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The relationship between media coverage and post-earnings announcement drift

Evidence from the Swedish stock market

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Abstract

We investigate empirically if there is a connection between media coverage and post-earnings announcement drift. We test and find support for both our hypotheses; media coverage is positively associated with both earnings surprises and the drift following earnings announcements. We argue that our results can be attributed to limited investor attention. As attention is a scarce resource for investors, and media has been shown to act as an attention-grabber, media coverage might create more homogenous expectations and in turn less accurate earnings estimates. Moreover, we suggest that media's ability to drive price reactions in the context of post-earnings announcement drift can cause an amplified drift.

Key words: Post-earnings announcement drift, Media, Limited investor attention

JEL-classifications: G14, L82

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1. Introduction

In 2000, Shiller stated that news media is naturally attracted to financial markets as they provide constant news in form of daily price changes. News media is however not only a detached observer, but plays an integral part in market events. To illustrate this, Shiller (2000) uses the example of the Kobe earthquake in Japan in 1995. On the day of the event, the Nikkei index only fell slightly. A week later, the Nikkei fell 5.6% in one day, although there was no apparent news except the gradual unfolding of numerous news accounts on earthquake damages. But even more interesting, on the same day other markets such as FTSE100 in London fell 1.4%, CAC40 in Paris fell 2.2% and DAX in Germany fell 1.4%. In Brazil and Argentina, the stock markets fell roughly 3% each. Shiller (2000) interprets the international market reaction as media coverage of the earthquake engaged the attention of investors and created a negative market sentiment. As none of these markets were substantially affected in an economic sense by the earthquake in Kobe, this indicates that media do shape market reactions.

A vast body of literature studying the potential relationship between news media and stock markets has evolved over the past decades. One of the more famous contributions is Barber and Odean (2008), who show that individual investors are net-buyers of attention grabbing stocks, e.g. stocks appearing in news media. More recently, research concerning the connection between news media and one of the biggest market anomalies, post-earnings announcement drift (PEAD) has emerged.

PEAD was first discovered almost 50 years ago (Ball and Brown, 1968) and has since been proven to be robust across markets, time and methodologies. It essentially refers to that firms reporting unexpected positive quarterly earnings are associated with positive excess stock returns for an extended period after the earnings announcement reporting date; and firms reporting unexpected negative quarterly earnings results are associated with negative excess stock returns for an extended period after the earnings announcement. As PEAD implies deviations from market efficiency, it has been the cause of much discussion and many have sought to explain the anomaly, but at this point in time no theory has been fully able to.

Our study investigates empirically whether there is a connection between firm-specific media coverage prior to- and following earnings announcements and PEAD. The study is performed using Swedish stock market data spanning from 2006 to 2015. We find evidence supporting both an indirect and direct positive relationship between media coverage and post-earnings

announcement drift in periods surrounding the announcement date. Possible explanations for our results can be found within the theory of limited investor attention. We argue that as limited investor attention implies that investors cannot continuously assess all information, media will play a role in determining what set of information an investor assesses. As stated by Barber and Odean (2008), "*preferences determine choices after attention has determined the choice set*". In addition, media has the ability to further drive price reactions (e.g. Huberman and Regev, 2001; Pinnuck, 2014), for example by making already public information appear to be new information.

The rest of the paper is organized as follows. The subsequent section outlines findings in previous research, and develops hypotheses regarding the relationship between PEAD and media coverage prior to- and following the earnings announcement. Section 3 provides an overview of data employed and section 4 covers methodology. Section 5 lays out our findings and section 6 consists of concluding remarks.

2. Literature

In order to understand the context of our study, we will first give a brief description of PEAD and some of the most prominent attempts to explain its existence. Secondly, we will discuss previous literature on media's impact on stock markets. Lastly, we will lay out our hypotheses regarding the relationship between PEAD and media coverage.

2.1 Post-earnings announcement drift in the literature

In short, PEAD refers to evidence that earnings announcements with large positive unexpected earnings (UE) are followed by an upward drift in security prices, and vice versa; earnings announcements with large negative UE are followed by a downward drift in security prices (e.g. Bernard and Thomas, 1989; Francis, Lafond, Olsson and Schipper, 2007; Brandt, Kishore, Santa-Clara and Venkatachalam, 2008). This is a clear violation of market efficiency, as it disrupts the assumption of information being incorporated into prices instantaneously.

Since the concept of post-earnings announcement drift was first introduced by Ball and Brown (1968), numerous attempts have been made to explain the phenomenon. While explanations vary, the market anomaly has been proven to be consistent across time and markets. Liu, Strong and Xu (2003) find evidence of PEAD in the UK stock market in the period between 1988 and

1998. Evidence of the existence of PEAD has also been found in various other European countries such as Spain, 1993-2003, (Forner, Sanabria and Marhuenda, 2009), Germany, 1987-2000, (Dische, 2002), and Finland, 1989-1993, (Booth, Kallunki and Martikainen, 1996) among others. Hong, Lee and Swaminathan perform a study in 2003 investigating international markets and find evidence of PEAD in Australia, Canada, France, Germany, Hong Kong and the UK between 1987 and 2001. However, they fail to find it in Malaysia, South Korea, Japan, Singapore and Taiwan for the same time period. Previous literature regarding PEAD in Sweden is scarce, and Setterberg (2011) is to our knowledge the first paper establishing the existence of the drift in the Swedish market.

Even though previous literature has been unsuccessful in fully explaining PEAD, some interesting findings surrounding the phenomenon have been discovered. For example, several studies highlight a robust relationship between PEAD and firm size. Foster, Olsen and Shevlin (1984) and Bernard and Thomas (1989) show that the drift is larger for smaller firms and Bhushan (1994) show that it is higher for firms with low share prices and illiquid shares. Furthermore, Bartov, Radhakrishnan and Krinsky (2000) find that the drift is larger for firms with low institutional ownership.

Much of the previous literature show the existence of PEAD through trading strategies, where portfolios are created based on earnings surprises and in theory earns a positive return. Recent examples include Battalio and Mendenhall (2007), who found that investors could have earned hedged-portfolio returns of at least 14% per year after trading costs exploiting PEAD in the US market and Setterberg (2011) who found that a hedged portfolio based on earnings surprise could have earned an average risk-adjusted monthly return of 0.9% (10.8% per year) in the Swedish market.

Previous attempts to explain PEAD can often be divided into two general categories: rational explanations based on misspecification of risk or market frictions, and behavioral explanations based on the assumption of market inefficiency.

2.1.1 Common rational explanations to post-earnings announcement drift

Rational explanations in the literature commonly suggest that the existence of PEAD is either reward for risk that prevails in an efficient market, which researchers fail to adjust for, or due to market frictions such as transaction costs.

The mismeasurement of risk argument builds on the idea that firms with unexpectedly high earnings become more risky and vice versa, and as such, the size and direction of abnormal returns is nothing more than fair compensation for bearing risk. Thus, if risk would be specified correctly, PEAD would not exist. Ball, Kothari and Watts (1993) look at CAPM misestimation and argue that betas will shift upward (downward) following high (low) unexpected earnings, and therefore previous studies using stationary betas create a bias in estimating the abnormal returns. To overcome this potential bias, they allow betas to shift annually, and find that the observed risk changes explain a substantial portion of the drift and that the PEAD is no longer significant. Bernard and Thomas (1989) fail to find evidence supporting this theory using quarterly data and a sample that is not dominated by large firms. Although they find a positive correlation between betas and earnings surprises, they find that the shifts in beta were only approximately 8% of what would have been necessary to explain the full drift. In 1998, Fama publishes a study in favor of the efficient market hypothesis, by looking at over- and underreactions to information in the market and testing the perseverance of long-term return anomalies when making reasonable changes in methodologies. He finds that overreactions to information are about as persistent as underreactions, and argues that this is in line with anomalies being a "chance event". Interestingly through, two anomalies survived the robustness checks, PEAD and short-term continuation of returns. Fama (1998) concludes by referring to these anomalies as "open puzzles".

If the existence of PEAD remains due to transaction costs, then PEAD would not exceed the transaction cost bounds. Bernard and Thomas (1989) find evidence supporting this, with the drift appearing "constrained" by an upper bound seemingly equal to the roundtrip transaction cost for an investor. The bound also seem to vary across firm size, the same way transaction costs do. If transaction costs are indeed the culprit, we would also expect abnormal returns for short positions in bad news firms to exceed the abnormal returns for short positions in good news firms in order to compensate for restrictions on short sales. Foster, Shevlin and Olsen (1984) and Bernard and Thomas (1989) find evidence supporting this when summing daily returns. Taking into consideration that this can cause noise and instead compounding daily returns, Bernard and Thomas (1989) do however fail to find that the abnormal returns for short positions exceed the abnormal returns for long positions.

2.1.2 Common behavioral explanations to post-earnings announcement drift

Behavioral explanations turn to the notion of inefficient markets and the theories relating to behavioral biases. These explanations are based on the idea that mispricings of earnings are caused by traders and investors failing to assimilate available information in the expected way. Post-earnings announcement drift is often explained as an underreaction to earnings news, and this section provides a brief overview of three behavioral models that have gained dominance in explaining under- and overreaction to information in the market, i.e. mispricing of information.

First, Barberis, Shleifer and Vishny (1998) develop a model suggesting that investors suffer from two behavioral biases, "conservatism" and "representativeness". Conservatism refers to investor reluctance to act on new information and is argued to be what causes investors to underreact to new information in the short term. Representativeness, also called 'small sample neglect', refers to investor misinterpretation of patterns and leads to investors wrongly estimate probabilities of future outcomes. As investors are inclined to wrongly judge how "representative" an event is, they estimate the likelihood of a positive, future earnings announcement to be higher following a set of positive past earnings announcements. Barberis et al. (1998) argues that this will cause overreaction to information in the long term. In the context of PEAD, the model would explain the drift as a correction of the initial underreaction to earnings announcements.

