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SOX Section 404 and Corporate Innovation

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Abstract

This paper exploits a quasi-natural experiment to investigate the relation between Sarbanes-Oxley Act (SOX) and corporate innovation: firms with a public float under $75 million can delay compliance with Section 404 of the Act. We find a significant decrease in the number of patents and patent citations for firms that are subject to Section 404 compliance relative to firms that are not. This relation is more pronounced when firms are financially constrained and when firms face high litigation risk. Overall, our evidence suggests that SOX imposes real costs to the economy by decreasing corporate innovativeness.

I. Introduction

In 2003, the SEC implemented Section 404 of the Sarbanes–Oxley Act (SOX), which requires managers to report the effectiveness of their company's internal control over financial reporting (Section 404(a)) and an independent auditor to attest to the managers' assessment (Section 404(b)). Section 404 has been extremely controversial. One side argues that the high costs of complying with Section 404 are not commensurate with its perceived benefits, while the other side claims that Section 404 leads to higher quality financial reporting and thus lower costs of capital. In this paper, we shed light on this debate by examining the relationship between Section 404 and corporate innovation.

Anecdotal evidence suggests that Section 404 impedes innovation. For example, in an interview with CNN, Mallory Factor, chairman of the Free Enterprise Fund, stated that "Sarbanes-Oxley is a classic example of government overreaction. We don't have a problem with transparency but we've created a class of people that are just professional bureaucrats that want a larger bureaucracy that's extraordinarily expensive and cuts down innovation."[1] Similarly, in a commentary in the *Wall Street Journal*, Mr. Bob Dole (former Senate Majority Leader (Republican)) and Mr. Tom Daschle (former Senate Majority leader (Democrat)) argue that an unintended consequence of SOX is a diminution in corporate innovation.[2] These arguments echo some academics' view that Section 404 imposes significant financial burden on compliance firms, forces these firms to reallocate resources to cope with regulation, diverts managerial attention from doing business to complying with the rules, and discourages managers from risk-taking activities (Solomon and Bryan-Low (2004), Ribstein (2002)).[3]

The unique feature of Section 404 allows us to estimate its effects in a difference-in-differences framework. Ideally, to study a regulation's effect, one would like to have an exogenous experiment in which firms were randomly assigned to comply with the new rules, which would allow us to compare treated and non-treated firms' outcomes and to attribute any differences to the regulation. As pointed out by Iliev (2010), something very close to such an experiment exists for Section 404. Many U.S. public companies were required to file their first management report regarding firms' internal control over financial reporting in their 10-K and provide the first independent outside auditor report with their annual reports for the fiscal year ending on or after November 15, 2004. However, companies with a public float of less than $75 million received a "stay of execution". The deadline for these companies to comply with Section 404(a) was postponed to 2007, while their compliance with Section 404(b) was deferred until 2010, when

[1] http://money.cnn.com/2006/03/21/news/companies/compliance_complaints/

[2] http://www.wsj.com/articles/SB112829439572458006

[3] Alternatively, Section 404 could foster corporate innovation because it enhances the quality of financial reporting and thus lowers the costs of capital. However, our empirical results don't support this view.

the Dodd–Frank Wall Street Reform and Consumer Protection Act permanently exempted them from complying with Section 404(b).

We empirically test the relationship between Section 404 and corporate innovation using a panel of 11,370 firm-year observations of U.S. public firms during 2001–2006 and a difference-in-differences approach. We find that the implementation of Section 404 is associated with a significant decrease in innovation outputs. On average, firms that have to comply with Section 404 experience a decrease in the number of patents by 18% and a decrease in the number of patent citations by 21%, relative to firms that are exempted from this rule.

The identifying assumption central to the difference-in-differences estimation is that treated and control firms share parallel trends prior to the change in law. Our tests show that their pre-treatment trends are indeed indistinguishable. Moreover, the impact of Section 404 on corporate innovation occurs after the regulation takes effect, which suggests a causal effect.

To investigate the channel through which Section 404 affects innovation, we apply a triple difference-in-differences approach to examine heterogeneous treatment effects. We find that the association between SOX Section 404 and corporate innovation is stronger for firms that face more severe financial constraints and for firms that face greater litigation risk. These cross-sectional variations in the treatment effects indicate that financial constraints and litigation risk are two possible mechanisms for Section 404 to affect innovation.

Moreover, we implement placebo tests to investigate the possibility that our results are purely driven by chance. In particular, we randomly select a group of firms as pseudo treated firms and the remaining firms as pseudo control firms. We repeat this procedure 10,000 times. The results indicate that the association between Section 404 and corporate innovation documented in our main tests are unlikely to be spurious: the maximum coefficient in magnitude estimated in the placebo test is substantially smaller than the magnitude of the actual coefficient estimate from the main test.

It is possible that our results are driven by firm size, because treated firms (whose public float is above $75 million) are usually larger than non-treated firms (whose public float is below $75 million). To investigate this possibility, we match each non-treated firm to a treated firm based on industry and firm size (measured by total assets, market capitalization, or the number of employees) and continue to find a significant and negative association between Section 404 and innovation. Thus, our results are unlikely to be spuriously driven by firm size.

Finally, we implement several robustness checks and show that our main results are robust to different measures of innovation, alternative post-treatment periods, and a sample of firms that switch from the non-treated group to the treated group.

This paper provides at least two major contributions to the existing literature. First, it adds to studies that examine drivers of innovation. This strand of research is important for the economy as innovation is widely believed to be crucial for sustainable growth and economic development (Solow (1957), Romer (1990), and Porter (1998)). Current research on this topic has focused on factors such as incentive compensation for management (Manso (2011)), institutional ownership (Aghion, Van Reenen, and Zingales (2013)), anti-takeover provisions (Atanassov (2013)), access to the equity market (Hsu, Tian, and Xu (2014)), and employees' job security (Acharya, Baghai, and Subramanian (2014)), etc. Although these studies enhance our understanding of the mechanisms that motivate firms to innovate, the role of firms' financial reporting system is largely overlooked. Our paper suggests that internal control over firms' financial reporting has a significant impact on corporate innovation.

Second, our study sheds light on the real consequences of SOX. Although SOX is widely considered to be the most far-reaching securities legislation since the Securities Act of 1933, its effect on firm performance is still under debate. One group of researchers argues that SOX decreases firm value because it imposes significant compliance costs, distracts managers from focusing on business to focusing on complying with the details of the rules, and discourages managers from taking risky, value-increasing investments (Ribstein (2002), Wallison (2003), Solomon and Bryan-Low (2004), and Zhang (2007)). In contrast, other researchers believe that SOX improves firm performance because it helps to remedy some deficiencies of U.S. corporate governance and provides better control over managerial agency problems (Holmstrom and Kaplan (2003), Ashbaugh-Skaife, Collins, Kinney, and Lafond (2009), and Feng, Li, McVay, and Skaife (2015)). Our paper establishes a new channel through which SOX affects firm value. The findings in this paper show that SOX (in particular, Section 404) is detrimental to corporate innovation.

The remainder of the paper is organized as follows: Section II reviews the background of SOX (specifically Section 404) and develops our hypothesis. Section III describes our sample and key variable construction. Section IV presents the empirical results. Section V concludes.

II. Background on Section 404 and Hypothesis Development

Section 404 of SOX requires 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 a public float of $75 million or more. Under the SEC's rules, the affected companies are required to disclose the following information about internal controls in their annual reports: (1)

management's responsibility for establishing and maintaining adequate internal controls; (2) the framework used by management to evaluate the adequacy of the internal controls; (3) a statement about the effectiveness of the internal control system or a disclosure of "material weaknesses" in the system of internal controls; and (4) a report by the company's external auditor attesting to management's assessment of the firm's internal controls. The SEC particularly emphasizes that a more extensive evaluation of internal controls is required for firms engaged in risky activities involving significant growth opportunities (e.g., high R&D firms).

We expect Section 404 to have a negative effect on corporate innovation for the following two reasons. First, SOX imposes significant financial burdens on firms, which makes them re-allocate their valuable financial resources from business operation to regulation compliance. The most apparent direct cost arises from Section 404's internal control auditing regulation. Iliev (2010) points out that compliance-related audit fees alone increase by 98% after the implementation of Section 404. Considering a significant stock price drop of disclosed weakness in internal control, managers have incentives to overspend on controls, which further exacerbates the costs associated with Section 404 (Ahmed, McAnally, Rasmussen, and Weaver (2010)). Other direct costs include additional new senior staff positions, such as Chief Compliance Officer, and additional rank-and-file employees to comply with the increased requirement associated with Section 404 (Carney (2006)). In addition to observable direct costs, there are also unobservable, indirect costs such as the opportunity costs of managers whose time and attention are diverted to designing, implementing, and ensuring compliance with new internal controls. In 2007, in a letter to the SEC regarding Section 404, the Biotechnology Industry Organization stated, "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."[4] CFOs also admit that projects such as technology and capital expenditures have been delayed or canceled as a result of SOX compliance (Stuart (2003)).

To better understand the costs of Section 404, we search each firm's disclosed costs associated with Section 404 in its 10-K filings. We find that, on average, such costs account for 0.49% of total assets, and 1.28% of sales. Considering that most of these costs are fixed, we further find that such costs are especially high for small firms: on average, costs associated with Section 404 compliance account for 0.82% of a small firm's total assets and 2.21% of its sales. Without these compliance costs, the average interest coverage ratio of the sample firms (small firms) could be at least 6.62% (10.06%) higher (More detailed information is provided in Section IV.D.1).

