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Sarbanes-Oxley and corporate risk-taking ☆

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ABSTRACT

We empirically examine whether risk-taking by publicly traded US companies declined significantly after adoption of the Sarbanes-Oxley Act of 2002 (SOX). Several provisions of SOX are likely to discourage risk-taking, including an expanded role for independent directors, an increase in director and officer liability, and rules related to internal controls. We find several measures of risk-taking decline significantly for US versus non-US firms after SOX. The magnitudes of the declines are related to several firm characteristics, including pre-SOX board structure, firm size, and R&D expenditures. The evidence is consistent with the proposition that SOX discourages risk-taking by public US companies.

1. Introduction

Prominent scholars and policymakers have criticized the Sarbanes-Oxley Act of 2002 (SOX)[1] for allegedly discouraging risk-taking by publicly traded US companies. In one of his last interviews, Milton Friedman opined that "Sarbanes-Oxley says to every entrepreneur, 'for God's sake don't innovate. Don't take chances because down will come the hatchet.'"[2] Former Federal Reserve chairman Alan Greenspan notes that "business leaders have been quite circumspect about embarking on major new investment projects"[3] because of SOX. William Donaldson, former chairman of the Securities and Exchange Commission (SEC), states that because of SOX "I worry about the loss of risk-taking zeal … [there is] a huge preoccupation with the dangers and risks of making the slightest mistake."[4]

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[1] Pub. L. 107-204, 116 Stat. 745 (2002).
[2] Gerstein (2006).
[3] Greenspan (2003).
[4] Michaels (2003).

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This paper empirically examines whether the adoption of SOX is associated with a subsequent decline in corporate risk-taking. Two provisions of SOX lead us to predict that the legislation has adversely affected risk-taking by publicly traded US companies.

First, by increasing the role of independent directors in corporate governance and expanding/criminalizing their liability for corporate misdeeds, SOX[5] discourages directors from approving risky investments that are costly to monitor. In addition, SOX requires chief executive officers (CEOs) and chief financial officers (CFOs) to certify their companies' financial statements and imposes criminal liability for knowing or willful violations of this provision. This, too, is predicted to dull the incentives of corporate officers to initiate and pursue risky projects.

Second, Section 404 of SOX, which requires companies to evaluate and disclose the adequacy of their internal controls, is expected to discourage companies from investing in risky projects that increase the likelihood that the controls will be compromised and alleged to be deficient. SEC guidance concerning compliance with Section 404 acknowledges that the risk of financial misstatements is directly related to the complexity of a firm's operations, the extent to which it relies on specialized knowledge, and the degree to which its organizational structure is decentralized. Under the SEC guidance, as these factors increase, firms are expected to expend more resources and engage in more testing of internal controls to ensure compliance with Section 404. Insofar that these characteristics are related directly to the risk of a firm's operations, the expected costs of complying with Section 404 are directly related to firm risk, thereby reduces the incentives of firms to invest in risky projects.

This paper contributes to a growing academic literature that examines various economic effects of SOX, including the relation between SOX and corporate risk-taking (Cohen et al., 2007; Shadab, 2008). We examine whether several measures of corporate risk-taking changed significantly after SOX was signed into law in 2002 for publicly traded US companies as compared with non-US companies not bound by SOX.

In an attempt to isolate effects associated with SOX, it is important to compare US firms, which are subject to SOX, to non-US firms that are most like US firms with the exception that they are not subject to SOX. For this reason, the sample of non-US firms is comprised of publicly listed UK and Canadian firms that are not cross-listed in the United States. We use publicly listed firms in the UK and Canada as a benchmark sample because these firms operate in similar capital market environments and under regulations similar to firms listed in the US.

Using data for a large sample of US and non-US firms during the period of 1994 through 2006, we find that after SOX US companies significantly reduced their investments, as measured by the sum of their capital and R&D expenditures, in comparison with their non-US counterparts. In addition, US firms significantly increased their holdings of cash and cash equivalents, which represent non-operating, low-risk investments, as compared with the non-US firms. Also, we find that the standard deviation of stock returns, a conventional measure of a company's equity risk, declined significantly for US firms compared with non-US firms, after SOX. Finally, these findings are consistent for an industry and size-matched sample of US and non-US firms. This evidence is consistent with the view that SOX has discouraged corporate risk-taking and it complements previous research on this topic (Cohen et al., 2007).

We also find cross-sectional differences consistent with the prediction that SOX has discouraged corporate risk-taking. The changes in the risk-taking variables are significantly greater for large versus small US firms, consistent with the view that the expected costs of complying with Section 404 are greater for firms characterized by more complexity. The changes are also significantly greater for firms with high versus low R&D expenditures before SOX, consistent with the view that the expected costs of complying with Section 404 are directly related to the degree of specialized knowledge in a firm. The changes in cash holdings and stock price volatility are significantly greater for firms that did not have a majority of outside directors before SOX, and hence were most affected by the SOX-related rules governing the independence of boards. The changes in capital and R&D expenditures were not significantly different across these two groups of companies.

We cannot rule out the possibility that other factors, unique to US firms and unrelated to SOX, might account for the relative decline in risk-taking by US companies after SOX. However, as discussed later in the paper, we do not believe that the US recession during 2001–2002, the collapse of the tech sector, or changes in accounting rules regarding employee stock options explain the results. Without a compelling alternative explanation for the decline in risk-taking by US companies since 2002, the evidence is consistent with the view that SOX has discouraged risk-taking by US companies.

The paper is organized as follows. Section 2 describes relevant provisions of SOX and discusses their relation to corporate risk-taking. Section 3 describes the sample and data. Section 4 contains empirical results on risk-taking by US corporations after SOX. Section 5 presents concluding comments.

2. SOX and corporate risk-taking

We expect SOX to affect corporate risk-taking in two ways. First, by expanding the role played by independent directors and imposing more liability, including criminal liability, on officers and directors for violations of securities laws, SOX discourages officers and directors from initiating and approving risky investment projects. Second, Section 404, which

[5] In addition to the Sarbanes-Oxley Act itself, SOX, as used in this paper, refers to SEC rules that implement SOX and changes in listing standards on the New York Stock Exchange and Nasdaq associated with SOX. The salient SEC rules and changes in listing standards are discussed in Section 2.

requires companies to test and disclose the adequacy of their internal controls, is expected to have a discouraging effect on corporate risk-taking. Each of these ways is discussed in turn.

2.1. Board structure and director/officer liability under SOX

2.1.1. Independent directors

SOX increased the role played by independent directors in the governance of publicly traded US companies. Section 301 of SOX requires the SEC to adopt rules prohibiting national securities exchanges and associations from listing securities of companies that do not have audit committees complying with the requirements of SOX. Under SOX and the associated SEC rules, audit committees of publicly traded companies are required to consist entirely of independent directors.[6] Furthermore, Section 407 of SOX requires publicly traded companies to disclose that at least one member of the audit committee is a "financial expert," defined according to criteria developed by the SEC,[7] or, if they do not have a financial expert on the committee, they are required to disclose why not.

Shortly after SOX was signed into law, the NYSE and Nasdaq proposed changes to their listing standards that increased the role of independent directors in the governance of firms listed in the two markets. The SEC approved the proposed changes, with amendments, in the fall of 2003.[8] The changes included the requirement that a majority of the board of directors of companies listed on the NYSE and Nasdaq be independent, based on new definitions of independent directors. Under the approved changes, the NYSE's listing standard requires audit, nominating/corporate governance, and compensation committees of companies listed on the NYSE to consist entirely of independent directors. The Nasdaq's listing standards also require audit committees of companies listed on Nasdaq to consist entirely of independent directors.[9]

The effect of these changes in regulations and listing standards is to increase the role of independent directors in the governance of publicly traded US companies. Consistent with this view, Linck et al. (2008) find that boards of publicly traded US corporations are larger and consist of more outside directors after SOX.

The increased role for independent directors after SOX is likely to adversely affect corporate risk-taking. Previous research has found that firms with high risk and high growth opportunities have significantly fewer outside directors than other firms. For example, Coles et al. (2008) find a direct relation between R&D expenditures and the proportion of a board consisting of inside directors. Similarly, Lehn et al. (2008) find an inverse relation between market-to-book ratio, a proxy for growth opportunities, and the proportion of a board consisting of outside directors.

The extant literature explains these relations in terms of information costs. The costs of monitoring managers' performance are presumed to be increasing in a firm's growth opportunities. For example, Smith and Watts (1992) note "It is difficult for shareholders or outside board members who do not have the manager's specific knowledge to observe all the investments from which the manager chooses." (p. 275). Insofar that it is more costly for outside directors to obtain information about the quality of investment projects in risky, high growth firms than it is for inside directors, then, all else equal, it is optimal for risky, high-growth firms to have fewer outside directors than less risky, low-growth firms. Hence, firms in high-growth industries (e.g., biotechnology and software) historically have fewer outside directors than firms in low growth industries (e.g., textiles and food processing).

By expanding the role played by independent directors in corporate governance, SOX may have imposed a suboptimal board structure on firms that previously relied less on independent directors. Based on existing evidence, the consequences of this action have likely fallen disproportionately on high-risk firms with large growth opportunities. As these firms adapt their board structures to comply with SOX, the SEC rules, and the new listing standards, we expect their investments in risky investment projects to decline, as the independent directors face relatively higher costs of acquiring information about the projects. These information costs effectively operate as a "tax" on investments, thereby discouraging investment activity. For this reason, we expect SOX to result in a decline in risk-taking activity by firms for which the change in board structure was a binding constraint.

