior solutions in the posterior calibration of λ for each firm-period. The last column of Table A.1 has the calibrated $\overline{L}$ for each industry.

TABLE A.1

Not only model fit is improved by using industry-specific expected default boundaries, but also the measure of accounting opacity displays a much less pronounced industry pattern. When when a unique $\overline{L} = \frac{1}{2}$ is used, the standard deviations of accounting opacity across the 10 industries are 0.385 in the pre-SOX period and 0.367 in the post-SOX period. In contrast, when $\overline{L}$ is industry-specific, the standard deviation is 0.254 in the pre-SOX period and 0.181 in the post-SOX period. The reduction is desirable since it is unlikely that there are huge differences in accounting opacity across industries. The remaining cross-industry variation in opacity could be due to cross-industry differences in the optimal level of corporate disclosure (see Ali, Klasa and Yeung 2008).

Table 1 – Sample mean and standard deviation of inputs for the CDS Spread Pricing model.
The table reports the cross-sectional means and standard deviations of time-series averages of the inputs required by the CreditGrades CDS pricing for the 250 firms in our sample. *CDS spreads* are for Modified Restructuring, US dollar denominated, 5-year maturity contracts of parent companies that are not financial firms (i.e. first digit SIC code equal to 6). *Pre-SOX* refers to quotes between Jan. 2001 and Jul. 2002, *Post-SOX* refers to quotes between Aug. 2002 and Dec. 2003. *CDS Spread (bp)* is the 5-year spread expressed in basis points. *Equity Volatility* is the 5-year equity volatility forecast at a point in time from a GARCH (1, 1) model fitted using daily stock returns between Jan. 2001 and Sep. 2007. *Risk-free rate* is the 5-year swap rate minus 10 basis points. *Recovery Rate* is the recovery rate in case of default reported by Markit. *(1 Minus Leverage)* is equal to stock price divided by the stock price plus liabilities per share. *Number of Time-Series Obs.* is the number time-series observations used to perform the calibration.

	Pre-SOX		*Post-SOX*	
	Mean	Std. Deviation	Mean	Std. Deviation
CDS Spread (bp)	119.3	112.8	111.2	118.7
Equity Volatility	0.331	0.124	0.329	0.116
Risk-free rate	0.049		0.033	
Recovery Rate	0.427	0.037	0.41	0.019
1 Minus Leverage	0.604	0.191	0.576	0.189
Number of Time-Series Obs.	261.5	125.3	350.1	58

Figure 1 – Realized versus Model CDS Spread (medians).

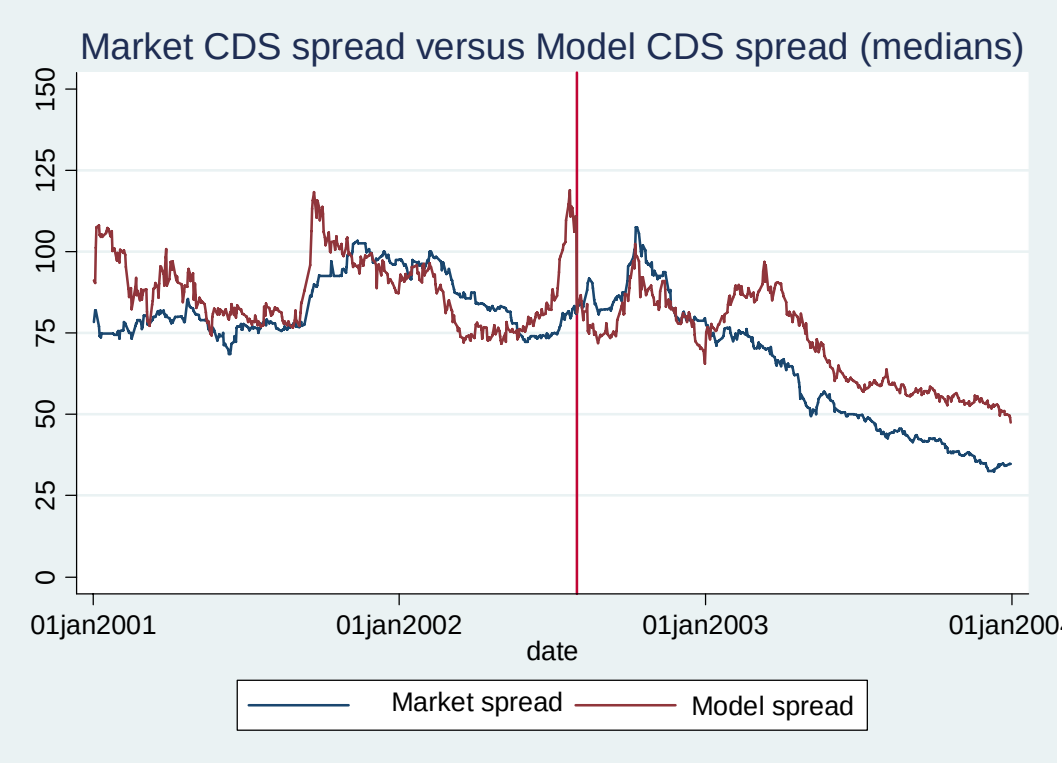

Table 2 – Is the calibrated corporate opacity parameter associated with earnings quality and/or third-party ratings of corporate governance and disclosure quality?

