CORPORATE NETWORKS AND SOCIAL SCANDALS: PRIVATE AND REGULATORY INFLUENCES ON EXECUTIVE BEHAVIOR

by

Nicholas F. Bormann

A Dissertation
Submitted to the
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Committee:

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DEDICATION

This is dedicated to my parents, Dale and Noel, who taught me the value of learning, and my grandmother Hester who has provided me with wisdom and support.

ACKNOWLEDGEMENTS

I would like to thank my dissertation director, Alex Tabarrok, and my committee-members, Garett Jones and Thomas Stratmann, for their insight and encouragement throughout this project. I also owe deep gratitude to Mary Jackson of the George Mason Economics Department, without whose guidance I would have been lost many times over.

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Sarbanes-Oxley Act (2002).....SOX
Social Network Analysis.....SNA

ABSTRACT

CORPORATE NETWORKS AND SOCIAL SCANDALS: PRIVATE AND REGULATORY INFLUENCES ON EXECUTIVE BEHAVIOR

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George Mason University, 2015

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Decisions by corporate executives are entangled in public regulation, private torts, and social influence. In my first chapter, I examine private lawsuits against directors and officers following the passage of the Sarbanes Oxley Act (2002). Sarbanes-Oxley created new responsibilities for corporate boards and expanded tort liability for corporate directors. I find that while the number of lawsuits increased after Sarbanes-Oxley, the probability of success and amount of payment decreased. This change influenced the deterrent effect of private torts. In the second chapter, using social network analysis I track changes in the structure of interlocking board networks following Sarbanes-Oxley. This Act required more outside directors to serve on corporate boards, hoping to increase accountability to shareholders. After Sarbanes-Oxley, I find that outside directors are relatively marginalized within the overall network of interlocking directorates, and that companies with less influential outside directors are less likely to have successful shareholder proposals which challenge management decisions. In the third chapter, I

study the after-effects of a 2009 insider trading scandal which forced the resignation of several prominent corporate insiders. I find that firms associated with the scandal lose network connections, as do other companies with ties to the affected firms. These results suggest that companies make strategic decisions as to which interlocking directorates to maintain or dissolve.

CHAPTER ONE: LEGAL ENTREPRENEURSHIP FOLLOWING SARBANES-OXLEY, DISCIPLINING EXECUTIVES OR ENRICHING ATTORNEYS? EVIDENCE FROM DIRECTORS AND OFFICERS LIABILITY INSURANCE

1.1 The Decennial of the Sarbanes-Oxley Act

The collapse of Enron in December 2001, followed by WorldCom and other corporate governance scandals, created a crisis whose full effects are still being felt today. Congress responded nearly unanimously by passing far-reaching reforms of auditor independence, financial reporting, and executive liability in the Sarbanes-Oxley Act of 2002 ("Sarbanes-Oxley" or "SOX"). This significantly changed how corporate responsibility to shareholders and the general public was to be enforced.

In a press release on March 7, 2002, five months before he would sign Sarbanes-Oxley into law, President George W. Bush expressed his desire "to provide sound regulation and remedies where needed, without inviting a rush of new lawsuits that exploit new problems instead of solving them."[1] In this paper, I investigate whether those two competing goals have been accomplished. While the soundness of regulation is difficult to test empirically, a wave of lawsuits can be easily observed following the passage of Sarbanes-Oxley. Whether those lawsuits have helped to solve, or exploited the problems of corporate governance is still an open question.

[1] Press Release, "President Outlines Plan to Improve Corporate Responsibility." March 7, 2002. Remarks by the President at Malcolm Baldrige National Quality Award Ceremony. URL: http://georgewbush-whitehouse.archives.gov/news/releases/2002/03/20020307-3.html

Critics of the Act point out that most of the Sarbanes-Oxley reforms were not tailored to address future Enron-type abuses, and closely resembled ideas that had been advocated for some time by corporate governance crusaders (Romano 2005). The crisis brought about by corporate governance scandals gave an opportunity to implement policies which, in less tumultuous times, had previously been rejected. The result is an expansive, hastily crafted piece of legislation which broadens federal control at the expense of flexible corporate governance between different states (Easterbrook 2009).

In spite of these problems, some scholars are optimistic about Sarbanes-Oxley. It has been argued to enforce better accounting practices and deter fraud through harsher punishments, benefiting stockholders in the long run (Coates 2007; Coffee 2007); give an advantage to "honest" corporations over their unethical competitors (Frankel 2006); and improve disclosure, reducing information asymmetries when hiring executives (Wang 2010). Companies with stronger shareholder rights appear to perform better (Gompers, Ishii and Metrick 2003) so to the extent that Sarbanes-Oxley improved those rights, the results could be positive.

There is a developing literature attempting to measure the impact of the SOX reforms. Most studies of Sarbanes-Oxley have focused on outcome variables such as abnormal returns following passage of the law (Chhaochharia and Grinstein 2007; Akhigbe, Martin and Newman 2010); whether firms with managed or unmanaged earnings fared better after SOX (Li, Pincus and Rego 2008) or the decision of small firms to withdraw from public listings and "go private" (Kamar, Karaca-Mandic and Talley 2008). In another line of investigation, researchers observed a drop in foreign filings and

bond issuance on U.S. markets following passage of SOX and tested whether this was due to the law's costly requirements for U.S.-listed companies (Marosi and Massoud 2008; Piotroski and Srinivasan 2008; Doidge, Karolyi and Stulz 2010; Gao 2011).

Much attention has been paid to Sarbanes-Oxley provisions regarding auditor independence and higher penalties for white-collar crime. Extending the reach of criminal law in the corporate setting is certainly worthy of study, yet these mechanisms are only the tip of the iceberg when it comes to the law's effects as "most securities enforcement continues to take place under a civil regime, through either SEC actions or private litigation" (Harvard Law Review 2002, p. 733). The effect of SOX on civil liability is noteworthy because it has received little empirical study.

Lawyers are also economic agents who respond to incentives. Congress often tries to recruit the legal profession to implement its mandates through civil penalties when top-down enforcement is difficult, or divided government weakens their capacity for regulatory measures (Farhang 2008). But, like any other effort to tamper with market incentives, these policies are fraught with unintended consequences.

In this paper, I explore the consequences of SOX civil liability enhancements on the directors and officers insurance market. I find that following SOX, there was a surge in litigation of questionable quality. It appears that rather than just disciplining executives, lawyers have taken advantage of the system as well as their clients to pursue cases with a low chance of success, driven on by a few high-profile victories. I find that the chance that a case would be dropped or dismissed before trial increased by as much as 45% after SOX, and the average indemnity payment was one quarter the value of pre-

SOX cases. The result has been higher litigation fees from fighting low-merit cases. These findings call into question the efficacy of Sarbanes-Oxley's enhanced civil litigation in deterring corporate fraud.

1.2 Incentives for Lawsuits and the Necessity of D&O Insurance

Linck, Netter and Yang (2009) find that Sarbanes-Oxley increased demand for corporate directors and reduced supply, leading to measurably higher executive wages. If SOX had such clear effects on the labor market for corporate executives, it is no stretch to imagine that it would spill over into related markets such as directors and officers (D&O) insurance. In this section I briefly review the literature on D&O insurance and discuss specific parts of SOX which influence this specialized insurance market.

1.2.1 Why Insure Directors and Officers?

D&O insurance is divided into three types. Side A insurance protects executives against personal liability lawsuits; Side B is used to repay the corporation when it must indemnify payments for its executives; and Side C protects the corporation against lawsuits it is involved in as an entity. For-profit firms commonly carry all three forms of D&O insurance (Towers Watson 2011).

While the 2005 class action settlements against Enron and WorldCom resulted in large out-of-pocket payments from directors, such cases are very rare (Black, Cheffins and Klausner 2006). Most D&O suits are handled by an insurance company and settled

without direct financial losses to the executive (although costs such as bad publicity and lost reputation are certainly present).

As a first impression it would seem directors and officers insurance is counterproductive for shareholders who want to deter executive malfeasance. Personal liability serves as an additional check against unethical corporate behavior (Finch 1994). However, there are several reasons that companies want to insure their directors. For one, it is harder to hire a qualified executive if he or she is worried about tort losses from conduct on the job. Further, Holderness (1990) suggests that D&O insurers serve as another layer of monitoring over executives though extensive checks before underwriting a policy. While shareholder interests are dispersed, reducing the incentive to monitor executive decision-making, an insurance company has a profit motive to cover only reliable firms. This "monitoring hypothesis" is verified empirically by O'Sullivan (1997) in a study of UK corporate structure.

For non-profits the biggest D&O liability risk comes from employee lawsuits (often related to allegations of discrimination) but for publicly- and privately-held corporations, complaints from shareholders are the most frequent cause of claims (Towers Watson 2011). This meshes with the view of insurance companies. Baker and Griffith (2007) conducted detailed interviews with D&O insurance underwriters and found that the highest perceived risk is misrepresentation from corporate executives which spurs a lawsuit by investors. They also describe how underwriters consider financial measures as well as more subjective impressions about corporate governance and "character" when deciding whether to offer coverage.

D&O insurers compete to provide low premiums without taking unnecessary risks. Their profitability is dependent on effectively screening companies before offering coverage, as well as the legal climate which determines the chance of indemnifying a tort settlement. In the next section, I outline provisions within Sarbanes-Oxley likely to increase the number of D&O cases handled by insurers.

1.2.2 Sarbanes-Oxley Increases Liability Risk for Executives

Shareholder lawsuits clearly respond to outside influences. As one example, in 1993 Japan reduced the cost of filing a shareholder lawsuit and the number of derivative suits increased dramatically, from dozens per year to hundreds (West 2001). While Sarbanes-Oxley does not lower the cost of a suit I will argue that it improves the expected payoff, which according to rational litigation models (e.g. Posner 1973; Shavell 1979) would have a near-equivalent effect.

Various provisions of SOX have increased the obligations of executives, exposing them to greater liability, as well as forcing more transparency within the corporation, giving stockholders more opportunity to observe actionable behavior. Here I discuss sections within SOX likely to increase the number of lawsuits being filed, and correspondingly, increase corporate executives' reliance on directors and officers insurance. For the sake of clarity, I will divide these into two broad categories.

1.2.2.1 Increased Transparency

Section 307 of the Sarbanes-Oxley Act requires "an attorney to report evidence of a material violation of securities law or breach of fiduciary duty or similar violation by the company or any agent thereof, to the chief legal counsel or the chief executive officer of the company." In other words, corporate attorneys are responsible not only for representing their clients but also serving as "gatekeepers" tasked with preventing exploitation of stockholders (Coffee 2003). This erosion of attorney-client privilege makes defending against lawsuits more difficult because corporate lawyers are concerned with their own liability, not just the clients'. Further, this reduces the cost of litigation for the government because lawyers can be recruited as *de facto* enforcers for the SEC (McLucas, Shapiro and Song 2006). Both factors might lead to a higher volume of tort cases.

Section 406 mandates disclosure of corporate codes of ethics. This is intended to put pressure on companies to create ethical standards and expose them to public scrutiny if those codes are not followed. However, this provision also creates legal risks, as "strong internal compliance programs are likely to produce incriminating information that, if given no legal protection, could lead to criminal or civil liability" (Harvard Law Review 2003, p. 2127). If a company discloses their code and then fails to follow it, the risk of a lawsuit is higher because their obligations are already stated, making any defense based on innocent or unknowing error less credible.

Section 806 extends whistleblower protection to any individual who reports fraud within an organization, and entitles them to relief through civil actions. While Sarbanes-Oxley also includes criminal penalties for retribution against reports to law enforcement,

the civil provisions are much broader in their application (Bucy 2004). This increases transparency within the company, and also creates new causes for litigation in order to enforce these whistleblower provisions.

Whistleblower protections can be used to protect ethically upstanding employees, but the potential for opportunism exists as well. Imagine a disgruntled worker who expects to be released from employment soon. That person could come forward as a "whistleblower" preemptively, and be shielded from termination by this section of the law. Even if the revelation ends up being incorrect or of no value to law enforcement, all that is required is that the employee "reasonably believe" a cover-up is occurring (Dworkin 2007). Also, as this section adds protection for internal whistleblowers, it is not even necessary for the employee to seek an external authority. Raising an issue higher in the corporate chain is sufficient to be granted civil redress if "retribution" were to occur, unless the employer can prove the counterfactual, that disciplinary action would have occurred regardless of the whistleblowing. Unlike previous whistleblower statutes, SOX switches the burden of proof to the employer, who must prove that their conduct *was not* retaliatory rather than requiring the employee to show that they were retaliated against (Stern and Cohen 2007).

Such provisions make litigation upon the conclusion of an employment contract more likely, because what constitutes retaliation can be construed very broadly by employees. In one case, workers alleged that workplace relocations and a higher recorded error rate in their quality assurance records were retaliation against exposure of faulty interest payment calculations in the company's system (which the employees had been

assigned to fix).[2] While unsuccessful, this claim illustrates how otherwise normal business operations may be reinterpreted as discrimination under the SOX whistleblower protections.

In another case, an employee was fired for an inappropriate relationship with a union executive she negotiated with as part of her job.[3] She filed a case claiming she was terminated for revealing fraud in union-company negotiations. The firm (an airline) lost in the initial hearing because they could not prove a definite separation between her termination and whistleblower status, although they were successful in denying the claim upon appeal. As more claims emerge, Sarbanes-Oxley will also shape the development of common law, leading to more wrongful termination cases in the state courts (Westman 2005).

1.2.2.2 Expanded Liability and Reduced Capacity for Defense

One of the more controversial provisions, **Section 906** demands "[e]ach periodic report containing financial statements... shall be accompanied by a written statement by the chief executive officer and chief financial officer". In other words, directors are expected to personally certify that each financial statement is correct, and can be held liable for mistakes made by their subordinates or outside agents responsible for preparing those statements. This closes the loophole which allowed Enron to blame their

[2] Allen v. Stewart Enterprises, Inc., ARB No. 06-081, ALJ Nos. 2004-SOX-60 to 62 (ARB July 27, 2006). URL: http://www.oalj.dol.gov/PUBLIC/ARB/DECISIONS/ARB_DECISIONS/SOX/06_081.SOXP.HTM
[3] Platone v. FLYi, Inc., ARB No. 04-154, ALJ No. 2003-SOX-27 (ARB Sept. 29, 2006). URL: http://www.oalj.dol.gov/PUBLIC/ARB/DECISIONS/ARB_DECISIONS/SOX/04_154.SOXP.HTM

accounting firm for fraudulent restatements of earnings, but it also exposes directors to much higher risk from accounting errors.

Section 402 prohibits a company from advancing personal loans to its officers and directors. The goal is to prevent abuse of corporate funds, but the statute is written broadly enough that it may also bar the company from advancing payment of legal fees to fight a lawsuit against a director or officer (Black and Boundas 2002). For companies without D&O insurance, this may tie their hands in a legal battle and force them to accept a settlement. The restriction on funds for a defense might also increase a plaintiff's estimate of their chance at victory, making a lawsuit appear more worthwhile.

Finally, **Section 902** states "[a]ny person who attempts or conspires to commit any offense under this chapter shall be subject to the same penalties as those prescribed for the offense." The "chapter" referred to here is Chapter 63 of title 18 (United States Code) which covers mail and wire fraud, already one of the most expansively interpreted and easily prosecuted federal offenses. If a director is presumed to have knowledge of the entire company's operations, he or she might be considered to have "conspired" with nearly any fraudulent action committed by a subordinate, and be exposed to liability.

1.2.2.3 Summary

This section only scratches the surface of new obligations created by Sarbanes-Oxley. From this brief sketch however, it is obvious that in addition to criminal penalties aimed at corporate executives, SOX also creates many new causes for civil litigation. Further, criminal actions or SEC enforcement can generate parallel private suits, which

would magnify these effects (Cox, Thomas and Kiku 2003). If an SEC investigation begins, plaintiffs' lawyers know that they might win a large private settlement against the targeted company even if the formal inquest is deemed a failure.

Based on this analysis, I predict a large increase in civil litigation against directors and officers following the passage of SOX. In the next section I verify this intuition empirically, and begin to assess the effects of SOX on case quality and settlement amounts, measures which have until now remained unexamined.

1.3 Settlement Data and Empirical Strategy

One potential weakness in prior event studies of Sarbanes-Oxley is that the data sample is limited to just a few years before and after passage. Research designs which capture immediate market reactions to the legislation might not account for unintended effects on the legal system which take several years to manifest. My goal here is to track evolution of the legal landscape in the decade following the law's passage, and compare the promise of deterring executive misconduct against the possibility that plaintiffs' lawyers have abused SOX provisions for their own enrichment.

1.3.1 The Dataset: Settled D&O Claims in Florida

Sarbanes-Oxley creates many new causes for litigation but does not establish forums for redress of these complaints, so its enforcement largely falls upon the state courts system (Chandler and Strine 2003). It is this feature of SOX which I will exploit for my empirical strategy. In Florida, state law requires the public disclosure of all settled

tort claims against professionals covered by insurance companies and self-insurance funds (Chapter 627.912, F.S.). As a result, records of settled cases for directors and officers are maintained in a searchable online database with coverage from the early 1990s up to the present day.

The dataset consists of 3,937 resolved D&O claims, the earliest closed in 1994 and the most recent in 2012. Measures of interest include: deductible paid by the defendant; indemnity payment made by insurance company; non-economic loss; date of injury, date injury reported, date of final dispensation for case; court decision and stage in court system when settlement is made; county where suit is filed; whether suit filed by an entity or an individual; as well as identifying information for the insured, the injured party, and the insurance company, which are not used in this study.

Summary statistics for select variables can be found in Table 1, and summary statistics divided by pre- and post-SOX cases in Table 2. All dollar amounts are reported in 2005 dollars. Tables 3 and 4 tabulate the reported court decision and stage settlement is reached, respectively.

From these descriptive statistics, a few observations can be made. Most cases (65%) were settled with no court proceedings; another 26% are reported as “Other” and 8% as “No Response.” Court judgments make up a very small minority of cases. Looking at the stage cases settle at, roughly a third are dropped or dismissed, 28% are settled before they reach trial and just one in twenty-five is settled through a court decision.

