Board Interlocks and Earnings Management Contagion

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Abstract

We examine whether earnings management spreads from firm to firm via board connections of shared directors. A firm has a higher likelihood of restating earnings in a given year if it shares a director with another firm that restated earnings either in that same year or within the past two years. We also find evidence of earning management contagion at the earlier restating period when the accounting violated GAAP. In this case, a firm has a higher probability of later restating earnings reported in the current year if it shares a director with other firms that have to restate earnings for the current or past two years. Furthermore, we find that earnings management contagion is stronger when it's the shared director has a more important relevant position. A board chairman, audit committee member or especially audit committee chairman who is also a director at another firm is associated with stronger contagion relative to other board positions of shared directors. This finding is consistent with the importance of the role of board monitoring to ensure high quality financial reporting. Board network contagion effects are not due to reverse causality, endogenous matching of firm characteristics or common industry shocks, but are weakened by endogenous matching of director characteristics. Board network contagion effects also subsume contagion from geographical proximity of firms, and are incremental to other sources of earnings management incentives, such as M&A and new issue activities. Overall, the evidence supports the idea that economic behaviors such as earnings manipulation spread through social networks.

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"*He that lies with dogs, shall rise up with fleas*." ---Benjamin Franklin

1. Introduction

Theoretical research on social influence has examined how information and behaviors are transmitted from individual to individual (e.g., Banerjee 1992; Bikhchandani et al. 1992). A growing body of research on social networks examines how social linkages affect the spread of behaviors and social outcomes.

Behaviors can spread for several reasons. Rational observers may follow the behavior of others based on either direct communication of the rationale for the chosen action, or through observation of the action. In either case, rational Bayesian updating leads to similar behavior. Observers may also imitate because of a preference to conform, or because of excessive deference to the judgment of a high-prestige model.

On the empirical side, recent research has documented that several types of corporate behaviors such as mergers & acquisitions, compensation practices, poison pill adoption, and stock exchange listing decisions spread through networks of interlocking boards (see note 2). Hirshleifer and Teoh (2009) suggest that financial reporting practices (earnings management included) may be infectious in social networks. Srinivasan (2005) provides evidence that a restatement of earnings by one member firm in a network of firms with interlocking boards contaminates the stock values of other firms in the network.

In this study, we test empirically whether financial reporting behaviors, specifically earnings management, are propagated through interlocking corporate boards. This is similar to studying virus contagion using flu outbreaks to indicate the presence of viral agents. A board

link exists when an individual sits on the board of more than one firm. A typical firm in our sample has nine members on its board of directors and the median number of links a board has to other boards is about 5 (see Table 1). We rely on restatements of financial reports to indicate the presence of earnings management.

We conduct tests of contagion via board links tainted by exposure to restating firms at two different periods relative to a restatement event. First, we consider board links at the time of the restatement itself and test whether restatements are contagious. For these tests, the restatement event is the virus. We examine the relation between the likelihood that a firm restates its financial statements within two years of having an interlocked director with another firm that restated earnings. We find that a board link to a firm with a recent restatement significantly increases the likelihood that the firm will restate its own earnings by an odds ratio of 48%. The marginal effect of having a board link to a recent restatement firm is 27% of the unconditional probability that a firm restates its earnings.

Second, we consider contagion in earnings management at the time when earnings are being manipulated prior to restatement. We examine whether a firm is more likely to manipulate financial reports if it has a common board member with a manipulating firm. The later restatement is an indicator that the accounting reporting choices in this period violated GAAP. We refer to this earlier period as the manipulation period; we test the effect of board links during this period. The advantage of studying contagion in this period is that we can distinguish contagion of earnings management from contagion of other information related to the announcement of the restatement. For example, a restatement if often accompanied with director

turnovers, and so the board directors who are present at the time of the restatement may be different from those during the manipulation period.[1]

We find that a board link to a firm that is currently managing earnings that later needed to be restated also significantly increases the likelihood that the firm manages its own earnings that later also needed to be restated. The contagion effect is large. The odds ratio from the regression suggests that a board link to a manipulator doubles the firm's likelihood of being an earnings manipulator. In contrast, a board link to a firm that is not a manipulator significantly decreases the likelihood of the firm being a manipulator. In other words, there is both positive and negative financial reporting contagion.

Just as some virus vectors are more effective than others, we also consider whether the board position in the test firm of the interlocked director that is shared with a firm that is manipulating earnings affects the intensity of earnings management contagion. We differentiate board links by whether the board director is the CEO, board chairman, audit committee member, or audit committee chairman. We find the earnings management contagion is stronger for the latter three positions, but not for the CEO. Board chair and audit committee positions generally exert a greater influence over the firm's financial reporting decisions than other board positions, and can constrain the CEO from her desire to manipulate earnings. The evidence suggests that board supervision of management is important to ensure high quality financial reporting.

There are several potential mechanisms by which contagion operates. A board member sitting on a 'tainted' board that later restated earnings may learn about how to manage earnings. When businesses are complex, there is gray area for what is acceptable under GAAP versus

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[1] Srinivasan (2005) documents that the outside directors of restating firms are more likely to lose not just their board position in the restating firm but also their board positions in other firms.

deceptive financial reporting that violates GAAP. This is especially so in an equilibrium where a firm that declines to manage earnings and fails to meet analysts' benchmark may be sharply devalued by the stock market because investors expect and discount for earnings management when valuing the firm. A board member of a tainted firm may learn about either the social norm or the auditor's cutoff for deceptive financial reporting. This information can encourage more earnings management in the linked firm. Alternatively, it may be that the similar financial reporting choice is the outcome of similar characteristics of linked firms or similar characteristics of directors of linked firms. For example, a director on two boards may be a lax monitor, encouraging earnings management at both. Furthermore, managers who wish to manage earnings may choose directors who are lax monitors, or who have a more aggressive or optimistic outlook about firm prospects.

To ascertain whether the estimated board contagion is driven by director characteristics, and/or by endogenous matching of board members and firms, we conduct several additional analyses. First, we examine financial reporting contagion in situations where the director migrated to the test firm after serving on a firm that began to manipulate earnings. If such a director has a fixed characteristic that promotes earnings management, then we should observe a stronger apparent contagion effect when the migrated director is present. For example, this should occur if firms that want to manipulate earnings intentionally recruit such directors. However, we find no evidence that migrated directors increase earnings management contagion.

Second, if companies with intentions to manage earnings choose certain types of directors (lax directors or directors who know earnings management), we expect to observe the stronger earnings management in firms with newly hired tainted directors. We find no support that the presence of new tainted directors increases the contagion effect.

Third, if firms and directors are matched together endogenously, the timing of when the test firm is exposed to bad accounting practices through board links should be irrelevant. In our test, we find the timing is relevant to the contagion effect, thereby ruling out the endogenous firm and endogenous director matching explanation.

Finally, we find that the contagion effect is not confined to board links within the same industry. There is significant cross-industry earnings management contagion. Therefore, the contagion effect from common industry accounting practices can't explain our findings.

These results contribute to the accounting and social network literature by demonstrating that earnings management behavior is transmitted from one firm to another through board interlocks. Most previous studies on earnings management treat earnings management behavior as firm-specific, while Granovetter (1985) suggests that economic choices more generally are embedded in social networks such as board interlocks. Our study expands earnings management research into social network settings.

This paper is also related to the accounting literature on the influence of geography on accounting behavior (e.g., Kedia and Rajgopal 2008a; Defond et al. 2009). The key difference is that we consider board interlocked members instead of geographic proximity as a specific conduit for behavior propagation in the network. We compare contagion via board links versus via geographical proximity in our tests. We find insignificant geographical contagion and the board contagion effect remains after controlling for geographical proximity. This suggests that previous findings of geographical effects may derive from board interlocks.

Finally, this paper also contributes to the corporate governance literature by evaluating whether firm monitoring is influenced by social networks within interlocked boards. Our

findings suggest that to improve financial reporting quality, regulators also need to pay attention to the board connectivity of companies.

The remainder of the paper is organized as follows. Section 2 summarizes related research in more depth and discusses our predictions on how board links to restating firms affect earnings quality and the propensity of earnings management. Section 3 discusses the research design and the sample. Section 4 presents our results and Section 5 concludes our paper.