Panel A – Relation between earnings' quality and opacity

The table reports the estimated relation between the pre-SOX corporate opacity parameter calibrated from CDS spreads using the CreditGrades CDS pricing model and firms' pre-SOX earnings quality. *Earnings Conservative* measures the speed with which earnings reflect bad news, as defined in Basu (1997) and Zhang (1998). *Accruals Quality* measures the sensitivity of current accruals to cash flow realizations, as defined by Dechow and Dichev (2002). *Earnings Smoothness* is defined as the volatility of yearly earnings scaled by the volatility of yearly operating cash flows, as defined by Francis et al (2004). These three measures of earnings quality are measured using at least 7 years worth of data for each firm and as many as 10 yearly observations. *Discretionary Accruals* are performance-matched absolute accruals, as defined by Kothari et al (2005), averaged over a 3-year period as in Hutton et al (2008). Columns (1)-(5) report Tobit coefficient estimates, while column (6) reports the coefficients from the median regression. The figures in parenthesis are the coefficient estimates standard errors. *, **, and *** indicate the corresponding coefficient estimate is significant at a 10%, 5%, and 1% probability level in a two-sided test, respectively.

	(1) Coeff. Est. (Std. Err.)	(2) Coeff. Est. (Std. Err.)	(3) Coeff. Est. (Std. Err.)	(4) Coeff. Est. (Std. Err.)	(5) Coeff. Est. (Std. Err.)	(6) Coeff. Est. (Std. Err.)
Intercept	0.6514*** (0.0401)	0.5087*** (0.0642)	0.5082*** (0.0895)	0.5218*** (0.0696)	0.2487** (0.1068)	0.1699* (0.0966)
Earnings Conservative	-0.023*** (0.0073)				-0.0197*** (0.0070)	-0.0158*** (0.0022)
Accruals Quality		-7.653*** (2.0596)			-8.5509*** (2.6316)	-9.2201*** (2.4383)
Earnings Smoothness			-0.239** (0.1071)		-0.1914* (0.1117)	-0.1309 (0.1000)
Discretionary Accruals				0.5439** (0.2371)	0.3976 (0.2501)	0.5039** (0.2297)
N	225	223	229	240	203	203
Pseudo-R^2	0.023	0.032	0.012	0.011	0.087	0.060

Panel B – Third-Party Corporate Governance and Disclosure Quality

The table reports mean, median, and standard errors of the opacity parameter calibrated from CDS spreads for each firm-period using the CreditGrades pricing model. The *Pre-SOX* period is Jan/2001-Jul/2002 and the *Post-SOX* period is Aug/2002-Dec/2003. Firms are grouped by third-party accounting transparency or corporate governance ratings. The row labeled *Difference* reports the difference between the mean and median of the corporate opacity parameter across groups. The figures in *italics* are the corresponding test statistics (t-statistic for the mean difference, z-statistic for Wilcoxon signed-rank test for the median difference). ^, ^^, and ^^^ (*, **, and ***) indicate the corresponding test-statistic is significant at a 10%, 5%, and 1% probability level in a two-sided (one-sided) test, respectively.

		Pre-SOX		*Post-SOX*	
		Mean [Std. Error]	Median	Mean [Std. Error]	Median
(A) S&P Transparency and Disclosure 2002 Ratings	High Transparency (N=63)	0.5949 [0.0649]	0.4862		
	Low Transparency (N=120)	0.7507 [0.0530]	0.5999		
	Difference	-0.1557 *-1.86^** *	-0.1137 *-1.79** *		
(B) KLD Corp. Gov. 2002 Ratings	Better Governance (N=103)	0.6172 [0.0480]	0.4961		
	Worse Governance (N=127)	0.7457 [0.0542]	0.5624		
	Difference	-0.1285 *-1.77^** *	-0.0663 *-1.25*		
(C) KLD Corp. Gov. 2004 Ratings	Better Governance (N=61)			0.4269 [0.0514]	0.3143
	Worse Governance (N=159)			0.5221 [0.0377]	0.4204
	Difference			-0.0952 *-1.49** *	-0.1061 *-1.36*
(D) ISS Corp. Gov. 2003 Ratings	Better Governance (N=115)			0.4532 [0.0361]	0.3738
	Worse Governance (N=116)			0.5584 [0.0461]	0.4266
	Difference			-0.1104 *-1.79^** *	-0.0528 *-1.27*

Table 3 - Corporate opacity parameter before and after the passage of SOX. The table reports the distribution (Panel A) and tests statistics for the differences of (Panel B) the corporate opacity parameter calibrated from CDS spreads using the CreditGrades CDS pricing model in the pre- and post-SOX periods. The *Pre-SOX* period is Jan/2001-Jul/2002 and *Post-SOX* period is Aug/2002-Dec/2003.

Panel A - Sample distribution of calibrated corporate opacity parameter before and after enactment of the Sarbanes-Oxley Act (July 30, 2002). The panel reports descriptive statistics of the opacity parameter for *Pre-SOX* and *Post-SOX* periods.