Second, Daniel, Hirshleifer and Subrahmanyam (1998) develop a model where the initial underreaction and the following price drift are caused by investor "overconfidence" and "self-attribution bias". An overconfident investor is one who overweighs private information over public information. Self-attribution bias means that the investor becomes more confident in his private information if he receives a confirming public signal but disregards the public signal if it contradicts his private information. In combination, these two biases cause investors to overreact to private information and not correctly adjust their beliefs for public information, and thereby create a mispricing of information.

Third, Hong and Stein (1999) propose a model that divides investors into two groups, "newswatchers" and "momentum traders". Newswatchers make projections based on private signals but are unable to account for past and current prices. That is, they are unable to read out information of other traders through prices. Momentum traders however can condition projections on past and current prices but are limited in their trading to only use "simple" methods of trading (functions of historical prices). As newswatchers fail to account for

information of other investors, information spreads slowly across the population, which causes prices to underreact in the short term. Momentum traders are able to trade on this and gain from this adaption, however as more and more momentum traders enter the market, and they eventually push prices above fundamentals and eventually cause a long-term overreaction.

A common criticism of the behavioral models is that they are tailored to explain certain empirical patterns - and that it is therefore not surprising that they do in fact explain them. In addition, Forner and Sanabria (2010) find no evidence in support of these models in relation to PEAD in the Spanish market.

2.2. Media as a tool for information dissemination

News media has a much broader reach than many other sources of corporate information, e.g. analyst reports. As such, one would expect their role as a tool for information dissemination to affect market prices. Earlier studies within this field include Klibanoff, Lamont and Wizman (1998), who showed that the pricing of closed-end country funds were affected by country-specific news reported on the front page of the New York Times, and Pound and Zeckhauser (1990) who examined the effect of takeover rumors on stock prices using a sample of rumors published in Wall Street Journal's "Heard on the Street".

There has been a growing body of literature discussing media's relationship to stock markets. Most of the recent research can roughly be viewed as belonging to either the rational-agent framework or the limited investor attention body of literature. The first strand includes the investor recognition hypothesis, which dates back to the 1980's. The second strand, and more relevant to our research question, introduces noise and highlights attention as a scarce resource.

In 1987, Merton postulated that investors that are not aware of a firm would not become stockholders of the firm. Investors are assumed to have incomplete information and to be aware of only a subset of stocks. But an increase in the size of the firm's investor base (i.e. degree of "investor recognition") would reduce the cost of capital and increase the market value of the firm. One way to achieve this could be through media coverage, where a story about a firm would reach a large number of investors not currently shareholders, who would start following the firm. Grullon, Kanatas and Weston (2004) found evidence in support of this; firms that spent more money on advertising, e.g. through mass media, had both a larger individual and institutional investor base, as well as more liquidity in their common stock. They conclude that "*a*

firm's advertising, even if it accomplished nothing else, would at least make people aware of its existence". Along the same line, Frieder and Subrahmanyam (2005) record that individuals are more likely to hold stocks with strong brand recognition. Also consistent with the investor recognition hypothesis advanced by Merton (1987), Fang and Peress (2009) found that stocks with no media coverage earned higher returns than stocks with high media coverage, and coined the term "no-media premium". The study found this premium to be more pronounced in small stocks, stocks with low analyst coverage, stocks primary held by individuals and stocks with high idiosyncratic volatility. Their results indicate that by disseminating information to a broader audience, media coverage increases investor recognition and thereby the shareholder base.

Barber and Odean (2008) on the other hand found evidence that can be interpreted as inconsistent with the investor recognition as proposed by Merton (1987). Their study showed that individual investors are net buyers of attention grabbing stocks, e.g. stocks featured in news media. If individual investors only buy and sell stocks they follow, as under the investor recognition hypothesis, they will not spontaneously trade in a different stock based on some attention-grabbing feature. Hu, Dong, Liu and Yao (2013) also found evidence that cannot be explained by the rational-agent framework. They examined the relationship between firm's visibility in blog spaces and cross-sectional returns, and found that securities with low blog exposure earn higher returns in comparison to securities with high blog exposure. This would be equivalent to a "no-blog premium". But contrary to traditional media coverage, Hu et al. (2013) found that the blog exposure premium cannot be attributed to the investor recognition hypothesis. Instead, they attribute this to a string within the behavioral finance literature, limited investor attention.

Limited investor attention is a leading explanation to why markets underreact to information and is based on a psychological constraint, that investors will neglect new information due to limited attention (Hirshleifer, Lim and Teoh, 2009). Within the framework of limited investor attention, Hirshleifer et al. (2009) put forward the investor distraction hypothesis, where extraneous earnings news makes volume and prices react slowly to relevant news about a firm. They find evidence that when an earnings announcement is released amid a large number of competing earnings announcements, price and volume reactions are weaker on the date, and subsequent post-earnings announcement drift is stronger. Hirshleifer et al. (2009) also conclude that their findings indirectly suggest that investor limited attention may drive PEAD, as distracted investors during reporting periods are prone to underreact to information in earnings announcements. The

drift following the earnings announcement would therefore represent a continuous correction of the initial underreaction. Consistent with the investor distraction hypothesis put forward by Hirshleifer et al. (2009), Feng and Hu (2014) perform a study in China and find that investor distraction causes market underreaction using earnings announcement data. Along the same line, Dellavigna and Pollet (2009) compared responses to earnings announcement on Fridays, when investor inattention is more likely, to other weekdays. They found that Friday announcements have a 15% lower immediate response, and argue that this support explanations of post-earnings announcement drift based on underreaction to information caused by limited attention.

Moreover, there is evidence that media can cause the stock market to react to information that has already been made public. Ho and Michaely (1988) state that while accounting statements are publicly available, to analyze and to relate the statements to the stock value can be costly. Consequently, publicly available information may not be incorporated into prices. Ho and Michaely (1988) investigate empirically the impact of newspaper commentaries on stock prices, and find that stock prices respond significantly. Considering that newspaper commentaries are "*simply repackaging publicly available information*", they conclude that markets need not be efficient. Along the same line, Huberman and Regev (2001) examine the famous case of EntreMed. On Sunday May 3rd, 1998, the *New York Times* report of a breakthrough in cancer research and mentions EntreMed, a firm with licensing rights to the breakthrough. The reported story's impact on the stock price was immediate, huge and to a large extent permanent; the stock closed at $12 on Friday, opened at $85 on Monday, and closed near $52 on Monday. The "news" was however not actually new, as the story had previously been reported as a scientific piece in *Nature* and in the popular press, including the *New York Times*, more than five months earlier. Even though no genuinely new information had been presented, news media induced a price reaction.

More recently, Pinnuck (2014) examines the "stale information hypothesis", and finds that media coverage gives rise to further reaction to past quarters earnings news. A part of current quarter earnings when reported is "news" that was known or predictable at previous quarter announcement due to serial correlation in seasonally differenced quarterly earnings. By shedding light on already existing information, media can cause price reactions to "stale" or "old" news, i.e. to information that is already public. In addition to proving that media can impact stock prices, Pinnuck find that variation in the media reporting of earnings surprises mirrors the variation in abnormal returns associated with PEAD.

Peress (2008) examines the direct relationship between media coverage and post-earnings announcement drift. He pairs events with similar surprises occurring in the same year for the same firm, and uses a dummy variable indicating if there is an article in the Wall Street Journal on the announcement date. He finds that one article or more on the day of the announcement causes a larger immediate price reaction and subsequently a smaller drift.

2.3 Hypothesis development

As the media landscape is rapidly changing, we believe it is becoming increasingly important to understand how media and financial markets are intertwined. More specifically, we wish to examine the role of media in relation to features of the financial markets that some believe represent inefficiencies. Post-earnings announcement drift is one of the major financial market anomalies, and any contribution to further understand the phenomenon is of great interest. Recently, Peress (2008) suggested a relationship between media and PEAD, and our study attempts to further build on a possible connection between the two. We hope to contribute to the literature by examining the relationship between media coverage and earnings surprises as well as the relationship between the amount of media coverage and post-earnings announcement drift in the period following the announcement in the Swedish stock market. To the best of our knowledge, this has not been done before.

A prerequisite for our study is the existence of PEAD in our sample. As discussed, it has previously been established in the Swedish market by Setterberg (2011), but we intend to certify its existence in our sample.

To investigate the relationship between media and PEAD, we develop two hypotheses:

H1: Media coverage prior to an earnings announcement will amplify earnings surprises.

First, we examine if media coverage in the period leading up to the earnings announcement have any effect on the earnings surprise, and consequently an indirect effect on the post-earnings announcement drift. Our first hypothesis builds on the notion that investors have a limited attention span, and thus cannot properly assess each and every firm and firm parameter continuously. Consequently, investors will focus on only a subset of stocks and parameters at each point in time. As previous literature has shown that media can grab investor attention and direct it towards some specific features, this will create a tendency for all investors to assess the

same features and become a more homogenous group. The homogeneity of the group is not created by similar preferences, but rather a consequence of investors assessing the same set of information. As Barber and Odean (2008) states, "*preferences determine choices after attention has determined the choice set*". We believe that this will lead to less accurate earnings estimates, and in turn a larger earnings surprise. To test our hypothesis we see whether media coverage, using a proxy of aggregated number of articles published in the 20 trading days prior to the earnings announcements, have an effect on the earnings surprise. If our hypothesis holds, this relationship should be positive.

H2: Media coverage following an earnings announcement will amplify the drift.

Secondly, we examine if media coverage following the earnings announcement has an amplifying effect on the drift. It has been proven that media can affect stock prices. Peress (2008) shows this effect in relation to PEAD, looking only at the announcement date and treating media as a binary component, and finds that media drives an immediate price reaction. He attributes this to limited investor attention. In line with his findings, we believe that media coverage can drive a price reaction even after the announcement has been made. The direction of the price reaction will be in line with the surprise, as media coverage can direct attention to already public information, e.g. the earnings announcement. A larger price reaction in the period after the event will correspond to a higher cumulative abnormal return. Thereby, excluding the event itself, we expect that the price reaction driven by media will result in a larger drift. We test this hypothesis by examining the relationship between media coverage and the drift, while controlling for the surprise itself. As for the first hypothesis, we use aggregated number of articles published as a proxy for media coverage. Although we do not control for the content of each article, we believe that increased attention to a particular firm will indirectly cause increased attention to their latest financial result. If our hypothesis holds, the relationship between media coverage and PEAD should be positive.

