

Shadow Trading: Do Insiders Exploit Private Information About Stakeholders?

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March 5, 2015

ABSTRACT

US regulations prohibit a firm's employees from exploiting their private information about the firm for personal gain. Private information, however, often exhibits spillover effects and implications for a firm's customers, suppliers, and competitors. We label the potential opportunities for employees at various levels of the firm (source firms) to profitably trade or disseminate private information about their business partners or competitors (target firms) as shadow trading. Our evidence indicates that target firms experience a 12% to 17% change in symptoms of informed trading activity prior to the release of private information by a business partner or competitor. Additional tests reveal that shadow trading symptoms arise more readily when source firms (1) have no explicit policy restricting shadow trading by their employees; (2) experience regulatory shocks to own firm insider trading; (3) encounter exogenous employee mobility shocks; (4) internally promote their CEOs; or (5) face the sudden death of the CEO and promote internally. Back-of-the-envelope calculations indicate that each typical shadow trading event represents trading profits of up to \$678,000. In sum, the evidence suggests that source firm employees constitute a key source of information leakage regarding customers, suppliers, and competitors.

Key Words: Business Partners; Informed Trading; Private Information; Supply Chain

JEL Codes: D4, G14, K22

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1. Introduction

The U.S. Department of Justice routinely seeks to prosecute managers for trading in their own-firm stocks or for breaching their fiduciary duty by leaking valuable information to outsiders. Yet, corporate events often exhibit spillover effects and implications for related firms (Fee et al., 2006), creating opportunities for employees with stakeholder-relevant private information (“source firm” insiders) to profitably make trades in, or leak information about, their business partners or competitors (“target firms”). Government regulations prohibit the “tipping” of material, non-public information, and also require a firm’s senior employees to report their trades in their own firms but these disclosure rules do not apply to other employees, or for trading activity in a firm’s business partners (suppliers and customers) or competitors. Disparities in government scrutiny of insider trading provide opportunities for a firm’s employees to exploit their private information about business partners or competitors by trading or leaking the information to other investors, activities that we term “shadow trading”.

US regulations penalize illegal insider trading but fail to explicitly define it, relying on case law and targeted prosecutions to deter such activity (Dolgoplov, 2012). With limited prosecutions against shadow trading, source firm employees arguably face low detection, few penalties, and limited deterrence against trading in their business partners or competitors. Moreover, source firm employees may rationalize shadow trading based on its lack of an explicit definition, regulatory restrictions on own-firm trades, and regulatory burdens to only disclose own-firm trades. Yet, US regulatory policy suggests that shadow trading remains a minor concern, with a substantive focus on direct insider trading (Alldredge and Cicero, 2015) or trading by finance professionals (Acharya and Johnson, 2010). Disclosure requirements for officers and directors of the firm only apply to own firm trades and implicitly exclude trades in the firm’s business partners or competitors, or the leakage of information about these stakeholders. The potential for the immateriality or irrelevancy of shadow trading activity provides a likely explanation for this limited regulatory attention.

Publicly traded firms often provide extensive codes and rules on trading using private information from the firm or its business partners. In a broad sub-sample of US publicly listed firms that publicly disclose their corporate ethics and rules, we find that over half of the sample explicitly

prohibits shadow trading by their managers and employees. The other firms mainly provide general proscriptions against conventional insider trading. Thus, extensive overall regulatory scrutiny, broad internal company proscriptions, and the coarse nature of private information regarding business partners and competitors suggest that shadow trading could remain an inconsequential concern.¹ In this context, it is possible that regulators do not require managers to disclose shadow trading because insiders rarely engage in such avaricious activity.

We explore whether information spillovers represent an important, undocumented, and material channel that affects trading activity. We use the term “source firm” to denote the company from which private information potentially emerges, while “target firm” refers to the business partner or competitor for whom the private information could be price relevant. Our research strategy employs two distinct steps: 1) establish whether information leakage from source firms affects trading in target firms; and 2) determine if this leakage appears attributable to source firm employees. In the first step, we identify situations where it appears feasible to accurately attribute abnormal trading activity in a target firm to an affiliated source firm’s private information. In the second step, we determine if source firm employees plausibly serve as an origin of this information leakage by exploiting cross-sectional variation in the costs and benefits of shadow trading. We identify several distinct situations where source firm employees face differing shadow trading costs that should not influence trading activity by sophisticated market traders or by *target firm* insiders.

Our primary tests exploit a unique dataset from Standard & Poor’s Capital IQ database that allows us to precisely identify firm-specific material business partners (customers and suppliers) and competitors for a large sample of US firms. The firm-specific supplier data allows us to overcome limitations in reverse engineering the supplier data from material customer data disclosures available in Compustat. Rather than focusing on all suppliers and customers, we isolate a subsample that

¹ In a rare case against shadow trading, the SEC in 2011 brought action against employees of Flextronics for leaking information about business partner component orders (including Apple Inc. (NASDAQ: APPL) and Research in Motion (NASDAQ: RIMM)) to hedge fund managers. In a related case, the SEC and DOJ initiated enforcement actions against mid-level managers for leaking information about their business partners to Primary Global Research LLC, an expert-network firm. Two associated indictments against insider trading using confidential business partner data include actions against executives at Advanced Micro Devices (NASDAQ: AMD) and Taiwan Semiconductor Manufacturing Company (NYSE: TSM) (<http://www.sec.gov/news/press/2011/2011-38.htm>).

consists of target-source firm pairs in which the target firm only has one source firm that makes an earnings announcement during a given window. While this requirement significantly reduces the sample size, it facilitates identification by limiting the sources of potential private information, providing clearer attribution as to the information source. We validate our results by using an alternative sample that relies on an alternative dataset over a longer time period.

The intuition of our test strategy is straightforward: if a source firm insider has private information about an own-firm forthcoming earnings shock, two avenues for monetization prior to the release of this information to the public seem plausible. First, the source firm employee with private information could trade in their own firm, for instance, by short selling the stock in the case of an impending negative earnings shock. Second, the employee could leak information or trade in a business partner's or competitor's stock (shadow trading). We explicitly control for the effects of the first case and focus on the latter case to examine whether private information held by a source firm employee is related to informed trading in stakeholder (i.e., target) firms.²

We test for the presence of shadow trading using two proxies of informed trading commonly used in the literature on private information based trading - abnormal short sales and abnormal Amihud (Desai et al., 2002; Christophe et al., 2004; Diether et al., 2009; Anderson et al., 2012). The univariate tests provide evidence consistent with the presence of shadow trading. Specifically, we find that abnormal short selling in a target firm increases (decreases) by 10.1% (4.7%) in the 30-day window leading up to a business partner's future negative (positive) quarterly earnings announcement shock. We also find evidence of abnormal trading activity in a source firm's competitors prior to the source firm's public disclosure of its private information. Specifically, we find source firm competitors experience a 6.7% (3%) increase (decrease) in abnormal short selling prior to a negative (positive)

² An example from our sample provides a simple illustration of this finding: On May 4, 2010, The Proctor & Gamble Company (NYSE: PG) announced unexpectedly low quarterly earnings (based on both earnings expectation models and analyst consensus forecasts). Sally Beauty Holdings Inc. (NYSE: SBH), a material customer for Proctor & Gamble, experienced a 25% increase in short sales in the 30-day window prior to the date of Proctor & Gamble's earnings announcement. Sally Beauty Holdings did not experience any single-day stock price shocks during that 30-day window, did not provide any new disclosures, and nor did they have any other material suppliers (i.e., for which Sally Beauty Holdings is a material customer) release earnings information during that window. In comparison, short selling in PG increased by 14% over the same window.

earnings announcement shock from the source firm. We find similar results when using abnormal Amihud as an alternative proxy for shadow trading. Hence, prior to the public disclosure of an earnings announcement shock in a source firm, we observe symptoms of informed trading in that source firm's stakeholders.

Multivariate test results are consistent with the univariate findings: abnormal short sales in target firms are statistically and economically related to the magnitude of *future* earnings shocks from both competitor and business partner source firms, and the results are predictably different across both positive and negative earnings announcement shocks. Furthermore, our findings are robust to the use of the abnormal Amihud proxy to identify shadow trading. In terms of the net magnitude of this information leakage, we find that a one standard deviation increase in source firm CAR around an earnings announcement is associated with a 12% - 17% change in target firm short sale activity prior to the source firm earnings announcement. The findings are robust to the use of large set of control variables, as well as industry and year fixed effects.

Our next series of tests focus on identifying whether the documented results above are attributable to information leakages by source firm employees or from sophisticated traders without access to employee information. First, we examine whether shadow trading varies with cross-sectional differences in firm-level restrictions on shadow trading between source firms. Using a sub-sample of firms that disclose their corporate ethics guidelines and insider trading policies, we compare the presence and magnitude of shadow trading across firms with restrictions on shadow trading to those without explicit restrictions. As the public disclosure of corporate rules represents a conscious choice made by a firm, our tests do not allow us to draw inferences about the veracity of such rules but only the decision to create such a rule. However the empirical test does allow for inferences about the role of source firm employees with respect to the documented abnormal trading of their stakeholders. Intuitively, sophisticated traders that trade in target firms (but without access to inside information) should be unaffected by source firm internal trading rules. By comparing shadow trading between source firms with differential restrictions on shadow trading, we are able to isolate the effects of sophisticated market participants. Empirical results suggest that the subsample of source firms that

only ban insider-trading (but not shadow trading) display over three times more shadow trading than firms that ban both shadow trading and insider trading.

Our second test exploits a shock to insider trading regulations in Section 32(a) of the Securities Exchange Act of 1934 as amended by the Sarbanes-Oxley Act of 2002, which increased the disclosure requirements for insider trades and the magnitude of the penalty for “willful” violation of the act and regulations.³ We find evidence of a significant *increase* in shadow trading activity following these regulatory changes that increased government scrutiny of conventional insider trading in own-firm shares. While own-firm insider trading exhibits a significant decrease (Anderson et al., 2013), we find that shadow insider trading *increases* by about 11% - 12% following the regulatory shock. This finding appears inconsistent with the hypothesis that our results are driven by trading activity from target company insiders or by sophisticated market participants without access to private information.

The next set of tests focuses on state-level exogenous shocks to the information environment. Specifically, we focus on state-level adoptions and rejections of the Inevitable Disclosure Doctrine (IDD). The doctrine influences the labor market opportunities for employees of (source) firms headquartered in affected states. However, target firms located in other states (and their employees) remain relatively unaffected by an IDD shock, as do sophisticated market participants that do not rely on information transfers from source firm employees. Evidence from difference-in-differences tests indicates that shadow trading in target firms is significantly affected when the source firm is in a state that adopts (rejects a previously adopted) IDD. For a one standard deviation increase in source firm earnings announcement shock, we find that target firms experience a 9% greater change in shadow trading following an IDD shock to the source firm, relative to shadow trading in target firms with unaffected source firms. These results appear inconsistent with information leakage by target firm employees or sophisticated trader information production driving shadow trading.

Our next test investigates whether managerial knowledge about the source firm explains the variations in shadow trading in target firms. Internally promoted CEOs in the source firms, relative to outside CEOs, are likely to be more familiar with the firm’s operations and governance practices,

³ The current mandated penalty for individuals is a maximum of 20 years in prison and/or a maximum fine of \$5 million. Corporations face penalties of up to \$25 million.

especially early in the CEO's tenure (Murphy and Zábojník, 2004). Thus, internally promoted CEOs are arguably better positioned to evaluate the effect of the firm's operations on business partners and competitors and thus profitably trade or leak relevant information. Empirical results indicate that shadow trading is concentrated in firms that have appointed an internally promoted CEO during the sample period. Further tests indicate that the variation in shadow trading occurs after normal CEO turnover and the promotion of an internal candidate. Economically, for cases where source firms have a new internally promoted CEO, a one standard deviation increase in the source firm's earnings announcement shock CAR is associated with a 16% change in shadow trading. In contrast, we find no evidence of changes in shadow trading for cases where the new source firm CEO is an outsider. Similar results based on source firm CEO sudden deaths provide additional evidence on the effect of internal versus external CEO hires. In sum, these results again appear inconsistent with arguments that our results are driven either by trading conducted by target firm employees or trading by sophisticated investors without access to source firm inside information.

Finally, a closing series of robustness tests consider alternative approaches to identify information shocks and the effects from relaxing sampling restrictions that allow us to exploit a larger sample. Further testing reveals that the extent of shadow trading in business partners is more pronounced in less competitive industries. In sum, a series of test all point in a single direction, namely that shadow trading does not appear inconsequential.

2. Legal Issues in Trading in Corporate Stakeholders

The separation of ownership and control in publicly traded firms generates incentives for employees to exploit their private information, allowing profitable trade strategies to be implemented at the expense of outside shareholders (Cheng and Lo, 2006; Huddart et al., 2007). Banerjee and Eckard (2001) document how managers gain substantive profits on their insider trading activity, while Ke et al. (2003) report that employees trade upon their private information up to two years prior to the corporate disclosure. DeMarzo et al. (1996) note how regulators create strict rules, with substantial penalties and well-publicized enforcement actions, to limit managerial use of this private information for personal gain. Generally, US regulations and case law stipulate that trading as an employee while

in possession of material private information creates an illegal breach of fiduciary responsibility (Acharya and Johnson, 2010).⁴ A stream of empirical studies document a substantial reduction in trading based on private information over time due to greater regulatory scrutiny by the SEC and DOJ (Brochet, 2010; Del Guercio et al., 2013; Anderson et al., 2013).

Recent concerns center on expert networks gathering information for their hedge fund clients by focusing on information procurement from mid-level managers of a target firm's suppliers and customers. A recent well-publicized example involves a business development manager at Flextronics (a camera component supplier) who is charged with supplying information about a client's (Apple) sales forecasts and upcoming product releases (Yin, 2010). Furthermore, in contrast to the extensive SEC and Department of Justice prosecutorial efforts against own-firm insider trading, very few prosecutions are based on trading activity using information that indirectly affects a firm's suppliers or customers. Existing prosecution of insider trading activity requires the navigation of a loosely defined scope of insider trading (Anderson et al., 2012), but the legality of shadow trading imposes an additional hurdle because it requires an assessment as to whether the trading creates a breach of fiduciary responsibility.

The extensive debate and attention on insider trading stems from concerns about insiders' incentives to engage in trading activities (Bozanic et al., 2012). US insider trading rules and regulations have progressed from a landmark decision by the US Supreme Court in *United States v. O'Hagan* (1997). In that decision, the Supreme Court ruled that securities laws meant to limit insider trading "inspire investor confidence", thereby promoting market pricing and the efficient allocation of resources. Senior SEC regulators note "...insider trading is legally forbidden. It is morally wrong. And it is economically dangerous. Moreover, the SEC has zero tolerance for the crime of insider trading" (Levitt, 1998).