2. Literature and predictions

We use restatements to identify previous earnings management because restatements are clear indicators of GAAP violations (Palmrose and Scholz 2004); other earnings management proxies such as discretionary accruals are statistical measures and their meaning is debated in the literature. Previous studies show that the disclosures of earnings restatement are related to large declines in market value. For example, Palmrose, Richardson, and Scholz (2004) report a -9.2% of market return loss over a two-day (0, 1) of restatement announcement period, and Hribar and Jenkins (2004) find that the cost of capital rises after restatements. Moreover, Gleason et al. (2008) explore the industry contagion effect of earning restatements from the investor's perspective, and find that when a firm restates, peer firms in the same industry also experience stock price declines.

Existing studies on earnings management primarily focus on effects on the firm itself and do not usually examine its effect on other firms. However, behaviors are embedded in social networks, and executives' corporate decisions may be influenced by other companies through social network ties via board interlocks (Granovetter 1985). A growing set of studies provide

evidence that firms' corporate actions are significantly affected by other companies through social networks (see, e.g., the reviews of Hirshleifer and Teoh, 2009, 2003).

Kedia and Rajgopal's (2008a) study of geographical network effects on restatements find that neighboring firms' misreporting of accounting increases a firm's tendency to misreport financial restatements, and that a firm's distance to the SEC offices is negatively associated with the likelihood of misreporting. DeFond et al. (2009) find that the geography of SEC enforcement is a key factor influencing auditor independence. Specifically, non-Big 4 auditors are less likely to issue going concern audit opinions when the auditor's engagement office is located farther from SEC offices, while Big 4 auditors have the opposite correlation. This result suggests that Big 4 auditors, with reputations to protect, monitor for misreporting more carefully. Another study on geographical networks considers its effect on the granting of stock options. Kedia and Rajgopal (2008b) report that the stock option granting practices of a firm are largely shaped by neighboring companies' practices, possibly in response to competitive pressure from a local labor market where individuals within the social network share information about compensation practices.

Among publicly traded companies, boards of directors supervise and monitor the operation of the companies, and approve important management decisions. Directors in America commonly sit on more than one board, and each board meets several times a year---sometimes frequently, as in the case of Citibank whose board met 16 times in 2002. These interlocking boards form a social network in which board members can carry knowledge and corporate practices (good or bad) from one company to another regardless of location. Directors who serve on interlocking boards, therefore, are much like agents carrying infectious viruses from one firm

to another. Therefore, the board network of interlocked directors can be an effective channel for transmitting corporate practices.

There have been a large number of papers in the finance literature that have tested for potential behavior contagion via board networks across firms in a wide range of firm activities such as investment, mergers and acquisitions, option backdating, adoption of antitakeover devices such as poison pills, going private transactions, and exchange listings.[2] The evidence in these papers generally identify higher correlation in behaviors of firms when they share common directors. None of the papers mentioned in note (2) specifically consider contagion of accounting financial reporting behaviors.

Other studies focus on within firm networks. Hwang and Kim (2010) focus on the social ties between CEO and audit committee board members, and find that that increased social ties within the firm facilitate earnings management and higher CEO bonuses. Fracassi and Tate (2009) find that firms with greater social ties between the CEO and the own firm's directors have fewer voluntary restatements (and more value destroying acquisitions, and have lower valuations.

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[2] Fracassi (2009) finds that a pair of firms with greater social ties between its board and management tends to have more similar investment and corporate finance policies. Stuart and Yim (2010) find that a company is more likely to receive private equity offers if its directors have private equity deal experience at the other firms where they are also directors. Davis (1991) finds that a company is more likely to adopt poison pills, an anti-takeover device, if the company is linked to the companies that have adopted poison pills through board interlocks. Haunschild finds that firms that are linked to acquisitive firms tend to become more acquisitive. Rao et al. (2000) find that the NASDAQ firms are more likely to migrate to the NYSE later on when their directors served on the boards of prior migrating companies; this migrating effect was weakened by board links to NASDAQ companies and strengthened by board links to NYSE companies. Bizjak, Lemmon, and Whitby (2009) report that firms interlocked with backdating firms are more likely to backdate employee stock options.

Past studies also have shown that board networks affect firm performance. Cai and Sevilir (2009) find that greater board connections between acquirers and targets increase acquirer announcement returns and lower takeover premiums. However, Ishii and Xuan (2010) find that alumni ties between acquirers' board members/executives and target firm board directors/executives lead to poor mergers and acquisition decisions. Cohen, Frazzini, and Malloy (2008) find that strong school ties among mutual fund portfolio managers and among board members of companies lead to improved performance especially during corporate news events, suggesting that these social networks facilitate the communication of information.

They infer that social ties within boards reduce effective board monitoring.[3] Our paper focuses on contagion of earnings management behaviors and restatements via interlocked directors in board networks across firms, not within firms.

Within the psychology literature, there is evidence of contagion of unethical behaviors (Gino, Ayal, and Ariely 2009). Sah (1991) points out that exposure to the dishonesty of others could lead managers to change their subjective estimate of manipulation costs and benefits. The social psychology literature also suggests that individuals in groups tend to conform to social norms even when the social norms are clearly incorrect (Asch 1951). The evidence on the higher frequency of stock option backdating in board interlocked firms mentioned earlier (Bizjak et al. 2009) is consistent with this effect. Fich and Shivdasani (2007) find that firms are more likely to face a financial lawsuit if they have a board member who sits on the board of another firm that has previously been sued for fraud.

Earnings management in firms is unlikely to be publicized widely by the firm and its directors, for obvious reasons. However, this behavior may diffuse quietly from one firm to another through individual conversations between directors, some of whom serve on multiple boards. Whether or not a firm manages its earnings depends on the subjective perceived cost and benefit of such management. For example, when a company manipulates its earnings, directors linked to the manipulating firm observe such behavior through board interlocks are likely to estimate a lower perceived cost of manipulation and a higher perceived benefit. This can lead to rational herd behavior or information cascades.

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[3] Other studies on CEO connectedness with either other firms or with members of its own board on CEO compensation are Engelberg, Gao, and Parson (2009), Horton, Millo, and Serafeim (2009), and Larcker et al. (2007).

Furthermore, board connections to firms that manage earnings can change the directors and managers' view of whether managing earnings is a social norm, and therefore can affect the preferences of directors and executives. The use of earnings management at other firms can be viewed as a moral justification for its use by others. It can also convey information about what limits on aggressive accounting is permitted by auditors. In sum, direct communication of information signals, observation of actions and preference interactions through social networks via board interlocks can all cause behaviors such as earnings management to spread from one firm to another.

Overall, based on the discussion above, we hypothesize that the likelihood of earnings management for a firm is greater when it has a director who has served on the board of another firm that previously managed earnings. We discuss the research design to test this hypothesis next. It is important in tests of contagion to address the issue of independent common causation (a shared director is the cause of the behavior in both firms, without any contagion across firms) or endogeneity (firms that engage in certain behaviors tend to hire the same directors). One of the distinctive features of our paper is that it performs tests to address the possibilities of common caustion and endogenity.

3. Research design and data

To test whether there is contagion in accounting reporting choices between board-linked firms, we start with a sample of restatements. Restating firms have clearly violated Generally Accepted Accounting Principles (GAAP) in the period leading up to the restatement date. We consider the directors of such firms as infectious agents for earnings management. The general theme for the empirical tests examine whether the firms that are linked via common directors

with the infectious firms also tend to manage earnings. We discuss the two alternative event periods when board links are present below.

We begin with an initial sample of restatement firms from the General Accounting/Government Accountability Office (GAO) released on Oct 4, 2002 that identify whether a firm restated its financial reports from 1997 to June 2002. The GAO sample is widely used by recent studies on earnings management (e.g., Badertscher et al. 2009). For each restatement firm in the sample, we identify the members of its board of directors during the restatement year, and trace them to linked firms on whose board these members also sit. To identify these board links, we use information about directors from the database from Risk Metrics, formerly the Investor Responsibility Research Center (IRRC) database.

In the rest of this section, we describe how the test variables are calculated and the test method for contagion effects. The summary of the definition and calculation of all variables are in the Appendix.

3.1 Contagion at the time of the restatement event

We call a firm 'infected' if it possesses the behavior in question (e.g. in this subsection, a restatement) and we call a firm 'susceptible' if we are testing whether it will acquire the behavior. We are testing whether the behavior from the infected firm (the sender) will be transferred to a susceptible firm (the receiver). In this subsection, we measure contagion links between an infected firm and a susceptible firm that share directors *at the time of a restatement*. The indicator variable *RESTATELINK* for a susceptible firm is equal to 1 when its director sits on the board of an infected firm at the time the infected firm announces a restatement. To allow for an

incubation period for the restatement infection to develop, we also consider the susceptible firm as linked if the susceptible firm shares a director with a restating firm within the past two years.

