the role of the media in disseminating insider-trading activity

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Abstract
We use the disclosure of insiders’ trades to investigate whether the manner in which news is disseminated by the media affects the way securities markets respond to news. To do this, we utilize recent changes in disclosure rules governing insider trades to cleanly identify media effects. Using high-resolution intraday data, we find clear effects of media disclosure on the way prices and volume respond to news. These results help to resolve open questions regarding the importance of investor inattention and why apparently “second hand” news affects securities prices.

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1. Introduction

A growing literature explores the role of the media in financial markets and in particular whether and how the media influences prices and trading activity. While there is a growing consensus that the media can help discipline managers, reduce information asymmetry among market participants, and affect the market response to information, we still lack a clear understanding of the mechanism through which this occurs.\(^1\) Many settings of interest to researchers make it difficult to separate the various roles that the media can play. In the context of earnings announcements, for example, the release of the underlying earnings news results almost immediately in the generation of additional related content, in the form of discussion and analysis by the media, by securities analysts, and more recently by other actors on social media.

The dissemination of insiders’ trades via the SEC’s EDGAR system is a powerful setting for understanding the role of the media for at least two reasons. First, details of insiders’ trades first become available through SEC (Form 4) filings, which are simple, standardized documents, resulting in limited managerial discretion as to the timing or content of the news. This is in contrast to, say, earnings announcements where management has discretion over both timing and content of the news (e.g., Doyle and Magilke, 2009). Second, the media coverage that immediately follows insider filings simply regurgitates facts about the trade—who made the trade, when, how many shares, and at what price—without generating additional content. This also contrasts with earnings announcements, for which additional, related content is almost immediately produced and disseminated by the media. Moreover, media coverage of earnings announcements, like media coverage more generally, is fundamentally endogenous, with the existence, nature, and extent of coverage likely depending on informational aspects of the news. Because of the mechanical nature

\(^1\) See Miller and Skinner (2015) for a recent summary of this research. Representative papers include Blankespoor et al. (2014), Bushee et al., (2010), Dai et al. (2015), Drake et al. (2014), Li et al. (2011), and Twedt (2015).
of the media coverage we use as well as our natural experiment (described below), our approach enables us to clearly identify media coverage effects, and so provide a useful complement to existing approaches in the accounting literature.

Around 2002, the SEC made two changes in the rules that govern the filing and dissemination of insider trades that facilitate our tests. First, in 2002, the SEC substantially shortened the time between an insider trade and when information about that trade has to be filed with the SEC. Prior to the change in regulation, insiders had up to 10 days after the end of the calendar month in which the trade occurred to file the requisite information (Form 4) about the trade with the SEC. This often led to delays of more than a month between the trade and its disclosure to the public (e.g., Seyhun, 1986). After the rule change in 2002, insiders were required to make these filings within two business days of the trade. Evidence suggests that most filings are now made within two business days of the trade (Brochet, 2010; Rogers et al., 2015). Second, prior to 2002, it was not clear exactly when outside investors could access the information in SEC filings. In June 2003, the SEC required that these filings be made electronically, via its online EDGAR system, meaning that the information should be instantaneously available to outside investors and that there is no ambiguity about when the data becomes publicly available, a process discussed in some detail by Rogers et al. (2015).³

Although these changes improved the timeliness of insider filings, outsiders do not benefit unless the information is actually disseminated to investors. Recent evidence on investor inattention and the role of the media in securities markets suggests that how news is disseminated can affect the

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² For example, Lakonishok and Lee (2001) discuss the fact that CDA/Investnet’s Insider Trading Monitor, a vendor that specializes in insider information, often takes several days to report the filing information. This is a more general problem: studies of other types of SEC filings often have to make assumptions about when these filings become available to the public (Carter and Soo, 1999; Alford, Jones, and Zmijewski, 1994).

³ Some firms voluntarily filed Form 4 documents electronically prior to the required June 2003 date. In May 2002, the SEC added the time-stamp to the actual filings.
market’s response. If investors’ information processing abilities are limited, as suggested by the investor inattention literature, more visible dissemination of news—over prominent wire services as opposed to public but less visible EDGAR filings—may be what triggers investors to pay attention and prices to respond (e.g. Barber and Odean, 2008; Cohen and Frazzini, 2008; Dellavigna and Pollet, 2009; Hirshleifer, Lim, and Teoh, 2009). Further, it may be that dissemination by the media directly affects how investors interpret and react to news. These arguments suggest that there are non-trivial frictions in the market that impede its ability to quickly and fully impound news, even that which is publicly-available, which means there is a role for the media to affect price formation (e.g., Davies and Canes, 1978; Huberman and Regev, 2001; Tetlock, 2011). We view the new disclosure regime for insider trading as a powerful place to test these ideas, and use two complementary approaches to identify the effect of media coverage on the price response to insider trading news.

First, we gather precise (to the second) intraday information on the timing of both the underlying SEC filing and subsequent media coverage of that news, which allows us to separate the effects of the news from media coverage of that news. We download Form 4 filings from the SEC’s EDGAR database and use the approach of Rogers et al. (2015) to ascertain when the filing first becomes publicly available, either by posting to the SEC website or through a subscriber feed to the EDGAR Public Dissemination System (PDS). We then examine whether dissemination of that news over Dow Jones newswires a short time after its public release affects the way that information is incorporated into security prices. This experiment exploits the precision of our knowledge of the timing of both when the news is initially released and its dissemination by the media, as well as high resolution intraday trading data, to identify the effect of media coverage.