⁴ An extensive empirical literature documents information externalities for competitors and vertical stakeholders in earnings announcements, management forecasts, and news releases (e.g., Foster 1981; Olson and Dietrich, 1985; Clinch and Sinclair, 1987; Baginski, 1987; Han et al., 1989; Han and Wild, 1990; Pyo and Lustgarten, 1990; Slovin et al., 1991; Freeman and Tse, 1992; Shahrur, 2005; Raman and Shahrur, 2008; Hertz et al., 2008; Cohen and Frazzini, 2008; Pandit et al., 2011; Valta, 2012).

While insider trading has garnered much regulatory attention, its legal definition provides limited guidance about how a firm's boundaries are defined, and therefore the legality with which insiders can use own-firm private information that affects stakeholders to trade through them.⁵ Beeson (1996) notes that the US Congress deliberated over whether to include a definition of this in the Insider Trading Sanctions Act of 1984, but ultimately decided that extensive case law provided sufficient guidance. The SEC provides guidance in interpreting case law on insider trading. For instance, SEC Rule 10b-5, implementing Section 10(b) of the Securities Exchange Act of 1934, states, in part, that an insider must disclose material inside information or refrain from trading when in possession of it. Ausubel (1990) notes that in order to violate Rule 10b-5, the insider must be linked with the firm whose security is traded or with the nonpublic information in such a way that the use of the information in his trading is deemed to breach some fiduciary duty. Misappropriation theory suggests that an individual who trades on the basis of material nonpublic information that is from their employer and about another firm breaches their fiduciary duty of trust or confidence and has committed fraud (Salbu, 1992).

The SEC and Department of Justice largely focus on insider trading prosecutions and enforcement actions regarding illegal trades by managers in their own firms or by financial market participants (e.g., hedge fund managers) rather than on managers or employees who trade in related firms, i.e., business partners or competitors. Academic research also appears to focus on understanding the implications and consequences of insider trading activity by corporate insiders in their own firm's stock. We consider a different type of insider trading activity that appears to provide an opportunity for managers and employees of other firms in the value chain to use their private information to profit from trading activity with seemingly limited risk of regulatory prosecution. In this context, employees' private information about their firms' customers, suppliers, and competitors arguably creates an opportunity for either direct or indirect shadow trading.

⁵ Insiders include managers, employees and anyone else who obtains material, nonpublic information from a corporate insider or from the issuer, or anyone who expropriates such information from another source. Material information occurs if a "substantial likelihood exists that a reasonable investor would consider it important in making his or her investment decisions" and insider trading requires "an intent to deceive, manipulate, or defraud".

3. Data and Empirical Framework

3.1 Sample Selection

Our central research objective is to examine whether a firm's employees opportunistically use or share their stakeholder-relevant private information before the public release of that information. Intuitively, if the source firm's earnings announcement contains stakeholder-relevant news, source firm employees who have access to relevant information can trade on or share the information with outsiders, resulting in abnormal trading activity in the target firm *prior to* the source firm's earnings announcement. Note that our objective in this study is to focus on documenting whether shadow trading *occurs*. We do not attempt to determine whether shadow trading occurs because of trades made by source firm insiders or because of information leakage by source firm insiders to other traders.

We identify firms and their stakeholders (i.e., target and source firm records) from Standard & Poor's Capital IQ database for the 2010 fiscal year. Capital IQ identifies material stakeholders for a large sample of U.S. firms using a proprietary classification methodology that employs a combination of annual reports, SEC filings, press releases, conference calls, and industry sources. A key difference between the Capital IQ database and the alternative methodology we use to validate our main tests (discussed below) is that the Capital IQ data is not based entirely on required firm disclosures, but instead relies on judgment based on Capital IQ's propriety methodology. A benefit of this approach is the procedure used to identify a firm's material competitors, customers and suppliers is consistent across firms. In addition, the Capital IQ data also has an advantage over traditional methods to identify competitors that relies on Standard Industrial Classification (SIC) code matches: SIC codes to identify competitors are susceptible to fairly wide and potentially inaccurate categorizations of competitors since the classifications were designed to facilitate sector evaluation (Hoberg and Phillips, 2010, 2014; Hoberg et al., 2014).

The Capital IQ data is also subject to some limitations.⁶ In order to address these limitations, we investigate and find that our main findings are robust to using an alternative sample that relies on

⁶ First, as the Capital IQ data is provided in real time without access to archival records, the sample window over which we can conduct tests is limited. This affects the generalizability of our findings. Second, while all stakeholders captured by Capital IQ are classified as "material", we cannot ascertain the relative magnitude or duration of the relationship between the firm and a given stakeholder.

competitor data from Hoberg and Phillips (2010, 2014) and the Compustat Segment dataset using the Ellis et al. (2012) methodology to identify customers and suppliers. We discuss these findings in Section 4.

We first collect all non-utility, non-financial US stock exchange listed firm observations (source firms) in Capital IQ for which we can also collect data about material publicly listed stakeholders (target firms).⁷ Given that stakeholders are likely to be relatively stable in the short run, we apply our 2010 data to the 2009 and 2011 fiscal years, which increases our sample by threefold. We then merge the stakeholder data with earnings announcement data from the Institutional Brokers' Estimate System (I/B/E/S) and impose two filters to identify whether abnormal trading in target firms is influenced by information leaks from source firms.

First, we require that for each source firm's earnings announcement at day t , none of the target firm's other stakeholders release an earnings announcement during the 30-day window around the source firm's earnings announcement (i.e., from $t-30$ to $t+30$ days) in order to alleviate the possibility that abnormal trading in target firms occurs for reasons unrelated to information from the source firm's earnings announcement. Second, we require that each target firm's earnings announcement does not occur within the same window in order to isolate the informed trading from its own informational shock.⁸ Figure 1 presents a graphical illustration of the timeline.

We also collect additional required data from a variety of sources. We obtain daily short sale data from NYSE, NASDAQ, and FINRA; institutional holdings data from Thomson Reuter's 13F filings; and reported insider trades from Thomson Reuters Insider Filing. We obtain stock price data from the Center for Research in Security Prices (CRSP), firm specific financial data from Compustat, board information from RiskMetrics and BoardEx database, and firm proxy statements from the Electronic Data-Gathering, Analysis, and Retrieval system (EDGAR). Finally, we procure insider

⁷ We classify non-US domiciled stakeholders as all firms not listed on the NYSE, NASDAQ, or AMEX. To account for the possibility that firms classified as US listed firms are actually foreign firms with ADRs, we obtain headquarters location from Compustat Legacy files and Compact Disclosure and manually remove all firms that have non-US location headquarters.

⁸ While these restrictions improve the identification between source firm shocks and target firm insider trading activities, it affects the power of our tests. In Appendix B, we present results in which we drop the two restrictions and perform tests on the full sample. The results yield similar inference with the larger sample.

ownership data from firm proxy statements, ExecuComp, RiskMetrics, Capital IQ, and BoardEx. We delete observations for which we cannot obtain all the required data. Our final sample consists of 1,750 target firm quarter observations, of which 639 represent negative earnings shocks and 1,111 represent positive shocks. The sample consists of 485 unique target firms and 332 unique source firms (188 competitors, 58 customers, and 86 suppliers).

3.2 Primary Variable Measurement

Our main test specification is as follows:

$$ShadowTrading = \beta_1 * Business\ Partner\ CAR + \beta_2 * Competitor\ CAR + \beta_x * Controls_x + \varepsilon \quad (1)$$

The primary dependent variable, *ShadowTrading*, is defined as one of two measures: 1) abnormal short sales or 2) abnormal Amihud. Abnormal short sales for each target firm are computed as the average of the following firm-specific measure: ([target firm *i*'s average daily short sales prior to source firm *A*'s quarterly earnings announcement (day *t*-30 to *t*-1) divided by target firm *i*'s average daily short sales for the year outside of *A*'s earnings announcement windows] - 1).⁹ Daily short sales is daily short sale volume divided by daily share trading volume.

Our second measure is based on the “Amihud” measure from Amihud (2002), calculated as the absolute value of daily stock returns scaled by the daily dollar volume. This measure of informational asymmetry builds on the idea that market makers cannot distinguish between order flow that is generated by informed traders and that generated by noise traders; thus, market makers set prices that are an increasing function of the imbalance in the order flow, which may indicate informed trading (Kyle, 1985). The Amihud measure does not utilize detailed order flow information but it is positively and strongly related to the microstructure estimate of Kyle’s measure (Amihud, 2002; Brennan and Subrahmanyam, 1996), and it has been shown to perform well when compared to measures using intraday data (Goyenko et al., 2009). Greater values of Amihud indicate higher information asymmetry and more severe informed trading. Our second measure for shadow trading, labeled “*Abnormal Amihud*”, is calculated as: ([target firm *i*'s average daily Amihud prior to source firm

⁹ Our results are qualitatively similar if we use target firm *i*'s earnings announcement dates to determine the non-event window.

A 's quarterly earnings announcement (day $t-30$ to $t-1$) divided by target firm i 's average daily Amihud for the year outside of A 's earnings announcement windows] - 1).

Our primary independent variables are *Business Partner CAR* and *Competitor CAR*. These continuous variables capture the three-day ($t-1$ to $t+1$) cumulative abnormal return around the source firm earnings announcement, when the source firm is a target firm's business partner or competitor, respectively.¹⁰ All multivariate tests explicitly differentiate between whether the source firm news results in a positive or negative earnings surprise around the earnings announcement.¹¹ The advantage of using a market based measure instead of an earnings surprise model is that it allows us to precisely capture the extent to which the earnings announcement is informative to market participants. For exposition purposes, we use the absolute value of CAR in multivariate tests.

3.3 Control Variables

Our multivariate tests include controls for both target firm and source firm characteristics. Control variables for target firms include *Firm Size* (log of total assets) as larger firms are likely to have greater transparency and liquidity, reducing the ability to profit from informed trading. We also include target *ROA* (income before extraordinary items divided by total assets), *Leverage* (long-term liabilities divided by total assets), *Market-to-Book* (market value of equity divided by book value of equity), and *Institution%*, which captures the institutional ownership in firm i as a percentage of common outstanding shares. Sias and Whidbee (2010) note that greater institutional investor attention in a stock increases liquidity and potentially facilitates insider trading. We also include *Bid-Ask Spread* (daily bid-ask spread averaged over the previous year), *Trading Volume* (log of the average daily trading volume over the previous year), the stakeholder's stock liquidity (*Turnover*), calculated as daily stock trading volume divided by average common shares outstanding, *Analyst Following* (log number of analysts

¹⁰ Abnormal return is the raw return minus the equally-weighted market return. We find similar results when we use alternative CAR windows (e.g., $t-5$ to $t+5$, $t-3$ to $t+3$, t to $t+1$, t to $t+3$, or t to $t+5$), or value-weighted market returns.

¹¹ We measure earnings surprise as the residual term from the following regression:

$$EPS_{A,q} = \alpha + \beta_1 EPS_{A,q-1} + \beta_2 EPS_{A,q-4} + \beta_3 EPS_{A,q-8} + \varepsilon_{A,q}$$

where $EPS_{A,q}$ is reported earnings per share in announcement quarter q , and historical EPS is reported earnings per share in the prior quarter ($q-1$), four quarters ago ($q-4$), and eight quarters ago ($q-8$) using quarterly earnings announcements from I/B/E/S. In addition, we use an alternative measure of an earnings announcement shock, calculated as the difference between the consensus analyst quarterly earnings forecast and the corresponding reported quarterly earnings.

following the firm) and *Forecast Dispersion* (standard deviation of the analysts' quarterly EPS forecasts divided by the prior quarter-end stock price, averaged over the year).

We control for total opportunistic trades reported by target firm insiders during the prior year (*Opportunistic Trade*), calculated following Cohen et al. (2012). *Opportunistic Trade* allows us to control for the degree or magnitude of the informed trading of the target firm attributable to the target firm employees. In order to control for effects from sophisticated market participants, we control for *Volatility* (standard deviation of monthly stock return over the prior five years),¹² and *Option Trading*, which is the (log) daily trading volume of at-the-money call and put options with an expiration of 60 days or less, averaged over the year. We define at-the-money options where an option's exercise price is within 0.95 to 1.05 times of the spot stock price. These two controls variables are included to capture sophisticated investor trading without source employee information. More volatile firms and firms with greater options trading are likely to draw sophisticated traders that are unlikely to systematically have access to employee information at the target firm.

We also control for source firm factors including informed trading in the source firm, measured as the source firm CAR between day $t-5$ and t , where t is the source firm earnings announcement date (*Inside Trade Source*).¹³ We also include a number of controls for source firms as previously defined, and add the suffix "Source" to the variable names: *Firm Size*, *Leverage*, *Volatility*, *Institution %*, *Market-to-Book*, and *Analyst Following*. These additional firm characteristics help to mitigate the concern that results are driven by variation in source firm characteristics. Finally, we estimate standard errors by clustering at firm level and also include year and Fama-French industry fixed effects. All variables are defined in Table 1.

3.4. Descriptive Statistics

We present summary statistics in Table 2. Panel A presents statistics for target firms. First, we observe that in the 30-day window leading up to a source firm's negative (positive) earnings

¹² We find similar results using the previous four quarters EPS volatility.

¹³ Higher insider trading in the source firm may lead to either higher or lower shadow trading. We do not have any priors as to the specific direction of the effect on shadow trading.

announcement, target firms experience abnormal short sales of 0.079 (-0.036), or in other words, a 7.9% increase (3.6% decrease) in short selling activity relative to the short selling activity during nonevent windows. The evidence for the abnormal Amihud measure is consistent with the short sale results: on average, abnormal Amihud for target firms is 0.156 (0.099) in the 30-day window leading up to source firm negative (positive) earnings shock. The average target firm has total assets of \$4.4 billion (lower quartile = \$335 million; upper quartile = \$2.53 billion). Mean ROA is 1.23% and mean Market-to-Book is 1.98. The average institutional ownership of the target firms is 53% and the mean bid-ask spread is 0.043. On average, 27 analysts follow each target firm.

Panel B presents sample source firm characteristics. On average, source business partner firms experience a negative (positive) CAR of -3.5% (2.1%) in the three day window around negative (positive) earnings announcement shocks. Source competitor firms report mean negative (positive) CAR of -3.3% (2.3%) over the three-day window around negative (positive) earnings announcement shocks respectively. Source firms have average total assets of \$6.1 billion and the average market-to-book ratio is 2.37. Institutional investors own approximately 60% of source firm outstanding stock. The mean (median) volatility is 14% (12%). Source firms are covered by an average of 29 analysts. Finally, the average value for *Inside Trade Source* is 2.3%.¹⁴

Panel C presents the proportion of target and source firms for the top ten Fama-French industries represented in the respective groups. Sample target firms represent a large distribution of industries, with no single industry representing more than 9% of the total sample. These top ten industries represent about 56% of the entire sample. In addition, the sample source firms appear to have similar levels of industry dispersion. No single industry represents more than about 10% of the source firm sample, and the top ten industries represent approximately 55% of the entire source firm sample.