Just as with the spread of disease, there is a higher rate of infection if a person is exposed to a greater number of infecteds. Therefore, the second non-binary discrete measure *#RESTATELINK* is the number of distinct restating firms that the susceptible firm has common directors with.

Since some boards are very large and so are more likely to have board interlocks, we also apply a measure of the connectedness of the susceptible firm's board to other firms generally. The variable *#BOARDLINK* is the number of links the firm's board has to other boards regardless of whether the linked firms have a restatement or not. This measure picks up other contagion effects via board networks that are unrelated to restatements. In contrast to the restatement link that identifies bad accounting contaminant, the board link picks up contagion of relatively good accounting

The dependent variable is whether a susceptible firm restates its financial statements. If there is a restatement, the indicator variable *RESTATE* equals 1 for the firm, and is zero otherwise. The motivation for examining restatements is that it is a clear indicator that the firm had manipulated its earnings at some time in the past.

To test for restatement contagion, we run the following cross-sectional pooled logistic regressions:[4]

$$Logit\ (RESTATE) = F(\beta_0 + \beta_1 RESTATELINK + \beta_2 \#BOARDLINK + \textstyle\sum \beta_j\ Controls_j + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon) \quad (1)$$

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[4] We also use the probit models to run all the regressions in the paper and obtain similar results.

$Logit\ (RESTATE) = F(\beta_0 + \beta_1 \#RESTATELINK + \beta_2 \#BOARDLINK + \sum \beta_j\ Controls_j + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon)$ ……………………………………………………………………..(2)

The key variables of interest are the indicator variable *RESTATELINK* in equation (1), or the continuous measure reflecting the strength of the restatement link *#RESTATELINK* in equation (2). The control variables are described in Section 3.4. If contagion via board membership exists, we predict that the coefficients β_1 on these variables will be positive. A susceptible firm with board members who also serve on boards of infected firms within the past two years is more likely to be infected (restate its own financial statements).

Additionally, the estimated coefficient on the variable *#BOARDLINK* carries an interesting implication that is also new to the literature. A significant negative coefficient would suggest that a firm whose board of directors is linked to other firms that did not restate earnings is less likely to have to restate its own earnings. In other words, there is contagion of positive accounting reporting practice.

3.2 Contagion in the earnings manipulation period preceding restatements

The restatement tests discussed in Section 3.1 have the advantage that they permit the use of the full sample of firms whose earnings were eventually restated. However, they are subject to the objection that the information transmitted via the *RESTATELINK* may not be solely about earnings management. A restatement also conveys information about the limits that regulators and auditors use to determine GAAP violation in addition to information that earnings were previously managed. Restatements occur only after firms have managed earnings, and the board directors present when earnings were managed may no longer be present at the time of the restatement event (Srinivasan 2005).

We therefore consider an alternative identification strategy for board links to focus specifically on contagion during the earnings manipulation period. This more accurately tests for contagion about information concerning the technology for managing earnings or norms about earnings management behavior. In these tests, we trace the restatement event back to the initial period when the accounting choices in that period violated GAAP to examine contagion occurring *during this manipulation period*.[5]

We hand-collect information about when restating companies begin to manage earnings. Starting with the GAO sample of restatements from 1/1/1997 to 6/30/2002, we collect news articles or press releases from LexisNexis within two days of the GAO restatement announcement date. We read each article to identify the starting period of earnings manipulation related to the restatement. If this information is not available, we search the SEC EDGAR system for related Form 10K or 10Q of restating companies subsequent to restatement announcement dates, and read these documents to determine the manipulation period.

We ascertain whether a board link to an infected firm at this initial bad accounting period exists using the Risk Metrics database. The indicator variable *EMLINK* equals 1 if the susceptible firm has a common board member that sits on another firm at the time that the linked firm began manipulating earnings in the current year or in the past two years to allow for an incubation period for infection. (In other words, the linked firm had to restate earnings and the start of the restating period is the current year or the past two years.) The non-indicator discrete measure *#EMLINK* measures the number of such links to distinct firms.

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[5] The two-year incubation period that is allowed for in the tests based on the announcement of a restatement is likely to cover the period when earnings were manipulated but is less accurate at pinpointing the manipulation period than the alternative design.

The relevant dependent variable measures the likelihood that a susceptible firm engages in earnings management. The indicator variable *EM* equals one for a susceptible firm in year *t* if year *t* is the first year for which its earnings were corrected in an eventual restatement, and is zero otherwise. In other words, a susceptible firm becomes infected at the time it begins to manipulate its earnings in year *t*. When a susceptible firm becomes infected in a given year, the firm is no longer checked for infection or counted as infected subsequently to prevent multiple counting of the same infection.

Compared to the earlier test design that is focused on contagion at the time of the restatement announcement, we lose 79 observations because the initial earnings manipulation period cannot be found or it falls earlier than 1996 when Risk Metrics coverage of director information begins; this reduces the power of the test.[6] The sharper identification of the manipulation period, however, may increase test power.

To test for contagion of earnings management in the initial manipulation period, we run the following cross-sectional pooled logistic regressions:

$$Logit\ (EM) = F(\beta_0 + \beta_1 EMLINK + \beta_2 \#BOARDLINK + \sum\beta_j Controls_j + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon) \quad \ldots\ldots(3)$$

$$Logit\ (EM) = F(\beta_0 + \beta_1 \#EMLINK + \beta_2 \#BOARDLINK + \sum\beta_j Controls_j + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon) \quad \ldots\ldots(4)$$

The key variables of interest are *EMLINK* and *#EMLINK*. A positive coefficient on these variables indicates that a board link to an infected firm (a firm that subsequently restated) during

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[6] An earlier draft of the paper considered beginning dates for the earnings manipulation period ranging from three to seven years prior to the restatement year, and obtained qualitatively similar results.

the earnings management period increases the likelihood that a susceptible firm becomes infected, i.e., that it manages earnings to an extent that required later restatement. As before, *#BOARDLINK* tests for contagion of positive accounting reporting.

We further tests whether the board position of the interlocked director matters for the strength of the contagion. Director's influence over the financial reporting practices of the firm varies with the position of the member on the board. The CEO, the board chair, and members of the audit committee are likely to wield greater influence than other directors on financial reporting issues. We therefore we include these additional indicator variables *EMCEOLINK, EMBOARDCHAIRLINK, EMAUDITCHAIRLINK,* and *EMAUDITCOMLINK* to represent links to manipulating firms by the test firm's interlocked board member position as the CEO, board chair, audit committee chair, or audit committee member respectively.

In our tests, in addition to the earnings management link variable *EMLINK*, we include one of the above board member position link variables. For example, we run the regression:

$$Logit\ (EM) = F(\beta_0+\beta_1\ EMLINK + \beta_2 EMCEOLINK + \beta_3 \#BOARDLINK + \sum \beta_j Controls_j + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon) \quad \text{......(5)}$$

EMCEOLINK variable is substituted by *EMBOARDCHAIRLINK, EMAUDITCHAIRLINK,* and *EMAUDITCOMLINK* in each successive regression. The board position link variables evaluate the incremental strength of the earnings management contagion effect.

3.3 Control variables

Both sets of regressions require appropriate controls for other known determinants for restatement or earnings management. We discuss next the set of control variables associated with

earnings management and restatements from the literature (e.g., Lee et al. 2006; Lennox and Pittman 2010). The details for all variables used in the paper are summarized in the Appendix. All the accounting and stock return data are from COMPUSTAT and CRSP respectively. All other databases used are noted where the relevant variables are discussed below.

We control for firm performance with return on total assets (*ROA*), and a loss indicator variable, *Loss*. *Size* is estimated as the natural logarithm of total assets. Large firms are more visible and therefore politically more vulnerable to regulators wishing to send a message of intolerance for earnings manipulation to the capital markets. Growth effects are controlled using *Market to Book,* the firm's equity market-to-book ratio. High growth firms may be tempted to manage earnings to sustain the perception of high growth when actual growth has slowed. High growth firms may also be less understood by investors and so may more be able to get away with earnings manipulation.