Second, we exploit a natural experiment in which Dow Jones initiated coverage of insider trading filings in early 2004. This initiation of media coverage/dissemination is plausibly exogenous
with respect to the underlying production and content of the news, and so offers a clean way of identifying the effect of that coverage, as discussed further below.

The insider trading setting has a number of advantages over potential alternatives for investigating the effect of media dissemination and investor inattention on security prices. First, a large fraction of these filings are made during the trading day, which facilitates tests based on intraday data.4

Second, insider trading news is less likely to be accompanied by ancillary information produced by other market agents. In contrast, the release of earnings news very quickly results in the production of various forms of analysis by market commentators, including the media, analysts, and investors. This additional commentary makes it hard to separate the effect of the news from the way it is disseminated because more news is immediately produced and that production is likely to both affect, and be affected by, the nature of the earnings news. Further, managers have incentives to strategically time the release of earnings news based on various attributes of that news (such as its sign and magnitude), which further complicates identification. In contrast, insider trading filings are likely to be made as part of a routine and mechanical process.5

Finally, filings of insider trades with the SEC are important informational events. Going back to the early literature on insider trading (Lorie and Niederhoffer, 1968; Seyhun, 1986), it has long been known that trading on inside information is profitable. Using data from the new regulatory regime and daily returns, Brochet (2010) reports that there is a positive and significant reaction to filings of insider purchases under the new post-SOX regime but that there was little

4 Our evidence (unreported) indicates that over 90% of earnings announcements are now reported outside trading hours.

5 See, for example, Patell and Wolfson (1982) and Bagnoli, Kross, and Watts (2002) for evidence on the relation between earnings news and the timing of its disclosure. Dellavigna and Pollet (2009) provide evidence that prices are less responsive to earnings news on Fridays, which is likely related to managers’ disclosure incentives (a cause, effect, or both). Also see Doyle and Magilke (2009).
evidence of a reaction prior to SOX, a finding consistent with prior evidence (e.g., Lakonishok and Lee, 2001). This clearer reaction is likely due to both the more timely filings and the fact that we now know with some precision when the insider trade information is released through EDGAR.

Both of our sets of evidence clearly support the conclusion that there is a pure dissemination effect of the media. First, we find that intraday prices respond to the release of insider trading news when it is disseminated by Dow Jones, which typically occurs 20-30 seconds after the news first becomes publicly available. Second, the results of our natural experiment, which compares the way intraday prices respond to the release of insider trading news in regimes with and without coverage by Dow Jones, also shows that there is a media dissemination effect over and above the response of the market to the initial release of the news.

Our research contributes to the literature on the role of the media by identifying the dissemination effect of the media. Bushee et al. (2010) provide evidence on the role of the business press as an information intermediary that both disseminates news and creates related content. They focus on earnings announcements, and show that the business press reduces information asymmetry, lowering spreads and increasing depth. As they recognize, the business press plays a dual role in this setting, both disseminating firm-generated earnings news and creating additional related content, and so they do not identify the mechanism. Similarly, Blankespoor et al. (2014) analyze firms’ use of Twitter to disseminate earnings news, and provide evidence that this lowers information asymmetry. However, to make inferences about the effect of disclosure in designs such as these, the authors have to rely on controls for information content, coverage by intermediaries such as the press and analysts, etc. There are similar complications in the designs used in papers such as Drake et al. (2014) and Twedt (2015); these papers use selection models and propensity score matching, respectively, to address the endogeneity of media coverage. Our tests avoid such
complications and focus on dissemination, resulting in cleaner, more powerful evidence on the dissemination role of the media.

The next section details our sample and data. Section 3 reports our tests. Section 4 provides a summary and conclusion.

2. Sample, data, and timing of media coverage

We provide details of sample construction in Table 1. We obtain insider trade filing data (SEC Form 4s) from Thomson-Reuters, and merge these data with EDGAR filings from the SEC, media coverage data from RavenPack, and intraday trading data from TAQ.

To perform our primary analysis, we require the precise time Form 4 filings are available to the public. As detailed in Rogers et al. (2015), the process through which EDGAR disseminates insider filings means that the EDGAR time stamp is not the time filings are made available to the public. After filings are uploaded to EDGAR, it takes a short period of time (usually measured in seconds) for filings to be “accepted” by EDGAR; this is the EDGAR time stamp shown in the filing header. It then takes additional time, typically 30-40 seconds, before the filings are publicly available. This occurs in either of two ways. First, it is sometimes (a little over half of the time) the case that subscribers to the Public Dissemination System (PDS) receive the filings before they are posted to the SEC website. In these cases, we treat the time filings are first made available to the PDS subscriber from whom we get these data as the time of first public dissemination. Second, in the remaining cases (just under half the time), the filing is posted to the SEC site before it is available to the PDS subscriber.\(^6\) In these cases we treat this “posting” time as the time of first public dissemination. Thus, we take the earlier of these two times as first public dissemination,\(^6\)

\(^6\) The PDS subscriber has two feeds; we take the first of these as the time the filing is available to the subscriber. As Rogers et al. (2015) discuss, there are around 40 PDS subscribers during our sample period, so it could be that other PDS subscribers get the data before the time we are designating as the time of first public dissemination. To the extent this happens, our measure of the time of first public dissemination is biased late, which understates the gap between first public dissemination and its dissemination by Dow Jones.
measured to the closest second. Rogers et al. (2015) report that the median difference in these times is around 3 seconds.