Second, Section 404 increases the litigation risk faced by top managers, because they need to certify annual assessment reports of internal control and thus bear personal fiduciary duties (Zhang (2007), Indjejikian and Matejka (2009)). As shown in Bargeron, Lehn, and Zutter (2010) and Kang, Liu, and Qi (2010), in response to this requirement, managers tend to curtail risky investment projects that are likely to increase litigation risk. Management's assessment of internal control under Section 404 is particularly likely to lead them to reduce innovation-related activities, because innovation usually involves non-routine and unusual transactions, is highly risky, is uncertain, and is opaque to outside investors and thus is easy to cause litigation (Aboody and Lev (2000), Kothari, Laguerre, and Leone (2002)).

It is worth noting that the litigation risk associated with SOX pertains to many parts of the law that was put in place immediately in 2002. For example, SOX's requirement of CEOs

[4] https://www.sec.gov/comments/pcaob-2007-02/pcaob200702-27.pdf

and CFOs to certify financial statements went into effect for financial statements filed with the SEC after August 2002 (SOX Section 302), which applies to both accelerated filers and non-accelerated filers. However, Section 404 further increased the scrutiny faced by management of accelerated filers by imposing more specific requirements (Ashbaugh-Skaife, Collins, and Kinney (2007)), and requires CEOs and CFOs to certify financial statements. Glass, Lewis & Co. (2005) argues that "the CEO and CFO of these companies were using a rubber stamp to certify the effectiveness of internal controls prior to SOX 404. We believe it took the pressure of the PCAOB on audit firms, more rigorous audits, and the implementation of SOX 404 to get the management of these companies to realize and/or disclose that their internal controls were not effective." Moreover, compared to Section 302, Section 404 further increases CEOs and CFOs' personal liability associated with their firms' internal control, because Section 404 additionally requires executives' attestation of internal control effectiveness and leads to more disclosure of internal control deficiencies (Hermanson and Ye (2009)). Both the attestation and the disclosure further increase managers' personal liability, because they can no longer claim the unawareness of internal control weaknesses (Coates (2007), Rice, Weber, and Wu (2015)).

In summary, the discussion above leads to our prediction that Section 404 decreases corporate innovation. Moreover, we expect that the impacts of Section 404 on innovation are more pronounced for firms that face greater financial constraints and for firms that are more likely to be litigation targets.

It is possible that Section 404 enhances the quality of financial reporting and reduces the information asymmetry between corporate insiders and outside investors, which leads to a lower cost of capital. This could have a positive effect on innovation, considering that a lower financing cost usually fosters corporate innovation activities (Brown, Fazzari, and Peterson

(2009), Acharya and Xu (2017)). However, this view is largely inconsistent with our empirical findings.

III. Sample Formation and Variable Construction

We start with all U.S. public firms in the Compustat-CRSP merged database from 2001 to 2006 (from three years prior to the implementation of Section 404 to three years afterwards). We then exclude firms in the financial industry (SIC codes 6000-6999) and utility industry (SIC codes 4900-4999) due to the differences in regulatory oversight for these industries.

We obtain historical accelerated filer status from the Audit Analytics Database. In this paper, accelerated filers represent the treatment group, while non-accelerated filers represent the control group. To clearly identify the treated and control groups, we exclude firms whose accelerated filer status is missing and firms that switch from being accelerated filers to being non-accelerated filers (or vice versa) in the period after the implementation of Section 404. Moreover, firms, especially small firms with poor performance and low growth, tend to be delisted from the stock market following the implementation of SOX (Leuz, Triantis, and Wang (2008)). This bias could lead to an observed decrease in innovation for treated firms relative to control firms, because poorly-performing control firms are dropped out of our sample. To address this bias, we further require that each firm stays in the sample for the entire 2001–2006 period. Our final sample consists of 11,370 firm-year observations (1,895 unique firms) from 2001 to 2006; among them 8,490 firm-year observations (1,415 unique firms) are in the treatment group.

We obtain patent and citation information from the patent database of Kogan, Papanikolaou, Seru, and Stoffman (2017), which covers all patents awarded by the U.S. Patent and Trademark Office (USPTO) over the period 1976–2010 and links each patent and its citations to a CRSP firm (if the assignee is a public firm).[5] We mainly use two measures for innovation output. The first measure is the number of patent applications filed in a year that are eventually granted. This measure captures the quantity of innovation output. We use the application year (instead of the award year) to better capture the exact timing of the underlying innovative activities behind a patent, because the application year is closer to the time of the actual innovation (Hall, Jaffe, and Trajtenberg (2005), Fang, Tian, and Tice (2014)). Our second measure of innovation is the sum of citation counts across all patents filed by the firm in a given year, which captures the significance of the patent outputs. Because citations are received for many years after a patent is created, patents created near the end of the sample period have less time to accumulate citations. To address this truncation bias, we follow the recommendations of Hall et al. (2005) and Chang, Fu, Low, and Zhang (2015) and scale the citation count of each patent by the average citation count of all firms' patents that are granted in the same year. The use of patenting to measure a firm's innovativeness has been widely used in the literature since Scherer (1965) and Griliches (1981).

We control for a vector of firm and industry characteristics that may affect a firm's innovation productivity, and these controls are motivated by prior literature (e.g., Aghion, Bloom, Blundell, Griffith, and Howitt (2005)). These variables include firm size, firm age, asset tangibility, leverage, cash holding, R&D expenditures, capital expenditures, ROA, Tobin's Q, and industry concentration (the Herfindahl index based on sales) and the squared Herfindahl index (which controls for non-linear effects of product market competition on innovation outputs). All these control variables are lagged by 1 year. To minimize the effect of outliers, we

[5] The dataset can be downloaded from https://iu.app.box.com/v/patents.

winsorize all variables at the 1st and 99th percentiles. Detailed variable definitions are provided in Appendix 1.

Table 1 provides summary statistics. On average, firms in our sample have 8.59 patents filed (and subsequently granted) per year and receive 7.99 total citations. Our average sample firms have a book value of total assets of $1.81 billion, and are 18.77 years old. The average R&D and capital expenditure account for 6.72% and 5.16% of total assets, respectively. The average firms are moderately levered with a book leverage ratio of 21.21%, and tangible assets account for 24.39% of total assets.

VI. Empirical Results

A. Univariate Tests

We examine the change in innovation in firms that comply with Section 404 (the treatment group) compared to the change in innovation in firms that are exempted from such a policy (the control group). Table 2 reports the univariate test. For each firm, we compute the change in the number of patents as:

$$\sum_{2004}^{2006} \ln(1 + \text{PATENT}) - \sum_{2001}^{2003} \ln(1 + \text{PATENT}).$$

As shown in column (1), change in the number of patents is -0.504 for the treatment group and is only -0.223 for the control group. This difference is significant at the 1% level.

In column (2), we define change in the number of patent citations as:

$$\sum_{2004}^{2006} \ln(1 + \text{CITATION}) - \sum_{2001}^{2003} \ln(1 + \text{CITATION}).$$

We find that change in the number of patent citations is -0.636 for the treatment group, which is almost three times as large as that for the control group (-0.215). This difference is also significant at the 1% level.

Overall, the univariate test shows that treated firms become less innovative after the implementation of Section 404, compared to the control firms. This result indicates that Section 404 has a significantly negative association with corporate innovation.

B. Baseline Regression

We implement a standard difference-in-differences test through the following regression:

(1) $\text{INNOVATION} =$

$\alpha + \beta_1 \text{TREAT} \times \text{POST} + \beta_2 \text{TREAT} + \beta_3 \text{POST} + \text{FIRM CHARACTERISTICS} +$

$\text{INDUSTRY\_FE} + \varepsilon.$

The dependent variable is a proxy for innovation performance for a firm in a given year. The indicator variable TREAT takes the value of 1 if the company is an accelerated filer in the 2004–2006 period, and 0 otherwise. The indicator variable POST takes the value of 1 for the post-Section 404 period (i.e., 2004–2006), and 0 for the pre-Section 404 period (i.e., 2001–2003). We include a set of control variables (lagged by 1 year) that may affect a firm's innovation output, as discussed in Section III. Given that our treatment is defined at the firm level, we cluster standard errors by firm.

The coefficient of interest in this model is the $\beta_1$coefficient, which captures the innovation differences in treated firms before and after Section 404 as opposed to similar before-after differences in control firms.

It is helpful to consider an example. Suppose we want to estimate the effect of Section 404 on innovation. We can subtract the number of innovations before the implementation of

Section 404 from the number of innovations after the implementation of Section 404 for firms that need to comply with this regulation. However, economy-wide shocks may occur at the same time and affect corporate innovations. To difference away such factors, we calculate the same difference in innovations in firms that are exempted from this regulation. Finally, we calculate the difference between these two differences, which represents the incremental effect of Section 404 on treated firms compared to control firms.

Table 3 presents the regression results. The coefficient estimates on TREAT × POST are negative and statistically significant in all columns. The dependent variable in column (1) is ln(1+PATENT), and we include TREAT × POST, TREAT, POST, and industry fixed effects (based on 2-digit SIC code) in the regression. We find that the coefficient on TREAT × POST is negative and significant at the 1% level, indicating a negative association between Section 404 and corporate innovations.

Examining ln(1+CITATION) as the dependent variable in column (2), we find that the coefficient on the TREAT × POST indicator is also negative and is significant at the 1% level, which implies that the implementation of Section 404 is associated with a decrease in the quality of patents.

In columns (3) and (4), we additionally control for a long list of firm characteristics, and we continue to find a negative association between Section 404 and innovation. The economic magnitude is also sizeable. For example, the coefficient on TREAT × POST is -0.198 in column (3) and is significant at the 1% level, indicating that Section 404 is associated with a decrease in the number of patents by approximately 18% ($= e^{-0.198} - 1$). When examining patent citations in column (4), the coefficient on TREAT × POST is a significant -0.234, indicating that the number of patent citations decreases by 21% (= $e^{-0.234} - 1$) following the implementation of Section 404.