These results match the prediction made about tort cases in general: most cases are not tried, because the outcome is often clear from the start and trials are costly.

Reasonable estimates for tort settlement rates range from 67% to 90% of cases (Eisenberg and Lanvers 2008) yet it appears from this dataset that D&O cases are even less likely to reach trial than tort cases in general.

Table 1: Summary Statistics of D&O Cases

Variable	Obs	Mean	Std. Dev.	Min	Max
Indemnity Paid	3937	22,754	294,495	0	8107609
Deductible Paid	3937	38,018	824,982	0	2.87E+07
Suit by Individual?	3937	0.669	N/A	0	1
Non-Economic Loss	3937	187	2,796	0	80000
Paid Off? (Indem>0)	3937	0.142	N/A	0	1

Table 2: Summary Statistics, Divided Pre- and Post-SOX

Pre-SOX

Variable	Obs	Mean	Std. Dev.	Min	Max
Indemnity Paid	437	52,149	421,452	0	8107609
Deductible Paid	437	11,422	73,315	0	1033282
Suit by Individual?	437	0.769	N/A	0	1
Non-Economic Loss	437	568	4,527	0	70000
Paid Off? (Indem>0)	437	0.33	N/A	0	1

Post-SOX

Variable	Obs	Mean	Std. Dev.	Min	Max
Indemnity Paid	3500	19,084	274,416	0	7749836
Deductible Paid	3500	41,339	874,544	0	2.87E+07
Suit by Individual?	3500	0.656	N/A	0	1
Non-Economic Loss	3500	140	2,495	0	80000
Paid Off? (Indem>0)	3500	0.119	N/A	0	1

Table 3: Tabulating Court Decisions

Court Decision	Freq.	Percent
No Court Proceedings.	2,550	64.77
Other	1,017	25.83
No Response	298	7.57
Summary judgment for the defendant.	27	0.69
Judgment for the defendant.	18	0.46
Directed verdict for defendant.	9	0.23
Directed verdict for plaintiff.	6	0.15
Judgment for the plaintiff.	6	0.15
Judgment for the defendant after the appeal	2	0.05
Judgment for the plaintiff after appeal	2	0.05
Judgment notwithstanding the verdict	1	0.03
Summary judgment for the plaintiff.	1	0.03

Table 4: Tabulating Stage Settlement is Reached

Stage Settlement Reached	Freq.	Percent
Claim Dropped or Dismissed	1,335	33.91
No Response	1,176	29.87
Suit Filed but Settlement Reached Before Trial	1,107	28.12
Court Verdict	156	3.96
As a Result of Arbitration	59	1.5
Settlement Reached Prior to Pre-Suit Period	51	1.3
During Trial, but Before Court Verdict	35	0.89
Settlement Reached After Verdict	9	0.23
Settlement Reached After Appeal was Filed	9	0.23

1.3.2 Distribution of Cases over Time

Figure 1 shows the frequency of injuries being reported to insurance companies which result in a D&O claim. There is a spike in the early 1990s, a dip, and then a rapid increase from 2004 to the present.[4] This closely tracks the occurrence of national and state legislation throughout that time, and effects were not limited to Florida: according to a Tillinghast-Towers Perrin (2005) survey of for profit firms, the average premium for D&O insurance roughly doubled between 1999 and 2005.

The first spike seen in Figure 1 coincides with Congress passing the Civil Rights Act of 1991, which expanded civil remedies against employers who engage in discriminatory conduct. This law allowed employees to collect back pay with interest along with punitive damages, and is thought to be a prime cause of large settlements throughout the 1990s (Tillinghast Towers-Perrin 2002). Then, in 1999, Florida passed The Tort Reform Act. While primarily aimed at restricting product liability cases, it also increased the standard of proof for applying punitive damages. This gives some context for the dip in cases between the late-90s and early-2000s: the expected tort payoff was lower because punitive damages were harder to acquire.

[4] A weakness in this dataset is that it only includes D&O cases against insured parties; if a corporation is not insured, any settlement made would not be apparent. One might speculate that following SOX, more companies decided to purchase D&O insurance, causing an upward bias in the observed number of suits. However, this is unlikely to account for the full increase in observed litigation: national surveys find that 85% of corporations responding had D&O insurance in 1994, up to 97% in 2003 (Tillinghast Towers-Perrin 2003). While the prevalence of D&O coverage has certainly increased, this effect alone is not enough to explain the meteoric rise in D&O settlements made.

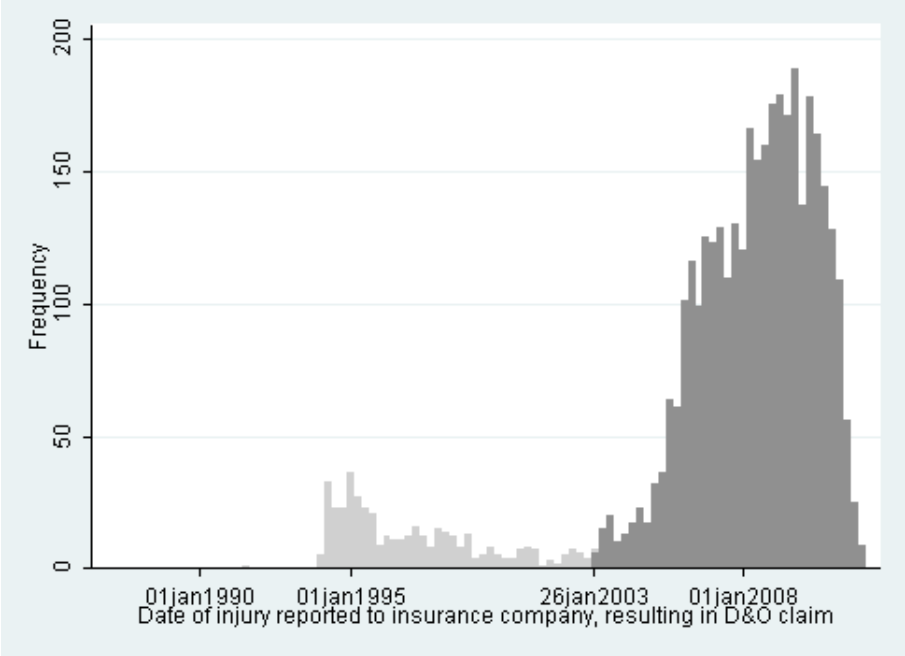


Figure 1: Distribution of D&O Cases over Time by Date Reported.[5]

Sarbanes-Oxley was signed into law on July 30, 2002. The reader might wonder why there is a delay of several years between passage of SOX and the current spike in D&O cases. Two explanations are available. First, the SEC did not finish its rule-making process for SOX until January 26, 2003 and repeatedly extended the deadline for full compliance, especially for smaller companies. Lawyers might have bided their time until the requirements for SOX were fully cemented. The effect of the law may have been delayed yet further by time required to understand and assimilate all the new regulations.

Second, Sarbanes-Oxley extends the statute of limitations for fraud to two years after its disclosure (from one year) and to five years after occurrence (from three years).

[5] Each bar represents 90-day period. Light gray is pre-SOX, dark is post-SOX rulemaking period which concluded January 26, 2003.

Buckberg et al (2005) note that "plaintiffs' attorneys could have responded to the passage of SOX by filing additional suits for cases on which the pre-SOX statute of limitations had expired—perhaps cases with weaker merits that had not ranked as high on their priority lists." After controlling for concurrent factors, this possibility is confirmed by the dataset: post-SOX cases have a longer span between injury occurring and final dispensation (see footnote)[6] and a lower chance of being successful (covered in part *III.e* of the paper). The next section, discussing expected value of a lawsuit after SOX, also sheds some light on this delay between passage of the Act and the flood of lawsuits to follow.

1.3.3 Expected Value of Litigation

A revenue-maximizing plaintiff or lawyer cares about both the size of the settlement and the chance of a successful suit. These two measures multiplied together are the expected value of litigation. In a given year *t*, the expected value of a D&O suit is the probability of receiving an indemnity payment, multiplied by the payment received conditional on victory.

[6] Looking at a simple comparison of means, it appears that D&O cases from 2003 onwards have been settled much faster than those from 2002 and before. However, there have been changes in the state court system over time: the number of judges in Florida increased from 719 in 1990 to 982 in 2012, so cases are cleared more expeditiously; further, Congress allocated funds to all the states in 1993 to improve court efficiency, and the program expanded in 2005 to allow online processing of court data. To account for this, I regressed the time from injury to dispensation on post-SOX status while controlling for the year of injury, and found that post-SOX cases had 493 extra days between injury and closure of the case. After adding controls for court outcome and stage of settlement, I found that post-SOX cases took 264 days longer than pre-SOX; both results were statistically significant (robust standard errors). For a more elaborate test I used a differing time-trend model with the year of injury, post-SOX status, and an interaction of the two (the variable of interest) while controlling for stage of settlement, court outcome, and county fixed effects. From this specification I found that time from injury to dispensation increased by 35 days for each year after SOX, although the statistical significance of the trend is vulnerable to heteroskedasticity.

$$EV_t = \sum x_t * p(x)_t = Value(Payout|Success)_t * P(Success)_t$$

Figure 2 shows the expected value of a D&O case in each year from 1994 to the present (blue line) and the probability of a successful case in each year (red line) with labels on the points indicating how many cases were dispensed with in each year.

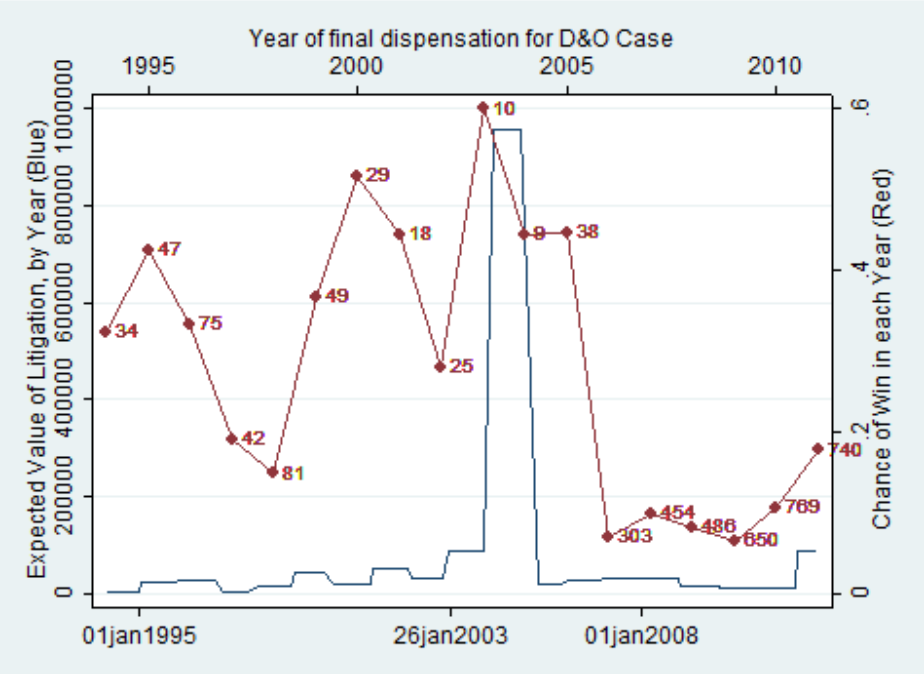


Figure 2: Expected Value in 2005 dollars [Blue, left y-axis] and Win Rate [Red, right y-axis] for D&O Cases.[7]

In every year up until 2003 the expected value of a case is low, reaching a maximum of $50,700 in 2001 (in 2005 dollars) and the highest chance of winning a

[7] Labels in red show number of cases filed each year.

settlement is around 50%, observed in the year 2000. In this time period, the number of cases filed per year never rises above 100. Then, in 2004, there are several very large, successful settlements which push the expected value of a case up to $958,000. In the years that follow, the number of cases goes up drastically, but the probability of winning drops to below 10%. This takes the expected value of cases back to pre-2004 levels but the number of cases rises rapidly, up to 769 cases in 2011, more in that single year than in all the years together before SOX.

From a rational litigation perspective, this result seems mysterious. If the expected value of a case from 1994 to 2002 only incentivized a few dozen cases per year, and the expected value from 2005-2012 is roughly the same, why are we seeing many hundreds of D&O cases per year instead of dozens? Even though few cases are successful in receiving settlements, the number of claims filed continues to go up.

Of course, lawyers and plaintiffs deciding whether to file a D&O suit do not have the benefit of a detached, *ex post* view of how every other similar case has settled. Their estimate of the expected value will be based on the lawyer's experience, or cases that have recently been in the news (representativeness or availability bias). The occasional successful settlement is more likely to be talked about and remembered than the many lost cases in between.

It appears that a few windfall settlements immediately following Sarbanes-Oxley opened the floodgates of litigation, as lawyers and clients grew more optimistic about their own chances at winning a D&O claim. Combined with the extended statute of limitations provided by SOX, cases that previously did not seem worthwhile began to

enter the system. These effects should also show up in settlement amounts, which I turn my attention to next.

1.3.4 Settlement Amounts

I expect to see lower settlement amounts following Sarbanes-Oxley due to the much lower success rate for claims. However, settlement amounts may also be driven by any number of other economic factors, so it is helpful to control for those as well.[8] To do this, I specify a linear regression model of the form:

$$\ln(Indem)_{it} = \alpha + \beta SOX_i + \gamma Time_t + \delta Individual_i + \theta X_t + \mu Z_i + \varepsilon_{it}$$

Indem is the indemnity payment made by the insurance company for case *i* at time *t*, measured in 2005 dollars. *SOX* is an indicator variable which is equal to 1 if the injury leading to the claim occurred in 2003 or after, and 0 otherwise. *Time* is a daily time trend based on the day that the case's final dispensation is made. All else being equal, one would expect indemnity payments to increase over time. When deciding on how much to award, the reference point is not likely to be zero but instead anchors on the amount of other recent tort awards. If any sympathetic plaintiff is judged to deserve an above-average award, this "tyranny of small steps" will drive up awards as cases accumulate (Tullberg 2006). *Individual* is an indicator which is equal to 1 if the claim is filed by a person, and equal to 0 if filed by a legal entity.

Z is a vector of dummy variables for stage that settlement is reached, court outcome, and county that the suit is filed in. The purpose of these is to control for the

[8] Data Sources Used: Bureau of Labor Statistics, Local Area Unemployment Statistics; Federal Reserve Bank St. Louis (FRED) Economic Data; Florida Office of Insurance Regulation, Professional Liability Tracking System.

merit or other unobservable characteristics of a D&O case. A claim which is settled through arbitration, for example, might be different from one resolved through a directed verdict and is certainly not the same as a case dropped before trial. The county fixed effects control for time-invariant differences between local court systems. Judges employed in county courts tend to be constant over time, and if some judges are either more generous or parsimonious in awards given then the fixed effects will capture that variation.

X is a vector of economic indices coincident with the time that the case's dispensation is made. Litigation is generally thought to be correlated with the business cycle, as "when many firms are losing money, lawsuits blossom" (Ronen 2010, p. 196). To control for cyclical effects on indemnity payments, the following measures are used: Dow Jones Industrial Average (DJIA) on the date the case's dispensation is made; the unemployment rate in Florida, measured in monthly increments; the leading index for Florida, which is an aggregate measure intended to predict the state's 6-month growth rate using housing permits, unemployment claims, and interest rate spread, among other measures, also calculated monthly; and county-level unemployment rate, measured yearly. These encompass the business atmosphere at the time of the case's settlement as well as the near-term economic outlook, to control for the bargaining position of lawyers, plaintiffs, and the insurance company when negotiating settlements.

The huge spread between many unsuccessful cases which show an indemnity payment of zero versus the occasional but very large payout is likely to inflate the standard errors of a linearly specified model. To offset this, I use a logarithmic transform of the dependent variable (after adding 1 to all indemnity payouts, to avoid missing values when the payment is zero).[9] These results are shown in Table 5. Nearly all variables show statistical significance with this specification. Pre-SOX cases have between four to five times higher indemnity payments than post-SOX cases. The economic controls also become significant: higher unemployment rates as associated with lower indemnity payments, and higher DJIA and leading index values tend to increase payments.

The causal relationship from these economic indicators to D&O liability payments is not immediately obvious, but the interpretation is clear: when the local or national economy is doing better (worse) then indemnity payments become higher (lower). If indemnity payments were being driven by executive behavior, one would expect the opposite result, because fraud is more often discovered when firms are losing money (e.g. Bernie Madoff's investment Ponzi scheme was not revealed until the housing crisis caused his payout system to collapse). Instead, settlements tend to be larger when the economy is strong, which suggests some other factor at work aside from corporate conduct.

[9] There is some debate in the literature about how to handle observations of zero when using a logarithmic transform model. Adding 1 to each observation is one method, which I choose for its simplicity, but it is beyond the scope of this paper to say what approach is most optimal. The biggest problem would be if there are many observations in the range (0,1) which would become negative after the log transform, but fortunately that is not an issue for indemnity payments.

Table 5: Log of Indemnity Amount as Dependent Variable

	(1)	(2)	(3)	(4)	(5)	(6)
SOX	-4.337***	-5.776***	-4.055***	-5.865***	-5.084***	-4.457***
	(-9.15)	(-7.84)	(-6.06)	(-7.08)	(-5.19)	(-4.66)
Time Trend	0.000562***	0.00155***	0.00119***	0.00200***	0.00120**	0.000708
	(5.66)	(6.45)	(4.72)	(6.29)	(2.72)	(1.81)
Individual	0.144	0.0643	0.121	0.308*	0.486**	0.444**
	(1.33)	(0.58)	(1.21)	(2.31)	(3.25)	(3.01)
DJIA		-0.000244***	-0.000184***	-0.000202**	-0.0000815	0.0000270
		(-4.14)	(-3.66)	(-3.21)	(-1.03)	(0.48)
Florida Unemployment		-0.347***	-0.305***	-0.483***	-0.406***	
		(-6.18)	(-5.64)	(-6.92)	(-3.92)	
Florida Leading Index		0.250***	0.162***	0.167***	0.119*	
		(6.08)	(4.48)	(3.41)	(1.99)	
Court & Settlement FE	NO	NO	YES	YES	YES	YES
County Fixed Effects	NO	NO	NO	YES	NO	YES
County Unemployment					0.106	-0.189*
					(1.71)	(-2.32)
Constant	-4.881***	-15.54***	-14.35***	-7.130	-13.61*	-2.056
	(-3.48)	(-5.46)	(-4.49)	(-1.62)	(-2.12)	(-0.36)
R-squared	0.054	0.075	0.244	0.269	0.229	0.271
N	3937	3792	3792	2434	1727	1727

1.3.5 Frivolous Litigation

So far, we know that there are many more cases after SOX and they tend to have lower indemnity payments. The interpretation of these findings is unclear, however. A defender of SOX might say that its transparency provisions have brought to light fraudulent activity that was undetected before (perhaps because of its small scale) and that fraud is now being found and punished more often. A critic of SOX would argue that lower payments suggest more weak cases are being brought forward, clogging the court system and redistributing wealth from plaintiffs and shareholders to lawyers.

