

Is There Life after the Complete Loss of Analyst Coverage?

Simona Mola

U.S. Securities and Exchange Commission

P. Raghavendra Rau

University of Cambridge

Ajay Khorana

Independent Author

ABSTRACT: This paper examines the value of sell-side analysts to covered firms by documenting the effects on firm performance and investor interest after a complete loss of analyst coverage for periods of at least one year. We find that analyst coverage adds value to a firm both because it reduces information asymmetries about the firm's future performance and because it maintains investor recognition for that firm's stock. After the introduction of regulations that curtailed the informational advantage of analysts in the early 2000s, the investor recognition role of analysts remains important. Firms that lose all analyst coverage continue to suffer a significant deterioration in bid-ask spreads, trading volumes, and institutional presence but do not show a significant difference in subsequent performance relative to covered peers. In addition, controlling for other factors, we find that firms that lose all analyst coverage for one year are significantly more likely to delist than their covered peers. Our results provide insight into the reasons why firms place so much importance on analyst coverage.

Keywords: *analyst coverage; investor recognition; delisting prediction.*

We thank two anonymous referees, Katrien Bosquet, Naveen Daniel, Dave Denis, Barb Dwyer, John Harry Evans III (senior editor), Anzhela Knyazeva, S. P. Kothari, Chen Lin, Alexander Ljungqvist, Tim Loughran, Ronald Masulis, John McConnell, Lalitha Naveen, Jay Ritter, Henri Servaes, Ann Sherman, Lakshmanan Shivakumar, Anil Shivdasani, Issouf Soumare, Brett Trueman, Beverly Walther (editor), Kent Womack, and seminar participants at Arizona State University, Helsinki School of Economics, University of Western Ontario, the U.S. Securities and Exchange Commission, the 2007 FMA Meeting, the 2008 EFA Meeting, the 2009 EFMA Meeting, the 2009 International Conference in Corporate Finance and Financial Institutions at the City University of Hong Kong, the 2009 National Investor Relations Institute Meeting in Denver, the 2010 FMA European Meeting, the 2010 "People & Money" Conference at DePaul University, and the 2010 NFA Conference for helpful comments.

The Securities and Exchange Commission, as a matter of policy, disclaims responsibility for any private publication or statement by any of its employees. The views expressed herein are those of the author and do not necessarily reflect the views of the Commission or of the author's colleagues on the staff of the Commission.

Editor's note: Accepted by Beverly Walther.

Submitted: March 2010

Accepted: October 2012

Published Online: October 2012

I. INTRODUCTION

Firms value analyst coverage. CEOs spend time and resources attempting to obtain and maintain coverage from sell-side analysts, who typically work for a brokerage house and provide investment research to their employer's clients. [Rajan and Servaes \(1997\)](#) and [Cliff and Denis \(2004\)](#) show that firms pay for the extent and quality of analyst coverage by underpricing their initial public offerings (IPOs). [Krigman et al. \(2001\)](#) find that the prospect of gaining access to better analyst coverage motivates firms to switch underwriters between their IPOs and their subsequent seasoned equity offerings (SEOs). Moreover, as [Bushee and Miller \(2010\)](#) document, firms that lose analyst coverage sometimes hire investor relations professionals to pitch their business to analysts. [Kirk \(2011\)](#) shows that firms without analyst coverage buy paid-for research. Why do firms value analyst coverage so much?

This question is especially relevant because firms appear to use the availability of analyst coverage as an important factor in their decision to list on public exchanges. [Weild and Kim \(2009\)](#) document that, over the past two decades, the number of firms listed on public exchanges has dropped by 22 percent, from 6,943 firms in 1991 to 5,401 firms in 2008. They argue that the "great depression in listings" is partly due to analysts ceasing to cover small- and mid-capitalization stocks. Similarly, [Mehran and Peristiani \(2010\)](#) argue that one reason behind the decision of recent IPO firms to abandon their public status and go private is that being listed on public exchanges no longer guarantees analyst coverage.

In this paper, we examine the value of analyst coverage to a firm by documenting the effects on investor interest, operating performance, and stock performance after a complete loss of analyst coverage. Specifically, we investigate two non-mutually exclusive hypotheses. The *private information* hypothesis argues that analysts have access to management's private information about a firm's prospects and convey it to investors through their coverage choices. [McNichols and O'Brien \(1997\)](#) argue that analysts drop coverage after receiving negative information, which is not reflected in their last outstanding forecast. According to the private information hypothesis, therefore, the loss of coverage will be followed by a decrease in firm performance. The *investor recognition* hypothesis argues that analysts direct investor attention to particular stocks. The loss of analyst coverage for a stock will reduce the investor interest for that stock, with adverse effects in liquidity, trading volume, and institutional presence ([Merton 1987](#)).

Our sample period ranges from 1984 to 2008. This is an appropriate period to analyze because it covers a series of significant analyst regulations and the enforcement of the Global Settlement ([Bradshaw 2009](#)). The analyst regulations, issued between 2000 and 2003, include Regulation Fair Disclosure (Reg FD), NASD Rule 2711, NYSE Rule 472, and Regulation Analyst Certification (Reg AC). It is likely that these rules have impacted analysts' access to private information and changed their economic incentives to cover firms. Consequently, the regulatory changes in the early 2000s represent a natural break in the analysis and enable us to draw inferences about why firms value analyst coverage.

We define a firm as having lost all analyst coverage when the firm, previously covered on I/B/E/S, receives no earnings forecasts during a calendar year.¹ Our sample consists of 16,662 observations of firms that receive no analyst coverage in a given year. These sample firm-year observations represent 19 percent of all U.S. firms covered by I/B/E/S from 1984 through 2008.

¹ This definition allows us to select a sample free from look-ahead bias. Such a bias arises if *ex post* information is used to establish termination of coverage. Instead, in our study, we infer the complete loss of coverage for a firm based only on the information available up to that date, given that analysts can choose to discontinue coverage in one year but then resume it in subsequent years.

Most sample firms are small, seasoned companies that have been previously covered for three years.

To address potential endogeneity issues in the data, we compare our sample firms to control firms that are similar to the sample firms across all dimensions, except for analysts' coverage decisions. Our research design thus consists of three steps. First, building on prior theoretical and empirical literature, we model an analyst's decision to not cover a firm in a given year t , as a function of the firm's performance and its potential for investor interest in year $t-1$. Investor interest is likely to be important to the analyst since it is related to the firm's ability to generate both trading and underwriting revenue for the analyst's employer. Second, we use a propensity score matching (PSM) technique to identify, for each sample firm that loses analyst coverage in a year, a covered firm that matches the sample firm on both factors. Finally, we measure the difference-in-differences effects after the loss of coverage over the next five years.

Before the introduction of the regulations that curtailed the informational advantages of analysts, we find that the effects of losing all analyst coverage are significantly related both to the information-gathering and processing abilities of analysts and to their ability to direct investor attention to stocks. The sample firms that lose analyst coverage before the regulatory changes experience a significant decline in both performance and investor interest indicators relative to their control firms. After the regulatory changes, the pattern shifts strikingly. The sample firms that lose analyst coverage after the regulatory changes continue to suffer a significant deterioration of bid-ask spreads, trading volumes, and institutional presence. Their performance indicators, however, are in line with covered peers, implying that analysts' coverage decisions no longer convey private information on firm performance.

After losing analyst coverage, our sample firms delist at a significantly higher rate than their control firms. A Cox proportional hazards model shows that, after controlling for a firm's performance and investor interest indicators, the loss of analyst coverage in year t significantly predicts the firm's delisting over the next ten years. This result is also economically significant: a firm that remains an orphan for one year is 11 percent more likely to delist in the next ten years than its control firm. The predictive power of the loss of analyst coverage for delisting holds both before and after the new regulations, although the economic magnitude shrinks in the period following the regulatory changes. Finally, a number of additional tests show that these results are robust and unlikely to be driven by endogeneity issues.

The paper makes several contributions to the literature on the value of analyst coverage. We show that analysts add value to firms both by gathering and processing information and by directing investor attention. Regulatory changes that reduce the information-gathering advantages of analysts change how analysts affect firm value. The investor recognition role of analysts, however, remains important. [Lehavy and Sloan \(2008, 359\)](#) argue that an unanswered puzzle in the literature is: "What factors cause investors to be cognizant of some securities, but not others?" Our results suggest that analysts are an important factor in bringing covered stocks to the attention of investors. Consistent with the predictions in [Merton \(1987\)](#), we find that the loss of analyst coverage reduces the number of investors who recognize and trade the firm's stock, with attendant effects of widening the bid-ask spread and decreasing trading volume and institutional presence. We also contribute to prior literature by analyzing the relation between analyst coverage and delisting. After controlling for firm performance and investor interest characteristics, the complete loss of analyst coverage significantly predicts a firm's delisting. Our findings thus provide empirical evidence for the arguments made by [Weild and Kim \(2009\)](#) and [Mehran and Peristiani \(2010\)](#) about the scarcity of analyst coverage as a reason for the decrease (increase) in U.S. listings (delistings).

Overall, our results suggest that managers are correct to worry about a complete loss in analyst coverage. Given that the demand curve for a stock with low investor recognition is downward-sloping, a demand shock can significantly depress its stock price, making the firm

vulnerable to possible acquisitions or other delisting events. Moreover, firms with low investor recognition face difficulty raising capital and investing in positive-NPV projects (Lehavy and Sloan 2008). When firms remain without analyst coverage for several years, finance and investment projects are likely to become exceedingly expensive, forcing firms to forgo value-enhancing opportunities and ultimately jeopardizing their growth and survival prospects. Without coverage, firms are likely to disappear from investors' radar and their odds of survival in the financial markets drop significantly. To reverse the philosopher Bishop Berkeley's dictum, for these firms, *percipi est esse*, to be perceived is to be.

Section II next develops the hypotheses and reviews the related literature, while Section III describes the regulatory changes over our sample period. In Section IV, we discuss data and sample descriptive statistics, and model an analyst's decision to provide coverage on a firm. Section V reports the effects on firm performance and investor interest characteristics after losing coverage, while Section VI reports the effects after regaining coverage. We discuss robustness checks in Section VII and conclude in Section VIII.

II. HYPOTHESES DEVELOPMENT AND RELATED LITERATURE

We investigate two non-mutually exclusive hypotheses as to how analysts impact firm value. The *private information* hypothesis argues that analysts add value by conveying private information from a firm's management to investors. Brennan and Subrahmanyam (1995) and Ellul and Panayides (2009), among others, argue that analyst research is valuable because it reduces informational asymmetries between investors and a firm's insiders. Lehavy et al. (2011) find that the informativeness of analyst reports is greater for firms with less readable 10-K filings. Frankel et al. (2006) show that analyst reports are more informative when the potential brokerage profits are higher (e.g., high trading volume, high volatility, and high institutional ownership) but less informative when information-processing costs are higher (e.g., in firms with more business segments). They also argue that the informativeness of analyst research and the informativeness of financial statements are complementary.

However, analysts do not necessarily add value only by serving as a conduit for information privately obtained from management. The *investor recognition* hypothesis argues that analysts make investors aware of stocks. Analysts release common industry-level information (Pietroski and Roulstone 2004), piggyback on corporate news (Altinkılıç and Hansen 2009), or boost the outlook of clients' stock (James and Karceski 2006). Easley et al. (1998) argue that when analysts release a report on a stock, they add no private information but generally repackage publicly available information. In doing so, they attract investors' limited attention by showcasing one stock among many. This argument is consistent with Merton (1987) in that analyst coverage broadens the investor recognition of firms and improves the liquidity of the firms' stock (Baker et al. 2002; Irvine 2003).

What distinguishes the two hypotheses is the existence of material private information about a firm. When analysts have private information about a deterioration of the firm's growth prospects, they can decide to discontinue coverage on that firm, rather than issue a negative recommendation. McNichols and O'Brien (1997) argue that analysts are reluctant to issue negative information because they either fear jeopardizing potential client relationships or fear losing access to management. This implies that the negative information is not reflected in their last forecast. The private information hypothesis predicts that a drop in coverage driven by private information about a firm's outlook is likely to be followed by a decline in that firm's performance. In contrast, a drop in coverage driven by reasons unrelated to private information about a firm's performance (e.g., the firm is considered unable to generate sufficient underwriting and/or trading revenue) or exogenous factors (e.g., analyst's resignation) is unlikely to be followed by a decline in firm performance. The

investor recognition hypothesis predicts that the adverse effects for that firm will result in lower stock liquidity, lower contemporaneous returns, and higher expected returns to compensate shareholders for being imperfectly diversified (Amihud and Mendelson 1986; Merton 1987).²

The binary distinction between the two hypotheses is somewhat artificial because the extent of “private information” and “investor recognition” can vary significantly from one stock to another. For example, analysts can convey their own private information, as opposed to management’s private information, by producing forecasts or recommendations from public data, highlighting public nonfinancial data in reports to clients, or making coverage decisions. These activities have the potential to play an information role beyond making firms visible to investors.

Two studies examine the price effects of partial decreases in analyst following and find conflicting results. Kelly and Ljungqvist (2011) investigate coverage reductions that are the result of brokerage firms downsizing their research operations in the early 2000s. They argue that reductions in the supply of information have a direct adverse effect on asset prices. Cumulative excess returns average -0.47 percent on the day of a coverage termination. The price impact is reduced when other analysts continue to cover the stock but the observed price reaction is not mean-reverting over the first month of trading or over the next six to 24 months. In contrast, Kecskés and Womack (2007) document that investors initially overreact to a decrease in the number of analysts covering a stock. In their sample, a drop in analyst following in one year produces negative returns that are followed by higher positive returns the next year.

Our paper differs from these studies across several dimensions. First, we analyze the effects on firm performance, investor interest, and delisting rates after the loss of analyst coverage, and relate them to analyst information-gathering and processing abilities. Second, our analysis of complete losses of analyst coverage allows for a clearer test than partial reductions in coverage because it is likely that a firm continues to be visible to investors when it experiences a partial loss in analyst coverage. Finally, the extent of our sample period from 1984 up to the end of 2008 offers the opportunity to examine the effects of losing analyst coverage after the regulatory changes in the analyst information environment.

III. REGULATORY CHANGES

Our 1984–2008 sample period covers a series of important regulatory changes that affected analyst activities. Adopted by the Securities and Exchange Commission (SEC) in August 2000, Reg FD states that managers cannot privately disclose material information to financial analysts (Release No. 33-7881). Gintschel and Markov (2004) show that, consistent with Reg FD curtailing the flow of information from managers to analysts, the average price impact associated with the dissemination of analysts’ information drops by 28 percent from the pre-Reg FD level.

In May 2002, the SEC approved similar changes to both National Association of Securities Dealers (NASD) Rule 2711 and NYSE Rule 472 (Release No. 34-45908). NASD Rule 2711 now requires that every brokerage firm discloses in its research reports the distribution of stock ratings across its coverage universe. Barber et al. (2006) document that, as a result of this rule, the percentage of buys has decreased steadily since mid-2000. Rule 2711 also prohibits NASD members from tying analysts’ compensation to their employers’ investment banking transactions and from offering favorable research, rating, or price target to a firm as inducement for future business. Chen and Chen (2009) find that the implementation of this rule has enhanced analysts’

² Our analysis depends on identifying publicly available variables that play a role in an analyst’s decision to cover a firm. To the extent that analysts use private information in their coverage choices, our tests may suffer from the joint hypothesis problem that is common to all event studies, and we cannot conclusively detect causality. However, matching on observable characteristics greatly reduces this concern, and our additional tests on exogenous losses of coverage further alleviate this issue.

independence. Another relevant provision of NASD Rule 2711, stated in paragraph (f)(5), requires analysts to issue a final research report prior to terminating coverage of a stock so that investors receive the benefit of the guidance from the analysts who recommended the stock in the first place.³ Finally, the SEC approved Reg AC in February 2003 (Release No. 33-8193), a few months before the Global Settlement was reached between the SEC, NASD, NYSE, and ten large investment banks. Among other features, Reg AC requires a statement from analysts about their compensation.⁴

The enactment of all these regulations over a short period makes it virtually impossible to analyze the incremental impact of the loss of coverage on firms from any one regulation. However, the relatively short enactment period of these rules forms a natural break in which to examine the change in the effects of losing analyst coverage prior to 2000 and after 2003. These regulations likely changed the information environment for analysts and the incentives to cover firms. Reg FD is likely to have reduced the informational advantage of analysts, while NASD Rule 2711, NYSE Rule 472, and Reg AC are likely to have curbed analysts' incentives to gain underwriting business potentially through biased coverage. In the wake of these regulatory changes, analysts may be less likely to drop coverage on firms based on private information about the firms' future performance, and they may be less likely to drop coverage on firms that generate little or no underwriting business to their employers.

