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Abstract

Using a dataset that classifies firm-level ESG news as positive and negative, we examine how stock prices react to different types of ESG news. We analyze 111,020 firm–day observations for 3,126 companies and find that prices react only to issues identified as financially material for a given industry by sustainability accounting standards, and the reaction is larger for news that is positive, receive more attention, and that is related to social capital issues. We conclude that investors differentiate in their reactions based on whether the news is likely to affect a company's fundamentals, and therefore their reactions are motivated by a financial rather than a nonpecuniary motive.

INTRODUCTION

Every day, environmental, social, and governance (ESG) related news can be found for hundreds of companies as events unfold, and as the media, analysts, regulators, and other stakeholders uncover information. In this paper, we use a unique dataset that tracks daily ESG news across thousands of companies and examine whether and how investors react to the release of different ESG-related information. This question is an important one as more investors are integrating ESG information in their portfolio management and as ESG news can have a major impact on companies. For example, Bank of America Merrill Lynch examined 24 major ESG controversies of S&P 500 companies during 2014-2019 and found that the total market cap loss amounted to $534 billion.[1] As a result, more companies are investing resources in improving their performance on ESG issues and regulators are placing an increasing emphasis on understanding how ESG information flows to the market, seeking to learn how capital-market participants react to this information.

Prior literature examined the market reaction to ESG regulations, eco-friendly initiatives, and engagements (e.g., Flammer 2013; Dimson, Karkas, and Li 2015; Hoepner, Grewal, Riedl and Serafeim 2019; Naughton, Wang, and Yeung 2019; Oikonomou, Sautner, Starks, and Zhou 2019). In this paper, we extend the prior literature by providing new evidence on *which* ESG news the market reacts to and why. We examine this question because we do not know much about which ESG news the market would react to and it is ex-ante unclear whether any prior evidence would be generalizable in recent years for the following reasons. First, prior research conducted small sample analyses on periods when capital markets did not pay nearly as much attention to ESG issues or viewed such issues through an agency-cost lens (Krüger 2015, Ioannou and Serafeim 2015). Indicatively, investment associations such as the United Nations Principles for Responsible Investment (UN PRI) was set up in 2006 and at the time of initiation UN PRI signatories only had a few hundred billion dollars in assets under management in the first few years, but by 2020 the assets under management had reached $110 trillion. Therefore, investor awareness

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[1] Bank of America Merrill Lynch: "10 Reasons You Should Care about ESG." Sep 23, 2019.

around ESG issues was very limited during the sample period of prior work. Second, past research did not differentiate between news on ESG issues that are likely to be financially material for a given industry. Third, the samples analyzed in most of prior work were events identified by human analysts and more limited in range. We overcome this limitation using recent technological developments in natural language processing, which allows us with a much larger set of companies and events.

We examine whether and how investors react to different types of ESG news using much more recent sample that is orders-of-magnitude larger than those used in prior studies and separate the sample using materiality classifications from the Sustainability Accounting Standards Board (SASB). Our total sample includes 111,020 unique firm–day observations for 3,126 companies with ESG news between January 2010 and June 2018. The data from TruValue Labs (TVL) track ESG-related information every day across thousands of companies, classify news to positive or negative, and provide insights on how positive or negative the news is. This dataset includes information from a wide variety of sources— including reports by analysts, media, advocacy groups, and government regulators—and emphasizes that the measures focus on vetted, reputable, and credible sources that are likely to generate new information and insights for investors.

Our primary research design is on a firm-day panel where the dependent variable is the daily market-adjusted stock return, and our key independent variables of interest are indicator variables for positive and negative news on that day. In addition, we consider the industry-adjusted return as an alternative dependent variable. This daily structure allows us to implement an event-study research design, measuring short-term price reactions to ESG news every day, which helps alleviate reverse-causality concerns and other confounding events unlike the studies that examine long-term returns and corporate performance.

We split the sample according to SASB's industry-specific materiality classification to test whether investors react more strongly to news that is likely to provide financially material information. The literature has proposed multiple explanations on why investors might react to ESG news. One explanation is that investors react because of their own reputational or nonpecuniary reasons (Jones, Jones, and Little 2000;

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Wether and Chandler 2005; Baker, Bergstresser, Serafeim, and Wurgler 2018). Under this explanation, ESG information is value irrelevant and therefore financially immaterial. In such a case, we expect the reaction to be significant for any ESG issue regardless of its financial materiality. On the other hand, some papers argued that ESG news convey value-relevant information about a firm's future growth, risk, and competitive positioning (Khan, Serafeim, and Yoon 2016; Grewal, Riedl, Serafeim 2019). In such a case, investors may react to ESG news that could convey financially material information.

Our first set of analyses shows that not all events are associated with significant price reactions. We find significant market reaction only to news classified as financially material based on a company's industry membership. Specifically, when we examine the firm-dates with at least three news articles, we find significant and positive price reactions for positive ESG news only for the sample classified as financially material ESG issues according to SASB standards.[2] On average, the price reaction is 60 basis points on the day of the news and 75 basis points during the two-day window from the day prior to the day of the news.

Our results increase in economic significance when we restrict the sample to material news that receive more attention (e.g., having more than five ESG articles on that day). We now find that negative news is accompanied by negative price reactions. For example, the market reaction to positive news increases to 218 basis points and the market reaction to negative news increases to 70 basis points. In contrast, we find no price reaction for the sample of ESG issues that are not classified as material according to SASB standards regardless of how we restrict our sample. We find results that are just as strong when using the industry-adjusted return as an alternate dependent variable. Overall, our results are supportive of the view that investors differentiate in their reactions based on whether the news is likely to affect a company's fundamentals, and therefore their reactions are motivated by a financial rather than a nonpecuniary motive.[3]

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[2] According to TVL, sentiment analysis requires at least three articles to be accurate.
[3] Given the lack of results for the sample not classified as material according to SASB, we focus on further analyzing the sample classified as material in the remainder of the paper.

