Crowdsourced Employee sentiment and Abnormal Stock Returns

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Abstract

Previous literature has found crowdsourced employee sentiment obtained from Glassdoor.com is related to stock returns. Evidence has shown this data can suffer from some abnormalities which may limit its usefulness. To account for these discrepancies, we utilize textual analysis through the multinominal inverse regression method to create monthly firm specific expected employee sentiment indexes for US public firms from the period 2008-2019. We test the implications of the previous literature to determine if our expected employee sentiment index is related to the cross section of abnormal returns. We find evidence that our expected employee sentiment index is related to the cross section of abnormal returns. Further, we find that employee sentiment as estimated similar to the previous literature is no longer related to stock returns. These result are robust to different specifications.

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1 Introduction

Can non-financial company stakeholders provide valuable information to investors? Employees, with a front row seat to management decisions, company operations and culture, may

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possess information that gives outsiders key insights to company inner workings. Further, employee satisfaction, (i.e. happiness) in may be directly related to company efficiency and thus related to profitability. Online employer review websites (i.e., Indeed.com and Glassdoor.com) offer a forum for current and past employees to "rate" their employer and indicate their satisfaction at work. Employees provide not only overall "star" ratings, similar to other product and service review sites (e.g., Yelp for restaurants, Amazon for products), but also textual comments on company culture, work environment, and overall satisfaction with the company. The intended audience for this information is prospective employees who may use non-monetary benefits (firm culture, or work-life balance) to determine if a particular employer would be a suitable. However, this information may also be of interest to investors, which we discuss below.

Prior research has found a relationship between stock returns and crowd sourced employee sentiment (Green et al. (2019); Huang et al. (2020)). These studies have either obtained employee sentiment from Glassdoor.com or Indeed. Glassdoor.com is a website where current and former employees assign a star rating and provide textual descriptions to rate their employers and work experience. Glassdoor.com asks reviewers to provide information on salary, the corporate culture, work environment, career opportunities, and even future company outlook.

Prior studies generally use the raw employee review scores to investigate associations between employee sentiment and measurable corporate outcomes such as operating efficiency, productivity, and stock returns. However, investigation of the raw data suggests that not all reviews can be interpreted equally. At the start of our data set and when Glassdoor.com was introduced, reviewers were forced to fill out all information requested by the website, including all subcategory reviews and textboxes. In order to improve the user experience and encourage the submission of more reviews, in April 2012 Glassdoor.com changed how reviews were collected such that all information requested by Glassdoor.com was not required to submit a review (i.e. reviewers could leave some categories blank). [1] The change in data collection methodology seems to have influenced reviewer responses. Figure 4 shows the frequency of overall employee sentiment scores over the period 2008-2020. A dotted vertical line represents the 2012 change date. Visual inspection suggests a relative increase (decrease) in the number of "5 star" ("2 star") reviews almost immediately after this date. Further the figure shows that the frequency of "5 star reviews" increased by about 20 % over the last eight years of the sample while "1,2,and 3 star reviews" declined over the same period.

[1] According to discussions with Glassdoor.

This trend, or review drift, could be due to ever increasing employee satisfaction for all firms covered by Glassdoor.com. However, plausible counter explanations are that employees are simply more willing to give 5-star reviews regardless of their true opinion of the company or that firms are incentivizing employees to post positive reviews.[2] It naturally follows that if over time the same employee in the same situation is more likely to give a higher star rating, then bias may exist in estimates of raw employee sentiment. However, while the overall star ratings of each review may be biased, we argue that the words or lexicon employee reviewers have not likely changed. Employee sentiment, therefore, can be observed in an unbiased manner by reading the textual portion of the reviews.

In this study, we utilize employee reviews found on Glassdoor.com to study the relationship between sentiment indicated from employee reviews and monthly abnormal stock returns for public companies in the Russell 3000 over the period 2012-2019. We expand the research by using a supervised machine learning method, Multinominal Inverse Regression (MNIR), developed in Taddy (2013b) to estimate an expected employee sentiment ($E[ES]_c$) score for each firm each month. Using this method, which relies on textual examination of reviews provided, we do not find an upward trend in employee sentiment. This provides evidence that although star based measures of employee sentiment may not be consistent throughout the sample period, the lexicon describing a employee sentiment has not changed.

To determine the relationship between employee sentiment and abnormal stock returns, we first estimate abnormal returns as the difference between excess returns and expected excess returns using a 5-year (60-month) rolling CAPM. We then estimate several models which include either level or change in raw or expected employee sentiment. We find no evidence that the change in raw employee sentiment as utilized by the previous literature is related to abnormal returns, however, we find support that the change in our expected employee sentiment is related to abnormal returns. Further, when we split our sample into deciles by market capitalization we find evidence that the impact of employee sentiment is stronger for smaller firms.

Prior research has investigated relationships between company performance and subcategories of Glassdoor.com reviews. For example, raters can give a star rating in areas such as "Career Opportunities" (CO), "Compensations & Benefits" (CB), and "Culture & Values

[2]Dube and Zhu (2021) notes this is a possibility although possibly having little impact. See also: `https://www.wsj.com/articles/companies-manipulate-glassdoor-by-inflating-rankings-and-pressuring-employees-11548171977`

(CV), to name a few. When we examine these subcategories we find that change in the perception of senior management has the most consistent positive relationship with abnormal returns, and that this relationship is found for the expected employee sentiment score but not the raw score.