An alternative, but not mutually exclusive, hypothesis is that an increase in the representation and liability of independent directors increases the effectiveness of boards, thereby making it more likely that boards will reject "bad" projects. However, whether boards are more or less willing to incur the higher information costs associated with monitoring riskier projects, the prediction is the same—increasing the representation and liability of independent directors leads to a reduction in corporate risk-taking.

2.1.2. Expanded liability and increased penalties for officers and directors

SOX significantly increased the liability and penalties faced by officers and directors for violations of US securities laws. For example, SOX imposes criminal liability for knowingly violating US securities laws, with up to 25 years in prison for a single violation.[10] In addition, SOX quadruples the maximum prison sentence from 5 to 20 years for each mail/wire fraud

[6] SEC Release Nos. 33-8220 and 34-47654, April 9, 2003.
[7] SEC Release Nos. 33-8177 and 34-47235, January 23, 2003.
[8] SEC Release No. 34-48745, November 4, 2003.
[9] Nasdaq's listing standards do not require companies listed on Nasdaq to have nominating or compensation committees.
[10] The SOX, Section 807.

violation related to a securities fraud[11] and imposes criminal liability or new penalties for other violations of US securities laws.[12]

SOX also increased the liability of CEOs and CFOs in particular, by requiring, in Section 906, that they annually certify their companies' financial statements. CEOs and CFOs face up to 10 years in prison for each "knowing" violation of this requirement, and up to 20 years in prison for each "willful" violation of the requirement.[13]

The creation of criminal liability for securities violations, along with other increases in liability and penalties as specified in SOX, are expected to increase the risk aversion of corporate officers and directors. Previous research has found that the likelihood a firm is charged with accounting fraud by the SEC is directly related to a firm's growth opportunities, as measured by R&D expenditures (Gerety and Lehn, 1997). This result is consistent with the view that fraud is more likely to occur in industries with substantial intangible assets characterized by high monitoring costs. Insofar that the likelihood of fraud is directly related to the risk of a firm's assets and its growth opportunities, then the increase in expected penalties for fraud under SOX is expected to reduce the incentives of officers and directors to initiate and approve risky projects that are hard to monitor, such as projects involving R&D expenditures and other investments in intangible assets.

2.2. Internal control provisions of SOX

Section 404 of SOX, perhaps the most contentious part of the legislation, directs the SEC to adopt rules requiring companies to evaluate and disclose the adequacy of their internal financial controls in annual reports. In 2003, the SEC adopted rules implementing this requirement of SOX, which took effect in 2004 for "accelerated filers," defined as companies with market capitalizations of $75 million or more.[14] Under the SEC rules, the affected companies are required to disclose the following information about internal controls in their annual reports:

(a) a statement of management's responsibility for establishing and maintaining adequate internal controls;
(b) identification of the framework used by management to evaluate the adequacy of the internal controls;
(c) a statement as to whether or not the system of internal controls as of year-end is effective;
(d) disclosure of any "material weaknesses" in the system of internal controls; and
(e) a report by the company's external auditor attesting to management's assessment of the firm's internal controls.

In response to feedback it received on the rules, the SEC issued a release in 2007 that attempts to provide guidance on how issuers should comply with the rules.[15] In the introduction to the release, the SEC describes its guidance as organized around two principles. The first principle is that "management should evaluate whether it has implemented controls that adequately address the risk that a material misstatement of the financial statements would not be prevented or detected in a timely manner."[16] The second principle is that "management's evaluation of evidence about the operation of its controls should be based on its assessment of risk."[17] In short, the SEC's guidance emphasizes that management has the flexibility to design processes for evaluating internal controls based on the risks of financial misstatements—where the risks are greater, more extensive testing and evaluation is expected.

The SEC's guidance goes on to describe characteristics of companies that it believes increases the likelihood of financial reporting misstatements, including "the size, complexity, and organizational structure of the company."[18] The SEC suggests that the risk of financial reporting misstatements is higher in large firms:

> … to identify financial reporting risks in a larger business or a complex business process, management's methods and procedures may involve a variety of company personnel, including those with specialized knowledge. These individuals, collectively, may be necessary to have a sufficient understanding of GAAP, the underlying business transactions and the process activities, including the role of computer technology, that are required to initiate, authorize, record, and process transactions. In contrast, a small company that operates on a centralized basis with less complex business processes and with little change in the risks or processes, management's daily involvement with the business may provide it with adequate knowledge to appropriately identify financial reporting risks.[19]

Later in the release, the SEC provides additional commentary on factors affecting "whether there is a reasonable possibility that a deficiency, or a combination of deficiencies, will result in a misstatement of a financial statement amount

[11] The SOX, Section 903.
[12] For example, SOX imposes enhanced penalties for conspiracies or attempts to violate the mail and wire fraud law (Section 902), it revises and creates new obstruction of justice crimes related to tampering with evidence and obstructing justice (Section 802), and it imposes a requirement on auditors of public companies to maintain audit and work papers for a minimum of five years, with criminal liability and imprisonment of up to 10 years for anyone who "knowingly and willfully" violates the requirements (Section 802).
[13] The Sarbanes-Oxley Act, Section 906.
[14] SEC Release No. 33-8238, June 11, 2003.
[15] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007.
[16] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007, pp. 4–5.
[17] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007, p. 5.
[18] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007, pp. 13–14.
[19] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007.

or disclosure,"[20] citing, among other factors, "the susceptibility of the related asset or liability to loss or fraud" and "the subjectivity, complexity, or extent of judgment required to determine the amount involved."[21]

The SEC's guidance and identification of firm characteristics associated with a greater risk of financial misstatements implies that more extensive evaluation of internal controls is required for large firms and firms with activities involving specialized knowledge, decentralized organizational structures, and complex transactions. Hence, the incidence of the costs associated with Section 404 is expected to fall disproportionately on large firms and firms engaged in risky activities involving significant growth opportunities. Consistent with the view that these costs are likely to be high for high growth firms, research finds that firms disclosing problems with internal controls before the Section 404 rules became effective tend to be younger, more complex, cash constrained, and faster growing than other firms (Ashbaugh-Skaife et al., 2007; Doyle et al., 2007).

A predictable response of firms to the Section 404 rules is to curtail investments in risky investment projects that increase the expected costs of complying with the Section 404 rules adopted by the SEC. Anecdotal evidence of this is found in a letter, commenting on the Section 404 rules, from the Biotechnology Industry Organization to the SEC, stating "Many emerging biotech companies are directing precious resources from core research and development of new therapies for patients due to overly complex controls or unnecessary evaluation of controls."[22]

2.3. Summary

We expect that several provisions of SOX, including those affecting the structure of boards, the liability and penalties associated with securities fraud, and rules related to internal controls, discourage corporate risk-taking. Although it is difficult to disentangle the effects that other provisions of SOX might have on corporate risk-taking, these two sets of provisions have engendered the most controversy and are likely to be the most important. Several academic papers find evidence consistent with this prediction.

Graham et al. (2003) provide survey evidence that CFOs believe SOX adversely affects corporate risk-taking by "providing an environment in which second-guessing of actions taken by management is more prevalent … and … altering compensation incentives, which might affect risk-taking motivations (p. 36)." Consistent with this view, Cohen et al. (2007) find evidence of reduced risk-taking by US companies after SOX and link it to a reduction in the use of stock options in executive compensation plans following SOX. Wintoki (2007) finds that residual stock returns around announcements of events related to the passage and adoption of SOX and related regulations vary inversely with firms' growth opportunities and the uncertainty of their business environments. Litvak (2007) also finds stock price evidence consistent with the view that SOX has adversely affected corporate risk-taking.

We add to the literature on the relation between SOX and corporate risk-taking. Similar to Cohen et al. (2007), we directly examine whether there was a significant change in investments made by publicly traded US firms and their stock price volatility after SOX. Our analysis, which complements Cohen et al. (2007), differs from their analysis in several ways. First, we use a benchmark sample of non-US firms to control for inter-temporal changes in the key variables. Second, in addition to analyzing changes in capital expenditures, R&D, and stock price volatility after SOX, we examine changes in cash holdings of US versus non-US firms after SOX. Third, we focus on firm characteristics that might explain the change in risk-taking observed after SOX, including board structure, firm size, and R&D intensity. Unlike Cohen et al. (2007), we do not examine changes in management compensation contracts after SOX. To do so, in the context of our study, would require analysis of how managerial incentives changed in US firms, as compared with non-US firms, after SOX, a topic that is worthy of investigation but beyond the scope of our present analysis.

3. Sample and data

3.1. Sample

Excluding financial firms (two-digit SIC equal to 67) and cross-listed non-US firms, the sample consists of 2171 US and non-US publicly traded corporations, including 1764 US, 325 UK, and 82 Canadian firms.[23] These firms represent all US, U.K, and Canadian firms in the Thomson One Banker database for which there is consistent time series data, spanning the adoption of SOX, on the key variables used in the analyses. Specifically, to be included in the sample we require that the following variables are available for at least twelve years during the period of 1994 through 2006: assets, capital expenditures, and cash holdings. Because data on R&D expenditures is considerably sparser, existing for only 884 firms (769 US and 115 non-US firms); we do not require data on R&D expenditures for each period in order for firms to be included in the sample.

[20] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007, p. 35.
[21] SEC Release Nos. 33-8810 and 34-55929; June 20, 2007, p. 36.
[22] Eisenberg (2007).
[23] One hundred and thirty non-US firms that are cross-listed in the US and 200 financial firms (two-digit SIC equal to 67) are excluded from this sample (19 financial firms are also cross-listed).

The sample consists of both large and small companies. For example, 231, or 13.1%, of the 1764 US companies in the year 2000 have assets more than $5 billion, and 250, or 14.2%, have assets less than $50 million. For the non-US 27, or 6.6%, of the 407 companies in the year 2000 have assets more than $5 billion, and 70, or 17.2%, have assets less then $50 million.