The necessity of getting these timing data from the PDS subscriber limits the sample period to March 1, 2012 through December 31, 2013. We further restrict attention to filings made during the trading day (so we can use TAQ data to measure trading effects) and more specifically to filings made between 9:40am and 3:30pm EST (to eliminates possible beginning or ending trading day effects). To remove transactions that are likely data errors, we also require that the insider transaction price is within the daily trading range on CRSP.

Having established the precise time the filing is made available to the public by EDGAR, we also need the precise time filings are disseminated by the media, which we take as the time (also measured to the nearest second) that filings are disseminated by Dow Jones. We obtain these data from RavenPack (RP), which provides time-stamped data for all news items disseminated via Dow Jones Newswires. This match is complicated by the fact that this source does not include the identity of the insider, and so does not allow us to match the article to the SEC filings in those cases where there are multiple insider filings by a given firm in a short period of time. To ensure an unambiguous match, we eliminate observations in which two or more filings for a given firm occur within 15 minutes of each other. We collect trade details (e.g., transaction price, number of shares, etc.) from Thomson Reuters.

After we impose these requirements we are left with 16,567 observations, as shown on line 6 of Table 1. We use these data to provide evidence on the timing of media dissemination relative to when the filing first becomes publicly available.

The first panel of Figure 1 shows a histogram of the delay in seconds from first public dissemination to dissemination via Dow Jones, bucketed in five-second intervals, and separately reported for insider purchases and sales. We discuss results for purchases (dark bars) first. There
are almost no observations for which the delay is less than 15 seconds. Around 7% of observations have a delay of 15-19 seconds while most observations (over 20% in each case) fall into the 20-24 and 25-29 second delay groups. This means that in more than 40% of cases the delay is around 20-30 seconds with an additional 15% from 30-35 seconds. This indicates that Dow Jones generally disseminates insider filings quickly, within half a minute or so of first public dissemination via EDGAR. Perhaps not surprisingly, the distribution of delay times has a long right tail, with a small number of observations taking more than 90 seconds before they are disseminated by Dow Jones. The distribution of delays for insider sales (unshaded bars) is similar although delays are somewhat longer for sales than purchases.

The second panel of Figure 1 shows histograms for the time between SEC posting and dissemination via Dow Jones, again reported separately for purchases and sales. In this figure, the time differences can be negative because in a small fraction of cases, Dow Jones evidently obtains the filing information from a PDS subscriber in advance of its public posting on the SEC site; the figure shows that this happens in approximately 5% of cases. For the bulk of the observations, however, the delay is in the 15 to 35 second range, again indicating that Dow Jones disseminates filings quickly after they become available via the SEC website.

Overall, the evidence in Figure 1 indicates that there is significant variation in the length of time between when filings first become publicly available and when they are disseminated via Dow Jones. While for many observations this delay is in the 20-30 second range, for some observations the delay is shorter while for others it is longer, and sometimes much longer. We exploit this variation in our main tests to investigate whether the market fully responds to the information in these filings when the information first becomes publicly available, or whether it also reacts when

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7 As discussed above, just over half of the time, the SEC post occurs after the filings are disseminated to PDS subscribers, who quickly disseminate to their clients, which include media outlets.
the information is disseminated by Dow Jones, given that the evidence in Figure 1 shows that there is usually a significant period of time between these two events.

It possible that economically important characteristics of the trades explain variation in the length of time it takes for them to be disseminated by the media. However, because insider filings are easy to interpret and homogeneous, they should also be easy for Dow Jones to process and disseminate (it is possible that this is done mechanically without human intervention). This would suggest that the timing of media dissemination is not affected by informational characteristics of the disclosure. Indeed, this is what motivates our focus on insider filings as opposed to (say) earnings announcements, where the news being released is likely to generate additional content and/or affect the way it is disseminated by the media.

To examine this question, we regress the length of the coverage delay (in seconds) on variables likely to capture variation in the information content of the trade—size of the trade, past trades by the same insider over the prior year, and CFO and CEO dummies. We also include a Filing Cluster variable which counts the number of other EDGAR filings (of all types) that occur in the minute before public dissemination of the filing, the idea being to see if delays are longer at busier times when there are more filings. This variable is distinct from the others because it is unlikely to reflect informational aspects of the filings. We also include a time trend to examine how the length of the delay changes over our sample period.

The results, which we report in Table 2, show that there is a modest time trend in these data: over the sample period (of 22 months), the delay gets smaller, although statistical significance is not very strong (t-statistics of around -1.9). This could reflect gradually improving technological capability that allows Dow Jones to access and disseminate filings more quickly. The only other significant variables are Filing Cluster and CEO dummy, both of which have positive, statistically significant coefficients. The result on Filing Cluster indicates that dissemination takes longer during
busier periods, implying that there is some form of capacity constraint in the process through which Dow Jones accesses, processes, and disseminates filing. Trades by the CEO are generally seen as being more informative, so the positive coefficient on the CEO dummy implies that more informative trades take longer to process. Overall, however, there is no clear evidence here that length of the delay in media dissemination reflects informational aspects of the filing.

As shown in the last two rows of Table 1, for our tests we further limit the sample to observations for which the time between first public dissemination and dissemination by Dow Jones is between 15 and 300 seconds. This ensures that we have a sufficient gap (15 seconds or more) between the two events such that our intraday event analysis can separately identify market effects. In addition, we exclude those few observations for which the delay seems excessively long (longer than 300 seconds).

To conduct the first set of tests, we examine whether the price response varies according to the length of the delay between the time of first public dissemination (as defined above) and dissemination via Dow Jones, as summarized in Figure 1. To do this, we sort observations into two equal groups based on whether the delay is above or below the sample median. The “short delay” group contains observations for which the delay is below the median; the “long delay” group contains observations for which the delay is above the median.