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When we evaluate the themes of ESG news, we find that news classified under social capital (i.e., news that primarily relates to product impact; the positive and negative impacts that organizations have on customers due to issues such as product safety, quality, affordability, and access) generate the largest and most significant market reactions for both positive and negative news. On average, the price reaction to positive news is 187 basis points on the day of the news and 241 basis points during the three-day window around the day of the news. This is a particularly interesting finding given that ESG data and ratings contain little information about product impacts with most metrics reflecting operational activities (Serafeim and Trinh 2020). Among other themes, we find smaller but significant reactions for negative natural capital related news and positive human capital and business model innovation related news.

We add to the prior literature in the following ways. First, we add to the literature that examines whether the market reacts to ESG news (see Krüger 2015; Capelle-Blancard and Petit 2019). Unlike prior literature, we show that investors react positively to positive news and that the reaction is stronger for positive rather than negative news even when we look at news with more attention.[4] We show that news related to social capital and more specifically to product related impacts generate the most consistent and significant market reactions. Second, our paper adds to the literature that examines the financial materiality of different ESG investments (e.g., Khan, Serafeim, and Yoon 2016). Our results suggest that some ESG news contain more value-relevant information than other news and that this information can be utilized by market participants.

The remainder of the paper is organized as follows. The next section provides the motivation and background. Section 3 presents a description of the data and sample. Section 4 presents the research design and results. Section 5 concludes.

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[4] We note that our overall results paint a different picture about how investors react to ESG news and believe the difference in findings could be multifold. First, we examine a period that is more recent and when ESG became more prevalent than the prior studies. Second, we rely on technological advancements that systematically measure ESG news using natural language processing which is an improvement in measurement quality and selection bias compared to papers that relied on a human analyst subjectively codifying ESG news.

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LITERATURE REVIEW AND MOTIVATION

Environmental, social, and governance (ESG) issues in business has been a fast-growing phenomenon and much attention has been paid by companies in recent years. For example, there were a handful of companies that issued reports that included ESG data in the early 1990s. By now, this number has increased to cover most large companies listed around the world. This growing salience of ESG is not unique just to companies but also prevalent in the asset management industry. For example, UN PRI signatories only had a few hundred billion dollars in AUM in the first few years starting in 2006, but the AUM reached $80 trillion by 2019. Forbes pointed out such massive inflow of capital into ESG "remarkable" and the Wall Street Journal pointed out that more companies are investing resources in better communicating their ESG efforts and regulators are placing an increasing emphasis on understanding how ESG information flows to the market, seeking to learn how capital-market participants react to this information.[5,6]

Numerous academic papers examined how market reacts to ESG related information and events. For example, Grewal, Riedl, and Serafeim (2019) examined the impact of ESG disclosure mandate in the European Union and documented less negative market reaction for firms that have high ESG disclosure. Naughton, Wang, and Yeung (2019) found that announcements of CSR activities generate positive abnormal returns during periods when investors place a valuation premium on CSR performance, Flammer (2013) found that market reacts positively to the announcement of eco-friendly initiatives, and Dimson, Karakas, and Li (2015) found positive abnormal returns to successful ESG engagements by investors. More closely related to our paper, Capelle-Blancard and Petit (2019) found negative market reaction to negative ESG news, and Krüger (2015) found that the market reacts negatively to both positive and negative ESG news.

There are multiple viewpoints that may lead to different predictions as to how the market would react to ESG news. The first viewpoint is that a firm's ESG efforts are mainly associated with agency costs. In such a case, ESG would mainly enhance managers' reputation at the expense of shareholders (Cheng,

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[5] Forbes. The Remarkable Rise of ESG. Jul 11, 2018.
[6] WSJ. ESG Funds Draw SEC Scrutiny. Dec 16, 2019.

Hong, and Shue 2013). This would lead to a rise in a firm's costs which would also be a disadvantage in a competitive market (Friedman 1970; Jensen 2002). This stream of argument would be consistent with Krüger (2015) that documented a negative market reaction to even positive ESG news.

The second viewpoint suggests that ESG information may be related to shareholder value. The argument is that better sustainability performance can not only lead to better resources (Cochran and Wood 1984; Waddock and Graves 1997), higher-quality employees (Turban and Greening 1997), and marketing success (Moskowitz 1972; Fombrun 1996), but also mitigate the likelihood of stock price crash risk (Kim, Li, and Li 2014; Hoepner, Oikonomou, Sautner, Starks, and Zhou 2019) and enhance firm reputation (Fombrun and Shanley 1990; Fombrun 2005; Freeman, Harrison, and Wicks 2007).

The third viewpoint suggests that there may be no reaction to ESG news. For example, investors might only care about ESG because of reputational or nonpecuniary reasons (Jones, Jones, and Little 2000; Wether and Chandler 2005; Baker, Bergstresser, Serafeim, and Wurgler 2018). Under such circumstances, ESG information would be value irrelevant and therefore financially immaterial. There would also be no reaction if investors do not update their beliefs post ESG news because much is already known through already existing channels (Griffin and Sun 2013). In such a case, ESG news may not lead to any price reactions.

However, it is likely that market reaction to ESG news could vary depending on the type of news. For example, Khan, Serafeim, and Yoon (2016) found only a small subset of ESG issues in each industry, as identified by sustainability accounting standard setters, are associated with future stock returns and accounting performance. This suggests a possibility that different ESG news in different industries may convey more value-relevant information about a firm's future growth, risk, and competitive positioning than other information. In another stream of literature, Mitchell, Agle, and Wood (1997) suggested that different stakeholders may have varying salience to company operations and Agle, Mitchell, and Sonnenfeld (1999) found that primary stakeholders, such as employees and customers transacting directly with the firm, are more salient to shareholders than more distant stakeholders, such as the natural

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environment or local communities. In such a scenario, we may expect stronger market reactions to social capital and human capital related news relative to natural capital news.

DATA AND SAMPLE

ESG News Data

We use TVL data that tracks ESG-related information every day across thousands of companies and classify that news as positive or negative. TVL is used by some of the largest asset managers (e.g., State Street) and asset owners (e.g., Global Pension Investment Fund of Japan) and employs big data and artificial intelligence to capture and analyze unstructured data (Serafeim 2020). Every day, TVL uses artificial-intelligence algorithms to find ESG-relevant articles for each company categorized by ESG-specific issue. SASB has issued industry-specific disclosure standards identifying, for 79 industries, which ESG issues are financially material. In doing so, SASB has identified evidence of interest and financial impact from emerging regulations, disruptions in the physical environment, changes in consumer preferences, and supply-chain pressures that might generate effects on costs, revenues, assets, liabilities, or costs of financing. TVL uses this SASB classification of 30 ESG issues to determine whether the news is material or not.