Firm reporting quality is affected by the length of the operating cycle, measured as the sum of the number of days that accounts receivables and inventories are held. We use 360 days divided by the relevant turnover ratios to measure days held, and the natural log of the operating cycle (*Log Operating Cycle*) as the control variable. Off balance sheet activities can be used to reduce reported liability and inflate earnings (e.g., Dechow et al. 2010; Ge 2006). Therefore, we follow Ge (2006) and construct *Operating Lease*, which is equal to 1, if the company's future operational lease obligations are greater than zero. In addition, we include a non-financial indicator of earnings management, *Abnormal Employee,* in the regressions to complement the limitation of financial measures for the earnings management tendency (Brazel et al. 2009).

Firms facing higher operating risks and the likelihood of failure have greater incentives to manage earnings. So, we further control for operating risks using *Ret Volatility*, measured as the

standard deviation of the stock returns in the fiscal year. The variable *Leverage* is measured as the ratio total liabilities to total assets and controls for higher risk of firm failure and higher incentive to manage earnings to avoid debt-related constraints imposed on management.

To control for other governance-related variables that may separately affect earnings management, we include a corporate governance score using G-index from Gompers, Ishii and Metrick (2003), and the fraction of institutional holdings, *Inst Holdings*. To isolate the effect of contagion from board links as conservatively as possible, we also control for other board characteristics that prior literature has suggested is a proxy for the strength of monitoring by the board. These include *CEO Duality* which is equal to one, if the CEO is also the chairman of the board, and 0 otherwise, the size of the corporate board, *Board Size,* and the percentage of independent board member *Pct Ind Directors*. We also use the Risk Metrics and Thomson Financial databases to construct an anti-takeover variable and an institutional holding variable, both of which are likely to be related to board governance.

4. Empirical results

4.1 Summary statistics and correlations

Panel A, Table 1 reports how the restatement sample as well as earnings management contagion sample are selected. The sample size is limited by the coverage of the Risk Metrics database (formerly the IRRC database) and the coverage of the GAO restatement sample. The earliest available restatement data begins in 1997. We do not consider restatements after 2001, which prior literature suggests are technical restatements following SOX, rather than

restatements because of accounting irregularities. Risk Metrics' coverage of board of directors is limited to the S&P top 1500 firms and about 400 other widely held firms in our sample period.

Our sample consists of 179 restatement observations and 118 earnings management observations that eventually restated earnings. The small sample size is common to studies related to accounting fraud. For example, Erickson et al. (2006) use only 50 fraud events to explore the relation between executive equity incentive and accounting fraud and Lee et al. (2006) use 91 restatement cases to investigate the relation between earnings management and performance and growth.

Combining with all non-restating firms in Risk Metrics for the 1997 to 2001 period gives the total sample size of 8,145 firm-year observations and 2,403 distinct firms. The number of observations in each regression varies with data availability for the included variables. We run our regressions including and excluding control variables, and results on contagion are generally robust to inclusion of control variables.

Panel B, Table 1 reports the summary characteristics separately for the sample identified to manage earnings from later restatements (*EM* group) versus the sample of firm-year observations that did not manage earnings (Control group). These two groups are similar along many dimensions with several exceptions. *EM* firms have significantly higher *EMLINK* than the control sample. 28.8% of *EM* firms versus 18.7% of control firms have a board link to a firm that later restated earnings, so earnings manipulators have greater exposure to firms that later restated earnings. The number of interlocked boards, *#BOARDLINK*, however, is not significantly different between the two groups, suggesting that any differences in earnings management behavior is not coming from different levels of connectedness to other firms. *EM* firms have more volatile stock returns, worse performance and use more off balance sheet activities than the

control sample firms consistent with these firms facing greater incentives and opportunities to manage earnings.

Panel C reports the correlations among independent variables for our main tests. The high correlation between *EMLINK* and *#BOARDLINK* (0.429) suggests that opportunities for earnings management contagion increases with greater board exposure to other companies. Therefore, in all the regression analyses, we always control for *#BOARDLINK* to measure the incremental effect of earnings management contagion.

4.2 Restatements and board interlocks

Table 2 reports the empirical results regressing the likelihood of restating financial reports against board interlock variables *RESTATELINK* and *#BOARDLINK*. In Column (1) the coefficient on *RESTATELINK* is 0.646 and positively significant at the one percent level, implying that a company is more likely to restate its financial reports when the company's board is linked to firms that restated within the past two years. The coefficient on *#BOARDLINK* is negative but insignificant. In Column (2) and (3), we include year fixed effects and industry fixed effects, and find the coefficient on *RESTATELINK* remains positive and significant at the 10% level. In Column (4), we control for various firm and board characteristics, and find similar significant results. The marginal effect for *RESTATELINK* is 0.64%. This constitutes 27% of the unconditional probability of a restatement in the sample (128 restatement observations / 5392 total observations = 2.37%). In Column (5), we use the continuous variable for restatement board links to take into account the strength of the links and find similar significant results. Overall, we find that firms with restatement-tainted directors have high propensity to restate subsequently.

4.3 Contagion during the earnings manipulation period preceding restatements

The results in Table 3 show that there is a significant positive association between the likelihood that a firm begins to manipulate earnings and the firm having a director who serves on the board of another firm that later is identified to be a manipulator. In all the model specifications, the coefficient estimate on *EMLINK* is positive and significant at the 5% level. The results are robust to the use of the continuous measure #*EMLINK* that measures the strength of these manipulator board links.

We calculate the economic significance of the board link variables in two ways using the multiple logistic regression in Column (4) of Table 3.

P1 = Probability (*EM*=1| *EMLINK*=1, other controls) = 1.96%

P2 = Probability (*EM*=1| *EMLINK*=0, other controls) = 0.98%

This implies a marginal effect of *EMLINK* = 1 of 0.98%. The baseline unconditional probability of earnings management is 1.73% (89 observations where *EM* = 1 divided by 5131 total number of firm year observations). Therefore a board link to manipulators (*EMLINK* = 1) has a marginal affect that is 0.98/1.73 = 56% as large as the unconditional probability of managing earnings. Alternatively, the odds ratio [P1/(1-P1)] / [P2/(1-P2)] is 2.02, which suggests that a board link to a manipulator doubles the firm's likelihood of becoming an earnings manipulator.

Column (5) uses the continuous measure #*EMLINK* to capture the intensity in earnings management contagion. The coefficient estimate of 0.378 is significantly positive (*p* value = 0.027), with a marginal effect of 0.42%.

Interestingly, the variable #*BOARDLINK* is significantly negative -0.047 (p value = 0.079), implying that a firm with directors linked to firms with no earnings management are less likely to manage earnings. This is evidence that good financial reporting behaviors are also

contagious. In our sample, the average number of board links to other firms is 5, and so the average marginal effect of 0.26% is about 62% of the marginal effect for #*EMLINK*. Finally, we also interact #*BOARDLINK* with *EMLINK* and find that the interaction variable has a significant negative coefficient (not reported in Table 3). This indicates that a higher number of board links distracts from the firm listening to the information transmitted from a manipulator firm, and so earnings management contagion is weaker in a larger board network.

4.4 The effect of director position on contagion of earnings management

Table 4 explores whether influential tainted directors by virtue of their position on the board have a disproportionate effect on the spread of earnings management across the director network. Among the four types of positions investigated in Table 4, we find that tainted board network links when the tainted board director is either the board chair, audit committee chair, or audit committee member significantly raises the likelihood that the firm manages earnings. The CEO position, however, does not have a significant incremental influence on earnings management contagion.

Relative to an average board director, an audit committee member has a significant incremental influence, followed by an even larger influence for the board chairman, and the largest influence is reserved for the audit committee chairman. Compared to the marginal effect of *EMLINK*, the marginal effect of *EMAUDITCOMLINK* is 1.8 times larger, of *EMBOARDCHAIRLINK* is 2.4 times larger, and of *EMAUDITCHAIRLINK* is largest by 3.6 times. Since the audit committee has a supervisory role specifically over financial reporting, these results are intuitive and consistent with the role of monitoring by the board.

These results suggest that board governance matters considerably for the quality of financial statements, consistent with the findings from the famous Milgram (1963) experiment that an authority figure can induce unethical behavior in groups. Even though management is responsible for the financial reporting choices, the board of directors plays an important role in what is finally reported in the financial statements. In their role as monitors, they can acquiesce to or limit aggressive accounting choices. An aggressive CEO can be tamed by a forceful board chairman, and especially a strict audit committee chairman.