3. Data

Data included in the analysis span ten years, from January 1, 2006 to December 31, 2015. The sample consists of small-, mid- and large cap index constituents listed on the Nasdaq OMX Stockholm Stock Exchange as per March 2016, for which we can calculate standardized unexpected earnings (SUE) and retrieve reliable media data as well as data on other variables.

We retrieve data on share prices, reporting dates, earnings per share (EPS) estimates and actuals as well as control variables from Thomson Datastream. Underlying sources include I/B/E/S for EPS estimates and number of EPS estimates and Worldscope for EPS actuals, reporting dates and price to book value. Share prices and market values are provided by Datastream. As a control variable we also include sector, based on the classification used by Nasdaq OMX at the time of data extraction. Although firms can move across sectors over time, for simplicity we have assumed each firm to belong to the same sector throughout our sample. In estimating abnormal returns, OMXAFGX has been used. It is a broad market capitalized index including all listed companies on Nasdaq OMX Stockholm's main market.

We use Retriever to extract data on firm-specific media coverage. We limit the data to include only the largest nationwide Swedish daily newspapers, more specifically Dagens Nyheter (DN), Svenska Dagbladet (SvD) and Dagens Industri (DI). We include both articles published in printed newspapers and online. To avoid as much noise as possible, where firms are only referenced briefly, we only include DI Plus or DI Agenda[1] for DI's online publications. Although there are several other influential media outlets in the relevant market, we believe that DN, SvD and DI give a good approximation of relative media coverage at each point in time. We measure media coverage of a specific firm as the number of times a firm's name appears in a headline or preamble of an article during each day. We do not count the number of times a firm name is mentioned in the entire article to guard against articles containing very little or irrelevant information about the firm.

We remove the less liquid share class for any firms with dual share classes, as not to double count any events. In addition, we remove all firms with split financial years to simplify our analysis. Doing this, we mostly lose firms within the retail sector, most notably the Swedish stock market giant H&M. Lastly, we have excluded firms with obvious issues with regards to referencing in the media data, e.g. Björn Borg (retail company but also the name of a Swedish tennis player), Trelleborg (industrial company but also the name of a municipality and urban area in the southern part of Sweden) and Ericsson (telecommunications company but also one of the most common surnames in Sweden), as to avoid consistently overstating the number of articles.

[1] Including both articles published online and in print, as well as both DI Plus and DI Agenda, means that we risk double counting articles that appear in several formats. As we aim to investigate the overall media coverage, and the amount of times each firm or firm-specific parameter is visible to investors, we do however believe this way of aggregating articles to be in line with our research question.

Our sample includes 146 firms. Defining each event as a firm quarter, our total observations amount to 2,544. Note that as we only include firms listed on Nasdaq Stockholm OMX as per March 2016, there is a possibility of survivorship bias in our sample. This, combined with more data available for the more recent years, makes our sample somewhat skewed towards the end of the period, as visible in Table A1 (Appendix A). Our sample, like the Swedish market in general, is dominated by industrial firms and they account for roughly one third of our observations. Together with financial firms, which make up 17% of our observations, these two sectors correspond to approximately 50% of all events included in our analysis. Utilities correspond to the least featured sector, with only 2 observations out of 2,544.

It is worth noting that as data is more often readily available for larger firms our sample is tilted towards large cap firms compared to mid- and small cap firms. The observations in our study have market values ranging from 71 to 447,115 million SEK, with a median value of 6,423 million SEK. The number of analysts' estimates included in EPS consensus estimates range from 1 to 15 estimates, with a median of 4 estimates (Table A3, Appendix A).

The number of articles published for each firm in the 20 trading days leading up to an earnings announcement range between 0 and 359, with an average of 10 and a median of 2 (Table A5 and Figure A1, Appendix A). The number of articles published for each firms published from the second day following the earnings announcement up to the 60th day following the earnings announcement ranges between 0 and 835, with an average of 29 and a median of 8 (Table A6 and Figure A2, Appendix A). Plotting the aggregated media coverage over our entire event window, we detect an increase in media coverage around the announcement date (Figure A4, Appendix A).

4. Method

4.1 Post-earnings announcement drift in sample

4.1.1 Estimation of standardized unexpected earnings

There are several methods to create a measurement of earnings surprise, however most approaches in previous literature build their measurement based on the difference between actual EPS and expected EPS, scaled by some factor. The actual EPS is straightforward, as it is stated in the earnings announcement. Most previous research has either chosen to base their expected

EPS on a seasonal random walk with drift model (e.g. Bernard and Thomas, 1990; Brand et al., 2008; Hirschleifer et al., 2009) or analysts' consensus estimates (e.g. Francis et al., 2007; Brandt et al., 2008, Hung, Li and Wang, 2015). We apply the latter approach, as to incorporate public information other than previous earnings (e.g. product news) in the forecasted EPS. The drawback of this approach is that the consensus estimate is subject to the amount of analysts covering each firm and potential biases in individual estimates. Subtracting the forecasted EPS from the actual EPS gives unexpected earnings. In order to properly apply these, they need to be scaled. Previous literature includes scaling by actual EPS (e.g. Bird, Choi and Yeung, 2014), price per share (e.g. Francis et al., 2007; Hirschleifer et al., 2008; Chung and Hrazdil, 2011) or standard deviation of previous UE (e.g. Brandt et al., 2008; Bernard and Thomas, 1989). We use standard deviations of previous UE to get Standardized Unexpected Earnings (SUE), defined as:

$$SUE_{i,t} = \frac{Actual\ EPS_{i,t} - Expected\ EPS_{i,t-1}}{\sigma(Actual\ EPS - Expected\ EPS)_{i,t}} \quad (1)$$

where $Actual\ EPS_{i,t}$ is the EPS reported in the earnings announcement, $Expected\ EPS_{i,t-1}$ is the analysts' consensus EPS estimate one day prior to the announcement date, and $\sigma(Actual\ EPS - Expected\ EPS)_{i,t}$ is the standard deviation of the unexpected earnings over the last eight quarters.

SUE can be interpreted as a normalized measurement of earnings surprises. The scaling of unexpected earnings allow us to adjust for the fact that some firms might always deviate from analyst forecasts while some might not. That is, if a firm that rarely fails to meet analyst forecast have unexpectedly high/low earnings during one quarter, this unexpected earnings is a bigger surprise than if a firm that always tend to deviate from forecasts has the same unexpected earnings in that same quarter. One can reasonably assume that firms that frequently deviate from the consensus estimate is more likely to have low analyst coverage.

The retrieved SUE values range from -7 to 12, but the majority is concentrated around zero, as can be seen in Table 1 and Figure A3 (Appendix A).

4.1.2 Portfolio assignment

Earnings announcements are divided into portfolios through ranking of SUE. Following e.g. Bernard and Thomas (1989) and Brandt et al. (2008), we assign earnings announcements into

portfolios based on ranking SUE compared to the SUE distribution of the previous quarter. That is, the SUE of an earnings announcement of firm *i* in quarter *q* is ranked compared to all SUEs of quarter *q-1*. Based on this ranking, we assign events into five different portfolios (Table 1). Another approach would be to use the entire sample of events to construct rankings, thus include events that have not yet announced earnings. This would, however, create a hindsight bias that tends to magnify PEAD (Foster, Olsen and Shevlin, 1984). By constructing rankings based on previous quarter, we avoid this.

Table 1. Standardized Unexpected Earnings

SUE	*Mean*	*N*	*Max*	*Min*	*St. dev.*	*p25*	*p50*	*p75*
Total	0.00	2,544	12.42	-7.00	1.58	-0.71	-0.04	0.51
By portfolio								
1	-1.82	491	-0.35	-7.00	0.89	-2.26	-1.67	-1.15
2	-0.65	457	0.04	-3.53	0.38	-0.82	-0.58	-0.40
3	-0.09	561	0.65	-1.23	0.21	-0.20	-0.07	0.02
4	0.36	510	1.70	-1.42	0.30	0.15	0.33	0.51
5	1.99	525	12.42	0.25	1.90	0.90	1.39	2.15
By PUE/NUE								
PUE	1.06	1,179	12.42	0.00	1.53	0.22	0.58	1.29
NUE	-0.93	1,365	0.00	-7.00	0.91	-1.41	-0.65	-0.24

Notes: Portfolio 1 include events with the relatively lowest standardized unexpected earnings rankings and Portfolio 5 include events with the relatively highest standardized unexpected earnings. PUE denotes positive standardized expected earnings and NUE denotes negative standardized unexpected earnings. Data from 2006-2015.

Portfolio 1 includes the events with the relatively lowest SUE rankings and portfolio 5 includes the events with the relatively highest SUE rankings. PUE includes positive unexpected earnings while NUE includes negative unexpected earnings. Note that as portfolio assignments are done based on individual events, the same firm can be present in all portfolios and in both PUE and NUE subsamples.

4.1.3 Estimation of abnormal returns

Following Bird et al. (2014) we calculate abnormal returns on a daily basis as the difference between the daily return on a particular stock and the daily return on a benchmark. The clear disadvantage of this method is that abnormal returns are poorly adjusted for different levels of risk between stocks as all stocks are compared using the same benchmark every period. Hence, our abnormal returns does not properly account for risk premium of holding a particular stock. Alternative methods that would adjust for risk in a more sophisticated way would be to use

Capital Asset Pricing Method (CAPM) or a Fama-French factor model. However, as no previous research has been able to prove that poor representation of risk leads to PEAD, we have chosen to use a more simplistic approach. Other methods include using industry or size specific portfolio returns as benchmarks (e.g. Bernard and Thomas, 1989). Considering that our study is limited to the Swedish market, constructing e.g. industry portfolios would be hard due to the rather small number of firms in some industries over each quarter. We calculate cumulative abnormal returns (CAR) by compounding abnormal returns across event windows.