TVL does not source news that is coming directly from the company, such as press releases or company reports. Rather, TVL sources news from outside the organization including a wide variety of sources such as analyst reports, various media, advocacy groups, and government regulators. TVL emphasizes that its measures focus on vetted, reputable, and credible sources that are likely to generate new information and therefore insights for investors. To increase transparency and validate the data, the TVL platform allows a user to track the original source of the articles and events that inform the sentiment analysis for each specific issue. The platform aggregates unstructured data from over 100,000 sources into a continuous stream of ESG data for monitored companies. The cognitive computing system uses natural language processing (NLP) to interpret semantic content and generate analytics scoring data points on performance, using a scale of 0 to 100. A *News Score* of 50 represents a neutral impact. Scores above 50

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indicate positive sentiment, and scores below 50 reflect negative sentiment. For example, Ingersoll Land had positive sentiment following news on the firm's investments to improve waste and hazardous-materials management, materials sourcing, and product safety. In contrast, Facebook had negative sentiment following news on the firm's data-privacy issues, concerns about regulatory pressure, and user rights.

The analysis performed by TVL is capable of codifying not only positive versus negative in a binary way, but also degrees of positivity or negativity. For example, the algorithms assign a more negative score to a catastrophic oil spill affecting several workers and communities and a less negative score to a workplace incident that leads to a minor injury for one worker. The algorithms assign such scores in a consistent manner based on the semantic content across data points, so that if there is hypothetically an identical event such as the catastrophic oil spill and an identical discussion of the event in a textual document, the sentiment-based score for such an event would be the same.

Other Data

We use Compustat and CRSP to construct the following variables. We consider the following dates with respect to the news: 1) t-5 to 5-2, 2) t-1, 3) t, 4) t+1, and 5) t+2 to t+5. This approach enables us to understand when the market reaction occurs—and to detect whether there is any leakage of information during the days preceding the news or any under- or overreaction during the days following it. *MA Return* is the market-adjusted return during the days relative to the date of the news. For example, *MA Return -5, -2* is the cumulative market return between five and two days before the news minus the cumulative value-weighted market returns during the same period. *MA Return -1* is the cumulative market return during the day before the news minus the cumulative value-weighted market return during the same day. *IA Return* is the industry adjusted return over the days relative to the date of the news (i.e. -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted industry returns). *Market Capitalization* is the beginning-of-day market capitalization for a firm on the day the news article is published.

Sample

Table 1 Panel A presents the summary statistics for all observations with at least three news articles from TVL. Our total sample includes 111,020 unique firm–day observations with ESG news between January 2010 and June 2018. Average *MA Return -5, -2, MA Return -1, MA Return 0, MA Return +1,* and *MA Return +2, +5* are 0.035%, 0.035%, 0.086%, -0.010%, and -0.004%, respectively. Average *IA Return -5, -2, IA Return -1, IA Return 0, IA Return +1,* and *IA Return +2, +5* are -0.003%, 0.025%, 0.077%, -0.020%, and -0.038%, respectively. Average *News Score*, *Article Volume, and Market Cap* are 58, 6, and $70 billion, respectively.

Panel B presents the summary statistics for observations with at least three news articles from TVL and classified as material for their respective industry by SASB. Our sample includes 46,430 unique firm–day observations. Average *MA Return -5, -2, MA Return -1, MA Return 0, MA Return +1,* and *MA Return +2, +5* are 0.045%, 0.040%, 0.140%, -0.011%, and -0.005%, respectively, showing that the market reactions are larger for material issues. Average *IA Return -5, -2, IA Return -1, IA Return 0, IA Return +1,* and *IA Return +2, +5* are 0.011 %, 0.030%, 0.132%, -0.022%, and -0.036%, respectively. Average *News Score*, *Article Volume, and Market Cap* are 57, 5, and $84 billion, respectively.

Table 2 presents the frequency table for all observations with at least three news articles from TVL. Panel A presents the table by year. There are 6,257, 7,176, 7,473, 8,621, 11,002, 17,883, 18,988, 22,176, and 11,444 observations for years 2010 through 2018, respectively. As for material observations, there are 2,478, 2,739, 2,859, 3,391, 4,450, 7,737, 8,064, 9,527, and 5,187 observations for years 2010 through 2018, respectively.[7] In addition, we provide the observation breakdown by ESG theme as defined by the SASB: 1) social capital, 2) human capital, 3) natural capital, 4) sustainability leadership and governance, and 5) business model and social innovation. Overall, there generally is an increasing trend in the number of observations, and there are 18,214, 6,770, 6,051, 8,127, and 6,622 observations in social capital, human

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[7] Note that as mentioned in the previous section, the number of observations for 2018 is smaller than that for the previous years because our data are through June 2018.

capital, natural capital, sustainability leadership and governance, and business model and social innovation, respectively.

Panel B presents the breakdown of observations by industry. We use two-digit GICS industry code to define the industry, and there are 6,557, 6,329, 11,099, 18,008, 10,820, 19,102, 7,567, 18,771, 8,493, 3,678, and 596 observations for energy, materials, industrials, consumer discretionary, consumer staples, health care, financials, information technology, communication services, utilities, and real estate, respectively. As for material observations, there are 3,679, 2,393, 2,749, 6,730, 4,841, 12,076, 1,869, 6,785, 3,649, 1,559, and 100 observations for energy, materials, industrials, consumer discretionary, consumer staples, health care, financials, information technology, communication services, utilities, and real estate, respectively. Panel C presents the breakdown of observations by ESG Theme and TVL Classification.