The regression results in Table 2 show that delay is not related to informational characteristics of the filings, with the exception that delays are longer for trades by the CEO (as well as filings processed during busy periods, but this is unlikely to be related to information). To examine this further, Table 3 compares characteristics of the observations in the short delay and long delay groups. First, as is true by construction, the delays are significantly longer for the long delay groups: the mean (median) delay for the long delay group is 43 (37) seconds versus 21 (21)
seconds for the short delays group. This indicates that there is a significant difference in delay between the two groups, of 16 seconds at the median, which is important for our tests.

Second, the results in Table 3 show that trade size is larger for the long delay group compared to the short delay group although the differences are not large in economic terms. Mean (median) trade size is $92,688 ($22,210) for the long delay group compared to $64,940 ($19,000) for the short delay group (these differences are significant at the 1% level). Similar to the CEO dummy result in Table 2, this is some evidence that the delay is longer for more informative trades, although the trade size variable is not significant in the Table 2 regression. The evidence in Table 3 shows little in the way of differences between the groups in terms of insider type, another common indicator of the information content of the trade. Overall, there is at best modest support for the idea that the informational nature of the trade affects how quickly it is disseminated via Dow Jones. This strengthens our design because in many settings the informational nature of the news being disseminated is likely to be related to the way it is disclosed and often affects the incentives of agents to create and discuss the news, making it difficult to make strong inferences about the effect of media dissemination per se.

3. Empirical Tests

3.1 Intraday Analysis of Insider Filings

Our first set of analyses examines how prices and volume respond to the first public dissemination of news via EDGAR and to the subsequent dissemination of news via Dow Jones. If all that is important is the initial release of the news, then the market should respond at the time the news is disseminated through EDGAR as opposed to when it is later disseminated via Dow Jones. In contrast, if the dissemination role of the media is important, we will observe a market response at the time the news is disseminated by Dow Jones over and above what is observed at initial dissemination.
We use price and volume changes to measure market activity, both measured on a second-by-second basis using TAQ data. More specifically, we measure and report changes in prices in event time (percent change in price relative to 60 seconds before dissemination), and abnormal volumes (percent abnormal volume relative to typical volume for the two minutes around the dissemination). Formal definitions of these measures are provided in Appendix A.

To give a general sense for the intraday information content of insider trade data, Figure 2 plots percent change in prices and volumes for up to two minutes after first dissemination of the filing news. For descriptive purposes, we also report changes in spreads but do not include those in our tests because it is not clear how we expect them to respond to multiple dissemination events (abnormal spreads are defined analogously to abnormal volume), especially since previous research shows that dissemination lowers spreads (e.g., Bushee et al., 2010). We plot results for purchases and sales separately.

Consistent with previous research on how the market responds to insider trading news (e.g., Seyhun, 1986; Lakonishok and Lee, 2001), prices increase in response to insider purchases but do not react to insider sales. Figure 2, Panel A shows that for purchases (solid line), prices increase by 50 basis points (bps) by the time of first public dissemination. This is measured relative to the price at which the insider executes the purchase. Thus, for purchases, prices increase by 50 bps before the news is publicly available (this is the return available exclusively to the insider). There is then a distinct jump (of around 4 bps) at the time of initial public dissemination followed by clear upward

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8 Our tests assume that the clocks we use to measure the time of first public dissemination (which comes from our PDS data, described above) and by TAQ are correctly synchronized. Rogers et al. (2015) provide evidence that this is likely to be the case. The tests also assume that there is no delay in recording the quotes using TAQ, which is supported by Rogers (2008).

9 We take cumulative dollar volume from t = -60 to through event second t minus the average volume for the exact same window (calculated over the previous 52 weeks), deflated by the average cumulative volume for the entire 120 second window (again calculated over the prior 52 weeks).
drift that totals around 15 bps over the two minute event period. In strong contrast, the plot for sales (dashed line) shows essentially no movement after the first public dissemination.

These impressions are reinforced by Panel B, which shows how volume responds to dissemination of the insider trading news. For purchases (solid line), we see a very significant response in abnormal volume with a concave shape, so that volume responds quickly to the information release but that the response slows over the two minute window as the news is impounded. Similar to Panel A, the results for insider sales show essentially no response to the news. Because these results show that insider sales in general do not generate any significant market response, we drop them from further analysis and instead focus on insider purchase transactions.

Panel C reports on abnormal spreads. Once again, there is a clear response to the release of the insider filing news in that spreads for insider purchases jump sharply at the time of public dissemination. Consistent with a persistent increase in information asymmetry, spreads stay elevated for the full two minute window but gradually decline, which presumably reflects assimilation of the news by market participants.\(^\text{10}\) The plot for insider sales is again quite different, but shows little evidence of a jump but a more gradual increase over the sample period.

We report the results of our first main test in Figure 3, which plots price and volume changes in event time relative to the time of first public dissemination, as defined in Section 2, with observations split into the short and long delay groups. Panel A reports on prices while Panel B reports on volume. If media dissemination is important, we expect to see a difference in the timing

\(^\text{10}\) Interestingly, these results differ from previous papers such as Bushee et al. (2010) which shows that greater dissemination lowers spreads in daily data. It is possible that the initial effect of dissemination is to increase spreads as the information is being impounded by the market but that spreads then recede as differences in information across market participants declines. Rogers et al. (2015) show that in some cases the information in insider filings is available to some market participants before others, which likely increases information asymmetry. Subsequent dissemination by the media would then mitigate this information asymmetry.
of the response for the short and long delay groups, with more rapid response for the short delay being evidence of an effect of media dissemination.