4.5 Additional analyses and robustness tests

In this subsection, we address other explanations for our findings and robustness tests for industry effects and other market incentives for managing earnings. One alternative explanation is reverse causation. A firm desiring to manage earnings may hire directors with specific characteristics, such as earnings management experience at other firms or a history of being a lax monitor to facilitate its ability to manipulate earnings. Therefore we create two indicator variables, one for a director who recently migrated to the susceptible firm, *EMMIGRATEDLINK*, and the other for a newly hired director, *EMNEWDIRECTORLINK*. The migrated director moved to the susceptible firm after acquiring earnings management experience from the linked firm. A newly hired director must be hired within the past three years but need not have moved with earnings management experience as long she gained the earnings management experience at other boards during these three years. If there is reverse causality, a firm with a migrated director link or a newly hired tainted director link has a higher likelihood of managing earnings.

The result for *EMMIGRATEDLINK* is in Column (1) and for *EMNEWDIRECTORLINK* is in Column (2) of Table 5. Neither of these two variables' coefficients are statistically

significant, whereas *EMLINK* remains statistically significant in both regressions, and so the evidence provides no support for the reverse causation explanation.

Another alternative explanation for our earlier findings is that the assignment of directors to firms is non-random and is the result of an endogenous firm or director matching. In this matching explanation, the positive effect of *EMLINK* indicates only similarities in the propensity to manage earnings between two firms that share a common director, and not from an information contagion about the earnings management technology or about norms for discretionary accounting reporting behaviors. In other words, "*birds of the same feather flock together*."

One way to view the matching explanation is as an omitted variables problem, in which a potentially omitted factor is anything that determines both director matching to firms and is correlated with susceptibility to earnings management behaviors. In our earlier tests, we have carefully controlled for a large set of known determinants for earnings management and restatements and so we have attempted to control for the matching explanation. To test between the matching hypothesis and the board network contagion hypothesis, we exploit the difference in importance between these two hypotheses about the timing of the presence of a board link and the infection. The board network contagion hypothesis requires that the infection develops in the susceptible firm after it has been exposed via a board link to an infected firm. In contrast, when a firm manages earnings under the matching hypothesis is invariant to when the board-linked firm managed earnings.

We introduce two new indicator variables to capture time-invariant board links to infected firms. *ENDOGENOUSFIRM* equals one if the susceptible firm at *any* time in the sample period has *EMLINK* directors (linked to a board of an infected firm), and is zero otherwise. The

ENDOGENOUSDIRECTOR indicator variable is more restrictive than the *ENDOGENOUSFIRM* variable. It is equal to one only for the years when the tainted director who is or will have earnings management experience serves on the board. The coefficients for *ENDOGENOUSFIRM* in Column (3) of Table 5 and *ENDOGENOUSDIRECTOR* in Column (4) are not statistically significant, and so there is no support for the director or firm matching hypotheses. Instead, the coefficient on *EMLINK* remains positively significant in Column (3), consistent with the board network contagion hypothesis. In Column 4, adding *ENDOGENOUSDIRECTOR* causes *EMLINK* to become insignificant at conventional levels, though the two-tailed *p*-value is 12% and its coefficient 0.662 is comparable to its coefficient 0.707 in Table 3 Column (4) without the *ENDOGENOUSDIRECTOR* variable.

Finally, firms in the same industry tend to have similar accounting practices and face common business conditions. The contagion effect we document may be the result of these common factors. To address such a concern, Column (5), Table 5 shows that the results are not driven solely by same-industry contagion by including only *EMLINK* from board networks from different industries in the regression.

Previous studies show that earnings management is correlated geographically (e.g., Kedia and Rajgopal 2008a). Table 6 explores whether our findings can be explained by the earnings management correlation derived from geographical proximity by constructing a variable *GEOPROXIMITY*. This variable is calculated as the sum of the reciprocal of the distance between test firm *i* and all *EM* = 1 firms in the same year and prior two years (i.e. $\sum 1/(1 +$ distance(i, k) where k is an *EM* = 1 firm). Column (1) shows that firms located close to infected firms tend to manipulate earnings, consistent with the findings in past studies. Column (2) and (3) include our variable of interest *EMLINK*. The results suggest that tainted board links have a

robust effect on the earnings management of linked susceptible firms after additionally controlling for geographical proximity. Interestingly, *GEOPROXIMITY* is no longer significant. This suggests that the earnings management contagion through board interlocks may explain the previously documented earnings management contagion through geographical proximity.

Previous studies have documented circumstances in which earnings management incentives are especially strong. We test whether earnings management contagion is incremental to these factors in Table 7. We control for mergers and acquisitions with *M&A* indicator variable in Column (1) (Louis 2004), issuances of new equities or debts with *ISSUE* indicator variable (e.g., Teoh et al. 1998b, 1998a) in Column (2), and the likelihood of accounting frauds using *FSCORE* (Dechow et al. 2010) in Column (3). Column (4) further includes all these three variables. The results in Table 7 show that *EMLINK* and *#BOARDLINK* are robust to the inclusion of these further determinants of earnings management, implying that board networks incrementally affect both positive and negative accounting reporting behaviors.

5. Concluding remarks

This paper studies the role of board interlocks in the propagation of corporate financial reporting practices**.** We find evidence that a firm is more likely to manage its earnings when it has board links to other firms that are infected with earnings management, identified in two ways. The first is when the linked firm recently restated earnings. The second is when the linked firm is engaged in manipulating its accounting that later had to be restated. Both identification methods provide evidence of contagion of earnings management behaviors. This evidence support Granovetter's (1985) argument that economic actions are influenced by social networks and

contacts. More broadly, our findings suggest that social influence is important for financial accounting practices.

Furthermore, we find that the more important the board position held by interlocked director in the susceptible firm, the stronger the contagion effect. This is particularly the case with board positions that have influence over financial reporting. These pieces of evidence suggest that board monitoring plays a key role on the contagion and quality of the firm's financial reports.

We have focused on only a particular type of social network, board interlocks. Other types of social networks such as school ties, golf club memberships, and country club memberships may also influence financial reporting and other business decisions. Future studies might investigate the various types of social networks' influence on firm activities.

Our sample drawn from Risk Metrics mainly focuses on the large S&P 1500 companies. Earnings management contagion through boards of directors in small companies and private firms are not considered. Social networks may be even more important in small businesses and private firms, so further empirical study of social contagion across such firms is called for.

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Table 1: Descriptive Statistics

The table describes the selection process and summary statistics of the sample. The sample consists of all firms in Risk Metrics from 1997 to 2001. Panel A provides the number of observations obtained at each sample selection step beginning with the GAO (2002) restatement sample. Panel B provides the summary statistics for two groups of the sample. In the *EM* sample, firms are identified as earnings manipulators if the earnings for that firm year had to be restated at a future date. The control group consists of the remaining firms in Risk Metrics not identified as earnings manipulators. Panel C reports correlations among all independent variables. *Definitions of the control variables* are in the Appendix.

Panel A: Sample Selection

GAO sample released on Oct 4, 2002 (1/1/1997-6/30/2002)	919
Less:	
Missing Gvkey	91
Not covered by Risk Metrics	606
Missing Beginning EM date or outside of Risk Metrics coverage period	79
Duplicate Restatements or Multiple Restatements per year	6
Multiple Restatements per firm	19
Final Usable Restatement Sample	118

Panel A provides information on how the restatement sample is selected.

Table 1: **Descriptive Statistics** (Continued)

Panel B: Comparison of firm characteristics for EM sample and Control sample.