RESEARCH DESIGN AND RESULTS

Market Reaction to ESG News

To examine the market's reaction to ESG news, we estimate the following firm–day panel:

$$MA\ Return_{i,t} = \beta_0 + \beta_1 Negative\ News_{i,t} + \beta_2 Positive\ News_{i,t} + Date\ FE + Industry\ FE \quad (1)$$

The dependent variable is daily market-adjusted stock return relative to the news. We consider five separate windows of *MA Return* as dependent variables. We use four-digit GICS codes to create *Industry Fixed Effects*.[8] Our key independent variables of interest are *Positive News*, which indicates the firm date with *News Score* above 75, and *Negative News*, which indicates the firm date with *News Score* below 25. We choose these thresholds as they represent the top and bottom quartiles of scoring in the TVL method.

Table 3 presents the results from equation 1 above. We first consider all observations with at least three news articles from TVL. We use this threshold to ensure that there is a minimum number of articles, because the algorithm used in TVL's sentiment analysis requires at least a few articles to be accurate.[9] In Panel A, we find that not all events are associated with a significant price reaction. Specifically, we find

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[8] In unreported results we also used six-digit codes, and all our results remained unchanged.
[9] We present results using higher volume thresholds in the robustness section. We find stronger results.

significant positive price reactions for positive ESG news. On average, the price reaction to positive news is 32 basis points on day zero and 39 basis points during the two-day window between the day prior to the news and the day of. However, we do not find significant price reactions for negative ESG news.

Panel B includes observations classified as material by the SASB and with at least three news articles from TVL. We also find significant positive price reactions for positive ESG news, but the economic magnitude of the reactions is much larger than for those presented in Panel A. On average, the price reaction to positive news is 60 basis points on day zero and 75 basis points during the two-day window between the day prior to the news and the day of. We do not find significant price reactions for negative ESG news, as in Panel A.

In Panel C, we take the observations from Panel A but exclude the firm–dates in Panel B that are classified as material by SASB. We find little to no market reaction. On average the price reaction to positive news is insignificant on day zero and only 6 basis points during the two-day window between the day prior to and the day of the news. Also, there are no significant price reactions to negative ESG news. Overall, the evidence in Table 3 shows that the market reaction is strongest for material issues.

In Table 4 Panel A, we restrict the sample to firm–dates with at least five ESG articles (instead of the three articles in Table 3) that are classified as material by the SASB. We find a much stronger market reaction than in the previous results, presented in Table 3 Panel B. In the first five columns, we assign equal weights to each observation. On average, the price reaction to positive news is 218 basis points on day zero and 245 basis points during the two-day window between the day prior to and the day of the news. In addition, we find a market reaction to negative news: the price reaction to negative news is minus 70 basis points on day zero. It is interesting to note that the magnitude of reaction on negative news (i.e., 70 basis points) is significantly greater than the 27 basis points presented in Capelle-Blancard and Petit (2019), which may be due to the growing saliency of ESG information in the recent years in addition to much our larger sample size. In the last five columns, we weigh each observation by its beginning of date market capitalization. On average, the price reaction to positive news is 32 basis points on day zero. Also, the price reaction to negative news is minus 25 basis points on day zero. Overall, we confirm the phenomenon from

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Table 3 and observe that negative news tends to trigger significant negative reactions for firms that receive more attention (i.e., measured as a higher ESG article volume on that day).

In Table 4 Panel B, we further restrict our sample to only include the firm–date observations with more than seven material ESG articles. Not surprisingly, our results are even stronger than those presented in Table 4. When we assign equal weights to each observation, we find that positive news generates one-day market-adjusted reactions of 340 basis points. We find that negative news generates a market reaction of minus 138 basis points, but fails to achieve strong statistical significance (t-stat: -1.61). When we value-weigh each observation using the beginning-of-day market cap, we find that positive news generates one-day market-adjusted reactions of 48 basis points and that negative news generates one-day reactions of minus 45 basis points.

Market Reaction to ESG News by ESG Theme

In Table 5, we segment the sample by ESG theme (i.e., social capital, human capital, natural capital, sustainability governance and leadership, and business model and social innovation) as defined by SASB and estimate our main specification (equation 1) for each theme separately. We find that the largest reactions are generated by news related to social-capital issues. These news primarily relate to product impact; the positive and negative impacts that organizations have on customers due to issues such as product safety, quality, affordability and access (see Table 2 Panel C). This is a particularly interesting finding given that ESG data and ratings contain little information about product impacts with most metrics reflecting operational activities (Serafeim and Trinh 2020). Specifically, positive social-capital news generates one-day market-adjusted reactions of 187 basis points and 241 basis points during the three-day window around the day of the news. On the other hand, negative social-capital news generates a one-day reaction of minus 107 basis points.

For positive human-capital issues, we find aggregate positive reactions of 25 basis points during one day before to one day after the news event. We do not find a significant market reaction to negative human capital issues. For natural capital issues, negative news generates negative one-day reactions of 55

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basis points on average. The negative reaction is in line with the topic covered in natural capital news (e.g., news related to air quality, waste and hazardous materials, and emission: see Table 2 Panel C for details). Reactions to news related to sustainability governance and leadership are insignificant. For positive news on business model and social innovation, we find one-day market-adjusted reactions of 35 basis points, but we do not find any market reactions to negative news.

Given the result that social capital related news drives the largest market reactions, using the TVL classification reported in Table 2, Panel C we investigate which topics drive this phenomenon. The two most consistent themes with the largest price reactions both relate to product impact attributes and impacts: customer welfare and product quality and safety. Figure 1 tabulates the market reactions for day zero for those two topics, both for positive and negative news. Positive news related to customer welfare and product quality and safety are associated with positive market reaction of 2.9 and 5.2% respectively.[10] Negative news relates to -3.2 and -2.5% respectively. To avoid results tabulation overload, we briefly mention here other topics that are associated with significant price reactions. Human rights and community relations (also classified under social capital) positive news are associated with significant market reaction of 3.9% but not significant reaction to negative news. Recruitment Development and Retention, classified under human capital, positive (negative) news is related to 0.7 and -0.9% market reactions but in both cases those are happening in days -5 to -1. Negative news about GHG emissions (Scope 1 emissions) or Energy Management (Scope 2 emissions) are associated with -1.2 and -1.6% respectively, but we observe offsetting market reactions before the event, so we interpret this result with caution as they could be attributed to short-term price reversals. Lifecycle impacts of products and services positive news is associated with a smaller but also statistically significant market reaction of 24 basis points.