The sample spans a broad array of industries: 70 different two-digit SIC codes are represented. To determine whether the industry distributions of the two samples are similar, we calculate the correlation coefficient between the number of firms in each industry in the US and non-US samples. Across the 70 industries, the correlation coefficient is 0.71 and significant at the 0.001 level. Hence, the industry distributions of the two samples appear to be similar.

3.2. Data

We collect financial accounting data for the sample from the Thomson One Banker database. For each firm during the period 1994 through 2006 we collect the following data: capital expenditures, R&D expenditures, cash holdings, book value of assets, market value of assets, EBIT, and total debt. We express the variables CAPEX, capital expenditures, R&D, research and development expenditures, CASH, cash and short term securities, and EBIT, earnings before interest and taxes, as ratios to the average book value of assets. INVEST is the sum of CAPEX and R&D. We express DEBT, total debt, as a ratio to the average market value of assets. We express MB as the ratio of the market-to-book value of assets. Throughout the analysis, because SOX was passed in late July 2002, we define each year as August to July, i.e. the 2002 year begins on August 1, 2001 and ends on July 31, 2002.

We collect data on the annual growth rate in gross domestic product (GDP) in the US, UK, and Canada for each year from the International Monetary Fund's website. Data on stock prices, used to compute the stock-based risk measure, and returns on the US S&P500, UK FTSE100, and Canadian TSX Composite indices come from the Datastream database. Daily stock returns are calculated from the daily adjusted stock prices. The variable STD is the standard deviation of returns over the August–July year.

4. Empirical results on investment decisions and stock price volatility after SOX

To test whether risk-taking by publicly traded US companies declined significantly after SOX, we use both univariate and multivariate regression analysis. Each analysis is discussed in turn.

4.1. Summary statistics and univariate tests

The five panels of Table 1 provide summary statistics for the variables of interest based on different divisions of the sample. Panel A tabulates the means and medians over the entire sample period for the US sample and the non-US sample and tests for differences between the two samples. Across the full sample period, average levels of R&D, CASH, and STD are all significantly higher for US versus non-US firms. CAPEX is not significantly different at the mean, but is significantly lower in the US at median levels. Although INVEST is significantly higher in the US, this result is driven by the difference in R&D between the two samples. For the control variables, EBIT and DEBT are both higher and MB is lower in the non-US sample. These differences are all significant at the 0.01 level.

Panel B examines the sample of US firms exclusively and compares the earlier pre-SOX period (Period1: 1994–1997) to the post-SOX period (2003–2006). The results show that the five key variables all change from the pre-SOX to the post-SOX period. Average CAPEX, R&D, INVEST, and STD decreased while CASH increased. All five changes, significant at the 0.01 level, are consistent with the hypothesis that risk-taking in US firms decreased significantly after SOX.

Interestingly, as demonstrated in Panel C, not all of these changes are mirrored in the non-US sample. Panel C replicates Panel B using non-US instead of US firms. As in the US, average CAPEX decreases significantly in the non-US sample. In contrast to the US, the average changes for the non-US sample in R&D, CASH, and STD are in the opposite direction from the

Table 1
Summary statistics by country and time period.

Panel A: Summary statistics for US and non-US firms

	Means			Medians		
	US	Non-US	*p*-Value	US	Non-US	*p*-Value
CAPEX	0.0630	0.0646	0.105	0.0445	0.0488	0.000
R&D	0.0813	0.0359	0.000	0.0477	0.0178	0.000
INVEST	0.0988	0.0749	0.000	0.0704	0.0590	0.000
CASH	0.1605	0.1147	0.000	0.0689	0.0687	0.000
STD	0.0315	0.0188	0.000	0.0271	0.0159	0.000
EBIT	0.0691	0.0857	0.000	0.0907	0.0934	0.001
MB	1.8838	1.3074	0.000	1.2452	0.9915	0.000
DEBT	0.2134	0.2241	0.001	0.1502	0.1785	0.000

Table 1 (*continued.*)

Panel B: Summary statistics for US firms Period1 and post-SOX

	US Means			US Medians		
	Period1	Post-SOX	*p*-Value	Period1	Post-SOX	*p*-Value
CAPEX	0.0732	0.0484	0.000	0.0539	0.0332	0.000
R&D	0.0867	0.0768	0.000	0.0501	0.0451	0.000
INVEST	0.1107	0.0830	0.000	0.0798	0.0584	0.000
CASH	0.1611	0.1728	0.001	0.0639	0.0907	0.000
STD	0.0295	0.0271	0.000	0.0257	0.0231	0.000
EBIT	0.0877	0.0496	0.000	0.1025	0.0755	0.000
MB	1.9809	1.6943	0.000	1.3212	1.2337	0.000
DEBT	0.2028	0.2138	0.002	0.1351	0.1532	0.012

Panel C: Summary statistics for non-US firms Period1 and post-SOX

	Non-US Means			Non-US Medians		
	Period1	Post-SOX	*p*-Value	Period1	Post-SOX	*p*-Value
CAPEX	0.0708	0.0516	0.000	0.0546	0.0399	0.000
R&D	0.0325	0.0392	0.062	0.0178	0.0188	0.825
INVEST	0.0798	0.0634	0.000	0.0642	0.0492	0.000
CASH	0.1214	0.1127	0.079	0.0758	0.0664	0.324
STD	0.0141	0.0190	0.000	0.0121	0.0162	0.000
EBIT	0.1002	0.0629	0.000	0.1043	0.0758	0.000
MB	1.4049	1.1688	0.000	1.0785	0.9360	0.000
DEBT	0.2059	0.2460	0.000	0.1465	0.2207	0.000

Panel D: Summary statistics for US firms Period2 and post-SOX

	US Means			US Medians		
	Period2	Post-SOX	*p*-Value	Period2	Post-SOX	*p*-Value
CAPEX	0.0692	0.0484	0.000	0.0504	0.0332	0.000
R&D	0.0820	0.0768	0.028	0.0486	0.0451	0.005
INVEST	0.1050	0.0830	0.000	0.0772	0.0584	0.000
CASH	0.1499	0.1728	0.000	0.0543	0.0907	0.000
STD	0.0368	0.0271	0.000	0.0319	0.0231	0.000
EBIT	0.0782	0.0496	0.000	0.0984	0.0755	0.000
MB	2.0365	1.6943	0.000	1.2247	1.2337	0.098
DEBT	0.2141	0.2138	0.930	0.1497	0.1532	0.519

Panel E: Summary statistics for non-US firms Period2 and post-SOX

	Non-US Means			Non-US Medians		
	Period2	Post-SOX	*p*-Value	Period2	Post-SOX	*p*-Value
CAPEX	0.0730	0.0516	0.000	0.0572	0.0399	0.000
R&D	0.0361	0.0392	0.430	0.0168	0.0188	0.729
INVEST	0.0831	0.0634	0.000	0.0659	0.0492	0.000
CASH	0.1118	0.1127	0.859	0.0696	0.0664	0.546
STD	0.0219	0.0190	0.000	0.0191	0.0162	0.000
EBIT	0.0990	0.0629	0.000	0.1074	0.0758	0.000
MB	1.4155	1.1688	0.000	0.9974	0.9360	0.000
DEBT	0.2111	0.2460	0.000	0.1610	0.2207	0.000

The sample includes all US and non-US firms with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period. Financial firms and firms cross-listed in the US are excluded. Panel A reports mean and median values for US and non-US firms over the entire date range. Panel B reports mean and median values for US firms in Period1 (1994–1997) and the post-SOX period (2003–2006). Panel C replicates Panel B for the non-US sample. Panel D reports mean and median values for US firms in Period2 (1998–2001) and the post-SOX period (2003–2006). Panel E replicates Panel D for the non-US sample. The panels include 1764 US, 325 UK, and 82 Canadian firms with a total of 22,893, 4216, and 1066 firm-years, respectively. CAPEX is the capital expenditures for the year divided by the average assets for the year. R&D is the R&D expenditures for the year divided by the average assets for firm-years with non-zero R&D expense. INVEST is the sum of CAPEX and R&D. CASH is the year-end level of cash and short-term investments divided by average assets. STD is the standard deviation of the returns for the year. EBIT is the earnings before interest and taxes divided by average assets. MB is the year-end market value of the assets divided by the year-end book value of the assets. DEBT is the average debt divided by the average market value of assets. All variables are winsorized at the 1% and 99% levels. *p*-Values are based on two-sided tests resulting from difference in means tests and from Wilcoxon rank-sum tests.

respective changes for the US sample, although only the mean and median changes in STD are significant at conventional levels.

The analyses in Panels D and E parallel those in Panels B and C except they compare the latter pre-SOX period (Period2: 1998–2001) and the post-SOX period. The results in Panel D for the US are the same as those in Panel B. The results for the non-US sample in Panel E differ slightly from those in Panel C in that STD decreases significantly from the pre- to post-SOX period.

Taken together these univariate results suggest that the decrease in risk-taking after SOX is unique to the US sample. In the next section we investigate this question in a setting that allows for direct tests of the US vs. non-US sample while controlling for observed and unobserved firm specific characteristics.

4.2. Basic regression results

To test more thoroughly whether there was a significant change in the investment decisions and stock price volatility of US firms after SOX, we estimate a series of regression equations. In each set of equations, we estimate separate regressions for the five variables of interest—CAPEX, R&D, INVEST, CASH, and STD.[24] Using a firm fixed effects model, each of these variables is regressed on a set of independent variables for a panel dataset consisting of all 2171 US and non-US firms over the period of 1994 through 2006.