4.1.4 Post-earnings announcement drift analysis

Following Bird et al. (2014) we perform a straightforward regression to detect PEAD in our sample. We employ absolute standardized unexpected earnings, to see if there is a structural difference in cumulative abnormal returns between different levels of earnings surprises. The basic model has the following structure, where the existence of PEAD is determined by the relationship between SUE and CAR:

$$|CAR_{i;(\tau,\tau+n)}| = \alpha + \beta_1|SUE_{i,\tau=0}| + \beta_2 \log(mv_{i,\tau=0}) + \beta_3\, no.of\ est._{i,\tau=0} + \beta_4 PTBV_{i,\tau=0} + \beta_5 sector_i + \varepsilon_{i,\tau} \quad (2)$$

where $|CAR_{i;(\tau,\tau+n)}|$ denotes absolute CAR during our event window, $|SUE_{i,\tau=0}|$ denotes absolute SUE of the event, $mv_{i,\tau=0}$ denotes market value of each firm at the announcement date, $no.of\ est._{i,\tau=0}$ denotes number of estimates included in the consensus estimate, $PTBV_{i,\tau=0}$ denotes price-to-book value at the announcement date, and lastly, $sector_{i,\tau=0}$ denotes sector dummy variables.

In line with previous research, e.g. Bird et al. (2014), we control for market value (size) and price-to-book value. We control for number of analysts' estimates as it has been shown that momentum strategies yield a higher return for firms with low analyst coverage (Hong, Lim and Stein, 2000). Following, Hong et al. (2000), we also control for sector using dummies. We employ absolute earnings surprises as well as cumulative abnormal return to simplify our analysis and facilitate interpretation.

If PEAD exists in our sample, we expect the beta of absolute SUE to be positive, as absolute CAR will increase in the surprise. That is, a higher (lower) earnings surprise will be positively associated with a higher (lower) CAR. Naturally, we also expect positive (negative) surprises to

yield positive (negative) CAR. To conclude if a drift is present for both positive and negative surprises we also perform the regression using subsamples. We do not want to capture the initial effect of the surprise, but only to study the drift following the announcement. Hence, our estimation windows run from the second day following the earnings announcement to the 60th day following the earnings announcement.

4.2 Post-earnings announcement drift in relation to media coverage

As previously mentioned, number of published articles is used as a proxy for media coverage. All articles published on weekends are assigned to the following Monday. We note that any public holidays are not accounted for in our study, but do not believe that this will lead to a bias in any particular direction. To account for publication lags and that some articles are published after the markets close, we use one-day lags for our media measurements.

4.2.1 Effect of media prior to the earnings announcement

We expect that information disseminated by media will lead to less accurate earnings estimates, i.e. the earnings surprise will be relatively larger for firms with a lot of media coverage prior to the announcement date. To test our first hypothesis, we employ the following model:

$$\begin{aligned} |SUE_{i,\tau=0}| \;=\; & \alpha \;+\; \beta_1 Media_{i;(\tau,\tau+n)} + \beta_2 Media_{i;(\tau,\tau+n)}{}^2 \\ & + \beta_3 \log\left(mv_{i,\tau=0}\right) \;+\; \beta_4\, no.of\ est._{i,\tau=0} \;+\; \beta_5 PTBV_{i,\tau=0} \;+\; \beta_6 sector_i \;+\; \varepsilon_{i,\tau} \end{aligned} \tag{3}$$

where $|SUE_{i,\tau=0}|$ denotes the absolute value of the earnings surprise, $Media_{i;(\tau,\tau+n)}$ denotes the lagged accumulated number of published articles in the 20 trading days prior to the announcement, i.e. w(-20,0)[2]. We allow for a non-linear relationship by adding a squared term of media, $Media_{i;(\tau,\tau+n)}{}^2$ (Wooldridge, 2009) as the value of additional media coverage is expected to fall with increasing media exposure. We employ the same set of controls as in equation (2). If our hypothesis holds, the media coefficient, β_1, will be positive.

[2] w(X, Y) denotes the event window from day X to day Y relative to the date of the earnings announcement, that occurs on day 0. Hence, w(2, 20) denotes the event window from day 2 to day 20 following the earnings announcement. The notation is used throughout this paper.

4.2.2 Effect of media following the earnings announcement

Our second hypothesis concerns the relationship between aggregated media coverage following the earnings announcement date and the drift. Similar to Bird et al. (2014), we continue building on the regression model (equation (2)) by adding our variables of interest. We employ the following model:

$$\begin{aligned}\left|CAR_{i;(\tau,\tau+n)}\right| = {} & \alpha + \beta_1\, Media_{i;(\tau,\tau+n)} + \beta_2 Media_{i;(\tau,\tau+n)}{}^2 + \beta_3\left|SUE_{i,\tau=0}\right| \\ & + \beta_4 \log\left(mv_{i,\tau=0}\right) + \beta_5\, no.of\ est._{i,\tau=0} + \beta_6 PTBV_{i,\tau=0} + \beta_7 sector_i + \varepsilon_{i,\tau} \end{aligned} \quad (4)$$

where $|CAR_{i,\tau}|$ is the absolute cumulative abnormal return over the period following the earnings announcement, $|SUE_{i,\tau}|$ denotes the absolute value of the earnings surprise, $media_{i,\tau-1}$ denotes the lagged accumulated number of published articles under the same event window as for $|CAR_{i;(\tau,\tau+n)}|$. We employ the same set of controls as in equation (2) and allow for a non-linear relationship as in equation (3). We remove observations with cumulative abnormal returns or aggregated media coverage deviating more than three standard deviations from the mean. Observations with extreme values are likely to be impacted by extraordinary events that we do not wish to capture in our analysis.[3]

If β_1 is positive this could indicate that media coverage following an earnings announcement have a positive effect on CAR over the same event window, which can be interpreted as media coverage amplifying PEAD. To further examine this relationship, we apply the regression model using subsamples based on positive and negative earnings surprises, SUE portfolios and different levels of analysts' estimates.

5. Results

5.1 Post-earnings announcement drift in sample

Graphically, we find indication of PEAD in our sample, by plotting CARs around the earnings announcement according to our five different portfolios, where portfolio 5 has the highest SUE ranking and portfolio 1 has the lowest SUE ranking. As can be seen in Figure 1, there is an indication of the drift being larger for the more extreme SUE portfolios. We also note that

[3] By removing outliers, we lose approximately 90 observations. The results are however largely the same when including outliers; the direction of the coefficients and the significant levels remain the same, but the size of the coefficients are slightly smaller.

earnings announcements with positive (negative) surprises have positive (negative) cumulative abnormal returns, consistent with previous research. However, the pattern is not clear enough for us to draw any solid conclusions.

Pre-announcement drift, as can be seen prior to the actual earnings announcement date in Figure 1, has previously been attributed to e.g. leakage of information (Keown and Pinkerton, 1981) and earlier earnings announcements containing information relevant to the later announcements (Foster, 1981).

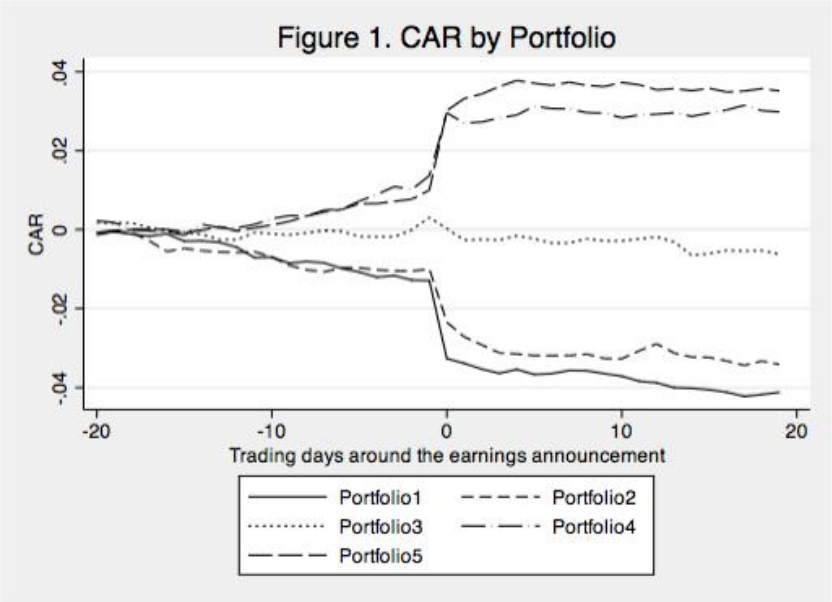

Fig. 1. – Cumulative abnormal returns for Portfolio 1-5 around the earnings announcement. Portfolio 5 includes firms with the highest SUE ranking and portfolio 1 includes firms with the lowest SUE ranking. Based on data from 2006-2015. Cumulative abnormal returns are the compounded returns over 40 trading days prior to- and following the earnings announcement. SUE ranking is based on the earnings surprises.

A statistical analysis also indicates the existence of PEAD in our sample. The effect of an increase in absolute SUE on absolute CAR, w(2, 20), is 0.16%. The absolute SUE coefficient is 0.36% when extending the event window to w(2, 60). We control for size, number of analysts' estimates, price-to-book value and sectors. Both results are statistically significant at a 5%-level (Table 2).