N=250	Mean	StDev	Min	5Pct	10Pct	25Pct	50Pct	75Pct	90Pct	95Pct	Max
Pre-SOX	0.682	0.558	0	0	0	0.292	0.539	0.967	1.553	1.8	2.4
Post-SOX	0.498	0.455	0	0	0	0.171	0.409	0.669	1.091	1.483	2.1

Panel B - Is the enactment of Sarbanes-Oxley Act associated with a significant reduction in corporate opacity? The column labeled *Difference* reports the difference between the mean and median of the corporate opacity parameter across the *Pre-SOX* and *Post-SOX* periods. The column labeled *Test statistic for Difference* reports the corresponding test statistics (t-statistic for the mean difference, z-statistic for Wilcoxon signed-rank test). ^, ^^, and ^^^ (*, **, and ***) indicate the corresponding test-statistic is significant at a 10%, 5%, and 1% probability level in a two-sided (one-sided) test, respectively.

N=250	Pre-SOX	Post-SOX	Difference	*Test statistic for Difference*
Mean	0.6819	0.4982	-0.1815	*-9.05*^^^***
[St. Error]	[0.0352]	[0.0287]		
Median	0.5388	0.4087	-0.1301	*-9.51*^^^***

Figure 2 – Scatter plot of calibrated corporate opacity before and after enactment of the Sarbanes-Oxley Act (July 30, 2002).

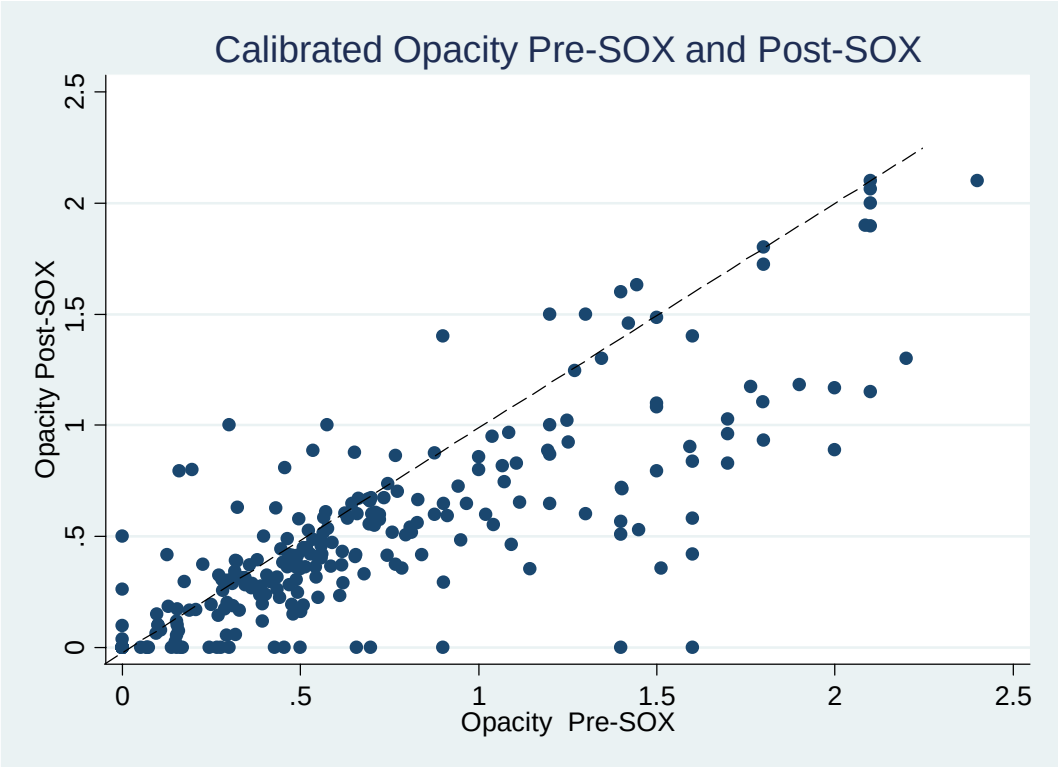

Table 4 – Is the enactment of Sarbanes-Oxley Act associated with a larger reduction in corporate opacity for less transparent or less compliant firms?

Panel A – Typical changes in corporate opacity around enactment of Sarbanes-Oxley Act after segmenting the sample by pre-enactment level of transparency and compliance.

The panel reports summary statistics of the change in the corporate opacity parameter between the *Pre-Sox* and *Post-Sox* period. The corporate opacity parameters are calibrated from CDS spreads for each firm-period using the CreditGrades' CDS pricing model. *Pre-SOX* period is Jan/2001-Jul/2002 and *Post-SOX* period is Aug/2002-Dec/2003. In Panel A (B, C, D) firms are grouped based on whether their pre-SOX earnings conservativeness (accrual quality, earnings smoothness, S&P Transparency and Disclosure 2002 Rankings) measure is above or below the sample median. In Panel E (F, G, H) firms are grouped based on whether in the pre-SOX period there were instances of related third-party transactions (insider trading, restatements, or any of these three) as defined in Chhaochharia and Grinstein (2007). The row labeled *Diff.* reports the difference between the mean and median change in opacity parameter across subsamples. The figures in *italics* are the corresponding test statistics (t-statistic for the mean difference, z-statistic for Wilcoxon signed-rank test for the median difference). *, **, and *** indicate statistical significance at a 10%, 5%, and 1% probability level, respectively, in a one-sided test.