With regards to control variables, larger firms, cash-rich firms, firms with higher R&D and capital expenditures, firms with more intangible assets, firms with low leverage, and firms with higher growth potential are more innovative. These results are broadly consistent with prior literature (see, e.g., Aghion et al. (2005)).

Taken together, these results are consistent with the view that Section 404 causes a decline of innovation outputs in terms of both quantity and quality.

C. The Pre-treatment Trends

The validity of difference-in-differences estimation depends on the parallel trends assumption: absent Section 404, treated firms' innovation would have evolved in the same way as that of control firms. To be precise, the parallel trends assumption does not require the level of innovation variables to be identical across the treatment and control groups in the pre-treatment period. Instead, this assumption requires a similar trend in innovation variables during the pre-treatment period for both the treatment and control groups. Following the method of Hong and Kacperczyk (2010), we present the results that investigate the pre-trend between the treated group and control group in Table 4. In particular, we estimate the following regression:

$$(2)\ \Delta\text{INNOVATION} = \alpha + \beta_1\text{TREAT} \times \text{YEAR2002} + \beta_2\text{TREAT} \times \text{YEAR2003} + \beta_3\text{TREAT} \times \text{YEAR2004} + \beta_4\text{TREAT} \times \text{YEAR2005} + \beta_5\text{TREAT} \times \text{YEAR2006} + \beta_6\text{TREAT} + \beta_7\text{YEAR2002} + \beta_8\text{YEAR2003} + \beta_9\text{YEAR2004} + \beta_{10}\text{YEAR2005} + \beta_{11}\text{YEAR2006} + \text{FIRM CHARACTERISTICS} + \text{INDUSTRY\_FE} + \varepsilon.$$

The dependent variables include the change in innovation output from year *t - 1* to *t*, defined as $\ln(1+\text{PATENT})_t - \ln(1+\text{PATENT})_{t-1}$ in column (1) and $\ln(1+\text{CITATION})_t -$

$\ln(1+\text{CITATION})_{t-1}$ in column (2), respectively. We define five dummies, YEAR2002, YEAR2003, YEAR2004, YEAR2005, and YEAR2006 to indicate the corresponding years, respectively. Year 2001 is the baseline year.

The coefficients on $\text{TREAT} \times \text{YEAR2002}$ and $\text{TREAT} \times \text{YEAR2003}$ indicators are especially important, because their significance and magnitude indicate whether there is any difference in the innovation trend between the treatment group and the control group prior to Section 404's enactment. The coefficients on both variables are close to 0 and not statistically significant in either column. These results suggest that the parallel trend assumption of the difference-in-differences approach is not violated.

The impact of Section 404 starts to show up after its enactment: the coefficients on $\text{TREAT} \times \text{YEAR2004}$, $\text{TREAT} \times \text{YEAR2005}$ and $\text{TREAT} \times \text{YEAR2006}$ variables are significantly negative.

Overall, Table 4 shows that the treated group and the control group share a similar trend in innovation prior to the implementation of Section 404, thus supporting the parallel trends assumption associated with the difference-in-differences estimation. Moreover, Table 4 also indicates that the negative association between Section 404 and innovation occurs *after* it is implemented, which suggests a causal effect.

Table 4 also shows that innovation outputs start to decline immediately after the implementation of the Section 404, which might beg the question why Section 404's influence on innovation is so prompt. Chemmanur and Tian (2017) show that, while there is significant variation in the time interval between R&D expenditures and patent applications across different industries, the average lag is less than 1 year. Hausman, Hall, and Griliches (1984), Hall, Griliches, and Hausman (1986), and Lerner and Wulf (2007) argue that patent applications are generated almost contemporaneously with R&D expenditures. Atanassov (2013) examines the effect of state anti-takeover law on corporate innovation and finds that patent citations start to decline right from the year of the law's adoption (see Atanassov ((2013), Table 4)). Fang et al. (2014) examine the effect of the 2001 decimalization on corporate innovation and find that the number of patents and patent citations starts to decline immediately after the decimalization (see Fang et al. ((2014), Table 3 Panel F)). He and Tian (2013) examine the effect of brokerage closures on corporate innovation and find that the number of patents and patent citations starts to increase immediately after the closures (see He and Tian ((2013), Figure 1)). In terms of the time interval for Section 404 to affect innovation, our results are comparable to these studies.

D. Triple Difference-in-differences Tests

To better understand the mechanisms for Section 404 to influence innovation, in this subsection we implement triple difference-in-differences tests to examine the heterogeneous treatment effects. Examining heterogeneous treatment effects can further alleviate the concern that some omitted variables are driving our results, because such variables would have to be uncorrelated with all the control variables included in the regression model. They would also have to explain the cross-sectional variation of the treatment effects, which is less likely (Claessens and Laeven (2003), Raddatz (2006)).

1. Financial Constraints

First, if a firm's decreased innovation after the implementation of Section 404 is due to scarce financial resources being diverted from research and development toward regulation compliance, we expect this treatment effect to be stronger in firms that face greater financial constraints.

To better understand the costs associated with Section 404, we follow the approach of Krishnan, Rama, and Zhang (2008) and search for mentions of the said costs in an accelerated filer's 10-K filing. In particular, we search for specific keywords—"cost," "expense," "expenditure," "fee," and "charge"—that appear within ten words of "404" or "internal control" or within 25 words of "SOX" or "Sarbanes," As mentioned by Krishnan et al. (2008), such a reported amount of SOX Section 404 compliance costs is likely underestimated, as some companies may disclose only professional fees or attestation fees relevant to Section 404 compliance, but not the entire costs related to Section 404 compliance. Moreover, some non-monetary costs (such as an employee's or a manager's shifted attention) can hardly be reported in the financial statement. Thus, the costs we collect here likely represent the lower bound of the costs associated with Section 404 compliance.

The summary statistics of the compliance costs associated with Section 404 are reported in Panel A of Table 5. We find that, on average, such costs represent 0.49% of total assets and 1.28% of sales. Without such compliance costs, the average interest coverage ratio would increase from 17.53 to 18.69 (i.e., an increase of 6.62%). Considering that most of such costs are fixed, we further find that such costs are especially higher for small firms. For small firms (i.e., accelerated filers whose total assets are below the median of all accelerated filers), compliance costs associated with Section 404 are, on average, 0.82% of total assets and 2.21% of sales. Without such compliance costs, the average interest coverage ratio would increase from 18.48 to 20.34 (i.e., an increase of 10.06%). Overall, these results indicate that the compliance costs associated with Section 404 are economically significant (especially for financially-constrained firms).

In Panel B of Table 5, we implement a triple difference-in-differences test to examine whether the treatment effect is stronger in firms that face greater financial constraints. In columns (1) and (2) of Table 5 Panel B, we use the WW index of Whited and Wu (2006) to capture the financial constraints faced by firms. Their index is based on the coefficients obtained from a structural model and is effectively measured as the projection of the shadow price of raising equity capital onto the following six variables: cash flow to total assets, an indicator variable flagging the dividend payer, long-term debt to total assets, firm size, sales growth, and industry sales growth. A larger index value indicates greater financial constraints. The details of the index are in Appendix 2. We then define the HIGH_FINANCIAL_CONSTRAINT indicator as 1 if the firm's WW index is above the sample median in 2003 (the year prior to the enactment of Section 404), and 0 otherwise. Finally, we add the three-way interaction TREAT × POST × HIGH_FINANCIAL_CONSTRAINT, and estimate the following regression:

(3) $\text{INNOVATION} = \alpha + \beta_1 \text{TREAT} \times \text{POST} \times \text{HIGH\_FINANCIAL\_CONSTRAINT} + \beta_2 \text{TREAT} \times \text{POST} + \beta_3 \text{TREAT} \times \text{HIGH\_FINANCIAL\_CONSTRAINT} + \beta_4 \text{POST} \times \text{HIGH\_FINANCIAL\_CONSTRAINT} + \beta_5 \text{TREAT} + \beta_6 \text{POST} + \beta_7 \text{HIGH\_FINANCIAL\_CONSTRAINT} + \beta_8 \text{FIRM CHARACTERISTICS} + \text{INDUSTRY\_FE} + \varepsilon.$

The coefficients on TREAT × POST × HIGH_FINANCIAL_CONSTRAINT are significantly negative in both columns, indicating that the negative association between Section 404 and innovation is more pronounced for firms that face greater financial constraints. Taking column (1) (where the dependent variable is the number of patents) for example, the coefficient on TREAT × POST is -0.169 and the coefficient on TREAT × POST × HIGH_FINANCIAL_CONSTRAINT is -0.112; both are significant at or below the 5% level. For firms with high financial constraints, their number of patents decreases by 25% (=

$e^{-(0.169+0.112)} - 1$), while the number of patents decreases by 16% (= $e^{-0.169} - 1$) for firms with low financial constraints.

As a robustness check, we use the HP index of Hadlock and Pierce (2010) as an alternative measure of financial constraints faced by a firm in columns (3) and (4) of Table 5 Panel B. Hadlock and Pierce (2010) use a text-based approach and search the SEC filings of firms for evidence of firms identifying themselves as financially constrained. They use this classification to create their own index of financial constraints based on firm size, firm size-squared, and firm age. A larger index value indicates greater financial constraints. The details of constructing the HP index are also provided in Appendix 2. We continue to find negative and significant coefficients on TREAT × POST × HIGH_FINANCIAL_CONSTRAINT. Taking column (4) (where the dependent variable is the number of patent citations) for example, the coefficient on TREAT × POST is -0.145 and the coefficient on TREAT × POST × HIGH_FINANCIAL_CONSTRAINT is -0.129; both are significant at the 1% level. For firms with high financial constraints, their number of patent citations decreases by 24% (= $e^{-(0.145+0.129)} - 1$), while the number of patent citations decreases by 13% (= $e^{-0.145} - 1$) for firms with low financial constraints.