It is impossible to evaluate the social desirability of a policy based solely on the number of lawsuits; what matters is the proportion of those which are meritorious rather than frivolous (Choi 2007). Fortunately, the richness of the D&O dataset makes such a test possible. Following Helland and Tabarrok (2003), I use whether a case is dropped or dismissed without trial as a measure of low quality. With that strategy in mind, I specify a linear probability model[10] of the form:

$$Dropped_{it} = \alpha + \beta SOX_i + \gamma Time_t + \delta Individual_i + \theta X_t + \mu Z_i + \varepsilon_{it}$$

Variables and controls are defined in the same way as above, except Z can only include county fixed effects and not court or settlement stage, as those would be redundant with the dependent variable. Results for this regression are shown in Table 6.

The findings here are dramatic. Depending on the specification, post-SOX cases are from 12% to 45% more likely to be dropped or dismissed, results which are consistent and statistically significant. The largest estimated coefficients occur in specifications with

[10] A probit model was also specified, but the results are qualitatively identical so they are not reported.

the most control variables included (county fixed effects and economic indices) so the lower estimated coefficients might be attributed to omitted variable bias, which is attenuated in the more thorough specifications. It is reasonable to believe that the most accurate estimate is toward the upper end of the 12% - 45% range.

Cases filed by individuals are 5% to 6% more likely to be dropped, a result which is also consistent and significant. One way to interpret this finding is that an individual plaintiff is more subject to cognitive bias than a corporate entity due to lack of experience with other similar suits, or might pursue a weak case out of personal animosity toward a company ("it's not about the money, it's about sending a message"). Intuitively, an individual's case is also more likely to be employment-discrimination related, and while I have no reason to believe such cases are more or less likely to succeed, a selection effect may be at work here.

Positive economic conditions tend to reduce the chance of a frivolous case being filed, although the coefficients are small. One interpretation of this finding is that when companies are doing badly, investors feel angry and pursue cases with little merit. Alternately, courts might be hesitant to punish local businesses and/or insurance companies fight harder against claims when the economy is already down, leading to more dismissals. How the economy affects case quality cannot be fully determined from these results, although it is an interesting potential area for further study.

Table 6: Case Dropped or Dismissed as Dependent Var. (Linear Probability Model)

	(1)	(2)	(3)	(4)	(5)
SOX	0.280***	0.118	0.380***	0.421***	0.455***
	(5.84)	(1.91)	(5.29)	(6.34)	(6.46)
Time Trend	-0.00000674	-0.000000433	-0.000126***	-0.000137***	-0.0000807*
	(-0.67)	(-0.02)	(-3.96)	(-3.60)	(-2.18)
Individual	0.0502**	0.0469**	0.0613**	0.0629**	0.0666**
	(3.18)	(2.93)	(3.14)	(2.75)	(2.83)
DJIA		0.0000112	-0.0000228*	-0.0000264*	-0.0000577***
		(1.53)	(-2.52)	(-2.32)	(-5.98)
Florida Unemployment		0.00494	0.00249	0.0123	
		(0.82)	(0.31)	(0.96)	
Florida Leading Index		-0.0370***	-0.0284***	-0.0346***	
		(-6.59)	(-4.00)	(-4.18)	
County Fixed Effects	NO	NO	YES	NO	YES
County Unemployment				-0.00895	-0.0219*
				(-0.91)	(-2.38)
Constant	0.176	0.0342	3.253***	2.581***	1.532**
	(1.26)	(0.15)	(7.14)	(5.08)	(2.92)
N	3937	3792	2434	1727	1727

1.4 Discussion

As a starting point, observing that many more D&O insurance claims were settled after Sarbanes-Oxley is an ambiguous effect. One might argue that this is desirable because executives are being held to task for violations of investor confidence they had previously hidden behind the corporate veil. However, after examining the characteristics of cases pre- and post-SOX, this interpretation quickly falls apart.

Following SOX, the indemnity payments made for D&O liability decline. If courts award payments commensurate with the damage caused, this suggests that cases are being filed for less serious offenses than before. SOX improved corporate transparency, so all else being equal one would expect more cases to be successful because better information on wrongdoing is available. But, the empirical evidence contradicts this story, because the chance of a successful case declined sharply after SOX even as the volume of cases was increasing.

The intended goal of SOX was to deter fraud and improve executive conduct. The results here suggest one of two possibilities. First, executives may have improved their behavior, but the provisions for civil litigation under SOX led to many new lawsuits regardless. The result is a transfer of wealth away from shareholders and investors, as corporations purchase stronger liability insurance, and redistribution toward law firms. This also imposes costs on the economy as a whole, because "[u]nnecessary civil or criminal liability diminishes the return to, and increases the cost of, capital" (Winter 1993, p. 948). The incentive to invest productively is reduced when more is taken through rent-seeking litigation.

The second possibility is that executive conduct remained basically the same before and after SOX, but now bad directors are noticed more due to greater transparency. In this case, the deterrent aspect of the law has failed. Punishing fraud may be morally desirable in and of itself, but if those punishments do not reduce the incidence of fraud then society is not tangibly better off than it was before. In this case, the high costs of complying with SOX might exceed the benefits (although there is not enough evidence from this paper alone to make that comparison directly).

If not society as a whole, who has benefited from the surge of litigation following SOX? Law firms are the obvious winners. Regardless of whether a case reaches a settlement, an attorney working at an hourly rate will make money. The few high payoff cases immediately following SOX may have distorted plaintiff views about their own chance of success, leading to many claims with a very low probability of receiving a settlement. If plaintiffs are not fully rational actors and are subject to cognitive biases when deciding whether or not to litigate, the result can be unnecessary and frivolous litigation (Guthrie 2000). This certainly appears to be the case after SOX, as D&O cases are much more likely to be dropped or dismissed than they were before. Ideally, lawyers would help to mitigate their clients' biases, but that does not appear to be the case here.

How economically significant are the litigation costs arising from SOX? Obviously we can never know how lawyers and insurance companies would have behaved without passage of SOX, and the cost of lower capital investment by firms is even harder to estimate. However, the estimates of increased low-merit litigation can

generate a rough counter-factual of how many cases would *not* have been filed had SOX not passed.

SOX resulted in 12% to 45% more dropped or dismissed cases being filed, and 3,500 cases were filed in the time period after SOX, so suppose that from 420 to 1,575 of those cases were low-merit lawsuits resulting from SOX. The mean deductible paid by the insured in a case that is dropped or dismissed is $84,751 (in 2005 dollars). Deductibles are a reasonable estimate for the cost of defending a claim, because legal expenditures incurred by the insurance company in fighting the settlement are typically included in the deductible (up to some maximum value). The estimated cost of defending frivolous cases post-SOX then ranges from $35.6 million to $133.5 million in the state of Florida. Making the heroic assumption that Florida is representative of the nation as a whole and D&O cases are proportional to population, the minimum national cost of SOX solely from fighting frivolous lawsuits is from $583.5 million to $2.2 billion.

These estimates should be taken with a grain of salt; however, they represent the very lowest possible bound on total litigation costs from SOX. If the cost of fighting a claim is above a policy's deductible it would be capped at the deductible amount in the dataset (e.g. if the policy deductible is $100,000 and the insurance company spends $150,000 on legal representation, my cost estimate would only show $100,000) which understates litigation costs. Further, money spent by plaintiffs in pursuing the case is not recorded, which could easily double the estimates given.

Hiring lawyers to fight an unsuccessful D&O claim is a transaction cost incurred to prevent a transfer from occurring, and represents a pure economic loss. If we expand

the measure of transaction costs to all cases before and after SOX, not just frivolous ones, an even more stark comparison can be made: in Florida D&O cases from 1994 to 2002, each year approximately $550,000 in deductibles were paid, while from 2003 to 2012, each year $14.5 million in deductibles were paid, a 26-fold increase in yearly transaction costs of D&O litigation. The economic losses from litigation enabled by SOX are indeed significant.

1.5 Conclusion

Sarbanes-Oxley lowered the bar for civil litigation against corporate directors, hoping to deter executive misconduct through stricter penalties. In spite of the many advantages that SOX gave to plaintiffs, examining the data on directors and officers insurance payouts shows that lawsuits have become less effective not more effective. In this regard, SOX has not achieved its stated goals.

I find that indemnity payments for claims against directors and officers declined following Sarbanes-Oxley, suggesting that suits are arising for less serious offenses. Further, while the number of lawsuits has increased dramatically, so has the probability that a case will be dropped or dismissed before trial, indicating that many of the new cases are lacking in merit. The cost of fighting these lawsuits has certainly reached into the billions on a national level, and the unmeasured impact on capital investment is even higher.

In crafting Sarbanes-Oxley, lawmakers hoped that attorneys would act as enforcers to stop corporate fraud. What was ignored, however, is that lawyers are

themselves economic agents who respond to profit opportunities. As a result, the post-SOX legal climate has been exploited, enriching lawyers at plaintiffs and shareholders' expense. While this paper contributes to the literature on incentives for attorneys in relation to political economy, more research is still needed to determine whether the goal of preventing corporate fraud can be accomplished without incurring such high transaction costs from litigation, and if indeed such a goal is worth the price.

CHAPTER TWO: INTERLOCKING BOARDS AND CORPORATE OUTSIDERS. NETWORK CHANGES AFTER SARBANES-OXLEY

When one corporate executive serves on the board of two or more corporations, the configuration is referred to as an interlocking directorate. The influence of interlocking directorates on firm culture, corporate control, and political behavior has been studied extensively within the economic sociology literature. However, this methodology has only recently broken into the realm of economic policy analysis (Jackson 2010). This paper bridges that gap by studying dynamic changes in interlocking directorates and the behavior of corporate executives following the legal and institutional changes after the passage of the Sarbanes-Oxley Act (2002).

The Sarbanes-Oxley Act (SOX) was passed in July of 2002 and took effect at the beginning of 2003. In response to corporate governance scandals within Enron and Worldcom, SOX imposed new requirements on firms to improve accountability and director independence.

Most importantly in the context of this paper, SOX encourages firms to employ more outside directors on their corporate boards to protect shareholder interests. Coincident with the passage of SOX, the NYSE and NASDAQ stock exchanges began to require that listed firms have a majority of outside directors on their boards.[11] Further, the qualifications necessary for an outside director were more stringently defined and

[11] New York Stock Exchange Rule 303A.01 and NASD Rule 4350(c).

enforced (Harvard Law Review 2004). This combination of "shocks" to corporate board structure invites further investigation.

2.1 Corporate Boards as Social Networks

Corporate directorships have provided a fertile ground for social network research. Directorships are clearly defined, are temporally bound, and have explicit legal meaning, avoiding the problems of self-reported data on subjective social relationships that sociologists have grappled with for decades (Marsden 1990). Corporate interlocks have predictive power regarding political donations and influence by corporations on government (Mizruchi and Koenig 1988; Moody and White 2003; Burris 2005; Stark and Vedres 2012). The influence of corporate networks on policy has received ample attention, but the inverse effect of government policy on corporate networks has remained relatively understudied.

Some social networks are made up of close ties such as marriage or long-lasting friendship. Other ties are "weaker" and less involved. Interlocking directorates are an example of the latter. Mutual board memberships entail infrequent interpersonal meetings, limited emotional investment, marginal intimacy, and only occasional reciprocal services (Westphal 1998). However, Granovetter's (1973) influential work suggests that weak ties are important for information sharing and bridging gaps between separate networks.

A director who serves on the board of two companies acts as a bridge between their respective networks—the corporate boards—which are likely characterized by stronger internal ties. A bridging tie generates power and influence because it is a

potential bottleneck for transfer between two otherwise disconnected networks. Interlocking board memberships serve both to enhance corporate cooperation and to provide sources of private information (Schoorman, Bazerman, and Atkin 1981; Uzzi and Lancaster 2004). The role of corporate interlocks in information sharing, potentially up to the point of collusion, is problematic for regulators because interlocks are both inevitable and desirable in many cases. Well-connected corporate board members also propagate best practices between corporations and likely improve overall corporate governance (Shipilov, Greve, and Rowley 2010; Shropshire 2010; Bouwman 2011).

I attempt to address several interrelated issues. First, have corporate social networks become more closely knit following the passage of Sarbanes-Oxley? The goal of SOX was to increase the transparency and independence of firms to protect stockholders. To the extent that interlocking directorates allow closer corporate cooperation and purveyance of private information, they can run counter to that goal. However, interlocking directorates may be a "necessary evil" following new regulation, as knowledge for compliance is diffused and must be aggregated in some fashion. Second, I examine the effect of SOX on outside directors within the context of director networks. Outside directors were mandated by SOX to improve shareholder protection. However, that role cannot be filled in a vacuum. Outside directors are human and subject to social norms and influence. I investigate the location of outside directors within interlocking directorates, and then trace out the tangible implications on votes for shareholder proposals.

2.1.1 Social Network Metrics

Social network analysis applies graph theory to human relationships. Within this context, a *node* refers to an individual or entity, while an *edge* refers to the relationship or tie that connects two nodes.[12] In this section I give a brief background of social network theory and discuss the methods used for modeling corporate board networks.

A network of interlocking directorates can be constructed in two different ways. The first method is to treat corporations as nodes and connect two corporations with an edge when they share the same individual on their corporate boards. The second method is to treat each director as a node and to connect two directors with an edge when they sit on the same board together (Battiston and Catanzaro 2004). I will use both network structures to model interlocking directorates, and refer to them as "board networks" and "director networks," respectively. The former aids analysis of linkages between companies, while the latter emphasizes interpersonal ties between directors.

As shown in Table 7, the number of nodes and edges in the graph of board interlocks has increased substantially over time. The density of the network has also changed over time. Graph density is the number of actual edges divided by the number of potential edges if the graph were fully connected—

$$density = \frac{m}{n(n-1)}$$

[12] Edges may be directed or non-directed. An example of a non-directed tie would be mutual friendship, a legal contract, or a two-lane highway between cities. A directed node implies that the connection goes from one party to the other but not necessarily vice-versa; for example, sending an email, a position of hierarchy (boss to subordinate), or a link to one web page from another. For the purposes of this paper all edges are nondirected, so I do not discuss this distinction further.

—where *m* is the number of edges, and *n* is the number of nodes. A graph with higher density has more closely connected nodes relative to the total number of possible connections. The density of director networks is decreasing over time in the dataset as the number of nodes has increased, which introduces confounding factors that must be controlled for.

Table 7: Summary Statistics for Director Networks by Year

Year	Nodes (Directors)	Edges	Graph Density
2001	11,169	66,339	0.00106
2002	16,370	135,673	0.00101
2003	18,561	161,831	0.00094
2004	14,181	81,093	0.00081
2005	14,653	82,825	0.00077
2006	29,522	267,685	0.00061
2007	32,602	311,562	0.00059
2008	34,629	353,659	0.00059

Table 8: Summary Statistics for Board Networks by Year

Year	Nodes (Companies)	Edges	Graph Density
2001	1,272	3,951	0.00489
2002	1,540	5,099	0.00430
2003	1,801	7,240	0.00447
2004	1,761	5,541	0.00358
2005	1,830	5,690	0.00340
2006	2,803	14,729	0.00375
2007	3,043	16,663	0.00360
2008	3,082	17,881	0.00377

Graph theory provides many powerful tools for analyzing and comparing different social networks. I choose two metrics for further analysis: degree and PageRank.[13] Summary statistics for these measures are shown in Tables 9 and 10.

The **degree** of a node is the number of edges that connect to that node. For example, a director of degree=3 is connected to three other directors through shared board membership. A higher degree represents more opportunities to exchange information, and generally greater power and prestige within the network (Valenti and Horner 2010). The distribution of degree values for all directors in all years is shown in Figure 3.

Table 9: Summary Statistics for Director Network Centrality Metrics

Variable	Obs	Mean	Std. Dev.	Min	Max
Degree	226,582	23.16	20.66	1	222
Degree Cent.[14]	226,582	.0009714	.0008208	.0000289	.0122793
PageRank	226,582	.0000563	.0000385	5.17e-06	.0003979

Table 10: Summary Statistics for Director Network Centrality Metrics

Variable	Obs	Mean	Std. Dev.	Min	Max
Degree	209,193	10.98645	10.25213	1	81
Degree Cent.	209,193	.0045066	.0039307	.0003246	.0288889
PageRank	209,193	.0004923	.0003395	.0000669	.0030735

[13] Many other metrics also exist, such as closeness, betweenness centrality, and Eigenvector centrality (of which PageRank is a subset). I choose not to use these metrics due to computational limitations imposed by the size of the director social networks and by the disconnected nature of the overall graph.

[14] $Degree\ Centrality = \frac{degree}{n-1}$ where n is the number of nodes in the network.