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[10] For customer welfare the reaction is large but with a large standard error and a t-statistic of 1.54.

Industry Adjusted Returns

So far, we have used market-adjusted returns to measure abnormal price reactions. However, it could be the case that industry membership might be confounding the relation between ESG news and market reactions. To assess how our results might be influence when we adjust for industry membership, we use industry-adjusted returns as an alternate dependent variable. We note that the downside of this approach is that if the news for a focal firm also affects other firms in the industry, we might be controlling for the effect we are trying to document. We consider the following specification:

$$IA\ Return_{i,t} = \beta_0 + \beta_1 Negative\ News_{i,t} + \beta_2 Positive\ News_{i,t} + Date\ FE \qquad (2)$$

The dependent variable is the daily industry-adjusted stock return relative to the news. As in equation 1, we consider five separate dependent variables that relates to different time windows around the news. The difference from equation (1) is that this specification excludes industry fixed effects and adjusts the return directly.

In Appendix Table 1 Panel A, we consider all observations with at least three news articles and use industry-adjusted returns as the dependent variable. Like Table 3, our main table using market adjusted return, we find significant positive price reactions for positive ESG news. On average, the price reaction to positive news is 35 basis points on day zero and 45 basis points in the two-day window comprising the previous day and day zero. However, we do not find significant price reactions for negative ESG news. Panel B includes observations classified as material by the SASB. We also find significant positive price reactions for positive ESG news, but the economic magnitude of the reactions is much larger than that in Panel A. On average, the price reaction to positive news is 67 basis points on day zero and 87 basis points during the two-day window between the day prior to and the day of the news. In Panel C, we take observations from Panel A, excluding the firm dates that are classified as material by SASB, and we find little to no market reaction. On average the price reaction to positive news is 10 basis points on day zero and 18 basis points during the two-day window between the day prior to and the day of the news.

In Appendix Table 2, we restrict the sample to firm–date observations with five ESG articles (instead of three articles) that are classified as material by SASB. We find a much stronger market reaction

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than in the results presented in Table 4. In the first five columns, we assign equal weights to each observation. On average the price reaction to positive news is 225 basis points on day zero and 260 basis points during the two-day window between the day prior to and the day of the news. In addition, we find a market reaction to negative news: the price reaction to negative news is minus 67 basis points on day zero. In the last five columns, we weigh each observation by its beginning-of-date market capitalization. On average, the price reaction to positive news is 38 basis points on day zero and 48 basis points during the two-day window between the day prior to and the day of the news. The price reaction to negative news is minus 19 basis points on day zero. Overall, the above results corroborate significant market reactions to ESG news.

CONCLUSION

In this paper, we examine stock-price reactions to ESG news and whether the news can be predicted by firm-specific ESG performance scores. This is an important question because more investors are integrating ESG information in their portfolio, more companies are investing resources in improving their performance on ESG issues, and regulators are placing an increasing emphasis on understanding how ESG information is flowing to the market and seeking evidence to understand how capital-market participants react to this information. To answer this question, we use a unique dataset from TVL that tracks ESG-related information every day across thousands of companies, and we classify news as positive or negative.

This dataset provides us with the following advantages over important recent literature. First, the recent technological advancements that systematically measure ESG-related news allow us to mitigate concerns about measurement quality and selection bias. Second, we can implement an event-study research design, measuring short-term price reactions to ESG news every day, which helps us to mitigate reverse-causality concerns and other confounding events. Third, our

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sample is orders-of-magnitude larger in size compared to prior studies, increasing the generalizability of our results. Fourth, we conduct our analyses during a recent time period, which helps generalize our results.

Our findings can be summarized as follows. Stock prices only react to the news on ESG issues that is classified as financially material for a given industry by the SASB, suggesting that investors respond selectively to news. This price reaction is larger for ESG news that is positive, receives more attention, and relates to social capital issues relative to natural or human capital issues. This last point is of particular importance given the relative lack of ESG data related to social capital issues.

Future research could examine several important questions. How do the results we document here vary around the world? Do country institutions shape how markets react to ESG news? What is the relationship between firm disclosures and ESG news? How do firms respond in the presence of significant ESG news? Answering these questions are likely to generate useful insights.

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Table 1: Summary Statistics

Panel A: Summary Statistics for All Observations

	N	Average	St. Dev	p25	p75
MA Return -5, -2	111,020	0.035%	4.556%	-1.541%	1.509%
MA Return -1	111,020	0.035%	3.005%	-0.726%	0.709%
MA Return 0	111,020	0.086%	4.158%	-0.733%	0.739%
MA Return +1	111,020	-0.010%	2.461%	-0.735%	0.701%
MA Return +2, +5	111,020	-0.004%	4.154%	-1.559%	1.473%
IA Return -5, -2	111,020	-0.003%	4.382%	-1.387%	1.270%
IA Return -1	111,020	0.025%	2.937%	-0.645%	0.612%
IA Return 0	111,020	0.077%	4.105%	-0.654%	0.645%
IA Return +1	111,020	-0.020%	2.385%	-0.660%	0.606%
IA Return +2, +5	111,020	-0.038%	3.974%	-1.404%	1.247%
News Score	111,020	58	14	49	67
Article Volume	111,020	6	6	3	6
Market Cap	111,020	69,900,000	112,000,000	3,822,478	93,400,000

Panel B: Summary Statistics for Observations on Material Issues

	N	Average	St. Dev	p25	p75
MA Return -5, -2	46,430	0.045%	4.874%	-1.508%	1.469%
MA Return -1	46,430	0.040%	3.548%	-0.711%	0.695%
MA Return 0	46,430	0.140%	5.383%	-0.728%	0.739%
MA Return +1	46,430	-0.011%	2.800%	-0.721%	0.679%
MA Return +2, +5	46,430	-0.005%	4.170%	-1.511%	1.441%
IA Return -5, -2	46,430	0.011%	4.693%	-1.345%	1.221%
IA Return -1	46,430	0.030%	3.483%	-0.627%	0.594%
IA Return 0	46,430	0.132%	5.338%	-0.646%	0.638%
IA Return +1	46,430	-0.022%	2.727%	-0.653%	0.582%
IA Return +2, +5	46,430	-0.036%	3.976%	-1.347%	1.215%
News Score	46,430	57	16	48	68
Article Volume	46,430	5	5	3	6
Market Cap	46,430	84,000,000	123,000,000	6,104,866	126,000,000