The price results in Panel A of Figure 3 are consistent with a media effect. First, consistent with there being an effect of first public dissemination, there is a steep increase in price in the first second after the news is first made available. This is true for both the short and long delay groups, consistent with what we would expect if some market participants trade immediately upon dissemination via EDGAR. Second, consistent with the overall information content of the news being similar for the two groups, prices end up in the same place after the full two minutes has elapsed. This provides further assurance that the trades have similar information content. Third, and most important, the price paths diverge noticeably beginning around 15-20 seconds, with prices jumping up more strongly for the short delay group over the period when our earlier (Figure 1) results tell us that Dow Jones is disseminating the news. Differences between the price paths are statistically significant at the 5% level (two tailed) at seconds 36-38 and at the 10% level for seconds 31-46, 50, 54, and 55. We interpret this as evidence that there is a significant Dow Jones dissemination effect.  

The results using volume (Panel B of Figure 3) are harder to interpret clearly. Here we see that the overall volume effect is larger for the long delay group, that there is no clear difference in the evolution of volume between the two groups, and that volume continues to respond over the full window for both groups. Earlier we saw that trade sizes are larger for the long delay group. We also find (not reported) that trade size is positively associated with the magnitude of the volume response. This makes it likely that the larger volume effect for the long delay group is due to the

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11 We have also analyzed whether these patterns differ for large and small trades. We find that the overall price effect is larger for larger trades and that prices respond more quickly for larger trades. Because trade size is larger for the long delay group compared to the short delay group (Table 3), this biases against the result we observe in Panel A of Figure 3.
larger trade sizes. This means that the price results are a more informative test because they are not confounded by trade size.

In Figure 3, event time is defined relative to first public dissemination. This means that the timing of dissemination of Dow Jones varies across different observations, even within the short and long delay groups, which makes the treatment effect harder to observe. A different way of conducting the analysis is to examine how prices and volume respond when event time is defined relative to when Dow Jones disseminates the news. This is what we report in Figure 4, with Panel A showing price changes and Panel B showing volume. Actual price and volume numbers are reported as solid lines.

The results in Figure 4, Panel A are consistent with a Dow Jones dissemination effect. While the plot is generally increasing gently before the release (consistent with the evidence in Figure 3, which shows that price begins to move at the time of first public dissemination), there is a pronounced kink at the time of the Dow Jones release. To provide a benchmark for the evolution in price, we use the percent change in price before dissemination by Dow Jones to predict the slope following the kink in the absence of media coverage and, thereby, provide a counterfactual price response. Specifically, we predict the percent returns after the media coverage using the data from 15 seconds prior to the media coverage and second, third, and forth order polynomials of the time elapsed. These counterfactual price responses, assuming no media coverage, are shown as dashed lines in Figure 4. The differences between the predicted response lines and that observed clearly suggest that there is an effect of Dow Jones coverage.

We obtain similar evidence using volume, shown in Figure 4, Panel B. Once again, we use fitted values from the regression to produce a counterfactual volume path in a world without the Dow Jones release. As is clear from the figure, the actual line diverges from this path in an upward direction, consistent with a volume response to Dow Jones coverage after conditioning on how
volume would respond to the news absent Dow Jones coverage. What is less consistent, however, is that the “kink” does not emerge until about five seconds after Dow Jones dissemination, making the evidence less definitive than in Panel A.

Overall, the evidence in this section provides a clear indication that there is an incremental effect of the media in intraday prices and volume, consistent with there being a pure dissemination effect of the media.

3.2 Analysis of presence/absence of Dow Jones coverage

We next use a variation on this setting to examine the effect of Dow Jones dissemination on the market response to the release of insider trading news. To understand this setting, Figure 5 plots a timeline that shows, for a period that surrounds when Dow Jones initiated its coverage of Form 4 filings in early 2004: (i) the full set of SEC filings of insider trades, per EDGAR, (ii) the set of insider transactions available from Thomson Reuters, (iii) Dow Jones’ coverage of the SEC filings, per RP. For our purposes, the important feature is that Dow Jones first provides coverage of these filings in mid-January 2004, around 18 months after time-stamps on electronic EDGAR filings of insider trades on Form 4 became available. This allows us to compare the price response to filings before and after initiation of coverage by Dow Jones, where coverage can be viewed as exogenous (i.e., Dow Jones’ initiation of coverage is plausibly unrelated to the news content).

To conduct this test, we need to match insider transactions before and after Dow Jones initiates coverage as closely as possible. To do this, we restrict attention to firms that report insider purchases in both one-year periods immediately before and after coverage initiation on January 20, 2004, and eliminate pairs with large differences in trade size (the trade size between the pre and post-DJ coverage windows differs by more than $100,000) or that lack return data. This results in a sample of 280 firm/pairs. To evaluate how well this matching process works, Table 4 compares
observations in the before and after groups, and shows that the two groups are similar with respect
to both the titles/position of the insiders and trade size.

We report the results of the analysis in Figure 6. There are again separate panels for the
price and volume tests. For this figure, we report the market response in event time (measured in
seconds) relative to the time of dissemination by Dow Jones and a pseudo-Dow Jones release time
and compare responses between the two groups. For the non-covered trades, we define a pseudo-
Dow Jones release time using the delay in media coverage for the matched covered trade. The event
period is the five minutes after dissemination by Dow Jones.