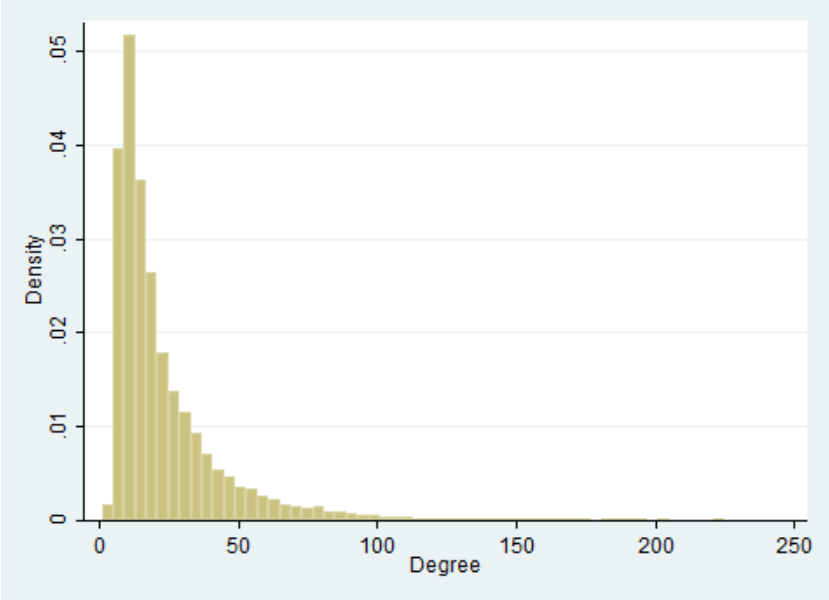


Figure 3: Distribution of Degree, All Directors in All Years

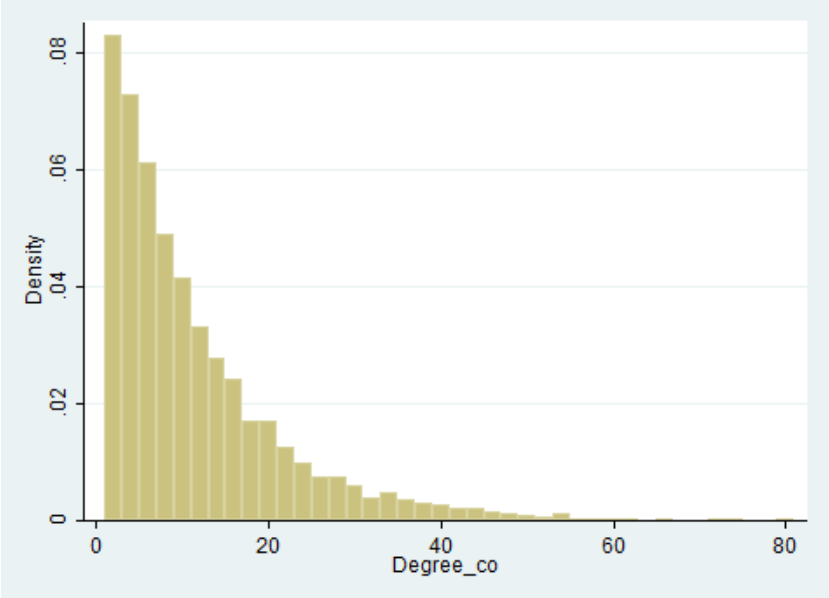


Figure 4: Distribution of Degree, All Companies in All Years

One weakness of degree as a measure of influence is that it does not control for the overall size of a network. Further, all connections are obviously not equal. Social connections with more influential individuals are likely to be valued more highly and should be "weighted" higher. Bonacich (1972) made an important contribution in this area, with an algorithm that weights the value of each edge according to the centrality of the node that it links to; in other words, the way to become important is to know other important people.

Modern iterations of the same idea have expanded this concept. PageRank is an algorithm developed for Google's search rankings, but it is also meaningful in the context of social networks. The intuition behind PageRank is that a website with incoming links from popular websites is itself more popular and should be ranked higher (Page et al. 1998). In the context of corporate social networks, a director who is connected to other influential directors is assigned more weight, and a shared directorship with an important director raises the estimate for each connection's network centrality.

As a data source, I use the WRDS Corporate Library, which lists the corporate directors for nearly all publicly traded companies. Figures 5 and 6 show director interlocks for the most-connected directors in 2001 and 2008, respectively. There were over 11,000 directors in 2001. To make the graphs visually understandable, it is necessary to trim out many of the nodes. As a cutoff for each year, I select a PageRank value that corresponds to the PageRank of the 50^{th} most-connected director. Director nodes below that value are removed from the graphs. What emerges is a bare-bones

network containing only the most connected directors in each year. The cutoff point chosen is itself arbitrary but helps to give a first impression of director networks.

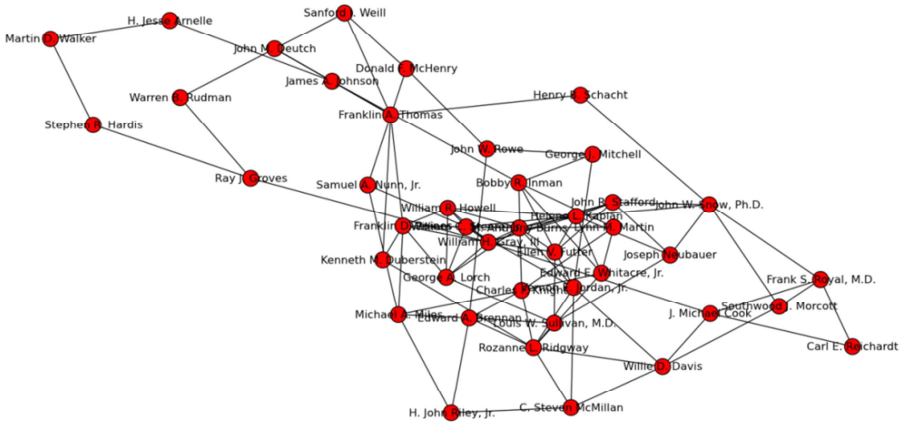


Figure 5: Director Network S&P 500, 2001 (cutoff: PageRank 0.0006)

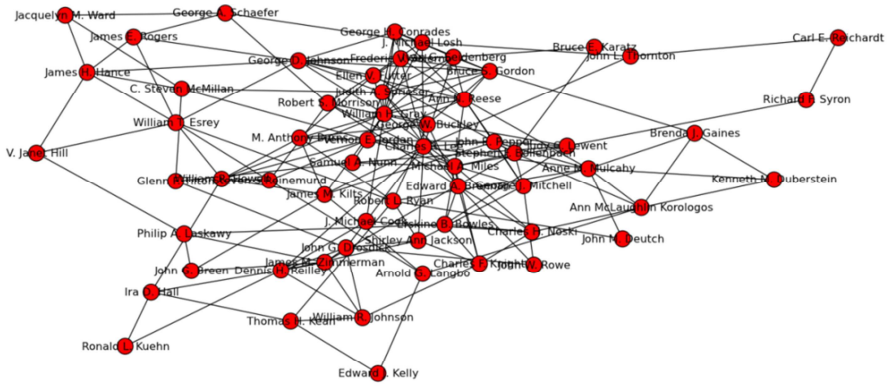


Figure 6: Director Network S&P 500, 2008 (cutoff: PageRank 0.0004)

Inspection indicates that in 2008 the "core" directors are more closely connected with each other than in 2001. To go beyond visual impressions and check for differences over time, in the next sections I employ multiple linear regressions to identify changes in board and director networks following the passage of Sarbanes-Oxley.

In Section 2, I use network centrality measures as evidence that Sarbanes-Oxley influenced the structure of interlocking board networks. In Section 3, I focus on the impact SOX had on outside directors specifically, finding that outside directors are more numerous but have a lower degree of influence than they had prior to SOX. I also suggest some implications of this finding on corporate decision-making and pluralistic ignorance. In Section 4, I test these suppositions using records of voting behavior in companies with more influential outside directors versus those without. I find that in boards with less-connected outside directors, shareholder proposals receive fewer votes in favor. Section 5 concludes the paper and offers some policy implications resulting from these findings.

2.2 Board Networks and Size Effects

Barring external shocks, centrality measures for networks of interlocking directorates are expected to be stable over time (Mariolis and Jones 1982; Marquis 2003). Therefore, the large institutional changes imposed by Sarbanes-Oxley and concurrent industry self-regulation can be attributed as the cause for diverging network metrics before and after 2003.

Using the WRDS database of corporate directors, I employ a network-building algorithm to create edges between companies with directors who served on the same

corporate board in a given year (if Companies A and B have the same director listed in the same year, plot an edge between them for the graph in that year). Next, I calculate network centrality measures for each company in each year (degree and PageRank). Network centrality is the dependent variable I attempt to explain.

The Sarbanes-Oxley Act primarily targets large publicly traded companies. Smaller companies with less than $75 million in public float (nonaccelerated filers) were granted several "temporary" exemptions from the more costly aspects of SOX compliance, particularly the accounting requirements of Section 404(b). These exemptions were made permanent by the Wall Street Reform and Consumer Protection Act of 2010, but even before that point, smaller companies could easily delay compliance via the SEC's exemptions.

The result of these temporary exemptions is a fuzzy discontinuity between companies of different sizes. Very large corporations listed in the S&P 500 are certain to be fully regulated by SOX, and the S&P Midcap companies are also very likely to be regulated, but some S&P Smallcap companies may have been exempted. I exploit this discontinuity for my empirical strategy.[15]

To be clear, every publicly listed company was required to have a board of more than half independent directors as per the new NYSE and NASDAQ rules in 2003; however, larger companies may have also made strategic decisions in selecting directors to ease compliance with Sarbanes-Oxley, while smaller companies were less likely to do

[15] The delineation for S&P 500, midcap, and smallcap companies changes from year to year based on internally -decided standards relevant primarily to investors. The discontinuity I refer to is necessarily imprecise.

so. Hiring a director already experienced with regulatory compliance reduces the cost for a company to adapt to new regulations (Helland and Sykuda 2004). As a result, I expect large corporations to form more new interlocks after Sarbanes-Oxley.

I estimate regressions of the form—

$$Centrality_i = \alpha + \beta SOX_i + \gamma Size_i + \delta SOX * Size_i + \eta X_i + \varepsilon_i$$

—where "Centrality" is one of the two network centrality measures, "SOX" is a dummy-variable for years post-2003 where Sarbanes-Oxley is in effect, "Size" is a dummy for which S&P Index the company appears in, and "SOX*Size" is their interaction (the main variable of interest). "*X*" represents a vector of fixed effects by industry categorization (202 different categories such as "Appliances," "Financial," etc.[16]). If companies within different industries have differing purposes and goals in creating interlocking directorates, the fixed effects will capture those changes.

If Sarbanes-Oxley influences the structure of board networks, I would expect to see the largest effect on S&P 500 companies and less effect on Midcap and Smallcap companies. This pattern emerges most clearly with Degree as dependent variable (Table 11). The degree for all companies increased, likely reflecting the requirement for boards to include additional outside directors. However, the effects of company size heavily diverge. In Column 1, S&P categorization and the interaction show a positive sign for S&P 500 companies and mid-cap companies (small-cap are the "base case"). S&P 500 companies are expected to have 7.7 more connections on average, and, after SOX, to gain

[16] A common finding in the interlocking directorates literature is that insurance and banking companies are clustered at the center of board networks (Mintz and Schwartz 1981, 1983; Sonquist and Koenig, 1984; Glasberg, 1987).

almost six more connections above that. This shift represents a significant increase in the number of interlocking directorates centered on very large corporations.

Table 11, Column 2 shows the same specification except using mid-cap companies as the base case. S&P 500 companies are expected to have approximately six more connections than mid-cap companies, while small-cap companies have one to two less. The magnitude of both these divergences increases with the interaction from SOX. Column 3 displays the results when using S&P 500 companies as the base case. Both mid- and small-cap companies have less connections than those in the S&P 500, and have their degree further reduced after passage of SOX.

For corporations, Sarbanes-Oxley pulls in two directions regarding the optimal number of interlocking directorates. On the one hand, corporations have an incentive to hire directors who already serve with other companies and are experienced with regulatory compliance. On the other hand, interlocking directorates may be closely scrutinized for ethical conflicts or corporate collusion. Sarbanes-Oxley offers more tools to pierce the corporate veil and harsher sanctions for violations. If the costs of vetting a new interlocking director are fixed while the benefits of reduced compliance costs are greater for large companies, these findings would be explained (Black, Cheffins, and Klausner 2006). Alternately, small companies may have low compliance costs due to SEC exemptions and thus feel less need to add directors.

Table 11: Board Networks with Size Effects (Degree)

	(1) Degree	(2) Degree	(3) Degree
Post-SOX	-0.111	2.335***	5.458***
	(-1.41)	(26.82)	(54.28)
Density	-4923.7***	-4993.1***	-5152.8***
	(-55.72)	(-56.50)	(-58.03)
S&P 500	7.699***	6.269***	
	(91.73)	(69.56)	
SOX*SP500	5.896***	3.408***	
	(56.25)	(30.39)	
S&P Midcap	1.441***		-6.286***
	(19.66)		(-69.71)
SOX*Midcap	2.427***		-3.291***
	(26.89)		(-29.44)
S&P Small		-1.445***	-7.728***
		(-19.73)	(-91.97)
SOX*Small		-2.684***	-5.906***
		(-29.80)	(-56.62)
Constant	14.86***	16.60***	23.68***
	(28.84)	(32.11)	(45.63)
Industry Dummies	Yes	Yes	Yes
N	131774	131774	131774
R^2	0.494	0.496	0.492

t statistics in parentheses. Standard errors robust to heteroscedasticity.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Regressions on PageRank, in Table 6, are more ambiguous. S&P 500 companies have a higher rank within the overall network, which is unsurprising. However, Column 1 shows that influence declined after SOX. Midcap and smallcap companies both show a relative increase in centrality following SOX. One possibility is that the overall increase in number of firms diluted the effect of connections for S&P 500 members while offering useful new connections for smaller firms. The "Density" variable is intended to control for growth in size of the network, but it may have still omitted part of the effect. This puzzling result is open to interpretation and further research.

One might assume that large firms naturally expand their influence through more and more interlocks over time, but this supposition is contrary to the existing literature. Galaskiewicz and Wasserman (1981) find that in the past, large firms were as likely to shrink as to grow in influence within the board interlock network. Having many interlocks alone does not predict that a firm will gain new interlocks. The pattern of large firms expanding their board networks requires an explanation based on institutional changes, rather than on historical trends.

The primary finding from these regressions is that Sarbanes-Oxley did have a measurable impact on the structure of board networks. In addition to NYSE and NASDAQ requirements, SOX changed the cost and benefit calculus for corporations in hiring directors. Many of the new regulations and requirements were aimed at increasing the number of outside directors on corporate boards, and I turn specifically to this issue in the next section.

Table 12: Board Networks with Size Effects (Degree)

	(1) PageRank	(2) PageRank	(3) PageRank
Post-SOX	-0.0000741***	-0.0000494***	-0.000208***
	(-17.62)	(-10.32)	(-36.98)
Density	0.169***	0.167***	0.163***
	(42.17)	(41.73)	(40.53)
S&P 500	0.000495***	0.000420***	
	(84.50)	(66.56)	
SOX*S&P500	-0.000124***	-0.000149***	
	(-20.23)	(-22.70)	
S&P Midcap	0.0000753***		-0.000421***
	(14.59)		(-66.61)
SOX*Midcap	0.0000254***		0.000155***
	(4.73)		(23.53)
S&P Small		-0.0000754***	-0.000496***
		(-14.61)	(-84.59)
SOX*Small		-0.0000297***	0.000126***
		(-5.53)	(20.57)
Constant	-0.000180***	-0.0000965***	0.000347***
	(-6.53)	(-3.51)	(12.56)
Industry Dummies	Yes	Yes	Yes
N	131774	131774	131774
R^2	0.434	0.435	0.431

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2.3 Director Networks and "Outsider" Directors

Why do social networks matter for outside directors? Often tasked with an oversight or advisory role, outside directors have been described as a "rubber stamp" for management decisions. However, focusing on the explicit power of decision-making misses the importance of social influence. As Koenig and Gogel (1981) observe,

> The prestigious, socially well-connected outside director may have little or no financial power of his own within the company but still be able to harm or destroy a management team simply by quitting his "window dressing" position on the board, since to leave is to publicly accuse the firm of misbehaving; an accusation deleterious to stock prices and thus to personal fortunes. (46)

A well-connected director can make a credible threat to quit upon observing bad governance practices, whereas a threat from a less influential director with few outside options may be taken as pure posturing.

Fogel, Ma, and Morck (2014) find that companies with well-connected outside directors have better economic performance, CEO accountability, and less earnings management, all suggesting better corporate governance. They connect this result to the credibility of outside directors, who have better ability to confront bad governance practices, improving shareholder value. I contribute to this literature by examining the effect of Sarbanes-Oxley on the relative network position of outside directors, which may in turn influence their effectiveness as shareholder representatives.

2.3.1 Outside Directors, Inside Networks

My empirical strategy here focuses on outside directors within director networks. Each director represents a node, and a shared board membership with any other director is an edge. Then, I calculate network metrics and use information about companies and directors to isolate the effects of Sarbanes-Oxley. Regressions are specified as

$$Centrality_i = \alpha + \beta SOX_i + \gamma Outside_i + \delta SOX * Outside_i + \eta X_i + \varepsilon_i$$

where variables are defined as in Section 2, and "X" represents a vector of control variables including network density in a given year, director age and tenure, and size of the corporation. Results for these specifications are found in Tables 7 and 8.

Mizruchi (1996) notes that "most interlocks are created by a firm's outside directors." These findings agree: Outside directors have approximately three more connections, on average, than inside directors (Table 13). After Sarbanes-Oxley, the average degree for inside directors declined by between six and nine connections. The degree for outside directors declined as well, but not by as much: only a loss of three to seven connections on average (exact value depending on other controls included in the specification). Sarbanes-Oxley widened the gap between inside and outside directors with regard to their degree of interlocking board connections.

Director age and tenure have some predictive value regarding the number of connections a director will have. For each additional five years of age, we expect a director to have one additional connection. Interestingly, director tenure pushes on the opposite direction, with directors who have served on the same board for longer periods having a lower degree of connections.