MA Return is the market-adjusted return over the days relative to the date of the news (i.e., -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted market returns). IA Return is the industry adjusted return over the days relative to the date of the news (i.e. -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted industry returns). News Score is a score that ranges from 0 to a 100 and tracks how positive or negative the ESG news coming out for a firm is on that date. 100 is the most positive news and 0 the most negative. Article Volume is the unique number of articles for the firm on that date. Market Cap is the beginning-of-day market capitalization (in $ thousands) for a firm on each day. Panel A includes all observations with available news data from TruValue Labs (TVL) where the volume articles are at least three. Panel B includes all observations with available news data from TVL where the volume of articles is at least three and the issue is classified as material for this industry by the Sustainability Accounting Standards Board.

Table 2: Frequency Table

Panel A: Frequency by Year

Year	All Obs.	Material Obs.	Social Capital	Human Capital	Natural Capital	Sustainability Leadership & Governance	Business Model & Social Innovation
2010	6,257	2,478	732	209	306	305	329
2011	7,176	2,739	648	217	273	326	333
2012	7,473	2,859	595	255	223	363	330
2013	8,621	3,391	738	275	259	358	436
2014	11,002	4,450	1902	396	289	623	485
2015	17,883	7,737	3400	1190	946	1417	1117
2016	18,988	8,064	3273	1354	1135	1499	1101
2017	22,176	9,527	4365	1580	1569	1783	1575
2018	11,444	5,185	2561	1294	1051	1453	916
Total	111,020	46,430	18,214	6,770	6,051	8,127	6,622

Panel B: Frequency by Sector

Sectors	All Obs.	Material Obs.	Social Capital	Human Capital	Natural Capital	Sustainability Leadership & Governance	Business Model & Social Innovation
Energy	6,557	3,679	195	931	1,403	506	200
Materials	6,329	2,393	437	288	329	214	432
Industrials	11,099	2,749	450	588	474	380	443
Consumer Discretionary	18,008	6,730	4,589	1,494	1,517	1,008	1,805
Consumer Staples	10,820	4,841	1,959	546	366	441	301
Health Care	19,102	12,076	4,159	319	105	747	65
Financials	7,567	1,869	561	589	134	986	180
Information Technology	18,771	6,785	2,798	694	524	1,063	2,082
Communication Services	8,493	3,649	1,965	636	229	1,838	395
Utilities	3,678	1,559	36	151	526	105	258
Real Estate	596	100	27	7	16	4	10
Total	111,020	46,430	17,176	6,243	5,623	7,292	6,171

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Panel C Frequency by TVL Classification

ESG Theme	TVL Classification	Frequency
Social Capital	Access and Affordability	1,597
	Customer Welfare	3,867
	Data Security and Customer Privacy	3,631
	Fair Disclosure and Labeling	1,020
	Fair Marketing and Advertising	649
	Human Rights and Community Relations	2,118
	Product Packaging	116
	Product Quality and Safety	4,178
Human Capital	Accident and Safety Management	1,674
	Diversity and Inclusion	456
	Employee Health Safety and Wellbeing	392
	Fair Labor Practices	335
	Labor Relations	662
	Recruitment Development and Retention	2,724
Natural Capital	Air Quality	74
	Biodiversity Impacts	828
	Energy Management	1,637
	Environmental Social Impacts on Assets/Operations	711
	Fuel Management	944
	GHG Emissions	803
	Waste and Hazardous Materials Management	475
	Water and Wastewater Management	151
Sustainability Leadership & Governance	Business Ethics and Transparency of Payments	1,687
	Compensation and Benefits	1,112
	Competitive Behavior	3,034
	Regulatory Capture and Political Influence	973
	Systemic Risk Management	486
Business Model & Social Innovation	Lifecycle Impacts of Products and Services	5,192
	Materials Sourcing	424
	Supply Chain Management	555

Table 3: Panel Regressions on Market-Adjusted Returns

Panel A: All Observations

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.000293	-0.000594	0.000500	0.000153	0.002327*
	[-0.188]	[-0.611]	[0.372]	[0.197]	[1.696]
Positive News	0.000421	0.000733**	0.003198***	0.000116	0.000225
	[0.768]	[2.076]	[4.799]	[0.370]	[0.393]
Intercept	0.000308	0.000284***	0.000500***	-0.000119	-0.000110
	[1.615]	[2.926]	[3.537]	[-1.628]	[-0.712]

Panel B: Observations on Material Issues

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	0.002897	-0.000343	-0.001087	0.000249	0.002810
	[1.296]	[-0.236]	[-0.544]	[0.218]	[1.429]
Positive News	0.001646	0.001473**	0.006036***	-0.000062	0.000756
	[1.609]	[2.157]	[4.497]	[-0.107]	[0.810]
Intercept	0.000179	0.000244	0.000752***	-0.000114	-0.000211
	[0.621]	[1.397]	[2.649]	[-0.889]	[-0.852]

Panel C: All Observations, Excluding Those on Material Issues

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.002079	0.000513	0.000561	0.000406	0.001557
	[-1.271]	[0.502]	[0.415]	[0.498]	[0.858]
Positive News	-0.000170	0.000647**	0.000766	0.000216	0.000062
	[-0.289]	[1.981]	[1.616]	[0.645]	[0.096]
Intercept	0.000339	0.000226**	0.000362***	-0.000130	-0.000075
	[1.462]	[2.150]	[2.676]	[-1.472]	[-0.404]

Panels A, B, and C use 111,020, 46,430, and 64,590 observations respectively. Panel A includes all observations with available news data from TruValue Labs (TVL) where the volume of articles is at least three. Panel B includes all observations with available news data from TVL where the volume of articles is at least three and the issue is classified as material for this industry by the Sustainability Accounting Standards Board (SASB). Panel C includes all observations with available news data from TVL where the volume of articles is at least three and the issue is not classified as material for this industry by SASB. The dependent variable is the market-adjusted return over the days relative to the date of the news (i.e., -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted market returns). Positive (negative) news takes the value of one for a firm–date if the news score by TVL is 75 or more (25 or less). All models include industry and date fixed effects. Standard errors are robust to heteroscedasticity and clustered at the firm level. ***, **, * are statistically significant at the 1, 5, and 10% levels, respectively.