The results in Panel A of Figure 6 for prices show clear evidence of a coverage effect, with
price moving steadily upwards for the covered (“Dow Jones”) observations in the period after
dissemination, for an overall increase of around 12 bps. In contrast, the series for the non-covered
(“No Dow Jones”) group is essentially flat for the first two minutes, before moving upwards but not
nearly to the same degree as for the covered transactions (total increase of around 2 bps).
Differences between the series are statistically significant at the 1% level or better beginning at 7
seconds and then for the remainder of the period. Overall then, Panel A shows clear evidence of a
Dow Jones price effect.

Panel B of Figure 6 provides the same analysis using the abnormal volume measure. Here
we again see a pronounced difference between the Dow Jones and No Dow Jones series. For the
Dow Jones series there is clear upward movement in volume after the time of dissemination. For
the No Dow Jones series, the movement is much less pronounced. Differences between the two
series are statistically significant but not as strongly as for the price series, with significance at the 5%
level (one tailed) beginning around one minute after dissemination and persisting through around
four minutes after dissemination.
Overall then, the results of the Dow Jones coverage natural experiment provides evidence consistent with the findings from the event study. In both cases, the evidence suggests that there is a pure media dissemination effect.

4. Conclusions

We use a change in the regime under which insiders file and report their trades to obtain precise data on the timing of these filings. We use this setting as well as plausibly exogenous variation in the media’s coverage of these filings to better understand whether the pure dissemination of publicly-available information affects how it is impounded into security prices and trading volume, an important issue given recent interest in the role of the media and the importance of various “frictions” that result in puzzling inefficiencies (such as investor inattention) in the way that securities markets process public information.

To do this we utilize the insider trading disclosures in two ways that allow us to directly assess the effect of the dissemination of insider trading news on prices and volumes. We find evidence that the speed of adjustment and perhaps the overall price effect itself are affected by the existence and timeliness of media coverage—prices adjust more rapidly to SEC filings of insider trading news when there is accompanying media coverage and that coverage is more timely, both of which suggest that the media plays an economically important role in the price formation process in securities markets.
Appendix A: Variable Definitions

**Independent Variables (Tables)**
Note: all continuous variables winsorized at 1% and 99%.

- **Trade Size** = The dollar value of the insider purchase, from T-R.
- **Firm Size** = Total assets, from Compustat, in millions.
- **Filing Cluster** = The number of filings posted to EDGAR in the 60 seconds prior to the Form 4 posting.
- **Prior Trading** = The total amount of purchase activity, in dollars, that the insider engaged in during the prior 365 days, from T-R.
- **CEO** = 1 if the insider is the CEO, 0 otherwise.
- **CFO** = 1 if the insider is the CFO, 0 otherwise.
- **Time Trend** = a measure of chronological time, equal to 1 for observations in the first month of the data and 22 for those in the last month.

**Market Reaction Variables (Figures)**

- **Returns** = The percent change in price between event time and the price 60 seconds prior to dissemination.
- **% Abnormal Volume** = Cumulative dollar volume from t = -60 through event second t minus the average of the same for the exact same window (calculated over the prior 52 weeks), deflated by the average cumulative volume for the entire 120 second window (again calculated over the prior 52 weeks).
- **% Abnormal Spreads** = The percent abnormal spread, measured as (actual spread – normal spread for time t) / (normal spread at 60 seconds prior to dissemination).
References


Table 1: Sample construction

This table describes the sample construction procedures. The table begins with Thomson Reuters insider trading data. We then merge in data from three other sources. First, we add in the Form 4 insider trading time-date stamps obtained from the SEC’s EDGAR filing system. Second, we merge in details about the Dow Jones media coverage of the filings. Finally, we incorporate TAQ data. The details on sample attrition for the full sample, as well as purchases and sales separately, are provided below.

<table>
<thead>
<tr>
<th>Line</th>
<th>Description</th>
<th>Total Trades</th>
<th>Purchases</th>
<th>Sales</th>
<th>% Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Starting sample from Thomson Reuters (stock not options, Form 4 including Officers, Directors and Committee members)</td>
<td>97,398</td>
<td>23,128</td>
<td>74,270</td>
<td>23.75%</td>
</tr>
<tr>
<td>2</td>
<td>Able to match company CIK and insider name to SEC filings on EDGAR</td>
<td>88,841</td>
<td>19,327</td>
<td>69,514</td>
<td>21.75%</td>
</tr>
<tr>
<td>3</td>
<td>Restrict to a “isolated” Form 4 filings (excluding multiple filings within 15 minutes of each other)</td>
<td>66,110</td>
<td>15,257</td>
<td>50,853</td>
<td>23.08%</td>
</tr>
<tr>
<td>4</td>
<td>Filed with SEC 9:40am to 3:30pm EST</td>
<td>21,004</td>
<td>6,727</td>
<td>14,277</td>
<td>32.03%</td>
</tr>
<tr>
<td>5</td>
<td>With RavenPack (Dow Jones) coverage and TAQ data</td>
<td>17,064</td>
<td>4,098</td>
<td>12,966</td>
<td>24.02%</td>
</tr>
<tr>
<td>6</td>
<td>Insider's last transaction price within daily trading range on CRSP</td>
<td>16,567</td>
<td>3,814</td>
<td>12,753</td>
<td>23.02%</td>
</tr>
<tr>
<td>7</td>
<td>Time between first dissemination and Dow Jones report is between 0 and 300 seconds</td>
<td>16,518</td>
<td>3,789</td>
<td>12,729</td>
<td>22.94%</td>
</tr>
<tr>
<td>8</td>
<td>Time between first dissemination and Dow Jones report is between 15 and 300 seconds</td>
<td>15,346</td>
<td>3,469</td>
<td>11,877</td>
<td>22.61%</td>
</tr>
</tbody>
</table>
Table 2: Determinants of Dow Jones coverage delays