IV. DATA AND SAMPLE DESCRIPTIVE STATISTICS

We define a firm as having lost all analyst coverage when analysts have issued no earnings forecasts on the firm during a calendar year.⁵ From all firms covered on the I/B/E/S detail files, we isolate firms that receive no analyst coverage during at least one calendar year, from 1984 through 2008. To construct our sample, we apply three screening criteria to this population of firms. First, we remove American Depository Receipts (ADRs) and retain only firms incorporated in the U.S. because foreign firms may be covered by other analysts who we cannot track. Second, sample firms must have ordinary common shares publicly traded on the NYSE, AMEX, or NASDAQ. We remove certificates, shares of beneficial interest, depository units, units of beneficial interest, units of limited partnership interests, depository receipts, real estate investment trusts (REITs), and closed-end funds. Third, using CRSP delisting dates, we retain those firms that are still publicly traded at the end of the year when analyst coverage is absent. This eliminates firms that lose coverage in a year only because they have been liquidated, acquired, or delisted for other reasons in that year. Our final sample consists of 16,662 firm-year observations of U.S. firms that are still publicly traded at the end of the year when they receive no analyst coverage. Most firms in our

³ In Section VII, our analysis of a large sample of the final reports issued in compliance with NASD Rule 2711 (f)(5) suggests that these reports offer little guidance to investors.

⁴ According to the text of Reg AC (part I, section A, point (B)), analysts need to include in their research reports "a statement by the research analyst (or analysts) certifying either: (1) that no part of his or her compensation was, is, or will be directly or indirectly related to the specific recommendations or views contained in the research report; or (2) that part or all of his or her compensation was, is, or will be directly or indirectly related to the specific recommendations or views contained in the research report. If the analyst's compensation was, is, or will be directly or indirectly related to the specific recommendations or views contained in the research report, the statement must include the source, amount, and purpose of such compensation, and further disclose that it may influence the recommendation in the research report."

⁵ In our research design, we use calendar year in preference to fiscal year-end and make no assumptions on the length of time a firm can have outstanding coverage before it is considered stale. This simplifies the propensity score matching but may affect the firms (37 percent of our sample) whose fiscal year does not end in December. In robustness checks, we find that our results are qualitatively unaffected by the use of calendar year.

sample are listed on NASDAQ (71 percent) and are not recent IPOs. Fewer than 11 percent of these firms have been listed for less than three years. The median trading age is about eight years.

The data used in this paper come from multiple sources. Stock returns, bid-ask spreads, and trading volume data are obtained from CRSP, accounting data from Compustat, institutional holdings from CDA/Spectrum Institutional 13f Holdings, and analyst recommendations and earnings forecasts from I/B/E/S. To classify analysts' employers, we use firm websites, Factiva, Businessweek, and Nelson's Research Directory.

Figure 1 shows the evolution of sample firms by year from 1984 to 2008, and compares the number of previously covered firms that receive no analyst coverage in a given year to the number of firms that analysts actually cover in that year. We apply the same criteria used to screen our sample firms to the universe of covered firms on I/B/E/S. The covered firms are thus U.S. firms whose ordinary shares are publicly traded on the main domestic exchanges at the end of the year when they receive analyst coverage.

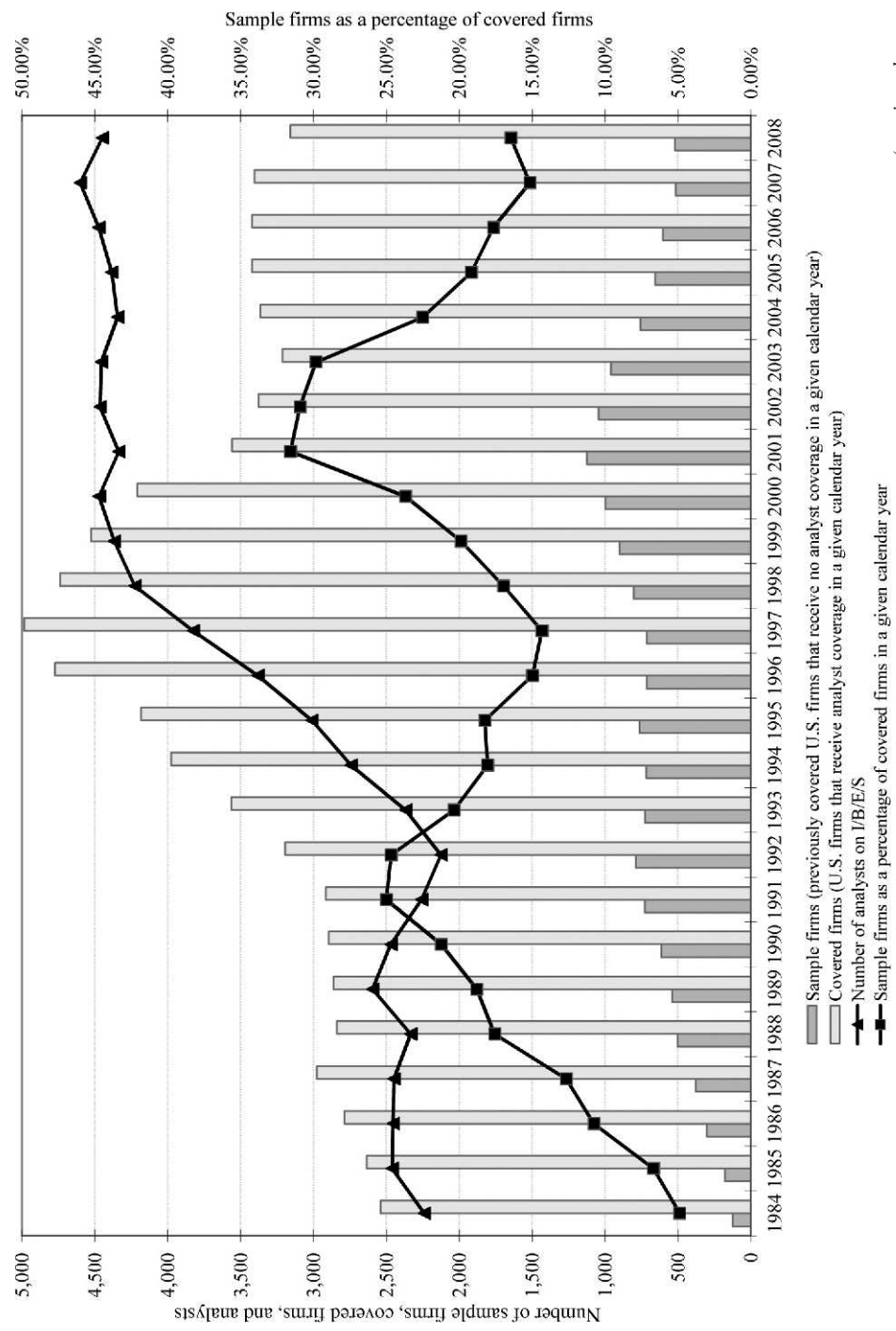
Over the 25-year period, the number of firms that lose coverage appears to rise and fall with the business cycle, with more firms being dropped by analysts during economic contractions and fewer firms being dropped during economic booms. Since our sample is restricted to firms that continue to be traded publicly at the end of the year when coverage is absent, the loss of coverage in this period is not simply due to firms failing or being delisted. It may seem plausible that more analysts leave the business during contractions than during booms, resulting in a mechanical relation between business cycle and coverage losses. However, Figure 1 shows that the number of analysts on I/B/E/S has stayed relatively stable in the 2000s. An alternative hypothesis is that, during contractions, analysts are more likely to work shorter hours, selectively paying more attention to those firms that generate significant fees, while dropping other firms from their coverage universe without replacement.⁶

Panel A of Table 1 categorizes our sample of 16,662 firm-year observations into three subperiods that coincide with different regulatory environments in which analysts operated from 1984 to 2008: (1) the pre-Reg FD subperiod (1984–2000); (2) the post-Reg FD subperiod (2001–2002) when most changes in analyst regulation occurred; and (3) the post-Reg AC subperiod (2003–2008). Before the regulatory change subperiod, an average of 617 firms lost coverage every year with each analyst covering an average of 13 firms. In contrast, after the regulatory change subperiod, 669 firms, on average, lose coverage annually while analysts cover an average of 10 firms each. Starting from 2001 therefore, more analysts have concentrated their attention on fewer firms.

In Panel B of Table 1, we sort the 16,662 sample observations by the number of consecutive years with and without analyst coverage. First, we determine the length of time that a sample firm has been covered before becoming an orphan as a fraction of years from the day of the first earnings estimate to the day of the last earnings estimate by any analyst on I/B/E/S. About 21 percent of sample firms fell out of analyst favor after only one year of coverage, while about 21 percent received continuing coverage for more than seven years. The median duration of analyst coverage for our treatment sample firms is three years. Second, at the end of a given calendar year, we categorize each firm-year observation by the number of consecutive years spent without analyst coverage. The duration of the loss of analyst coverage is negatively related to the number of years of coverage prior to the loss ($p = -0.06$). *Ex post*, the median sample firm remains an orphan for

⁶ Using the first two digits of the North American Industry Classification System (NAICS) to classify firms by industry, we test the hypothesis that sample firms and covered firms are from populations with the same distribution by year and industry. We find no significant difference in the distributions at the conventional levels, according to two-sample two-tailed Wilcoxon rank-sum tests. A large proportion of our sample firms are manufacturing (41 percent) or financial firms (17 percent), and they do not cluster in time. We find significantly different distributions only for the firms operating in the high-tech and Internet industry (p -value = 0.07). As defined in Loughran and Ritter (2004), these firms cluster around the end of the dotcom bubble but account for only 10 percent of the sample.

FIGURE 1
Sample by Year



(continued on next page)

FIGURE 1 (continued)

The figure plots the evolution in the number of sample firms, from 1984 to 2008. “Sample firms” are previously covered U.S. firms that receive no earnings estimates during a calendar year. “Covered firms” are U.S. firms that receive at least one analyst estimate during a calendar year. To be included in the analysis, the common stock of sample firms and covered firms must still be publicly traded on the main domestic exchanges (i.e., the New York Stock Exchange, American Exchange, and NASDAQ) at the end of a calendar year. The figure also displays the number of analysts on I/B/E/S and the number of sample firms as a percentage of covered firms in a given calendar year.

Data come from I/B/E/S Detail and CRSP databases.

three years before regaining coverage or being delisted. *Ex ante*, the distribution of our sample is monotonically decreasing with 4,836 firms receiving no coverage for the first year, 3,040 of these firms remaining uncovered for the second year in a row, while others regain analyst coverage or delist, and so on. This procedure is free from any look-ahead bias. At the end of each calendar year, market participants learn about the lack of analyst coverage on a firm and the duration of the coverage loss for the firm, up to that date.

Do Firms Lose Analyst Coverage Abruptly?

In Table 2, we report analyst earnings per share (EPS) estimates and recommendations on sample firms in the five years prior to year t , which is the first year when firms lose all analyst coverage. Since the level of the EPS is a firm-specific arbitrary number unrelated to the firm’s economic performance, we focus on changes in EPS. The mean EPS estimate declines steadily from \$0.58 in year $t-5$ to \$0.13 in year $t-1$. The annual changes are significant at the 1 percent level. Similarly, the mean industry-adjusted EPS estimate is $-\$0.59$ in year $t-5$ and drops significantly to $-\$1.05$ below the industry estimate in year $t-1$. The fact that the mean industry-adjusted estimate becomes increasingly negative over time indicates that analysts believe that sample firms are performing, on average, worse than the industry, not that the industry itself is out of favor. Recommendations (with strong buy = 1 and sell = 5) slowly worsen for the average sample firm from 2.05 in year $t-5$ to 2.42 in year $t-1$. Industry-adjusted recommendations show the same pattern.

The number of annual estimates for the average sample firm gradually decreases from 10 to 3 in the five years examined with a commensurate decrease in the number of analysts covering the firm. The quality of analyst coverage declines over time with mean analyst forecasting ability, which is proxied by the proportional mean absolute forecast error (PMAFE) for an analyst in a year (Clement 1999). It worsens sharply in year $t-1$, suggesting that superior analysts decide to stop coverage earlier. Both the proportion of Institutional Investor star analysts and the proportion of analysts affiliated with investment banks decrease over the five-year period.

In contrast, the proportions of analysts employed by independent brokers or paid-for research firms gradually increase. In our data, 352 distinct firms purchase coverage from 15 paid-for research firms, such as Taglich Brothers Inc., J. M. Dutton & Associates, and Spelman Financial. Overall, Table 2 indicates that losing coverage is not a precipitous process that is triggered by some external shock; instead, sample firms experience a gradual loss of analyst interest.

Which Firms Lose Coverage?

We model the analyst’s decision to drop coverage on a firm as a function of the firm’s operating and stock performance, and its potential for investor interest. McNichols and O’Brien (1997) argue that analysts prefer to report good news than bad news because good news is easier to sell to a broader audience. This implies that, instead of downgrading, analysts are likely to drop

TABLE 1
Sample by Subperiods and Number of Years with (without) Analyst Coverage

Panel A: Subperiods

Subperiod	Sample Firm-Year Observations	Average Number of Sample Firms Per Year	Average Number of Covered Firms Per Year	Average Number of Analysts Per Year	Average Number of Covered Firms Per Analyst
Pre-Reg FD, 1984–2000	10,482	617	3,565	2,928	13.23
Post-Reg FD, 2001–2002	2,168	1,084	3,468	4,400	8.95
Post-Reg AC, 2003–2008	4,012	669	3,331	4,451	9.63
All sample period	16,662	666	3,501	3,411	12.02

Panel B: Number of Years with (without) Analyst Coverage

Number of Years with Analyst Coverage	Sample Firm-Year Observations	As % of All Sample Firm-Year Observations	Number of Years without Analyst Coverage	Sample Firm-Year Observations	As % of All Sample Firm-Year Observations
≤ 1 year	3,571	21.43%	1st year	4,836	29.02%
1 to 3 years	4,737	28.43%	2nd year	3,040	18.25%
3 to 7 years	4,851	29.11%	3rd year	2,168	13.01%
> 7 years	3,503	21.03%	4th year and beyond	6,618	39.72%
Total	16,662	100.00%	Total	16,662	100.00%

Panel A categorizes the 16,662 sample firm-year observations by subperiods that coincide with different regulatory environments in which analysts operated from 1984 through 2008. Also, Panel A reports the average number of sample firms, covered firms, and analysts per year by subperiods. In Panel B, sample observations are categorized by the number of subsequent years during which sample firms consistently received analyst coverage. The duration of analyst coverage for a firm is defined as the fraction of years between the day of the first report and the day of the last report on that firm by any analyst on I/B/E/S. Sample observations are also categorized by the number of subsequent years during which sample firms receive no analyst coverage. To illustrate the methodology, consider a sample firm *i* that loses coverage in 1994 for the first year and regains it in 1997. *Ex ante*, market participants can only observe the number of years spent without coverage at the end of every year *t*, sequentially, year by year. Our sample contains three firm-year observations of firm *i*: *i*-1994, *i*-1995, and *i*-1996. As we sort these observations by the number of years without analyst coverage, observation *i*-1994 is categorized as “1st year without analyst coverage”; observation *i*-1995 as “2nd year without analyst coverage”; and observation *i*-1996 as “3rd year without analyst coverage.”