Table 4: Panel Regressions with Equal- and Market-Weighted Least Squares Models for Samples with More News Articles

Panel A: Article Volume More than Four

	EW					VW				
	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.001280	-0.003526	-0.006951*	0.000684	0.002381	0.000790	0.000663	-0.002506**	0.001723	0.001578
	[-0.555]	[-1.428]	[-1.651]	[0.469]	[0.784]	[0.375]	[0.613]	[-2.091]	[1.265]	[0.369]
Positive News	0.001449	0.002735*	0.021767***	-0.000362	0.000549	-0.000560	0.001125	0.003179***	0.000391	-0.000217
	[0.564]	[1.651]	[4.044]	[-0.191]	[0.260]	[-0.384]	[1.318]	[3.205]	[0.563]	[-0.136]
Intercept	-0.000056	0.000147	0.000767	-0.000363*	-0.000572	0.000456**	0.000155***	-0.000130	-0.000197**	0.000008
	[-0.119]	[0.522]	[1.279]	[-1.916]	[-1.557]	[2.009]	[2.668]	[-1.560]	[-2.527]	[0.036]

This table uses 17,002 observations, and it includes all observations with available news data from TruValue Labs (TVL) where the volume of articles is at least five and the issue is classified as material for this industry by the Sustainability Accounting Standards Board. The dependent variable is the market-adjusted return over the days relative to the date of the news (i.e., -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted market returns). Positive (negative) news takes the value of one for a firm–date if the news score by TVL is 75 or more (25 or less). EW are ordinary-least-square models where each observation is equal-weighted in the model. VW are ordinary-least-square models where each observation is weighted by its beginning-of-date market capitalization in the model. All models include industry and date fixed effects. Standard errors are robust to heteroscedasticity and clustered at the firm level. ***, **, * are statistically significant at the 1, 5, and 10% levels, respectively.

Panel B: Article Volume More than Six

	EW					VW				
	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.000116	-0.000488	-0.013810	0.001523	0.003655	0.000249	0.000361	-0.004545**	0.003101*	0.003102
	[-0.036]	[-0.169]	[-1.608]	[0.809]	[0.869]	[0.075]	[0.219]	[-2.232]	[1.824]	[0.665]
Positive News	-0.003937	0.003251	0.033925***	-0.000030	-0.004466	-0.000568	0.001425	0.004822**	0.001637	0.000633
	[-1.005]	[0.858]	[2.912]	[-0.013]	[-1.245]	[-0.191]	[1.003]	[2.316]	[1.233]	[0.280]
Intercept	-0.000629	-0.000027	0.001359	-0.000247	-0.000030	0.000684***	0.000161*	0.000059	-0.000051	0.000170
	[-1.221]	[-0.075]	[1.503]	[-0.838]	[-0.063]	[2.977]	[1.950]	[0.486]	[-0.436]	[0.934]

This table uses 8,391 observations and it includes all observations with available news data from TruValue Labs (TVL) where volume of articles is at least seven and the issue is classified as material for this industry by the Sustainability Accounting Standards Board. The dependent variable is market adjusted return over the days relative to the date of the news (i.e. -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted market returns). Positive (negative) news takes the value of one for a firm-date if the news score by TVL is 75 or more (25 or less). EW is ordinary least square models where each observation is equal weighted in the model. VW is ordinary least square models where each observation is weighted by its beginning of date market capitalization in the model. All models include industry and date fixed effects. Standard errors are robust to heteroscedasticity and clustered at the firm level. ***, **, * are statistically significant at the 1, 5, and 10% level respectively.

Table 5: Panel Regressions by Theme

Panel A: Social Capital

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.005369**	-0.002321	-0.010715**	0.000048	0.001873
	[-2.057]	[-1.472]	[-2.558]	[0.047]	[1.087]
Positive News	-0.000501	0.003242**	0.018651***	0.002148*	0.000594
	[-0.269]	[1.987]	[4.118]	[1.807]	[0.379]
Intercept	-0.000799	-0.000414	0.001898*	-0.000480	0.000088
	[-1.483]	[-1.448]	[1.848]	[-1.525]	[0.174]

Panel B: Human Capital

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.001267	0.000001	-0.002164	-0.000536	-0.001298
	[-0.619]	[0.001]	[-1.503]	[-0.416]	[-0.550]
Positive News	-0.001208	0.002524**	-0.000468	0.002349*	0.001233
	[-0.456]	[2.196]	[-0.187]	[1.931]	[0.477]
Intercept	-0.000979	-0.000944***	-0.000662	-0.000248	-0.000900
	[-1.372]	[-2.741]	[-1.352]	[-0.766]	[-1.317]

Panel C: Natural Capital

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	0.000570	-0.000385	-0.005495***	0.000928	-0.004394
	[0.207]	[-0.364]	[-2.715]	[0.811]	[-1.557]
Positive News	0.001885	0.001866**	-0.001607*	-0.000237	0.000896
	[1.422]	[2.087]	[-1.664]	[-0.293]	[0.611]
Intercept	-0.001753**	-0.000320	0.000784	0.000053	0.000618
	[-2.251]	[-0.947]	[1.597]	[0.150]	[0.901]

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Panel D: Sustainability Leadership and Governance

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	0.002114	0.000039	-0.000557	-0.000747	0.000523
	[1.105]	[0.027]	[-0.383]	[-0.809]	[0.299]
Positive News	0.002017	0.002531	0.003185	0.006077	0.002300
	[0.695]	[1.352]	[1.091]	[1.253]	[0.876]
Intercept	-0.001304**	-0.000725**	0.000143	-0.000216	-0.000263
	[-2.065]	[-1.990]	[0.271]	[-0.631]	[-0.568]