4. Main Results

¹⁴ After partitioning by whether the source firm earnings surprise is positive (negative), we find that *Inside Trade Source* is 4.2% (-1.5%).

Our primary objective is to examine whether employees with private information about their stakeholders opportunistically use that information to trade in those stakeholders (target firms) or disseminate the information prior to the public release of the information. We use the period leading up to source firm earnings announcement shocks as a setting for trading opportunities using informational advantages and expect that if source firms employees use their stakeholder-relevant private information to trade in those stakeholders, we should observe abnormal trading activity in the respective target firms prior to the source firm earnings announcement. Figure 2 presents abnormal short selling in target firms from trading-day $t-25$ to $t+5$ where t represents the source firm earnings announcement date. Panel A (B) presents evidence for target firms that are a source firm's competitors (business partners). The shaded region represents the 95% confidence interval. The evidence is consistent with the univariate results. Abnormal short selling occurs for a source firm's competitors and business partners, but the magnitude appears greater in the latter group relative to the former.

Table 3 presents the results from tests of Equation (1). Panel A presents results from tests using the Capital IQ sample, and Panel B presents results from Compustat sample. In both panels, Columns 1 (2) present results for the effect of negative (positive) earnings surprises on short selling and Column 3 (4) present results from a regression in which the dependent variable is *Abnormal Amibud*.

In the first two columns in Panel A, the dependent variable is the abnormal short sales for the target firm during the 30-day window prior to the source firm earnings announcement. In Column 1 (2) the coefficient on *Business Partner CAR* is positive (negative) and is statistically significant at the 5% level or better, indicating that as the magnitude of a business partner's CAR around a negative (positive) earnings shock increases, abnormal short sales for stakeholder firms increases (decreases). Note that the coefficient is positive because we take the absolute value of negative earnings CAR in column (1). In economic terms, a one standard deviation increase in the negative (positive) CAR around a source firm earnings announcement is associated with a 17.8% (12.8%) increase (decrease) in abnormal short selling for the business partner target firm in the 30 day window *prior* to the source

firm's earnings announcement.¹⁵ A back of the envelope calculation suggests that the dollar value profit from a single shadow trading event ranges from \$139,400 to \$678,000.¹⁶ We find parallel results for the coefficients on *Competitor CAR* across both positive and negative earnings shocks, although the magnitudes are slightly smaller. In economic terms, a one standard deviation change in the CAR around a negative (positive) earnings announcement results in a 15.9% (12.7%) increase (decrease) in abnormal short selling for a competitor target firm in the 30 day window prior to the source firm's earnings announcement.

Next, *F*-tests of differences between coefficients indicate that there is no significant difference between the effects on shadow trading for business partners versus competitors. Importantly, our results are robust to the inclusion of controls for both source and target firm characteristics, including short selling in the source firm. In sum, the evidence in columns 1 and 2 using short sales to proxy for shadow trading is consistent with the argument that shadow trading in target firms occurs in the lead up to source firm earnings shocks, and that the effect is increasing in the magnitude of the earnings shock.

In Column 3 and 4, we present results from tests using abnormal Amihud to proxy for shadow trading. Note that greater values of abnormal Amihud indicate higher information asymmetry and more severe informed trading, implying that positive coefficients on either of our variables of interest (*Business Partner CAR* and *Competitor CAR*) are consistent with greater shadow trading. The multivariate results for both positive and negative shock earnings announcement events support this view: coefficients on *Business Partner CAR* for both subsamples are positive and statistically significant at the

¹⁵ We calculate the economic significance as the coefficient divided by the mean abnormal short sales leading up to negative (positive), all multiplied by the standard deviation of positive (negative) CARs around earnings announcements. Thus for Column 1: $(0.055/0.079) * 0.256 = 17.8\%$.

¹⁶ This rough calculation is based on the estimated range of the possible profits from shadow trading when source firms report negative earnings announcement shocks. Over the 30-day window prior to a source firm earnings announcement, an aggregate of 2.6 million shares of sample target firms are shorted on average. Next, Table 1 indicates that short sales are abnormally higher by 7.9% in target firms. Thus, abnormal short sales over the 30-day window represent 205,000 shares (2.6m shares multiplied by 7.9%). We assume that short sellers reverse all open positions at day t+1. As such, the profit range for short sellers is calculated by the difference between the maximum and minimum stock price during the 30-day window prior to the earnings announcement and the day subsequent to the earnings announcement (t+1). The average range of the price difference for sample target firms is between \$0.68 to \$3.30. Accordingly, the profit range (excluding trading costs) from abnormal short selling in a single target firm during the 30-day window prior to a source firm's earnings announcement ranges from \$139,400 to \$678,000 (205,000 shares multiplied by \$0.68 and \$3.30 respectively). We note that our estimates are based on a number of assumptions and should be evaluated accordingly.

1% level for negative shocks and 5% level for positive shocks. On average, a one standard deviation change in the CAR around a negative (positive) earnings announcement shock by a business partner source firm is associated with a 10.8% (12.2%) increase in abnormal Amihud for the target firm in the 30-day window leading up to the source firm earnings announcement. Next, the coefficients on the *Competitor CAR* variable also bear positive and statistically significant signs (at the 5% level) results across both positive and negative news announcement shocks. On average, a one standard deviation change in the CAR around negative (positive) earnings announcement shocks by a competitor source firm is associated with an 8.8% (10.8%) increase in the target firm's abnormal Amihud in the 30-day window leading up to the earnings announcement. We do not find evidence that option trading or volatility in the target firm is statistically associated with shadow trading.

Next, we undertake tests to ensure that our results are not driven by biases in the Capital IQ data. Panel B presents results of tests using an alternative sample that identifies competitors using the Hoberg and Phillips (2010) methodology and suppliers and customers using the Compustat Segment files. We impose the same identification restrictions as for our main sample. As short sales data is only available from January 2005 to December 2011, tests using short sales to proxy for shadow trading have a different sample size to those using Abnormal Amihud. The final sample using short sales is 3,111 target firm quarter observations, of which 1,129 represent negative earnings shocks and 1,982 represent positive shocks. The sample consists of 745 unique target firms and 598 unique source firms. The sample for tests using abnormal Amihud consists of 7,976 target firm quarter observations, of which 2,958 represent negative earnings shocks and 5,018 represent positive shocks. The sample consists of 1,528 unique target firms and 1,218 unique source firms. We present summary statistics in Appendix A.

We reestimate Equation (1) and continue to control for identical target and source firm characteristics as in our main tests. Panel B Columns 1-4 present results from tests that mirror those in Panel A but using the alternative sample to identify stakeholders. In economic terms, we find that a one standard deviation increase in business partner (competitor) CAR around source firm negative earnings announcement surprises is associated with an 8.5% (7.2%) increase in abnormal short sales in the target firm.

In sum, the analysis in Table 3 indicates that: (1) target firms experience significant informed trading leading up to their stakeholders' earnings announcements; (2) the results are robust to both multiple measures of informed trading and to alternate samples; (3) target firm shadow trading is economically important, but not statistically different across business partner and competitor stakeholders.

5. Attribution of Information Leakage

Our research methodology and analysis presents results consistent with shadow trading activity but arguably could stem from trading by sophisticated market participants that do not have access to source firm private information. We examine the validity of this possibility by undertaking several pseudo-experiments to identify the source of insider trading activity in each target firm. Our first identification strategy exploits cross-sectional variation in source firm shadow insider trading restrictions as disclosed in each firm's Corporate Code of Conduct. The second test examines the effect of an exogenous shock to regulations against conventional insider trading. Third, we use an exogenous shock to state-level laws that affects the incentives of source firm employees to profit from trading on or leaking their stakeholder-relevant private information. Next, we explore the effect of source firm executive turnover, and investigate whether shadow trading is affected by whether the replacement executive is an internal candidate or an external hire. Finally, we investigate shadow insider trading around sudden deaths of source firm CEOs.

5.1 Firm-Specific Policies Against Shadow Trading

Our first test examines cross-sectional differences in source firms' corporate restrictions on shadow trading. Bettis et al. (2000) find that firms with corporate policies to restrict insider-trading exhibit lower instances of such activity. If our findings represent trading activities that are not linked to source firm insiders that leak information, then we should not expect our findings to differ across firms that explicitly do (do not) prohibit shadow trading. For each source firm in our sample, we hand collect and read insider trading policy disclosures from the firm's Code of Ethics statement. We determine whether a firm's insider trading policy explicitly prohibits insiders from trading in business

partners and/or competitors, or whether the insider trading policy exclusively focuses on restricting own-firm trading. After excluding source firms that do not publicly disclose their insider trading policies, we are able to obtain data for 267 unique source firms. Approximately 53% of the source firms explicitly prohibit firm insiders from using private information to trade in their own firms or in their business partners, whereas the remaining 47% only explicitly prohibit firm insiders from using private information to trade in their *own* firms. Additional untabulated analyses also indicate that firms with explicit prohibitions against shadow trading have significantly greater analyst following than firms without an explicit policy (significant at the 5% level). We find no statistical evidence that the average Amihud differs between the explicit-policy and no-explicit-policy groups.

Figure 3 presents graphical depictions of average abnormal short selling in competitor and business partner target firms during the $t-25$ to $t+5$ trading-day window around a source firm's earnings announcement date for the 267 cases for which we can identify source firm insider trading policies. Panel A (B) present abnormal short selling for cases where the source firm is a competitor that explicitly (does not explicitly) prohibits shadow trading. Panels C and D present corresponding evidence of abnormal short sales for source firm business partners. In all figures, the shaded region represents the 95% confidence interval. The evidence indicates that information leakage from both competitor and business partner source firms is much greater when those source firms have insider-trading policies that do not explicitly prohibit insiders from trading in or sharing private information about the source firm's stakeholders relative to firms that explicitly prohibit shadow trading.

Table 4 presents results from empirical tests. Panel A (Panel B) present results for the partition of source firms that explicitly restrict (do not explicitly restrict) shadow trading by insiders. We present results based on negative and positive earnings shocks across both measures of shadow trading: abnormal short sales and abnormal Amihud.¹⁷ In Panel A, coefficients on *Business Partner CAR* and *Competitor CAR* are statistically insignificant across positive and negative earnings shocks and across both measures of shadow trading. These results suggest that target firms do not appear to experience

¹⁷ In robustness checks, we find that the inferences are similar if we combine the partition groups and include a dummy variable labeled *Policy* to capture the two different types of firm-specific insider trading classifications (as well as additional interaction terms).

abnormal levels of trading as a result of information leaks from source firms with policies that prohibit shadow trading in target firms.

In Panel B we present coefficients from identical tests on the “no explicit restriction” group. Column 1 (2) presents results when the dependent variable is abnormal short sales for the stakeholder during the 30-day window prior to the source firm negative CAR (positive CAR) earnings announcement. The coefficient on *Business Partner CAR* across both columns is positive (negative) and is statistically significant at the 1% (5%) level. In economic terms a one standard deviation increase in negative (positive) CAR around an earnings announcement results in a 13% (12.8%) increase (decrease) in abnormal short selling for the target firm in the 30-day window prior to the business partner source firm’s earnings announcement.¹⁸ Coefficients on *Competitor CAR* across both positive and negative earnings shocks suggest similar inferences. In columns 3 (4), we use abnormal Amihud as the measure for informed trading. The coefficients on Business Partner CAR and Competitor CAR are positive and statistically significant at the 5% level across both specifications. In economic terms, a one standard deviation increase in Business Partner negative (positive) CAR is associated with a 15.5% (12.1%) increase in abnormal Amihud in the target firm. For competitor source firm, a one standard deviation increase in negative (positive) CAR is related to a 12% (9.8%) increase in abnormal Amihud in the target firm. *F*-tests comparing the coefficients of Business Partner CAR and Competitor CAR indicate no significant differences across any of the specifications.

In sum, the cumulative evidence in Table 4 and in Figure 3 suggests that the prevalence of shadow trading varies with firm-specific policies. Our findings are inconsistent with arguments that our primary results are attributable to trading activity by sophisticated traders who do not have access to the private information released via the earnings announcement.

5.2 The Impact of Regulatory Changes on Shadow Trading

¹⁸ We calculate the economic significance in column 1 as: $(0.040/0.069) * 0.221 = 13\%$, where 0.040 is the coefficient, 0.069 is the mean abnormal short sales with negative shocks, and 0.221 is the standard deviation of Business Partner CAR (negative shock sample).

In this section we examine the effects of a shock to insider trading regulations in 2002 via the Sarbanes-Oxley Act (SOX). The regulations increased the disclosure requirements for insider trades and the magnitude of the penalty for “willful” violation of the act and its regulations. We examine the prevalence of shadow trading around the 2002 regulatory regime shift. We rely on the sample of Compustat firms over the ten-year window between 1997 and 2007 (excluding all observations in the regulatory change year). We apply the same procedure and restrictions used for our primary sample as for the identified stakeholder firms to generate a final sample of 14,885 observations. The empirical test focuses on shadow trading before and after the regulatory shock. We argue that if our main results represent information leakage by insiders, then restrictions on own firm trading may result in increased trading (or information leakage) that affects a firm’s business partners and/or competitors. In contrast, if the results documented above are attributable to trading by sophisticated investors, then we expect the regulatory change to have no effect on shadow trading activity.

Figure 4 presents graphical depictions of abnormal Amihud in competitor and business partner target firms around the passage of the laws in 2002. We rely on abnormal Amihud for tests because daily short sale data is only publicly available from 2005 onwards. Panels A and B present average abnormal Amihud for source firm competitors and business partners respectively, as well as the abnormal Amihud for the source firms. In both figures, the shaded region represents the 95% confidence interval for target firm abnormal Amihud values. The graphs clearly indicate that shadow trading (conventional insider trading) increases (decreases) in the period around the passage of SOX.

Table 5 presents regression coefficients. The variables *Business Partner CAR* and *Competitor CAR* are as previously defined. *Post* is a dummy variable set to one for all the years after the passage of the regulation (i.e., 2003-2007). The variable allows the level of abnormal Amihud to vary after the passage of the regulation in 2002. $Post * Business Partner (Competitor) CAR$ captures whether the relation between the magnitude of a business partner (competitor) source firm earnings shock affects abnormal Amihud differentially in the post-regulation period. We find that consistent with the results in Table 3, *Business Partner CAR* and *Competitor CAR* are both positive and statistically significant at the 5% level, consistent with the presence of shadow trading in the pre-SOX period. In addition, the coefficient on *Post* is positive and statistically significant at the 5% level or better, which indicates that

informed trading in both competitor and business partner stakeholders *increases* following the change in insider trading restrictions in 2002, irrespective of the size of the source firm earnings announcement magnitude.