		(Post-SOX) - (Pre-SOX)				(Post-SOX) - (Pre-SOX)	
		Mean [Std. Error]	Median			Mean [Std. Error]	Median
(A) Pre-SOX Earnings Conservative	Low (N=111)	-0.2006 [0.0357]	-0.1186	(B) Pre-SOX Accruals Quality	Low (N=112)	-0.2472 [0.0334]	-0.155
	High (N=115)	-0.1776 [0.0228]	-0.1131		High (N=124)	-0.1495 [0.025]	-0.0895
	Diff.	-0.023 *-0.54*	-0.0055 *0.05*		Diff.	-0.0977 *-2.34***	-0.0655 *-2.32***
(C) Pre-SOX Earnings Smoothness	Low (N=114)	-0.2405 [0.0309]	-0.1328	(D) S&P Transparency Disclosure 2002 Ratings	Low (N=120)	-0.2237 [0.0287]	-0.1438
	High (N=128)	-0.1467 [0.0275]	-0.0895		High (N=63)	-0.1531 [0.0388]	-0.0704
	Diff.	-0.0938 *-2.26***	-0.0433 *-2.21***		Diff.	-0.0706 *1.46**	-0.0734 *2.28***
(E) Pre-SOX Insider Trading	Yes (N=23)	-0.2543 [0.0737]	-0.1683	(F) Pre-SOX Restate	Yes (N=28)	-0.291 [0.059]	-0.2424
	No (N=227)	-0.1766 [0.0211]	-0.1019		No (N=222)	-0.1702 [0.0215]	-0.0976
	Diff.	-0.0777 *-1.01*	-0.0664 *-0.62*		Diff.	-0.1208 *-1.92***	-0.1448 *-2.28***
(G) Pre-SOX Related-Party Transaction	Yes (N=16)	-0.2485 [0.0861]	-0.1422	(H) Chhaochharia and Grinstein (2007) Pre-SOX Governance Dummy	Yes (N=63)	-0.263 [0.0402]	-0.1683
	No (N=234)	-0.1793 [0.0209]	-0.1029		No (N=187)	-0.157 [0.0233]	-0.0911
	Diff.	-0.0692 *-0.78*	-0.0393 *-0.57*		Diff.	-0.106 *-2.27***	-0.0772 *-2.30***

Panel B – Relation between changes in corporate opacity around the enactment of Sarbanes-Oxley Act and the pre-enactment level of transparency and compliance: OLS and Median Regressions.
This panel reports ordinary least-squares (columns 1-4) and median (columns 5-8) regression estimates for the relation between the change in the corporate opacity parameter (*Post-SOX* minus *Pre-SOX*) and the indicator variables defined in Panel A. Heteroskedasticity-robust standard errors are reported in parentheses for the OLS regressions. *, **, and *** indicate statistical significance at a 10%, 5%, and 1% probability level, respectively.

	Ordinary Least-Squares Regressions				Median Regressions			
	(1) Coeff. Est. (Std. Err.)	(2) Coeff. Est. (Std. Err.)	(3) Coeff. Est. (Std. Err.)	(4) Coeff. Est. (Std. Err.)	(5) Coeff. Est. (Std. Err.)	(6) Coeff. Est. (Std. Err.)	(7) Coeff. Est. (Std. Err.)	(8) Coeff. Est. (Std. Err.)
Intercept	-0.1728*** (0.0374)	-0.2203*** (0.0366)	-0.215*** (0.0323)	-0.1161** (0.0450)	-0.0811*** (0.0257)	-0.1372*** (0.0310)	-0.1186*** (0.0243)	-0.0494* (0.0256)
CG Pre-SOX Gov. Dummy	-0.1062** (0.0474)	-0.1038** (0.0501)	-0.0969** (0.0464)	-0.0973* (0.0516)	-0.1167*** (0.0373)	-0.1307*** (0.0468)	-0.1*** (0.0351)	-0.1162*** (0.0300)
High Pre-SOX Earn. Conservative	0.0243 (0.0420)				-0.0208 (0.0333)			
High Pre-SOX Accruals Quality		0.0826* (0.0430)				0.0652* (0.0385)		
High Pre-SOX Earn. Smoothness			0.0932** (0.0411)				0.0509* (0.0308)	
Low Pre-SOX S&P Rating				-0.0841* (0.0493)				-0.0742*** (0.0286)
N	225	223	229	183	225	223	229	183
R^2	0.024	0.036	0.038	0.031	0.015	0.014	0.018	0.031

Table 5 – Does corporate opacity capture differences in systematic risk not accommodated by the CDS Spread pricing model?