Data come from I/B/E/S Detail and CRSP databases.

coverage of firms that are performing poorly or that they believe will perform poorly. Similarly, factors that promote investor interest are also likely to generate revenue for the analyst’s employer, either trading (Irvine 2001, 2004) or underwriting revenue (Clarke et al. 2007). Analysts may potentially consider dropping coverage of firms that are unable to generate these types of revenue.

The performance indicators include sales growth rate, operating cash flow on assets, and return on assets (ROA). Following Zmijewski (1984), we compute total liabilities/total assets as a predictor of financial distress. We also calculate Ohlson’s O-score (Ohlson 1980) as a predictor of bankruptcy with higher values indicating greater distress risk. Shumway (2001) finds that market-driven indicators better predict bankruptcy events than accounting ratios, and we therefore include excess

TABLE 2
Analyst Earnings Estimates and Recommendations prior to the First Year
without Analyst Coverage

Year $t-n$	Levels			Changes	
	$t-5$	$t-3$	$t-1$	$t-5$ to $t-1$	$t-3$ to $t-1$
EPS estimate	0.58	0.37	0.13	-0.47	-0.33
Industry-adjusted EPS estimate	-0.59	-0.82	-1.05	-0.43	-0.29
Recommendation	2.05	2.14	2.42	0.72	0.65
Industry-adjusted recommendation	-0.10	-0.01†	0.23	-0.10	-0.01
Number of estimates	10	8	3	-6	-4
Number of analysts	4	3	2	-2	-1
Analyst forecasting ability, PMAFE (%)	-1.38	-1.37	2.13	4.17	3.65
Proportion of star analysts (%)	9.31	8.37	6.36	-0.44	-0.20†
Proportion of analysts affiliated with					
investment banks (%)	90.89	90.11	86.15	-3.13	-2.25
independent brokers (%)	8.40	8.94	11.70	3.07	1.77
paid-for research firms (%)	0.71	0.95	2.15	0.32†	0.28†

All mean values are different from zero at the 1 percent level according to the standard one-sample, two-tailed t-test, except for the † values, which are not significantly different from zero at the conventional levels (p -value > 0.10). Mean analyst earnings-per-share (EPS) estimates and mean recommendations for sample firms are determined in the five-year period prior to the first year without analyst coverage. Industry-adjusted EPS estimate is the mean difference between sample EPS estimate and the mean industry EPS estimate. Industry is defined using the two-digit NAICS code. Recommendations range from 1 = strong buy to 5 = sell. Industry-adjusted recommendation is the mean difference between the sample recommendation and the mean industry recommendation. The EPS estimates come from the I/B/E/S Detail tapes, while recommendations come from the I/B/E/S Recommendation tapes. Earnings estimates are available on the I/B/E/S tapes starting 1981, while analyst recommendations are available starting 1994. Number of estimates is the mean number of EPS estimates issued on sample firms in year $t-n$. Number of analysts is the mean number of analysts issuing at least one report on the sample firms in year $t-n$. Analyst forecasting ability is determined as the average proportional mean absolute forecast error (PMAFE) across all the stocks covered by an analyst i in a given year. Following Clement (1999), the PMAFE is defined as the percent deviation of the absolute forecast error for analyst i on stock j in a year from the mean absolute forecast error made by all analysts covering stock j in that year. Negative (positive) values of the average PMAFE represent better (worse) than average performance. Star analysts are the analysts identified once a year by Institutional Investor as members of the All-American Research Team. Firms that employ analysts are assigned to one of the following categories: (1) investment bank, if analysts' employer is affiliated with an investment bank; (2) independent broker, if analysts' employer has no investment banking affiliation and provides research that is tied to brokerage services and/or institutional trading; or (3) paid-for research firm, if analysts' employer provides research that is directly or indirectly paid by covered firms.

return and idiosyncratic volatility. Finally, since the performance indicators are correlated, we report a composite performance index as the first principal component of the performance variables.

Our measures of potential investor interest and consequent revenue generation for the analyst's employer include market capitalization, book-to-market (B/M) ratio, trading volume, bid-ask spread, total institutional holdings, number of institutions, and the number of M&A deals and equity issues in which the firm was involved in the last three years. Collins et al. (1987) note that firm size can serve as a proxy for the potential to generate brokerage revenue, since larger firms are more visible, raise larger amounts of capital, have more traded shares, and engage in larger acquisitions. Jegadeesh et al. (2004) argue that analysts have significant economic incentives to endorse glamour firms with low book-to-market ratios, because these firms tend to be widely held by institutional clients. As in Bhushan (1989), we compute institutional holdings and the number of

institutions holding a stock as a measure of buy-side interest in that stock. We also determine a composite index for investor interest. Appendix A presents more information about how we compute each proxy.

Table 3 reports median and mean performance indicators and investor interest characteristics for sample and covered firms in year $t-1$. All variables are winsorized at the 1 percent and 99 percent levels. Given that the loss of analyst coverage is defined on an annual basis, year t marks the year when the firm is not covered by any analyst. More specifically, year t can denote the first year the firm spends without analyst coverage, the second year, and so on. We focus on median values, although our inferences on means are qualitatively similar. All median (mean) differences between sample and covered firms in the table are significantly different from zero at the two-tailed 1 percent level, using a two-sample Wilcoxon rank-sum test (two-sample t -test).

In the year prior to losing analyst coverage, the median sample firm is significantly less profitable and less financially stable than the median firm covered on I/B/E/S. The median composite performance index is -20.11 , compared to 19.41 for covered firms. The individual factors that compose the performance index are also significantly worse than covered firms. Sample stocks are “losers” in terms of stock performance, earning significantly lower excess returns with greater

TABLE 3
Performance Indicators and Investor Interest Characteristics for Sample Firms and Covered Firms

	Sample Firm-Year Observations			Covered Firm-Year Observations		
	Median	Mean	n	Median	Mean	n
Performance Indicators						
Sales growth (%)	0.84	10.38	14,292	5.96	11.56	76,347
Cash flow/total assets (%)	2.53	-5.18	14,482	7.45	4.14	75,625
ROA (%)	0.51	-10.61	14,647	3.35	-0.28	78,779
Total liabilities/total assets	0.55	0.56	14,652	0.53	0.53	78,615
Ohlson's O-score	0.33	0.42	14,478	-1.04	-1.03	77,606
Excess return (%)	-6.39	-3.38	14,732	2.08	4.90	80,237
Stock volatility (%)	12.69	15.20	14,689	9.35	11.20	79,278
Performance index (%)	-20.11	-40.57	13,599	19.41	11.29	72,131
Investor Interest Characteristics						
Market capitalization (\$ millions)	27.91	104.40	14,782	243.97	1,566.65	79,786
B/M ratio	0.78	0.86	14,569	0.51	0.59	78,769
Trading volume (millions of shares)	1.75	8.85	14,744	11.19	57.25	80,251
Bid-ask spread (%)	4.55	6.11	12,983	1.69	2.45	67,574
Total institutional holdings (%)	11.41	17.24	15,115	37.54	40.61	80,401
Number of institutions	9	13.41	15,052	40	82.65	80,171
Number of M&A deals	0	0.80	16,662	1	1.83	87,516
Number of issues	0	0.05	16,662	0	0.25	87,516
Investor interest index	-0.72	-0.74	12,387	0.13	0.13	60,909

Year t marks the calendar year during which sample firms receive no analyst coverage. All performance indicators and investor interest characteristics are determined at the end of year $t-1$. Accounting data come from the Compustat Fundamentals Annual database. Variables are winsorized at the 1 percent and 99 percent levels. All median (mean) differences between sample and covered firms in the table are significantly different from zero at the two-tailed 1 percent level, using a two-sample Wilcoxon rank-sum test (two-sample t -test).

volatility than covered stocks. A comparison between the distributions of performance indicators for sample firms and the quintile breakpoints of performance indicators for covered firms shows that the sample firms are disproportionately represented in the worst quintiles of performance.

The sample firms are typically small-cap firms with higher median B/M ratios and bid-ask spreads, and lower trading volume than covered firms. Sample stocks are not heavily traded, with annual trading volume of 1.75 million shares for the median sample stock. Both institutional holdings and the number of institutions holding sample firms' stock are significantly lower. The median firm in our sample engages in no M&A activity. This is also true for the typical firm covered on I/B/E/S. The mean M&A and issue activity—both number of deals and dollar amounts—of sample firms is considerably lower than the mean activity of covered firms. The overall investor interest index is also significantly lower than for the median covered firm. Again, most investor interest characteristics of sample firms fall into the worst quintiles relative to covered firms.

We next use a logistic regression to model the probability that analysts decide not to cover a firm. In models 1 to 4 of Table 4, the dependent variable is a binary variable that is equal to 1 in year t when a firm loses analyst coverage, or 0 otherwise. The independent variables are the performance indicators and investor interest characteristics from Table 3. Year, industry, and exchange fixed effects are included in each regression. Model 1 suggests that, in the 1984–2008 sample period, the likelihood of losing analyst coverage is inversely related to sales growth, cash flow/total assets, ROA, and excess return. It is positively related to financial distress proxies, such as debt ratio, Ohlson's O-score, and idiosyncratic volatility. The investor interest characteristics also significantly explain the probability of losing analyst coverage: market capitalization, trading volume, institutional holdings, number of institutions, the number of M&A deals, and the number of issues are all negatively related, while B/M ratio and bid-ask spread are positively related to the probability of losing coverage. In untabulated regressions, both the composite performance index and the composite investor interest index are significantly negatively related to the probability of losing coverage.

In models 2 to 4, we split the 25-year sample period into the three regulatory subperiods. In the pre-Reg FD subperiod, all independent variables are significant predictors. In the post-Reg FD subperiod however, the probability of losing coverage is mostly driven by a firm's potential for investor interest. While the coefficients of sales growth and the Ohlson's O-score are significant in the post-Reg AC subperiod, it is mainly a firm's potential to generate brokerage business, rather than its performance, that may induce analysts to drop coverage.⁷

To identify the control firms for model 5, we use the PSM methodology (Villalonga 2004; Cooper et al. 2005). This matching method has the advantage of identifying a control group of firms screened along multiple dimensions. Propensity scores are computed by running the logistic regression model 1 of Table 4 over 15 independent variables (sales growth, cash flow/total assets, ROA, total liabilities/total assets, Ohlson's O-score, excess return, stock volatility, market capitalization, B/M ratio, trading volume, bid-ask spread, total institutional holdings, number of institutions, number of M&A deals, and number of issues) computed in year $t-1$, along with year, industry, and exchange fixed effects. Using a one-to-one nearest available neighbor matching within calipers defined by propensity scores (Rosenbaum and Rubin 1985), we find matches for 8,732 of the 16,662 sample firm-year observations. The inability to find a control firm is due to missing variable values or the lack of overlap between the propensity score ranges for sample and control firms.

To verify that our matching procedure results in a number of good matches, we run two-tailed Wilcoxon rank-sum tests on the equality between the median values of each explanatory variable

⁷ When we run logit regressions with only the set of performance indicators across the three subperiods, Wald Chi-square tests significantly reject the hypothesis that all predicted coefficients are simultaneously equal to 0.

TABLE 4
Logistic Regression for the Probability that a Firm Will Lose Analyst Coverage

	Before Matching				After Matching
	All Sample Period (1)	Pre-Reg. FD, 1984–2000 (2)	Post-Reg. FD, 2001–2002 (3)	Post-Reg. AC, 2003–2008 (4)	All Sample Period (5)
Intercept	−0.44 (−0.89)	−0.19 (−0.38)	2.14** (2.09)	1.63** (2.22)	−0.19 (−0.32)
Performance Indicators					
Sales growth _{<i>t</i>−1}	−0.12*** (−6.03)	−0.12*** (−4.82)	−0.07 (−1.41)	−0.10*** (−2.82)	0.02 (0.94)
Cash flow/Total assets _{<i>t</i>−1}	−0.43** (−1.93)	−0.56* (−1.90)	−0.24 (−0.45)	−0.41 (−0.95)	0.04 (0.16)
ROA _{<i>t</i>−1}	−0.72*** (−3.63)	−1.09*** (−3.92)	−0.81* (−1.83)	−0.30 (−0.79)	0.10 (0.48)
Total liabilities _{<i>t</i>−1} /Total assets _{<i>t</i>−1}	0.74*** (8.90)	1.07*** (9.38)	0.30 (1.42)	0.30* (1.79)	0.05 (0.49)
Ohlson’s O-score _{<i>t</i>−1}	0.08*** (7.02)	0.11*** (6.96)	0.05* (1.67)	0.06*** (2.59)	−0.01 (−0.74)
Excess returns _{<i>t</i>−1}	−0.03 (−1.17)	−0.10*** (−2.66)	−0.03 (−0.40)	−0.06 (−0.96)	0.05 (1.40)
Stock volatility _{<i>t</i>−1}	1.75*** (7.61)	2.76*** (8.78)	−0.20 (−0.36)	0.55 (1.12)	−0.37 (−1.36)
Investor Interest Characteristics					
Ln(Market capitalization _{<i>t</i>−1})	−0.64*** (−29.04)	−0.55*** (−20.07)	−0.81*** (−12.66)	−0.80*** (−15.68)	−0.04* (−1.80)
B/M ratio _{<i>t</i>−1}	0.17*** (7.99)	0.26*** (8.88)	0.01 (0.15)	0.11** (2.23)	−0.01 (−0.51)
Ln(1 + Trading volume _{<i>t</i>−1})	−0.38*** (−22.70)	−0.38*** (−16.53)	−0.32*** (−6.90)	−0.38*** (−11.84)	0.01 (0.69)
Bid-ask spread _{<i>t</i>−1}	3.96*** (7.92)	3.67*** (6.61)	4.60** (2.41)	9.71*** (3.43)	0.50 (0.91)
Total institutional holdings _{<i>t</i>−1}	−1.52*** (−15.87)	−1.45*** (−11.71)	−1.34*** (−4.89)	−1.61*** (−8.81)	0.17 (1.60)
Number of institutions _{<i>t</i>−1}	−0.01*** (−4.91)	−0.01*** (−3.75)	−0.01*** (−2.47)	−0.00 (−1.46)	0.00 (1.12)
Number of M&A deals _{<i>t</i>−1}	−0.05*** (−6.30)	−0.06*** (−5.48)	−0.01 (−0.29)	−0.08*** (−4.06)	−0.01 (−0.95)
Number of issues _{<i>t</i>−1}	−0.61*** (−11.82)	−0.63*** (−9.91)	−0.35*** (−2.77)	−0.77*** (−6.40)	0.04 (0.61)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo-R ²	0.3747	0.3361	0.4375	0.4443	0.0028
Wald χ^2	11,236.34	6,540.85	1,506.84	3,396.72	66.17
Prob. > χ^2	0.0000	0.0000	0.0000	0.0000	0.3682
Number of observations	72,960	43,500	8,274	21,186	17,464

*, **, *** Indicate that coefficients are different from 0 at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively.