In economic terms, the coefficients suggest an 11% - 12% increase in shadow trading following SOX. Finally, the coefficients on the interaction terms are all positive and statistically significant at the 5% level, which suggests that for both types of source firms in the post SOX period, shadow trading increases in the 30-day window leading up to source firm earnings announcement shocks. Furthermore, the effect is increasing in the magnitude of the CAR around the earnings shock. Shadow trading in target firms becomes 2.6 (2.5) times more sensitive to business partner (competitor) earnings announcement CARs in the post-SOX period relative to the pre-SOX period for negative earnings surprises.¹⁹ In sum, our findings indicate that an exogenous shock that increases the costs for source firm employees to engage in own-firm insider trading is also associated with increased shadow trading, consistent with firm insiders changing their behavior to obtain personal gains.

5.3 Exogenous Shocks to Employee Mobility

Our next test focuses on exogenous changes in state-level laws that affect the ability of a firm's employees who have knowledge of its trade secrets from obtaining employment with competitor firms. We exploit changes in laws that occur via the state-level adoption and rejection of the Inevitable Disclosure Doctrine (IDD) through precedent setting cases. A state's adoption or the rejection (following a previous adoption) of the IDD affects the ability of employees employed by firms in those states to profit from their firm-specific human capital. The IDD shock is thus likely to change the incentives of those employees to look for alternative opportunities to use firm-specific human capital (or knowledge) to accrue wealth, such as the leakage of private information that is stakeholder-relevant.

We obtain all state-level IDD dates based on legal cases as described in Klasa et al. (2014). Empirical tests span the period from 1997 to 2011 because we use the same dataset referred to Table

¹⁹ For business partner and negative earnings surprise, we calculate these statistics as $(0.038+0.059)/0.038 = 2.6$.

3, Panel B, which identifies competitors from Hoberg and Phillips (2010) and business partners using the Compustat Segment Files.²⁰ For each source firm in a state that experiences an IDD shock, we identify a propensity-score matched control firm from a state that does not experience an IDD shock. The matched control firm is identified based on characteristics in the year prior to the treatment firm's IDD shock year, including industry, firm size, leverage, market-to-book, volatility, ROA, firm age, analyst following, institutional ownership, number of competitors, number of customers/suppliers, with no replacement and a caliper of 0.1%. The process yields a sample of 508 treatment source firms, and 508 matched control source firms. We estimate the following equation:

$$\begin{aligned}
 \text{Shadow Trading} = & \beta_1 * \text{Business Partner CAR} + \beta_2 * \text{Competitor CAR} + \beta_3 * \text{IDDShock} + \\
 & \beta_4 * \text{Business Partner CAR} * \text{IDDShock} + \beta_5 * \text{Competitor CAR} * \text{IDDShock} + \\
 & \beta_x * \text{Controls}_x + \xi
 \end{aligned} \tag{2}$$

Where *Business Partner CAR* (*Competitor CAR*) are as previously defined. *IDDShock* is an indicator variable. For all treatment source firms that experience the adoption (rejection) of the IDD in the past two years, *IDDShock* is set to one (zero) following the adoption (rejection), and zero (one) for the pre-shock observation. The interaction term *Business Partner CAR * IDDShock* (*Competitor CAR * IDDShock*) captures the incremental effect of business partner (competitor) source firm earnings shocks on shadow trading in target firms in the post IDD shock period. We use an identical set of control variables as specified in Equation (1) and also include year and industry fixed effects. We present results in Table 6 across partitions of negative and positive stakeholder earnings announcements.

The evidence indicates that in the leadup to either positive or negative earnings announcements by both types of source firms, abnormal Amihud for the target firm is positively and statistically associated with the magnitude of the source firm earnings announcement CAR. The coefficient on *IDDShock* bears positive and statistically significant signs in both specifications, suggesting that the imposition (removal) of restrictions that prohibit a firm's employees from working

²⁰ These cases are: Missouri adopts in 2000, Ohio adopts in 2000, Florida rejects in 2001, Michigan rejects in 2002, Texas rejects in 2003, Kansas adopts in 2006. We require at least 2 years prior to and after the shock so we do not use cases in 1998 and 1999. Our results remain robust if we include those cases.

for competitors is positively (negatively) associated with abnormal Amihud. The coefficients on $IDDShock * Business\ Partner\ CAR$ ($Competitor\ CAR$) bear positive and statistically significant signs across both specifications. Thus in the post-IDD change period, information leakage from source firms prior to either a positive or negative earnings shock has an incrementally larger effect on target firm abnormal Amihud. A one standard deviation increase in business partner (competitor) negative CAR is associated with an incremental 9% (4%) increase in abnormal Amihud in target firms that experience IDD shock relative to firms that do not experience an IDD shock. We find similar inferences for tests using the positive earnings announcement CAR sample.

This evidence is consistent with the notion that following exogenous shocks that decrease (increase) source firm employee opportunities to profit from their firm-specific human capital, the employees act in expected ways and appear to increase (decrease) information leaks about stakeholder firms. Our results suggest that shadow trading offers a viable alternative venue for insiders to exploit their private information when faced with a shock to the set of potential alternative employment opportunities.

5.4 Managerial Knowledge and Shadow Trading

Our next test relies on the notion that managerial ability to engage in shadow trading derives from their firm-specific knowledge of the firm and its operating environment. The greater the firm-specific knowledge about its stakeholders, the greater the likelihood that the source firm manager will engage in shadow trading. We predict that an internally promoted source firm CEO, relative to an externally hired CEO, is presumably more familiar with the firm's operations and supply-chain and is therefore more likely to engage in shadow trading. Furthermore, a new externally hired CEO has a relatively smaller under-diversification problem than an internally hired CEO, suggesting reduced incentives to engage in shadow trading in the short run, following the initial appointment.

We use a subsample of source firms that experience CEO turnover during the sample period and partition firms based on whether the replacement CEO is promoted from within the firm or externally recruited. We obtain CEO information based on a firm's proxy statements and news announcements to determine whether the new CEO is internally promoted or an external hire. We

identify 61 CEO turnover events among the Capital IQ sample source firms over our three-year sample period. Thirty-three of the CEO dismissals result in external successor replacement and the remainder denotes internal replacements (roughly 17% of the sample experiences CEO turnover). For each CEO turnover case, we identify another similar firm that does not experience CEO turnover using propensity-score matching. We use the year prior to the treatment firm CEO turnover to match firms based on industry, size, leverage, market-to-book, volatility, ROA, firm age, analyst following, institutional ownership, number of competitors, number of customers/suppliers, with no replacement and a caliper of 0.1%.

Two potential issues arise from this test. First, CEOs engaging in shadow trading are more likely to be replaced by diligently governed source firm, with a replacement CEO likely to be explicitly aware of the firm's stance and policy against shadow trading. The ambiguity of the legal boundaries and limited enforcement regarding shadow trading, however, suggest CEO turnover occurs for other reasons (Farrell and Whidbee, 2003). A second issue arises from the possibility that new CEOs act to readjust the composition of a firm's business partners, creating a bias in our sampling. However, in untabulated tests using the Compustat Segment Files to identify material business partners, we find no evidence of abnormal supply chain changes in the period immediately following CEO appointments. We use the following specification for our multivariate tests:

$$\begin{aligned} ShadowTrading = \beta_1 * CAR + \beta_2 * Insider + \beta_3 * CAR * Insider + \beta_4 * Outsider + \\ \beta_5 * CAR * Outsider + \beta_x * Controls_x + \xi \end{aligned} \quad (3)$$

Where CAR is as previously defined. $Insider$ ($Outsider$) is an indicator variable set to one for cases where the new source firm CEO is an insider (outsider), and zero otherwise. The interaction term $CAR * Insider$ or $CAR * Outsider$ captures the incremental effect of source firm earnings shocks on shadow trading in target firms for new CEOs that are insiders or outsiders, respectively. The regression also includes control variables and year and industry fixed effects. We present results in Table 7 from tests using both abnormal short selling and abnormal Amihud to measure shadow trading. In the interests of brevity, we combine competitor and business partner source firms in empirical tests.

In Columns 1 and 2 (3 and 4), the dependent variable is set to abnormal short sales (abnormal Amihud). The evidence in Columns 1 and 2 continues to indicate that earnings shocks from source firms are significantly associated with greater abnormal short sales in target firms during the source firm earnings preannouncement period. We use two dummy variables to represent the new CEO types, *Insider* and *Outsider*. In both Columns 1 and 2, the results indicate that when the new CEO is an insider, the target firms experience a significant increase (decrease) in abnormal short selling prior to source firm negative (positive) earnings shocks at the 10% level. The interaction term, *Insider * CAR*, also bears statistically significant coefficients (5% level), suggesting that the effect is a function of the magnitude of the earnings shock. Given a one standard deviation increase in the magnitude of *CAR*, abnormal short sales in the target firm increase by 16.2% if the source firm new CEO is an insider relative to firms that do not experience a CEO change.

We also find no evidence that shadow trading in a target firm prior to the source firm's earnings announcement is statistically associated with the presence of a new outsider source firm CEO. Furthermore, we find no evidence that the magnitude of the change in abnormal short sales is statistically significantly associated with the size of the earning shock, irrespective of whether the earnings shock results in a positive or negative CAR when the new CEO is an outsider. These findings indicate that managerial knowledge about source-target firm relationships affects shadow trading activity. It is important to note that we do not attempt to suggest that the new insider CEO is solely responsible for the increased trading. Rather, it is plausible that an internal CEO change results in less internal instability and uncertainty about the new culture of the firm and the "tone at the top".

Columns 3 and 4 present results from similar regressions in which we measure informed trading using abnormal Amihud. The results and inferences are similar to those presented in Columns 1 and 2 using abnormal short sales. The presence of a new insider (outsider) CEO at the source firm is associated with statistically significant (insignificant) effect on in preannouncement informed trading in the target firm prior to source firm earnings announcements, and the effect for insider CEO replacements is increasing in the magnitude of the source firm's earnings shock CAR. In economic terms, a one standard deviation increase in the earnings shock when the CEO is an insider among

source firms is associated with a 13% (8.8%) increase in abnormal Amihud in the target firms, when the news is negative (positive).

5.5 CEO Death and Shadow Trading

We undertake an additional test that focuses on source firm CEO replacement that occurs due to the unexpected death of an incumbent CEO. We use a larger sample of Compustat firms over the ten-year window between 2000 and 2010. As unexpected CEO death is relatively rare, we first identify all CEO turnover cases from Execucomp and retain cases where an outgoing CEO does not subsequently reappear in the database. For this sample of CEO turnover cases, we then read proxy statements and news releases in LexisNexis to classify turnover cases. Among a total of 185 source firm CEO turnover cases for our test sample, eight cases occur due to sudden death or unexpected health issues.²¹ Six of the eight firms replace the CEO with an insider. For the remaining 177 CEO turnover cases, 119 (58) replace the outgoing CEO with an internal candidate (external hire). We then calculate annual average abnormal Amihud for affiliated target firms over the three years around the source firm CEO death. We present results in Figure 5.

The evidence indicates substantial variation in shadow trading based on both the type of CEO turnover as well as whether the replacement CEO is a firm insider or an external hire. Panel A presents results for the eight cases where the source firm CEO unexpectedly leaves the firm because of death or unforeseen health issues, partitioned by type of replacement CEO. The evidence suggests that following unexpected CEO turnover, shadow trading increases (decreases) when the new CEO is an insider (outsider). The evidence is consistent with the results in Table 7. In Panel B, we present corresponding results for the 177 cases in which the source firm CEO is replaced for a non-shock related reason. The evidence suggests similar inferences to those from coefficients in Panel A: following anticipated CEO turnover, shadow trading increases (decreases) when the new CEO is an

²¹ Note that the total sample of CEO turnover cases is determined following imposing similar restrictions to those used in our main tests to ensure that the trading window is not contaminated by other confounding events. This results in a substantial loss of observations from the universe of CEO turnover observations.

insider (outsider). Furthermore, shadow trading appears to diverge up to about two years prior to the actual CEO turnover.

Overall, the results in Table 7 and Figure 5 are consistent with our primary hypothesis that shadow trading activity and information leakage is attributable to source firm insiders. It is impossible to fully rule out that our shadow trading results stem from sophisticated market participants who trade without access to the source firm's private information. However, in aggregate our results appear inconsistent with this alternative hypothesis. Instead, the results appear more consistent with information leakage by source firm employees.

6. Stock Return Methodology to Identify Shadow Trading

In this section, we present evidence on shadow trading using an alternative approach to capture informational shocks that rely on stock price reactions, rather than earnings shocks, to identify periods during which source firms have non-public information about stakeholders. More specifically, we use a sample of source firms and target firms that experience consecutive stock price shocks to identify when the source firms have incentives to engage in shadow trading. An advantage of this alternative approach is that it provides a robust setting to identify events that are unexpected by the market.

We construct our sample using the Capital IQ dataset and require that: (1) both a source firm and an affiliated target firm experience price shocks, which allows us to focus on cases where the source firm shock affects the target firm; (2) a stock price shock for a target firm must follow such a shock for a source firm and occur within one trading day. This requirement allows us to more accurately identify which source firm stock price shocks are relevant for a given target firm; (3) the shocks to the source firm and target firm are at least 5% to ensure that the stock return shocks are material and create incentives for source firm insiders to engage in shadow trading; (4) source firms not have highly volatile stock prices. We delete source firms with highly volatile stock returns, measured as firms with more than 50 days over the three-year sample window in which the stock price changes by more than 5% in a trading day; (5) source firms have not have more than one stakeholder experience a large stock price shock within one trading day after the source firm shock. This condition

allows us to ensure that our sample consists of observations where we can reliably assume that the effect of a source firm shock is applicable to a particular target firm. Finally, we eliminate observations for which multiple stakeholder firms affiliated with a given source firm experience price shocks on the same day in order to reduce the possibility of confounding events making it difficult to assess the net effect on the trading activity in the target firm. Note that these restrictions yield more conservative results than if we do not impose such conditions.

Based on short sale data, these restrictions result in a sample of 355 cases where we can match a source firm with at least one target firm, of which 163 (192) cases involve negative (positive) shocks from a source firm. Based on tests using abnormal Amihud to measure shadow trading, we identify 736 (341) cases of positive (negative) shocks from source firms. We then examine trading patterns in the target firms from $t-30$ to $t-1$ to identify the presence of shadow trading (where t represents the date of the source firm shock).

We present regression coefficients in Appendix B. Columns 1 and 2 (3 and 4) present results for tests of insider trading using abnormal short sales (abnormal Amihud), respectively. The overall inferences are largely consistent with our primary findings. In Column 1, we find evidence of a significant increase in abnormal short sales in the target firm prior to a negative abnormal stock return from the source firm. The positive coefficient estimates present on *Business Partner* indicate that a target firm experiences increased abnormal short sales activity in the 30-day window prior to business partner stakeholder firms experiencing negative abnormal stock returns. The evidence in Column 2 when the source firm stock return shock is negative suggests similar inferences.