The table reports summary statistics of the change in the corporate opacity parameter between the *Pre-Sox* and *Post-Sox* period. The corporate opacity parameters are calibrated from CDS spreads for each firm-period using the CreditGrades CDS pricing model. *Pre-SOX* period is Jan/2001-Jul/2002 and *Post-SOX* period is Aug/2002-Dec/2003. *Market Factor Loading* is the CAPM beta estimated during the relevant subperiod. *SMB Factor Loading* is the Fama-French (1992) Small-Minus-Big Size factor loading estimated during the relevant subperiod. *HML Factor Loading* is the Fama-French (1992) High-Minus-Low Book-to-Market factor loading estimated during the relevant subperiod. In the columns labeled *Pre-SOX* [*Post-SOX*, *Post-SOX Minus Pre-SOX*] of Panel A (B, C) firms are grouped based on whether their pre-SOX [post-SOX, change from pre- to post-SOX] *Market Factor Loading* (*SMB Factor Loading*, *HML Factor Loading*) is above or below the sample median. The row labeled *Diff.* reports the difference between the mean and median change in opacity parameter across subsamples. The figures in *italics* are the corresponding test statistics (t-statistic for the mean difference, z-statistic for Wilcoxon signed-rank test for the median difference). *, **, and *** indicate statistical significance at a 10%, 5%, and 1% probability level, respectively, in a one-sided test.

		Pre-SOX			Post-SOX			Post- Minus Pre-SOX	
		Mean [St. Err]	Median		Mean [St. Err]	Median		Mean [St. Err]	Median
(A) Market Factor Loading	Low (N=125)	0.7059 [0.0467]	0.5598	Low (N=125)	0.5662 [0.0417]	0.4206	Low (N=125)	-0.2136 [0.0317]	-0.1038
	High (N=125)	0.6579 [0.053]	0.5	High (N=125)	0.4302 [0.0388]	0.3242	High (N=125)	-0.1539 [0.0252]	-0.1159
	Diff.	0.048 *0.68*	0.0598 *1.24*	Diff.	0.136 *2.39***	0.0964 *2.83****	Diff.	-0.0597 *-1.47*	0.0121 *-0.99*
(B) SMB Factor Loading	Low (N=125)	0.7315 [0.0553]	0.5416	Low (N=125)	0.4788 [0.0418]	0.3738	Low (N=125)	-0.1876 [0.0295]	-0.1235
	High (N=125)	0.6323 [0.0436]	0.5223	High (N=125)	0.5176 [0.0396]	0.4417	High (N=125)	-0.1799 [0.028]	-0.0992
	Diff.	0.0992 *1.41*	0.0193 *0.68*	Diff.	-0.0388 *-0.67*	-0.0679 *-1*	Diff.	-0.0077 *-0.19*	-0.0243 *-0.65*
(C) HML Factor Loading	Low (N=125)	0.846 [0.0562]	0.6621	Low (N=125)	0.6114 [0.0453]	0.5085	Low (N=125)	-0.2338 [0.0307]	-0.1248
	High (N=125)	0.5179 [0.0375]	0.4609	High (N=125)	0.385 [0.0326]	0.3153	High (N=125)	-0.1337 [0.026]	-0.0704
	Diff.	0.3281 *4.86****	0.2012 *4.05****	Diff.	0.2264 *4.06****	0.1932 *3.87****	Diff.	-0.1001 *-2.49***	-0.0544 *-2.49***

Table 6 – Does the calibrated corporate opacity parameter reflect publicly available information about capital structure not accommodated by the CDS pricing model?

The table reports summary statistics of the change in the corporate opacity parameter between the *Pre-Sox* and *Post-Sox* period. The corporate opacity parameters are calibrated from CDS spreads for each firm-period using the CreditGrades CDS pricing model. *Pre-SOX* period is Jan/2001-Jul/2002 and *Post-SOX* period is Aug/2002-Dec/2003. *Median Credit Rating* for each firm-period is the time-series average of daily numerical credit rating according to Moody's. *Total Adj. Liabilities* is total liabilities minus minority interest and deferred taxes. *Short Term to Total Liabilities* is the time-series average of the ratio of current liabilities to total adjusted liabilities. *Short to Long Term Debt* is the time series average ratio of debt in current liabilities to total debt (due in one year or more). *Debt to Total Liabilities* is the time series average of the ratio of total debt to total adjusted liabilities. In the columns labeled *Pre-SOX* [*Post-SOX*, *Post-SOX Minus Pre-SOX*] of Panel A (B, C, D) firms are grouped based on whether their pre-SOX [post-SOX, change from pre- to post-SOX] *Short Term to Total Liabilities* (*Debt to Total Liabilities*, *Short to Long Term Debt*, *Median Credit Rating*) is above or below the sample median. The row labeled *Diff.* reports the difference between the mean and median change in opacity parameter across subsamples. The figures in *italics* are the corresponding test statistics (t-statistic for the mean difference, z-statistic for Wilcoxon signed-rank test for the median difference). *, **, and *** indicate statistical significance at a 10%, 5%, and 1% probability level, respectively, in a one-sided test.