Table 2. Standardized Unexpected Earnings in relation to Cumulative Abnormal Returns

	Day 2 to Day 20	**Day 2 to Day 40**	**Day 2 to Day 60**	**Day 2 to Day 60**	**Day 2 to Day 60**
	Complete Sample	**Complete Sample**	**Complete Sample**	**Positive Surprises**	**Negative Surprises**
Dependent	|CAR| w(2, 20)	|CAR| w(2, 40)	|CAR| w(2, 60)	|CAR| w(2, 60)	|CAR| w(2, 60)
Variables	*Coef.*	*Coef.*	*Coef.*	*Coef.*	*Coef.*
|SUE|	0.001557**	0.0015794	0.003559**	0.0052419**	-0.0010749
	(0.0006542)	(0.0011461)	(0.0017201)	(0.0020485)	(0.0031946)
Log(MV)	-0.005384***	-0.0082531***	-0.0122728***	-0.0118705***	-0.0132238***
	(0.000991)	(0.0014623)	(0.0022477)	(0.0034075)	(0.0030146)
No. of est.	-0.0011501**	-0.0008663	-0.0013644	-0.00161733	-0.0010753
	(0.0004606)	(0.0006654)	(0.0009247)	(0.001302)	(0.0013133)
PTBV	-0.0000936	-0.0000529	0.000079	0.0001172	-0.0001367
	(0.0000735)	(0.0001047)	(0.0001363)	(0.0001061)	(0.0001151)
Constant	0.118769***	0.176580***	0.248704***	0.2331631***	0.2712798***
	(0.0097254)	(0.0150383)	(0.0224337)	(0.0324369)	(0.03118)
Sector	Yes	Yes	Yes	Yes	Yes
Outlier adjusted	No	No	No	No	No
R-squared	0.0849	0.0743	0.0899	0.0907	0.1021

Notes: Regression results based on equation (2). Outlier adjusted indicates that events with media or CAR exceeding 3 standard deviations in either direction has been excluded. Data from 2006-2015. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Our results indicate that there is a systematic difference in cumulative abnormal returns based on the earnings surprise for an extended period of time following the announcement. This is inconsistent with efficient markets, as we would expect the new information in the earnings announcement to be priced in immediately, i.e. it would be incorporated before the beginning of our event windows.

However, looking at subsamples based on positive and negative earnings surprises, we are only able to determine a statistically significant relationship for positive surprises (significant at a 5%-level). For the negative subsample we cannot draw any conclusion regarding a possible relationship.

5.2 Post-earnings announcement drift in relation to media coverage

5.2.1 Effect of media prior to the earnings announcement

Plotting absolute standardized unexpected earnings against media coverage prior to the earnings announcement[4], we see an upward trending slope. This indicates a positive relationship between the amount of media prior to the announcement and the earnings surprise.

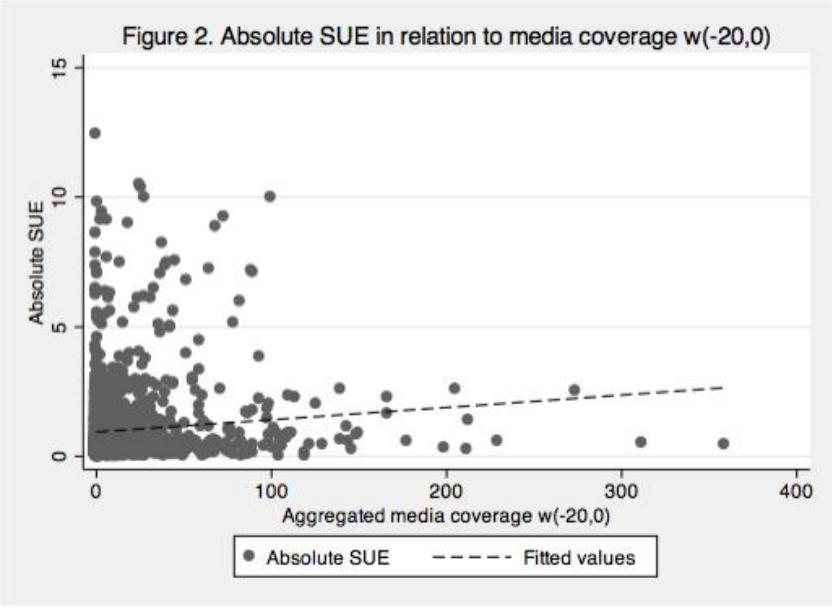

Fig. 2. – Aggregated media coverage prior to the earnings announcement in relation to absolute earnings surprises. Number of articles is used as a proxy for media coverage and earnings surprises are represented by standardized unexpected earnings. Based on data from 2006-2015.

[4] Note that as our media measurement is lagged one day, w(-20, 0) does not include articles on the actual date of the earnings announcement.

Regressing media coverage on absolute SUE, and controlling for size, number of analysts' estimates, price-to-book value, and sector in the regression, our coefficient for media is positive with a value of 0.0021. This indicates that for each additional article published about a firm, the surprise increases. The results are however only significant at a 10%-level. Allowing for a non-linear relationship of media by adding a squared term to the regression, the coefficient of media remains positive but with a value of 0.0061. The coefficient of the squared media term is negative but small, revealing a diminishing effect of media on absolute SUE. Both coefficients are significant at a 5%-level.

Table 3. Media Coverage in relation to Standardized Unexpected Earnings

	Specification 1	**Specification 2**	**Specification 3**
Dependent	|SUE|	|SUE|	|SUE|
Variables	*Coef.*	*Coef.*	*Coef.*
Media w(-20, 0)	0.004753***	0.002082*	0.006109**
	(0.0014431)	(0.0012608)	(0.0027667)
Media sq. w(-20, 0)			-0.0000226**
			(0.0000103)
Log(MV)		0.133930***	0.124106***
		(0.0270088)	(0.0266344)
No. of est.		-0.0074452	-0.0086515
		(0.0130067)	(0.0130948)
PTBV		-0.0008274	-0.0007034
		(0.001233)	(0.0012266)
Constant	0.941592***	-0.3392276	-0.2680126
	(0.0241893)	(0.2117721)	(0.2097127)
Sector	No	Yes	Yes
Outlier adjusted	No	No	No
R-squared	0.0083	0.0657	0.0674

Notes: Regression results based on equation (3). Outlier adjusted indicates that events with media or CAR exceeding 3 standard deviations in either direction has been excluded. Data from 2006-2015. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

We find the positive relationship between media and SUE to be in line with our first hypothesis, as this means that increased media coverage of a firm is related to less accurate earnings estimates. With less accurate earnings estimates, the surprise will increase and we expect the subsequent drift to become larger. From our test, however, we cannot draw any conclusions with regards to causality. A possible explanation for our findings could be that media introduces noise in the estimation process. Media as an attention-grabber might cause investors to focus on the parameters mentioned in media for each specific firm. In turn, this will lead investors to disregard

other important information about the firm and cause expectations among market participants to become more homogenous and consequently lead to less accurate earnings expectations.

5.2.2 Effect of media following the earnings announcement

In the days following the earnings announcement, from day 2 up to day 60, we find a statistically significant relationship between media coverage and CAR. We find that media has a positive coefficient, indicating that more media corresponds to a higher absolute CAR. The relationship is robust and statistically significant at a 1%-level over different event windows.

Table 4. Media Coverage in relation to Cumulative Abnormal Returns

	Day 2 to Day 20	**Day 2 to Day 40**	**Day 2 to Day 60**
Dependent	|CAR| w(2, 20)	|CAR| w(2, 40)	|CAR| w(2, 60)
	Coef.	*Coef.*	*Coef.*
Media w(2, 20)	0.000571***		
	(0.0002115)		
Media w(2, 40)		0.000552***	
		(0.0001624)	
Media w(2, 60)			0.000784***
			(0.0001527)
Media sq. w(2, 20)	-0.00000519		
	(0.00000425)		
Media sq. w(2, 40)		-0.00000206	
		(0.00000159)	
Media sq. w(2,60)			-0.000003***
			(0.000000907)
|SUE|	0.001361**	0.0005797	0.002352*
	(0.000575)	(0.0009125)	(0.0013849)
Log(MV)	-0.005417***	-0.007825***	-0.012603***
	(0.000816)	(0.0012421)	(0.0017682)
No. of est.	-0.001065***	-0.001044*	-0.001930**
	(0.0003786)	(0.0005556)	(0.0007634)
PTBV	-0.000085**	-0.000104*	-0.0000263
	(0.0000404)	(0.0000575)	(0.0000592)
Constant	0.104389***	0.147842***	0.216252***
	(0.0068139)	(0.0100022)	(0.0150319)
Sector	Yes	Yes	Yes
Outlier adjusted	Yes	Yes	Yes
R-squared	0.0917	0.0803	0.1066

Notes: Regression results based on equation (4). Outlier adjusted indicates that events with media or CAR exceeding 3 standard deviations in either direction has been excluded. Data from 2006-2015. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Looking at the window w(2, 60), we find a media coefficient of 0.0008 and a media squared

coefficient that is negative but close to zero, signaling that while more media corresponds to a higher absolute CAR, the effect is diminishing (Table 4). We find the diminishing effect natural, as the effect of additional media coverage should decrease as the overall level increases.

Looking at a subsample including only positive surprises, we find a media coefficient of 0.0007. For the subsample including only negative surprises, the media coefficient is 0.0009. In both cases, the coefficients are significant at a 1%-level (Table B1, Appendix B). It seems like the relationship between media and CAR is not symmetric for different directions of earnings surprises. The effect is larger for negative surprises than for positive surprises, indicating that if media amplifies the drift, negative surprises are amplified to a larger extent compared to positive surprises. We interpret these results as consistent with the findings of Hong et al. (2000); negative information diffuses more gradually than positive information. Hence, the additional information diffused by media has a larger impact on negative surprises. Although we can establish a relationship between media and absolute CAR for both subsamples, the absolute SUE coefficient for the subsample based on negative surprises remains insignificant.

Performing the regression by SUE portfolios, we aim to see if the effect differs with the size of the earnings surprise. The media coefficient is statistically significant at a 1%-level for all portfolios except portfolio 3, which is significant only at a 10%-level. The regression results can be found in Table B3 (Appendix B) and Figure 3 provides an overview of the beta coefficient across portfolios.