The results in Column 3 and 4 when the dependent variable is abnormal Amihud are similar to the result where the dependent variable is abnormal short sales. More specifically, we find that a one standard deviation increase in unexpected negative abnormal stock return surprise in competitor (business partner) source firms is associated with an increase in abnormal Amihud by 3.4% (6.1%) for target firms when the shock is negative.²² For positive shocks, we find that a one standard deviation

²² The average abnormal Amihud is 0.136.

increase in unexpected positive abnormal stock return surprise in competitor (business partner) source firms is associated with an increase in abnormal Amihud by 1.2% (1.3%) for target firms.

Overall, our insider trading results using a stock return approach yield very similar inferences to our tests using earnings announcement shocks. A key advantage of sampling based on stock market reactions is that we can better isolate the origin and the magnitude of the source firm shock for the target firm. As such, we are better able to provide inferences about causality between source firm shocks and informed trading activity in a target firm. In sum, our stock return test results strengthen our primary findings. Earnings shocks and market reaction shocks may reflect different information sources, natures and origins, and as such, our findings suggest that shadow trading activities are a prominent form of insider trading that receives relatively little attention.

7. Concluding Remarks and Policy Implications

While insider trading has garnered much regulatory attention, its legal definition provides limited guidance about how a firm's boundaries are defined, and therefore the legality with which insiders can use own-firm private information that affects stakeholders to trade through them. In this study, we examine and document evidence that corporate insiders use their stakeholder-relevant private information to trade in, or leak information about, those very stakeholders, prior to the public release of the private information – a phenomenon that we call “shadow trading”. We use the period immediately preceding earnings announcement shocks to identify periods in which a source firm's employees have private information, and likely recognize the impact of that private earnings information on stakeholders. Our results are robust to the use of multiple measures of insider trading and hold across different groups of stakeholders. Even though data limitations prevent us from identifying the individuals engaging in opportunistic trading or information leakage, our findings imply that source firm employees actively participate in shadow trading.

We also undertake a series of tests to rule out the possibility that our findings merely capture trading activity conducted by sophisticated investors who are not privy to any private information and who anticipate the earnings shock. Our approach relies on several pseudo-experiments that affect source firm information leakage including: 1) firm-specific restrictions on shadow trading; 2)

regulatory shocks to conventional insider trading; 3) exogenous employee mobility shocks; and 4) the new CEO's knowledge about the firm's operations. Our empirical results suggest the presence of shadow trading varies according to source firm and source firm CEO characteristics, which is inconsistent with alternative arguments that target firm insiders or sophisticated investor activity drives this information leakage.

Our study has an important policy implication. The vast majority of regulatory (and academic) attention on insider trading has centered on managers who use private information to trade in their *own* firms as opposed to other firms. Our findings suggest a need for regulatory attention and possibly for the development of additional disclosure requirements imposed on source firm managers regarding their trading activity on their business partners and competitors.

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Figure 1 Timeline of Events

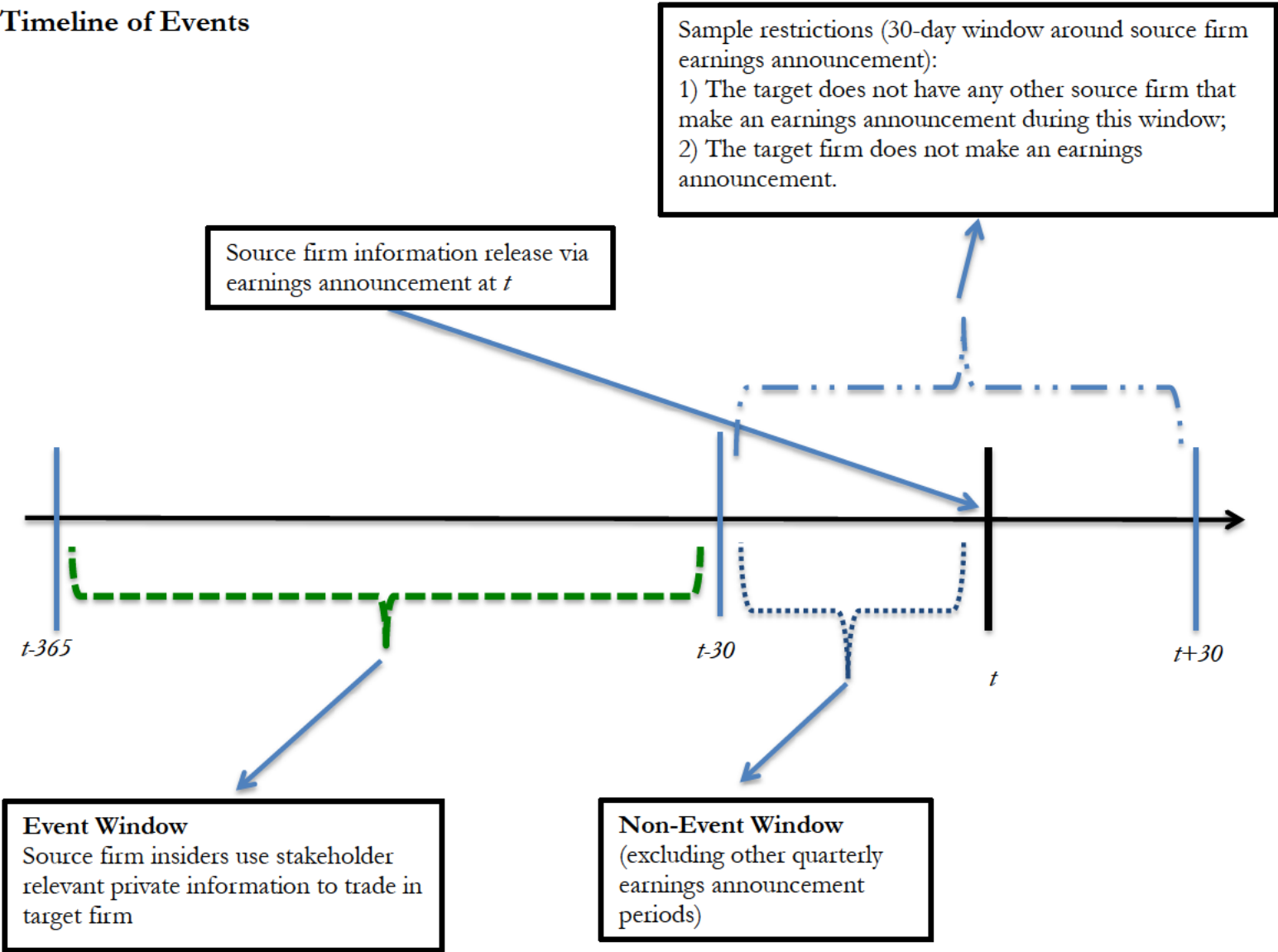


Figure 2 Abnormal Trading in Target Firms Around Competitor and Business Partner Source Firm Earnings Announcement

Panel A: Competitor Source Firm (*Negative Earnings Shock sample; Day 0 = Source Firm Earnings Announcement*)

Panel B: Business Partner Source Firm (*Negative Earnings Shock sample; Day 0 = Source Firm Earnings Announcement*)

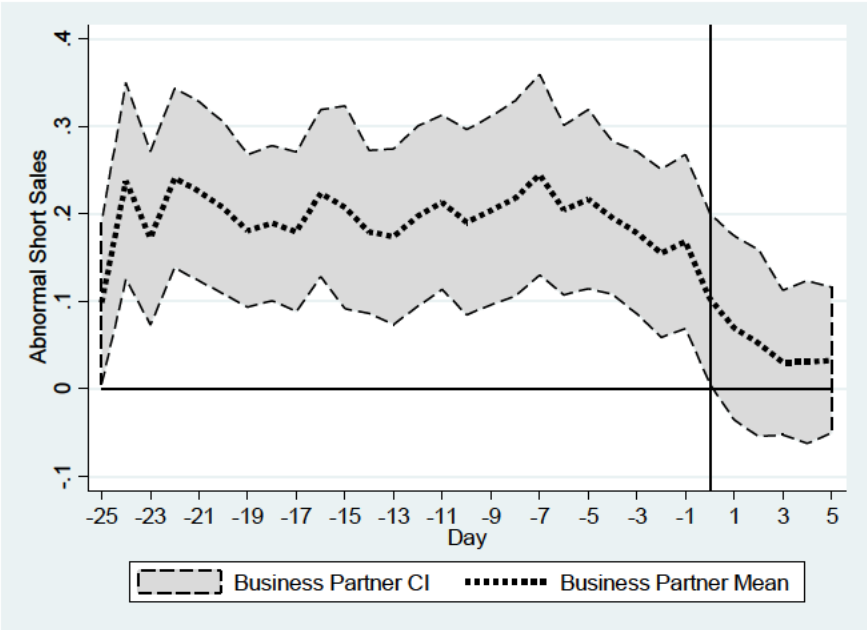
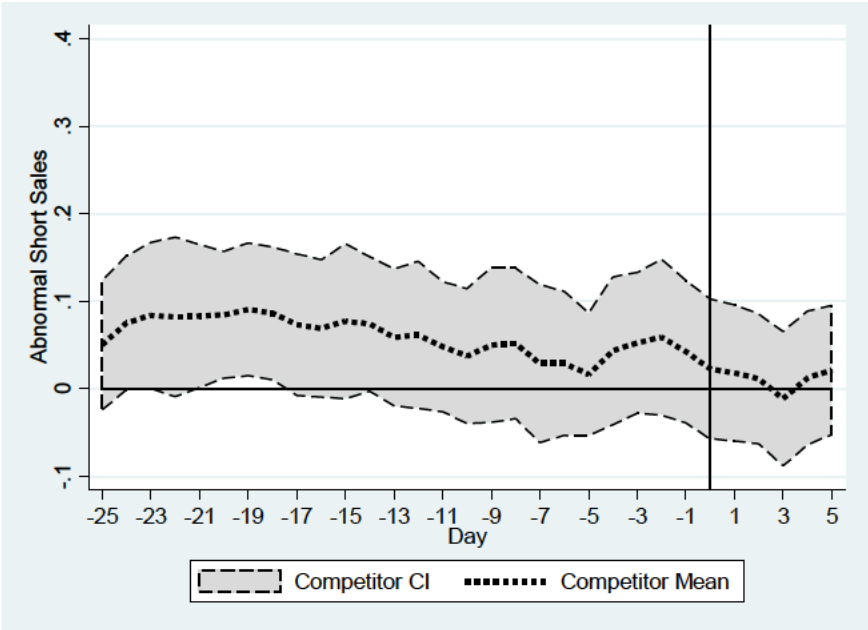
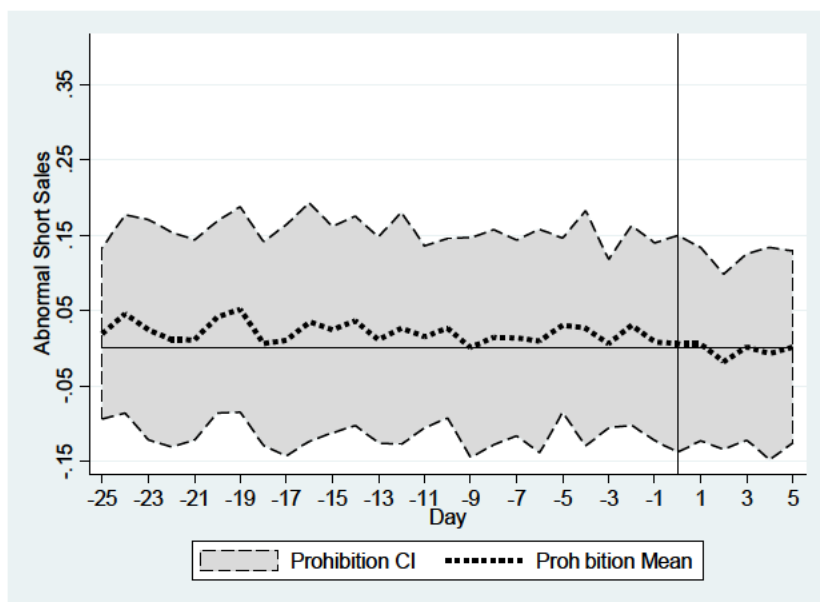


Figure 3 Target Firm Abnormal Short Sales – Subsample of Source Firms With Shadow Trading Policies

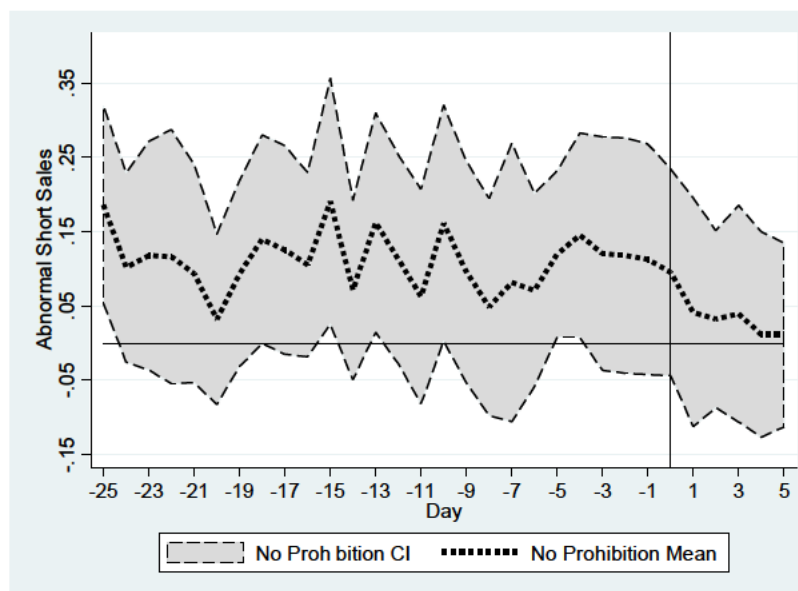
Panel A: Abnormal Short Sales In Competitors of Source Firms with Explicit Prohibitions on Shadow Trading

(Negative Earnings Shock sample; Day 0 = Source Firm Earnings Announcement)