Overall, Table 5 provides evidence that the negative association between Section 404 and corporate innovation is stronger for firms with more severe financial constraints. This evidence suggests that one possible mechanism for Section 404 to reduce innovation is diverting firms' limited financial resources toward regulation compliance.

2.Litigation Risk

As described in Section II, if potential litigation imposed by Section 404 is another factor leading to reduced innovation, we expect the treatment effect to be greater for firms facing high litigation risk. We define the HIGH_LITIGATION_RISK indicator as 1 if the number of securities law-related lawsuits in the firm's 2-digit SIC industry normalized by the total number of such lawsuits in 2003 is larger than sample median, and 0 otherwise. We obtain the data on lawsuits from the Audit Analytics Database.

We then re-estimate Equation (3) by replacing the HIGH_FINANCIAL_CONSTRAINTS indicator with the HIGH_LITIGATION_RISK indicator. As reported in columns (1) and (2) of Table 6, we find negative and significant coefficients on TREAT × POST × HIGH_LITIGATION_RISK, indicating that the negative association between Section 404 and innovation is more pronounced for firms facing high litigation risk. Taking column (1) (where the dependent variable is the number of patents) for example, the coefficient on TREAT × POST is -0.157 and the coefficient on TREAT × POST × HIGH_LITIGATION_RISK is -0.085; both coefficients are significant at or below the 5% level. For firms with high litigation risk, their number of patents decreases by 21% ($= e^{-(0.157+0.085)} - 1$), while the number of patents decreases by 15% ($= e^{-0.157} - 1$) for firms with low litigation risk.

High technology companies are frequently the target of litigation and are twice as likely as other companies to be sued (Jones and Weingram (1996), Johnson, Kasznik, and Nelson (2001)). Thus, we use a firm's R&D intensity as another proxy for the firm's litigation risk. We classify a firm as the one facing high litigation risk if its R&D intensity in 2003 is above the sample median. As reported in columns (3) and (4) of Table 6, we continue to find that the treatment effect is greater for firms facing high litigation risk, suggesting that higher litigation risk imposed by Section 404 is another possible mechanism for Section 404 to reduce innovation.

In summary, the cross-sectional variation of treatment effects provides supporting evidence that Section 404 reduces corporate innovation possibly by diverting scarce financial resources to regulation compliance and by enhancing the litigation threats faced by such companies.

E. Placebo Tests

In this section, we implement placebo tests to investigate the possibility that our results are purely driven by chance. In particular, we draw a random sample of 1,415 firms (the same number of the actual accelerated filers) as the "pseudo accelerated filers" from our sample pool in the event year (2004), and then treat the rest of the pool as "pseudo non-accelerated filers." Based on these "pseudo" treated and control groups, we re-estimate columns (3) and (4) of Table 3 and save the coefficients on TREAT × POST. We repeat this procedure 10,000 times.

Figure 1a plots the distribution of the coefficients on TREAT × POST when the dependent variable is ln(1+PATENT). The actual coefficient on TREAT × POST of -0.198 (see column (3) of Table 3) is more than eight times the standard deviation (0.024) below the mean (0.000) of the distribution and much smaller than the minimum coefficient estimate (-0.088). Figure 1b plots the distribution of the coefficients on TREAT × POST when the dependent variable is ln(1+CITATION). The actual coefficient on TREAT × POST of -0.234 (see column (4) of Table 3) is also more than eight times the standard deviation (0.028) below the mean (0.000) of the distribution and is much smaller than the minimum coefficient estimate (-0.118). This indicates that our results are indeed driven by the compliance of Section 404 and are unlikely to be driven by chance.

F. Matched Sample

Given that the classification of accelerated filers and non-accelerated filers is based on public float (which is positively related to firm size), it is possible that our results are merely driven by firm size (although we have controlled for firm size in the regression). To formally investigate this possibility, we implement our analysis on a matched sample.

In particular, for each non-accelerated filer, we match it to an accelerated filer that is in the same industry based on the 2-digit SIC code and the closest in total assets in 2003. We further require that the total assets of the matched accelerated filer be within [90%, 110%] of that of the non-accelerated filer. If the difference in total assets between a non-accelerated filer and its industry and size-matched accelerated filer is beyond this range, we drop this pair from our sample. By doing so, we increase our confidence that treated firms and control firms are truly similar in size. We then re-estimate columns (3) and (4) of Table 3 based on this matched sample.

Columns (1) and (2) of Table 7 report the results. Restricting our sample to the pairs of treated and matched control firms reduces the sample to 2,052 firm-year observations; yet we still find negative and significant coefficients on TREAT × POST. The coefficients on TREAT × POST are -0.208 for patents and -0.291 for patent citations, respectively. This result indicates that an accelerated filer (relative to a non-accelerated filer of similar firm size) experiences a reduction in the number of patents by 19% ($= e^{-0.208} - 1$) and a reduction in the number of patent citations by 25% ($= e^{-0.291} - 1$). In columns (3)–(6), we repeat the matching procedure based on firms' market capitalization and number of employees (other proxies for firm size), and we continue to find a significant negative association between Section 404 and innovation. Overall, the results in Table 7 indicate that our results are not spuriously driven by firm size.

G. Other Measures of Innovation

In this section, we use several alternative measures of innovation: (1) number of patents per 1,000 employees, (2) patent citations per 1,000 employees, (3) number of patents normalized by R&D expenditure, (4) patent citations normalized by R&D expenditure, (5) R&D expenditure, and (6) the sum of R&D expenditure, capital expenditure, and selling, general and administrative (SG&A) expenses. We then re-estimate Equation (1) by employing the above six variables as the dependent variables. The results are reported in Table 8. We find that the coefficients on TREAT × POST are negative and significant at the 1% level across all columns (except for column (5)), indicating a negative association between Section 404 and innovation. Taking column (1) for example, the dependent variable is ln (1+ PATENT_PER_EMPLOYEE) and the coefficient on TREAT × POST is -0.113 and is significant at the 1% level, indicating that Section 404 is associated with a decrease in patents per 1,000 employees by 11% ($= e^{-0.113} - 1$).

In column (5), we use R&D expenditure as the dependent variable. Different from those patent-based variables that capture innovation outputs, R&D expenditure could be an (imperfect) measure of innovation input. However, we do not find any significant association between Section 404 and a firm's R&D expenditures. Such an insignificant result is possibly due to the fact that R&D expenditures are not an accurate measure of a firm's innovation input. Horwitz and Kolodny (1980) point out that the notion of what outlays are considered R&D expenditures can be difficult to assess and often represents the manager's discretionary choice. For example, if managers are interested in limiting information to competitors about their R&D activities, they may have incentive to avoid classifying some research-related outlays as R&D expenses. Koh and Reeb (2015) analyze a sample of 3000+ NYSE-listed firms and find that 1,737 firms report zero or missing R&D expenditures, even though many of them actively file patents. Koh, Reeb, and Zhao (2017) further find whether to report R&D depends on managerial confidence:

Confident CEOs are 24 percent more likely to report a non-missing or non-zero R&D expenditures relative to cautious CEOs. Moreover, as pointed out by Atanassov (2013), many important innovation inputs may not be categorized as "R&D expenditures." For example, investment in physical assets (such as purchasing lab equipment) may be classified as capital expenditure; investment in human capital (such as employee benefits for scientists and engineers) may be classified as SG&A expenses. To account for the possible inaccuracy associated with R&D expenditure, in column (6) we take the sum of R&D expenditure, capital expenditure, and SG&A expenses normalized by total assets to capture a firm's overall input that could be (partially) relevant to innovation. The coefficient on TREAT × POST is negative and significant at the 5% level, suggesting that innovation input broadly decreases following the implementation of Section 404.

Overall, based on various measures of innovation, we continue to find a significantly negative association between Section 404 and corporate innovation.

H. Alternative Post-Event Period

So far, we chose a window of three years before and after the implementation of Section 404 as our sample event period. Such a choice reflects a trade-off between relevance and accuracy. On the one hand, choosing too wide a window could incorporate too much noise irrelevant to the events and thus lower the power of our tests. On the other hand, considering that innovation is relatively a long-term process, the major effects of Section 404 on innovation output could manifest several years after its implementation. Thus, choosing too narrow a window could limit our ability to identify any meaningful changes in innovation outputs. In this subsection, and as a robustness check, we extend the post-event period by several more years. We extend the patent data set of Kogan et al. (2017) to 2014 using Google patent and citation data. Since it takes two to three years for the USPTO to approve a patent, we end our sample in 2011 to ensure that most of the patents applied before 2012 have been granted by the USPTO and thus exist in our database. In Table 9 columns (1) and (2), we extend our post-event period to 2011 and re-estimate the baseline regression of Equation (1). The coefficients on TREAT × POST are negative and significant at the 1% level, indicating a significant association between Section 404 and corporate innovation.

This might complicate our study, as the 2007–2009 period encompasses the global financial crisis. Thus, in columns (3) and (4), we further exclude the period of 2007–2009 and repeat the analysis in columns (1) and (2). We show that our results are almost unchanged.

In summary, the negative association between SOX Section 404 and firm innovation is robust to our alternative post-event period.