The regressions include two variables that control for the health of the US and non-US economies—(i) the one-year return on the US S&P500 Index for US firms, the UK FTSE100 Index for UK firms, and the TSX Composite Index for Canadian firms and (ii) GDP growth, expressed as the percent change in US GDP for US firms, UK GDP for UK firms, and Canada's GDP for Canadian firms, as independent variables.[25] We expect these variables to be directly related to CAPEX, R&D, and INVEST as companies' investments should be directly related to the health of the overall economy. We are less clear about the expected coefficient on these two variables in the CASH and STD equations. Firms may hold more cash when the economy is performing well as they have more earnings to retain. Alternatively, firms might hold less cash and instead invest more in CAPEX and R&D when the economy is performing well. Also, insofar that a strong economy is associated with increased growth options, then the two variables might be associated with increases in uncertainty and therefore increases in STD. Alternatively, insofar as a strong economy decreases corporate debt-equity ratios, by increasing corporate equity values, an inverse relation between the two variables and STD might be expected.

The regressions also include measures of EBIT, the ratio of the market-to-book value of assets (MB), DEBT (used only in the STD equation), and their interactions with a dummy variable for US companies. We expect CAPEX, R&D, and INVEST to be directly related to both profits, as measured by EBIT, and growth opportunities, as measured by MB. We expect CASH to be directly related to EBIT, as more profitable firms have more earnings to retain as cash, and inversely related to MB, as firms with higher growth opportunities are expected to hold less cash. We expect STD to be directly related to MB as firms with higher growth opportunities are expected to have greater equity risk. We do not have a clear prediction about the relation between STD and EBIT. We expect STD to be directly related to DEBT, as, all else equal, more debt results in greater equity risk.[26]

Except for GDP growth, which is measured on a calendar year basis, all other variables used in the regressions are measured from August of one year through July of the following year. All of the independent variables mentioned above are lagged one year.

The regressions also include two dummy variables. US Post-SOX takes the value of one if the observation is a US firm in the post-SOX period and, zero otherwise. Non-US Post-SOX takes the value of one if the observation is a non-US firm in the post-SOX period, and zero otherwise. To test if the variables of interest changed significantly for US firms relative to non-US firms in the post-SOX period, an *F*-test is conducted to determine if there is a significant difference in the coefficients on US Post-SOX and Non-US Post-SOX.

Table 2 contains the results for five regressions, one specification for each of the five dependent variables. The results show that all five dependent variables changed significantly for US firms in the post-SOX period in the direction consistent with a reduction in risk-taking. In particular, the US Post-SOX dummies indicate that CAPEX, R&D, INVEST, and STD all decreased and CASH increased in the US in the post-SOX period. In every case the US Post-SOX dummy is significant at the 0.01 level. CAPEX, R&D, INVEST, and STD also significantly changed for the non-US firms, while the change in CASH is insignificant. In order to sharpen the comparison between US and non-US firms, consider the relative magnitudes of change and *F*-tests reported at the bottom of Table 2.

The changes in CAPEX are not statistically different for the US and non-US samples. However changes in R&D and INVEST are significantly different across the two samples.[27] In the R&D equation, the coefficients on US Post-SOX and

[24] Throughout all regression analyses R&D is set equal to zero if R&D is missing.

[25] We thank the referee for suggesting the inclusion of GDP growth as an independent variable.

[26] Table A1 in the appendix contains a correlation matrix for the independent variables used in the regression analyses.

[27] If the regressions in Table 2 are run with only the US Post-SOX and Non-US Post-SOX dummies and no control variables, then all five models show a significant difference between the estimates on the US Post-SOX and Non-US Post-SOX dummies. In particular, in the CAPEX model the estimates are −0.0214 and −0.0189 for US Post-SOX and Non-US Post-SOX dummies, respectively, and are significantly different indicating a sharper decline in CAPEX in the US relative to the non-US sample.

Table 2
Multivariate regression analysis.

	Model 1 CAPEX	Model 2 R&D	Model 3 INVEST	Model 4 CASH	Model 5 STD
US Post-SOX	−0.0171***	−0.0028***	−0.0199***	0.0247***	−0.0080***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-US Post-SOX	−0.0161***	0.0022***	−0.0139***	0.0009	−0.0008**
	[0.000]	[0.002]	[0.000]	[0.773]	[0.021]
Index Return	0.0109***	0.0025*	0.0134***	0.0343***	−0.0163***
	[0.000]	[0.096]	[0.000]	[0.000]	[0.000]
GDP Growth	0.0007**	0.0001	0.0008*	−0.0038***	0.0013***
	[0.040]	[0.685]	[0.065]	[0.000]	[0.000]
EBIT	0.0391***	−0.0160**	0.0231*	0.0332	−0.0017
	[0.000]	[0.013]	[0.050]	[0.128]	[0.410]
US*EBIT	0.0056	−0.0187**	−0.0131	−0.0204	−0.0072***
	[0.629]	[0.038]	[0.338]	[0.399]	[0.003]
MB	0.0025***	0.0016	0.0042***	0.0103***	0.0005***
	[0.001]	[0.120]	[0.008]	[0.000]	[0.007]
US*MB	0.0005	−0.0009	−0.0005	0.0059**	−0.0004*
	[0.589]	[0.438]	[0.790]	[0.011]	[0.055]
DEBT					0.0057***
					[0.006]
US*DEBT					0.0084***
					[0.000]
Constant	0.0617***	0.0342***	0.0959***	0.1548***	0.0294***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	26,044	26,044	26,044	26,044	24,803
Number of firms	2166	2166	2166	2166	2078
Adjusted R^2	0.085	0.018	0.053	0.059	0.112
F-test: US = non-US	0.40	31.74***	11.72***	50.32***	370.85***
p-Value	0.528	0.000	0.001	0.000	0.000

The sample includes all US and non-US firms with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period. Financial firms and firms cross-listed in the US are excluded. The dependent variable in model (1) is CAPEX, (2) is R&D, (3) is INVEST, (4) is CASH, and (5) is STD. US Post-SOX (non-US Post-SOX) is an indicator variable equal to one for US firms (non-US firms) in the years 2003 through 2006. Index Return is the return on the S&P500 index for US firms, the return on the FTSE100 index for UK firms, and the return on the TSX Composite index for Canadian firms. GDP growth is the growth in GDP for the respective firm's country. Remaining variables are defined in the header to Table 1. The control variables other than the Post-SOX indicators are lagged one year. Variables other than Index Return and GDP Growth are winsorized at the 1% and 99% levels. The estimates are from firm fixed effects regressions. The *F*-tests test if the coefficient on US Post-SOX equals the coefficient on non-US Post-SOX. *p*-Values are in brackets and are based on two-sided tests. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Non-US Post-SOX are significantly different (*F*-statistic of 31.74)—the coefficient on US Post-SOX is a significantly negative -0.0028, whereas the coefficient on UK Post-SOX is a significantly positive 0.0022. Hence, R&D spending fell significantly for US firms in the post-SOX period, while it increased significantly for non-US firms. The aggregate investment in CAPEX and R&D as measured by INVEST has declined more significantly in the US relative the non-US sample as evidenced by an *F*-statistic of 11.72.

CASH levels increased significantly in the US post-SOX while remaining unchanged for non-US firms (0.0247 vs. 0.0009; *F*-statistic of 50.32). Because cash is a low-risk asset, this result also is consistent with the view that SOX has resulted in a reduction in corporate risk-taking.[28] In the STD equation, the coefficient on US Post-SOX is highly significant -0.0080 and the coefficient on Non-US Post-SOX is a significant −0.0008. The *F*-statistic of 370.85 indicates the difference in the two

[28] We replicate the results for the CASH equation by including the independent variables used by Bates et al. (forthcoming) in a study of firms' cash holdings. The variables include variation in industry cash flows, a dummy variable that takes the value of one if the firm pays a dividend and zero otherwise, firm size, CAPEX, R&D, net working capital, and debt-to-book value of equity. The coefficients on firm size, CAPEX, R&D, net working capital, and debt-to-book value of equity are negative and significant at the 0.01 level. The coefficients on the other additional variables are not significant. Most importantly, the coefficient on US Post-SOX remains positive and significant at the 0.01 level and it remains significantly larger than the corresponding coefficient on UK Post-SOX. In addition, we examined whether the increase in cash holdings of US firms might have occurred because their foreign profits would have been taxed if they had been repatriated, as discussed in Foley et al. (2007). Specifically, we estimated a regression in which we included dummy variables for US firms with and without foreign sales in the post-SOX period as independent variables. The coefficient on the dummy variable for firms with no foreign sales is positive and significant and also significantly larger than the corresponding coefficient for UK firms in the post-SOX period. Because firms with no foreign sales presumably do not have foreign profits, this tax explanation cannot explain the significant increase in the cash holdings of these firms. The results also show that the dummy variable for US firms with foreign sales is significantly larger than the corresponding coefficient on the dummy variable for US firms with no foreign sales, which is consistent with the results in Foley et al. (2007).

coefficients is significant, thus, indicating that following enactment of SOX there was a significant decline in the volatility of US stock returns as compared with non-US stock returns. This, too, is consistent with the view that SOX has discouraged corporate risk-taking by US firms vis-à-vis non-US firms.

In addition, several of the control variables enter with significant coefficients and usually have the anticipated signs. The lagged index return enters with positive coefficients (all significant at the 0.05 level except in the R&D equation) in all but the STD equation. GDP growth enters with positive and significant coefficients in the CAPEX and STD equations, a negative and significant coefficient in the CASH equation, and a coefficient that is not significant in the R&D equation. EBIT enters with a positive and significant coefficient in the CAPEX equation, negative and significant coefficient in the R&D equation, and coefficients that are not significant in the CASH and STD equations. MB enters with positive and significant coefficients the CAPEX, INVEST, CASH, and STD equations. The MB coefficient is not significant in the R&D equation. The coefficient on DEBT, which only enters as an independent variable in the STD equation, is positive and significant.