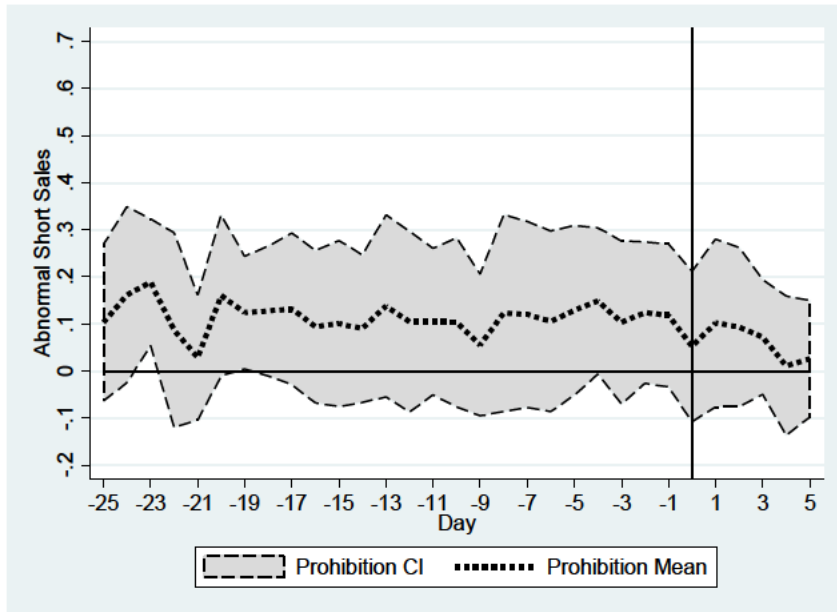
Panel B: Abnormal Short Sales In Competitors of Source Firms without Explicit Prohibitions on Shadow Trading

(Negative Earnings Shock sample; Day 0 = Source Firm Earnings Announcement)



Panel C: Abnormal Short Sales In Business Partners of Source Firms with Explicit Prohibitions on Shadow Trading

(Negative Earnings Shock sample; Day 0 = Source Firm Earnings Announcement)



Panel D: Abnormal Short Sales In Business Partners of Source Firms without Explicit Prohibitions on Shadow Trading

(Negative Earnings Shock sample; Day 0 = Source Firm Earnings Announcement)

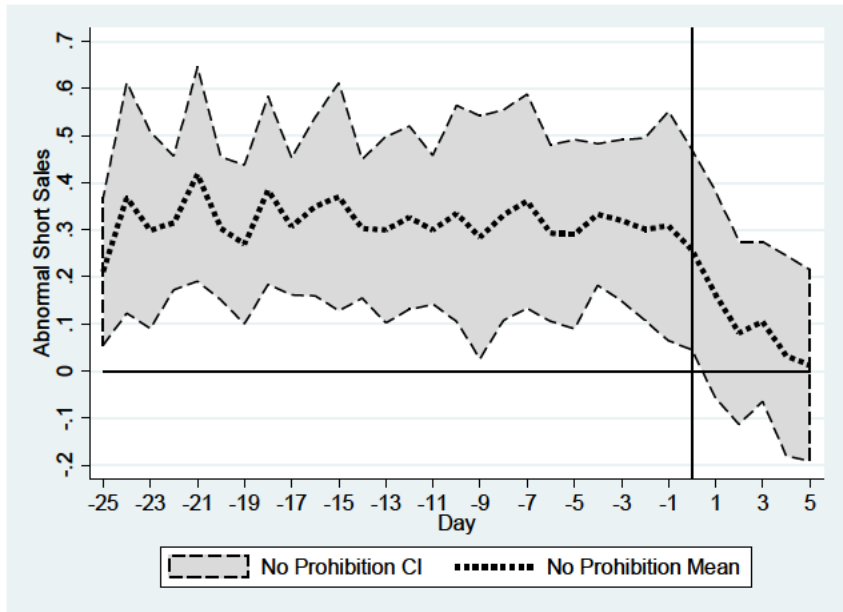


Figure 4 The Effect on Shadow Trading from Regulatory Changes on Insider Trading

Panel A: Abnormal Amihud for Competitors of Source Firms Around Passage of SOX Insider Trading Restrictions

Panel B: Abnormal Amihud for Business Partners of Source Firms Around Passage of SOX Insider Trading Restrictions

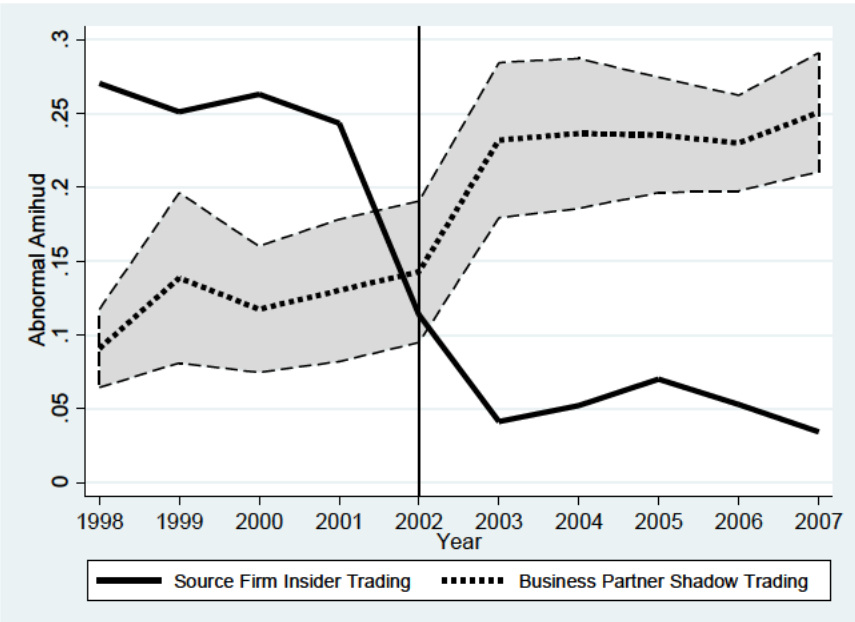
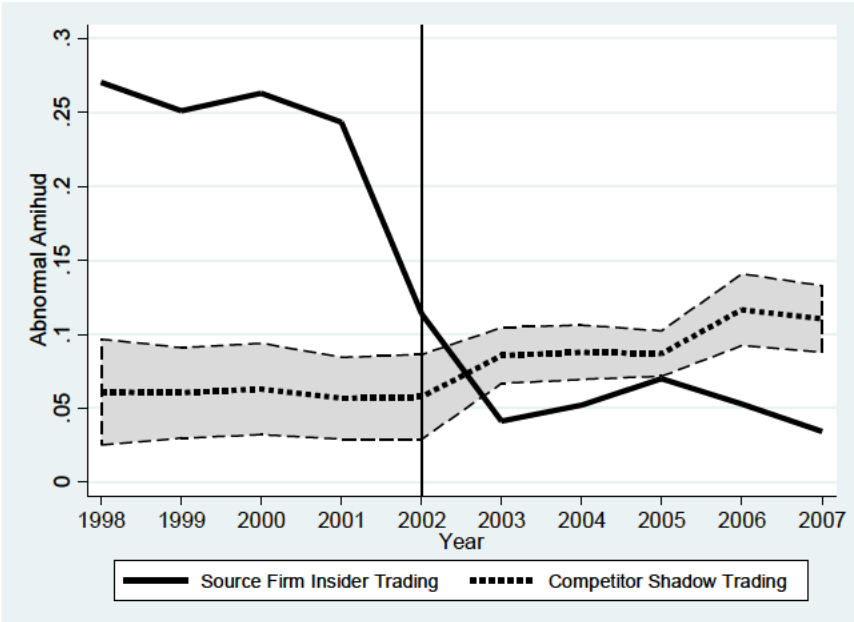
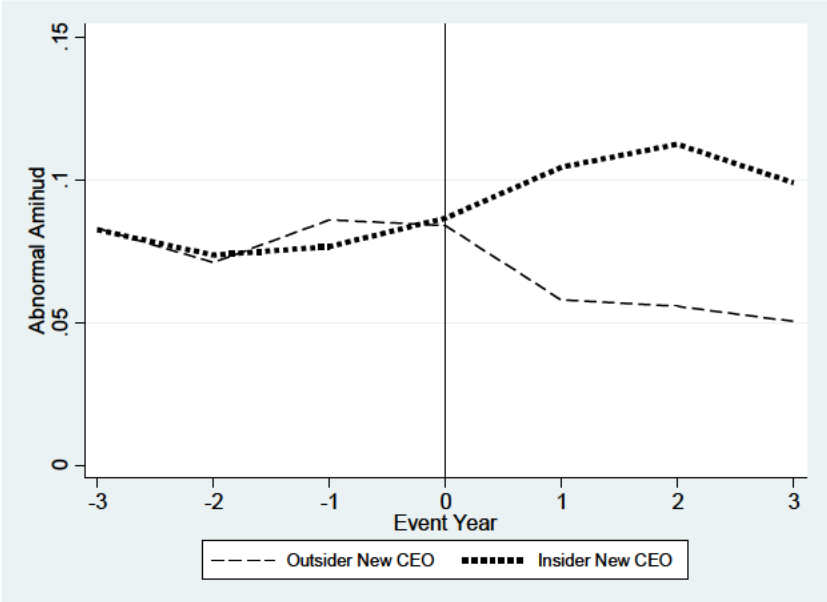


Figure 5: Shadow Trading Around Source Firm CEO Turnover

Panel A: Shadow Trading in Stakeholders of Source Firms with CEO Death



Panel B: Shadow Trading in Stakeholders of Source Firms with Non-Death-Related CEO Turnover

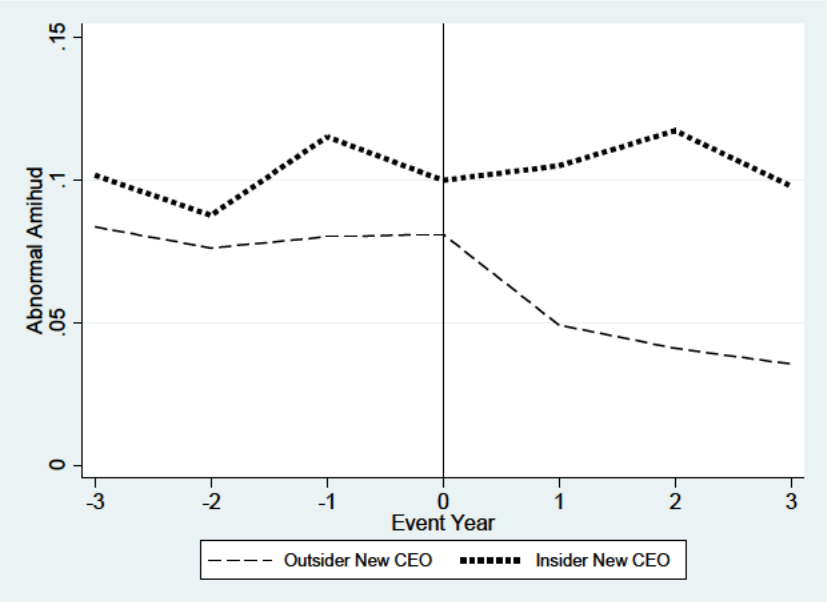


Table 1. Variable Definitions

Short Sales: daily short sale volume divided by total stock trading volume.

Abnormal Short Sales: ([target firm i 's average daily short sales prior to source firm A's quarterly earnings announcement (day $t-30$ to $t-1$) divided by target firm i 's average daily short sales for the year outside of A's earnings announcement windows] - 1)

Amihud: daily absolute return divided by daily dollar trading volume.

Abnormal Amihud: ([target firm i 's average daily Amihud prior to source firm A's quarterly earnings announcement (day $t-30$ to $t-1$) divided by target firm i 's average daily Amihud for the year outside of A's earnings announcement windows] - 1).

Business Partner CAR: cumulative abnormal return of business partner source firm from day $t-1$ to $t+1$ where t is the earnings announcement date.

Competitor CAR: cumulative abnormal return of competitor source firm from day $t-1$ to $t+1$ where t is the earnings announcement date.

Vertical: a dummy variable equals 1 if the source firm is the target firm's supplier or customer, and 0 otherwise.

CAR: cumulative abnormal return of source firm from day $t-1$ to $t+1$ around earnings announcement date. Abnormal return is raw return minus market return.

BusinessPartner_StockShock: the absolute daily excess stock return of the business partner target firm, when the target firm experiences a significant shock (excess stock return of 1% or greater) between day $t+1$ and $t+5$, where t represents the day of the source firm shock.

Business Partner StockShock: the absolute daily excess stock return of the business partner target firm, when the target firm experiences a significant shock (excess stock return of 1% or greater) between day $t+1$ and $t+5$, where t represents the day of the source firm shock.

Competitor_StockShock: the absolute daily excess stock return of the competitor target firm, when the target firm experiences a significant shock (excess stock return of 1% or greater) between day $t+1$ and $t+5$, where t represents the day of the source firm shock.

Post: a dummy variable set to 1 if the year is after 2002 and 0 otherwise.

IDDShock: is set to one (zero) following the adoption (rejection), and zero (one) for the pre-shock observation, when the source firms that experiences the adoption (rejection) of the IDD in the past prior years.

Source Firm Variables:

Inside Trade Source: CAR of day $t-5$ to t in source firm prior to its quarterly earnings announcement.

Firm Size Source: log of total assets.

Volatility Source: standard deviation of monthly stock returns over previous 5 years.

Leverage Source: long-term liabilities divided by total assets.

Institutional% Source: proportion of common equity owned by institutional investors.

Market-to-Book Source: market value of common equity scaled by book value of common equity.

Analyst Following Source: log of the number of analysts following the firm during the year.

Target Firm Variables:

Firm Size: log of total assets.

Earnings Volatility: standard deviation of quarterly EPS of the prior 5 years.

ROA: return on assets, measured as income before extraordinary items divided by total assets.

Leverage: long-term liabilities divided by total assets.

Market-to-book: market value of common equity scaled by book value of common equity.

R&D: R&D expenditure scaled by total assets.

Institutional%: proportion of common equity owned by institutional investors.

Forecast Dispersion: the standard deviation of quarterly EPS forecasts divided by the prior-quarter-end stock price, averaged over the year.

Bid-Ask Spread: daily stock bid-ask spread averaged over the year.

Trading Volume: log of daily stock trading volume averaged over the year.

Turnover: daily stock trading volume divided by common shares outstanding, averaged over the year.

Analyst Following: log of the number of analysts following the firm during the year.

Volatility: standard deviation of monthly stock returns over previous 5 years.

Opportunistic Trade: reported opportunistic insider trading activity by managers as measured in Cohen et al. (2012).

Option trading: log of daily option trading volume for the target firm averaged over the year.
Option includes at-the-money call and put options with an expiration of 60 days or less.

Table 2. Summary Statistics

Table 2 presents summary statistics for sample target and source firms. Panel A presents descriptive data for sample target firms. Panel B displays summary statistics for source firms. Panel C outlines the top ten industries represented for sample target and source firms. All variables are defined in Table 1.