Table 13: Network Effect on Outside Directors Post-SOX (Degree)

	(1) Degree	(2) Degree	(3) Degree	(4) Degree
Post-SOX	-7.631***	-9.671***	-9.253***	-6.317***
	(-38.86)	(-50.28)	(-48.10)	(-36.37)
Outside Dir.	1.292***	3.355***	2.481***	3.500***
	(7.59)	(24.17)	(11.12)	(23.99)
SOX*Outside	4.825***	3.163***	2.191***	1.448***
	(24.92)	(17.34)	(11.67)	(8.27)
Density	-29696.8***	-52255.5***	-52926.1***	-36076.5***
	(-84.32)	(-122.31)	(-118.88)	(-100.29)
S&P 500		3.746***	3.635***	
		(4.26)	(4.15)	
S&P Midcaps		-6.975***	-6.990***	
		(-7.93)	(-7.97)	
S&P Smallcap		-11.71***	-11.57***	
		(-13.34)	(-13.19)	
TSX 60		-0.257	1.016	
		(-0.22)	(0.81)	
Director Age			0.175***	0.206***
			(10.37)	(43.74)
Dir. Tenure			-0.107**	-0.00482
			(-2.79)	(-1.02)
Constant	47.91***	71.91***	63.85***	39.34***
	(122.68)	(70.27)	(52.90)	(88.07)
N	226582	140062	130519	200642

t statistics in parentheses. Standard errors robust to heteroskedasticity.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results for PageRank as dependent variable (Table 14) are subtly different. Again, outside directors appear to be important locus points for connecting the network, and show a higher PageRank value. However, after Sarbanes-Oxley the PageRank for inside directors generally increased, while that out of outside directors went down. To quantify the effect: Outside directors lost 20.5% of a standard deviation worth of PageRank, while inside directors gained 40.1% of a standard deviation following SOX (using point estimates from Column 3).

There is tension between the changes in degree for outside directors, which went up, versus PageRank, which went down. The supply of corporate directors is inelastic, at least in the short term, and institutional changes in 2003 created sudden new demand for outside directors. More directorships per person are a quick fix for the new demand.

However, being hired to fill a position does not necessarily imply having power and influence. Incumbent CEOs and board members may pick strategically among new outside directors. Zajac and Westphal (1996) find that CEOs choose new board members whose background suggests agreement with the board's existing strategy. Taking on outside directors who are inexperienced and have few other connections poses less threat to the status quo (further explored in Section 4). If companies chose outside directors from their large competitors or peers, the PageRank for those directors would be higher (they would be new connections between important nodes). Knowing that PageRank declined, we can infer that the new directors chosen were relatively marginalized, and likely remained so, after Sarbanes-Oxley.

Table 14: Network Effect on Outside Directors Post-SOX (PageRank)

	(1) PageRank	(2) PageRank	(3) PageRank	(4) PageRank
Post-SOX	0.0000127***	0.0000110***	0.0000114***	0.0000141***
	(31.80)	(21.00)	(21.65)	(30.94)
Outside	0.0000177***	0.0000154***	0.0000140***	0.0000156***
	(39.48)	(28.63)	(23.23)	(31.88)
SOX*Outside	-0.00000669***	-0.00000462***	-0.00000578***	-0.00000732***
	(-14.33)	(-8.13)	(-10.03)	(-14.30)
Density	0.120***	0.117***	0.116***	0.125***
	(184.75)	(139.92)	(134.70)	(174.94)
S&P 500		0.0000308***	0.0000309***	
		(14.25)	(14.30)	
S&P Midcaps		0.0000173***	0.0000171***	
		(8.01)	(7.91)	
S&P Smallcap		0.0000132***	0.0000131***	
		(6.12)	(6.08)	
TSX 60		0.0000143***	0.0000148***	
		(6.38)	(6.48)	
Director Age			0.000000251***	0.000000266***
			(9.07)	(34.15)
Dir. Tenure			-0.000000171**	-9.23e-09
			(-2.76)	(-1.11)
Constant	-0.0000501***	-0.0000639***	-0.0000748***	-0.0000677***
	(-68.48)	(-26.13)	(-27.81)	(-73.29)
N	226582	140062	130519	200642

t statistics in parentheses. Standard errors robust to heteroskedasticity.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2.3.2 Discussion: Outside Directors and Pluralistic Ignorance

Separating ownership and control and deferring decision tasks to a specialized group of corporate managers should maximize shareholder value, but agency problems within the board, the incompleteness of incentive schemes for board members, and differing attitudes toward risk all suggest that some sort of monitoring system is also desirable (Fama and Jensen 1983; Beatty and Zajac 1994). Interventions in corporate structure are also interventions in the network of personal and professional relationships between board members. As a result, unintended consequences can easily pass from the interpersonal to the bottom line.

Corporate malfeasance emerges from group dynamics within corporations (Granovetter 1985). Breaking up insider cliques and preventing "groupthink" is part of the rationale for requiring the presence of outside directors on corporate boards. However, the marginalized status of outside directors within director networks may affect their effectiveness as watchdogs. The diligence of outside directors in speaking out against bad management practices is a core justification for their inclusion on corporate boards (Tobin 1994). In a highly suggestive study, Westphal and Bednar (2005) find that socially marginalized outside directors are less likely to counteract harmful policies chosen by the rest of the board. The fear of losing social esteem combined with an already precarious social position makes some outside directors less effective at contesting a harmful corporate strategy. Westphal and Bednar refer to this problem of inaction as "pluralistic ignorance."

Pluralistic ignorance describes the situation when each member of a group disagrees with a group decision or norm, but remains publicly accepting of it (Miller and

McFarland 1987). Reasons for not speaking include fear of embarrassment or belief that one's own perception is significantly different from the group's. A single member of the group may observe the rest not acting to resolve a problem, and then assume that because others are not acting, the problem is not serious. If every member makes this same calculation, then a problem remains unresolved, even though every person secretly thinks that action should be taken.

This phenomenon has been extensively studied within interpersonal interactions such as "who should make the first move" or rapprochement between groups (Vorauer and Ratner 1996; Miller and Nelson 2002; Shelton and Richeson 2005). Possible applications continue to grow, however, as pluralistic ignorance can occur even in a context of rational agents engaging in high-stakes economic activity (Zhu and Westphal 2011; Bjerring, Hansen, and Pedersen 2014). If an insider with relatively low status doubts his or her ability to influence group behavior, that individual may support a norm of unethical behavior or fraud despite personally disagreeing with it (Bicchieri and Fukui 1999; Buckley, Harvey, and Beu 2000; Halbesleben, Wheeler, and Buckley 2005).

Pluralistic ignorance emerges as a growing problem within the business ethics and corporate governance literature, but with the exception of the 2005 Westphal and Bednar study, most discussions remain in the realm of theory or abstract social psychology experiments. Finding that after Sarbanes-Oxley outside directorships are more numerous but also relatively low-impact within director networks connects the world of psychology experiments to that of policy analysis. The reduced ability of weakly connected individuals to challenge group behavior constitutes an obstacle to the independence and

effectiveness of outside directorships. The next section investigates a tangible application of this problem.

2.4 Shareholder Proposals and Excluded Outsiders

By design, outside directors are intended to represent shareholders; but how effective they are in doing so remains an open question (Gilson and Kraakman 1991). I begin with the assumption that, all else being equal, outside directors are more likely to support shareholder proposals than are inside directors.[17] This hypothesis is supported by existing research on shareholder proposals and corporate control (Gordon and Pound 1993; Sundaramurthy and Lyon 1998). However, an outside director who fears a loss of status and is already weakly situated within director networks may choose to remain silent and vote for the insiders over the shareholders. In this section, I test that hypothesis empirically.

I use the ISS (RiskMetrics) database on shareholder proposal voting outcomes for my empirical analysis. From the literature on pluralistic ignorance, I hypothesize that boards on which the outside directors are less central, in comparison with inside directors, are less likely to see contrary actions taken by outside directors. As a result, shareholder initiatives will receive fewer votes from boards with strongly influential inside directors.

[17] This is a strong assumption that glosses over the many cooperative interactions between inside and outside directors (Kaufman and Englander, 2005; Baranchuk and Dybvig, 2009). Further, vote trading between different proposals suggests that shareholder proposal outcomes may be endogenous (Christoffersen et al., 2007). Findings from this model should be regarded with these issues in mind.

Within the data that are available, I know which individual or entity initiated each shareholder proposal and the percentage that voted in favor of each proposal. Out of over 12,000 shareholder proposals initiated between 2001 and 2008, 4,464 reached a vote, offering a large sample for analysis. Director-specific voting records are not available. To address this gap, I construct a proxy measure for each company in each year, making use of the network centrality measures from Sections 2 and 3.

To model voting choices, I assume that each inside director would prefer to vote against a shareholder proposal, whereas each outside director would prefer to vote for it. However, the probability that a director chooses to vote her preferences is a function of confidence, based upon relative network centrality to the other directors. Westphal and Milton (2000) find that minority directors with more experience and network connections within boards are more successful at influencing other directors and at speaking against majority views. Outside directors with few connections may be swayed toward siding with the majority, especially if the insiders are highly influential.

For Company *i* in a given year, I construct an Oppositional Willingness Index (*OWI*) as

$$OWI_i = \frac{\sum Network\ Centrality\ (Outside\ Directors)_i}{\sum Network\ Centrality\ (Inside\ Directors)_i}$$

For robustness, I calculate these measures for both PageRank and degree centrality metrics. I also include controls for which individual or entity made the shareholder proposal, knowing that many shareholder proposals are likely to be rejected regardless of the board composition because they are harmful to the company's interests (Dooley 1992;

Brownstein and Kirman 2004; Bratton and Wachter 2010). Implicitly, this measure grants higher *OWI* to boards with more outside than inside directors, so I would expect to see more frequent acceptance of shareholder proposals in the period following Sarbanes-Oxley.

For each shareholder initiative *i* at company *c*, regressions are estimated as

$$\%\ in\ Favor_i = \alpha + \beta SOX_i + \gamma OWI_c + \eta X_i + \varepsilon_i$$

where "SOX" is a dummy variable for Year 2003 or later, "OWI" is calculated for a given company in the appropriate year, and X is a vector of dummy controls for either the company's industry, S&P categorization, or initiator of the shareholder proposal (union, charitable group, mutual fund, etc.) I consider each of these control vectors in separate regressions.

Table 15 shows results using *OWI* calculated using degree for each director in each company. Findings are wholly consistent with the hypothesis that when outside directors have fewer connections than inside directors, shareholder proposals receive less support. This finding is robust to all manner of controls and highly statistically significant. Comparing two identical boards, one with outside directors that are twice as well-connected, the outsider-dominated board would receive between 22 and 36 percentage points more votes in favor of a shareholder proposal (depending on specification of controls). Proposals initiated after Sarbanes-Oxley also receive a slightly larger amount of support, but this effect is dwarfed by the network connections of board members.

One source of endogeneity is strategic shareholder decisions in choosing at which companies to initiate proposals. The frequency and content of shareholder proposals is itself influenced by corporate governance quality (Bizjak and Marquette 1998; Schooley, Renner, and Allen 2010). Because shareholder proposals are not randomly assigned, part of the effect shown may be reverse-causal. However, only 1.4% of all shareholder proposals within the sample receive a "Yes" vote. Clearly, many shareholder proposals are initiated for symbolic reasons. Even if the result is fully driven by shareholder decisions to initiate proposals at companies with boards more likely to support them, this would indicate that those strategic decisions are influenced by the relative networks of board members, leading to more popular proposals at outsider-influenced boards. It is also possible that outsider-controlled boards are more easily influenced by pressure tactics from shareholders if a vote reaches plurality, leading to more shareholder pressure on such boards (Brownstein and Kirman 2004).

Ertimur, Ferri, and Stubben (2010) find that when a board accepts a majority-voted shareholder proposal, turnover of outside directors is reduced. This finding supports the idea of rational shareholders, who initiate proposals with boards made up of strong outside directors in the expectation that their interests will more closely align with the proposal. I also estimate logit regressions to test for the influence of outside directors against the chance that a proposal is passed by the board, but the result is too small to be of economic significance.

Table 15: Acceptance of Shareholder Proposals and Opp. Willingness (Degree)

	(1) Vote %	(2) Vote %	(3) Vote %	(4) Vote %
OWI (Degree)	0.219**	0.281***	0.227**	0.299***
	(2.75)	(3.77)	(2.94)	(3.50)
SOX	2.530*	3.106**	7.553***	6.002***
	(2.27)	(2.76)	(5.70)	(4.54)
Degree (Company)	-0.0226	0.0142	-0.201***	-0.0723
	(-0.70)	(0.40)	(-3.67)	(-1.45)
PageRank (Company)	-9437.9***	-7815.0***	-2951.5	-5736.8***
	(-8.81)	(-6.67)	(-1.92)	(-4.01)
Cons.	35.02***	31.96***	28.86***	30.54***
	(25.05)	(21.32)	(18.68)	(20.79)
Absorb	None (Robust SE)	S&P Index	Industry	Sponsor Type
N	4140	3971	4139	2415
R^2	0.037	0.047	0.174	0.199

t statistics in parentheses. Standard errors robust to heteroscedasticity.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16: Acceptance of Shareholder Proposals and Opp. Willingness (PageRank)

	(1) Vote %	(2) Vote %	(3) Vote %	(4) Vote %
OWI (PageRank)	0.262**	0.334***	0.296***	0.362***
	(2.91)	(3.98)	(3.40)	(3.72)
SOX	2.518*	3.093**	7.565***	6.024***
	(2.26)	(2.75)	(5.71)	(4.56)
Degree (Company)	-0.0214	0.0160	-0.199***	-0.0720
	(-0.66)	(0.45)	(-3.64)	(-1.45)
PageRank (Company)	-9576.4***	-7972.2***	-3137.4*	-5907.0***
	(-8.90)	(-6.78)	(-2.03)	(-4.12)
Cons.	34.99***	31.89***	28.72***	30.46***
	(25.04)	(21.28)	(18.59)	(20.74)
Absorb	None (Robust S.E.)	S&P Index	Industry	Sponsor Type
N	4140	3971	4139	2415
R^2	0.037	0.047	0.174	0.199

t statistics in parentheses. Standard errors robust to heteroscedasticity.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Outside directors cannot directly influence the percentage voting in favor of a shareholder proposal, but nonetheless their position within the board has a large effect on the plurality voting in favor. The precise mechanism that links outsider influence to higher support for shareholder proposals remains unknown. The exact cause for this relationship is a subject for further research.

2.4 Conclusions

This research has three broad findings. First, Sarbanes-Oxley influenced the degree of connection between large public firms through interlocking directorates. The firms most tightly regulated by SOX responded by adding new directors, while smaller firms did not respond so strongly. Second, these changes affected the role of outside directors within corporate networks. Although outside directors gained new job opportunities through regulated quotas for corporate boards, their importance as conduits for information and influence declined. Finally, a study of shareholder proposal voting records shows that boards with more influential outside directors see more support for shareholder proposals. The implication is that outside directors are indeed important for empowering shareholders, but their abilities to do so depend upon connections with other directors. Because the act added more outside directors while making them relatively weaker within director networks, Sarbanes-Oxley's overall effect on shareholder representation is ambiguous.

This paper contributes to the literature in several previously unconnected areas. First, it represents another case study on the structure of interlocking directorates in various institutional contexts. Previous social network studies on this topic have focused on particular countries or locales at fixed times (Bunting and Barbour 1971; Windolf and Beyer 1996; Ottoson 1997; Aguilera 1998; Kono et al. 1998; Battiston and Catanzaro 2004; Connelly et al. 2011; Elouaer-Mrizak 2012; Aviña-Vázquez and Uddin 2013). The unique contribution made by this paper is the addition of dynamics related to a large regulatory change that affects corporate boards, the Sarbanes-Oxley Act. Quantifying

changes within social network analysis crosses between empirical techniques previously used primarily by either sociologists or economists, but rarely both. As financial regulatory policy continues to be implemented in the United States, more avenues for this interdisciplinary research are likely to emerge.

Second, this research contributes to the broad strand of policy analysis on effects of the Sarbanes-Oxley Act. Previous event studies have looked at firm profitability or the decision to list on public capital exchanges within a relatively brief window (Chhaochharia and Grinstein 2007; Kamar, Karaca-Mandic, and Talley 2008; Akhigbe, Martin, and Newman 2010). This study extends to several years before and after the passage of SOX, accounting for changes as firms gradually adapt to the law's new requirements. Further, whereas previous research has examined outcomes, this study tracks the underpinnings of corporate governance and the relationships between firms that allow them to function under new regulation. Law and economics scholars have contributed a rich literature on agency theory and managerial incentives, but corporate directors are also embedded within social relationships that deserve more attention from economists (Granovetter 1985). The interplay among government regulation, private incentives, and interpersonal relationships offers a complex field of study that facilitates a better understanding of policy outcomes.

Previous studies on interlocking directorates have used social network analysis to estimate "corporate control" over important industries within the economy, typically through the lens of structural analysis and/or class-based interests (Marginson and Campbell 1979; Mizruchi and Bunting 1981). In this paper, I set aside the question of

whether corporations have meaningful "control" over each other, focusing instead on the transmission of information and possibilities for cooperation and oversight that Sarbanes-Oxley aims to regulate. This perspective on corporate networks is consistent with modern trends in social network studies of corporations, as well as with the work of Matthew Jackson, which emphasizes network formation between rational agents for mutual benefit (Jackson and Wolinsky 1996; Dutta and Jackson 2000; Jackson and Watts 2002; Jackson 2014). The incentives of corporations in choosing which directors will represent their interests, and of directors choosing where to allocate their managerial talents, form a complex interlocking structure that can be better analyzed as more data and research tools become available.

A third contribution is to the literature on group decision-making within corporate boards and the perception of shareholders. The use and efficacy of shareholder proposals has been rising over time, with more being approved by corporate board members than in the past, coupled with greater influence exerted by institutional shareholders (Prevost and Rao 2000; Brownstein and Kirman 2004). Shareholder proposals can be understood as a signal to board members that action is required, so the perception of that signal is crucial to a proposal's effectiveness. David Westphal has expanded the literature on pluralistic ignorance to encompass managerial decision-making, and I push those implications further here. Knowing that shareholder proposal pluralities are strongly correlated with the network strength of outside directors at a corporation opens interesting new angles for study. In particular, the direction of causality remains to be determined: Do strong

outside directors encourage shareholder activism, or do activist shareholders focus their attention on receptive boards?

The implications of this research are far-reaching. Mandates to improve corporate governance face complexity at the level of firms' economic decisions. Add to that difficulty the embedded nature of individuals within firms, and the number of interactions becomes almost intractably large. Crafting an intervention that harmonizes these interactions is likely beyond our current capabilities. This paper offers a glimpse at the dynamics that followed a single aspect of one corporate governance policy and opens the door to more comprehensive studies in the future.