I. Firms Switching from Being Non-Accelerated Filers to Accelerated Filers

In this subsection, we examine a subsample of firms that switch from being non-accelerated filers to accelerated filers.

In particular, we identify 371 firms that switch from non-accelerated filers to accelerated filers after they cross the $75 million threshold in the period of 2004–2006. We match each of these switching firms to a control firm that stays as a non-accelerated filer throughout the sample period, that is in the same industry, and that is closest in book value of total assets in the year prior to the switch. For each pair of switching firm and its control firm, we track innovation performance from three years prior to the switching to three years afterwards. We estimate the following regression:

$$(4)\ \text{INNOVATION} =$$

$$\alpha + \beta_1\text{NONTREAT\_TO\_TREAT} \times \text{POSTSWITCH} + \beta_2\text{NONTREAT\_TO\_TREAT} +$$

$$\beta_3\text{POSTSWITCH} + \text{FIRM CHARACTERISTICS} + \text{INDUSTRY\_FE} + \varepsilon.$$

The dependent variable is the measure of innovation output (i.e., patent and patent citation) for a firm in a given year. The indicator variable NONTREAT_TO_TREAT takes the value of 1 if the company is a switching firm that switches from a non-accelerated filer to an accelerated filer after it crosses the $75 million threshold, and 0 otherwise. The indicator variable POSTSWITCH takes the value of 1 for the period after the switching, and 0 for the period prior to the switching. The β_1 coefficient captures the innovation differences in firms that switch from non-accelerated filers to accelerated filers before and after the status change as opposed to similar before-after differences in firms that stay as non-accelerated filers. The results are reported in Table 10. The coefficients on NONTREAT_TO_TREAT × POSTSWITCH are negative and significant at the 1% in both columns, indicating a significant decrease in innovation after a firm switches from being a non-accelerated filer to being an accelerated filer.

V. Conclusions

In this paper, we investigate the relationship between SOX Section 404 and business activities from the perspective of innovation, and find that Section 404 is negatively associated with corporate innovation. Our empirical tests are based on a quasi-natural experiment: firms with a public float of under $75 million can delay Section 404 compliance. Using a difference-in-differences approach, we find a significant decrease in firms' patents and patent citations following the implementation of Section 404, relative to firms that are exempted from this regulation. In support of a causal interpretation of our findings, our timing tests indicate that there is no difference in pre-treatment trends in innovation between the two groups of firms, and that the reduction in innovation occurs in the years following the enactment of Section 404. Finally, the cross-sectional variation of the treatment effects supports the view that Section 404 reduces innovation by diverting firms' limited financial resources and enhancing firms' litigation risk: the treatment effect is more pronounced when firms are financially constrained and when firms face high litigation risk. Overall, our findings suggest that Section 404 imposes real costs to the economy by causing a decrease in corporate innovation.

Our paper provides important implications for public policies aimed at strengthening internal control over public firms' financial reporting procedures. Our results suggest that such policies can (unintendedly) hinder corporate innovation. This effect is nontrivial considering that technological innovation has long been recognized as a key factor in a nation's economic growth, productivity, and competitive advantage, and that the U.S. economy is increasingly reliant on innovation.

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Appendix 1: Variable Definitions

Variable	Definition
Measures of Innovation Output	
PATENT	Number of patents that are applied for (and subsequently awarded) by a firm.
ln(1+PATENT)	Ln (1 + PATENT).
CITATION	Number of citations received by a firm's patents. Following Hall et al. (2005) and Chang et al. (2015), we use the fixed-effects approach to adjust for the truncation bias of citations. Specifically, we normalize the number of citations received by each patent by dividing it by the average number of citations received by all the patents granted in the same year.
ln(1+CITATION)	Ln (1 + CITATION).
PATENT_PER_EMPLOYEE	Patent scaled by the number of employees (in 1,000s).
ln(1+PATENT_PER_EMPLOYEE)	Ln (1 + PATENT_PER_EMPLOYEE).
CITATION_PER_EMPLOYEE	Citation scaled by the number of employees (in 1,000s).
ln(1+CITATION_PER_EMPLOYEE)	Ln (1 + CITATION_PER_EMPLOYEE).
PATENT_PER_R&D	Patent scaled by the value of R&D expenditure (in $ millions).
ln(1+PATENT_PER_R&D)	Ln (1+ PATENT_PER_R&D).
CITATION_PER_R&D	Citation scaled by the value of R&D expenditure (in $ millions).
ln(1+CITATION_ PER_ R&D)	Ln (1+ CITATION_ PER_ R&D).
Firm Characteristics	
TREAT	A dummy variable that equals 1 if the firm is an accelerated filer, and 0 otherwise.
POST	A dummy variable that equals 1 for the 2004-2006 period, and 0 for the 2001-2003 period.
ASSET	Book value of total assets.
ln(ASSET)	Ln (Asset).
CASH	Cash and short-term investments normalized by total assets.
R&D	R&D intensity, measured as R&D expenditures normalized by average total assets between year *t* and *t-1*. If R&D expenditures variable is missing, we set the missing value to 0.
R&D+CAPEX+SGA	The sum of R&D expenditure, capital expenditure, and selling, general and administrative (SG&A) expenses, normalized by average total assets between year *t* and *t-1*.
ROA	EBIT (earnings before interest and tax) normalized by average total assets between year *t* and year *t-1*.
PPE	Property, plant & equipment normalized by total assets.
LEVERAGE	Total debt normalized by total assets.
CAPEX	Capital expenditures normalized by average total assets between year *t* and year *t-1*.
TOBINS_Q	Market value of equity plus book value of total assets minus book value of equity minus balance sheet deferred taxes, normalize by total assets.
HERFINDAHL_INDEX	Sum of squared sales-based market shares of all firms in a 2-digit SIC industry.
FIRM_AGE	Number of years since a firm's first appearance in Compustat.
ln(FIRM_AGE)	Ln (FIRM_AGE).
HIGH_FINANCIAL_CONSTRAINT	A dummy variable that equals 1 if the firm's WW index (HP index) in 2003 is larger than the sample median, and 0 otherwise.
HIGH_LITIGATION_RISK	A dummy variable that equals 1 if the total number of securities law-

	related lawsuits in the firm's 2-digit SIC industry normalized by total number of securities law-related lawsuits in 2003 is larger than the sample median (if the firm's R&D intensity in 2003 is larger than the sample median), and 0 otherwise.
COMPLIANCE_COST	Cost to comply with SOX Section 404.
COMPLIANCE_COST/ASSET	Compliance cost normalized by total assets
COMPLIANCE_COST/SALES	Compliance cost normalized by total sales.
INTEREST_COVERAGE_RATIO	EBITDA (earnings before interest, tax, depreciation and amortization) normalized by interest expense.
HYPOTHETICAL_INTEREST_COVERAGE_RATIO_WITHOUT_COMPLIANCE_COST	EBITDA plus compliance cost, normalized by interest expense.

Appendix 2: Measurement of Financial Constraints

$$\text{WW index} = -0.091 \times \frac{\text{IB} + \text{DP}}{\text{TA}} - 0.062 \times \text{DIV} + 0.021 \times \frac{\text{DLTT}}{\text{TA}} - 0.044 \times \ln(\text{TA}) + 0.102 \times \text{ISG} - 0.035 \times \text{SG}$$

IB is income before extraordinary items.

DP is depreciation and amortization.

TA is total assets.

DIV is a dummy variable that equals 1 if the company pays ordinary or preferred dividends, and 0 otherwise.

DLTT is long-term debt.

ISG is industry sales growth, measured as average sales growth in the 3-digit SIC industry.

SG is sales growth.

All these variables are lagged by 1 year.

A larger index value indicates greater financial constraints.

$$\text{HP index} = -0.737 \times \ln(\text{TA}) + 0.043 \times \ln(\text{TA}) \times \ln(\text{TA}) - 0.040 \times \text{FIRM\_AGE}$$

TA is total assets.

FIRM_AGE is the number of years since a firm's first appearance in Compustat.

All these variables are lagged by 1 year.

Following Hadlock and Pierce (2010), we delete observations whose value of LTA (measured in 2003, adjusted to 2004 dollars) is larger than $ ln(4.5 billion) or whose Age (measured in 2003) is larger than 37 years.

Data on the inflation rate is obtained from http://usinflation.org.

A larger index value indicates greater financial constraints.

TABLE 1

Summary Statistics

The sample in Table 1 consists of 11,370 firm-year observations from 2001–2006. We obtain patent information from Kogan et al. (2017) and financial information from Compustat. Definitions of all variables are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles.