The following regressions show the delay in media coverage by Dow Jones (in seconds) regressed on potential determinants of the coverage delay. In the first column, the delay is regressed on a measure of chronological time, equal to 1 for observations in the first month of the data and 22 for those in the last month (Time Trend). In the second column, control variables are included as follows: We include a measure of firm size, equal to total assets, from Compustat, in millions (Firm Size). We include the number of filings posted to EDGAR in the 60 seconds prior to the Form 4 posting (Filing Cluster). We include the amount of purchase activity, in dollars, that the insider engaged in during the prior 365 days, from Thomson-Reuters (Prior Trading). We include the dollar value of the insider purchase, from Thomson-Reuters (Trade Size). Finally, we include indicator variables for whether the insider is the CEO or CFO. Standard errors are clustered at the year-month level.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Panel A</th>
<th></th>
<th>Panel B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff</td>
<td>t-stat</td>
<td>Coeff</td>
<td>t-stat</td>
</tr>
<tr>
<td>Intercept</td>
<td>33.6573</td>
<td>19.95</td>
<td>26.0558</td>
<td>7.28</td>
</tr>
<tr>
<td>Log(1+Time Trend)</td>
<td>-1.3112</td>
<td>-1.95</td>
<td>-1.3507</td>
<td>-1.92</td>
</tr>
<tr>
<td>Log(1+Firm Size)</td>
<td>-0.0564</td>
<td>-0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(1+Filing Cluster)</td>
<td>2.0657</td>
<td>3.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(1+Prior Trading)</td>
<td>0.0116</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(1+Trade Size)</td>
<td>0.4892</td>
<td>1.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEO</td>
<td>2.1616</td>
<td>3.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFO</td>
<td>-0.2590</td>
<td>-0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.003</td>
<td></td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>3,294</td>
<td></td>
<td>3,294</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Descriptive statistics of insider purchases with long versus short delays

This table provides descriptive statistics of the trades with long versus short Dow Jones coverage delays. As in Figure 4, media coverage delays below the median delay of observations in Figure 3 are classified as “Short” and those above the median are classified as “Long.” Panel A provides the mean and median media coverage delay (in seconds) for the two samples. Panel B compares the mean and median trade sizes between the two delay group. The p-value of the means is from a t-test and the p-value of the medians is from a Wilcoxon rank-sum test. Panel C provides the frequency distribution of the primary role code for the insiders trading within each delay group.

<table>
<thead>
<tr>
<th>Panel A: Delay descriptives (in seconds)</th>
<th>Short Delay</th>
<th>Long Delay</th>
<th>Difference (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>21</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>21</td>
<td>37</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Trade Size (in dollars)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>64,940</td>
<td>92,688</td>
<td>0.00</td>
</tr>
<tr>
<td>Median</td>
<td>19,000</td>
<td>22,210</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C: Primary role code of insider</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CB (Chairman of the Board)</td>
<td>34</td>
<td>37</td>
<td>2%</td>
</tr>
<tr>
<td>CEO (Chief Executive Officer)</td>
<td>294</td>
<td>310</td>
<td>16% 19%</td>
</tr>
<tr>
<td>CFO (Chief Financial Officer)</td>
<td>99</td>
<td>102</td>
<td>5% 6%</td>
</tr>
<tr>
<td>CI (Chief Investment Officer)</td>
<td>10</td>
<td>4</td>
<td>1% 0%</td>
</tr>
<tr>
<td>CO (Chief Operating Officer)</td>
<td>32</td>
<td>41</td>
<td>2% 2%</td>
</tr>
<tr>
<td>CT (Chief Technology Officer)</td>
<td>3</td>
<td>3</td>
<td>0% 0%</td>
</tr>
<tr>
<td>D (Director)</td>
<td>1,035</td>
<td>849</td>
<td>57% 51%</td>
</tr>
<tr>
<td>DO (Director and Beneficial Owner)</td>
<td>39</td>
<td>32</td>
<td>2% 2%</td>
</tr>
<tr>
<td>EVP (Executive Vice President)</td>
<td>0</td>
<td>1</td>
<td>0% 0%</td>
</tr>
<tr>
<td>H (Officer, Director, and Beneficial Officer)</td>
<td>1</td>
<td>2</td>
<td>0% 0%</td>
</tr>
<tr>
<td>MC (Member of Committee or Advisor)</td>
<td>1</td>
<td>1</td>
<td>0% 0%</td>
</tr>
<tr>
<td>O (Officer)</td>
<td>194</td>
<td>201</td>
<td>11% 12%</td>
</tr>
<tr>
<td>OD (Officer and Director)</td>
<td>17</td>
<td>24</td>
<td>1% 1%</td>
</tr>
<tr>
<td>OS (Officer of Subsidiary)</td>
<td>2</td>
<td>2</td>
<td>0% 0%</td>
</tr>
<tr>
<td>OT (Officer and Treasurer)</td>
<td>3</td>
<td>4</td>
<td>0% 0%</td>
</tr>
<tr>
<td>OX (Divisional Officer)</td>
<td>3</td>
<td>1</td>
<td>0% 0%</td>
</tr>
<tr>
<td>P (President)</td>
<td>44</td>
<td>43</td>
<td>2% 3%</td>
</tr>
<tr>
<td>VP (Vice President)</td>
<td>0</td>
<td>1</td>
<td>0% 0%</td>
</tr>
<tr>
<td></td>
<td>1,811</td>
<td>1,658</td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Natural Experiment – Descriptive statistics for trades surrounding the Dow Jones initiation of Insider Trading coverage