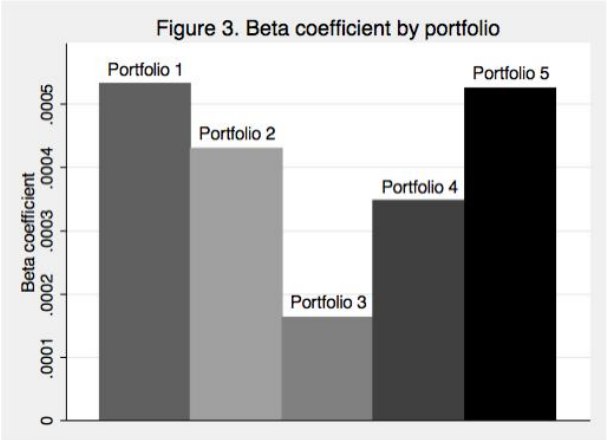

Fig. 3. – Beta coefficients by portfolio when regressing media coverage w(2, 60) on CAR w(2, 60). Portfolio 5 includes events with the highest SUE ranking and portfolio 1 includes events with the lowest SUE ranking. Based on data from 2006-2015.

As can be seen, the effect of media on CAR is not equal across portfolios but instead shows a convex pattern. Our results can be interpreted as CAR of events with more extreme SUE rankings, portfolio 1 and portfolio 5, will be impacted by media to a greater extent. A large

amount of media causing attention on a non-surprising event will not cause a significant price reaction. However, a large amount of attention being directed towards a surprising event will likely drive the price reaction to a larger extent. Note that the pattern will depend on the level of media across portfolios, as the betas describe the effect of one additional article. However, as can be seen in Table A6 (Appendix A) the levels of media coverage do not differ substantially across portfolios. In addition, we do not detect any clear pattern that corresponds to our findings.

Lastly, we split our sample into three different subsamples based on the number of analysts covering each event. We find that events with low analyst coverage (two or less analyst estimates), will have a larger media coefficient, i.e. for these events media will have a stronger relationship with CAR compared to events with medium analyst coverage (between three and six analyst estimates) and events with high analyst coverage (seven analyst estimates or more). This is unsurprising, as events with low analyst coverage are events with smaller firms and less media coverage in our sample. Hence, the effect of one additional article is larger in the subsample with 'Low' analyst coverage, as there is generally less information readily available for these firms.

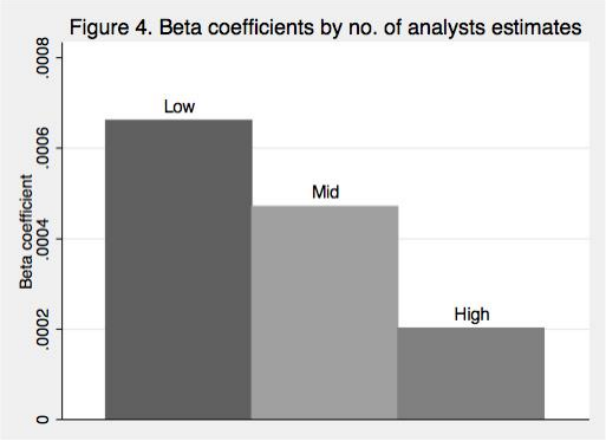

Fig. 4. – Beta coefficients by different levels of analysts' estimates when regressing media coverage w(2, 60) on CAR w(2, 60). Low includes events with two or less analyst estimates, Mid includes events between three and six analyst estimates and High includes events with more than seven analyst estimates. Based on data from 2006-2015.

In summary, our results regarding the effect of media following the earnings announcements confirm our second hypothesis, that media coverage is positively associated with the drift. The results are robust across event windows and portfolios. The relationship is stronger for events with higher earnings surprises and low analyst coverage.

Looking at specification, we test for imperfect multicollinearity by calculating our variance inflation factor (VIF) and consistently retrieve values below 5. In addition, none of our variables show correlation above 0.8. Hence, we conclude that multicollinearity is not an issue for our regression models. We use White's general test for heteroskedasticity, and find that we need to

correct for nonconstant variance. We have adjusted for this by using robust standard errors (Wooldridge, 2009).

6. Concluding remarks

We find indication of post-earnings announcement drift in our sample of the Swedish stock market between 2006 and 2015. Furthermore, we find evidence supporting both of our hypotheses, that media coverage is positively associated with earnings surprises and post-earnings announcement drift. We find that the relationship between media coverage and post-earnings announcement drift following the announcement drift is more evident for extreme earnings surprises and events with low analyst coverage.

We attribute our results to limited investor attention. All investors do not assess all parameters or firms continuously, and a possible explanation for the relationship between media coverage and earnings surprises could be that news media can grab the attention and direct it towards some specific parameters. As Shiller (2000) states, *"… news media are essential vehicles for the spread of common ideas"*. News media, e.g. newspapers, present themselves as observers of market events, but do in fact play a role in these events. We interpret our results as news media might create a more homogenous information environment as all investors are likely to assess the same sets of information. Consequently, media coverage might cause investors on an aggregate level to produce less accurate earnings estimates. Less accurate earnings surprises, i.e. larger earnings surprises, have in turn been found to be positively related to the post-earnings announcement drift.

Moreover, we argue that our results regarding the relationship between media and the drift following earnings announcements can be explained by media's ability to further drive price reactions. We believe that direction of this price reaction on aggregate corresponds to the direction of the earnings surprise as media can direct attention, and make investors react to the "old" information contained in the earnings announcement. In the context of post-earnings announcement drift, this could be interpreted as media amplifying the drift. However, we believe this effect to be more apparent among individual investors, as previous studies have shown that they are more prone to react to information in news media.

Our study is of course subject to the big caveat that the proxy for media coverage, number of published articles, is not an exogenous variable. Hence, we cannot draw any conclusions with regards to causality and all our results and interpretations should be seen in light of this. A contributing factor to any price reaction to an article and the drift could be the nature of firms and stories which news media chooses to report on. If we have an omitted variable that we have failed to control for, this could be driving the result rather than the media coverage itself. Moreover, our media measurement is a blunt tool – it does not take into account the nature of each article; whether it is a positive or negative piece, relevance of each article, and whether it concerns product, earnings or other firm-specific news. An enhanced media measurement tool is encouraged in further research. In addition, as previous research on media as a director of attention mostly concerns individual investors, it would be interesting to see whether our results can be attributed to only individual investors or also include institutional players.

Despite this, we believe this study provides an interesting insight into the relationship between media and one of the major market anomalies. Media as an integral part of financial markets have many interesting implications. It is likely that the increasingly intensive media cycle, and a rapidly changing media landscape, will have an impact on the behavior of financial markets. When the role of media as an observer becomes gradually more blurred and events are reported in real time, this might lead to further difficulty in disentangling leads and lags of media coverage and market reactions.

7. References

Ball, Ray and Brown, Philip (1968), "An Empirical Evaluation of Accounting Income Numbers", *Journal of Accounting Research*, vol. 6, no. 2, pp. 159-178.

Ball, Ray, Kothari, S.P. and Watts, Ross L. (1993), "Economic Determinants of the Relation Between Earnings Changes and Stock Returns", *The Accounting Review*, vol. 68, no. 3, pp. 622-638.

Barber, Brad M. and Odean, Terrence (2008), "All That Glitters: The Effect of Attention and News on the Buying Behaviour of Individual and Institutional Investors", *The Review of Financial Studies*, vol. 21, no. 2, pp. 785-818.

Barberis, Nicholas, Shleifer, Andrei and Vishny, Robert (1998), "A model of investor sentiment", *Journal of Financial Economics*, vol. 49, pp. 307-343.

Bartov, Eli, Radhakrishnan, Suresh and Krinsky, Itzhak (2000), "Investor Sophistication and Patterns in Stock Returns after Earnings Announcements", *The Accounting Review*, vol. 75, no. 1, pp.43-63.

Battalio, Robert H. and Mendenhall, Richard R. (2007), "Post Earnings Announcement Drift: Intra-day Timing and Liquidity Costs", Working Paper, University of Notre Dame, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=937257

Bernard, Victor L. and Thomas, Jacob K. (1989), "Post-Earnings-Announcment Drift: Delayed Price Response or Risk Premium?", *Journal of Accounting Research*, vol. 27, pp. 1-36.

Bird, Ron, Choi, Daniel F. S. and Yeung, Danny (2014), "Market uncertainty, market sentiment and the post-earnings announcement drift", *Review of Quantitative Finance and Accounting*, vol. 43, no. 1, pp. 45-73

Booth, Geoffrey G., Kallunki, Juha-Pekka and Martikainen, Teppo (1996), "Post-Announcement Drift and Income Smoothing: Finnish Evidence", *Journal of Business Finance & Accounting*, vol. 23, no. 8, pp. 1197-1211.

Brandt, Michael W., Kishore, Runeet, Santa-Clara, Pedro and Venkatachalam, Mohan (2008), "Earnings Announcements are Full of Surprises", Working Paper, Fuqua School of Business, Duke University and Anderson School of Business, UCLA, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=909563

Bhushan, Ravi (1994), "An informational efficiency perspective on the post-earnings announcement drift", *Journal of Accounting and Economics*, no. 18, pp. 45-65.

Chung, Dennis Y. and Hrazdil, Karel (2011), "Market Efficiency and the Post-Earnings Announcement Drift", *Contemporary Accounting Research*, vol. 28, no. 3, pp. 926-956.

Daniel, Kent, Hirshleifer, David and Subrahmanyam, Avanidhar (1998), "Investor psychology and Security Market Under- and Overreactions", *The Journal of Finance*, vol. 53, no. 6, pp. 1839-1885.

Dellavigna, Stefano and Pollet, Joshua M. (2009), "Investor Inattention and Friday Earnings Announcements", *The Journal of Finance*, vol. 64, no. 2, pp. 709-749.

Dische, Andreas (2001), "Dispersion in Analyst Forecasts and the Profitability of Earnings Momentum Strategies", Working Paper, University of St. Gallen, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=270036

Fama, Eugene F. (1998), "Market efficiency, long-term returns, and behavioural finance", *Journal of Financial Economics*, vol. 49, pp. 283-306.

Fang, Lily and Peress, Joel (2009), "Media Coverage and the Cross-section of Stock Returns", *The Journal of Finance*, vol. 64, no. 5, pp. 2023-2052.

Feng, Xunan and Hu, Na (2014),"Are individual investors affected by attention?", *China Finance Review International*, vol. 4, no. 3, pp. 289-304.