		Pre-SOX			Post-SOX			Post- Minus Pre-SOX	
		Mean [St. Err]	Median		Mean [St. Err]	Median		Mean [St. Err]	Median
(A) Short-Term to Total Liabilities	Low (N=125)	0.542 [0.0382]	0.4695	Low (N=125)	0.3968 [0.0287]	0.3844	Low (N=125)	-0.1741 [0.031]	-0.1045
	High (N=125)	0.8219 [0.0568]	0.6194	High (N=125)	0.5996 [0.0483]	0.4716	High (N=125)	-0.1934 [0.0263]	-0.1019
	Diff.	-0.2799 *-4.09****	-0.1499 *-3.2*	Diff.	-0.2028 *-3.61****	-0.0872 *-2.54*	Diff.	0.0193 *0.47*	-0.0026 *0.35*
(B) Debt to Total Liabilities	Low (N=125)	0.7992 [0.0543]	0.6165	Low (N=125)	0.5908 [0.0446]	0.5275	Low (N=125)	-0.1724 [0.0304]	-0.072
	High (N=125)	0.5647 [0.0428]	0.4693	High (N=125)	0.4056 [0.0345]	0.3664	High (N=125)	-0.1951 [0.027]	-0.1391
	Diff.	0.2345 *3.39****	0.1472 *3.02*	Diff.	0.1852 *3.28****	0.1611 *3.06*	Diff.	0.0227 *0.56*	0.0671 *1.47*
(C) Short- to Long-Term Debt	Low (N=125)	0.7454 [0.0507]	0.589	Low (N=125)	0.4685 [0.0354]	0.4079	Low (N=115)	-0.197 [0.0355]	-0.1
	High (N=125)	0.6184 [0.0487]	0.4923	High (N=125)	0.5279 [0.0453]	0.4095	High (N=135)	-0.1725 [0.0224]	-0.1248
	Diff.	0.127 *1.81*	0.0967 *2.05*	Diff.	-0.0594 *-1.03*	-0.0016 *-0.27*	Diff.	-0.0245 *-0.58*	0.0248 *0.23*
(D) Median Credit Rating	Low (N=157)	0.6199 [0.0406]	0.4952	Low (N=157)	0.4487 [0.0305]	0.3738			
	High (N=93)	0.7866 [0.0642]	0.589	High (N=93)	0.5816 [0.0567]	0.4715			
	Diff.	-0.1667 *-2.19***	-0.0938 *-2.01***		-0.1626 *-2.06***	-0.0977 *-1.48*			

Table 7 – Does greater competition in the CDS market or the introduction of TRACE explain the reduction in the calibrated corporate opacity parameter?

The table reports summary statistics of the change in the corporate opacity parameter between the *Pre-Sox* and *Post-Sox* period. The corporate opacity parameters are calibrated from CDS spreads for each firm-period using the CreditGrades CDS pricing model. *Pre-SOX* period is Jan/2001-Jul/2002 and *Post-SOX* period is Aug/2002-Dec/2003. *Number of Quoting Dealers* is the average daily number of distinct quotes for a particular contract reported by Markit for each subperiod. *Time in Trace* is the fraction of the post-SOX period in which a sample firm has at least one bond included in the TRACE reporting system. In the columns labeled *Pre-SOX* [*Post-SOX*, *Post-SOX Minus Pre-SOX*] of Panel A (B) firms are grouped based on whether their pre-SOX [post-SOX, change from pre- to post-SOX] *Number of Quoting Dealers* (*Time in Trace*) is above or below the sample median. The row labeled *Diff.* reports the difference between the mean and median change in opacity parameter across subsamples. The figures in *italics* are the corresponding test statistics (t-statistic for the mean difference, z-statistic for Wilcoxon signed-rank test for the median difference). *, **, and *** indicate statistical significance at a 10%, 5%, and 1% probability level, respectively, in a one-sided test.

		Pre-SOX			Post-SOX			Post- Minus Pre-SOX	
		Mean [St. Err]	Median		Mean [St. Err]	Median		Mean [St. Err]	Median
(A) Number of Quoting Dealers	Low (N=125)	0.7858 [0.0492]	0.6524	Low (N=125)	0.641 [0.0432]	0.5396	Low (N=125)	-0.2048 [0.0314]	-0.1019
	High (N=125)	0.5781 [0.049]	0.4549	High (N=125)	0.3554 [0.0335]	0.2921	High (N=125)	-0.1627 [0.0258]	-0.1045
	Diff.	0.2077 *2.99^^^****	0.1975 *3.52^^^*	Diff.	0.2856 *5.22^^^****	0.2475 *5.39^^^*	Diff.	-0.0421 *-1.04*	0.0026 *-0.54*
(B) Time in TRACE				Low (N=125)	0.4541 [0.0351]	0.3819	Low (N=125)	-0.1762 [0.0298]	-0.1159
				High (N=125)	0.5422 [0.0454]	0.4164	High (N=125)	-0.1913 [0.0277]	-0.1038
				Diff.	-0.0881 *-1.54^*	-0.0345 *-1.01*	Diff.	0.0151 *0.37*	-0.0121 *0.12*

Table 8 – Multiple regression analysis of Hypotheses 2 and 3: what explains changes in corporate opacity around SOX?

This panel reports ordinary least-squares (columns 1-4) and median (columns 5-8) regression estimates for the relation between the change in the corporate opacity parameter (*Post-SOX* minus *Pre-SOX*) and the variables defined in Tables 4-7. Heteroskedasticity-robust standard errors are reported in parentheses for the OLS regressions. *, **, and *** indicate statistical significance at a 10%, 5%, and 1% probability level, respectively.