This table provides descriptive statistics of the trades made under the Dow Jones coverage and non-coverage regimes used in the natural experiment. The "No DowJones" window covers the 12 months before the Dow Jones started covering insider trading filings (on January 20, 2004). The "DowJones" window covers the 12 months after Dow Jones started disseminating information about the insider trade filings. The sample consists of the 280 firms that had insider purchase filings during each of these windows. Panel A compares the mean and median trade sizes between the two regimes. The p-value of the means is from a t-test and the p-value of the medians is from a Wilcoxon rank-sum test. Panel B provides the primary role code for the title of the insiders trading within each regime.

<table>
<thead>
<tr>
<th></th>
<th>DJ Coverage</th>
<th>No DJ Coverage</th>
<th>Difference (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Trade Size (in dollars)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>18,729</td>
<td>18,024</td>
<td>0.70</td>
</tr>
<tr>
<td>Median</td>
<td>10,958</td>
<td>9,899</td>
<td>0.45</td>
</tr>
<tr>
<td><strong>Panel B: Primary role code of insider</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB (Chairman of the Board)</td>
<td>3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>CEO (Chief Executive Officer)</td>
<td>29</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>CFO (Chief Financial Officer)</td>
<td>23</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>CI (Chief Investment Officer)</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CO (Chief Operating Officer)</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>D (Director)</td>
<td>159</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>DO (Director and Beneficial Owner)</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>H (Officer, Director and Beneficial Owner)</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>O (Officer)</td>
<td>37</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>OB (Officer and Beneficial Owner)</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OD (Officer and Director)</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OS (Officer of Subsidiary)</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OT (Officer and Treasurer)</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OX (Divisional Officer)</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>P (President)</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

280  
280
Figure 1: Histogram of media dissemination delays

This histogram details the distribution of media coverage delays (difference, in seconds, between the SEC Form 4 acceptance and the first Dow Jones story) for insider purchases and sales. The sample is based on the Line 6 total observations described in the next to last line of Table 2.
Figure 2: Price and abnormal volume movements after insider trading SEC filings

These graphs detail the price and volume response following first dissemination of the Form 4. The solid (dashed) line details price and volume movements of insider purchases (sales). The sample is based on the Line 8 sample described in Table 2. The horizontal axis is the number of seconds after the SEC filing. In Panel A, the vertical axis captures the percent change between the current price and the insider's transaction price. Thus, for example, the purchase line begins at approximately 0.51% because, on average, the price is 0.51% higher at the time of the SEC filing relative to the insider's purchase price.

Panel A: Percent change in price

![Panel A Graph](image1)

Panel B: Percent change in abnormal volume

![Panel B Graph](image2)
Panel C: Percent change in abnormal spreads

![Graph showing percent change in abnormal spreads for purchases and sales over time. The graph has a y-axis labeled % Abnormal spreads with a range from 70% to 130%, and an x-axis labeled Seconds after first dissemination with values from 0 to 120. Two lines are depicted: one representing purchases and the other representing sales. The purchases line starts with a sharp increase and then levels off, while the sales line shows a steady increase.]
Figure 3: Price and volume movements after insider trading SEC filings for insider purchases split on various dimensions

These figures show price and volume movements after the first dissemination for those filings that are covered by the media relatively quickly (“short” delays) and those that are covered after a longer delay (“long” delays).

Panel A: Price movements

Panel B: Volume movements
Figure 4: Price and volume movements (actual and predicted) around Dow Jones media coverage of insider trading

These figures show price and volume movements around the Dow Jones coverage of insider purchases. Time zero is the second at which the first Dow Jones article is disseminated. The solid line shows the actual price movements (“Purchases”). The dashed line shows the predicted responses to the media coverage where the predicted values are derived using the coefficients from a regression of the percent change in price on a second order polynomial of time using the actual return data from -15 (or -10) seconds to -1 second.

Panel A: Price movement around DJ coverage with 10 second prediction model

Panel B: Volume movement around DJ coverage with 10 second prediction model
Figure 5: Comparison of insider trading coverage around the initiation of Dow Jones coverage

This figure shows the number of SEC Form 4 filings (SEC), insider trading filing events covered in Thomson-Reuters (TR), and insider trading events with Dow Jones (DJ) coverage in RavenPack around January 20, 2004 when Dow Jones began covering insider trading (Form 4) activity.
Figure 6: Natural Experiment – Dow Jones initiation of Insider Trading coverage

These figures graph price and volume movements before and after the initial Dow Jones coverage of insider purchase filings with the SEC for the 280 firms with at least one filing in the 12 months prior to the initiation of Dow Jones insider trading coverage on January 20, 2004 and at least one filing in the 12 months following. If a firm has more than one insider purchase after coverage was initiated and/or more than one insider purchase before coverage was initiated, we retain the trade closest in size (based on dollar-value) to the covered trade. The sample of 280 firms excludes those with a trade size difference greater than $25,000 between the covered and non-covered trade. Panel A shows the distribution of cumulative returns following the initial Dow Jones coverage of the trade and for a similar period following the non-covered matched trade. Panel B shows the same information for abnormal volume.

Panel A: Cumulative return before and after initiation of Dow Jones coverage
Panel B: Cumulative abnormal volume before and after initiation of Dow Jones coverage