CHAPTER THREE: TAINTED BY ASSOCIATION. THE EFFECT OF SCANDAL ON CORPORATE NETWORKS

3.1 Broken Faith, Broken Ties

An interlock exists when one person serves on the board of more than one corporate entity. Corporate boards which share a member are said to have an interlocking directorate. The study of interlocking directorates as a social network is well-developed within the economic sociology literature (Marginson and Campbell 1979; Koenig and Gogel 1981; Mizruchi and Bunting 1981; Marsden 1990; Scott 1991). Interlocking directorates have predictive power for corporate political involvement and campaign contributions, and are therefore an important input when analyzing regulatory policy (Mizruchi and Koenig 1988; Moody and White 2003; Burris 2005; Stark and Vedres 2012).

Early research on interlocking directorates proceeded from class-based or group-interest assumptions. If corporate managers represent a distinct group within the upper class, interlocking directorates allow them to diffuse power within this inner circle, maintaining control over core industries in the economy (Sonquist and Koenig 1984). Even without exercising explicit control, interlocking directorates are useful for coordination between companies (Haunschild and Beckman 1998; Uzzi and Lancaster 2004).

More recently, application of economic assumptions (rationality, self-interest, mutual exchange) to social networks has led to new perspectives on the formation and dissolution of social connections. Network ties are expected to form when two parties perceive it as their best interests (Jackson and Wolinsky 1996). Benefits of network ties include the dissemination of information, interpersonal influence, and social contacts (Jackson and Watts, 2002; Jackson 2010; Jackson 2014). This perspective has gained traction as a research program which continues to evolve rapidly. However, its application to interlocking directorates remains under-researched; it is unclear whether corporate entities can be assumed to operate under the same motivations as singular individuals.

In this paper, I expand on the literature of interlocking directorates by examining changes to network structure following a highly-publicized insider trading scandal. If, like individuals, corporations are "judged by the company they keep" then one would expect the structure of interlocking directorates to change following a corporate governance scandal. My findings confirm this supposition; companies and directors even tangentially connected to wrong-doing lose connections and prestige within the overall network of interlocking directorates. This research has implications for the study of dynamics within interlocking directorates, and the possibilities for socially-influenced corporate governance more generally.

3.1.1 The Galleon Group Scandal

I use resignations due to corporate scandal as a natural experiment to study dissolution of ties between linked firms. If influence and reputation flow through network ties, firms and individual directors will be conscious of the associations they make with others. Therefore, a scandal which heavily affects one company can ripple out into the networks of those associated with it. To study such a case, I briefly describe one such recent insider trading scandal here.

As president of Needham & Co., Raj Rajaratnam started the Needham Emerging Growth Partnership, a hedge fund, in 1992. He then purchased and renamed it the Galleon Group in 1997. Rajaratnam's hedge fund posted above-market returns, peaking at a value of $7 billion in 2008 (Burton and Kishan 2009). In October 2009, the SEC publicized an investigation into insider trading within the Galleon Group, and arrested Rajaratnam and several others. In December 2009, Rajaratnam was indicted by a grand jury on fraud and insider trading charges. In 2011, he was found guilty and is currently serving a prison sentence.

In addition to Rajaratnam, several other prominent businessmen were also charged. Rajiv Goel, a director for Intel's treasury department and Intel Capital, pled guilty to securities violations and was sentenced to two years of probation. Robert Moffat, a senior vice president at IBM, was also charged and served six months in prison. Both were alleged to have shared confidential information with Rajaratnam.

Goel and Moffat were not on the board of directors for Intel or IBM, respectively, but I hypothesize that their arrests still influenced willingness of other companies to share board interlocks with those companies. Loss of prestige from the allegations, as well as

the perception that confidential information might leak would reduce the desire of other companies to share interlocking connections with IBM or Intel. Throughout, I refer to this as the "contamination hypothesis." In the next sections I put this hypothesis to an empirical test, and find that both IBM and Intel suffered a decline in network connections following the Galleon Group scandal.

3.2 Network Effects after a Scandal

Within the social network analysis literature, a "node" is an individual or entity and an "edge" is a connection which ties them together. In the context of interlocking board networks, nodes represent companies while edges are directors who serve on the board of two or more companies. The "degree" of a node is the number of edges which connect to it, or in other words, the number of interlocking directorates tied with a particular company.

For example, suppose that Company A and Company B both have board member "Smith" as a director, and Company B and Company C both have board member "Jones" as a director. A graph of this network would show A connected to B, and B connected to C, as such:

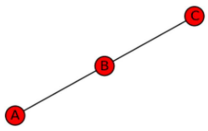


Figure 7: Board Network Example

I will refer to this as a "board network."[18] In this example, Company B has a degree of 2, based on the number of incoming edges. Companies A and C both have degree of 1.

Another way to represent the same information would be to treat directors as nodes, and shared corporate boards as edges. Keeping to the same example, we would say that Smith and Jones share a network connection, as they both serve on the board of Company B. Companies A and B will also have other directors, so Smith and Jones serve as a link between two separate clusters of individuals. Represented visually, this would appear as:

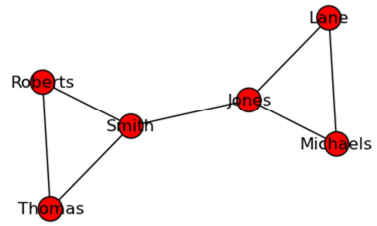


Figure 8: Director Network Example

I refer to this second type of network as a "director network." Through the association of Smith and Jones, Roberts and Thomas are twice-removed from a connection with Michaels and Lane (and vice-versa). Within the literature on corporate interlocks, board networks are used more frequently than director networks. However, I will be referring extensively to both throughout this paper.

[18] The position of nodes relative to each other (above, below) is arbitrary.

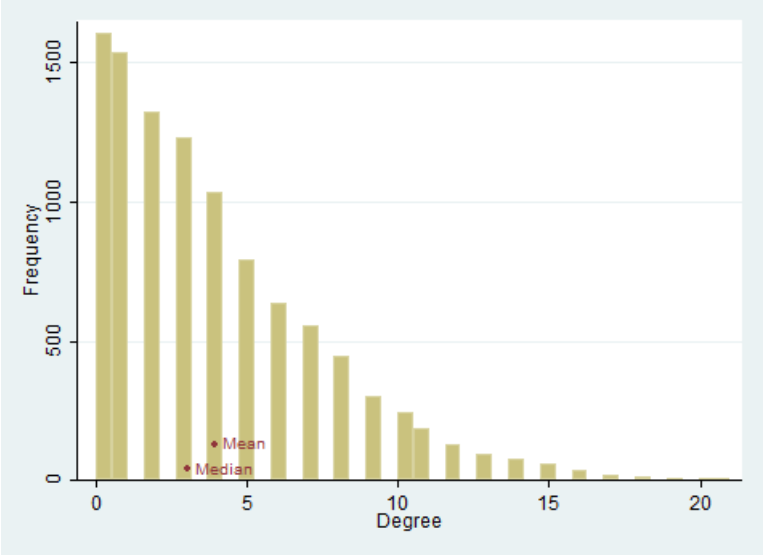
The most comprehensive study of scandal within corporate board networks was conducted by Sullivan, Haunschild and Page (2007). They examine Fortune 300 firms in the period 1990-1993, explaining network effects with both the number and severity of illegitimate corporate acts. Their finding, that unethical actions cause a decline in both the number and quality of interlocking directorate connections, is novel and robust.

In spite of its strength, however, the study does suffer from some possible weaknesses. First, the scandals in the sample are those reported in the business press, inviting selection effects. Second, they gauge severity of an illegitimate act according to a scale ranked by both lay-persons and business professionals. For example, unintentional environmental damage is ranked as the least severe (2.74 out of 5) while intentional environmental damage is the most severe (4.33 out of 5). Racial discrimination is treated as more severe than tax evasion, and so on. This approach has intuitive merit for judging public reaction to scandals. However, it is unclear whether unethical acts compare to each other on such a linear scale, or if all top corporate decision-makers share the same ranking preferences as the sample polled by Sullivan, Haunschild and Page. Finally, the inclusion of "intentionality" within these ranks invites subjectivity from the respondents as well as possible bias from the newspaper sources used for data. Whether an environmental harm is intentional or not is difficult to fathom, and whether harm is described as intentional or not may be subject to the discretion of prosecutors, reporters, and public relations managers.

To address some of these issues, my research examines the effect of a single insider trading scandal, which had spillover effects onto the top management of several

prominent technology companies. While more limited in scope, this approach has the advantage of perfect comparability between companies affected because each was subject to the same scandal, having a top manager charged with insider trading.

My data sample includes all companies listed on the S&P between 2007 and 2013 (including S&P 500, as well as S&P small cap and mid cap companies). In Figure 9, I show the distribution of degree by company for every year in the data sample. This distribution resembles a power law, a common finding in social network metrics (Jackson 2005). Many companies have few connections, while several (typically large and prominent) firms are more central to the network.



[19]

Figure 9: Distribution of Degree (All Companies in All Years)

[19] "Degree" refers to the number of edges connecting to a node (number of interlocks per company).
Mean = 3.92 Median = 3Std. Dev. = 3.58
Degree for IBM ranges from a minimum of 10 in 2007, to maximum 17 in 2013. Degree for Intel ranges from 8 in 2007, to maximum of 11 in 2012.

For my analysis, I create networks of two levels of connection for each company in each year, to track how the networks of companies connected to IBM or Intel changed in 2010 (the year after the insider trading scandal at Galleon Group). The algorithm used to generate these networks picks a particular company in a given year (the nexus of the graph), and generates an edge between that company and every other which shares a director with the nexus company, which I refer to as "primary" connections. Then, from each of these primary connections the procedure is repeated, adding on interlocks between those primary connections and other companies with shared directors, which I refer to as "secondary" connections. As examples, Figure 10 and Figure 11 present the twice-removed networks generated for IBM and Intel, respectively, in the year 2009 using this method. After generating such networks for every company in the sample, I collect measures of these networks for later analysis; summary statistics are shown in Table 17.

This network-building algorithm intends to model chains of interpersonal communication between corporate board members. Every individual serving on the board of a company represented by a node can "know someone who knows someone" on the board at IBM or Intel. These connections represent valuable opportunities for information-sharing between boards, but may also become a liability if the reputation of IBM or Intel is tarnished.

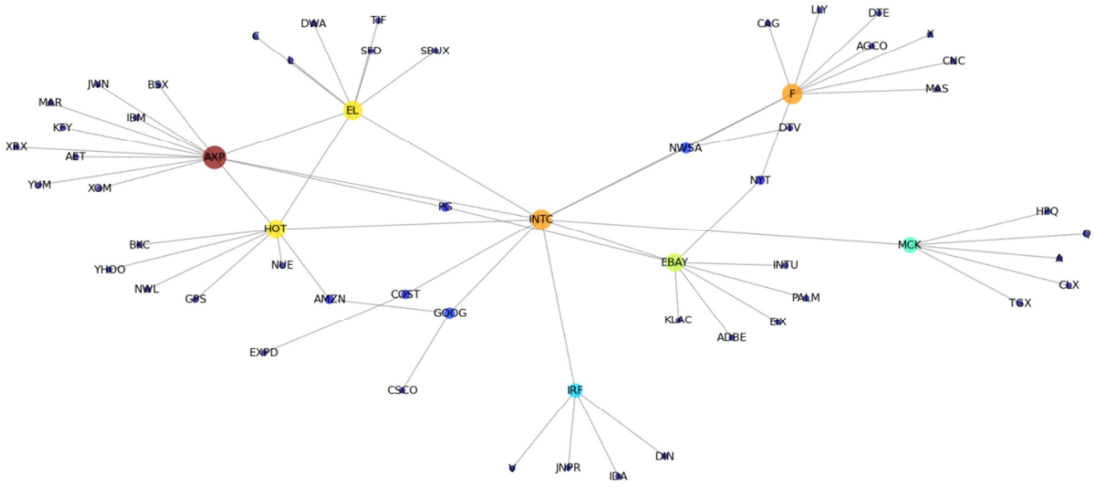


Figure 10: Intel - Twice-Removed Interlocks (2009)

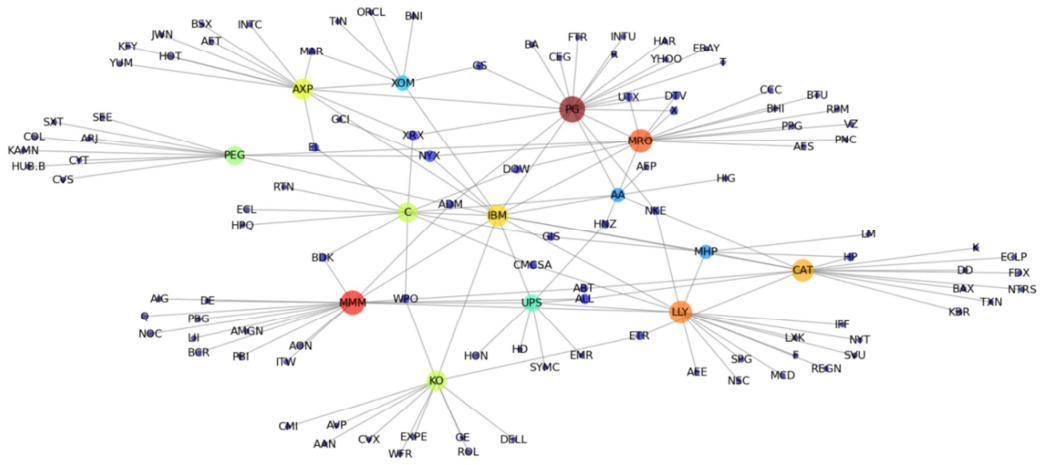


Figure 11: IBM - Twice-Removed Interlocks (2009)[20]

[20] Network is created by starting at IBM and generating an edge to each company that IBM has a shared director with (primary connections). Then, with each of those interlocked companies, create a new edge through each interlock by that company (secondary connections). Node size and color is scaled by degree of the node. Same algorithm is applied for Intel in Figure 4.

Table 17: Summary Statistics (Board Networks)

Variable	Obs	Mean	Std. Dev.	Min	Max
Nodes	10,329	24.83	26.54	0	178
IBM or Intel	10,329	0.0014	0.0368	0	1
IBM Network	10,329	0.0623	0.2418	0	1
Intel Network	10,329	0.0234	0.1513	0	1
Both Networks	10,329	0.0162	0.1261	0	1
PageRank	8,721	0.0008	.0004	.0002	.0028
In All Years	10,329	0.6723	0.4694	0	1

Table 18: Summary Statistics (Director Networks)

Variable	Obs	Mean	Std. Dev.	Min	Max
Nodes	79,466	53.02	52.64	0	488
Age	79,261	62.11	8.64	27	99
Female	79,466	0.1231	0.3286	0	1
Shares Held	77,831	821,689.4	1.84e+07	0	1.69e+09
Attend < 75%	79,466	0.0069	0.083	0	1
Outside Boards	79,415	0.6091	0.9183	0	8
Primary Nodes	79,466	10.72	5.79	0	63
Year 2010	79,466	0.1439	0.351	0	1
IBM Network	79,466	0.0748	0.2631	0	1
Intel Network	79,466	0.021	0.1432	0	1
Both Networks	79,466	0.0156	0.1239	0	1

3.2.1 Nodes in a Twice-Removed Network

Intuitively, the greater the number of nodes in a twice-removed network, the more opportunities there are for communication by a nexus company with others in the network. Sharing seats on a corporate board does not require strong interpersonal

connections between directors; board members meet infrequently, have only occasional reciprocation of services, and little emotional intimacy (Westphal 1998). Nevertheless, Granovetter (1973) demonstrates that these weak ties can be very important for social influence. Weak ties provide paths for information sharing and coordination between different members of a network. More nodes in a twice-removed network represent a greater number of weak ties which a company and its directors can potentially use to their advantage.

In Figure 12, I show the distribution of total nodes in these networks for all companies in all years. The majority of companies cluster on the left side of the graph. As prominent companies, IBM and Intel are both relatively more connected than the average company in the sample.

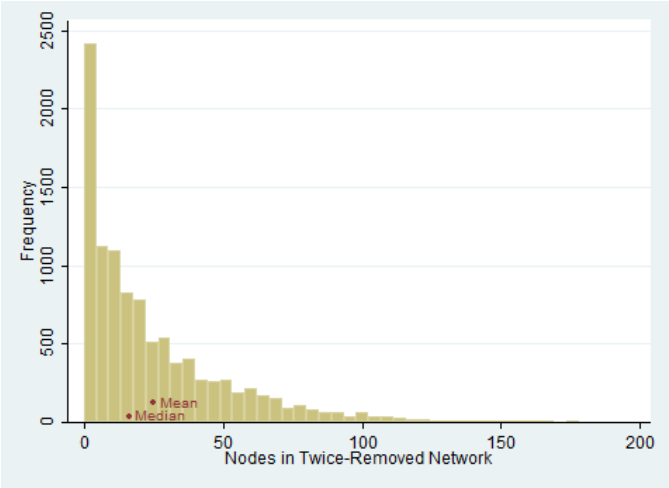


Figure 12: Distribution of Total Nodes in Twice-Removed Network (All Companies All Years)[21]

[21] "Total number of nodes" refers to the number of nodes formed by interlocks from the company (primary connections) plus all the interlocks from those primary connections (secondary connections).
Mean = 24.83 Median = 16Std. Dev. = 26.54
This value for IBM ranges from 99 in 2007, up to 125 in 2013; value for Intel ranges from 46 in 2007, to 65 in 2013.

The first measure I use to estimate effects from the 2009 insider trading scandal is loss of nodes from twice-removed networks. A company that does not want to be associated, through the network, to a company afflicted by scandal could dissolve interlocking connections by changing or replacing particular board members. I hypothesize that in 2010, IBM and Intel will lose nodes from their twice-removed networks as a result.