(continued on next page)

TABLE 4 (continued)

This table reports logistic regression models for the probability that a firm will lose analyst coverage in year t . In models 1–4, the dependent variable is a dummy variable equal to 1 for the 16,662 sample firm-year observations that lost analyst coverage in year t , and 0 for the universe of 87,516 covered firm-year observations. In model 5, for each sample firm, we select a covered firm matched on performance indicators and investor interest characteristics in year $t-1$. The propensity score matching method is a one-to-one nearest available neighbor matching within calipers, defined as 0.25 of the standard deviation of the propensity scores between the two groups. We find matches for 8,732 sample firm-year observations. Variables are winsorized at the 1 percent and 99 percent levels. Year, industry, and exchange fixed effects are included in all regression models. White's heteroscedasticity-adjusted Z-statistics are in parentheses.

for the sample and control firms. We cannot reject the null hypotheses of equality between medians for any of the variables at conventional significance levels (the lowest p-value is 0.19). We also run the logistic regression with the dependent variable equal to 1 when a firm is not covered in year t , or 0 when a firm is covered in year t , matched to a sample firm in year $t-1$. The results for model 5 of Table 4 show that none of the variables are significant and the pseudo- R^2 approximates zero, implying that our control firm selection procedures are effective. In the next section, we use this control group to examine the difference-in-differences effects of losing analyst coverage.

V. CONSEQUENCES OF LOSING ANALYST COVERAGE

After the firm loses all analyst coverage in year t , we compute the median differences in performance and investor interest between a sample firm and its control firm, over the five years following year t , from year $t+1$ to year $t+5$.⁸ Since the trends in performance and investor interest are consistent across the five years, for conciseness, we report values for years $t+1$, $t+3$, and $t+5$ only.

Firm Performance and Investor Interest by Subperiods

Panel A of Table 5 reports differences in firm performance indicators and investor interest characteristics from year $t+1$ to year $t+5$, categorized by subperiods. Specifically, year t in which a firm loses analyst coverage is sorted into one of the three regulatory subperiods. The sample firms that lose coverage in the pre-Reg FD subperiod exhibit a significant deterioration in their performance indicators over the five years after losing coverage. Cash flow/total assets, total liabilities/total assets, and the composite performance index all consistently worsen relative to the control firms. These results suggest that analysts indeed have private information on the performance prospects of these firms and convey it to investors through their coverage decisions. In addition, investor interest characteristics, such as market capitalization, trading volume, bid-ask spread, institutional holdings, and number of institutions, significantly worsen relative to covered peers.⁹ Given that the sample and control firms are matched on *ex ante* institutional presence, the drop in institutional holdings is likely to be driven by the loss in analyst coverage, consistent with O'Brien and Bhushan (1990).

⁸ As described in Table 1, sample firm i -1994 is matched to a covered firm j -1994, based on information available in year 1993; sample firm i -1995 is matched to a covered firm z -1995, based on information available in 1994, and so on. The performance and investor interest indicators for observation i -1994 are observed in the five years following year t , in 1995 (year $t+1$), 1996 (year $t+2$), 1997 (year $t+3$), 1998 (year $t+4$), and 1999 (year $t+5$). This procedure is not only free from any look-ahead bias, but also avoids potential issues associated with overlapping periods since sample firms are re-matched to control firms every year, based on the information available up to that date.

⁹ The median differences in number of M&A deals and number of issues between sample and control firms are insignificantly different from zero in all years at the conventional levels. For brevity, therefore, we do not tabulate the median differences for these variables.

TABLE 5
Differences in Performance Indicators and Investor Interest Characteristics after Losing Analyst Coverage
Categorized by Subperiods and Number of Years with (without) Analyst Coverage

Panel A: Subperiods

Year $t+n$	Pre-Reg FD, 1984–2000				Post-Reg FD, 2001–2002				Post-Reg AC, 2003–2008			
	$t+1$	$t+3$	$t+5$		$t+1$	$t+3$	$t+5$		$t+1$	$t+3$	$t+5$	
Performance Indicators												
Sales growth (%)	-0.24	0.62	-1.09		-2.70**	-2.13*	1.50		-1.82	-0.19	-2.14	
	-1.50	1.44	-1.32		-2.21	-1.81	0.42		-1.25	-0.38	-0.75	
Cash flow/Total assets (%)	-1.02***	-0.82***	-1.06***		-0.30	-0.24	0.79		-0.74*	0.28	-1.45	
	-4.02	-3.48	-2.50		-0.77	-0.65	1.44		-1.77	0.53	-0.75	
ROA (%)	-0.15*	-0.20	-0.03		-0.23	-0.04	1.07**		-0.52	0.22	-1.58	
	-1.72	-1.03	-0.65		-0.78	-0.42	2.00		-1.72	0.09	-1.10	
Total liabilities/Total assets	0.06***	0.07***	0.05***		0.00	-0.01	-0.01		0.00	-0.01	0.06	
	25.66	20.96	17.61		0.28	-0.23	-0.85		0.63	-1.31	1.13	
Ohlson's O-score	0.07	0.10*	0.17*		-0.20*	-0.20	-0.38*		0.05	-0.07	0.74	
	1.52	1.92	1.86		-1.77	-0.82	-1.82		1.00	-0.08	1.44	
Excess return (%)	3.64**	0.01	0.19		-0.28	-3.24	4.08*		2.13*	0.35	17.96	
	2.39	0.42	0.89		-0.13	-0.80	1.86		1.82	0.96	0.99	
Stock volatility (%)	0.00	-0.32	-0.35		-0.09	0.13	0.37		-0.23	0.41	-0.30	
	0.50	-0.62	-1.17		-0.03	0.17	1.03		-0.49	0.61	-0.78	
Performance index (%)	-1.24***	-1.45**	-2.62		3.91	4.98	13.75**		1.68	1.88	-9.86	
	-2.93	-2.09	-0.58		0.63	0.46	2.15		0.15	0.02	-0.41	
Investor Interest Characteristics												
Market capitalization	-3.53***	-4.67***	-6.41***		-8.38***	-21.25***	-12.75		-11.95***	-11.71**	-18.48**	
	-5.47	-4.36	-3.56		-3.97	-3.36	-1.29		-3.56	-2.24	-2.03	
B/M ratio	0.04***	0.02	0.03		0.02	0.03	-0.05		0.02	0.01	-0.15*	
	3.06	1.10	1.56		1.28	1.16	-1.08		1.21	0.39	-1.82	
Trading volume	-0.30***	-0.36***	-0.67***		-0.40***	-0.98***	-2.26***		-1.38***	-1.08***	-3.54***	
	-7.30	-6.55	-6.67		-3.98	-3.05	-3.36		-7.39	-4.17	-3.06	
Bid-ask spread (%)	0.53***	0.24***	0.27***		0.25***	0.13***	0.09***		0.23***	0.11***	0.25***	
	8.73	4.38	4.76		4.69	3.98	2.45		8.51	2.78	2.64	

(continued on next page)

TABLE 5 (continued)

Year $t+n$	Pre-Reg FD, 1984–2000			Post-Reg FD, 2001–2002			Post-Reg AC, 2003–2008		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Total institutional holdings (%)	-2.32***	-2.69***	-3.73***	-3.02***	-5.08***	-3.58***	-3.38***	-3.05***	-4.58***
	-9.26	-8.20	-7.55	-4.25	-4.58	-2.49	-5.46	-3.57	-2.49
Number of institutions	-1***	-1***	-2***	-2***	-4***	-7***	-2***	-4***	-8***
	-9.85	-7.82	-6.97	-5.64	-4.58	-3.34	-7.17	-4.66	-3.05
Investor interest index	-0.12***	-0.15***	-0.19***	-0.12***	-0.11***	-0.17***	-0.11***	-0.11***	-0.51***
	-11.92	-9.00	-7.21	-6.10	-3.42	-2.60	-6.93	-2.93	-3.02

Panel B: Number of Years with Analyst Coverage

Year $t+n$	Firms that Lose Analyst Coverage after Being Covered for Three Years or Less			More Than Three Years		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Performance Indicators						
Sales growth (%)	-0.98	-0.36	-1.62	-2.12***	-1.21	0.34
	-0.17	-0.19	-1.03	-3.13	-1.01	0.13
Cash flow/Total assets (%)	-0.07	0.11	-1.08**	-0.49***	-0.19	-0.27
	-0.91	0.99	-1.99	-3.06	-1.45	-0.89
ROA (%)	-0.03	0.13	-0.36**	-0.43**	0.12	-0.12
	-0.46	0.40	-1.95	-2.13	0.29	-0.02
Total liabilities/Total assets	0.00	0.00	0.00	-0.01	-0.02	-0.01
	1.09	0.82	0.46	-1.15	-1.68	-1.06
Ohlson's O-score	-0.03	0.05	0.13*	-0.01	0.01	-0.01
	-0.52	1.05	1.90	-0.85	0.56	-0.43
Excess return (%)	1.82	1.29	-1.57	1.39	-0.30	1.87
	1.03	0.24	-0.14	1.54	-0.95	1.53
Stock volatility (%)	-0.06	-0.15	0.48**	-0.15	-0.14	-0.36
	-0.54	-0.51	2.00	-0.01	-0.04	-0.96
Performance index (%)	0.94	1.43	-2.45	0.96	1.64	4.78
	0.33	0.25	-1.43	0.16	0.65	1.54

(continued on next page)

TABLE 5 (continued)

Firms that Lose Analyst Coverage after Being Covered for

Year $t+n$	Three Years or Less			More Than Three Years		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Investor Interest Characteristics						
Market capitalization	-3.56*** -4.74	-4.40*** -3.85	-5.30*** -3.68	-5.36*** -4.60	-3.36** -2.47	0.30 0.74
B/M ratio	0.03 1.49	-0.03 -1.37	-0.05 -1.48	0.04*** 3.31	0.02 0.43	0.00 0.72
Trading volume	-0.31*** -7.90	-0.35*** -4.78	-0.36*** -2.97	-0.34*** -5.76	-0.38*** -6.09	-0.57*** -4.12
Bid-ask spread (%)	0.28*** 8.80	0.15*** 5.21	0.10*** 3.15	0.32*** 5.74	0.30*** 4.59	0.32*** 4.57
Total institutional holdings (%)	-1.58*** -6.54	-2.70*** -7.39	-2.68*** -4.31	-2.46*** -8.06	-3.45*** -6.94	-5.32*** -7.65
Number of institutions	-1*** -5.84	-1*** -6.25	-1*** -3.69	-2*** -9.77	-1*** -5.75	-3*** -6.30
Investor interest index	-0.11*** -11.37	-0.12*** -7.51	-0.10*** -4.03	-0.13*** -9.89	-0.12*** -6.54	-0.19*** -5.93

Panel C: Number of Years without Analyst Coverage

Firms that Lose Analyst Coverage for

Year $t+n$	1st Year		2nd Year and Beyond		
	$t+1$	$t+3$	$t+1$	$t+3$	$t+5$
Performance Indicators					
Sales growth (%)	-2.17** -2.07	-1.02 -0.81	-1.63 -1.39	0.14 0.36	-0.16 -0.80
Cash flow/Total assets (%)	-2.11*** -6.35	-1.24*** -3.99	-0.04 -0.32	-0.08 -0.67	0.37 0.07
ROA (%)	-0.76 -0.40	-0.90 -0.70	0.18 1.50	0.01 0.97	0.36 1.21

(continued on next page)

TABLE 5 (continued)
Firms that Lose Analyst Coverage for

Year $t+n$	1st Year			2nd Year and Beyond		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Total liabilities/Total assets	0.00	-0.02	-0.01	-0.02	-0.01	-0.01
Ohlson's O-score	1.13	-0.42	-0.32	-1.63	-1.53	-0.81
Excess return (%)	0.31***	0.30***	0.39***	-0.11*	-0.02	0.05
	4.19	3.43	3.37	-1.79	-0.11	0.70
	2.59**	-0.30	5.58	0.61	0.18	1.52
	1.93	-0.23	1.58	1.14	0.81	0.52
Stock volatility (%)	0.89***	0.64**	0.86***	-0.78***	-0.51***	-0.51*
	5.36	2.17	3.45	-3.45	-2.66	-1.72
Performance index (%)	-10.58***	-1.97**	-4.32**	3.58	2.74	1.60
	-5.16	-2.10	-2.20	1.55	1.17	1.42
Investor Interest Characteristics						
Market capitalization	-12.13***	-11.92***	-24.51***	-1.78***	-3.34***	-4.42***
	-9.06	-5.29	-5.21	-3.11	-3.14	-2.76
B/M ratio	0.03	-0.03	-0.03	0.04***	0.03*	0.00
	1.23	-0.92	-1.21	3.66	1.72	0.05
Trading volume	-0.24***	-0.22**	-0.03*	-0.49***	-0.61***	-0.60***
	-3.17	-2.27	-1.73	-11.67	-9.03	-6.37
Bid-ask spread (%)	0.52***	0.22***	0.19***	0.23***	0.27***	0.14***
	9.81	4.61	4.03	6.76	6.63	3.13
Total institutional holdings (%)	-3.97***	-4.29***	-4.61***	-1.22***	-2.89***	-4.32***
	-8.73	-6.87	-5.96	-6.53	-7.96	-7.18
Number of institutions	-2***	-3***	-3***	-1***	-1***	-2***
	-10.60	-7.26	-5.65	-7.20	-7.60	-5.77
Investor interest index	-0.15***	-0.14***	-0.18***	-0.09***	-0.12***	-0.16***
	-10.82	-5.97	-4.49	-11.99	-9.52	-7.11

*, **, *** Indicate that median values are different from zero at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively, according to the Wilcoxon matched-pairs signed-ranks test.

This table reports median differences in performance indicators and investor interest characteristics between sample firms and control firms, which are covered firms matched on performance indicators and investor interest characteristics in year $t-1$. Year t marks the calendar year when sample firms receive no analyst coverage. Z-statistics are shown in italic.

The pattern shifts dramatically after the regulatory changes. Starting from 2001, with the exception of sales growth, none of the performance indicators of sample firms are significantly different from their covered peers after the loss of analyst coverage. Sales growth significantly worsens for the sample firms (at the 5 percent level), but only in year $t+1$. The investor interest characteristics of sample firms continue to be significantly worse than those for covered peers.

Because it takes time for analyst coverage to add value to a firm, the negative effects of losing coverage might be greater for a firm that has been covered for a longer period. We therefore categorize sample firms depending on whether they had more than three years with analyst coverage before becoming orphans, where three years is the median duration of analyst coverage for the sample. In Panel B of Table 5, firms that lose coverage after having been covered for three years or less exhibit no significant subsequent declines in performance. Firms that have been covered longer than the median do exhibit a decline in sales growth, cash flow/total assets, and ROA in the first two years after the loss of coverage. The effects on performance are consistent with the hypothesis that the longer analysts choose to cover a firm, the more firm-specific information they generate. In contrast, the deterioration in investor interest characteristics is largely similar across both subsamples.

In Panel C of Table 5, we report performance indicators and investor interest characteristics by the number of years without analyst coverage. Performance indicators appear to be significantly worse than covered peers only for the first year without analyst coverage. In subsequent years, the performance is largely in line with their peers, the only exception being the difference in idiosyncratic volatility that is lower for sample firms. Again, investor interest characteristics are worse in all years following the loss of analyst coverage for both subsamples.

Overall, our results in Table 5 suggest that, before the changes in analyst regulation, analysts added value to firms by communicating private information to investors and by increasing investor recognition. The informational advantage was larger for firms that analysts had been covering for a longer period of time. After the regulatory changes, analysts' decisions to drop coverage on a firm are unlikely to convey private information about the firm's performance, but the orphaned firms continue to experience a significant decrease in their stock liquidity.