	OLS Regressions				Median Regressions			
	(1) Coeff. Est. (Std. Err.)	(2) Coeff. Est. (Std. Err.)	(3) Coeff. Est. (Std. Err.)	(4) Coeff. Est. (Std. Err.)	(5) Coeff. Est. (Std. Err.)	(6) Coeff. Est. (Std. Err.)	(7) Coeff. Est. (Std. Err.)	(8) Coeff. Est. (Std. Err.)
Intercept	-0.174*** (0.0466)	-0.2042*** (0.0531)	-0.2234*** (0.0544)	-0.1292* (0.0696)	-0.0681* (0.0405)	-0.1057*** (0.0350)	-0.0967* (0.0495)	-0.0408 (0.0493)
CG Pre-SOX Gov. Dummy	-0.1191** (0.0473)	-0.1068** (0.0506)	-0.0988** (0.0471)	-0.1026* (0.0526)	-0.1255*** (0.0382)	-0.1395*** (0.0356)	-0.1214*** (0.0470)	-0.1456*** (0.0388)
High Pre-SOX Earn. Conservative	0.0331 (0.0420)				-0.0036 (0.0343)			
High Pre-SOX Accruals Quality		0.0899** (0.0448)				0.0596* (0.0322)		
High Pre-SOX Earn. Smoothness			0.0858** (0.0427)				0.0349 (0.0411)	
Low Pre-SOX S&P Rating				-0.0724* (0.0431)				-0.0711* (0.0369)
Chg. Number of Quoting Dealers	-0.0026 (0.0107)	-0.0041 (0.0117)	0.001 (0.0109)	0.0084 (0.0120)	-0.0009 (0.0100)	-0.0024 (0.0088)	0.0013 (0.0117)	0.0089 (0.0100)
Post-Sox Period in TRACE	0.0115 (0.0526)	-0.0048 (0.0528)	0.0176 (0.0507)	-0.0229 (0.0624)	0.0107 (0.0427)	0.0204 (0.0395)	0.0136 (0.0512)	-0.0016 (0.0449)
Chg. Market Factor Loading	0.1311 (0.0993)	0.003 (0.1280)	0.0517 (0.1202)	0.1037 (0.1401)	0.0457 (0.0883)	-0.0317 (0.0769)	-0.0076 (0.1019)	-0.0693 (0.0960)
Chg. SMB Factor Loading	-0.1033* (0.0614)	-0.0169 (0.0665)	-0.0532 (0.0607)	-0.0389 (0.0653)	-0.0197 (0.0508)	0.0586 (0.0462)	-0.0055 (0.0615)	0.0351 (0.0516)
Chg. HML Factor Loading	0.116*** (0.0375)	0.0798* (0.0428)	0.0747* (0.0396)	0.0814* (0.0470)	0.0837** (0.0331)	0.0666** (0.0302)	0.0797** (0.0391)	0.0641* (0.0340)
Chg. Short-Term to Total Liabilities	-0.5959 (0.6625)	-0.3385 (0.6916)	-0.4069 (0.6302)	-0.3188 (0.8007)	0.2321 (0.4110)	0.2354 (0.4216)	0.3536 (0.5105)	0.1383 (0.5003)
Chg. Debt to Total Liabilities	-0.5583 (0.5317)	-0.242 (0.5278)	-0.3381 (0.5202)	-0.478 (0.5791)	-0.218 (0.3740)	-0.1832 (0.3736)	0.0743 (0.4681)	-0.3724 (0.4525)
Chg. Short- to Long-Term Debt	0.1795 (0.1925)	0.2455 (0.2195)	0.1583 (0.1867)	-0.0104 (0.1441)	-0.1061 (0.1039)	0.0335 (0.1538)	-0.12 (0.1292)	-0.1123 (0.1062)
N	225	223	229	183	225	223	229	183
Adj-R^2 or Pseudo-R^2	0.100	0.067	0.069	0.086	0.046	0.045	0.034	0.071

Table A.1 – Mean calibrated corporate opacity by sector before and after enactment of the Sarbanes-Oxley Act (July 30, 2002).

The table reports the average calibrated corporate opacity parameter across different industries. Parameters are calibrated from CDS spreads for each firm-period using the CreditGrades CDS pricing model. The *Pre-SOX* period is Jan/2001-Jul/2002 and *Post-SOX* period is Aug/2002-Dec/2003. The *Unique* columns assume a unique expected default barrier equal to 50% of total adjusted liabilities for all industries. The *Industry-Specific* columns have a different expected default barrier for each industry, chosen so as to maximizes the proportion of time that market spreads are within the range that can be generated by the pricing model for all possible opacity parameters.

	[1] Unique Expected Default Barrier		[2] Industry Specific Expected Default Barrier		
	Pre-SOX	*Post-SOX*	*Pre-SOX*	*Post-SOX*	*Default Barrier*
Durables Goods	0.4005	0.2238	0.5516	0.5371	30%
Energy	0.8343	0.5219	0.5473	0.3331	70%
Hi-Tech	1.1208	0.8351	0.683	0.4176	100%
Health	1.6893	1.5354	1.1646	0.8995	100%
Manufacturing	0.7747	0.5884	0.7747	0.5883	50%
Non-Durable Goods	1.1715	0.9607	0.6941	0.5009	100%
Shops	1.1174	0.8359	0.9432	0.6043	80%
Telecommunication	0.7231	0.5981	0.4043	0.3705	65%
Utilities	0.4169	0.3602	0.3463	0.3255	85%
Other	0.8001	0.5744	0.4546	0.3165	55%

Table A.2 – Unique default barrier (i.e. 50% of total liabilities) across different sectors.
Panels A, B, and C reproduce the tests in Tables 2, 3, and 4 respectively, now assuming a unique default barrier equal to 50% of total adjusted liabilities.