Panel A: Target Firm Descriptive Statistics

	Mean	Median	Std. Dev.	Lower Quartile	Upper Quartile
Abnormal short sales following a source firm's:					
Negative Earnings Shock	0.079	0.055	0.279	-0.088	0.225
Positive Earnings Shock	-0.036	-0.029	0.332	-0.193	0.122
Abnormal Amihud following a source firm's:					
Negative Earnings Shock	0.156	0.016	0.662	-0.156	0.422
Positive Earnings Shock	0.099	-0.012	0.892	-0.220	0.321
Total Assets (\$million)	4,434.53	814.97	16,039.91	334.86	2,529.50
ROA (%)	1.23	1.33	12.02	0.00	6.38
Market-to-book	1.98	1.45	4.33	0.99	2.34
Institutional%	0.53	0.56	0.29	0.30	0.77
Volatility	0.14	0.13	0.07	0.09	0.18
Bid-Ask Spread	0.043	0.040	0.019	0.030	0.053
Trading Volume	12.12	12.12	1.78	10.95	13.41
Turnover	13.93	14.17	1.78	13.37	14.80
Analyst Following	27.05	25.00	23.09	12.00	39.00
Forecast Dispersion	0.012	0.004	0.031	0.002	0.010
Opportunistic Trade	9.54	0.00	37.87	0.00	5.00
Option Trading	5.32	6.82	4.70	0.00	9.31

Panel B: Source Firm Characteristics

	Mean	Median	Std. Dev.	Lower Quartile	Upper Quartile
CAR - Negative Earnings Shock (business partner)	-0.035	-0.028	0.256	-0.323	0.062
CAR - Negative Earnings Shock (competitor)	-0.033	-0.030	0.229	-0.292	0.068
CAR - Positive Earnings Shock (business partner)	0.021	0.011	0.219	-0.040	0.278
CAR - Positive Earnings Shock (competitor)	0.023	0.012	0.228	-0.043	0.235
Total Assets (\$million)	6,137.33	1,229.23	9,162.44	287.34	7,263.89
Market-to-Book	2.37	1.71	2.97	1.05	2.84
Institutional%	0.60	0.66	0.26	0.44	0.82
Volatility	0.14	0.12	0.07	0.09	0.16
Leverage	0.18	0.13	0.20	0.02	0.28
Analyst Following	27.82	21.00	25.07	11.00	37.00
Inside Trade	0.023	0.031	0.562	-0.085	0.099

Panel C: Industry Representation

Industry Name	% of Target Firms	Industry Name	% of Source Firms
Drugs	8.91	Drugs	10.02
Energy	8.51	Business Services	9.71
Business Services	8.24	Energy	7.27
Meals	6.68	Chemicals	5.25
Machinery	5.74	Telecommunications	4.34
Health	3.85	Retail	4.22
Building Materials	3.71	Machinery	3.73
Retail	3.51	Health	3.60
Transportation	3.51	Electric Equipment	3.54
Wholesale	3.31	Building Materials	3.48
<i>Total</i>	<i>55.97</i>	<i>Total</i>	<i>55.16</i>

Table 3. Earnings Shock and Shadow Trading

This table presents coefficients from regressions testing whether a source firm's competitors and business partners experience abnormal trading in the 30-day window prior to the source firm's earnings announcement. Panel A (Panel B) presents coefficients from a sample based on stakeholder data from Capital IQ (Compustat Segment File and Hoberg and Phillips 2010, 2014). We measure abnormal trading using two proxies: 1) abnormal short sales and 2) abnormal Amihud. All variables are defined in Table 1. *t*-values are reported in parentheses based on Huber-White Sandwich standard errors clustered at the firm level. All specifications include year and Fama-French industry fixed effects. Statistical significance at the 1%, 5%, and 10% level is denoted by ***, **, and *, respectively.

Panel A: Shadow Trading Using Capital IQ Sample

Dependent variable: Earnings Shock Type:	Abnormal Short Sales		Abnormal Amihud	
	Negative	Positive	Negative	Positive
Business Partner CAR (β_1)	0.055*** (2.58)	-0.025** (-2.29)	0.066*** (2.59)	0.055** (2.41)
Competitor CAR (β_2)	0.042** (2.48)	-0.020** (-2.18)	0.060** (2.35)	0.047** (2.30)
Firm Size	-0.014 (-1.01)	0.031 (0.77)	-0.014 (-1.18)	-0.012 (-1.01)
ROA	0.066 (1.39)	0.030 (1.41)	0.100 (1.25)	0.076 (1.52)
Leverage	-0.069* (-1.87)	0.080* (1.90)	-0.155 (-1.50)	-0.113 (-1.27)
Market-to-Book	0.022 (1.25)	-0.006 (-1.18)	0.005 (1.26)	0.003 (1.35)
Volatility	0.070 (1.37)	-0.072 (-0.80)	0.141 (1.30)	0.069 (1.11)
Institutional%	-0.032 (-1.10)	0.030 (0.89)	-0.088 (-1.31)	-0.089 (-0.92)
Bid-Ask Spread	0.666 (1.20)	-0.381 (-1.03)	1.242* (1.71)	1.506* (1.76)
Trading Volume	-0.026 (-1.00)	0.027 (1.32)	-0.011 (-0.99)	-0.010 (-1.15)
Turnover	-0.016 (-1.55)	0.021 (1.25)	-0.085* (-1.75)	-0.070* (-1.90)
Analyst Following	-0.077 (-1.61)	0.019 (1.35)	-0.026 (-0.80)	-0.035 (-1.22)
Forecast Dispersion	0.208 (1.08)	-0.242 (-1.50)	0.588* (1.76)	0.875* (1.75)
Opportunistic Trade	0.001 (1.43)	-0.001 (-1.30)	0.001* (1.87)	0.001* (1.88)
Option Trading	-0.009 (-0.89)	0.015 (0.72)	-0.009 (-0.90)	-0.007 (-0.73)
Inside Trade Source	0.006* (1.88)	-0.005 (-1.50)	0.009* (1.85)	0.006* (1.82)
Firm Size Source	0.004 (1.36)	-0.003 (-0.55)	0.009 (1.55)	0.002 (0.82)
Leverage Source	0.025 (1.31)	-0.025 (-1.11)	0.072 (1.20)	0.036 (0.93)
Volatility Source	-0.022 (-1.33)	0.012 (1.33)	-0.034 (-1.50)	-0.033 (-1.39)
Institutional% Source	0.012 (1.20)	-0.006 (-1.08)	0.025 (1.33)	0.017 (1.02)
Market-to-book Source	-0.002 (-0.73)	0.003 (1.00)	0.003 (0.53)	0.003 (0.52)
Analyst Following Source	0.031 (1.32)	-0.033 (-1.41)	0.031 (1.07)	0.029 (1.30)
<i>F-test: $\beta_1 = \beta_2$</i>	0.17	0.20	0.31	0.27
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	639	1,111	652	1,134
<i>Adjusted R²</i>	0.142	0.059	0.115	0.098

Panel B: Shadow Trading Using Alternative Sample

Dependent variable: Earnings Shock Type:	Abnormal Short Sales		Abnormal Amihud	
	Negative	Positive	Negative	Positive
Business Partner CAR (β_1)	0.035** (2.50)	-0.021** (-2.01)	0.038** (2.35)	0.026** (2.31)
Competitor CAR (β_2)	0.030** (2.05)	-0.023** (-2.22)	0.033** (2.12)	0.021** (2.30)
Firm Size	-0.020 (-1.16)	0.010 (0.82)	-0.026 (-1.42)	-0.019 (-1.11)
ROA	0.117 (1.47)	-0.012 (-1.02)	0.091 (1.22)	0.088 (1.08)
Leverage	-0.071* (-1.88)	0.075* (1.75)	-0.071 (-1.30)	-0.080 (-1.35)
Market-to-Book	0.014 (1.40)	-0.004 (-1.52)	0.011 (1.33)	0.006 (1.22)
Volatility	0.067 (1.35)	-0.099 (-1.10)	0.120 (1.36)	0.108 (1.28)
Institutional%	-0.023 (-1.08)	0.042 (1.40)	-0.028 (-1.05)	-0.070 (-1.02)
Bid-Ask Spread	0.387 (1.02)	-0.509 (-1.60)	1.122* (1.88)	1.437* (1.75)
Trading Volume	-0.031 (-1.26)	0.028 (1.28)	-0.018 (-1.02)	-0.028 (-1.07)
Turnover	-0.028 (-1.52)	0.030 (1.61)	-0.072* (-1.90)	-0.098 (-1.28)
Analyst Following	-0.035 (-1.28)	0.012 (1.37)	-0.025 (-1.11)	-0.020 (-1.20)
Forecast Dispersion	0.288 (1.05)	-0.218 (-1.34)	0.766* (1.81)	0.902 (1.47)
Opportunistic Trade	0.003 (1.35)	-0.003 (-1.52)	0.002* (1.79)	0.003* (1.80)
Option Trading	-0.008 (-0.79)	0.004 (0.90)	-0.015 (-1.29)	-0.011 (-1.02)
Inside Trade Source	0.011* (1.77)	-0.003* (-1.72)	0.018** (2.15)	0.008** (1.98)
Firm Size Source	0.010 (1.05)	0.003 (0.60)	0.006 (1.18)	0.008 (1.50)
Leverage Source	0.037 (1.55)	0.010 (1.05)	0.068 (1.33)	0.062 (1.30)
Volatility Source	-0.022 (-1.51)	0.007 (0.88)	-0.070 (-1.42)	-0.050 (-1.45)
Institutional% Source	0.013 (1.33)	0.002 (0.60)	0.028 (0.79)	0.026 (1.05)
Market-to-book Source	-0.006 (-1.31)	0.006 (0.75)	0.007 (1.26)	0.007 (0.95)
Analyst Following Source	0.032 (1.25)	-0.042 (-1.39)	0.039 (0.88)	0.025 (1.07)
<i>F-test: $\beta_1 = \beta_2$</i>	0.21	0.65	0.31	0.27
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	1,129	1,982	2,958	5,018
<i>Adjusted R²</i>	0.198	0.182	0.165	0.146

Table 4. Source Firm Shadow Trading Policy and Target Firm Trading

This table presents coefficients from regressions testing whether cross-sectional variation in source firm insider trading policies affects competitors and business partners abnormal trading in the 30-day window prior to the source firm's earnings announcement. Panel A (Panel B) present results from tests using sample source firms that explicitly prohibit (do not explicitly prohibit) shadow trading. We measure shadow trading using two proxies: 1) Abnormal Short Sales; and 2) Abnormal Amihud. All variables are defined in Table 1. t-values are reported in parentheses based on Huber-White Sandwich standard errors clustered at the firm level. All specifications include year and Fama-French industry fixed effects. Statistical significance at the 1%, 5%, and 10% level is denoted by ***, **, and *, respectively.

Panel A: Firms that Explicitly Prohibit Shadow Trading

Dependent variable: Earnings Shock Type:	Abnormal Short Sales		Abnormal Amihud	
	Negative	Positive	Negative	Positive
Business Partner CAR	0.012 (0.58)	-0.005 (-0.60)	0.010 (1.03)	0.011 (0.88)
Competitor CAR	0.012 (1.19)	-0.007 (-1.16)	0.012 (1.11)	0.005 (0.82)
Firm Size	-0.007 (-1.08)	0.014 (1.05)	-0.012 (-1.31)	-0.008 (-0.90)
ROA	0.085 (1.32)	0.018 (1.23)	0.071 (0.95)	0.092 (1.43)
Leverage	-0.065 (-1.52)	0.078 (1.57)	-0.150 (-1.55)	-0.127 (-1.50)
Market-to-Book	0.013 (1.47)	-0.007 (-1.15)	0.005 (1.21)	0.005 (1.32)
Volatility	0.065 (1.22)	-0.093 (-0.69)	0.109 (1.01)	0.088 (1.32)
Institutional%	-0.045 (-1.25)	0.037 (1.26)	-0.088 (-1.45)	-0.083 (-1.33)
Bid-Ask Spread	0.407 (1.05)	-0.659 (-1.49)	1.320 (1.33)	1.521 (1.45)
Trading Volume	-0.042 (-1.31)	0.018 (1.23)	-0.017 (-1.32)	-0.010 (-1.18)
Turnover	-0.017 (-1.42)	0.026 (1.55)	-0.061* (-1.77)	-0.102* (-1.87)
Analyst Following	-0.045 (-1.10)	0.020 (1.40)	-0.023 (-0.90)	-0.030 (-1.08)
Forecast Dispersion	0.228 (1.15)	-0.250 (-1.47)	0.452 (1.28)	0.677 (1.49)
Opportunistic Trade	0.002 (1.51)	-0.001 (-1.37)	0.001* (1.79)	0.001* (1.70)
Option Trading	-0.003 (-0.56)	0.006 (0.69)	-0.005 (-0.60)	0.002 (0.33)
Inside Trade Source	0.002 (0.52)	-0.004 (-0.90)	0.004 (0.70)	0.005 (1.47)
Firm Size Source	0.003 (1.33)	-0.003 (-1.22)	0.009 (1.28)	0.004 (1.49)
Leverage Source	0.020 (1.20)	-0.005 (-1.12)	0.053 (1.10)	0.036 (1.01)
Volatility Source	-0.028 (-1.25)	0.005 (0.52)	-0.045 (-1.39)	-0.033 (-1.26)
Institutional% Source	0.010 (1.06)	-0.008 (-1.30)	0.015 (1.18)	0.033 (1.52)
Market-to-book Source	-0.004 (-0.85)	0.003 (0.86)	0.002 (0.88)	0.004 (1.03)
Analyst Following Source	0.029 (1.08)	-0.027 (-1.36)	0.030 (1.08)	0.033 (1.31)
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	226	212	305	286
<i>Adjusted R²</i>	0.180	0.135	0.158	0.142

Panel B: Firms without Explicit Policy that Prohibits Shadow Trading

Dependent variable: Earnings Shock Type:	Abnormal Short Sales		Abnormal Amihud	
	Negative	Positive	Negative	Positive
Business Partner CAR	0.040*** (2.60)	-0.024** (-2.53)	0.041*** (2.65)	0.031** (2.30)
Competitor CAR	0.036** (2.22)	-0.019** (-2.02)	0.031** (2.18)	0.026** (2.28)
Firm Size	-0.011 (-1.02)	0.007 (0.82)	-0.017 (-1.52)	-0.013 (-1.25)
ROA	0.066 (1.05)	0.031 (1.42)	0.070 (1.02)	0.081 (1.23)
Leverage	-0.102* (-1.88)	0.106* (1.85)	-0.111 (-1.30)	-0.162 (-1.35)
Market-to-Book	0.020 (1.33)	-0.004 (-1.18)	0.003 (1.20)	0.004 (1.44)
Volatility	0.064 (1.22)	-0.107 (-0.97)	0.082 (1.01)	0.108 (1.52)
Institutional%	-0.031 (-1.40)	0.022 (0.81)	-0.101 (-1.16)	-0.107 (-1.37)
Bid-Ask Spread	0.499 (1.25)	-0.372 (-1.01)	1.829* (1.78)	2.111* (1.75)
Trading Volume	-0.028 (-1.28)	0.025 (1.10)	-0.013 (-1.28)	-0.011 (-1.15)
Turnover	-0.016 (-1.33)	0.020 (1.26)	-0.088* (-1.82)	-0.075* (-1.83)
Analyst Following	-0.065 (-1.51)	0.013 (1.33)	-0.042 (-1.41)	-0.030 (-1.22)
Forecast Dispersion	0.117 (0.99)	-0.232 (-1.48)	1.118* (1.90)	0.952* (1.80)
Opportunistic Trade	0.001 (1.33)	-0.001 (-1.30)	0.001* (1.69)	0.001* (1.82)
Option Trading	-0.004 (-0.72)	0.004 (0.89)	-0.005 (-0.45)	0.002 (0.39)
Inside Trade Source	0.007* (1.88)	-0.012* (-1.79)	0.011* (1.85)	0.010* (1.89)
Firm Size Source	0.004 (1.32)	-0.002 (-0.89)	0.008 (1.27)	0.005 (1.07)
Leverage Source	0.020 (1.28)	-0.016 (-1.05)	0.031 (0.75)	0.045 (1.31)
Volatility Source	-0.016 (-1.11)	0.020 (1.42)	-0.025 (-1.18)	-0.031 (-1.08)
Institutional% Source	0.008 (0.85)	-0.008 (-1.28)	0.032 (1.47)	0.013 (0.69)
Market-to-book Source	-0.003 (-1.15)	0.003 (0.59)	0.003 (0.75)	0.003 (0.51)
Analyst Following Source	0.031 (1.55)	-0.030 (-1.42)	0.038 (1.15)	0.034 (1.26)
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	360	399	297	329
<i>Adjusted R²</i>	0.237	0.382	0.185	0.157