To assuage any concern that our results are affected by differences in industry concentration or firm size between the US and non-US samples, Table 3 repeats the Table 2 analysis for an industry and size-matched sample of US and non-US firms. Each US firm is matched to a non-US firm in the same one-digit SIC and closest in total assets; matching is done with replacement of non-US firms. The results in Table 3 are consistent with those presented in Table 2, the only exceptions being that the post-SOX changes in CAPEX are significantly different for the US and non-US samples and the Non-US Post-SOX effect is negative and significant in the CASH equation. Hence, the results in Table 3 provide corroborating support for the premise that SOX has discouraged corporate risk-taking by US firms relative to non-US firms in similar industries and of similar size.

Returning to the full sample of firms, Table 4 presents an analysis similar to that shown in Table 2 with one modification. Instead of using the entire pre-SOX period of 1994–2002 as the reference point for the post-SOX period, we decompose the pre-SOX period into two sub periods, 1994–1997, referred to as Period 1, and 1998–2001, referred to as Period 2. Data from 2002, the year SOX was adopted, is excluded. We then use the 1994–1997 period as the reference point for both Period 2 and the post-SOX period. Hence, in the regression results reported in Table 4, we include four dummy variables: (i) a dummy variable for US firms in Period 2 (US Period2), (ii) a dummy variable for non-US firms in Period 2 (non-US Period2), (iii) US Post-SOX, and (iv) Non-US Post-SOX.

As in Table 2, we test whether the coefficients on US Post-SOX and Non-US Post-SOX are significantly different, which reveals whether there is a significant change in risk-taking by US companies in the post-SOX period as compared with the reference period of 1994–1997. We also test whether the difference in the coefficients on US Post-SOX and US Period2 is significantly different from the corresponding difference in the coefficients on Non-US Post-SOX and Non-US Period2. This test reveals if there has been a significant change in risk-taking by US companies in the post-SOX period as compared with the pre-SOX period of 1998–2001.

Table 4 shows that the difference in the coefficients on US Post-SOX and Non-US Post-SOX is highly significant in all five equations, indicating that there was a decline in risk-taking by US firms in the post-SOX period as compared with the pre-SOX period of 1994–1997. We also find that, except for CAPEX and INVEST, the difference in the coefficients on US [Post-SOX-Period2] is significantly different from the difference in Non-US [Post-SOX-Period2] at the 0.01 level, indicating that there also was a decline in risk-taking by US firms in the post-SOX period as compared with the pre-SOX period of 1998–2001.

We next present regression results testing whether the results reported in Table 2 are robust to controlling for three important firm characteristics—board structure, size, and R&D intensity.

4.3. Regression results partitioned by board structure

To test whether the change in risk-taking by US firms in the post-SOX period is related to the increased role played by independent directors after SOX, we replicate the results in Table 2, with one change. We classify US firms into two groups—(i) firms that had a minority (up to and including 50%) of outsiders on the board as of the end of 2001 (i.e., the year before the adoption of SOX) and (ii) firms that had a majority of outsiders on the board as of the same time. We collect data on the officers and directors from Compact Disclosure CDs. Any director who is also an officer of the company is defined as an inside director; all others are classified as outsiders.[29]

We then define two dummy variables: US Minority Outsiders Post-SOX, which takes the value of one for US firms in the first group during the Post-SOX period, and zero otherwise; and US Majority Outsiders Post-SOX, which takes the value of one for US firms in the second group during the Post-SOX period. These two dummy variables are then substituted for US Post-SOX in the regression models reported in Table 2. To test whether the change in risk-taking for US firms differs according to their pre-SOX board structures, we calculate an *F*-statistic testing whether there is a significant difference in the coefficients on US Minority Outsider Post-SOX and US Majority Outsiders Post-SOX.

Table 5 shows significant differences, at the 0.05 level, in the coefficients on the two variables in the CASH and STD equations. In the CASH equation, the coefficients on firms with outsiders comprising a minority and a majority of the boards before SOX are 0.0408 and 0.0240, respectively, and both are highly significant, indicating that both groups of firms

[29] Our definition does not distinguish between outside directors who have contractual relations with the company and other outside directors.

Table 3
Multivariate regressions with industry and size-matched sample.

	Model 1 CAPEX	Model 2 R&D	Model 3 INVEST	Model 4 CASH	Model 5 STD
US Post-SOX	−0.0143***	−0.0028***	−0.0171***	0.0248***	−0.0081***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-US Post-SOX	−0.0171***	0.0025***	−0.0146***	−0.0076***	−0.0016***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Index Return	0.0125***	0.0008	0.0133***	0.0440***	−0.0146***
	[0.000]	[0.318]	[0.000]	[0.000]	[0.000]
GDP Growth	0.0007***	0.0001	0.0008***	−0.0036***	0.0006***
	[0.005]	[0.413]	[0.007]	[0.000]	[0.000]
EBIT	0.0376***	−0.0066**	0.0310***	0.0511***	−0.0026**
	[0.000]	[0.040]	[0.000]	[0.000]	[0.036]
US*EBIT	0.0075	−0.0290***	−0.0215**	−0.0420***	−0.0065***
	[0.203]	[0.000]	[0.012]	[0.005]	[0.000]
MB	0.0044***	0.0058***	0.0102***	0.0045***	0.0011***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
US*MB	−0.0014**	−0.0052***	−0.0066***	0.0121***	−0.0009***
	[0.029]	[0.000]	[0.000]	[0.000]	[0.000]
DEBT					0.0081***
					[0.000]
US*DEBT					0.0049***
					[0.005]
Constant	0.0612***	0.0288***	0.0900***	0.1383***	0.0270***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	45,580	45,580	45,580	45,580	41,211
Number of firms	3694	3694	3694	3694	3365
Adjusted R^2	0.086	0.040	0.075	0.047	0.102
F-test: US = non-US	11.01***	81.68***	6.01**	250.81***	699.94***
p-Value	0.001	0.000	0.014	0.000	0.000

The sample includes all US firms and a matching non-US firm with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period. Each US firm is matched to the non-US firm in the same one-digit SIC that is closest in total assets; matching is done with replacement of non-US firms. The dependent variable in model (1) is CAPEX, (2) is R&D, (3) is INVEST, (4) is CASH, and (5) is STD. US Post-SOX (non-US Post-SOX) is an indicator variable equal to one for US firms (non-US firms) in the years 2003 through 2006 Remaining variables are defined in Tables 1 and 2. The control variables other than the Post-SOX indicators are lagged one year. Variables other than Index Return and GDP Growth are winsorized at the 1% and 99% levels. The estimates are from firm fixed effects regressions. The *F*-tests test if the coefficient on US Post-SOX equals the coefficient on non-US Post-SOX. *p*-Values are in brackets and are based on two-sided tests. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

significantly increased cash holdings in the post-SOX period. The *F*-statistic testing the difference between the two coefficients is 7.51 thus revealing that the increase in cash holdings is significantly greater for firms that had a minority of outsiders on the board before SOX. These are the firms most affected by the SOX-related change in listing standards requiring that boards be comprised of a majority of independent directors. Hence, these results are consistent with the prediction that the increased role played by independent directors after SOX has contributed to a reduction in risk-taking by publicly traded US companies. The R&D specification shows a reduction in R&D for both groups, with a greater reduction for US firms with a minority of outsiders on the board prior to SOX, but the difference is significant at only the 0.10 level.

In the STD equation, the coefficients on the two groups of firms are −0.0090 and −0.0076, respectively, and both are highly significant, indicating that firms with both a minority and a majority of outside directors before SOX experienced significant declines in stock price volatility after SOX. The *F*-statistic testing the difference in the two coefficients is 5.44, revealing that the decline in stock price volatility was greater for firms with a minority of outside directors before SOX, i.e., the firms most affected by the increased role of independent directors after SOX. This result also is consistent with the prediction that the reduction in risk-taking by publicly traded US companies after SOX is, at least in part, due to the increased importance of independent directors after SOX.

The coefficients on US Minority Outsider Post-SOX and US Majority Outsiders Post-SOX enter with negative and highly significant coefficients in the CAPEX and INVEST equations. Although the coefficient on US Minority Post-SOX is more negative in both equations, the corresponding *F*-statistics are 0.16 and 1.24 in the CAPEX and INVEST equations, respectively, revealing no significant difference in the two sets of coefficients. These results do not support the prediction that the expanded role for independent directors after SOX has discouraged risk-taking by publicly traded US companies.

Overall, the results related to pre-SOX board structure are mixed. Given that pre-SOX board structures are endogenous to firm characteristics, we cannot rule out the possibility that where we find significant relations between pre-SOX board

Table 4
Multivariate regressions with 4-year sub-periods.