	Control group				EM group					
Variable	N	Mean	Median	Std Dev.	N	Mean	Median	Std Dev.	t-statistics for Mean Difference	Wilcoxon test for Median Difference
EMLINK	8,027	0.187	0.000	0.39	118	0.288	0.000	0.455	(-2.40)**	(-2.79)***
#BOARDLINK	8,027	7.422	5.000	7.595	118	7.839	6.000	7.584	(-0.59)	(-1.13)
ROA	7,930	0.026	0.037	0.111	117	0.004	0.025	0.132	(1.81)*	(2.55)**
Loss	7,948	0.186	0.000	0.389	117	0.239	0.000	0.429	(-1.33)	(-1.45)
Size	7,930	7.481	7.268	1.637	117	7.665	7.612	1.473	(-1.34)	(-1.78)
Leverage	7,902	0.584	0.595	0.229	117	0.600	0.599	0.237	(-0.73)	(-0.70)
Market to Book	7,691	3.347	2.244	3.452	112	3.362	2.338	3.074	(-0.05)	(-0.10)
Log Operating Cycle	7,699	4.855	4.725	1.059	113	4.817	4.691	0.92	(0.44)	(0.01)
Ret Volatility	7,931	3.128	2.74	1.529	117	3.598	3.151	1.638	(-3.08)***	(-3.51)***
Operating Lease 0/1	7,948	0.773	1.000	0.419	117	0.855	1.000	0.354	(-2.49)**	(-2.11)**
Firm Age	7,948	23.686	19.000	15.547	117	23.444	19.000	16.285	(0.16)	(0.37)
Abnormal Employee	7,617	-0.057	-0.039	0.229	114	-0.049	-0.021	0.275	(-0.31)	(-1.18)
G-index	6,863	8.958	9.000	2.762	100	9.290	9.000	2.844	(-1.16)	(-1.15)
Inst Holdings	8,019	0.153	0.134	0.123	118	0.149	0.139	0.125	(0.35)	(0.47)
Board Size	8,027	9.599	9.000	3.181	118	9.356	9.000	2.833	(0.92)	(0.45)
CEO Duality	8,027	0.670	1.000	0.47	118	0.703	1.000	0.459	(-0.79)	(-0.77)
Pct Ind directors	7,989	60.522	62.5	18.946	118	62.717	66.667	19.086	(-1.24)	(-1.36)

* significant at 10%; ** significant at 5%; *** significant at 1%. Panel B compare the characteristics of EM group and Control group. t-statistics are in parentheses for mean difference tests and z-statistics are in parentheses for median difference tests. *Definitions of the control variables* are described in Appendix.

Table 1: Descriptive Statistics (Continued)

Panel C: Correlations

	EMLINK	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(2)	*#BOARDLINK*	**0.429**															
(3)	ROA	0.008	**0.045**														
(4)	Loss	-0.017	**-0.085**	**-0.639**													
(5)	Size	**0.282**	**0.573**	0.016	**-0.158**												
(6)	Leverage	**0.125**	**0.288**	**-0.230**	-0.002	**0.542**											
(7)	Market to Book	**0.074**	**0.158**	**0.226**	**-0.089**	**0.061**	**0.027**										
(8)	Log Operating Cycle	**0.043**	**0.075**	**-0.100**	**-0.030**	**0.311**	**0.306**	-0.020									
(9)	Ret Volatility	**-0.057**	**-0.239**	**-0.334**	**0.415**	**-0.324**	**-0.252**	**0.047**	**-0.046**								
(10)	Operating Lease (0/1)	0.022	0.010	-0.002	**0.127**	**-0.228**	**-0.238**	**0.080**	**-0.229**	**0.291**							
(11)	Firm Age	**0.169**	**0.393**	**0.075**	**-0.117**	**0.320**	**0.224**	**-0.046**	0.005	**-0.429**	**-0.234**						
(12)	Abnormal Employee	-0.024	0.002	**-0.078**	**0.037**	**-0.064**	-0.003	**-0.069**	0.007	**-0.026**	-0.013	0.013					
(13)	G-index	**0.081**	**0.240**	**0.028**	**-0.070**	**0.169**	**0.196**	**-0.044**	**0.046**	**-0.220**	**-0.086**	**0.362**	-0.004				
(14)	Inst Holdings	**-0.065**	**-0.114**	**-0.078**	**0.112**	**-0.253**	**-0.071**	**-0.116**	**-0.096**	**0.124**	**0.242**	**-0.163**	0.024	**-0.092**			
(15)	Board Size	**0.202**	**0.502**	**0.024**	**-0.147**	**0.584**	**0.405**	**0.023**	**0.296**	**-0.367**	**-0.270**	**0.342**	-0.012	**0.224**	**-0.244**		
(16)	CEO Duality	**0.068**	**0.161**	0.005	**-0.045**	**0.149**	**0.110**	0.011	**0.039**	**-0.097**	**-0.035**	**0.122**	0.004	**0.111**	**-0.029**	**0.058**	
(17)	Pct Ind Directors	**0.149**	**0.335**	**-0.026**	**-0.039**	**0.182**	**0.183**	-0.012	**0.059**	**-0.131**	**-0.133**	**0.274**	-0.002	**0.280**	**-0.017**	**0.134**	**0.142**

Correlation figures are bold-faced if they are significant at the 5% level. Panel C reports correlations among all independent variables. *Definitions of the control variables* are described in Appendix.

Table 2: Propensity of restatements on board links to restating firms

The table presents results of logistic regressions of *RESTATE* on *RESTATELINK* or *#RESTATELINK* based on Equations (1) or (2) in the paper. *RESTATE* equals one if there is a restatement for a firm-year observation, and is zero otherwise. *RESTATELINK* equals one when a board member is linked a restatement firm within the two past years, and is zero otherwise. *#RESTATELINK* is measured as the number of board interlocks with other distinct restating firms. *Definitions of the control variables* are in Appendix. Robust p values are in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

	(1)	(2)	(3)	(4)	(5)
#RESTATELINK					0.226*
					(0.052)
RESTATELINK	0.646***	0.354*	0.364*	0.392*	
	(0.001)	(0.100)	(0.087)	(0.095)	
#BOARDLINK	-0.004	0.005	0.009	-0.010	-0.013
	(0.730)	(0.710)	(0.503)	(0.632)	(0.541)
ROA				-0.181	-0.229
				(0.877)	(0.843)
Loss				0.417	0.416
				(0.142)	(0.145)
Size				0.291***	0.295***
				(0.002)	(0.002)
Leverage				1.469**	1.442**
				(0.025)	(0.026)
Market to Book				-0.036	-0.034
				(0.196)	(0.220)
Log operating cycle				-0.209	-0.214
				(0.123)	(0.116)
Ret Volatility				0.267***	0.265***
				(0.003)	(0.003)
Operating Lease 0/1				0.617	0.601
				(0.112)	(0.119)
Firm Age				-0.003	-0.002
				(0.738)	(0.804)
Abnormal Employee				-0.359	-0.353
				(0.327)	(0.333)
G-index				0.073*	0.073*
				(0.053)	(0.050)
Inst Holdings				0.744	0.767
				(0.352)	(0.338)
Board Size				-0.046	-0.047
				(0.298)	(0.288)
CEO Duality				0.234	0.232
				(0.262)	(0.267)
Pct Ind Directors				-0.004	-0.003
				(0.551)	(0.569)
Year Fixed Effects	No	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	Yes	Yes	Yes
Observations	8,042	8,042	7,192	5,392	5,392
Pseudo R-Squared	0.007	0.023	0.047	0.100	0.100

Table 3: Propensity to manage earnings on board links to earnings manipulators
The table presents results of logistic regressions of *EM* on *EMLINK* or #*EMLINK* based on Equations (3) or (4). *EM* equals one if this is the initial year of the restating period for a firm that later had to restate its earnings, and is zero otherwise. *EMLINK* equals one when a firm has an interlocked board member with another firm whose earnings in that period or two years prior were managed and had to be restated at a future date, and is zero otherwise. # *EMLINK* is measured as the number of board interlocks with other distinct earnings manipulators. Definitions of all variables are in the Appendix. Robust p values are in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

	(1)	(2)	(3)	(4)	(5)
# *EMLINK*					0.378**
					(0.027)
EMLINK	0.636**	0.593**	0.592**	0.707**	
	(0.013)	(0.024)	(0.025)	(0.015)	
#*BOARDLINK*	-0.009	-0.009	-0.004	-0.046*	-0.047*
	(0.547)	(0.537)	(0.808)	(0.071)	(0.079)
ROA				-0.686	-0.710
				(0.589)	(0.572)
Loss				-0.004	0.010
				(0.993)	(0.980)
Size				0.442***	0.447***
				(0.000)	(0.000)
Leverage				0.833	0.818
				(0.305)	(0.309)
Market to Book				-0.055*	-0.052
				(0.089)	(0.111)
Log operating cycle				0.019	0.025
				(0.920)	(0.893)
Ret Volatility				0.147	0.143
				(0.173)	(0.185)
Operating Lease (0/1)				0.881*	0.866**
				(0.051)	(0.050)
Firm Age				-0.012	-0.012
				(0.178)	(0.180)
Abnormal Employee				-0.130	-0.143
				(0.798)	(0.778)
G-index				0.075*	0.078*
				(0.096)	(0.084)
Inst Holdings				0.274	0.314
				(0.777)	(0.747)
Board Size				-0.031	-0.030
				(0.599)	(0.612)
CEO Duality				0.119	0.118
				(0.632)	(0.633)
Pct Ind Directors				0.004	0.004
				(0.602)	(0.570)
Year Fixed Effects	No	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	Yes	Yes	Yes
Observations	8,077	8,077	7,004	5,131	5,131
Pseudo R-Squared	0.006	0.016	0.036	0.074	0.071

Table 4: Propensity to manage earnings and board links to earnings manipulators depending on directors' board position.