Table 5. The Effect of an Exogenous Regulatory Shock on Shadow Trading

This table presents coefficients from regressions testing whether a regulatory change in insider trading laws in the early 2000s affects shadow trading. All variables are defined in Table 1. In all columns, *t*-values are reported in parentheses based on Huber-White Sandwich standard errors estimation clustered at the firm level. All specifications include year and Fama-French industry fixed effects. Statistical significance is denoted by *, **, and ***, for significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	Abnormal Amihud	
	Negative	Positive
Earnings Shock Type:		
Business Partner CAR	0.038** (2.22)	0.025** (1.99)
Competitor CAR	0.030** (2.10)	0.017* (1.80)
Post	0.018*** (3.29)	0.011** (2.27)
Post * Business Partner CAR	0.059** (2.18)	0.037** (2.28)
Post * Competitor CAR	0.045** (2.02)	0.022** (2.09)
Firm Size	-0.015* (-1.72)	-0.015* (-1.71)
ROA	0.085* (1.79)	0.063 (1.50)
Leverage	-0.095* (-1.82)	-0.095* (-1.79)
Market-to-Book	0.005* (1.89)	0.005* (1.88)
Volatility	0.118* (1.90)	0.089* (1.86)
Institutional%	-0.080* (-1.80)	-0.076 (-1.49)
Bid-Ask Spread	1.306* (1.92)	1.385* (1.82)
Trading Volume	-0.026 (-0.78)	-0.019 (-0.67)
Turnover	-0.068* (-1.82)	-0.061* (-1.70)
Analyst Following	-0.019* (-1.75)	-0.022* (-1.86)
Forecast Dispersion	0.702* (1.85)	0.536* (1.72)
Opportunistic Trade	0.002** (2.19)	0.002* (1.88)
Option Trading	-0.006 (-0.90)	-0.005 (-0.83)
Inside Trade Source	0.011* (1.89)	0.013* (1.82)
Firm Size Source	0.005 (1.13)	0.005 (0.89)
Leverage Source	0.066 (1.49)	0.070 (1.12)
Volatility Source	-0.050 (-0.95)	-0.042 (-0.73)
Institutional% Source	0.020 (1.18)	0.021 (0.97)
Market-to-book Source	0.005 (0.67)	0.005 (0.69)
Analyst Following Source	0.027 (1.02)	0.030 (0.80)
<i>Year & Industry Dummy</i>	Yes	Yes
<i>Observations</i>	5,128	9,757
<i>Adjusted R²</i>	0.172	0.150

Table 6. IDD Legal Case Shock and Shadow Trading

This table presents coefficients from regressions testing whether shadow trading in competitors and business partners varies when source firms experience an IDD legal case shock. All variables are defined in Table 1. We measure shadow trading using abnormal Amihud, t -values are reported in parentheses based on Huber-White Sandwich standard errors clustered at the firm level. All specifications include year and Fama-French industry fixed effects. Statistical significance at the 1%, 5%, and 10% level is denoted by ***, **, and *, respectively.

Dependent Variable: Earnings Shock Type:	Abnormal Amihud	
	Negative	Positive
Business Partner CAR	0.033** (2.28)	0.022** (2.11)
Competitor CAR	0.026* (1.90)	0.016** (2.02)
IDDShock	0.021** (2.17)	0.015* (1.92)
Business Partner CAR * IDDShock	0.058** (2.42)	0.029** (2.39)
Competitor CAR * IDDShock	0.023** (2.10)	0.015** (2.22)
Firm Size	-0.018 (-1.29)	-0.017 (-1.23)
ROA	0.085 (1.09)	0.078 (1.29)
Leverage	-0.055 (-1.26)	-0.067 (-1.09)
Market-to-Book	0.010 (1.37)	0.012 (1.35)
Volatility	0.079 (1.28)	0.082 (1.08)
Institutional%	-0.025 (-1.22)	-0.053 (-1.38)
Bid-Ask Spread	1.005* (1.90)	1.117* (1.75)
Trading Volume	-0.015 (-1.12)	-0.023 (-0.99)
Turnover	-0.062* (-1.78)	-0.067 (-1.37)
Analyst Following	-0.028 (-1.28)	-0.020 (-1.07)
Forecast Dispersion	0.662* (1.83)	0.659* (1.73)
Opportunistic Trade	0.003* (1.88)	0.003* (1.81)
Option Trading	-0.004 (-0.68)	-0.005 (-0.53)
Inside Trade Source	0.020* (1.92)	0.021* (1.88)
Firm Size Source	0.005 (0.82)	0.004 (0.77)
Leverage Source	0.054 (1.12)	0.050 (1.23)
Volatility Source	-0.062* (-1.80)	-0.050* (-1.75)
Institutional% Source	0.021 (0.55)	0.018 (0.62)
Market-to-book Source	0.005 (0.78)	0.005 (0.80)
Analyst Following Source	0.034 (1.03)	0.042 (1.20)
<i>Year & Industry Dummy</i>	Yes	Yes
<i>Observations</i>	2,039	3,528
<i>Adjusted R²</i>	0.167	0.141

Table 7. CEO Knowledge and Shadow Trading

This table presents coefficients from regressions testing whether shadow trading in competitors and business partners varies when source firms experience CEO turnover and the new CEO is an internal candidate or an external hire. All variables are defined in Table 1. *t*-values are reported in parentheses based on Huber-White Sandwich standard errors clustered at the firm level. All specifications include year and Fama-French industry fixed effects. Statistical significance at the 1%, 5%, and 10% level is denoted by ***, **, and *, respectively.

Dependent Variable: Earnings Shock Type:	Abnormal Short Sales		Abnormal Amihud	
	Negative	Positive	Negative	Positive
CAR	0.026** (2.22)	-0.016* (-1.91)	0.031** (2.09)	0.015* (1.88)
Insider	0.007** (2.31)	-0.005* (-1.88)	0.009** (2.19)	0.004* (1.90)
CAR * Insider	0.071** (2.12)	-0.066** (-2.02)	0.090** (2.33)	0.041* (1.88)
Outsider	-0.007 (-1.11)	0.006 (1.29)	-0.006 (-1.10)	-0.004 (-1.08)
CAR * Outsider	-0.010 (-1.17)	0.007 (1.22)	-0.070 (-1.15)	-0.007 (-1.05)
Firm Size	-0.012 (-0.96)	0.016 (1.02)	-0.011 (-1.06)	-0.015 (-1.13)
ROA	0.069 (1.28)	-0.010 (-0.87)	0.085 (1.37)	0.073 (1.17)
Leverage	-0.036* (-1.74)	0.069 (1.37)	-0.075 (-1.26)	-0.077 (-1.26)
Market-to-Book	0.017 (1.33)	-0.006 (-1.47)	0.006 (1.17)	0.007 (1.18)
Volatility	0.042 (1.27)	-0.080 (-1.22)	0.077 (1.20)	0.076 (1.24)
Institutional%	-0.022 (-1.21)	0.031 (1.03)	-0.030 (-1.25)	-0.072 (-1.30)
Bid-Ask Spread	0.528 (1.28)	-0.456 (-1.50)	0.937* (1.76)	1.306* (1.80)
Trading Volume	-0.022 (-1.47)	0.030 (1.41)	-0.025 (-1.11)	-0.031 (-1.27)
Turnover	-0.030 (-1.25)	0.018 (1.23)	-0.077* (-1.77)	-0.093 (-1.15)
Analyst Following	-0.031 (-1.10)	0.011 (0.79)	-0.025 (-1.15)	-0.021 (-1.32)
Forecast Dispersion	0.132 (1.18)	-0.218 (-1.25)	0.455 (1.42)	0.668 (1.34)
Opportunistic Trade	0.004 (1.40)	-0.005 (-1.49)	0.003* (1.88)	0.003* (1.85)
Option Trading	-0.003 (-0.89)	0.004 (0.66)	-0.005 (-0.90)	-0.005 (-0.78)
Inside Trade Source	0.015* (1.85)	-0.005* (-1.81)	0.011* (1.82)	0.008* (1.82)
Firm Size Source	0.004 (0.88)	0.001 (0.38)	0.006 (1.37)	0.007 (1.33)
Leverage Source	0.035 (1.33)	0.011 (1.03)	0.070 (1.33)	0.039 (1.41)
Volatility Source	-0.020 (-1.37)	0.008 (0.77)	-0.063 (-1.42)	-0.040 (-1.35)
Institutional% Source	0.007 (1.10)	0.003 (1.03)	0.026 (0.89)	0.021 (0.75)
Market-to-book Source	-0.006 (-1.21)	0.007 (1.06)	0.005 (0.90)	0.006 (1.18)
Analyst Following Source	0.028 (1.30)	-0.037 (-1.33)	0.055 (1.40)	0.032 (1.08)
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	382	257	1,068	718
<i>Adjusted R²</i>	0.189	0.175	0.158	0.146

Appendix A. Summary Statistics of Compustat Sample Firms Sample

Panel A: Target Firm Descriptive Statistics

	Mean	Median	Std.	Lower	Upper
Abnormal short sales following a					
Negative Earnings Shock	0.069	0.058	0.335	-0.092	0.249
Positive Earnings Shock	-0.032	-0.039	0.372	-0.221	0.155
Abnormal Amihud following a					
Negative Earnings Shock	0.121	0.023	0.553	-0.142	0.387
Positive Earnings Shock CAR	0.088	0.019	0.672	-0.210	0.273
Total Assets (\$billion)	3,012.66	1,205.33	9,322.90	552.60	2,879.32
ROA (%)	1.15	1.20	8.390	-0.33	5.72
Market-to-book	2.15	1.88	3.85	0.85	2.09
Institutional%	0.59	0.57	0.26	0.28	0.79
Volatility	0.13	0.12	0.07	0.08	0.17
Bid-Ask Spread	0.038	0.042	0.026	0.027	0.066
Trading Volume	10.44	10.56	1.34	9.92	12.15
Turnover	15.02	14.89	1.56	13.90	16.55
Analyst Following	27.05	26.00	17.315	11.00	33.00
Forecast Dispersion	0.008	0.005	0.025	0.001	0.009
Opportunistic Trade	8.34	0.00	26.77	0.00	6.00
Option Trading	5.05	6.22	4.37	0.00	8.89

Panel B: Source Firm Characteristics

	Mean	Median	Std.	Lower	Upper
Negative Earnings Shock	-0.037	-0.032	0.262	-0.267	0.078
Positive Earnings Shock CAR	0.033	0.025	0.267	-0.060	0.295
Total Assets Source	3,245.09	926.55	10,114.68	432.92	3,092.45
Market-to-Book Source	2.33	2.01	2.77	0.91	2.67
Institutional% Source	0.63	0.60	0.22	0.25	0.77
Volatility Source	0.15	0.14	0.08	0.07	0.21
Leverage Source	0.15	0.14	0.17	0.02	0.33
Analyst Following Source	25.88	25.00	15.902	10.00	28.00
Inside Trade Source	0.016	0.021	0.328	-0.056	0.089

Appendix B. Shadow Trading Based On All Source Firms

This table presents coefficients from regressions testing whether a source firm's competitors and business partners experience abnormal trading in the 30-day window prior to the source firm's earnings announcement but without imposing constraints on other information sources imposed for our main sample. We present results for both the Capital IQ and alternate sample. Control variables are the same as used in Table 2 but not tabulated in the interests of brevity. All variables are defined in Table 1. In all columns, t -values are reported in parentheses based on Huber-White Sandwich standard errors estimation clustered at the firm level. Statistical significance is denoted by *, **, and ***, for significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: Sample: Earnings Shock type:	Abnormal Short Sales		Abnormal Amihud		Abnormal Short Sales		Abnormal Amihud	
	Capital IQ				Compustat			
	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
Business Partner CAR	0.015* (1.92)	-0.004* (-1.80)	0.016** (1.99)	0.014* (1.90)	0.014** (2.18)	-0.005* (-1.85)	0.015** (2.20)	0.017* (1.90)
Competitor CAR	0.012* (1.70)	-0.004* (-1.77)	0.012** (2.00)	0.011* (1.91)	0.012** (2.05)	-0.006* (-1.84)	0.009* (1.88)	0.013* (1.82)
<i>Controls?</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Observations</i>	30,182	64,516	78,474	174,194	10,128	18,226	28,381	51,088
<i>Adjusted R²</i>	0.088	0.065	0.062	0.054	0.103	0.123	0.089	0.084

Appendix C. Stock Return Methodology to Identify Shadow Trading

We replicate the tests in Table 2 but use abnormal stock returns rather than earnings announcements to identify shocks that affect trading in target stakeholder. We use all sample firms across both Capital IQ and our alternative dataset over the 2009-2011. All the variables are defined in Table 1. In all columns, t -values are reported in parentheses based on Huber-White Sandwich standard errors estimation clustered at the firm level. Statistical significance is denoted by *, **, and ***, for significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: Earnings Shock type:	Abnormal Short Sales		Abnormal Amihud	
	Negative	Positive	Negative	Positive
Business Partner StockShock	0.029** (2.35)	-0.010* (-1.90)	0.039** (2.33)	0.011* (1.89)
Competitor StockShock	0.026** (2.11)	-0.012* (-1.89)	0.029** (1.99)	0.010* (1.92)
<i>Control Variables</i>	Yes	Yes	Yes	Yes
<i>Year & Industry Dummy</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	163	355	163	355
<i>Adjusted R²</i>	0.139	0.075	0.105	0.099