Firm Performance and Investor Interest by Analyst Characteristics

Table 6 analyzes whether the effects on a firm's performance and investor interest affected by the characteristics of the analyst(s) who decide to drop coverage on that firm. The analyst characteristics we examine are the number, type, and quality of the analyst(s) who last covered the firm in year $t-1$. Year t indicates the first year when a firm loses analyst coverage. As in Table 5, for conciseness, we report results only for alternate years.

Panel A of Table 6 categorizes sample firms by the number of analysts in year $t-1$. As shown in Table 2, sample firms typically experience a gradual, rather than precipitous, loss of analyst interest. From year $t-1$ to year t , 67 percent of sample firms lose the coverage of one last analyst. Only 20 percent lose the coverage of two analysts simultaneously, 7 percent of three analysts, and 6 percent of four or more analysts. Investor interest, but not performance, deteriorates when only one analyst drops coverage. From year $t+1$ to year $t+5$, market capitalization, trading volume, bid-ask spread, institutional holdings, and number of institutions all significantly worsen. The effects on investor interest are generally smaller when two analysts drop coverage than when only one drops coverage, suggesting that the larger the number of analysts who simultaneously drop coverage, the more likely the drop is related to performance-related factors. Consistent with this interpretation, after a firm loses the coverage of two or more analysts simultaneously, it exhibits a decline in several performance indicators. For example, sales growth, cash flow/total assets, and ROA for the sample firms are significantly lower than the control firms at the 1 percent level,

TABLE 6

Differences in Performance Indicators and Investor Interest Characteristics after Losing Analyst Coverage Categorized by Analyst Characteristics

Panel A: Number of Analysts Who Last Covered Sample Firms

Year $t+n$	Firms that Lose the Coverage of 1 Analyst			Firms that Lose the Coverage of 2 or More Analysts		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Performance Indicators						
Sales growth (%)	-1.18 <i>-1.28</i>	-0.64 <i>-0.67</i>	-1.27 <i>-1.11</i>	-3.65*** <i>-3.74</i>	0.48 <i>0.72</i>	0.54 <i>1.15</i>
Cash flow/Total assets (%)	-0.26 <i>-1.26</i>	-0.57 <i>-1.63</i>	-0.17** <i>-2.05</i>	-1.41*** <i>-5.11</i>	-0.36** <i>-2.57</i>	-0.03 <i>-0.55</i>
ROA (%)	-0.04 <i>-0.04</i>	-0.24 <i>-0.36</i>	-0.38 <i>-1.24</i>	-1.13*** <i>-4.46</i>	-0.29 <i>-1.78</i>	0.14 <i>0.39</i>
Total liabilities/Total assets	-0.01 <i>-0.05</i>	-0.01 <i>-0.26</i>	0.00 <i>0.50</i>	-0.03* <i>-1.85</i>	-0.03** <i>-2.31</i>	-0.04** <i>-2.27</i>
Ohlson's O-score	0.00 <i>0.30</i>	0.07* <i>1.78</i>	0.22*** <i>3.03</i>	0.06 <i>1.12</i>	0.09 <i>0.96</i>	-0.04 <i>-0.02</i>
Excess return (%)	-0.40 <i>-0.66</i>	-0.23 <i>-0.12</i>	2.77 <i>1.21</i>	0.54 <i>1.67</i>	0.63 <i>1.27</i>	2.40 <i>0.60</i>
Stock volatility (%)	-0.70*** <i>-3.16</i>	-0.43*** <i>-2.80</i>	-0.24 <i>-0.90</i>	1.01*** <i>5.00</i>	0.51** <i>2.39</i>	0.63** <i>2.43</i>
Performance index (%)	0.27 <i>0.42</i>	2.14 <i>0.36</i>	0.74 <i>0.41</i>	-2.17** <i>-2.06</i>	0.96 <i>0.91</i>	0.05 <i>0.43</i>
Investor Interest Characteristics						
Market capitalization	-4.76*** <i>-7.40</i>	-6.49*** <i>-5.75</i>	-10.00*** <i>-5.28</i>	-5.31*** <i>-2.93</i>	-3.66 <i>-1.53</i>	-8.32 <i>-1.74</i>
B/M ratio	0.06*** <i>4.45</i>	0.02 <i>1.45</i>	0.01 <i>0.22</i>	-0.01 <i>-0.04</i>	-0.01 <i>-0.56</i>	-0.06 <i>-1.42</i>
Trading volume	-0.54*** <i>-12.80</i>	-0.67*** <i>-9.84</i>	-0.64*** <i>-7.21</i>	-0.15 <i>-1.59</i>	-0.02 <i>-1.14</i>	0.22 <i>0.30</i>
Bid-ask spread (%)	0.28*** <i>7.86</i>	0.28*** <i>6.50</i>	0.23*** <i>5.04</i>	0.36*** <i>8.32</i>	0.19*** <i>4.78</i>	0.04 <i>1.03</i>
Total institutional holdings (%)	-1.69*** <i>-8.54</i>	-3.88*** <i>-10.17</i>	-5.29*** <i>-9.51</i>	-2.92*** <i>-5.79</i>	-2.36*** <i>-3.62</i>	-2.47** <i>-2.35</i>
Number of institutions	-1*** <i>-10.86</i>	-2*** <i>-9.69</i>	-3*** <i>-8.20</i>	-1*** <i>-5.46</i>	-2*** <i>-4.28</i>	-1 <i>-2.15</i>
Investor interest index	-0.12*** <i>-14.83</i>	-0.15*** <i>-11.29</i>	-0.21*** <i>-8.78</i>	-0.09*** <i>-6.75</i>	-0.08*** <i>-3.38</i>	-0.05* <i>-1.89</i>

(continued on next page)

TABLE 6 (continued)

Panel B: Type of Analyst Who Last Covered Sample Firms

Year $t+n$	Firms that Lose Coverage of an Investment Bank Analyst			Firms that Lose Coverage of Other Analyst		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Performance Indicators						
Sales growth (%)	-1.51*** -2.62	-0.32 -0.12	-0.84 -0.48	-3.79* -1.85	-0.76 -0.69	-0.19 -0.36
Cash flow/Total assets (%)	-0.62*** -3.91	-0.47** -2.54	-0.18* -1.93	-0.48 -0.77	-0.73 -1.27	0.33 0.64
ROA (%)	-0.27** -2.53	-0.16 -0.88	-0.27 -1.33	-0.27 -0.35	-0.64 -1.36	0.17 0.04
Total liabilities/Total assets	-0.01 -0.62	-0.02 -1.23	-0.01 -0.93	-0.03 -1.62	0.00 0.97	0.00 0.08
Ohlson's O-score	0.04 1.13	0.09* 1.88	0.14** 2.27	-0.03 -0.42	0.01 0.71	0.02 1.16
Excess return (%)	1.64* 1.68	-0.33 -0.33	3.31 1.35	0.04 1.25	1.05 1.28	-0.02 -0.29
Stock volatility (%)	-0.17 -0.08	-0.27* -1.78	-0.01 -0.58	-0.51 -0.32	0.50* 1.77	0.18 0.06
Performance index (%)	-0.64 -1.27	0.35 0.10	0.82 0.09	0.96 0.94	-1.19 -0.38	-2.88 -0.60
Investor Interest Characteristics						
Market capitalization	-4.42*** -6.45	-5.51*** -4.77	-9.67*** -4.81	-6.70*** -4.80	-7.53*** -3.19	-5.65** -2.40
B/M ratio	0.04*** 3.39	0.00 0.39	-0.01 -1.03	0.04 1.47	0.04 1.40	0.04 0.89
Trading volume	-0.40*** -10.47	-0.46*** -8.24	-0.42*** -5.48	-0.43*** -4.52	-0.46*** -2.85	-0.52*** -2.83
Bid-ask spread (%)	0.34*** 10.32	0.26*** 7.54	0.15*** 3.97	0.22*** 4.17	0.22*** 2.93	0.32*** 3.19
Total institutional holdings (%)	-1.69*** -8.51	-2.97*** -9.06	-4.14*** -8.34	-3.54*** -6.43	-4.88*** -5.55	-6.55*** -4.18
Number of institutions	-1*** -10.92	-2*** -9.66	-2*** -7.36	-2*** -5.11	-2*** -3.98	-3*** -3.22
Investor interest index	-0.11*** -14.51	-0.13*** -10.32	-0.15*** -7.31	-0.12*** -6.88	-0.14*** -4.48	-0.25*** -4.44

Panel C: Quality of the Analyst Who Last Covered Sample Firms

Year $t+n$	Firms that Lose Coverage of Inferior Analyst			Firms that Lose Coverage of Superior Analyst		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Performance Indicators						
Sales growth (%)	-1.50 -1.47	-0.93 -0.98	-1.17 -1.15	-2.01** -2.09	0.30 0.73	-0.06 -0.73
Cash flow/Total assets (%)	-0.20** -1.97	-0.41 -1.63	0.19 1.18	-0.92*** -3.62	-0.62** -2.36	-0.65* -1.90
ROA (%)	-0.14 -1.35	-0.26 -0.80	-0.08 -1.15	-0.41** -2.18	-0.24 -1.01	-0.45 -0.85

(continued on next page)

TABLE 6 (continued)

Year $t+n$	Firms that Lose Coverage of Inferior Analyst			Firms that Lose Coverage of Superior Analyst		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Total liabilities/Total assets	-0.01 <i>-1.04</i>	-0.02 <i>-1.27</i>	-0.01 <i>-0.87</i>	-0.02 <i>-1.18</i>	-0.02 <i>-0.90</i>	-0.01 <i>-0.19</i>
Ohlson's O-score	-0.02 <i>-0.11</i>	0.00 <i>1.25</i>	0.18** <i>2.06</i>	0.07 <i>1.35</i>	0.16 <i>1.62</i>	0.09* <i>1.79</i>
Excess return (%)	3.64*** <i>2.66</i>	0.55 <i>1.20</i>	3.35 <i>0.90</i>	-1.09 <i>-0.26</i>	-0.63 <i>-0.02</i>	2.10 <i>0.92</i>
Stock volatility (%)	-0.18 <i>-0.52</i>	-0.01 <i>-0.46</i>	0.22 <i>1.10</i>	-0.35 <i>-0.40</i>	-0.31 <i>-0.96</i>	-0.08 <i>-0.16</i>
Performance index (%)	0.51 <i>0.28</i>	3.12 <i>0.06</i>	1.15 <i>0.01</i>	-1.00 <i>-1.43</i>	-0.30 <i>-0.29</i>	-1.65 <i>-0.49</i>
Investor Interest Characteristics						
Market capitalization	-4.81*** <i>-5.38</i>	-5.53*** <i>-3.52</i>	-7.60*** <i>-3.46</i>	-4.94*** <i>-5.73</i>	-5.80*** <i>-4.27</i>	-11.27*** <i>-4.16</i>
B/M ratio	0.02 <i>1.28</i>	-0.02 <i>-0.55</i>	-0.03 <i>-1.33</i>	0.05*** <i>3.98</i>	0.03* <i>1.70</i>	0.00 <i>0.35</i>
Trading volume	-0.38*** <i>-7.28</i>	-0.45*** <i>-5.39</i>	-0.31*** <i>-3.42</i>	-0.46*** <i>-9.07</i>	-0.48*** <i>-6.93</i>	-0.59*** <i>-5.14</i>
Bid-ask spread (%)	0.23*** <i>7.02</i>	0.23*** <i>5.41</i>	0.16*** <i>3.13</i>	0.39*** <i>8.75</i>	0.27*** <i>5.92</i>	0.17*** <i>3.76</i>
Total institutional holdings (%)	-1.81*** <i>-7.58</i>	-2.71*** <i>-6.43</i>	-4.11*** <i>-5.80</i>	-2.14*** <i>-7.16</i>	-3.99*** <i>-8.41</i>	-4.65*** <i>-7.28</i>
Number of institutions	-1*** <i>-8.01</i>	-2*** <i>-7.01</i>	-2*** <i>-5.71</i>	-1*** <i>-9.09</i>	-2*** <i>-7.59</i>	-2*** <i>-5.55</i>
Investor interest index	-0.11*** <i>-10.21</i>	-0.12*** <i>-6.91</i>	-0.16*** <i>-5.35</i>	-0.12*** <i>-12.61</i>	-0.14*** <i>-8.87</i>	-0.17*** <i>-6.46</i>

*, **, *** Indicate that median values are different from zero at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively, according to the Wilcoxon matched-pairs signed-ranks test.

This table reports median differences in performance indicators and investor interest characteristics between sample firms and control firms, categorized by analyst characteristics. Specifically, we look at the number (Panel A), type (Panel B), and quality (Panel C) of the analyst(s) who last covered sample firms in year $t-1$. Year t marks the first year when sample firms lose analyst coverage. Z-statistics are shown in italic.

implying that the presence of more analysts increases the depth of the information pool on a firm's future performance.¹⁰

Panel B of Table 6 categorizes sample firms by the type of the analyst who issued the last earnings estimate in year $t-1$. Specifically, we distinguish between investment bank analysts and other analysts who work for an independent broker or a paid-for firm. We examine paid-for analysts and independent broker analysts together, because a separate analysis of paid-for analysts would not be meaningful due to the modest number of observations. Clarke et al. (2011) document that

¹⁰ When firms lose coverage of two or more analysts, the effects on investor interest appear to weaken over time. For some of these firms, analysts' decision to discontinue coverage may anticipate temporary performance issues. When these issues are resolved in later years, some firms may regain analyst coverage along with investor interest.

investment bank analysts are more likely to be perceived as influential by the market than analysts who work for independent brokers or paid-for research firms. There is some evidence that investment bank analysts drop firms because of unfavorable private information. In the years after the loss of analyst coverage, sales growth, cash flow/total assets, and ROA, all significantly decline relative to covered peers. When non-investment bank analysts drop coverage, only the differences in sales growth are significant. Interestingly, the effects on investor interest are largely similar across the two types of analysts.

Panel C of Table 6 categorizes sample firms by the quality of the analyst who issued the last earnings estimate in year $t-1$. As shown in Table 2, an Institutional Investor star analyst is rarely the last analyst to cover sample firms. To proxy for the quality of the last analyst, we use the analyst's forecasting ability as measured by PMAFE. This allows us to separate analysts into two almost equally populated groups of superior and inferior analysts. Specifically, a superior analyst has a negative PMAFE, indicating that her forecasting ability is better than the mean analyst ability in a year (Clement 1999). There is some evidence that superior analysts drop coverage owing to unfavorable private information. Sales growth, cash flow/total assets, and ROA for sample firms are significantly lower than their covered peers. Again, the effects on investor interest characteristics are largely similar across analyst quality. The similarity between Panels B and C is consistent with superior analysts being more likely to be affiliated with investment banks.

Firm Performance and Investor Interest by Firm's Information Environment

We expect that the loss of analyst coverage will exacerbate the investor interest effects for firms with an opaque information environment. We compute a reporting opacity index, as the first principal component of earnings volatility, absence of company earnings guidance, intangibles/total assets, auditor's qualified opinion, and absolute value and volatility of discretionary accruals over the last five years. Firms that report an above (below) median reporting opacity index are regarded as firms with an opaque (transparent) information environment.

Table 7 reports median differences in performance indicators and investor interest characteristics between the sample and control firms, categorized by the firm's information environment. All else equal, analyst coverage is more valuable for opaque firms. After the loss of analyst coverage, cash flow/total assets and Ohlson's O-score for opaque firms significantly worsen relative to their control firms (p -values are 0.02 and 0.05, respectively), while none of the differences in performance indicators are significant for transparent firms. Moreover, opaque firms experience a greater decline in investor interest than transparent firms. Our results complement Kirk (2011) who examines a sample of firms with no prior coverage and finds that firms with weaker information environments are more likely to buy paid-for coverage as they have the most to gain from analyst coverage.