	(1)	(2)	(3)	(4)
EMLINK	0.618**	0.561*	0.569*	0.398
	(0.036)	(0.061)	(0.068)	(0.298)
EMCEOLINK	0.641			
	(0.221)			
EMBOARDCHAIRLINK		0.970**		
		(0.050)		
EMAUDITCHAIRLINK			1.279**	
			(0.016)	
EMAUDITCOMLINK				0.631*
				(0.098)
#BOARDLINK	-0.046*	-0.046*	-0.044*	-0.047*
	(0.074)	(0.072)	(0.080)	(0.064)
ROA	-0.607	-0.565	-0.452	-0.674
	(0.635)	(0.657)	(0.729)	(0.594)
Loss	0.012	0.007	0.032	0.013
	(0.976)	(0.985)	(0.934)	(0.974)
Size	0.447***	0.451***	0.447***	0.446***
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.832	0.870	0.882	0.830
	(0.303)	(0.281)	(0.277)	(0.307)
Market to Book	-0.054*	-0.053	-0.056*	-0.056*
	(0.092)	(0.101)	(0.086)	(0.084)
Log operating cycle	0.013	0.019	0.040	0.029
	(0.943)	(0.920)	(0.831)	(0.877)
Ret Volatility	0.146	0.148	0.152	0.151
	(0.175)	(0.169)	(0.167)	(0.165)
Operating Lease (0/1)	0.903**	0.880**	0.866*	0.840*
	(0.039)	(0.049)	(0.057)	(0.065)
Firm Age	-0.013	-0.012	-0.012	-0.013
	(0.169)	(0.182)	(0.188)	(0.142)
Abnormal Employee	-0.125	-0.094	-0.124	-0.108
	(0.807)	(0.854)	(0.808)	(0.832)
G-index	0.076*	0.079*	0.074	0.074*
	(0.091)	(0.079)	(0.100)	(0.100)
Inst Holdings	0.336	0.395	0.293	0.334
	(0.731)	(0.684)	(0.766)	(0.731)
Board Size	-0.032	-0.032	-0.034	-0.025
	(0.577)	(0.580)	(0.568)	(0.673)
CEO Duality	0.109	0.096	0.105	0.123
	(0.660)	(0.699)	(0.669)	(0.619)
Pct Ind Directors	0.004	0.004	0.003	0.004
	(0.590)	(0.587)	(0.634)	(0.594)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,131	5,131	5,131	5,131
Pseudo R-Squared	0.075	0.077	0.079	0.076

Table 4 (Continued)

The table reports results of logistic regressions of *EM* on *EMLINK* and one of the board member influence or position variables from the list *EMCEOLINK*, *EMBOARDCHAIRLINK*, *EMAUDITCHAIRLINK* and *EMAUDITCOMLINK* respectively, see example in Equation (5) in the paper. *EM* and *EMLINK* are as described in Table 3. *EMCEOLINK* equals one when the firm's *EMLINK* is via a director who is the CEO of the test firm, and is zero otherwise. *EMBOARDCHAIRLINK* equals one if a firm's *EMLINK* is via a director who is the chairman of the board, and is zero otherwise. *EMAUDITCHAIRLINK* equals one if a firm's *EMLINK* is via a director who is the chairman of the audit committee, and is zero otherwise. *EMADUITCOMLINK* equals one if a firm's *EMLINK* is via a director who is an audit committee member. *Definitions of the control variables* are described in Appendix. Robust p values in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 5: Propensity to manage earnings and board links to earnings manipulators by migrated or newly hired directors, and time invariant/cross-industry board links.

	(1)	(2)	(3)	(4)	(5)
EMLINK	0.678**	0.741**	0.615*	0.662	
	(0.025)	(0.017)	(0.090)	(0.122)	
EMMIGRATEDLINK	0.252				
	(0.643)				
EMNEWDIRECTOR		-0.111			
		(0.786)			
ENDOGENOUSFIRM			0.130		
			(0.686)		
ENDOGENOUSFIRMDIRECTOR				0.056	
				(0.892)	
EMLINK - Different Ind. Only					0.565*
					(0.062)
#BOARDLINK	-0.046*	-0.045*	-0.046*	-0.046*	-0.040
	(0.070)	(0.075)	(0.064)	(0.069)	(0.102)
ROA	-0.718	-0.666	-0.695	-0.688	-0.646
	(0.568)	(0.600)	(0.585)	(0.588)	(0.611)
Loss	-0.010	-0.001	-0.002	-0.003	0.005
	(0.980)	(0.999)	(0.996)	(0.994)	(0.991)
Size	0.443***	0.442***	0.438***	0.442***	0.448***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.842	0.832	0.832	0.834	0.848
	(0.301)	(0.305)	(0.306)	(0.305)	(0.290)
Market to Book	-0.055*	-0.055*	-0.055*	-0.055*	-0.053*
	(0.087)	(0.091)	(0.086)	(0.090)	(0.097)
Log Operating Cycle	0.017	0.018	0.019	0.019	0.016
	(0.927)	(0.924)	(0.919)	(0.919)	(0.931)
Ret Volatility	0.147	0.147	0.145	0.147	0.150
	(0.175)	(0.174)	(0.176)	(0.174)	(0.162)
Operating Lease (0/1)	0.892*	0.879*	0.878*	0.880*	0.871*
	(0.050)	(0.051)	(0.052)	(0.052)	(0.054)
Firm Age	-0.013	-0.013	-0.013	-0.012	-0.013
	(0.173)	(0.177)	(0.177)	(0.178)	(0.165)
Abnormal Employee	-0.137	-0.124	-0.131	-0.130	-0.141
	(0.787)	(0.807)	(0.796)	(0.798)	(0.782)
G-index	0.075*	0.076*	0.074	0.075*	0.076*
	(0.099)	(0.095)	(0.101)	(0.096)	(0.090)
Inst Holdings	0.249	0.276	0.256	0.269	0.303
	(0.799)	(0.776)	(0.793)	(0.782)	(0.754)
Board Size	-0.031	-0.031	-0.031	-0.031	-0.032
	(0.597)	(0.594)	(0.595)	(0.599)	(0.581)
CEO Duality	0.117	0.119	0.118	0.119	0.116
	(0.635)	(0.632)	(0.632)	(0.630)	(0.639)
Pct Ind Directors	0.004	0.004	0.004	0.004	0.004
	(0.601)	(0.604)	(0.594)	(0.603)	(0.617)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	5,131	5,131	5,131	5,131	5,131
Pseudo R-Squared	0.074	0.074	0.074	0.074	0.070

Table 5 (Continued)

The table reports results of logistic regressions of *EM* on *EMLINK* and one of the variables *EMMIGRATEDLINK, EMNEWDIRECTOR*, *ENDOGENOUSFIRM*, and *ENDOGENOUSDIRECTOR* from Column (1) to Column (4). Column (5) replaces the presence of tainted directors (*EMLINK*) with the presence of tainted directors from different industries (*EMLINK-Different Ind. Only*). *EM* and *EMLINK* are described previously in Table 3. *EMMIGRATEDLINK* equals one if the director who triggered *EMLINK*=1 joined the test firm subsequent to his earnings management (*EM*) experience in the linked firm. *EMNEWDIRECTOR* equals one if the director joined the test firm for no more than three years, and earned earnings management experience from sitting on other boards at any time in the three year period. *ENDOGENOUSFIRM* equals one if the firm at some point in the sample period acquires *EM*-experienced directors. *ENDOGENOUSDIRECTOR* equals one if a board director is *EM* experienced or will become *EM* experienced in the sample period. *Definitions of the control variables* are described in Appendix. Robust p values in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 6: Comparing earnings management contagion from geographical proximity versus from board interlocks.