	Model 1 CAPEX	Model 2 R&D	Model 3 INVEST	Model 4 CASH	Model 5 STD
US Period2	−0.0058***	−0.0030***	−0.0088***	−0.0200***	0.0113***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-US Period2	0.0013	0.0005	0.0018	−0.0148***	0.0088***
	[0.425]	[0.463]	[0.314]	[0.000]	[0.000]
US Post-SOX	−0.0224***	−0.0045***	−0.0269***	0.0195***	−0.0054***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-US Post-SOX	−0.0178***	0.0028***	−0.0150***	−0.0021	0.0012***
	[0.000]	[0.001]	[0.000]	[0.573]	[0.000]
Index Return	0.0083***	0.0029*	0.0112***	0.0385***	−0.0178***
	[0.000]	[0.065]	[0.000]	[0.000]	[0.000]
GDP Growth	−0.0004	0.0002	−0.0002	0.0012	−0.0019***
	[0.447]	[0.555]	[0.803]	[0.321]	[0.000]
EBIT	0.0408***	−0.0158**	0.0250**	0.0383*	−0.0040**
	[0.001]	[0.021]	[0.049]	[0.099]	[0.036]
US*EBIT	0.0081	−0.0221**	−0.014	−0.0322	−0.0061***
	[0.515]	[0.019]	[0.347]	[0.216]	[0.009]
MB	0.0022***	0.0016	0.0038**	0.0104***	0.0003**
	[0.006]	[0.154]	[0.019]	[0.000]	[0.040]
US*MB	0.0008	−0.0008	0.0001	0.0063**	−0.0002
	[0.334]	[0.541]	[0.968]	[0.011]	[0.184]
DEBT					0.0078***
					[0.000]
US*DEBT					0.0043*
					[0.064]
Constant	0.0689***	0.0355***	0.1043***	0.1469***	0.0356***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	23,969	23,969	23,969	23,969	22,815
Number of firms	2165	2165	2165	2165	2077
Adjusted R^2	0.096	0.021	0.061	0.064	0.219
F-tests:					
US Period2 = Non-US Period2	15.01***	14.08***	25.85***	1.77	41.53***
p-Value	0.000	0.000	0.000	0.183	0.000
US Post-SOX = Non-US Post-SOX	6.65***	45.48***	32.34***	26.55***	290.78***
p-Value	0.010	0.000	0.000	0.000	0.000
US[Post-SOX Period2] = Non-US[Post-SOX Period2]	1.85	14.07***	0.35	48.65***	419.43***
p-Value	0.174	0.000	0.553	0.000	0.000

The sample includes all US and non-US firms with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period. Financial firms and firms cross-listed in the US are excluded. All 2002 firm-years are excluded. The dependent variable in model (1) is CAPEX, (2) is R&D, (3) is INVEST, (4) is CASH, and (5) is STD. The table compares three distinct 4-year sub-periods. US Period2 (non-US Period 2) is an indicator variable equal to one for US firms (non-US firms) in the firm-years 1998 through 2001. US Post-SOX (non-US Post-SOX) is an indicator variable equal to one for US firms (non-US firms) in the firm-years 2003 through 2006. The reference period is 1994 through 1997. Remaining variables are defined in Tables 1 and 2. The control variables other than the period indicators are lagged one year. The estimates are from firm fixed effects regressions. The first set of *F*-tests test if the coefficient on US Period2 equals the coefficient on non-US Period2. The second set of *F*-tests test if the coefficient on US Post-SOX equals the coefficient on non-US Post-SOX. The final set of *F*-tests test if the difference in the coefficients on US Post-SOX and US Period2 equals the difference in the coefficients on non-US Post-SOX and non-US Period2. *p*-Values are in brackets and are based on two-sided tests. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

structure and post-SOX changes in risk-taking, the results could be explained by omitted variables associated with board structure.[30] However the fixed effects methodology does control for firm specific effects that are constant across time.

4.4. Regression results partitioned by firm size

As stated above, the SEC, in its interpretive guidance, cited that it considers firm size to be a variable associated with a greater likelihood of financial misstatements. As a result the expected costs of complying with Section 404 is expected to be

[30] We replicate the results in Table 5 by including dummy variables for the two pre-SOX subperiods instead of the one pre-SOX period. The *F*-tests for differences between US minority outsider firms and US majority outsider firms in the CAPEX, R&D, and INVEST equations are not significant for either of the pre-SOX periods versus the post-SOX period. In the CASH equation the difference is significant for each of the pre-SOX periods versus the post-SOX period and in the STD equation the difference is only significant for the early pre-SOX period versus the post-SOX period.

Table 5
Multivariate regressions with minority outsider boards table, outsider boards.

	Model 1 CAPEX	Model 2 R&D	Model 3 INVEST	Model 4 CASH	Model 5 STD
US Minority Outsiders Post-SOX	−0.0186***	−0.0065***	−0.0251***	0.0408***	−0.0090***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
US Majority Outsiders Post-SOX	−0.0175***	−0.0039***	−0.0214***	0.0240***	−0.0076***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-US post-SOX	−0.0160***	0.0022***	−0.0138***	0.0011	−0.0008**
	[0.000]	[0.002]	[0.000]	[0.710]	[0.022]
Index Return	0.0119***	0.0011	0.0129***	0.0322***	−0.0149***
	[0.000]	[0.502]	[0.000]	[0.000]	[0.000]
GDP Growth	0.0008**	0.0003	0.0011**	−0.0032***	0.0011***
	[0.048]	[0.313]	[0.031]	[0.001]	[0.000]
EBIT	0.0390***	−0.0159**	0.0231**	0.0333	−0.0017
	[0.000]	[0.014]	[0.050]	[0.126]	[0.394]
US*EBIT	0.014	−0.0222**	−0.0082	−0.0203	−0.0075***
	[0.244]	[0.015]	[0.563]	[0.436]	[0.002]
MB	0.0025***	0.0017	0.0042***	0.0103***	0.0005***
	[0.002]	[0.119]	[0.008]	[0.000]	[0.007]
US*MB	0.0008	−0.0011	−0.0003	0.0068***	−0.0003
	[0.368]	[0.339]	[0.853]	[0.006]	[0.159]
DEBT					0.0058***
					[0.005]
US*DEBT					0.0066***
					[0.007]
Constant	0.0614***	0.0350***	0.0964***	0.1567***	0.0290***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	19,976	19,976	19,976	19,976	18,887
Number of firms	1652	1652	1652	1652	1567
Adjusted R^2	0.096	0.020	0.062	0.058	0.116
F-test:					
US Minority Post-SOX = US Majority Post-SOX	0.16	2.87*	1.24	7.51***	5.44**
p-Value	0.691	0.090	0.265	0.006	0.020

The sample includes all US Majority, firms with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period non-US. Financial firms and firms cross-listed in the US are excluded. The dependent variable in model (1) is CAPEX, (2) is R&D, (3) is INVEST, (4) is CASH, and (5) is STD. The table compares US firms with minority outsider boards (including 50%) in the reference year 2001 to US firms with majority outsider boards in the year 2001. [The year prior to SOX, 2001, is chosen as the reference year for all firms.] US Minority Outsiders Post-SOX (US Majority Outsiders Post-SOX) is an indicator variable equal to one for the firm-years 2003 through 2006 for US firms that had a minority (majority) of outsiders on the board in the 2001 reference year. Remaining variables are defined in Tables 1 and 2. The control variables other than the Post-SOX indicators are lagged one year. The estimates are from firm fixed effects regressions. The *F*-tests test if the coefficient on US Minority Outsiders Post-SOX equals the coefficient on US Majority Outsiders Post-SOX. *p*-Values are in brackets and are based on two-sided tests. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

greater for large versus small firms. Hence, we also partition US firms by size, as measured by the book value of their assets as of year-end 2001, the year prior to SOX. The median value of assets for US firms in our sample for 2001 is $502 million. We define a US firm as large, for all firm years, if it had more than $502 million in assets in 2001 and small, for all firm years, if it had less than $502 million in assets in 2001.

We then create two dummy variables, (i) US Large Post-SOX, which takes the value of one if the firm is a "large" US firm and the year is 2003–2006, and zero otherwise; and (ii) US Small Post-SOX, which takes the value of one if the firm is a "small" US firm and the year is 2003–2006, and zero otherwise. We substitute these two dummy variables for US Post-SOX in the same regression models reported in Table 2. To test whether the change in risk-taking after SOX differs significantly for large versus small firms, we calculate an *F*-statistic corresponding to the difference in the two coefficients.

Table 6 shows that for all equations the difference in the coefficients on the two variables is highly significant. In the CAPEX, R&D, INVEST, and CASH equations, the directions and relative magnitudes are consistent with the prediction that larger firms, because of their complexity, are more likely to reduce risk-taking so as to reduce the expected costs of complying with Section 404.

In the CAPEX equation, the coefficients on US Large Post-SOX and US Small Post-SOX are −0.0204 and −0.0134, respectively, and both are highly significant. The *F*-statistic corresponding to the difference in the two coefficients is 34.13, indicating that larger US firms reduced their capital expenditures more than smaller US firms in the post-SOX period. Similarly, in the R&D equation, the coefficients on the two variables are −0.0044 and −0.0011, respectively, and the first is highly significant. The *F*-statistic testing the difference in the two coefficients is 9.42, revealing that larger US firms reduced

Table 6
Multivariate regressions with large and small firms.