Does the Loss of Analyst Coverage Predict Delisting?

An analysis of delisting dates indicates that, among the 4,836 sample firms that lost analyst coverage for the first time in year t , 3,374 (70 percent) subsequently delisted. About 24 percent of the sample firms delisted within two years from the initial loss of coverage, and 45 percent delisted within five years. Control firms report significantly lower percentages at the 1 percent level; 19 and 38 percent, respectively. We examine whether the loss of analyst coverage predicts the stock delisting in a multivariate framework, after we control for other factors. Specifically, we use a Cox proportional hazards model to compute the probability that a firm will be delisted after losing analyst coverage in year t . The observation units are the 8,732 sample firms and their control firms. All units enter the dataset in year t and are tracked over the next ten years until year $t+10$. Data are left-censored by construction, and some data can be also right-censored. Proportional hazards

TABLE 7

Differences in Performance Indicators and Investor Interest Characteristics after Losing Analyst Coverage Categorized by the Firm's Information Environment

Year $t+n$	Firms with Transparent Information Environment			Firms with Opaque Information Environment		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Performance Indicators						
Sales growth (%)	-1.34	-0.69	-0.33	-1.34	-0.23	1.86
	-1.53	-0.01	-0.46	-1.37	-0.36	1.09
Cash flow/Total assets (%)	-0.23	-0.26	0.25	-0.98**	-0.44	0.58
	-1.08	-1.17	0.13	-1.98	-1.53	0.23
ROA (%)	0.24	0.25	0.32	-0.40	0.12	0.47
	1.04	1.09	1.14	-0.70	0.17	1.00
Total liabilities/Total assets	-0.02	-0.02	-0.03	-0.01	-0.03	-0.00
	-1.10	-1.02	-1.18	-1.64	-1.10	-1.05
Ohlson's O-score	-0.22	-0.27*	-0.15	0.12**	0.12*	0.00
	-1.60	-1.70	-0.94	2.30	1.72	0.02
Excess return (%)	0.21	0.98	0.54	2.24**	0.83	5.92**
	1.01	1.27	0.54	2.09	1.25	2.40
Stock volatility (%)	-0.48	-0.69	-0.34	-0.36	-0.46	0.49
	-0.98	-1.60	-0.94	-0.60	-0.61	0.92
Performance index (%)	1.03	1.30	0.26	-2.47	0.06	8.50*
	1.08	1.15	0.09	-0.87	0.76	1.84
Investor Interest Characteristics						
Market capitalization	-2.78	-3.80	-4.96	-8.09***	-9.01***	-6.67***
	-0.77	-0.79	-1.14	-8.84	-6.36	-3.25
B/M ratio	0.05***	0.03	0.02	0.03***	0.01	-0.03*
	3.11	0.98	1.20	2.74	0.39	-1.78
Trading volume	-0.27***	-0.29***	-0.40***	-0.70***	-0.88***	-0.86***
	-7.19	-5.00	-3.62	-8.60	-6.42	-4.04
Bid-ask spread (%)	0.10***	0.04	0.02	0.51***	0.38***	0.11**
	3.19	0.92	0.25	11.29	7.39	2.50
Total institutional holdings (%)	0.56	0.33	-0.46	-3.43***	-4.74***	-4.86***
	1.25	-0.19	-0.60	-12.15	-10.00	-6.53
Number of institutions	0***	-1**	-1*	-2***	-3***	-3***
	-3.02	-2.43	-1.77	-13.49	-9.84	-5.26
Investor interest index	-0.05***	-0.06***	-0.00	-0.17***	-0.20***	-0.17***
	-4.37	-2.82	-0.71	-14.29	-9.78	-5.17

*, **, *** Indicate that median values are different from zero at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively, according to the Wilcoxon matched-pairs signed-ranks test.

This table reports median differences in performance indicators and investor interest characteristics between sample firms and control firms, categorized by the firm's information environment. Firms with an opaque (transparent) information environment are firms with above (below) the median reporting opacity score, which is an index based on earnings volatility, absence of company earnings guidance, intangibles/total assets, auditor's qualified opinion, absolute value of discretionary accruals, and volatility of discretionary accruals over the last five years. In particular, earnings volatility is the standard deviation of EPS in the last five years. Absence of company earnings guidance is equal to 1 if a firm never provided earnings guidance over the last five years. Earnings guidance data come from First Call Historical Database. Intangibles/total assets is the average ratio between intangible assets and total assets over the last five years (Compustat items INTAN/AT). Auditor's qualified opinion is equal to 1 if the auditor issued at least one qualified opinion in the last five years (Compustat item AUOP = 2 or 5). Discretionary accruals are determined according to the industry-modified

(continued on next page)

TABLE 7 (continued)

Jones method (Jones 1991; Dechow et al. 1995). Industry is defined using the 48 Fama-French industries classified by four-digit SIC codes. Specifically, for each sample firm with an opaque (transparent) information environment, we select a control firm with an opaque (transparent) information environment that is still covered in year t . We find 7,223 control firms that match sample firms over performance indicators, investor interest characteristics, and information environment. Z-statistics are shown in *italic*.

models have, however, the methodological advantage of dealing with censoring issues by incorporating a positive probability that the event might never occur for cross-sectional units.

Our main variable of interest is a time-constant dummy, *SAMPLE FIRM*, which is equal to 1 for sample firms not covered by analysts in year t , or 0 for control firms covered in the same year. As a result of the survival design, the *SAMPLE FIRM* dummy indicates whether analysts' decision not to cover a firm in year t predicts a greater hazard of delisting for that firm than its control firm, after controlling for other publicly available factors. The other covariates include time-varying indicators of performance and investor interest, along with year, industry, and exchange fixed effects. In addition, we include a control variable for the continued coverage of sample firms, *COVERAGE* dummy, which is equal to 1 when a firm is covered in a given year $t+n$, or 0 otherwise. Loderer et al. (2009) document that the delisting hazard for a firm is a U-shaped function of its age. We thus include *TRADING AGE*, defined as the fraction of years from the first trading day, and its squared term.

Panel A of Table 8 reports coefficients and Lin and Wei's (1989) heteroscedasticity-robust Z-statistics from the Cox regressions. Model 1 relates to the entire sample period. Coefficients on the covariates have the expected signs. The likelihood that a firm will delist increases as the firm's financial health, its operating performance, and stock liquidity deteriorate. Even after controlling for other publicly available factors from year t to year $t+10$ however, the coefficient of the *SAMPLE FIRM* dummy is significant at the 1 percent level in predicting delisting. The results are robust to including the composite performance and investor interest indicators in place of the individual characteristics. Hazard ratios—computed as $(e^{\text{coefficient}} - 1)$ but not reported in Table 8—suggest that analyst coverage is also economically important; the loss of analyst coverage for one year implies that a firm is 11 percent more likely to delist than its control firm over the next ten years. Models 2 to 4 categorize sample firms by subperiods. Losing analyst coverage in the pre-Reg FD subperiod significantly predicts delisting at the 1 percent level. In the next two subperiods, the coefficients of *SAMPLE FIRM* decrease in magnitude but remain statistically significant.

We run the Cox regression model 1 of Table 8, Panel A over various subsamples. For brevity, we report only the coefficient and Z-statistics for the *SAMPLE FIRM* dummy in Panels B and C of Table 8. Panel B of Table 8 examines the impact of losing analyst coverage on the delisting hazard, conditional on the number of years the sample firms spent with analyst coverage before the initial loss, and then without analyst coverage. A firm that loses analyst coverage after being covered for more than three years is 19 percent more likely to delist than its control firm. In addition, the longer a firm stays without coverage, the more likely it is to delist subsequently. In fact, the economic significance for the coefficient of the *SAMPLE FIRM* dummy increases as sample firms spend more years without analyst coverage. As a firm loses analyst coverage for one year, that firm is 8 percent more likely to delist than its control firm, while it is 17 percent more likely to delist as coverage is lost for four or more years, and 30 percent more likely to delist as coverage is lost for ten or more years. We note that these increases in probability are conditional on the firm choosing not to purchase coverage.

Panel C of Table 8 categorizes sample firms by the number, type, and quality of analyst(s) who last provided coverage in year $t-1$. The loss of analyst coverage in year t predicts a greater hazard of delisting for firms that lost the coverage of either two or more analysts, non-investment bank

TABLE 8
Cox Regression for the Probability that the Firm Will Be Delisted after
Losing Analyst Coverage

Panel A: Hazard Likelihood of Delisting over Ten Years after Losing Coverage for One Year

	All Sample Period (1)	Pre-Reg FD, 1984–2000 (2)	Post-Reg FD, 2001–2002 (3)	Post-Reg AC, 2003–2008 (4)
<i>SAMPLE FIRM</i> dummy	0.10*** (15.58)	0.10*** (12.55)	0.04*** (2.67)	0.04*** (2.59)
<i>COVERAGE</i> dummy	−0.02*** (−2.60)	−0.03*** (−3.43)	−0.02 (−1.31)	−0.06*** (−3.63)
<i>TRADING AGE</i>	−0.07*** (−67.84)	−0.07*** (−61.16)	−0.01*** (−4.22)	−0.01*** (−6.03)
<i>TRADING AGE</i> ²	0.00*** (47.55)	0.00*** (47.37)	0.00*** (3.05)	0.00*** (4.70)
Performance Indicators				
Sales growth	−0.00 (−0.83)	−0.01 (−0.83)	−0.00 (−0.24)	−0.01 (−1.27)
Cash flow/Total assets	−0.11** (−2.00)	−0.12* (−1.85)	0.02 (0.23)	−0.26** (−2.34)
ROA	−0.14*** (−2.90)	−0.18*** (−3.19)	−0.01 (−0.16)	0.21** (2.05)
Total liabilities/Total assets	0.02 (0.72)	0.07*** (2.49)	−0.05 (−1.21)	−0.03 (−0.63)
Ohlson's O-score	0.02*** (5.29)	0.02*** (5.14)	0.01 (1.04)	0.00 (0.43)
Excess return	−0.02*** (−3.31)	−0.01 (−1.38)	−0.03** (−2.09)	−0.02 (−0.94)
Stock volatility	0.08 (1.49)	0.09 (1.22)	0.14 (1.22)	0.31** (2.14)

(continued on next page)

TABLE 8 (continued)

	All Sample Period (1)	Pre-Reg FD, 1984-2000 (2)	Post-Reg FD, 2001-2002 (3)	Post-Reg AC, 2003-2008 (4)
Investor Interest Characteristics				
Ln(Market capitalization)	-0.02*** (-3.78)	-0.02*** (-2.89)	-0.02** (-2.08)	-0.01 (-0.75)
B/M ratio	0.00 (1.02)	0.01 (0.87)	0.00 (0.07)	0.00 (0.19)
Ln(1 + Trading volume)	-0.04*** (-11.38)	-0.03*** (-8.80)	-0.02*** (-3.71)	-0.04*** (-5.50)
Bid-ask spread	0.99*** (8.91)	0.92*** (6.93)	0.77** (1.94)	0.73 (1.32)
Total institutional holdings	-0.09*** (-4.36)	-0.04* (-1.65)	-0.12*** (-3.10)	-0.20*** (-4.56)
Number of institutions	-0.01** (-2.10)	-0.00 (-0.60)	-0.04*** (-3.25)	-0.02 (-1.16)
Number of M&A deals	-0.02*** (-9.73)	-0.01*** (-7.67)	-0.01 (-1.39)	-0.00 (-1.02)
Number of issues	-0.00 (-0.34)	-0.02* (-1.64)	-0.02 (-1.06)	-0.02 (-0.89)
Fixed effects	Yes	Yes	Yes	Yes
Wald χ^2	20,586.91	37,761.94	63,755.70	5,877.63
Prob. > χ^2	0.0000	0.0000	0.0000	0.0000
Number of Observations	78,018	59,304	9,473	9,241

(continued on next page)

TABLE 8 (continued)

Panel B: Number of Years with (without) Analyst Coverage

	Number of Years with Analyst Coverage		Number of Years without Analyst Coverage			
	Three Years or Less	More than Three Years	1st Year	2nd Year	3rd Year	4th Year and Beyond
<i>SAMPLE FIRM</i> dummy	0.03*** (2.92)	0.18*** (19.93)	0.07*** (6.46)	0.05*** (3.58)	0.14*** (7.18)	0.16*** (12.93)
Other variables not reported						
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Wald χ^2	11,426.45	14,059.09	9,245.72	5,034.89	3,801.81	7,478.18
Prob. > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of Observations	31,146	46,872	25,521	14,393	9,694	28,410
						0.26*** (7.85)
						2,273.16
						0.0000
						5,453

Panel C: Analyst Characteristics and Information Environment

	Number of Analysts Dropping Coverage		Type of the Analyst Dropping Coverage		Quality of the Analyst Dropping Coverage		Information Environment	
	1 Analyst	2 or More Analysts	Investment Bank	Other Firm	Inferior	Superior	Transparent	Opaque
<i>SAMPLE FIRM</i> dummy	0.09*** (11.13)	0.13*** (11.00)	0.09*** (12.15)	0.24*** (13.33)	0.09*** (9.23)	0.12*** (13.18)	0.07*** (6.21)	0.09*** (9.51)
Other variables not reported								
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald χ^2	13,833.42	13,480.60	18,094.74	8,778.11	10,729.52	10,200.05	11,942.35	20,808.85
Prob. > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
No. of Observations	54,151	23,867	66,707	11,311	39,412	38,329	23,891	36,381

*, **, *** Indicate that coefficients are different from zero at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively. Panel A presents Cox regression results. The failure event is the stock's delisting. The duration analysis covers ten years from year t to year $t+10$. Year t , when sample firms receive no analyst coverage, is the baseline time. "Sample firm" is a time-invariant dummy variable equal to 1 for sample firms, and 0 for control firms matched on performance indicators and investor interest characteristics. All other covariates are time-varying variables. "Coverage" is a dummy variable equal to 1 if analysts issue at least one earnings forecast on firms during the calendar year $t+1$. "Trading age" is the number of years from the first trading day to the end of year $t+n$. Panels B and C present Cox regression results for model 1 in Panel A. Specifically, in Panel B, sample observations are categorized by the number of consecutive years with (without) analyst coverage. In Panel C, sample observations are categorized by analyst coverage characteristics. Firms with an opaque (transparent) information environment are sample firms with above (below) the median reporting opacity score. All variables are winsorized at the 1 percent and 99 percent levels. Year, industry, and exchange fixed effects are included in all regressions. Lin and Wei's (1989) heteroscedasticity-adjusted Z-statistics are in parentheses.

analysts, or superior analysts. Finally, we sort firms on their information environment. We find that the loss of coverage predicts a greater probability of delisting for stocks with opaque reporting.

VI. CONSEQUENCES OF REGAINING ANALYST COVERAGE

We next examine if the results found from examining the event of losing all analyst coverage hold as we analyze the complementary event of regaining analyst coverage. After losing analyst coverage for one year or more, 2,463 firms in our full sample regain analyst attention. It is reasonable to believe that the same factors that drive the analyst's decision to drop coverage on a firm can later explain her decision to resume coverage on that firm. Therefore, to predict the restoration of analyst coverage on a firm, we run model 1 of Table 4, in which now the dependent variable is equal to 1 when a sample firm that was not covered in year $t-1$ regains analyst coverage in year t , or 0 when a sample firm continues not to be covered in year t . Again, we use PSM over the 15 independent variables and fixed effects to select, for each firm that regains analyst coverage in year t , a control firm among the firms that continue to be uncovered. We identify 1,809 control firms.