Panel A - Are better corporate governance and more accounting transparency associated with lower corporate opacity?

		Pre-SOX		*Post-SOX*	
		Mean [Std. Error]	Median	Mean [Std. Error]	Median
(A) S&P Transparency and Disclosure 2002 Rankings	High (N=63)	0.78748 [0.0766]	0.6201	0.6244 [0.0667]	0.5357
	Low (N=120)	1.0106 [0.0591]	0.9031	0.766 [0.0575]	0.5997
	Diff.	-0.223 *-2.30^^^***	-0.283 *-2.21***	-0.1416 *-1.61**	-0.064 *-1.14*
(B) KLD Corporate Governance 2002 Ratings	Better (N=103)	0.7935 [0.0581]	0.6542		
	Worse (N=127)	1.0287 [0.0601]	1.000		
	Diff.	-0.235 *-2.81^^^****	-0.3458 *-2.49***		
(C) KLD Corporate Governance 2004 Ratings	Better (N=61)			0.5862 [0.0654]	0.4715
	Worse (N=161)			0.7451 [0.0484]	0.5996
	Diff.			-0.159 *-1.95^^***	-0.1281 *-1.63*

Panel B - Is the enactment of Sarbanes-Oxley Act associated with a reduction in corporate opacity?

N=250	Pre-SOX	Post-SOX	Difference	*Test statistic for Difference*
Mean [St. Error]	0.9058 [0.0406]	0.6997 [0.0365]	-0.2061	*-8.41^^^****
Median	0.7475	0.5682	-0.1436	*-9.04^^^****

Panel C - Is the enactment of Sarbanes-Oxley Act associated with a larger reduction in corporate opacity for less transparent firms?

		(Post-SOX) - (Pre-SOX)	
		Mean [Std. Error]	Median
(A) S&P Transparency and Disclosure 2002 Rankings	High Transparency (N=63)	-0.1631 [0.0434]	-0.0715
	Low Transparency (N=120)	-0.2446 [0.0357]	-0.1882
	Difference	-0.0815 *1.45**	-0.1167 *2.07***
(B) Chhaochharia and Grinstein (2007) Pre-SOX Governance Dummy	More Compliant (N=187)	-0.1717 [0.0233]	-0.1175
	Less Compliant (N=63)	-0.3081 [0.0402]	-0.2387
	Difference	-0.1364 *2.49^^***	-0.1212 *2.37***

Table A.3 – Restricted sample discarding corner solutions.
Panels A, B, and C reproduce the tests in Tables 2, 3, and 4 respectively, now discarding firms with corner solutions in the calibration process either in the *Pre-SOX* period or in the *Post-SOX* one. The sample size drops from 252 firms to 162 firms accordingly.

Panel A - Are better corporate governance and more accounting transparency associated with lower corporate opacity?

		Pre-SOX Mean [Std. Error]	*Pre-SOX* Median	*Post-SOX* Mean [Std. Error]	*Post-SOX* Median
(A) S&P Transparency and Disclosure 2002 Ratings	High (N=43)	0.5694 [0.0458]	0.5361	0.4403 [0.0319]	0.4239
	Low (N=78)	0.7022 [0.0440]	0.5999	0.5132 [0.0374]	0.4346
	Diff.	-0.133 *-2.09^^^***	-0.0638 *-2.21***	-0.1416 *-1.48**	-0.0107 *-1.14*
(B) KLD Corp. Gov. 2002 Ratings	Better (N=71)	0.5979 [0.0397]	0.6542		
	Worse (N=74)	0.6644 [0.0438]	1.000		
	Diff.	-0.067 *-1.12*	-0.3458 *-2.49***		
(C) KLD Corp. Gov. 2004 Ratings	Better (N=44)			0.4201 [0.0411]	0.4715
	Worse (N=97)			0.4898 [0.0284]	0.5996
	Diff.			-0.070 *-1.39**	-0.1281 *-1.63**

Panel B - Is the enactment of Sarbanes-Oxley Act associated with a reduction in corporate opacity?

N=160	Pre-SOX	Post-SOX	Difference	*Test statistic for Difference*
Mean [St. Error]	0.6173 [0.0276]	0.4669 [0.0213]	-0.1504	*-8.34^^^****
Median	0.5426	0.4148	-0.1102	*-8.17^^^****

Panel C - Is the enactment of Sarbanes-Oxley Act associated with a larger reduction in corporate opacity for less transparent firms?

		(Post-SOX) - (Pre-SOX)	
		Mean [Std. Error]	Median
(A) S&P Transparency and Disclosure 2002 Rankings	High Transparency (N=43)	-0.129 [0.0344]	-0.0720
	Low Transparency (N=78)	-0.1889 [0.0235]	-0.1319
	Diff.	-0.0599 *1.43**	-0.0599 *2.32***
(B) Chhaochharia and Grinstein (2007) Pre-SOX Governance Dummy	More Compliant (N=122)	-0.1401 [0.0233]	-0.1005
	Less Compliant (N=38)	-0.1835 [0.0402]	-0.1647
	Diff.	-0.0434 *1.13*	-0.0642 *1.52*