	Mean	StdDev	25th Percentile	Median	75th Percentile
PATENT	8.59	35.67	0.00	0.00	2.00
CITATION	7.99	33.33	0.00	0.00	0.72
ASSET (in million $)	1811.23	5259.65	58.25	235.60	943.77
CASH	22.42%	24.77%	3.11%	12.04%	34.85%
R&D	6.72%	12.23%	0.00%	0.84%	8.59%
ROA	-0.67%	24.40%	-3.99%	5.86%	11.93%
PPE	24.39%	22.09%	7.27%	16.96%	35.06%
LEVERAGE	21.21%	22.70%	0.91%	16.15%	32.95%
CAPEX	5.16%	5.89%	1.61%	3.21%	6.24%
TOBINS_Q	2.23	1.99	1.12	1.55	2.49
HERFINDAHL_INDEX	0.09	0.09	0.04	0.05	0.08
$HERFINDAHL\_INDEX^2$	0.02	0.04	0.00	0.00	0.01
FIRM_AGE	18.77	13.99	8.00	13.00	25.00

TABLE 2

Univariate Tests

Table 2 reports the univariate tests that examine the relation between Section 404 and corporate innovation. Treated firms are the accelerated filers, and control firms are non-accelerated filers. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	$\sum_{2004}^{2006} \ln(1+\text{PATENT}) - \sum_{2001}^{2003} \ln(1+\text{PATENT})$	$\sum_{2004}^{2006} \ln(1+\text{CITATION}) - \sum_{2001}^{2003} \ln(1+\text{CITATION})$
Treated firms (1)	-0.504	-0.636
Control firms (2)	-0.223	-0.215
Difference-in-differences test (*p*-value of t-test: (1)=(2))	0.000***	0.000***

TABLE 3

Baseline Regression

Table 3 reports the difference-in-differences tests that examine the relation between Section 404 and corporate innovation. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variable POST takes the value of 1 for the 2004–2006 period, and 0 for the 2001–2003 period. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. *T*-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 3 (continued)

	(1) ln(1+PATENT)	(2) ln(1+CITATION)	(3) ln(1+PATENT)	(4) ln(1+CITATION)
TREAT × POST	-0.090***	-0.135***	-0.198***	-0.234***
	(-4.953)	(-6.873)	(-8.728)	(-9.721)
TREAT	0.838***	0.803***	-0.244***	-0.207***
	(19.378)	(18.928)	(-4.207)	(-3.557)
POST	-0.074***	-0.072***	-0.086***	-0.079***
	(-5.416)	(-5.501)	(-4.147)	(-3.808)
ln(ASSET)			0.409***	0.381***
			(18.286)	(16.750)
CASH			0.391***	0.332***
			(4.046)	(3.477)
R&D			1.703***	1.590***
			(8.471)	(7.523)
ROA			0.077	0.074
			(0.894)	(0.812)
PPE			-0.267**	-0.316**
			(-1.982)	(-2.329)
LEVERAGE			-0.233***	-0.260***
			(-2.767)	(-3.149)
CAPEX			0.971***	1.030***
			(3.657)	(3.635)
TOBINS_Q			0.067***	0.072***
			(7.427)	(7.343)
HERFINDAHL_INDEX			-0.082	0.135
			(-0.113)	(0.175)
$HERFINDAHL\_INDEX^2$			-0.021	0.224
			(-0.015)	(0.145)
ln(FIRM_AGE)			0.045	0.008
			(1.284)	(0.231)
INDUSTRY_FE	Yes	Yes	Yes	Yes
Constant	-0.574***	-0.514***	-2.335***	-2.104***
	(-4.000)	(-3.873)	(-10.474)	(-9.579)

Observations	11,370	11,370	11,370	11,370
Adj._R^2	0.247	0.197	0.436	0.366

TABLE 4

Pre-treatment Trend

Table 4 investigates the pre-treatment trends between the treated group and control group. The dependent variable in column (1) is Δln(1+PATENT), defined as $\ln(1+PATENT)_t - \ln(1+PATENT)_{t-1}$. The dependent variable in column (2) is Δln(1+CITATION), defined as $\ln(1+CITATION)_t - \ln(1+CITATION)_{t-1}$. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variables, YEAR2002–YEAR2006, flag years 2002–2006, respectively. Year 2001 is the baseline year. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 4 (continued)

	(1) Δln(1+PATENT)	(2) Δln(1+CITATION)
TREAT × YEAR2002	-0.057	-0.035
	(-1.564)	(-0.907)
TREAT × YEAR2003	-0.036	-0.019
	(-1.199)	(-0.590)
TREAT × YEAR2004	-0.063**	-0.068**
	(-2.051)	(-2.006)
TREAT × YEAR2005	-0.114***	-0.079***
	(-4.023)	(-2.741)
TREAT × YEAR2006	-0.098***	-0.092***
	(-3.374)	(-2.794)
TREAT	0.045**	0.030
	(1.979)	(1.184)
YEAR2002	0.005	0.031
	(0.177)	(1.033)
YEAR2003	-0.036	-0.023
	(-1.464)	(-0.961)
YEAR2004	-0.052**	-0.029
	(-2.030)	(-1.125)
YEAR2005	-0.003	0.000
	(-0.128)	(0.021)
YEAR2006	-0.021	0.021
	(-0.899)	(0.822)
ln(ASSET)	-0.004*	-0.010***
	(-1.795)	(-4.156)
CASH	-0.013	-0.045**
	(-0.693)	(-2.086)
R&D	-0.115***	-0.108**
	(-2.704)	(-2.105)
ROA	0.046**	0.043*
	(2.428)	(1.795)
PPE	-0.035*	-0.017

	(-1.957)	(-0.772)
LEVERAGE	-0.010	0.001
	(-0.663)	(0.031)
CAPEX	0.072	-0.025
	(1.028)	(-0.285)
TOBINS_Q	0.008***	0.003
	(3.257)	(0.942)
HERFINDAHL_INDEX	0.632	-0.221
	(1.292)	(-0.400)
HERFINDAHL_INDEX^2	-0.831	0.391
	(-0.900)	(0.390)
ln(FIRM_AGE)	-0.001	0.009*
	(-0.330)	(1.743)
INDUSTRY_FE	Yes	Yes
Constant	-0.031	0.126
	(-0.401)	(1.399)
Observations	11,370	11,370
Adj._R^2	0.007	0.004

TABLE 5

Heterogeneous Treatment Effects Based on Financial Constraints

Panel A presents the summary statistics on the compliance cost of SOX Section 404. Small-size accelerated filers refer to the ones with total assets below the median of all accelerated filers; large-size accelerated filers refer to the ones with total assets above the median of all accelerated filers. Panel B reports the triple difference-in-differences tests to examine the relative impacts of Section 404 on innovation in firms with high and low financial constraints. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variable POST takes the value of 1 for the 2004–2006 period, and 0 for the 2001–2003 period. The indicator variable HIGH_FINANCIAL_CONSTRAINT takes the value of 1 if the firm's measure of financial constraints is above the sample median in 2003, and 0 otherwise. In columns (1) and (2) of Panel B, we use the WW index of Whited and Wu (2006) to measure financial constraints. In columns (3) and (4) of Panel B, we use the HP index of Hadlock and Pierce (2010) to measure financial constraints. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Summary Statistics on the Average Compliance Cost of SOX Section 404

	All Accelerated Filers (1)	Small-Size Accelerated Filers (2)	Large-Size Accelerated Filers (3)	*T*-Test of the Difference (2)=(3)
Compliance cost ($ million)	1.82	1.04	2.59	-1.55***
Compliance cost / asset	0.49%	0.82%	0.16%	0.66%***
Compliance cost / sales	1.28%	2.21%	0.36%	1.85%***
Interest coverage ratio (a)	17.53	18.48	16.55	1.93
Hypothetical interest coverage ratio without compliance cost (b)	18.69	20.34	17.00	3.34
The difference between (a) and (b) (i.e., (a) – (b))	-1.16	-1.86	-0.45	-1.41***

TABLE 5 (continued)

Panel B. Triple Difference-in-Differences Test

	(1) ln(1+PATENT)	(2) ln(1+CITATION)	(3) ln(1+PATENT)	(4) ln(1+CITATION)
	WW Index		HP Index	
TREAT × POST × HIGH_FINANCIAL_CONSTRAINT	-0.112**	-0.146**	-0.121**	-0.129***
	(-2.028)	(-2.329)	(-2.496)	(-2.630)
TREAT × POST	-0.169***	-0.190***	-0.101***	-0.145***
	(-3.555)	(-3.556)	(-2.645)	(-4.318)
TREAT × HIGH_FINANCIAL_CONSTRAINT	-0.205*	-0.074	-0.045	0.033
	(-1.774)	(-0.612)	(-0.535)	(0.389)
POST × HIGH_FINANCIAL_CONSTRAINT	-0.010	0.002	-0.001	-0.008
	(-0.215)	(0.030)	(-0.037)	(-0.236)
TREAT	-0.017	-0.083	0.099	0.090
	(-0.153)	(-0.728)	(1.326)	(1.250)
POST	-0.069	-0.074	-0.050	-0.044
	(-1.513)	(-1.464)	(-1.444)	(-1.591)
HIGH_FINANCIAL_CONSTRAINT	0.391***	0.307***	-0.008	-0.031
	(3.522)	(2.609)	(-0.105)	(-0.414)
ln(ASSET)	0.434***	0.409***	0.233***	0.214***
	(17.520)	(16.170)	(10.232)	(8.999)
CASH	0.382***	0.306***	0.467***	0.399***
	(3.880)	(3.114)	(5.169)	(4.454)
R&D	1.824***	1.683***	1.375***	1.255***
	(8.644)	(7.554)	(7.977)	(6.698)
ROA	0.058	0.057	0.206***	0.190**
	(0.654)	(0.612)	(2.766)	(2.373)
PPE	-0.239*	-0.288**	-0.247**	-0.286***
	(-1.765)	(-2.105)	(-2.310)	(-2.703)
LEVERAGE	-0.227***	-0.255***	-0.059	-0.083
	(-2.650)	(-3.019)	(-0.795)	(-1.159)

CAPEX	0.950***	1.004***	0.731***	0.783***
	(3.556)	(3.508)	(3.344)	(3.214)
TOBINS_Q	0.070***	0.076***	0.037***	0.041***
	(7.301)	(7.303)	(4.578)	(4.485)
HERFINDAHL_INDEX	-0.778	-0.585	0.853	0.220
	(-1.072)	(-0.759)	(1.307)	(0.288)
$HERFINDAHL\_INDEX^2$	0.837	1.100	-0.898	0.775
	(0.592)	(0.717)	(-0.658)	(0.476)
ln(FIRM_AGE)	0.044	0.011	-0.119***	-0.129***
	(1.222)	(0.314)	(-2.966)	(-3.153)
INDUSTRY_FE	Yes	Yes	Yes	Yes
Constant	-2.600***	-2.322***	-1.453***	-1.232***
	(-10.340)	(-9.302)	(-6.800)	(-5.641)
Observations	11,208	11,208	9,420	9,420
Adj._R^2	0.442	0.370	0.368	0.296