Figure 13 shows the number of lost nodes from twice-removed networks for IBM and Intel, as well as randomly sampled subsections of companies in the dataset. To generate these random samples, I pull from the list of companies with a particular degree of first-connections in the years 2007-2008.[22] The sample most closely resembling IBM and Intel is that of companies with degrees between 8 and 12 (a range that encompasses the number of degrees for IBM and Intel in 2007 and 2008). I also pull samples with a broader range of degrees to compare effects on companies with differently-sized networks.

Networks appear to become more stable over time, with a generally declining trend in the number of node losses year-over-year. On inspection, there is a clear effect in 2010 on IBM and Intel. Where the average company with a similarly sized network loses 7.5 nodes in 2010, IBM and Intel lose 22.5 nodes (on average) in the same year. This effect quickly tapers off in 2011, with Intel and IBM returning to the approximate node

[22] The number of connections for the average company is increasing over time, so to choose my random sample, I restrict to companies with the given number of nodes in 2007 or 2008. Further, to avoid sampling companies which later drop out of the S&P indices, I limit the sample to companies which appear in the dataset every year 2007-2013. 67% of all companies in the sample meet this condition.

losses of other companies. For specificity, Tables 19 and 20 list all nodes lost and gained by IBM and Intel, respectively, in each year.

One weakness to this methodology is that the cause of node losses is unknown. Directors may resign, retire, or be replaced for a wide variety of reasons which are unrelated to corporate governance scandals. Further, the effect of losing a primary connection may have exaggerated influence on the number of nodes in a company's twice-removed network. For example, between 2007 and 2008, IBM lost its interlocking director with the Altria Group (MO). In that year, Altria had connections with four other companies, so the loss of that one tie with MO caused the number of nodes in IBM's twice-removed network to drop by five.

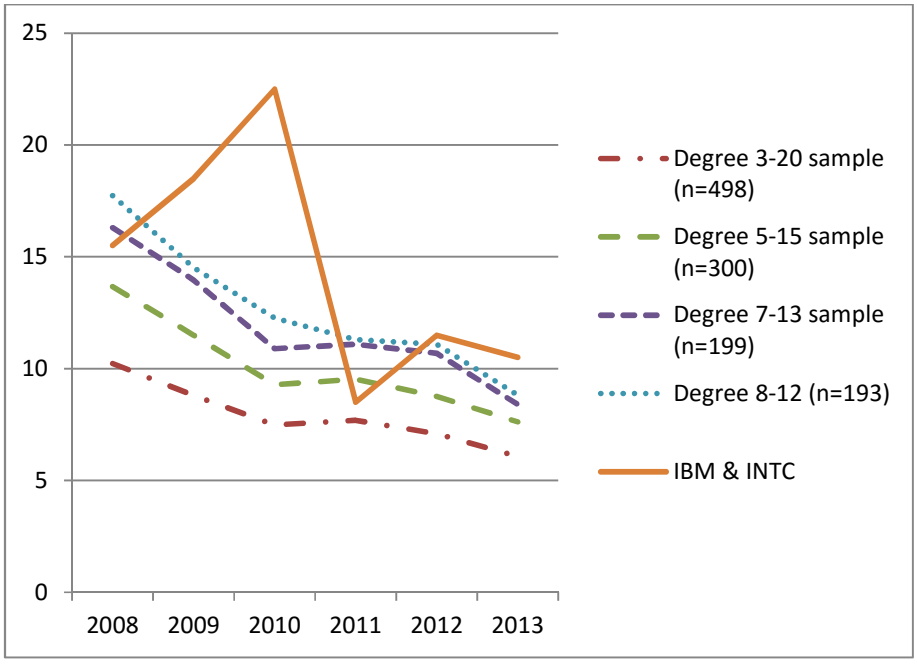


Figure 13: Nodes Lost from Twice-Removed Networks by Year (All)

Table 19: Nodes Lost and Gained by Year (IBM)

Year	Nodes Lost (All)	Primary Nodes Lost	Nodes Lost Due to Primary Node Loss	Primary Nodes Gained	Nodes Gained (All)
2007-2008	'CPB', 'AXE', 'WMB', 'GM', 'HAL', 'IACI', 'MAN', 'NWS.A', 'DNB', 'EMR', 'BMY', 'MO', 'CSX', 'WYE', 'ETN', 'RRD', 'MET', 'MER', 'CAH', 'KFT', 'JCP', 'STI', 'PFE'	'MO'	'AXE', 'CSX', 'RRD', 'KFT'	'NYX', 'MRO', 'PG'	'NYX', 'AXP', 'CCC', 'MRO', 'X', 'AES', 'BRS', 'DTV', 'LLY', 'HNZ', 'DOW', 'PG', 'GCI', 'UPS', 'PEG', 'VZ', 'BTU', 'KO', 'MMM', 'IBM', 'CAT', 'CIT', 'PPG', 'RPM', 'AA', 'UTX', 'BHI', 'PNC'
2008-2009	'AOC', 'JNJ', 'BRS', 'NWSA', 'CBB', 'RNT', 'GLW', 'NOVL', 'CIT', 'TGT', 'TXT', 'IP', 'IR', 'DWA', 'GFG'			'C'	'AXP', 'LLY', 'PG', 'C', 'UPS', 'PEG', 'KO'
2009-2010	'NYX', 'LII', 'GE', 'T', 'NTRS', 'CMI', 'IFF', 'AEE', 'EMR', 'WFR', 'CEG', 'ROL', 'RTN', 'GCI', 'BDK', 'PBG', 'YHOO', 'INTU', 'AVP', 'BSX', 'ECLP', 'WPO', 'EXPE', 'AAN', 'R', 'KO', 'CVX', 'AIG', 'DELL', 'MCD', 'BNI'	'NYX', 'KO'	'GE', 'CMI', 'WFR', 'ROL', 'GCI', 'AVP', 'WPO', 'EXPE', 'AAN', 'CVX', 'DELL'	'BA', 'FDX', 'MDT'	'AXP', 'BA', 'SRCL', 'GIS', 'MRO', 'FDX', 'LLY', 'PG', 'C', 'MHP', 'PEP', 'PEG', 'MDT', 'MMM', 'CAT', 'AA', 'XOM'
2010-2011	'TIN', 'MDRX', 'HAR', 'HP', 'KBR', 'SYMC', 'K', 'ETR', 'AZO', 'DD', 'BAX', 'TXN', 'Q', 'GD'	'CAT'	'MDRX', 'HP', 'KBR', 'K', 'ETR', 'DD', 'BAX', 'TXN', 'GD'	'DOW'	'MRO', 'FDX', 'MS', 'DOW'
2011-2012	'CCC', 'AGP', 'X', 'NTRI', 'AET', 'DTV', 'MHP', 'COH', 'ECL', 'CFN', 'FMC', 'ITT', 'DIS', 'PPG', 'RPM', 'PNC'			'EMR', 'IP'	'UTX', 'AXP', 'BA', 'BC', 'MRO', 'AEP', 'FDX', 'MMM', 'C', 'CSX', 'UPS', 'BTU', 'PEG', 'DOW', 'ASH', 'MHFI', 'IBM', 'IP'
2012-2013	'WLP', 'GS', 'WMT', 'TTC', 'SVU', 'MWW', 'XLS', 'HNZ', 'COP', 'MSFT', 'HES', 'KFY', 'ORCL'	'XOM'	'GS', 'WMT', 'ORCL'		'EMR', 'FDX', 'PG', 'MS', 'PEG', 'MDT', 'MHFI', 'MMM', 'IP'

Table 20: Nodes Lost and Gained by Year (Intel)

Year	Nodes Lost (All)	Primary Nodes Lost	Nodes Lost Due to Primary Node Loss	Primary Nodes Gained	Connections Gained (All)
2007-2008	'UTX', 'ILA', 'NWS.A', 'DTV', 'LTR', 'IRN', 'YHOO', 'CAH'			'ADSK', 'NTAP', 'CSCO'	'AXP', 'WFC', 'MFE', 'ADSK', 'INTC', 'GILD', 'MCK', 'NTAP', 'CSCO', 'INFA'
2008-2009	'WFC', 'AAPL', 'MFE', 'VMC', 'TWX', 'NSM', 'TGT', 'ADSK', 'K', 'JCP', 'GILD', 'BDK', 'WAB', 'PFE', 'WMT', 'NTAP', 'CBE', 'S', 'INFA', 'AG', 'JNJ', 'DNEX'	'ADSK', 'NTAP', 'CSCO'	'WFC', 'MFE', 'NSM', 'TGT', 'ADSK', 'JCP', 'GILD', 'BDK', 'PFE', 'WMT', 'NTAP', 'INFA', 'DNEX'	'EBAY'	'AXP', 'ADBE', 'EIX', 'NYT', 'KLAC', 'NWSA', 'PG', 'INTC', 'F', 'INTU', 'HOT', 'PALM', 'IRF', 'EBAY'
2009-2010	'CAG', 'LLY', 'BSX', 'AGCO', 'BKC', 'NWSA', 'TGX', 'INTU', 'PALM', 'DTE', 'X', 'MAS', 'SFD', 'CNC'	'F'	'CAG', 'LLY', 'AGCO', 'NWSA', 'DTE', 'X', 'MAS', 'CNC'		'AXP', 'COST', 'BRK.B', 'IRF'
2010-2011	'AET', 'YHOO', 'Q'				'AXP', 'GOOG', 'IRF', 'MCK'
2011-2012	'NYT', 'CTL', 'K', 'C', 'GPS', 'CFN', 'NTRI'			'CDNS'	'AXP', 'CDNS', 'ORCL', 'FNGN', 'EXPO', 'EL', 'INTC', 'ATMI', 'VAR', 'IRF
2012-2013	'NFLX', 'KFY', 'ORCL', 'GOOG', 'F', 'WMT', 'CSCO', 'CLX'	'GOOG'	'NFLX', 'CSCO'		'AXP', 'HOT', 'IRF', 'EBAY'

To control for the impact of losing primary nodes, I construct another measure, which is the number of secondary node losses not due to primary node loss. In Table 19 and Table 20, this measure would be calculated by subtracting the number of entries in Column 4 (nodes lost due to primary node loss) from Column 2 (total nodes lost). Again, I generate these measures for IBM and Intel as well as random samples of various degrees as described above.

The results are shown in Figure 14. As before, the number of node losses for the random samples is declining over time. For IBM and Intel the number of node losses peaks in 2010, and drops in 2011. Once again, it appears that companies within the network of interlocking directorates for IBM and Intel respond by disassociating themselves, cutting ties with companies even one degree removed from IBM or Intel.

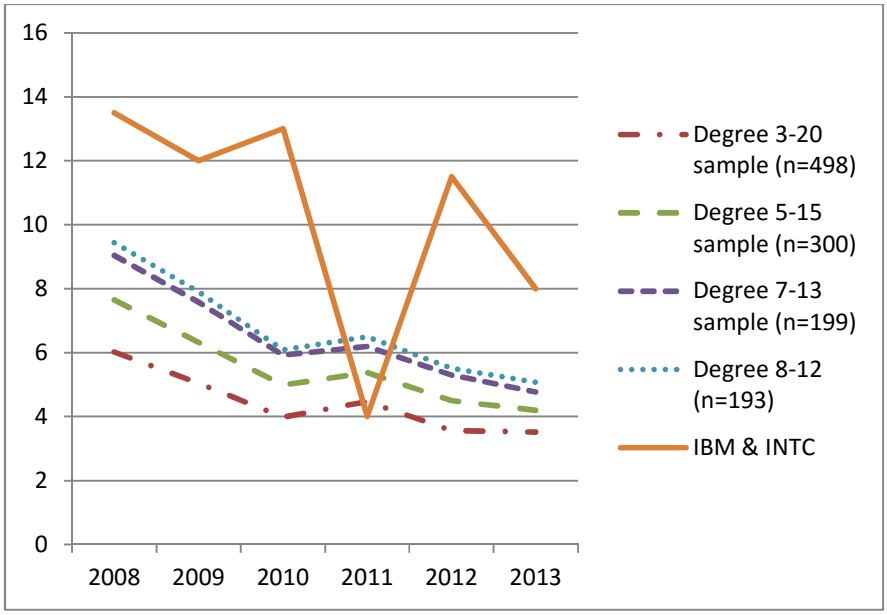


Figure 14: Nodes Lost from Twice-Removed Networks by Year (Not Due to Primary Node Loss)

3.2.2 Contamination Effects on Twice-Connected Companies

Given the results just described, it invites the question "are companies acting rationally when they disassociate with others affected by a scandal?" If firms perceive a threat to their own network positions as a result of association with scandal-afflicted companies, cutting ties is a logical response. This possibility can be tested empirically, by examining the networks of companies still within the networks of IBM and Intel in 2010. If these firms suffer from a contamination effect, then I would expect them to lose nodes in their twice-removed networks.

I estimate regressions of the form:

$$Nodes_i = \alpha + \beta_1 Affected_i + \beta_2 Y2010_i + \beta_3 Affected * Y2010_i + \beta_4 IBMNet_i + \beta_5 IBMNet * Y2010_i + \beta_6 IntelNet_i + \beta_7 IntelNet * 2010_i + \beta_8 BothNet_i + \beta_9 BothNet * Y2010_i + \gamma X_i + \varepsilon_i$$

Where "Affected" is a dummy variable for IBM or Intel and "Y2010" is a dummy variable for year 2010. "IBMNet" and "IntelNet" are indicators for whether company "*i*" appears within the twice-removed networks of IBM or Intel, respectively. "BothNet" indicates a company is in the network of both IBM and Intel in the given year. I interact these network indicators with the dummy variable for year 2010, creating the variables of interest. Finally, "X" is a vector of control variables representing the industry of each company. I also include fixed effects for the state headquarters of each company, to control for location-specific influences on network changes.

If the contamination hypothesis is correct, I predict that the signs on the interaction variables ($\beta_5, \beta_7, \beta_9$) will be negative, with companies associated with both IBM and Intel (β_9) having the largest absolute value of losses. That is, I expect

companies associated with either IBM or Intel will lose nodes within their twice-removed networks, and companies associated with both will lose more than companies associated with just one.

Table 21 displays the results of these regressions, and bears out the majority of these predictions. The signs of the interaction effects for IBM-network companies in the year 2010 are all negative, but not significant at conventional levels. The effect on Intel-network companies is also statistically insignificant. However, the effect on companies in the networks of both IBM and Intel is substantially negative and highly significant. On average, companies in the networks of both IBM and Intel are predicted to lose between 7.8 and 8.8 nodes from their own twice-removed networks. Connection to a scandal afflicted firm becomes a liability to those firms' own network stability.

Between the different specifications, I include varying levels of controls. Column 1 includes no fixed effects, and has the smallest estimated effect (7.8 node losses for firms in the networks of both IBM and Intel). In Column 2 I add fixed effects for the state in which the firm is headquartered. Previous literature on interlocking directorates suggests that geographic proximity influences a firm's connections (Kono et al 1998). Including these fixed effects increases the magnitude of the effect (8.8 nodes lost). In (3) I retain state fixed effects, and also include dummy variables by industry classification for firms, and in (4) I do the same but replace industry with NAICS description, which is even more granular. Both of these specifications result in similar point estimates of between 8 and 8.5 node losses as a result of contamination.

Table 21: Contamination Effects on Linked Companies (Dependent Variable: Number of Nodes in Twice Removed Network)

	(1) Nodes	(2) Nodes	(3) Nodes	(4) Nodes
IBM/Intel (Dummy)	11.05	13.32	22.00**	19.72*
	(1.23)	(1.67)	(2.80)	(2.53)
Year 2010 (Dummy)	-0.570	-0.222	-0.185	-0.444
	(-0.90)	(-0.32)	(-0.30)	(-0.78)
IBM/Intel * Year2010	4.099	4.752	4.387	4.209
	(0.19)	(0.25)	(0.24)	(0.23)
IBM Network	51.34***	48.10***	44.15***	41.88***
	(39.64)	(35.34)	(32.50)	(29.97)
Intel Network	21.21***	25.53***	23.01***	20.85***
	(14.59)	(17.12)	(15.38)	(13.16)
Both IBM & Intel Net.	56.38***	55.46***	50.55***	51.15***
	(22.29)	(23.91)	(21.15)	(22.51)
IBM Net * Year 2010	-2.489	-2.176	-1.829	-0.946
	(-0.77)	(-0.67)	(-0.56)	(-0.34)
Intel Net * Year 2010	2.134	0.219	-1.044	0.924
	(0.61)	(0.07)	(-0.34)	(0.32)
Both Nets * Year 2010	-7.780	-8.780*	-8.452*	-8.015*
	(-1.73)	(-2.22)	(-2.14)	(-2.26)
Constant	20.32***	9.603**	11.69	38.64***
	(83.13)	(3.02)	(1.70)	(4.71)
State Fixed Effects	No	Yes	Yes	Yes
Industry Dummies	No	No	Yes	No
NAICS Dummies	No	No	No	Yes
N	10329	8884	8884	8884
R^2	0.289	0.345	0.446	0.542

It should also be noted that there is a selection effect at work which is not controlled for. As shown in Section 3.2.1, IBM and Intel both show a loss of nodes in their twice-removed networks in 2010. It is possible that some connected firms foresaw the possibility that they would lose connections by remaining within the networks of IBM or Intel, and therefore chose to cut ties. These firms would not appear as connected in the regressions for Table 4. If companies made accurate predictions and those most likely to lose connections as a result of a contamination effect were also the ones to preemptively exit the affected networks, the results in Table 4 would be biased. That is, the estimates given are a lower bound on the possible effects of network contamination, if the companies who would have been more affected left the sample.

3.2.3 Global Network Effects

Up to this point, I have used local networks centered on each company as a proxy for influence. However, another valid line of inquiry would be to examine metrics which place all companies using some ranking metric relative to each other. Several such metrics are available.[23] I use the PageRank algorithm devised by Google for ranking the important of webpages (Page et al 1998). A website with many incoming links from other highly-ranked websites is assumed to be influential, and receives a higher rating. Within the context of an interlocking board network, companies with interlocks to other highly connected companies are assumed to have more overall influence on the network.

[23] Bonacich's (1972) contribution in this area was an algorithm which estimates the power and control interlocks are able to exercise. Bonacich's centrality metric assumes that a large, well-connected company surrounded by smaller companies is able to influence them, and a large company with this network structure would be given a higher rating of influence. However, in the context of information sharing and reputation, it is not obvious that this sort of influence would be relevant.