Forner, Carlos, Sanabria, Sonia and Marhuenda, Joaquín (2009), "Post-earnings announcement drift: Spanish evidence", *Spanish Economic Review*, no. 11, pp. 207-241.

Forner, Carlos and Sanabria, Sonia (2010), "Post-Earnings Announcement Drift in Spain and Behavioural Finance Models", *European Accounting Review*, vol. 19, no. 4, pp. 775-815.

Foster, George (1981), "Intra-Industry Information Transfers Associated with Earnings Releases", *Journal of Accounting and Economics*, vol. 3, no. 3, pp. 201-232.

Foster, George, Olsen Chris and Shevlin, Terry (1984), "Earnings Releases, Anomalies, and the Behaviour of Security Returns", *The Accounting Review*, vol. 59, no. 4, pp. 574-603.

Francis, Jennifer, Lafond, Ryan, Olsson, Per and Schipper, Katherine (2007), "Information Uncertainty and Post-Earnings-Announcement-Drift", *Journal of Business Finance & Accounting*, vol. 34, no. 3-4, pp. 403-433.

Frieder, Laura and Subrahmanyam, Avanidhar (2005), "Brand Pereption and the Market for Common Stock", *Journal of Financial and Quantitative Analysis*, vol. 40, no. 1, pp. 57-85.

Grullon, Gustavo, Kanatas, George and Weston, James P. (2004), "Advertising, Breadth of Ownership, and Liquidity", *The Review of Financial Studies*, vol. 17, no. 2, pp. 439-461.

Hirshleifer, David, Lim, Sonya Seongyeon and Teoh, Siew Hong (2009), "Driven to Distraction: Extraneous Events and Underreaction to Earnings News", *The Journal of Finance*, vol. 64, no. 5, pp. 2289 – 2325.

Ho, Thomas S.Y. and Michaely, Rony (1988), "Information Quality and Market Efficiency", *Journal of Financial and Quantitative Analysis*, vol. 23, no. 1, pp. 53-70.

Hong, Dong, Lee, Charles and Swaminathan, Bhaskaran (2003), "Earnings Momentum in International Markets", Working Paper, Cornell University, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=390107

Hong, Harrison and Stein, Jeremy C. (1999), "A Unified Theory of Underreaction, Momentum Trading and Overreaction in Asset Markets", The Journal of Finance, vol. 54, no. 6, pp. 2143-2184.

Hong, Harrison, Lim, Terence and Stein, Jeremy C. (2000), "Bad News Travels Slowly: Size, Analyst Coverage and the profitability of Momentum Strategies", *The Journal of Finance*, vol. 55, no. 1, pp. 265-295.

Hu, Nan, Dong, Yi, Liu, Ling and Yao, Lee J. (2013), "Not All That Glitters Is Gold: The Effect of Attention and Blogs on Investors' Investing Behaviors", *Journal of Accounting, Auditing & Finance*, vol. 28, no. 1, pp. 4 – 19.

Huberman, Gur and Regev, Tomer (2001), "Contagious Speculation and a Cure for Cancer: A Nonevent that Made Stock Prices Soar", *The Journal of Finance*, vol. 56, no. 1, pp. 387-396.

Hung, Mingyi, Li, XI and Wang, Shiheng (2015), "Post-Earnings-Announcement Drift in Global Markets: Evidence from an Information Shock", *The Review of Financial Studies*, vol. 28, no. 4, pp. 1242-1283.

Keown, Arthur J. and Pinkerton, John M. (1981), "Merger Announcements and Insider Trading Activity: An Empirical Investigation", *The Journal of Finance*, vol. 36, no. 4, pp. 855-869.

Klibanoff, Peter, Lamont, Owen and Wizman, Thierry A. (1998), "Investor Reaction to Salient News in Closed-End Country Funds", *The Journal of Finance*, vol. 53, no. 2, pp. 673-699.

Liu, Weimin, Strong, Norman and Xu, Xinzhong (2003), "Post-earnings-announcement Drift in the UK", *European Financial Management*, vol. 9, no. 1, pp. 89-116.

Merton, Robert C. (1987), "A Simple Model of Capital Market Equilibrium with Incomplete Information", *The Journal of Finance*, vol. 42, no. 3, pp. 483 – 510.

Pinnuck, Matthew (2014), "The New York Times and Wall Street Journal: Does Their Coverage of Earnings Announcements Cause "Stale" News to Become "New" News?", *The Journal of Behavioural Finance*, vol. 15, pp. 120-132.

Peress, Joel (2008), "Media Coverage and Investors' Attention to Earnings Announcements", Working paper, INSEAD and London School of Economics, available at: http://www.lse.ac.uk/fmg/researchProgrammes/paulWoolleyCentre/pdf/First%20Conference%20Papers/J_Peress.pdf

Pound, John and Zeckhauser, Richard (1990), "Clearly Heard on the Street: The Effect of Takeover Rumors on Stock Prices", *Journal of Business*, vol. 63, no. 3, pp. 291-308.

Shiller, Robert (2001), "Exhuberant Reporting Media and Misinformation in the Markets", *Harvard International Review*, Media, vol. 23, no. 1. An excerpt from the book "Irrational Exhuberance" (Princeton, 2000).

Setterberg, Hanna (2011), "Swedish post-earnings announcement drift and momentum return", Dissertation: "The Pricing of Earnings", Stockholm School of Economics, pp. 37-73.

Wooldridge, Jeffrey M. (2009) "Introductory Econometrics A Modern Approach", 4th Ed., South Western Engage Learning, pp. 192, 267.

8. Appendix A. Descriptive statistics

Table A1. Sample by Year and Sector

Sector	*Freq.*	*Percent*	*Year*	*Freq.*	*Percent*
Basic materials	179	7%	2006	11	0%
Consumer goods	300	12%	2007	74	3%
Consumer services	237	9%	2008	139	5%
Financials	440	17%	2009	181	7%
Healthcare	213	8%	2010	251	10%
Industrials	825	32%	2011	319	13%
Oil & Gas	30	1%	2012	367	14%
Technology	230	9%	2013	406	16%
Telecommunications	88	3%	2014	415	16%
Utilities	2	0%	2015	381	15%
Total	**2,544**	**100%**	**Total**	**2,544**	**100%**

Notes: Sector denotation based on classification by Nasdaq OMX Stockholm in March 2016. Data from 2006-2015.

Table A2. Positive vs. Negative Earnings Surprises

	Total		Positive SUE		Negative SUE	
	Freq.	*%*	*Freq.*	*%*	*Freq.*	*%*
Total	2,544	100%	1,179	46%	1,365	54%
By portfolio						
1	491	19%	0	0%	491	19%
2	457	18%	2	0%	455	18%
3	561	22%	160	6%	401	16%
4	510	20%	492	19%	18	1%
5	525	21%	525	21%	0	0%

Notes: Portfolio 1 include events with the relatively lowest standardized unexpected earnings rankings and Portfolio 5 include events with the relatively highest standardized unexpected earnings. PUE denotes positive standardized expected earnings and NUE denotes negative standardized unexpected earnings. Data from 2006-2015.

Table A3. Other Variables

	Mean	*N*	*Max*	*Min*	*St. dev.*	*p25*	*p50*	*p75*
Market Value	27,551	2,544	447,115	71	53,388	1,618	6,423	24,393
Price-to-Book Value	3.0	2,544	179.8	-83.3	12.9	1.2	2.0	3.1
No. of Analyst Estimates	4.5	2,527	15.0	1.0	3.3	2.0	4.0	6.0

Notes: Market Value in SEKm. Number of analysts' estimates denotes the number of estimates included in the consensus estimate. Price-to-Book Value: Both Min and Max value can be attributed to the firm Swedish Match. Data from 2006-2015.

Table A4. Cumulative Abnormal Returns following the Earnings Announcements

CAR w(2, 60)	*Mean*	*Adj. Mean**	*N*	*Max*	*Min*	*St. dev.*	*p25*	*p50*	*p75*
Total	-0.006	*-0.009*	2,450	1.018	-0.969	0.145	-0.079	-0.009	0.060
By portfolio									
1	0.000	*-0.010*	471	0.871	-0.747	0.148	-0.077	0.000	0.060
2	-0.015	*-0.017*	438	0.812	-0.969	0.154	-0.093	-0.022	0.060
3	-0.014	*-0.015*	540	0.574	-0.567	0.132	-0.079	-0.019	0.054
4	-0.003	*-0.005*	484	1.018	-0.964	0.152	-0.075	-0.007	0.054
5	0.001	*0.002*	517	0.620	-0.661	0.142	-0.068	0.000	0.071
By PUE/NUE									
PUE	-0.003	*-0.003*	1,139	1.018	-0.964	0.143	-0.070	-0.004	0.063
NUE	-0.009	*-0.014*	1,311	0.871	-0.969	0.147	-0.084	-0.012	0.057

*Adjusted for outliers , i.e. events with media or CAR exceeding 3 standard deviations in either direction has been excluded.

Notes: Portfolio 1 include events with the relatively lowest standardized unexpected earnings rankings and Portfolio 5 include events with the relatively highest standardized unexpected earnings. PUE denotes positive standardized expected earnings and NUE denotes negative standardized unexpected earnings. Data from 2006-2015.

Table A5. Media Coverage prior to the Earnings Announcements

Cumulative Media w(-20,0)	*Mean*	*Adj. Mean**	*N*	*Max*	*Min*	*St. dev.*	*p25*	*p50*	*p75*
Total	9.83	*7.64*	2,544	359	0	23.80	0	2	9
By portfolio									
1	9.44	*6.18*	491	274	0	24.09	0	2	8
2	8.00	*5.60*	457	359	0	25.08	0	1	6
3	9.92	*8.30*	561	212	0	21.09	0	3	10
4	10.14	*7.92*	510	312	0	25.28	0	2	10
5	11.37	*9.73*	525	213	0	23.63	0	2	9
By PUE/NUE									
PUE	10.96	*8.89*	1,179	312	0	24.37	0	2	10
NUE	8.85	*6.55*	1,365	359	0	23.26	0	2	8

*Adjusted for outliers, i.e. events with media or CAR exceeding 3 standard deviations in either direction has been excluded.