The table reports results of logistic regressions of *EM* on *EMLINK* and/or GEOPROXIMITY. *EM* and *EMLINK* are as described in Table 3. GEOPROXIMITY is the sum of the reciprocal of the distance the test firm and all *EM*=1 firms in the same year and prior two years. *Definitions of the control variables* are described in Appendix. Robust p values in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

	(1)	(2)	(3)
GEOPROXIMITY	0.132*	0.075	-0.026
	(0.063)	(0.315)	(0.788)
EMLINK		0.585**	0.718**
		(0.027)	(0.013)
#BOARDLINK		-0.004	-0.046*
		(0.793)	(0.067)
ROA			-0.713
			(0.575)
Loss			-0.004
			(0.993)
Size			0.449***
			(0.000)
Leverage			0.778
			(0.336)
Market to Book			-0.054
			(0.103)
Log Operating Cycle			0.018
			(0.926)
Ret Volatility			0.147
			(0.174)
Operating Lease (0/1)			0.891**
			(0.047)
Firm Age			-0.013
			(0.162)
Abnormal Employee			-0.123
			(0.810)
G-index			0.076*
			(0.093)
Inst Holdings			0.270
			(0.782)
Board Size			-0.032
			(0.581)
CEO Duality			0.115
			(0.640)
Pct Ind Directors			0.004
			(0.583)
Year Fixed Effect	Yes	Yes	Yes
Industry Fixed Effect	No	Yes	Yes
Observations	8,028	6,955	5,121
Pseudo R-Squared	0.014	0.036	0.074

Table 7: **Comparing board interlock contagion and market incentives on the propensity to manipulate earnings.**

	(1)	(2)	(3)	(4)
EMLINK	0.685**	0.695**	0.689**	0.673**
	(0.017)	(0.017)	(0.020)	(0.022)
#BOARDLINK	-0.041*	-0.047*	-0.043*	-0.043*
	(0.098)	(0.063)	(0.092)	(0.091)
M&A	0.640***			0.453
	(0.010)			(0.101)
ISSUE		0.462*		0.345
		(0.066)		(0.173)
FSCORE			1.685***	1.088*
			(0.002)	(0.062)
ROA	-0.500	-0.668	-0.048	0.023
	(0.704)	(0.600)	(0.973)	(0.987)
Loss	0.006	0.022	0.131	0.124
	(0.988)	(0.954)	(0.744)	(0.757)
Size	0.421***	0.431***	0.414***	0.406***
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.897	0.709	0.991	0.830
	(0.272)	(0.393)	(0.240)	(0.334)
Market to Book	-0.056*	-0.059*	-0.069*	-0.068*
	(0.088)	(0.071)	(0.051)	(0.056)
Log Operating Cycle	0.064	0.038	0.036	0.074
	(0.740)	(0.838)	(0.852)	(0.699)
Ret Volatility	0.151	0.134	0.112	0.111
	(0.162)	(0.216)	(0.322)	(0.319)
Operating Lease (0/1)	0.831*	0.793*	0.576	0.588
	(0.060)	(0.066)	(0.207)	(0.181)
Firm Age	-0.011	-0.012	-0.011	-0.010
	(0.237)	(0.212)	(0.254)	(0.293)
Abnormal Employee	0.006	-0.073	0.317	0.286
	(0.989)	(0.885)	(0.518)	(0.549)
G-index	0.075	0.075*	0.075	0.075
	(0.100)	(0.099)	(0.100)	(0.103)
Inst Holdings	0.307	0.230	0.378	0.372
	(0.753)	(0.815)	(0.699)	(0.707)
Board Size	-0.033	-0.030	-0.027	-0.028
	(0.578)	(0.609)	(0.648)	(0.634)
CEO Duality	0.116	0.114	0.095	0.095
	(0.639)	(0.648)	(0.703)	(0.703)
Pct Ind Directors	0.004	0.004	0.005	0.005
	(0.594)	(0.565)	(0.530)	(0.513)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	5,131	5,131	5,084	5,084
Pseudo R-Squared	0.079	0.077	0.079	0.084

Table 7 (Continued)

The table reports results of logistic regressions of *EM* on *EMLINK* with additional controls of M&A, ISSUE and FSCORE. M&A equals one if a firm has M&A activities in the year, and is zero otherwise. ISSUE equals one if a firm issues new debts or equity in the year, and is zero otherwise. FSCORE is calculated as the propensity of accounting frauds based on the model in Dechow et al. (2010). *EM* and *EMLINK* are previously described in Table 3. Definitions of the control variables are described in Appendix. Robust p values in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Appendix: Definitions Table

Variable Name	Definition
EM	Indicator variable equals 1 if this is the starting year of the restating period (i.e., the manipulation period) for a firm that had to restate earnings, and is zero otherwise.
RESTATE	Indicator variable equals 1 if firm announces restatement in the year, and is zero otherwise.
EMLINK	Indicator variable equals 1 if a firm shares a director with another firm that experienced *EM* = 1 either in the current year or in the past two years, and is zero otherwise. In other words, the linked firm is a restating firm and the restating period is either in the current year or in the past two years.
#EMLINK	Number of board links a firm has with another firm that has *EM* =1 in the current or past two years. It is the continuous measure of the *EMLINK* variable.
RESTATELINK	Indicator variable equals 1 if a firm is interlocked through a shared director with another firm that restates earnings within the past two years.
#RESTATELINK	Number of firm restatement board interlocks.
#BOARDLINK	Number of other firms connected to the firm through interlocked board network. A firm is interlocked with another firm if there is a common director serving on board of both firms.
ROA	Return on total assets ([NI]/[AT]) Compustat labels are in []
Loss	Indicator variable equals 1 if the firm's income before extraordinary items [IB] is negative in the year
Size	Natural logarithm of firm's total assets [AT]
Leverage	Total liabilities [LT] divided by total assets[AT]
Market to Book	Market to book ratio([CSHO]*[PRCC_F]/[CEQ])
Log Operating Cycle	Log of operating cycle which is equal to [360/ (Sales[SALE] /Average AR[RECT]) + 360/(Cost of Goods Sold[COGS]) / (Average Inventory[INV])].
Ret Volatility	100 times stock return volatility in year t
Operating Lease (0/1)	Indicator variable equals 1 if firm's future operating lease obligations ([MRC1],[MRC2],[MRC3],[MRC4] or [MRC5]) are greater than zero, and 0 otherwise
Firm Age	Firm's age

Abnormal Employee	Firm's abnormal change in employees equals the number of employees [EMP] for year t minus the number of employees for year t-1, scaled by the number of employees for year t-1, less total assets [AT] at year-end t minus total assets at year-end t-1, scaled by assets at year-end t-1.
G-index	G-Score of Gompers et al (2003)
Inst Holdings	Percentage of Institutional holdings
Board Size	Number of board members on firm i's board in a given year
CEO Duality	Indicator variable equals 1 if the CEO is also Chairman of Board
Pct Ind Directors	Percentage of independent board member on firm i's board
M&A	Indicator variable equals 1if a firm has M&A activities ([AQS]>0) in the year
ISSUE	Indicator variable equals 1 if the sum of new long-term debt [DLTIS] plus new equity [SSTK] exceeds 2 percent of total assets [AT] for a firm-year.
FSCORE	Average F-score in the past three years; F-score is the propensity of accounting frauds, and its estimation is based on Dechow et al. (2010).
EMCEOLINK	Indicator variable equals 1 if a firm' s *EMLINK* is via a director who is the CEO of the firm
EMBOARDCHAIRLINK	Indicator variable equals 1 if a firm's *EMLINK* is via a director who is the board chairman
EMAUDITCHAIRLINK	Indicator variable equals 1 if a firm's *EMLINK* is via a director who is the chairperson of the audit committee.
EMAUDITCOMLINK	Indicator variable equals 1 if a firm' s *EMLINK* is via a director who is an audit committee member
EMMIGRATEDLINK	Indicator variable equals 1 if the director who triggered *EMLINK*=1 joined test firm subsequent to his earnings management experience in the linked firms
EMNEWDIRECTOR	Indicator variable equals 1 if the director who triggered *EMLINK*=1 joined test firm for 3 or fewer years
ENDOGENOUSFIRM	Indicator variable equals 1 if a firm at some point in time acquires a director from a firm that has *EM* = 1 (i.e. has earnings management experience)
ENDOGENOUSFIRMDIRECTOR	Indicator variable equals 1 for firm-years in which there is a director on board who either is earnings management experienced or will become earnings management experienced

EMLINK - Different Ind. Only	Indicator variable equals 1 if a firm's *EMLINK* = 1 is from a firm in a different Fama-French 48 industries. That is, the tainted directors are from firms in a different industry.
GEOPROXIMITY	Sum of the reciprocal of the distance between test firm i and all EM=1 firms k in same year and prior two years (i.e. $\sum$ 1/(1+distance (i,k) where k is each EM firm)