	Model 1 CAPEX	Model 2 R&D	Model 3 INVEST	Model 4 CASH	Model 5 STD
US Large Post-SOX	−0.0204***	−0.0044***	−0.0248***	0.0278***	−0.0062***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
US Small Post-SOX	−0.0134***	−0.0011	−0.0145***	0.0213***	−0.0098***
	[0.000]	[0.282]	[0.000]	[0.000]	[0.000]
Non-US Post-SOX	−0.0161***	0.0022***	−0.0139***	0.0009	−0.0008**
	[0.000]	[0.002]	[0.000]	[0.766]	[0.022]
Index Return	0.0110***	0.0026*	0.0136***	0.0342***	−0.0164***
	[0.000]	[0.089]	[0.000]	[0.000]	[0.000]
GDP Growth	0.0007*	0.0001	0.0008*	−0.0038***	0.0013***
	[0.050]	[0.712]	[0.081]	[0.000]	[0.000]
EBIT	0.0390***	−0.0160**	0.0230*	0.0332	−0.0017
	[0.000]	[0.013]	[0.050]	[0.128]	[0.412]
US*EBIT	0.0057	−0.0186**	−0.0129	−0.0212	−0.0073***
	[0.620]	[0.039]	[0.347]	[0.382]	[0.002]
MB	0.0025***	0.0016	0.0042***	0.0103***	0.0005***
	[0.001]	[0.120]	[0.008]	[0.000]	[0.007]
US*MB	0.0005	−0.0009	−0.0003	0.0059**	−0.0004*
	[0.534]	[0.463]	[0.842]	[0.012]	[0.052]
DEBT					0.0057***
					[0.006]
US*DEBT					0.0074***
					[0.002]
Constant	0.0618***	0.0343***	0.0961***	0.1546***	0.0294***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	26,010	26,010	26,010	26,010	24,771
Number of firms	2163	2163	2163	2163	2075
Adjusted R^2	0.086	0.019	0.055	0.058	0.117
F-test:					
US Large = US Small (Post-SOX)	34.13***	9.42***	38.76***	3.88**	107.01***
p-Value	0.000	0.002	0.000	0.049	0.000

The sample includes all US and non-US firms with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period. Financial firms and firms cross-listed in the US are excluded. The dependent variable in model (1) is CAPEX, (2) is R&D, (3) is INVEST, (4) is CASH, and (5) is STD. The table compares large US firms (above the US median assets in the year 2001) to small US firms (below the US median assets in the year 2001). [The year prior to SOX, 2001, is chosen as the reference year for all firms.] US Large Post-SOX (US Small Post-SOX) is an indicator variable equal to one for the firm-years 2003 through 2006 for large (small) US firms. Remaining variables are defined in Tables 1 and 2. The control variables other than the Post-SOX indicators are lagged one year. The estimates are from firm fixed effects regressions. The *F*-tests test if the coefficient on US Large Post-SOX equals the coefficient on US Small Post-SOX. *p*-Values are in brackets and are based on two-sided tests. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

R&D spending more than smaller US firms. In the INVEST equation, the coefficients on the two variables are −0.0248 and −0.0145, respectively, and both are highly significant. The *F*-statistic testing the difference in the two coefficients is 38.76, revealing that larger US firms reduced aggregate investment in CAPEX and R&D more than smaller US firms.

The coefficients on the two variables in the CASH equation are 0.0278 and 0.0213, respectively, and both are highly significant. The *F*-statistic testing the difference in the two coefficients is 3.88, indicating the difference is significant. Consistent with a greater sensitivity to SOX-related impacts, larger firms increase cash holdings by a relatively larger amount than smaller firms in the post-SOX period.

In the STD equation, the coefficients on the two variables are −0.0062 and −0.0098, respectively, and both are highly significant. The *F*-statistic testing the difference in the two coefficients is 107.01, indicating that the stock price volatility of smaller US companies declined more in the post-SOX period than the stock price volatility of larger US companies. These results are not consistent with the prediction that the expected costs of complying with Section 404 are directly related to firm size.[31]

[31] We replicate the results in Table 6 by including dummy variables for the two pre-SOX subperiods instead of the dummy variable for the one pre-SOX period. In the CAPEX, R&D, and INVEST equations the difference between large firms and small firms is significant for each of the pre-SOX periods versus the post-SOX period. In the CASH equation the difference is not significant for either of the pre-SOX periods versus the post-SOX period. In the STD equation the decrease is significantly greater for small firms for each of the pre-SOX periods versus the post-SOX period.

Table 7
Multivariate regressions with R&D and non-R&D firms.

	Model 1 CAPEX	Model 2 CASH	Model 3 STD
US R&D Post-SOX	−0.0191***	0.0299***	−0.0088***
	[0.000]	[0.000]	[0.000]
US No R&D Post-SOX	−0.0155***	0.0208***	−0.0073***
	[0.000]	[0.000]	[0.000]
Non-US Post-SOX	−0.0161***	0.0009	−0.0007**
	[0.000]	[0.767]	[0.023]
Index Return	0.0109***	0.0344***	−0.0163***
	[0.000]	[0.000]	[0.000]
GDP Growth	0.0007**	−0.0038***	0.0013***
	[0.044]	[0.000]	[0.000]
EBIT	0.0391***	0.0332	−0.0017
	[0.000]	[0.128]	[0.411]
US*EBIT	0.0056	−0.0206	−0.0074***
	[0.629]	[0.395]	[0.002]
MB	0.0025***	0.0103***	0.0005***
	[0.001]	[0.000]	[0.007]
US*MB	0.0005	0.0060**	−0.0004**
	[0.552]	[0.011]	[0.048]
DEBT			0.0057***
			[0.006]
US*DEBT			0.0082***
			[0.000]
Constant	0.0618***	0.1546***	0.0294***
	[0.000]	[0.000]	[0.000]
Firm fixed effects	Yes	Yes	Yes
Observations	26,010	26,010	24,771
Number of firms	2163	2163	2075
Adjusted R^2	0.085	0.058	0.114
F-test:			
US R&D = US No R&D (Post-SOX)	9.50***	7.30***	18.69***
p-Value	0.002	0.007	0.000

The sample includes all US and non-US firms with at least 12 years of data available from Thomson ONE Banker database during the 1994 through 2006 period. Financial firms and firms cross-listed in the US are excluded. The dependent variable in model (1) is CAPEX, (2) is CASH, and (3) is STD. The table compares US firms with R&D expenses to US firms with no R&D expenses. The year prior to SOX, 2001, is chosen as the reference year for all firms. US R&D Post-SOX (US No R&D Post-SOX) is an indicator variable equal to one for the firm-years 2003 through 2006 for R&D (no R&D) US firms. Remaining variables are defined in Tables 1 and 2. The control variables other than the Post-SOX indicators are lagged one year. The estimates are from firm fixed effects regressions. The *F*-tests test if the coefficient on US Large Post-SOX equals the coefficient on US Small Post-SOX. *p*-Values are in brackets and are based on two-sided tests. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

4.5. Regression results partitioned by R&D spending

Finally, we partition the sample of US firms by R&D spending. We create two dummy variables: (i) US R&D Post-SOX, which takes the value of one if the firm is a US firm in the post-SOX period and reported nonzero R&D spending in 2001, and zero otherwise; and (ii) US No R&D Post-SOX, which takes the value of one if the firm is a US firm in the post-SOX period and reported zero R&D spending in 2001, and zero otherwise.[32] These two dummy variables are substituted for US Post-SOX in the regression model reported in Table 2. An *F*-statistic is then calculated to test whether there is a significant difference in the coefficients on the two variables.

Table 7 shows that in all three equations the coefficients on the two variables are significantly different and in the directions consistent with the prediction that firms characterized by a large amount of specialized knowledge, as measured by R&D, are more likely to reduced risk-taking after SOX because of the Section 404 rules.

In the CAPEX equation, the coefficients on US R&D Post-SOX and US No R&D Post-SOX are −0.0191 and −0.0155, respectively, and both are highly significant. The *F*-statistic of 9.50 indicates that US firms with R&D expenditures reduced CAPEX significantly more in the post-SOX period than US firms without R&D expenditures.

In the CASH equation, the coefficients on the two variables are 0.0299 and 0.0208, respectively, and both are highly significant. The *F*-statistic is 7.30, indicating that firms reporting nonzero R&D expenditures before SOX increased their cash

[32] Because firms are not required to report R&D expenditures if they are less than 1% of sales, it is possible that firms reporting zero R&D actually had nonzero R&D spending. We thank the referee for noting this point.

holdings after SOX by significantly more than other firms. This result is consistent with the prediction that firms characterized by large amounts of specialized knowledge were more likely to reduce their risk after SOX.

In the STD equation, the coefficients on the two variables are −0.0088 and −0.0073, respectively, and both are highly significant. The *F*-statistic corresponding to the difference in the two coefficients is 18.69, indicating that firms with nonzero R&D spending before SOX experienced a significantly larger decline in stock price volatility after SOX. This result also is consistent with the prediction that SOX caused firms with more specialized knowledge to curtail risk-taking by a larger amount than other firms.[33]

Finally, the results presented in Table 7 are not sensitive to the base year chosen for classifying firms as R&D vs. non-R&D. For example, if 1998 is used as the pre-SOX base year, the results presented in Table 7 are largely unaffected. Furthermore, the results shown in Table 7 are robust to including only firms that have either positive R&D spending or no R&D spending for all firm years.

5. Concluding comments

This paper finds that adoption of the Sarbanes-Oxley Act of 2002 is associated with a significant subsequent reduction in risk-taking by publicly traded US companies. We find evidence of this in both the investment decisions of US firms and their stock price volatility, as compared with UK and Canadian firms, after SOX. The results complement results found in Cohen et al. (2007), who find that the reduction in risk-taking is associated with changes in executive compensation contracts after SOX. We find that the changes are related to various firm characteristics, including pre-SOX board structure, firm size, and the degree of specialized knowledge, as measured by R&D expenditures.

We acknowledge it is difficult to isolate the effect that SOX, as opposed to other factors, might have had on risk-taking by US companies in the post-SOX period. However, we consider several other factors and conclude they cannot account for the post-SOX decline in risk-taking by publicly traded US companies.

First, GDP growths in the US, U.K, and Canada were similar during the sample period. For example in the post-Sox period of 2003 through 2006, median annual GDP growths in the US, UK, and Canada were 2.97%, 2.84%, and 2.99%, respectively. Furthermore, we include GDP growth as an independent variable in our regression analysis. Consequently, we do not believe that the results can be explained by relative weakness in the US economy in the post-SOX period.