Table 9 reports median differences in performance indicators and investor interest characteristics between sample firms that regain analyst coverage and their control firms, from year $t+1$ to year $t+5$. These results, categorized by subperiod, are largely consistent with those reported in Table 5. In the pre-Reg FD subperiod, after regaining analyst coverage, sample firms consistently outperform the control group in year $t+1$. Cash flow/total assets and ROA are significantly higher, while the total liabilities/total assets ratio is significantly lower than for the control firms, suggesting that analysts indeed have private information on the future prospects of these firms and convey it to investors through their decisions to resume coverage. In addition, the sample firms that regain coverage exhibit better market capitalizations, trading volumes, bid-ask spreads, and institutional presence than their peers. As in Panel A of Table 5, the pattern shifts considerably after the introduction of the new regulations. Few of the performance indicators are significantly different from their control firms after the reinstatement of analyst coverage. Investor interest proxies continue to improve significantly over time. Overall, these results are consistent with our earlier conclusion: after the regulatory changes, analysts continue to add value to a firm by enhancing its stock's recognition among investors.

VII. ROBUSTNESS CHECKS

In this section, we test the robustness of our results. Our results are qualitatively unchanged to including firm fixed effects in logistic regression models of Table 4. Analysts might base their coverage decisions on current factors, instead of on lagged indicators of performance and investor interest. We therefore repeat the PSM procedure by matching sample firms over the 15 independent variables computed in year t , instead of year $t-1$. Again, our results are qualitatively unchanged. In the remaining checks, we analyze: (1) partial and exogenous losses of analyst coverage; (2) a sample of firms that receive actual termination notices from analysts; and (3) the institutional investors who are likely to be affected in their investment decisions by the lack of analyst coverage.

Partial and Exogenous Losses of Analyst Coverage

What makes the loss of the last analyst(s) so important? We have no priors that the complete loss of the last two analysts, for example, signals more (or less) private information about the future performance of a firm than the partial loss of two analysts from five to three. However, to the extent that losing the last analyst(s) affects the investor recognition for a firm, we expect that the decrease in investor interest for a firm will be worse when it loses all analyst coverage and becomes an orphan than when it suffers only a partial reduction in analyst coverage.

TABLE 9

Differences in Performance Indicators and Investor Interest Characteristics after Regaining Analyst Coverage Categorized by Subperiods

Year $t+n$	Pre-Reg FD Period 1984–2000				Post-Reg FD Period 2001–2002				Post-Reg AC Period 2003–2008			
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+1$	$t+3$	$t+5$	$t+5$
Performance Indicators												
Sales growth (%)	-0.07	-2.36**	1.52	-1.18	-3.76	-0.44	2.63	1.34	2.63	1.34	0.91	0.91
Cash flow/Total assets (%)	-0.14	-2.38	0.04	-0.64	-1.13	-0.87	0.76	0.90	0.76	0.90	0.33	0.33
ROA (%)	2.93***	1.65***	-0.15	0.50	0.43	4.64**	0.92	-0.26	0.92	-0.26	-0.78	-0.78
Total liabilities/Total assets	2.89	2.59	-0.25	0.38	1.15	2.46	1.06	-1.36	1.06	-1.36	-0.59	-0.59
Ohlson's O-score	1.32***	0.06	0.63	1.37	1.31	2.32**	0.68	-0.33	0.68	-0.33	-1.29	-1.29
Excess return (%)	2.77	0.79	0.27	1.28	1.08	1.99	0.43	-1.46	0.43	-1.46	-0.63	-0.63
Stock volatility (%)	-0.09***	-0.03	0.03	0.03	0.01	-0.04	0.01	-0.03*	0.01	-0.03*	0.02	0.02
Performance index (%)	-4.05	-0.97	0.73	1.22	0.83	-0.02	0.18	-1.84	0.18	-1.84	0.10	0.10
Investor Interest Characteristics	-0.10*	-0.39*	-0.03	-0.14	-0.41	-0.58*	-0.66**	-0.02	-0.66**	-0.02	0.17	0.17
Market capitalization	-1.65	-1.91	-0.61	-0.78	-1.60	-1.71	-2.43	-0.39	-2.43	-0.39	0.08	0.08
B/M ratio	-4.85	0.66	6.50	12.65	-3.08	-7.40	-5.16	-0.34	-5.16	-0.34	-4.08	-4.08
Trading volume	-1.26	0.24	1.59	1.32	-0.65	-0.09	-1.58	-0.21	-1.58	-0.21	-0.66	-0.66
	-0.53	0.06	-0.49	0.56	-0.85	-1.08	1.48**	0.31	1.48**	0.31	0.59	0.59
	-1.57	1.02	-0.90	0.00	-0.62	-0.91	2.12	1.15	2.12	1.15	0.37	0.37
	6.19**	5.51	0.98	2.90	1.29	19.66*	7.01	-8.88	7.01	-8.88	-0.29	-0.29
	2.47	1.51	0.18	1.45	0.62	1.84	1.47	-0.61	1.47	-0.61	-0.21	-0.21
Investor Interest Characteristics												
Market capitalization	5.37**	5.40	10.72	18.79***	30.98*	11.06	23.26***	20.43	23.26***	20.43	31.12	31.12
B/M ratio	2.06	1.56	1.35	2.60	1.67	0.53	2.60	1.38	2.60	1.38	1.24	1.24
Trading volume	-0.01	-0.02	0.01	-0.09*	0.06	0.10	-0.07***	-0.09**	-0.07***	-0.09**	-0.05	-0.05
	-0.27	-0.58	0.06	-1.66	0.15	1.02	-2.58	-2.38	-2.58	-2.38	-0.69	-0.69
	0.38***	0.44**	0.33	1.55***	1.26	0.21	3.82***	6.04***	3.82***	6.04***	12.27***	12.27***
	2.89	2.45	1.58	3.20	1.37	0.36	5.53	3.73	5.53	3.73	3.84	3.84

(continued on next page)

TABLE 9 (continued)

Year $t+n$	Pre-Reg FD Period 1984–2000				Post-Reg FD Period 2001–2002				Post-Reg AC Period 2003–2008			
	$t+1$	$t+3$	$t+5$		$t+1$	$t+3$	$t+5$		$t+1$	$t+3$	$t+5$	
Bid-ask spread (%)	–0.92*** –7.87	–0.43*** –4.47	–0.26*** –2.71		–0.52*** –3.98	–0.26*** –3.78	–0.04 –0.80		–0.42*** –7.65	–0.28*** –3.94	–0.30** –2.00	
Total institutional holdings (%)	3.32*** 5.27	4.23*** 4.40	5.24*** 4.63		7.88*** 4.59	7.73** 2.52	7.54 0.96		6.53*** 4.60	2.79** 2.17	12.18 1.62	
Number of institutions	2*** 5.24	3*** 4.67	4*** 4.36		4*** 3.91	5** 2.47	4 1.50		8*** 6.34	5*** 3.15	12*** 2.56	
Investor interest index	0.20*** 7.78	0.15*** 4.56	0.19*** 4.14		0.25*** 5.19	0.24** 2.46	0.18 0.62		0.32*** 5.67	0.36*** 3.07	0.35 1.76	

*, **, *** Indicate that median values are different from zero at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively, according to the Wilcoxon matched-pairs signed-ranks test.

This table reports median differences in performance indicators and investor interest characteristics between firms that regain analyst coverage and control firms that are uncovered firms matched on performance indicators and investor interest characteristics in year $t-1$. Year t marks the calendar year when analyst coverage is resumed. Z-statistics are shown in *italic*.

To assess the importance of the last analyst(s), we perform a one-to-one matching of uncovered firms to covered firms on the decrease in analyst following, from year $t-1$ to year t . Specifically, for each sample firm that completely loses coverage by Δn analysts in year t , we select a control firm that loses coverage by the same number Δn of analysts in year t but still remains covered by at least one analyst. Again, we run model 1 of Table 4 over the 15 independent variables and fixed effects to estimate propensity scores, and use PSM to match firms on Δn . We find 2,639 control firms. The first set of columns of Table 10 reports the median differences between sample firms that experience a complete loss of analyst coverage and control firms that experience a partial loss in year t . In the five years after a complete loss of coverage, only stock volatility significantly worsens relative to a partial loss, indicating that there is only a modest amount of incremental private information when the firm completely loses all coverage than when it remains covered by at least one analyst. As expected, orphaned firms experience a significantly greater deterioration in investor interest proxies than firms that only partly lose coverage. Consistent with the investor recognition story, this result adds to the literature on the partial losses of analyst coverage.

To make sure that our research design corrects for possible endogeneity issues, we repeat the analysis on a subsample of firms that lose all analyst coverage for exogenous reasons. Similarly to [Hong and Kacperczyk \(2010\)](#), we search for events when the research department of the only brokerage house covering a firm closes due to concentration or corporate restructuring, making the firm an orphan in year t . We find 270 firms that are orphaned for exogenous reasons. Most events are confined either to small brokerage firms or geography-specialized divisions of larger brokerage houses. After manually checking that these events indeed correspond to exogenous losses of coverage, we follow the 270 firms over time leading to a subsample of 943 firm-year observations. For each subsample firm that remains uncovered in year t due to exogenous reasons, we select a firm that is covered in year t . Using PSM again, we find 665 control firms that are covered firms with comparable performance and investor interest characteristics. The second set of columns of Table 10 reports the median differences in the five years following year t . The results confirm that the event of losing analyst coverage for subsample firms is indeed exogenous and not performance-related. No performance indicator consistently deteriorates in the five-year period following the loss. Consistent with the investor recognition story, however, some proxies for stock liquidity worsen: bid-ask spread widens in year $t+1$, while total institutional holdings and the number of institutions drop dramatically relative to control firms, suggesting that the lack of analyst coverage drives institutions to sell their holdings.

Termination Notices

We analyze a large sample of termination notices issued in compliance with NASD Rule 2711. As mentioned earlier, paragraph (f)(5) of this rule requires an analyst who intends to drop the coverage of a firm to issue a final report specifying the rationale for the termination.¹¹ From Thomson Research Investtext database, which stores the PDF files of the original analyst reports, we manually collect data on 7,038 termination notices issued between 2003 and 2008. About 44 percent of the termination notices refer to the analyst departure, 29 percent to redirection of research

¹¹ According to the text of Rule 2711 paragraph (f)(5): "If a member intends to terminate its research coverage of a subject company, notice of this termination must be made. The member must make available a final research report on the subject company using the means of dissemination equivalent to those it ordinarily uses to provide the customer with its research reports on the subject company. The report must be comparable in scope and detail to prior research reports and must include a final recommendation or rating, unless it is impracticable for the member to produce a comparable report (e.g., if the research analyst covering the subject company or sector has left the member or if the member terminates coverage of the industry or sector). If it is impracticable to produce a final recommendation or rating, the final research report must disclose the member's rationale for the decision to terminate coverage."

TABLE 10

Differences in Performance Indicators and Investor Interest Characteristics for Subsamples of Partial and Exogenous Losses of Analyst Coverage

Year $t+n$	Partial Losses of Analyst Coverage			Exogenous Losses of Analyst Coverage		
	$t+1$	$t+3$	$t+5$	$t+1$	$t+3$	$t+5$
Performance Indicators						
Sales growth (%)	0.32 <i>0.17</i>	1.47 <i>0.85</i>	-0.40 <i>-0.23</i>	-5.54 <i>-1.47</i>	-0.69 <i>-0.20</i>	-14.05 <i>-0.92</i>
Cash flow/total assets (%)	0.04 <i>0.03</i>	-0.62 <i>-0.85</i>	-0.19 <i>-0.98</i>	-1.04* <i>-1.78</i>	-1.69* <i>-1.77</i>	0.17 <i>-0.12</i>
ROA (%)	0.21 <i>0.92</i>	0.15 <i>0.52</i>	-0.13 <i>-0.34</i>	-1.09 <i>-1.06</i>	-0.21 <i>-1.08</i>	-0.55 <i>-0.10</i>
Total liabilities/total assets	-0.01 <i>-0.05</i>	-0.01 <i>-0.34</i>	-0.01 <i>-0.18</i>	0.03 <i>0.72</i>	0.02 <i>0.70</i>	0.10 <i>1.52</i>
Ohlson's O-score	-0.01 <i>-0.28</i>	0.00 <i>0.47</i>	-0.06 <i>-0.74</i>	0.51* <i>1.87</i>	1.23** <i>2.07</i>	0.76 <i>1.03</i>
Excess return (%)	-1.13 <i>-0.20</i>	-1.48 <i>-0.65</i>	0.27 <i>0.02</i>	-5.41 <i>-0.22</i>	1.83 <i>0.12</i>	11.10 <i>1.59</i>
Stock volatility (%)	1.14*** <i>3.73</i>	0.61 <i>1.42</i>	0.35* <i>1.81</i>	0.70* <i>1.88</i>	0.45 <i>0.51</i>	0.94 <i>0.50</i>
Performance index (%)	2.36 <i>0.60</i>	-0.20 <i>-0.44</i>	1.46 <i>0.49</i>	-1.36 <i>-1.60</i>	-1.68* <i>-1.92</i>	-0.38 <i>-0.44</i>
Investor Interest Characteristics						
Market capitalization	-0.58 <i>-1.27</i>	-0.71 <i>-1.21</i>	-4.65** <i>-2.09</i>	-12.01 <i>-1.60</i>	-16.20 <i>-1.41</i>	-0.09 <i>-0.04</i>
B/M ratio	0.01 <i>0.73</i>	0.01 <i>0.61</i>	0.01 <i>0.30</i>	-0.17* <i>-1.90</i>	0.00 <i>0.70</i>	-0.07 <i>-0.87</i>
Trading volume	-0.72*** <i>-7.79</i>	-0.87*** <i>-5.91</i>	-0.48*** <i>-3.04</i>	-0.03 <i>-0.55</i>	0.08 <i>0.18</i>	-0.58 <i>-0.29</i>
Bid-ask spread (%)	0.16*** <i>2.31</i>	0.12** <i>2.09</i>	0.08* <i>1.65</i>	0.58*** <i>2.66</i>	0.17 <i>0.39</i>	-0.03 <i>-0.84</i>
Total institutional holdings (%)	-3.41*** <i>-7.26</i>	-3.55*** <i>-5.89</i>	-4.30*** <i>-4.63</i>	-6.09*** <i>-3.81</i>	-8.18*** <i>-3.67</i>	-2.24*** <i>-3.06</i>
Number of institutions	-1.5*** <i>-7.64</i>	-1*** <i>-5.21</i>	-3*** <i>-3.81</i>	-2.5*** <i>-3.89</i>	-3.5*** <i>-3.52</i>	0 <i>0.19</i>
Investor interest index	-0.10*** <i>-7.85</i>	-0.13*** <i>-5.49</i>	-0.14*** <i>-3.72</i>	-0.19*** <i>-3.08</i>	-0.00 <i>-1.58</i>	-0.18 <i>-0.77</i>

*, **, *** Indicate that median values are different from zero at the two-tailed 10 percent, 5 percent, and 1 percent levels, respectively, according to the Wilcoxon matched-pairs signed-ranks test.

The first set of columns reports the median differences between sample firms that experience a complete loss of analyst coverage and control firms that experience a partial loss in year t . Specifically, for each sample firm that completely loses the coverage from Δn analysts in year t , we select a control firm that loses the coverage from the same number Δn of analysts in year t but still remains covered by at least one. We find 2,639 control firms that match sample firms over performance indicators, investor interest characteristics, and the change in analyst following, Δn . The second set of columns reports the median differences between a subsample of firms that lose all analyst coverage in year t due to exogenous reasons and control firms that are covered firms in year t matched on performance indicators and investor interest characteristics. A firm is defined as having lost all analyst coverage due to exogenous reasons when the research department of the only brokerage house covering the firm closes due to concentration or corporate restructuring. For our subsample of 943 firms experiencing exogenous losses, we find 665 control firms. Z-statistics are shown in italic.

efforts, 25 percent to stock delisting, and the remaining 2 percent of the notices disclose no reason.¹² There are 399 cases of analysts' departures that result in complete, exogenous losses of coverage. We analyze the changes in stock liquidity for this subsample over a ± 365 day window surrounding the termination notice day. We find that the median trading volume declines by -3.15 percent, while the median bid-ask spread significantly widens in the 365-day period following the termination notice. Also, the institutional presence in the median firm decreases significantly with total holdings, dropping by -5.49 percent and the number of institutions reducing by 3.