The PageRank algorithm has a number of advantages: it reliably converges even for large, disconnected networks, models the sharing and flow of information and reputation, and is designed for ranking and comparison. I calculate the PageRank for each company in each year available, and use PageRank value as dependent variable in regressions of the form described in the section above. These results are shown in Table 22. The findings do not rise to the level of conventional statistical significance in any specification, however the sign of the results (negative) agrees with the theoretical prediction that companies within the networks of IBM and Intel lose some of their ranking in the year 2010.

3.2.4 Do Ties Regenerate?

Social network analysis has primarily studied the formation of ties between individuals or groups. However, the opposite process, the dissolution of ties, is equally important but more challenging to study. Within the context of interlocking directorate networks, the death or resignation of a director can sever ties between multiple companies. Alternately, as described here, ties may be cut for strategic reputation-management reasons.

If a tie is broken by random chance, theory would predict that a new tie would regenerate to replace the old one as long as the underlying incentives for forming ties remained unchanged (Koenig, Gogel and Sonquist 1979). Alternately, a company may decide to resume a previously-dissolved tie once the threat of scandal has passed by. If the structure of interlocking directorate networks is guided by class-based interests or industry concentration, the loss and formation of new ties complicates the model

Table 22: Contamination Effects on Linked Companies (Dependent Variable: PageRank)

	(1) PageRank	(2) PageRank	(3) PageRank	(4) PageRank
IBM/Intel (Dummy)	0.000220*	0.000265**	0.000365***	0.000351***
	(2.41)	(3.05)	(4.02)	(3.80)
Year 2010 (Dummy)	0.00000381	0.0000129	0.0000147	0.0000103
	(0.31)	(0.96)	(1.16)	(0.88)
IBM/Intel * Year2010	0.00000982	0.0000343	0.0000252	0.0000297
	(0.05)	(0.18)	(0.12)	(0.14)
IBM Network	0.000487***	0.000456***	0.000434***	0.000389***
	(25.51)	(22.45)	(21.19)	(17.91)
Intel Network	0.000188***	0.000271***	0.000246***	0.000222***
	(7.31)	(10.33)	(9.46)	(8.04)
Both IBM & Intel Net.	0.000556***	0.000544***	0.000501***	0.000501***
	(13.77)	(14.39)	(13.08)	(13.22)
IBM Net * Year 2010	-0.00000785	-0.00000788	-0.00000558	0.00000592
	(-0.15)	(-0.15)	(-0.11)	(0.13)
Intel Net * Year 2010	0.0000267	-0.0000120	-0.0000343	-0.00000935
	(0.41)	(-0.19)	(-0.59)	(-0.20)
Both Nets * Year 2010	-0.0000541	-0.0000877	-0.0000804	-0.0000804
	(-0.57)	(-1.00)	(-0.94)	(-1.06)
Constant	0.000750***	0.000363***	0.000385***	0.000631***
	(165.70)	(96.80)	(4.30)	(7.88)
State Fixed Effects	No	Yes	Yes	Yes
Industry Dummies	No	No	Yes	No
NAICS Dummies	No	No	No	Yes
N	8721	7535	7535	7535
R^2	0.135	0.185	0.284	0.406

substantially (Palmer, Friedland and Singh 1986). A research design to model these changes faces difficult problems with multiple-causality. If a tie is broken and not regenerated, it could be due to a change in the underlying interests of the actors over time (individual or corporate) which made the connection irrelevant, or the regeneration hypothesis could be false.

Researchers have attempted multiple strategies to overcome this multiple-causality problem. Palmer (1983) studies cases where interlocking directorates are accidentally broken, that is "as a result of events that are unrelated to the interorganizational strategies of the firms it was linking." (43) This includes death, retirement, change of employment, or similar events. Palmer finds that interlocks regenerate only in a small minority of cases. Stearns and Mizruchi (1986) expand tie regeneration to include "functional reconstitution" whereby a broken tie is replaced with another to a firm in a similar industry. They find that functional reconstitution of ties is more common that direct reconstitution, but the factors leading to each are largely unrelated. In a review of the broken ties literature, Mizruchi (1996) finds a general consensus that corporate ties do not reconstitute after dissolving.

A difficulty with this strand of research is that if corporations are future-oriented and have rational expectations, they would anticipate the "accidental" loss of an interlocking director, at least in the average case. Firms have particular incentive to do so if interlocks are correlated with access to important resources such as capital or market share (Galaskiewicz and Wasserman 1981; Schoorman, Bazerman and Atkin 1981). If a

firm anticipates a director's ill-health or future job aspirations, a new tie could be reconstituted well in advance of the old tie dissolving.

Causal factors surrounding interlocking directorates are complex, so researchers rely on some exogenous event to disentangle their effects. In the literature on corporate governance, sudden death of a CEO or director has been used as a proxy for managerial value on stock price (Johnson et al 1985; Falato, Kadyrzhanova and Lel 2013; Fogel, Ma and Morck 2014). However, such events are relatively rare, with 161 CEO deaths from 1978-2000, leaving a relatively small sample size for analysis (Borokhovich et al 2006). Further, most corporate charters include a succession plan for the sudden decease of a board member, so sudden deaths are anticipated for at least in the abstract (Shen and Cannella 2003; Naveen 2006).

The insider trading scandal examined in this study has the advantage of being relatively exogenous; that is, insider trading must, by definition, be hidden from public view. If IBM or Intel suspected that one of their managers would become embroiled in scandal, they would face both legal and practical pressures to preempt an SEC investigation with internal discipline. Assuming that the indictments against Goel and Moffat came as a surprise to their parent companies, the conditions for a "random shock" to director networks is better met here than in most other cases studied.

The twice-removed networks of IBM and Intel did suffer node losses in 2010, immediately following the Galleon Group scandal. Assuming that this shock is exogenous, it offers a natural experiment on whether node regeneration occurs after

nodes are lost. In the years to follow, do IBM and Intel resume ties with the companies that are broken off from their networks after the scandal?

I do not find any cases of node regeneration following the Galleon Group scandal. Within IBM and Intel's networks, the only nodes that regenerate were lost before 2010. In 2008, IBM's network lost connection with CSX Corp. (CSX), and the tie was recreated in 2012; and in 2009, IBM lost connection with International Paper Company (IP), and the tie was recreated in 2013. These are the only two cases of node regeneration for either IBM or Intel. These companies do create new network connections following the 2010 scandal, but those connections are to previously unconnected firms, not their former network partners.

The creation and disintegration of network ties between interlocking directorates clearly has a large stochastic element. How does node regeneration for IBM and Intel compare to a random sample of similarly-situated companies? I also test for node regeneration by 193 companies with a comparable number of primary connections (between 8 and 12) to IBM and Intel. I find 816 cases of node regeneration within the same time period (2008-2013), or an average of 4.2 nodes regenerated per company. IBM and Intel appear to be significant outliers, experiencing less node regeneration than other comparable companies. This effect could be due to scandal, or other unrelated features of their twice-removed interlocking director networks.

To avoid confusion when comparing these results to previous studies, it is worth mentioning that the node regeneration I discuss is in reference to twice-removed networks. Previous studies on node regeneration have all, to my knowledge, focused

exclusively on primary connections and not considered secondary network connections. Therefore, my findings are more likely to over-include the category of regenerated nodes. For example, if considering the network of company A, which has primary connections to B and C, and supposing that in 2008 company B loses connection to D but in 2009 company C gains connection with D, this would be counted as a node regeneration within company A's network. The advantage to this method is that it is more sensitive to regenerated nodes, which other studies report very rarely, but this comes at a cost of potentially over-including node regeneration due to stochastic or extraneous influences.

Taking into account the limitations of this methodology, the results are still quite clear, that IBM and Intel have less than half of the rate for node regeneration compared to other similar companies. None of the nodes lost in 2010, following the Galleon Group scandal, are shown to regenerate. One possible explanation is that the timeframe is too short, and those nodes may be regained over time, or alternately, the tainting effect of scandal on IBM and Intel's interlocking directorate connections may have made rebuilding lost nodes less likely.

3.3 Director Networks after Scandal

In the wake of an insider trading scandal, network effects rippled out from the companies affected and also touched firms with as many as two degrees of separation via the network of interlocking directorates. Up to this point I have discussed this effect as a strategic decision by firms, and an effort at reputation management, however the agents acting are directors who serve at those firms, not the corporate entities as a whole.

Leaving decisions by directors wholly under-theorized would do disservice to a full understanding of the phenomenon.

To more specifically address strategic decisions by directors, I create twice-removed networks of the same type discussed above, except representing directors as nodes and mutual associations through corporate boards as edges within the graph. I refer to these as "director networks." While intuitively the inverse of board networks, director networks share some distinct features worthy of analysis. Summary statistics for the director networks are shown in Table 18.

I expect director networks to show greater sensitivity to a scandal, for two reasons. First, directors as individuals have less reputation-management tools available to them than do large firms, and are also more vulnerable to personal scandal by association with guilty parties. A good reputation is a professional corporate director's main commodity (Koenig and Gogel 1981). Cutting ties which might damage their reputation is a rational decision. The second reason emerges from the properties of director networks. By construction, these networks tend to have more nodes associated with a directors' twice removed network; every director shares a primary connection with each other member of a board they serve on, and then secondary connections extend from each of those other board members. Corporate boards typically consist of 11 or more individuals, so the potential exists for very large twice-removed networks for directors. As such, losing a single primary connection can show a large impact on the network of a director.

After modeling a twice-removed network for each director in each year of the sample, I collect the characteristics of these networks as inputs for statistical analysis. Regressions are specified as:

$$\begin{aligned} Nodes_i = \ & \alpha + + \beta_1 Y2010_i + \beta_2 IBMNet_i + \beta_3 IBMNet * Y2010_i + \beta_4 IntelNet_i \\ & + \beta_5 IntelNet * 2010_i + \beta_6 BothNet_i + \beta_7 BothNet * Y2010_i + \beta_8 Age \\ & + \beta_9 Gender + \beta_{10} Shares + \beta_{11} Attendance + \beta_{12} Boards \\ & + \beta_{13} Primary + \gamma Ethnicity_i + \varepsilon_i \end{aligned}$$

I include as much demographic information as is available, including age, gender, and ethnicity.[24] Also included are ownership information (shares held) and attendance rate at board meetings, which might suggest varying degrees of commitment to a particular company. Finally, the "Boards" variable counts the number of total boards that a director sits on, and "Primary" the number of primary connections possessed by that director. By construction, "Primary" will closely track the total number of board members per company, as those make up the bulk of a director's first connections within the network. These are expected to correlate closely with the number of nodes in a twice-removed network, but also help to control for varying board size between companies.

Results for variations upon this specification are shown in Table 23. The results for the variable of interest (β_7) are consistently large and significant, confirming the contamination hypothesis. Column 1, which does not include demographic controls,

[24] "Ethnicity" is divided up into 16 categories within the dataset. Of these, "Caucasian" is the most common (64.5%) followed by "Unknown" (28.5%) and then "Black" (3%), "Asian" (2%) and Hispanic/Latino (added together 1.3%). The remaining categories make up less than 0.1% each of the sample. To what extent the "Unknown" category is masking broader diversity effects cannot be determined.

shows the largest effect, predicting a loss of 27 nodes for a director associated with both Intel and IBM in the year 2010. Column 2, which introduces age, gender, and ethnicity controls, estimates a loss of 26 nodes. Women are predicted to have 8 more nodes in their twice-removed networks than men, although women make up just 12% of directors. For each year ten years of age, a director is predicted to gain 1.5 nodes in his or her network, a small but statistically significant effect.

In Column 3 I introduce controls for the number of shares held and a dummy variable for those who attend less than 75% of board meetings. These controls do not significantly change the estimate for the contamination effect. Finally, Column 4 includes all previous controls and adds in measures for the number of other boards a director serves on, and the number of primary connections (loosely, how many other directors serve on those same boards). These controls suppress the estimated contamination effect but it remains large, predicting a loss of 18.5 nodes for directors associated with IBM and Intel in the year 2010.

While the contamination effect appears both statistically and economically significant for directors associated with both companies, it is not consistent with the estimates generated for directors associated with IBM or Intel singularly. Through all specifications, IBM-associated directors show a small and statistically insignificant effect, while Intel-associated directors actually gain connections during this time period (although the gain is less than half of what directors associated with both companies lose). This is consistent with results from Section 2, which shows Intel being less affected

Table 23: Contamination Effect on Board Members (Dependent Variable: Number of Nodes in Twice-Removed Network)

	(1) Nodes	(2) Nodes	(3) Nodes	(4) Nodes
IBM Network	91.88***	87.82***	88.01***	49.53***
	(85.30)	(82.14)	(81.02)	(75.40)
Intel Network	34.89***	32.73***	32.66***	15.40***
	(25.80)	(24.58)	(24.26)	(17.50)
Both Networks	105.9***	100.5***	101.0***	55.12***
	(43.80)	(42.07)	(41.92)	(40.08)
Year 2010	-0.839*	2.149***	2.156***	0.551
	(-1.97)	(5.13)	(5.14)	(1.80)
IBM Net * Y2010	2.151	-0.370	-0.552	-0.0782
	(0.77)	(-0.13)	(-0.20)	(-0.05)
Intel Net * Y2010	11.52**	9.162*	9.296*	8.396***
	(3.00)	(2.43)	(2.46)	(3.55)
Both Nets * Y2010	-27.31***	-25.80***	-26.09***	-18.45***
	(-3.46)	(-3.33)	(-3.37)	(-4.24)
Age		0.145***	0.137***	-0.101***
		(9.03)	(8.42)	(-8.63)
Female		7.943***	8.019***	2.833***
		(14.93)	(14.82)	(7.93)
Shares Held			-1.31e-08*	2.10e-09
			(-2.31)	(0.38)
Attends < 75%			-1.227	-3.351**
			(-0.68)	(-2.64)
Other Boards				3.693***
				(24.15)
Primary Nodes				5.757***
				(142.86)
Constant	43.86***	9.562***	10.09***	-20.42***
	(267.01)	(4.20)	(4.43)	(-6.06)
Ethnicity Dummies	No	Yes	Yes	Yes
N	79,466	79,242	77,657	77,644
R^2	0.270	0.297	0.299	0.676

by the scandal than IBM, although it does not explain why directors associated only with Intel would gain connections while those associated with both companies would lose.

3.4 Discussion

The results from this paper confirm the contamination effect first discussed by Sullivan, Haunschild, and Page (2007) and supplement their findings with a narrowly-focused case study. I find that after the 2009 Galleon Group insider trading scandal and subsequent arrests of two top management partners at IBM and Intel, both those companies and the ones associated with them lose network connections. Previous studies of interlocking directorates have focused on the benefits that these networks can give to linked companies, but this study reveals that those benefits can be fraught with risks as well.

To this point, the exact mechanism by which network connections are dissolved has remained under-theorized. It is not immediately obvious whether firms dismiss directors that might connect the company with scandal, or whether directors preemptively remove themselves to avoid becoming associated, or some combination of both effects. While I approach the problem both from the angle of board networks as well as director networks, the precise cause of network dissolutions cannot be determined with the available data. However, by taking into consideration the institutional structure and role of directors within corporate governance, some inferences can be made.

Broadly speaking, there are two categories of board members: inside directors, those directly affiliated with the firm, and outside directors intended to represent the interests of shareholders. Inside directors possess more specialized knowledge while outside directors can be seen as more generalized experts, and also face legal and ethical limitations as to how they relate to the parent firm (Black, Cheffins and Klausner 2006). These limitations are codified by corporate charters, civil liability and a variety of government regulations.

Rarely owning large blocks of voting shares, outside directors can advise the board but lack power to directly change management decisions. The most powerful tool available to an outside director when challenging the board is the threat to quit their position, as their resignation would imply corporate wrongdoing and publicly shame the company (Koenig and Gogel 1981). Further, the majority of interlocking board connections are formed by outside directors, who play the most notable linking function within board networks (Mizruchi 1996).

Taken together, these two observations suggest that the formation and dissolution of network links described in my results are the result of outside directors joining and leaving various corporate boards. This intuition matches the findings of Marcel and Cowen (2014) who observe that there is high turnover by outside directors following financial fraud. The novel finding here is that this turnover may spill over from the affected firms and also touch those firms within its network of interlocking directorates. This spillover effect deserves further exploration.

Good reputation is an outside director's stock and trade, which both makes them desirable candidates for a board seat and is the basis of their negotiating power with other board members. The most comprehensive recent study on this issue, by Fogel, Ma, and Morck (2014) finds that companies with well-connected and influential outside directors report better results on a variety of corporate governance measures, as well as returns to shareholders. Outside directors have strong incentives to preserve their good reputations, and firms have good reasons to prefer directors who will reflect positively on the corporate entity.

What this paper reveals, then, is a series of strategic decisions by directors as to which firms they associate their reputation with. It has been well-established by previous researchers that scandal leads to upheaval at the scandal-afflicted firm, but observing that scandals can spiral out to firms believed to be associated with the first complicates the incentive structure for directors. An outside director with strong foresight would avoid not only working with scandal-prone firms, but also avoid working with people who might be associated with those firms. The result could be that firms which would benefit more from oversight – are more scandal-prone – also have more difficulties in hiring experienced outside directors.

This research expands our general knowledge of interlocking board networks, but also adds a dynamic element which is missing from many other studies. The case study of scandal at IBM and Intel offers a discrete case for analysis, and the relatively simplistic coding of firms within their networks makes statistical testing possible. Most studies of interlocking board networks have been from the perspective and tools of economic

sociology and analyzed primarily with graph theory, so the use of regression analysis offers a new perspective. As better tools are developed for the study of dynamic change within networks, this approach can be expanded.

Further, studying the responses to insider trading scandals complements the law and economics and corporate governance literature. Social interaction is an understudied field within the realm of economics, and incentives imposed by professional connections may be just as important as direct legal mandates or profit motive. In fact, the literature on outside directors suggests that profit and interpersonal ties are deeply entangled. To better understand these ties is crucial for predicting the behavior of corporate directors, and ultimately in crafting policy which will be effective for upholding shareholder interests.

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