TABLE 6

Heterogeneous Treatment Effects Based on Litigating Risk

Table 6 reports the triple difference-in-differences tests to examine the relative impacts of Section 404 on innovation in firms with high and low litigation risk. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variable POST takes the value of 1 for the 2004–2006 period, and 0 for the 2001–2003 period. The indicator variable HIGH_LITIGATION_RISK takes the value of 1 if the firm's measure of litigation risk is above the sample median in 2003, and 0 otherwise. In columns (1) and (2), we use the total number of securities law-related lawsuits in the firm's 2-digit SIC industry normalized by total number of securities law-related lawsuits as the proxy for litigation risk. In columns (3) and (4), we use the firm's R&D intensity as the proxy for litigation risk. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 6 (continued)

	(1) ln(1+PATENT)	(2) ln(1+CITATION)	(3) ln(1+PATENT)	(4) ln(1+CITATION)
	Number of Lawsuits		R&D Intensity	
TREAT × POST × HIGH_LITIGATION_RISK	-0.085**	-0.110**	-0.162***	-0.211***
	(-1.978)	(-2.400)	(-3.828)	(-4.712)
TREAT × POST	-0.157***	-0.180***	-0.120***	-0.130***
	(-5.907)	(-6.947)	(-5.383)	(-6.059)
TREAT × HIGH_LITIGATION_RISK	0.638***	0.644***	1.224***	1.237***
	(7.686)	(7.806)	(16.655)	(16.746)
POST × HIGH_LITIGATION_RISK	0.023	-0.007	-0.041	-0.048
	(0.638)	(-0.198)	(-1.170)	(-1.402)
TREAT	-0.571***	-0.536***	-0.881***	-0.849***
	(-7.703)	(-7.389)	(-13.362)	(-13.031)
POST	-0.095***	-0.071***	-0.053***	-0.042**
	(-3.966)	(-3.266)	(-2.591)	(-2.201)
HIGH_LITIGATION_RISK	-0.055	-0.073	-0.013	-0.053
	(-0.301)	(-0.414)	(-0.208)	(-0.857)
ln(ASSET)	0.411***	0.383***	0.409***	0.382***
	(18.530)	(16.964)	(19.682)	(18.014)
CASH	0.344***	0.286***	0.155*	0.107
	(3.599)	(3.030)	(1.694)	(1.170)
R&D	1.698***	1.586***	0.898***	0.848***
	(8.658)	(7.653)	(4.627)	(4.065)
ROA	0.006	0.006	-0.109	-0.102
	(0.074)	(0.068)	(-1.361)	(-1.202)
PPE	-0.260*	-0.308**	-0.073	-0.128
	(-1.958)	(-2.293)	(-0.615)	(-1.061)
LEVERAGE	-0.250***	-0.276***	-0.221***	-0.252***
	(-2.989)	(-3.341)	(-2.863)	(-3.253)
CAPEX	0.968***	1.013***	0.924***	0.983***
	(3.772)	(3.668)	(3.996)	(3.878)

TOBINS_Q	0.065***	0.070***	0.064***	0.068***
	(7.151)	(7.081)	(7.784)	(7.716)
HERFINDAHL_INDEX	-0.721	-1.165	-0.928	-0.973
	(-1.020)	(-1.555)	(-1.340)	(-1.327)
HERFINDAHL_INDEX^2	0.876	2.106	0.743	1.244
	(0.633)	(1.400)	(0.554)	(0.859)
ln(FIRM_AGE)	0.059*	0.023	0.060*	0.023
	(1.693)	(0.646)	(1.858)	(0.697)
INDUSTRY_FE	Yes	Yes	Yes	Yes
Constant	-2.020***	-1.696***	-1.982***	-1.696***
	(-8.707)	(-7.421)	(-6.384)	(-5.438)
Observations	11,370	11,370	11,370	11,370
Adj._R^2	0.446	0.376	0.511	0.438

TABLE 7

Matched Sample

Table 7 reports the difference-in-differences tests that examine the relation between Section 404 and corporate innovation, based on matched samples. In columns (1) and (2), for each non-accelerated filer, we match it to an accelerated filer that is in the same 2-digit SIC industry and is closest in total assets in 2003. We further require that the total assets of the matched accelerated filer be within [90%, 110%] of that of the non-accelerated filer. In columns (3) and (4), we repeat the matching procedure based on the market capitalization. In columns (5) and (6), we repeat the matching procedure based on the number of employees. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variable POST takes the value of 1 for the 2004–2006 period, and 0 for the 2001–2003 period. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 7 (continued)

	(1) ln(1+PATENT)	(2) ln(1+CITATION)	(3) ln(1+PATENT)	(4) ln(1+CITATION)	(5) ln(1+PATENT)	(6) ln(1+CITATION)
	Matched on Total Assets		Matched on Market Capitalization		Matched on Number of Employees	
TREAT × POST	-0.208***	-0.291***	-0.116**	-0.173**	-0.303***	-0.349***
	(-4.280)	(-5.103)	(-1.975)	(-2.553)	(-7.405)	(-6.876)
TREAT	0.282***	0.321***	0.149*	0.206**	0.293***	0.331***
	(4.359)	(4.911)	(1.953)	(2.367)	(4.078)	(4.365)
POST	-0.043*	-0.044*	-0.046	-0.052	-0.025	-0.035
	(-1.685)	(-1.712)	(-1.445)	(-1.556)	(-1.119)	(-1.499)
ln(ASSET)	0.158***	0.112***	0.083***	0.061*	0.276***	0.264***
	(4.820)	(3.278)	(2.848)	(1.903)	(6.373)	(5.266)
CASH	0.157	0.121	0.215*	0.245*	0.416***	0.418***
	(1.417)	(1.186)	(1.805)	(1.874)	(2.987)	(2.960)
R&D	0.944***	0.818***	0.744***	0.606**	1.023***	0.896***
	(3.804)	(2.841)	(3.378)	(2.393)	(4.714)	(3.759)
ROA	0.045	0.101	0.145	0.127	0.180*	0.220*
	(0.422)	(0.897)	(1.347)	(1.081)	(1.719)	(1.953)
PPE	-0.061	-0.158	-0.119	-0.123	-0.050	-0.125
	(-0.432)	(-1.231)	(-0.833)	(-0.727)	(-0.283)	(-0.685)
LEVERAGE	0.046	0.014	-0.216**	-0.193**	-0.037	-0.050
	(0.428)	(0.153)	(-2.056)	(-2.112)	(-0.398)	(-0.550)
CAPEX	0.405	0.718	0.194	0.497	0.405	0.774
	(1.153)	(1.503)	(0.791)	(1.349)	(1.007)	(1.441)
TOBINS_Q	0.027***	0.025**	0.002	0.002	0.032***	0.036***
	(2.823)	(2.397)	(0.162)	(0.141)	(2.654)	(2.636)
HERFINDAHL_INDEX	4.618**	4.653**	4.585*	2.072	6.419***	4.161*
	(2.426)	(2.578)	(1.927)	(0.950)	(2.730)	(1.881)
$HERFINDAHL\_INDEX^2$	-7.856**	-7.546**	-7.677	-1.369	-15.016*	-7.861
	(-2.102)	(-2.163)	(-1.316)	(-0.244)	(-1.948)	(-1.096)
ln(FIRM_AGE)	-0.060	-0.063	-0.196***	-0.167***	-0.059	-0.047
	(-1.267)	(-1.373)	(-4.127)	(-3.002)	(-1.054)	(-0.770)
INDUSTRY_FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.669***	-1.379***	-0.266	-0.151	-1.987***	-1.831***
	(-4.225)	(-3.623)	(-0.948)	(-0.483)	(-4.735)	(-4.037)
Observations	2,052	2,052	1,416	1,416	2,676	2,676

Adj._R^2	0.266	0.203	0.245	0.170	0.341	0.279

TABLE 8

Alternative Measures of Innovation

Table 8 reports the difference-in-differences tests that examine the relation between Section 404 and corporate innovation, using different measures of innovation. The dependent variables are ln(1+PATENT_PER_EMPLOYEE), ln(1+CITATION_PER_EMPLOYEE), ln(1+PATENT_PER_R&D), ln(1+CITATION_PER_R&D), R&D, R&D+CAPEX+SGA in columns (1)–(6), respectively. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variable POST takes the value of 1 for the 2004–2006 period, and 0 for the 2001–2003 period. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. *T*-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 8 (continued)