Analyst Coverage and Institutional Presence

Institutional presence in a firm declines after the firm becomes an orphan either for endogenous or exogenous reasons. Which institutions are likely to follow the analysts? Institutions are not all equal: characteristics, such as size and industry, can make some institutions more sensitive to the loss of analyst coverage than others. Some types of money managers may use stock visibility, proxied by analyst coverage, as a factor in their portfolio allocation decisions.¹³ We examine which institutions typically depend on sell-side analyst research at the end of 2008.

We categorize institutions by type and portfolio size quintiles.¹⁴ In untabulated results, large institutions in the highest size quintile appear to rely more on their own research departments than small institutions in the lowest size quintile. The median stock held by large institutions receives a total number of 45 reports per year from 11 analysts, while the median stock held by small institutions receives more reports (62) from a higher number of analysts (16). Large institutions also hold more stocks that have no analyst coverage than the small institutional portfolios. Across the types of institution, large banks invest the most in uncovered stocks (8.68 percent), while small pension funds invest the least in these stocks (2.01 percent). The fact that small investment advisors hold a significant proportion of uncovered stocks (7.46 percent) is not surprising, given that the "Investment advisors" category is quite heterogeneous and includes hedge funds and private equity funds that might strategically invest in uncovered and under-covered firms. Interestingly, small institutions mostly invest in stocks covered by star analysts. Overall, the analysts' decision to stop covering a stock is likely to affect the investment in that stock by small institutions, such as small pension funds, mutual funds, banks, and insurance companies.

VIII. CONCLUSIONS

The popular press has highlighted how firms, especially small- and mid-capitalization firms are increasingly losing analyst coverage (*The Economist* 2009). In 2005, the NASDAQ and Reuters

¹² The reason for terminating coverage of a given firm while redirecting research efforts elsewhere is likely to be related to the firm's performance and/or investor interest. However, analysts appear reluctant to explicitly provide the firm-specific reasons behind their decisions to terminate coverage. They use expressions like "the stock no longer fits the coverage universe" and, only in less than 2 percent of notices, do they specify why, in their view, the stock is unfit for coverage. In general, the final reports do not appear to be comparable to prior research reports, either in scope or detail. Most of them revise the next-to-last recommendation to "Not rated."

¹³ We are unaware of any regulatory or internal provision requiring an institution to invest only in covered stocks, although we cannot entirely eliminate the possibility.

¹⁴ From Exchange Act Form 13f holdings filings, we remove those securities that cannot be identified by a PERMNO on the CRSP database. Securities without PERMNOs may be listed in foreign markets and therefore not covered by U.S. analysts. We also remove exchange-traded fund shares and mutual fund shares, which are generally not covered by analysts. To identify the type of institution, we use the *TYPECODE* variable in the 13f filings: Banks and trusts = 1; Insurance companies = 2; Mutual funds = 3; Investment advisors = 4; All others = 5. The "All others" category includes pension funds, endowments, and foundations. Thomson acknowledges serious classification errors starting from 1998, when many of the institutions were improperly classified as "All others." Hence, we manually check the institutions originally classified as "All others" and distribute them in one of the five categories.

created the Independent Research Network (IRN) to help public companies to obtain research. NASDAQ and Reuters motivated the launch of the IRN by citing the fact that about 35 percent of all public firms listed in the U.S. markets lack analyst coverage, and that 691 firms representing over 17 percent of the entire universe of covered firms lost all analyst coverage between 2002 and 2005.¹⁵ At the same time, paid-for research boutiques expanded their business by offering coverage to firms neglected by sell-side analysts in return for fees.

This paper analyzes firm performance and investor interest after losing all analyst coverage to test if analysts add value to a firm by signaling private information on the firm's performance and/or by increasing its visibility to investors. We find evidence of both in a sample of 16,662 firm-year observations without any analyst coverage for at least one year, from 1984 to 2008. In addition, we find that after the introduction of regulations that eroded analyst informational advantages, sample firms no longer experience a significant difference in performance indicators relative to covered peers. However, they continue to experience a significant deterioration of bid-ask spreads, trading volumes, and institutional presence relative to their peers. Moreover, sample firms that lose all analyst coverage for one year are significantly more likely to delist than their peers.

Our results have important policy implications. By eliminating investment-banking-derived compensation for analysts, the new analyst regulations changed the economic incentives in the research industry. Analysts employed in traditional soft-dollar brokerage houses now may have limited incentives to cover small- and mid-cap firms since these firms are unlikely to generate sufficient order flows to justify the costs of maintaining coverage. Our results offer a rationale for small- and mid-cap firms seeking hard-dollar research. As the paid-for research industry evolves, we may see a debate surrounding the appropriate model for equity research similar to the one surrounding credit-rating agencies. One policy implication of our work hinges on how research efforts and compensation should be structured in terms of quality, independence, and objectivity.

REFERENCES

- Altinkılıç, O., and R. S. Hansen. 2009. On the information role of stock recommendation revisions. *Journal of Accounting and Economics* 48: 17–36.
- Amihud, Y., and H. Mendelson. 1986. Asset pricing and the bid-ask spread. *Journal of Financial Economics* 17: 223–249.
- Baker, H. K., J. R. Nofsinger, and D. G. Weaver. 2002. International cross listing and visibility. *Journal of Financial and Quantitative Analysis* 37: 495–521.
- Barber, B. M., R. Lehavy, M. McNichols, and B. Trueman. 2006. Buys, holds, and sells: The distribution of investment banks' stock ratings and the implications for the profitability of analysts' recommendations. *Journal of Accounting and Economics* 41: 87–117.
- Bhushan, R. 1989. Firm characteristics and analyst following. *Journal of Accounting and Economics* 11: 255–274.
- Bradshaw, M. T. 2009. Analyst information processing, financial regulation, and academic research. *The Accounting Review* 84: 1073–1083.
- Brennan, M. J., and A. Subrahmanyam. 1995. Investment analysis and price formation in securities markets. *Journal of Financial Economics* 38: 361–381.
- Bushee, B. J., and G. S. Miller. 2010. *Investor Relations, Firm Visibility, and Investor Following*. Working paper, University of Pennsylvania and University of Michigan.

¹⁵ See the NASDAQ press release of June 7, 2005. IRN operated as a research matchmaker, connecting firms that seek coverage for their stocks with independent research firms and passing fees from the firms to the research firms. The annual charge for the firms was \$100,000 for three years, with the three-year commitment designed to keep the firms from pulling out in case of unfavorable research.

- Chen, C.-Y., and P. F. Chen. 2009. NASD rule 2711 and changes in analysts' independence in making stock recommendations. *The Accounting Review* 84: 1041–1071.
- Clarke, J., A. Khorana, A. Patel, and P. R. Rau. 2007. The impact of all-star analyst job changes on their coverage choices and investment banking deal flow. *Journal of Financial Economics* 84: 713–737.
- Clarke, J., A. Khorana, A. Patel, and P. R. Rau. 2011. Independents' day? Analyst behavior surrounding the Global Settlement. *Annals of Finance* 7: 529–547.
- Clement, M. B. 1999. Analyst forecast accuracy: Do ability, resources, and portfolio complexity matter? *Journal of Accounting and Economics* 27: 285–303.
- Cliff, M. T., and D. J. Denis. 2004. Do IPO firms purchase analyst coverage with underpricing? *Journal of Finance* 59: 2871–2901.
- Collins, D. W., S. P. Kothari, and J. Dawson Rayburn. 1987. Firm size and the information content of prices with respect to earnings. *Journal of Accounting and Economics* 9: 111–138.
- Cooper, M. J., H. Gulen, and P. R. Rau. 2005. Changing names with style: Mutual fund name changes and their effects on fund flows. *Journal of Finance* 60: 2825–2858.
- Dechow, P., R. Sloan, and A. Sweeney. 1995. Detecting earnings management. *The Accounting Review* 70: 193–225.
- Easley, D., M. O'Hara, and J. Paperman. 1998. Financial analysts and information-based trade. *Journal of Financial Markets* 1: 175–201.
- Economist*, The. 2009. High-speed slide. (November 14): 85–26.
- Ellul, A., and M. Panayides. 2009. *Do Financial Analysts Restrain Insiders' Informational Advantage?* Working paper. Indiana University and The University of Utah.
- Frankel, R., S. P. Kothari, and J. Weber. 2006. Determinants of the informativeness of analyst research. *Journal of Accounting and Economics* 41: 29–54.
- Gao, X., and J. R. Ritter. 2010. The marketing of seasoned equity offerings. *Journal of Financial Economics* 97: 33–52.
- Gintschel, A., and S. Markov. 2004. The effectiveness of Regulation FD. *Journal of Accounting and Economics* 37: 293–314.
- Hong, H., and M. Kacperczyk. 2010. Competition and bias. *Quarterly Journal of Economics* 125: 1683–1725.
- Irvine, P. J. 2001. Do analysts generate trade for their firms? Evidence from the Toronto stock exchange. *Journal of Accounting and Economics* 30: 209–226.
- Irvine, P. J. 2003. The incremental impact of analyst initiation of coverage. *Journal of Corporate Finance* 9: 431–451.
- Irvine, P. J. 2004. Analysts' forecasts and brokerage-firm trading. *The Accounting Review* 79: 125–149.
- James, C., and J. Karciski. 2006. Strength of analyst coverage following IPOs. *Journal of Financial Economics* 82: 1–34.
- Jegadeesh, N., J. Kim, S. D. Krische, and C. M. C. Lee. 2004. Analyzing the analysts: When do recommendations add value? *Journal of Finance* 59: 1083–1124.
- Jones, J. 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29: 193–228.
- Kecskés, A., and K. L. Womack. 2007. *Changes in Analyst Coverage: Does the Stock Market Overreact?* Working paper, University of Toronto and Dartmouth College.
- Kelly, B., and A. Ljungqvist. 2011. Testing asymmetric-information asset pricing models. *Review of Financial Studies* 25: 1366–1413.
- Kirk, M. 2011. Research for sale: Determinants and consequences of paid-for analyst research. *Journal of Financial Economics* 100: 182–200.
- Krigman, L., W. H. Shaw, and K. L. Womack. 2001. Why do firms switch underwriters? *Journal of Financial Economics* 60: 245–284.
- Lehavy, R., and R. Sloan. 2008. Investor recognition and stock returns. *Review of Accounting Studies* 13: 327–361.
- Lehavy, R., F. Li, and K. Merkley. 2011. The effect of annual report readability on analyst following and the properties of their earnings forecasts. *The Accounting Review* 86: 1087–1115.

- Lin, D., and L. Wei. 1989. Robust inference for the Cox proportional hazards model. *Journal of the American Statistical Association* 84: 1074–1078.
- Loderer, C., K. Neusser, and U. Waelchli. 2009. *Firm Age and Survival*. Working paper, University of Bern.
- Loughran, T., and J. Ritter. 2004. Why has IPO underpricing changed over time? *Financial Management* 33: 5–37.
- McNichols, M. F., and P. O'Brien. 1997. Self-selection and analyst coverage. *Journal of Accounting Research* 35: 167–199.
- Mehran, H., and S. Peristiani. 2010. Financial visibility and the decision to go private. *Review of Financial Studies* 23: 519–547.
- Merton, R. C. 1987. A simple model of capital market equilibrium with incomplete information. *Journal of Finance* 42: 483–510.
- O'Brien, P., and R. Bhushan. 1990. Analyst following and institutional ownership. *Journal of Accounting Research* 28 (Supplement): 55–76.
- Ohlson, J. A. 1980. Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research* 18: 109–131.
- Pietroski, J. D., and D. Roulstone. 2004. The influence of analysts, institutional investors, and insiders on the incorporation of market, industry, and firm-specific information into stock prices. *The Accounting Review* 79: 1119–1151.
- Rajan, R., and H. Servaes. 1997. Analyst following of initial public offerings. *Journal of Finance* 52: 507–529.
- Rosenbaum, P. R., and D. B. Rubin. 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician* 39: 33–38.
- Shumway, T. 2001. Forecasting bankruptcy more accurately: A simple hazard model. *Journal of Business* 74: 101–124.
- Villalonga, B. 2004. Does diversification cause the “diversification discount”? *Financial Management* 33: 5–27.
- Weild, D., and E. Kim. 2009. A wake-up call for America. *Grant Thornton Capital Markets Series* (November).
- Zmijewski, M. 1984. Methodological issues related to the estimation of financial distress prediction models. *Journal of Accounting Research* 22: 59–82.

APPENDIX A

Variable	Definition
Sales growth	Change in sales (Compustat item SALE) from the prior year.
Cash flow/total assets	Operating cash flow divided by total assets [(IB + DP)/AT].
ROA	Net income divided by total assets (NI/AT).
Total liabilities/Total assets	Total liabilities divided by total assets (LT/AT).
Ohlson's O-score	Measure of financial distress, defined as $-1.32 - 0.407 \times \log(\text{total assets}) + 6.03 \times (\text{total liabilities/total assets}) - 1.43 \times (\text{working capital/total assets}) + 0.076 \times (\text{current liabilities/current assets}) - 1.72 \times (1 \text{ if total liabilities} > \text{total assets, else } 0) - 2.37 \times (\text{net income/total assets}) - 1.83 \times (\text{funds from operations/total liabilities}) + 0.285 \times (1 \text{ if net loss for last two years, else } 0) - 0.521 \times (\text{change in net income/sum of absolute values of net income})$. That is, $-1.32 - 0.407 \times \log(\text{AT in constant 2005 dollars}) + 6.03 \times (\text{LT/AT}) - 1.43 \times (\text{WCAP/AT}) + 0.076 \times (\text{LCT/ACT}) - 1.72 \times (1 \text{ if LT} > \text{AT, else } 0) - 2.37 \times (\text{NI/AT}) - 1.83 \times (\text{OANCF/LT}) + 0.285 \times (1 \text{ if NI} < 0 \text{ for last two years, else } 0) - 0.521 \times (\text{change in NI/sum of absolute values of NI})$.
Excess return	Cumulative stock monthly return, adjusted for the CRSP NYSE/AMEX/NASDAQ value-weighted index.
Stock volatility	Idiosyncratic standard deviation of stock monthly returns.
Market capitalization	Common shares outstanding multiplied by fiscal year closing price (CSHO \times PRCC_F), expressed in \$ millions.
B/M ratio	Ratio (common equity + deferred taxes + investment tax credit - preferred stock)/market capitalization, or (CEQ + TXDB + ITCB-PSTK)/(CSHO \times PRCC_F).
Trading volume	Total number of shares traded in the year. We use the algorithm in Gao and Ritter (2010) to adjust the trading volume of NASDAQ-listed stocks and avoid double-counting NASDAQ volume relative to NYSE/AMEX volume.
Bid-ask spread	Annual average of daily differences between the closing bid and ask prices scaled by the mid-range closing price.
Institutional holdings and Number of institutions	Total holdings and total number of institutional investors reporting in the fourth quarter, respectively. Data on institutional holdings come from the 13f Institutional Holdings database.
Number of M&A deals	Cumulative number of M&A deals in the last three years, respectively.
Number of issues	Cumulative number of new equity issues in the last three years. Data on M&A deals and new equity issues come from the SDC New Issues database.

Copyright of Accounting Review is the property of American Accounting Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.