Second, we do not believe that the decline in US stock prices from August 2000 through July 2002, accounted for disproportionately by a decline in the US tech sector, can explain the results. As Fig. 1 shows, the declines in stock prices in the US, UK, and Canada were comparable over this period—the total returns on the US S&P500 Index, UK FTSE100 Index, and TSX Composite Index were −36.29%, -33.26%, and −40.82%, respectively. In addition, we include lagged stock market index returns as an independent variable in the various regression equations that we estimated. Furthermore, we find that the post-SOX decline in risk-taking is significant regardless of whether we define the pre-SOX period as 1994–1997, which preceded what is generally viewed as the period in which tech companies invested heavily, or 1998–2001, the period of substantial tech investments. Hence, we do not believe that the decline in US stock prices or the decline in the US tech sector can explain the results.

Third, we do not believe that the terrorist attack on the US in September 2001 or other factors caused a relative increase in uncertainty about the US business environment that might have caused US firms to reduce their risk-taking activities in the post-SOX period. As shown in Fig. 2, the standard deviation of daily returns on the US S&P500 Index, UK FTSE100 Index, and TSX Composite Index, a proxy for uncertainty, were similar over the sample period. For example, the median annual standard deviation on the US, UK, and Canadian indices were 0.71%, 0.75%, and 0.85%, respectively, in the post-SOX period. Based on these data, it does not appear that the reduction in risk-taking by US companies after SOX can be explained by an increase in relative uncertainty about the US economy in the post-SOX period.

Finally, we consider the possibility that a change in accounting rules requiring the expensing of employee stock option grants might have contributed to the decline in risk-taking by US companies after SOX. According to this conjecture, Statement of Financial Accounting Standards No. 123 (revised 2004), which requires publicly traded US companies to expense stock-based compensation on their income statements, might have discouraged companies from using executive stock options, thereby reducing managerial incentives to take on risky projects.[34] However, the rule went into effect for most publicly traded US companies in 2006, which accounts for only 1 of the 4 years in the post-SOX period used in the analysis.[35] We find that our baseline results, as represented in Tables 2 and 3, are largely unaffected if we define the post-SOX period as 2003–2005, so as to exclude any effect the expensing of stock options might have had on corporate risk-

[33] We replicate the results in Table 7 by including dummy variables for the two pre-SOX subperiods instead of the one pre-SOX period. The decrease in CAPEX for R&D firms is significantly larger than the decrease for non-R&D firms for each of the pre-SOX periods versus the post-SOX period. The increase in CASH is significantly larger for R&D firms in the later pre-SOX period versus the post-SOX period only. The decrease in STD is significantly larger for R&D firms in the later pre-SOX period versus the post-SOX period only.

[34] The Financial Accounting Standards Board published Statement of Financial Accounting Standards No. 123 (revised 2004), Share-Based Payment (“Standard No. 123”) in December 2004.

[35] The SEC amended Regulation S-X to require compliance with Statement of Financial Accounting Standards No. 123 (revised 2004), Share-Based Payment (“Statement No. 123R”) for publicly traded companies that were not small business issuers beginning with the first interim or annual reporting period of a company's first fiscal year beginning on or after June 15, 2005. See SEC Release Nos. 33-8568; 34-51558; 35-27959; IC-26833; and FR-74, April 15, 2005.

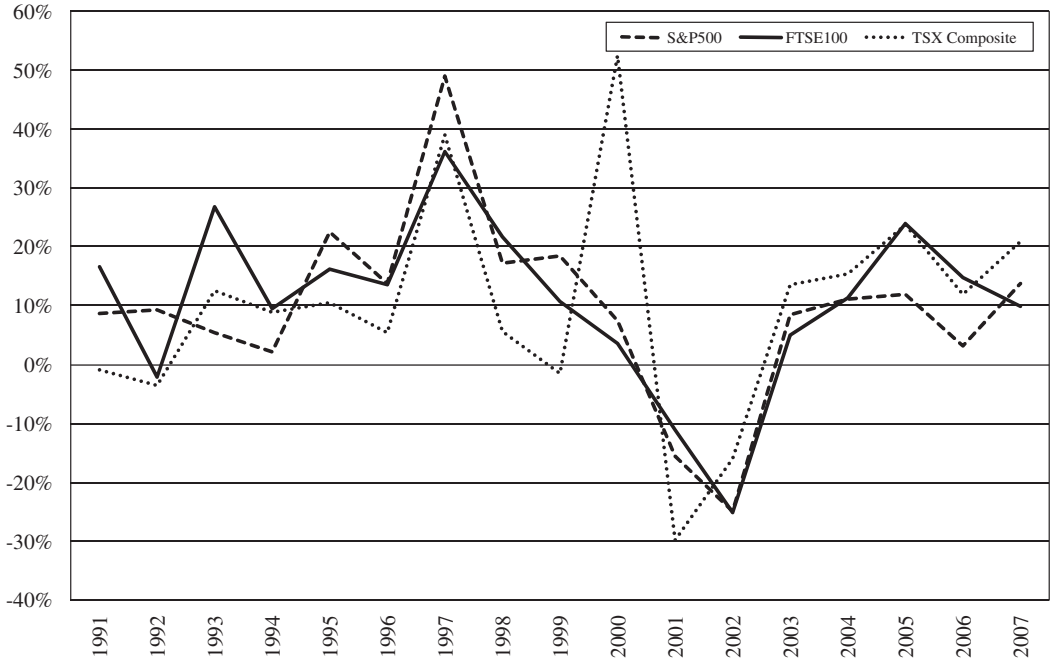

Fig. 1. Returns for the S&P500, FTSE100, and TSX Composite based on daily returns.

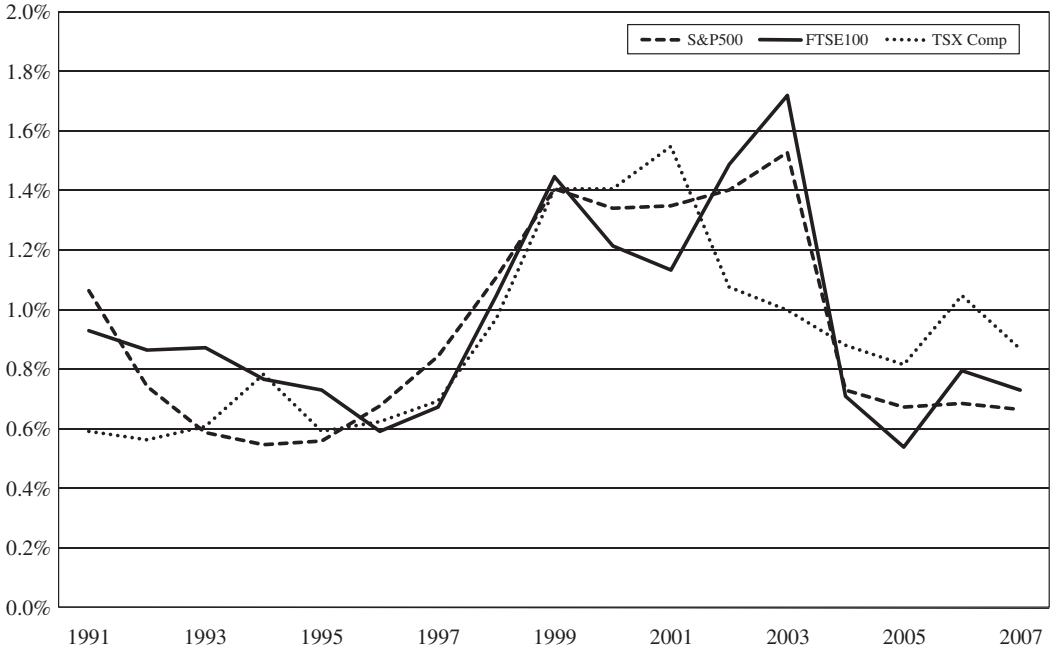

Fig. 2. Standard deviations for the S&P500, FTSE100, and TSX Composite based on daily returns.

taking. Hence, we are confident that our results are not explained by the change in rules regarding the expensing of stock options.

We make no normative judgment as to whether the reduction in risk-taking after SOX is socially efficient. However, if on average firms adopted value-maximizing governance structures before SOX, and we presume they did, then the changes in risk-taking induced by SOX are inefficient. Furthermore, insofar that a major source of agency problems is that managers are more risk averse than stockholders want them to be, then SOX may be aggravating this problem, leading to further value destruction. These issues await further investigation.

Table A1
Correlations.

	CAPEX	R&D	INVEST	CASH	STD	EBIT	MB	DEBT	ASSETS
R&D	−0.0648								
p-Value	0.000								
INVEST	0.6468	0.7192							
p-Value	0.000	0.000							
CASH	−0.1162	0.4489	0.2622						
p-Value	0.000	0.000	0.000						
STD	−0.0448	0.3218	0.2176	0.2576					
p-Value	0.000	0.000	0.000	0.000					
EBIT	0.1185	−0.3577	−0.1869	−0.2133	−0.3417				
p-Value	0.000	0.000	0.000	0.000	0.000				
MB	0.0723	0.3395	0.3099	0.3928	0.1706	−0.1202			
p-Value	0.000	0.000	0.000	0.000	0.000	0.000			
DEBT	−0.0833	−0.2897	−0.2794	−0.4024	−0.0717	−0.0801	−0.3429		
p-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
ASSETS	−0.0438	−0.0352	−0.0574	−0.0503	−0.0698	0.0087	−0.0288	0.1648	
p-Value	0.000	0.000	0.000	0.000	0.000	0.157	0.000	0.000	
OUTSIDE	−0.0554	0.0209	−0.0208	−0.0527	−0.1511	−0.0058	−0.0220	0.0491	0.0656
p-Value	0.000	0.009	0.009	0.000	0.000	0.478	0.006	0.000	0.000

OUTSIDE is the percentage of board of directors that are not officers of the firm. Board data is available for US firms only. All other variables are defined in Table 1. All *p*-Values are based on two-sided tests.

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Appendix

See Table A1.

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