Panel E: Business Model and Social Innovation

	MA Return -5, -2	MA Return -1	MA Return 0	MA Return +1	MA Return +2, +5
Negative News	-0.001911	-0.021119	-0.001681	0.001369	-0.001422
	[-0.249]	[-1.601]	[-0.474]	[0.338]	[-0.145]
Positive News	-0.002212	-0.000314	0.003510***	0.000690	-0.001190
	[-1.205]	[-0.271]	[3.179]	[1.098]	[-0.822]
Intercept	0.000965	0.000592*	-0.000493	-0.000314	0.001458**
	[1.163]	[1.778]	[-1.483]	[-1.292]	[2.315]

Panels A-E use 17,176, 6,243, 5,623, 7,292, and 6,171 observations, respectively, and include all observations with available news data from TruValue Labs (TVL) where the volume of articles is at least three. The dependent variable is the market-adjusted return over the days relative to the date of the news (i.e., -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted market returns). Positive (negative) news takes the value of one for a firm–date if the news score by TVL is 75 or more (25 or less). All models include industry and date fixed effects. Standard errors are robust to heteroscedasticity and clustered at the firm level. ***, **, * are statistically significant at the 1, 5, and 10% levels, respectively.

APPENDIX

Table 1: Panel Regressions on Industry Adjusted Returns

Panel A: All Observations

	IA Return -5, -2	IA Return -1	IA Return 0	IA Return +1	IA Return +2, +5
Negative News	-0.000239	-0.000529	0.000645	0.000206	0.002040
	[-0.158]	[-0.545]	[0.490]	[0.275]	[1.547]
Positive News	0.000599	0.001029***	0.003503***	-0.000024	0.000235
	[1.140]	[3.002]	[5.298]	[-0.080]	[0.424]
Intercept	-0.000086	0.000153*	0.000373***	-0.000198***	-0.000445***
	[-0.482]	[1.790]	[3.111]	[-2.899]	[-2.953]

Panel B: Observations on Material Issues

	IA Return -5, -2	IA Return -1	IA Return 0	IA Return +1	IA Return +2, +5
Negative News	0.002960	-0.000234	-0.000961	0.000392	0.002993*
	[1.377]	[-0.160]	[-0.512]	[0.370]	[1.730]
Positive News	0.002321**	0.001890***	0.006650***	-0.000329	0.000734
	[2.390]	[2.881]	[5.015]	[-0.595]	[0.843]
Intercept	-0.000237	0.000098	0.000603***	-0.000195	-0.000530**
	[-0.887]	[0.633]	[2.603]	[-1.591]	[-2.305]

Panel C: All Observations Excluding Those on Material Issues

	IA Return -5, -2	IA Return -1	IA Return 0	IA Return +1	IA Return +2, +5
Negative News	-0.002273	0.000391	0.000537	0.000078	0.000969
	[-1.441]	[0.394]	[0.407]	[0.097]	[0.549]
Positive News	-0.000050	0.000794**	0.000967**	0.000125	-0.000035
	[-0.090]	[2.519]	[2.159]	[0.392]	[-0.056]
Intercept	-0.000070	0.000113	0.000237*	-0.000196**	-0.000407**
	[-0.319]	[1.143]	[1.892]	[-2.414]	[-2.225]

Panels A, B and C use 111,020, 46,430 and 64,590 observations respectively. Panel A includes all observations with available news data from TruValue Labs (TVL) where volume of articles is at least three. Panel B includes all observations with available news data from TVL where volume of articles is at least three and the issue is classified as material for this industry by the Sustainability Accounting Standards Board (SASB). Panel C includes all observations with available news data from TVL where volume of articles is at least three and the issue is not classified as material for this industry by SASB. The dependent variable is industry adjusted return over the days relative to the date of the news (i.e. -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted industry returns). Positive (negative) news takes the value of one for a firm-date if the news score by TVL is 75 or more (25 or less). All models include date fixed effects. Standard errors are robust to heteroscedasticity and clustered at the firm level. ***, **, * are statistically significant at the 1, 5, and 10% level respectively.

Table 2: Panel Regressions with Equal and Market Weighted Least Squares Models for Samples with More News Articles

	EW					VW				
	IA Return -5, -2	IA Return -1	IA Return 0	IA Return +1	IA Return +2, +5	IA Return -5, -2	IA Return -1	IA Return 0	IA Return +1	IA Return +2, +5
Negative News	-0.001518	-0.002937	-0.006737*	0.001076	0.002231	-0.000706	0.000540	-0.001921*	0.001184	0.000807
	[-0.798]	[-1.093]	[-1.659]	[0.817]	[0.905]	[-0.399]	[0.575]	[-1.810]	[1.229]	[0.402]
Positive News	0.002052	0.003455**	0.022496***	-0.000430	0.000278	-0.000019	0.001022*	0.003822***	0.000119	-0.001165
	[0.858]	[2.172]	[4.209]	[-0.233]	[0.136]	[-0.015]	[1.653]	[4.124]	[0.187]	[-0.788]
Intercept	-0.000350	-0.000015	0.000704	-0.000372**	-0.000954***	0.000146	0.000011	-0.000186**	-0.000270**	-0.000354
	[-0.758]	[-0.056]	[1.421]	[-1.990]	[-2.800]	[0.466]	[0.150]	[-1.998]	[-2.433]	[-1.449]

This table uses 17,002 observations and it includes all observations with available news data from TruValue Labs (TVL) where volume of articles is at least five and the issue is classified as material for this industry by the Sustainability Accounting Standards Board. The dependent variable is industry adjusted return over the days relative to the date of the news (i.e. -5, -2 is cumulative firm returns between five and two days before the news minus cumulative value-weighted industry returns). Positive (negative) news takes the value of one for a firm-date if the news score by TVL is 75 or more (25 or less). EW is ordinary least square models where each observation is equal weighted in the model. VW is ordinary least square models where each observation is weighted by its beginning of date market capitalization in the model. All models include date fixed effects. Standard errors are robust to heteroscedasticity and clustered at the firm level. ***, **, * are statistically significant at the 1, 5, and 10% level respectively.

Figure 1 Market Adjusted Stock Price Reactions by TVL Classification

Market-adjusted Stock Price Reactions from Social Capital News