Notes: Portfolio 1 include events with the relatively lowest standardized unexpected earnings rankings and Portfolio 5 include events with the relatively highest standardized unexpected earnings. PUE denotes positive standardized expected earnings and NUE denotes negative standardized unexpected earnings. Data from 2006-2015.

Table A6. Media Coverage following the Earnings Announcements

Cumulative Media w(2,60)	*Mean*	*Adj. Mean**	*N*	*Max*	*Min*	*St. dev.*	*p25*	*p50*	*p75*
Total	29.39	*22.24*	2,544	835	0	63.99	2	8	27
By portfolio									
1	28.88	*18.38*	491	680	0	69.69	2	7	24
2	25.76	*17.64*	457	835	0	69.91	2	6	22
3	27.96	*22.49*	561	491	0	52.70	2	10	26
4	30.55	*23.68*	510	630	0	65.68	2	8	31
5	33.42	*28.12*	525	516	0	62.35	2	7	29
By PUE/NUE									
PUE	32.86	*25.75*	1179	835	0	67.58	2	8	31
NUE	26.39	*19.23*	1,365	680	0	60.59	2	7	24

*Adjusted for outliers, i.e. events with media or CAR exceeding 3 standard deviations in either direction has been excluded.

Notes: Portfolio 1 include events with the relatively lowest standardized unexpected earnings rankings and Portfolio 5 include events with the relatively highest standardized unexpected earnings. PUE denotes positive standardized expected earnings and NUE denotes negative standardized unexpected earnings. Data from 2006-2015.

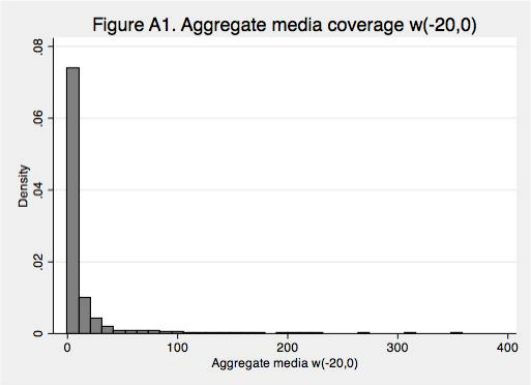

Fig. A1. – Histogram over aggregate media coverage 20 trading days prior to the earnings announcement. Figures range from 0 to 359, with a median value of 2 articles. Based on data from 2006-2015. For more details, see Table A5.

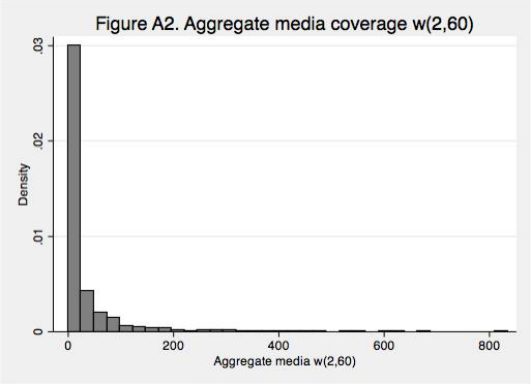

Fig. A2. – Histogram over aggregate media coverage 60 trading days following the earnings announcement. Figures range from 0 to 835, with a median value of 8 articles. Based on data from 2006-2015. For more details, see Table A6.

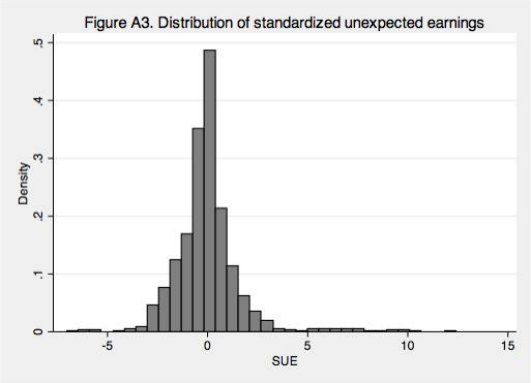

Fig. A3. – Histogram over standardized unexpected earnings for the events included in the sample. Figures range from -7.00 to 12.42, with a median value of -0.04. Based on data from 2006-2015. For more details, see Table 1.

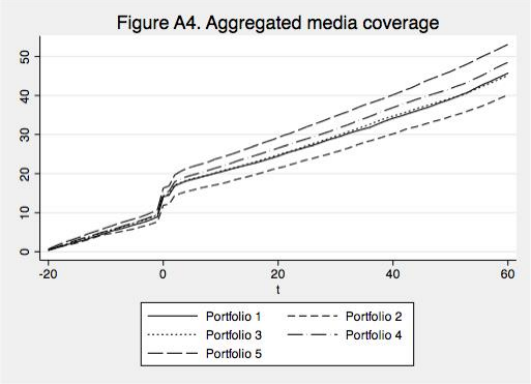

Fig. A4. – Aggregated media coverage in the period prior to- and following the earnings announcement, including the announcement date by SUE portfolio. The pattern around the announcement can be viewed as online coverage on the day of the announcement and print coverage the day after due to publication lags. The portfolio with the highest relative earnings surprises, Portfolio 5, seems to have the largest amount of media coverage. Based on data from 2006-2015.

9. Appendix B. Results

Table B1. Media Coverage in relation to Cumulative Abnormal Returns by PUE/NUE

	Positive surprises	**Negative surprises**
Dependent	|CAR| w(2, 60)	|CAR| w(2, 60)
	Coef.	*Coef.*
Media w(2, 60)	0.000682***	0.000941***
	(0.0002349)	(0.0001871)
Media sq. w(2, 60)	-0.00000197	-0.000004***
	(0.00000138)	(0.00000101)
|SUE|	0.003844**	-0.0016627
	(0.0016835)	(0.0022652)
Log(MV)	-0.012478***	-0.013987***
	(0.002766)	(0.002332)
No. of est.	-0.002644**	-0.0010391
	(0.0011305)	(0.0010505)
PTBV	0.0000941	-0.000197***
	(0.0000897)	(0.0000744)
Constant	0.219102***	0.225613***
	(0.0227312)	(0.0204297)
Sector	Yes	Yes
Outlier adjusted	Yes	Yes
R-squared	0.1113	0.1203

Notes: Regression results based on equation (4). Outlier adjusted indicates that events with media or CAR exceeding 3 standard deviations in either direction has been excluded. Data from 2006-2015. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table B2. Media Coverage in relation to Cumulative Abnormal Returns by Analyst Coverage

	Analyst coverage - Low	**Analyst coverage - Mid**	**Analyst coverage - High**
Dependent	|CAR| w(2, 60)	|CAR| w(2, 60)	|CAR| w(2, 60)
Variables	*Coef.*	*Coef.*	*Coef.*
Media w(2, 60)	0.000656***	0.000467***	0.000199***
	(0.0001812)	(0.0001061)	(0.0000694)
|SUE|	0.0032581	-0.000286	0.002595
	(0.0041952)	(0.0025029)	(0.0020888)
Log(MV)	-0.007510**	-0.017101***	-0.012301***
	(0.0031162)	(0.0032562)	(0.0032848)
No. of est.	-0.0092242	0.0005725	0.0017354
	(0.0064348)	(0.0025321)	(0.0015814)
PTBV	0.001137	0.0005713	-0.0000693
	(0.0008394)	(0.0004466)	(0.0000459)
Constant	0.206384***	0.245857***	0.191309***
	(0.02987)	(0.0281529)	(0.0307375)
Sector	Yes	Yes	Yes
Outlier adjusted	Yes	Yes	Yes
R-squared	0.0721	0.1193	0.0755

Notes: Regression results based on equation (4). Analyst coverage - Low denotes two estimates or less, Analyst coverage - Mid denotes three to six estimates and Analyst coverage - Large denotes 7 or more estimates. Outlier adjusted indicates that events with media or CAR exceeding 3 standard deviations in either direction has been excluded. Data from 2006-2015. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table B3. Media Coverage in relation to Cumulative Abnormal Returns by Portfolio

	Portfolio 1	**Portfolio 2**	**Portfolio 3**	**Portfolio 4**	**Portfolio 5**
Dependent	|CAR| w(2, 60)	|CAR| w(2, 60)	|CAR| w(2, 60)	|CAR| w(2, 60)	|CAR| w(2, 60)
	Coef.	*Coef.*	*Coef.*	*Coef.*	*Coef.*
Media w(2, 60)	0.000528***	0.000426***	0.000161*	0.000346***	0.000522***
	(0.000145)	(0.0001624)	(0.0000974)	(0.0001208)	(0.0001103)
|SUE|	0.0003922	0.0021901	0.0190543	-0.0173514	0.003720*
	(0.0037581)	(0.0089368)	(0.0204601)	(0.014562)	(0.001978)
Log(MV)	-0.010878***	-0.014020***	-0.012502***	-0.0053155	-0.020258***
	(0.0034079)	(0.0044624)	(0.0037867)	(0.004196)	(0.0042139)
No. of est.	-0.0022733	-0.0010088	0.0001564	-0.003726**	-0.0014763
	(0.0017031)	(0.0018947)	(0.0017787)	(0.0017166)	(0.0016316)
PTBV	-0.003721**	-0.000146	-0.000219	-0.0000426	0.0001424
	(0.0014854)	(0.0001108)	(0.0001741)	(0.0000881)	(0.0000924)
Constant	0.224306***	0.241356***	0.200514***	0.152055***	0.303857***
	(0.0338914)	(0.0378721)	(0.0311232)	(0.0344514)	(0.0359169)
Sector	Yes	Yes	Yes	Yes	Yes
Outlier adjusted	Yes	Yes	Yes	Yes	Yes
R-squared	0.1575	0.1360	0.1031	0.0661	0.1906

Notes: Regression results based on equation (4). Outlier adjusted indicates that events with media or CAR exceeding 3 standard deviations in either direction has been excluded. Portfolio 1 include events with the relatively lowest standardized unexpected earnings rankings and Portfolio 5 include events with the relatively highest standardized unexpected earnings. Data from 2006-2015. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1