	(1) ln(1+PATENT_PER_EMPLOYEE)	(2) ln(1+CITATION_PER_EMPLOYEE)	(3) ln(1+PATENT_PER_R&D)	(4) ln(1+CITATION_PER_R&D)	(5) R&D	(6) R&D+CAPEX+SGA
TREAT × POST	-0.113***	-0.132***	-0.026***	-0.025***	-0.002	-0.021**
	(-3.227)	(-3.813)	(-2.962)	(-2.772)	(-0.599)	(-1.962)
TREAT	0.255***	0.255***	0.037***	0.050***	0.025***	0.006
	(4.349)	(4.569)	(2.596)	(3.495)	(4.755)	(0.378)
POST	-0.138***	-0.158***	-0.025***	-0.027***	0.002	0.034***
	(-4.355)	(-5.167)	(-2.959)	(-3.198)	(0.619)	(3.200)
ln(ASSET)	0.097***	0.101***	0.010***	0.012***	-0.005***	-0.055***
	(7.450)	(7.869)	(3.148)	(3.579)	(-5.231)	(-14.840)
CASH	0.997***	0.842***	0.021	0.031	0.095***	-0.164***
	(8.926)	(8.137)	(0.944)	(1.431)	(9.816)	(-5.842)
R&D	2.207***	1.832***	0.000	0.054		
	(8.579)	(7.308)	(0.011)	(1.153)		
ROA	0.062	0.182*	-0.034	-0.015	-0.193***	-0.348***
	(0.589)	(1.762)	(-1.539)	(-0.670)	(-16.338)	(-11.646)
PPE	-0.170*	-0.198**	-0.012	-0.041	-0.011	-0.076***
	(-1.743)	(-2.036)	(-0.478)	(-1.481)	(-1.343)	(-2.579)
LEVERAGE	-0.115	-0.124*	-0.049***	-0.045***	-0.002	-0.070***
	(-1.493)	(-1.724)	(-2.819)	(-2.694)	(-0.315)	(-3.036)
CAPEX	0.831***	0.940***	0.115**	0.157**	0.028	
	(3.488)	(3.778)	(2.177)	(2.525)	(1.165)	
TOBINS_Q	0.012	0.020*	0.007***	0.008***	0.008***	0.040***
	(1.191)	(1.904)	(3.340)	(3.800)	(6.305)	(13.383)
HERFINDAHL_INDEX	3.436***	3.143***	0.558**	0.375*	0.050	0.456
	(4.087)	(3.837)	(2.336)	(1.664)	(0.679)	(1.446)
$HERFINDAHL\_INDEX^2$	-4.421**	-3.309*	-0.592	-0.294	-0.107	-1.037
	(-2.464)	(-1.926)	(-1.121)	(-0.571)	(-0.679)	(-1.462)
ln(FIRM_AGE)	-0.130***	-0.152***	-0.007	-0.019***	-0.002	0.001
	(-4.799)	(-5.693)	(-1.045)	(-2.742)	(-0.822)	(0.081)
INDUSTRY_FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.010***	-0.936***	-0.152***	-0.104***	0.008	0.456***
	(-5.817)	(-5.465)	(-3.862)	(-2.631)	(0.369)	(5.997)
Observations	11,370	11,370	11,370	11,370	11,370	11,370
Adj. R^2	0.366	0.284	0.162	0.135	0.583	0.449

TABLE 9

Alternative Post-Event Periods

Table 9 reports the difference-in-differences tests that examine relation between Section 404 and corporate innovation, using different post-event periods. In columns (1) and (2), the post-event period is 2004–2011. In columns (3) and (4), the post-event period is 2004–2011 but removing the 2007–2009 period. The indicator variable TREAT takes the value of 1 if the firm is an accelerated filer, and 0 otherwise. The indicator variable POST takes the value of 1 for the 2004–2011 period and 0 for the 2001–2003 period. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 9 (continued)

	(1) ln(1+PATENT)	(2) ln(1+CITATION)	(3) ln(1+PATENT)	(4) ln(1+CITATION)
	2001–2011		2001–2011, excluding 2007–2009	
TREAT × POST	-0.171***	-0.236***	-0.170***	-0.233***
	(-6.444)	(-8.495)	(-6.789)	(-8.781)
TREAT	-0.235***	-0.179***	-0.232***	-0.177***
	(-4.029)	(-3.062)	(-4.023)	(-3.042)
POST	-0.127***	-0.112***	-0.094***	-0.084***
	(-5.051)	(-4.348)	(-4.052)	(-3.485)
ln(ASSET)	0.408***	0.388***	0.407***	0.387***
	(18.291)	(16.976)	(18.533)	(17.234)
CASH	0.373***	0.334***	0.410***	0.369***
	(3.878)	(3.389)	(4.163)	(3.637)
R&D	1.946***	1.765***	1.931***	1.697***
	(9.139)	(8.051)	(9.045)	(7.647)
ROA	0.097	0.077	0.112	0.092
	(1.088)	(0.841)	(1.295)	(1.003)
PPE	-0.317**	-0.338**	-0.327**	-0.372***
	(-2.321)	(-2.428)	(-2.408)	(-2.686)
LEVERAGE	-0.215***	-0.246***	-0.182**	-0.217***
	(-2.788)	(-3.168)	(-2.298)	(-2.690)
CAPEX	0.909***	1.005***	1.083***	1.280***
	(3.346)	(3.537)	(3.952)	(4.387)
TOBINS_Q	0.079***	0.091***	0.075***	0.089***
	(7.953)	(8.513)	(7.608)	(8.163)
HERFINDAHL_INDEX	-1.507*	-1.282	-2.022**	-1.918**
	(-1.890)	(-1.594)	(-2.369)	(-2.215)
$HERFINDAHL\_INDEX^2$	2.434	1.967	3.120*	3.112*
	(1.601)	(1.255)	(1.898)	(1.829)
ln(FIRM_AGE)	0.036	-0.022	0.024	-0.029
	(0.939)	(-0.582)	(0.684)	(-0.812)
INDUSTRY_FE	Yes	Yes	Yes	Yes
Constant	-2.052***	-1.811***	-1.946***	-1.734***
	(-8.558)	(-7.357)	(-8.290)	(-7.108)

Observations	18,378	18,378	13,733	13,733
Adj._R^2	0.429	0.359	0.432	0.363

TABLE 10

Firms Switching from Being Non-accelerated Filers to Being Accelerated Filers

Table 10 reports the difference-in-differences tests that examine the relation between Section 404 and corporate innovation, using firms that switch from being non-accelerated filers to being accelerated filers. The indicator variable NONTREAT_TO_TREAT takes the value of 1 if the company is a switching firm that switches from being a non-accelerated filer to being an accelerated filer after it crosses the $75 million threshold, and 0 otherwise. The indicator variable POSTSWITCH takes the value of 1 for the 3-year period after the switch, and 0 for the 3-year period prior to the switch. Variable definitions are provided in Appendix 1. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics based on robust standard errors clustered by firm are in parentheses. The superscript ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE 10 (continued)

	(1) ln(1+PATENT)	(2) ln(1+CITATION)
NONTREAT_TO_TREAT × POSTSWITCH	-0.111***	-0.130***
	(-3.643)	(-4.183)
NONTREAT_TO_TREAT	0.112***	0.119***
	(3.174)	(3.508)
POSTSWITCH	-0.067***	-0.058***
	(-3.684)	(-3.077)
ln(ASSET)	0.095***	0.067***
	(3.481)	(2.685)
CASH	0.335***	0.214***
	(4.404)	(3.250)
R&D	0.652***	0.463***
	(4.337)	(3.504)
ROA	0.078	0.121**
	(1.247)	(1.977)
PPE	-0.095	-0.107*
	(-1.421)	(-1.906)
LEVERAGE	-0.046	-0.057
	(-0.905)	(-1.599)
CAPEX	0.210	0.096
	(1.513)	(0.821)
TOBINS_Q	0.009	0.009
	(1.145)	(1.207)
HERFINDAHL_INDEX	1.931**	1.305*
	(2.408)	(1.705)
HERFINDAHL_INDEX^2	-2.950	-1.127
	(-1.456)	(-0.673)
ln(FIRM_AGE)	-0.082***	-0.085***
	(-2.842)	(-3.162)
INDUSTRY_FE	Yes	Yes
Constant	-0.673***	-0.501**
	(-3.417)	(-2.449)
Observations	4,084	4,084
Adj. R^2	0.223	0.147

FIGURE 1

Placebo Test

Figure 1 shows a histogram of the coefficients on TREAT × POST from 10,000 bootstrap simulations of the model in Table 3. For each iteration, we draw a random sample of 1,415 firms (the same number of the actual accelerated firms) as the "accelerated filers" from our sample pool in the event year (2004), and then treat the rest of the pool as "non-accelerated filers." Based on these "pseudo" treated and control groups, we re-estimate columns (3) and (4) of Table 3 and save the coefficients on TREAT × POST. Graph A reports the distribution of the coefficients when the dependent variable is ln(1+PATENT), and Graph B reports the distribution of the coefficients when the dependent variable is ln(1+CITATION).

Graph A. Number of Patents

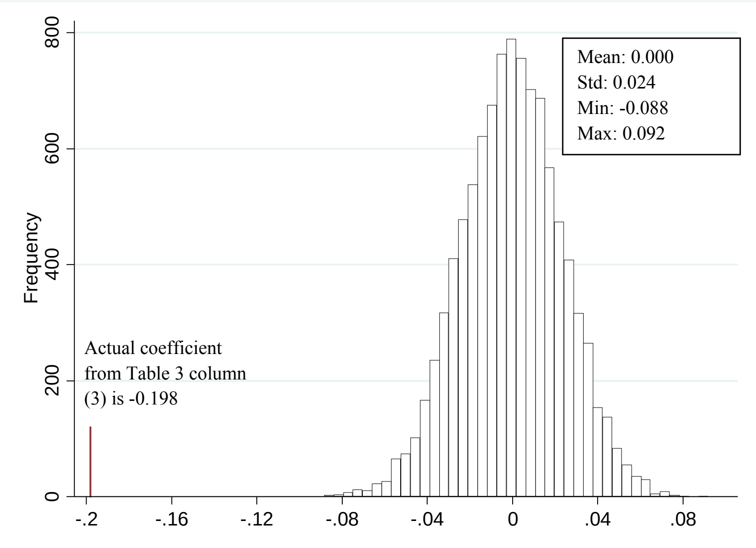

FIGURE 1 (continued)

Graph B. Number of Patent Citations