Finally, to determine the practicability of our cross section results, we create portfolios by quintiles of employee sentiment. We find that for equally weighted portfolios based on employee sentiment levels, significant risk adjusted returns can be earned. In contrast to Green et al. (2019), we find a U-shaped relationship where lower and higher quintile risk-adjusted returns are positive.

2 Literature Review

Early work in the area of employee satisfaction and firm performance relied on lists of top places to work and found a positive relationship to being included on the list and shareholder returns (Edmans (2011); Faleye and Trahan (2011)). Other research suggests that satisfied employees would be more productive and loyal (Black et al. (2003)). For example, Chen et al. (2016a) find that companies with better treatment arrangements produce more patents and Chen et al. (2016b) find that greater innovative success, as measured by patents, patent citations and R&D spending is higher for firms with employee-friendly workplaces. Evidence using employee satisfaction and corporate performance indicates that more satisfied employees experience positive earnings surprises (Edmans (2011)) and higher ROA and Tobin's Q (Fauver et al. (2018), and Ylinen and Ranta (2021)) when compared to companies with lower employee satisfaction. Further, Huang et al. (2020) use employee outlook from Glassdoor.com and find that it is positively associated with the firm's following two quarters' ROA.

Other evidence indicates that firms with higher employee reviews have performed better during major corporate events. For example, Chemmanur et al. (2019) find that when issuing equity, firms with higher employee reviews enjoy greater abnormal stock returns at the announcement and better long-run post-SEO operating performance. Research on the global financial crisis (GFC) of 2008-2009 provides evidence that during economy-wide shocks firms with higher employee ratings may perform differently. For example, research conducted on firms during the GFC indicates that firms with higher employee ratings experience more inefficient labor investments during the crisis but more efficient investments in the long run Cao and Rees (2020). Further, Chen et al. (2016b) found evidence that employee-friendly

firms achieve greater innovative success and were more likely to sustain R&D investment during the GFC.

Finally, research suggests that firms with more satisfied employees may be less risky. For example, firms with higher employee reviews have lower debt ratios (Bae et al. (2011)) and are less likely to experience bankruptcy (Verwijmeren and Derwall (2010)). Chi and Chen (2021) use Glassdoor.com data and find that employee ratings are negatively correlated with a firm's cost of debt. Bargeron et al. (2015) find that firms considered to be 'great places to work' tend to make smaller acquisitions than their counterparts.

An enormous amount of digitized text affecting business is being generated continuously as people post opinions and often give a 1-5 star rating on everything from toilet paper to kitchen appliances to cars. Researchers have sought to turn these reviews into data to investigate the value of crowdsourced information (Kumar et al. (2021); Humphreys and Wang (2018)). Beyond consumer choice research, corporate finance literature has begun to investigate the relationship between online reviews and corporate performance. For example, (Zhu and Zhang (2010) found a positive relationship between online reviews and revenues and citechevalier2006effect find a positive effect on average review ratings and product sales. Archak et al. (2011) uses textual evaluation of customer product reviews and finds that specific phrases are associated with higher sales rankings for certain products. Further, empirical relationships have been found between investor posts and stock returns (Chen et al. (2014)).

The rest of this paper is organized as the follow. First in Section 3, we will discuss the data and textual analysis method utilized. Second in Section 4, we discuss our empirical methods. Section 5 shows our empirical results and tests of robustness. Section 6 details our portfolio estimations and results. Finally, Section 7 concludes.

3 Data and Textual Analysis

3.1 Glassdoor.com Reviews

We gather employee reviews posted on Glassdoor.com for available Russell 3000 companies over the time period January 2008 to December 2020. We match full reviews with Russell 3000 companies by the unique ticker and\or company name. This results in a sample of 1,922 unique US public companies receiving a total of 2,049,735 ratings over the entire sample.

As of December 2020, when posting a review, reviewers (or posters) needed to include certain information before being allowed to proceed with a more detailed review. To begin, posters were required to give an "Overall Rating" one (worst) out of five (best) stars and a title for the review. Next, they were required to provide "Job Function" and employment status as "Full Time", " Part Time", "Temporary", "Contract", or "Intern". Finally, a description of the "Pros" and "Cons" had to be included with a minimum of five words per category. Beyond required information, posters could have included free text responses including "Job Title", "Advice for Management", and "Length of Employment". Additionally, reviewers could offer ratings out of five stars for the following subcategories: "Career Opportunities" (CO), "Compensations & Benefits" (CB), "Culture & Values (CV), "Diversity & Inclusion"(DI), "Senior Management"(SM), and "Work/Life Balance" (WL). The CV and DI subcategories have not been available for the entire sample period; they were introduced in 2012 and 2020, respectively. Finally, Glassdoor.com offered reviewers the ability to rate certain topics with a "thumbs up or thumbs down". These are "Recommend to a friend","Rate CEO Job Performance", and "6 Month Business Outlook."

The process described above was put into place in April 2012. Prior to this date, those wishing to post a review on Glassdoor.com were required to fill out all information (e.g., all scores for subcategories) and all subcategories (but not the overall rating) ranged from 0.5 stars to 5 stars using half star intervals. Glassdoor.com informed us that these changes where made to improve user experience and decrease "member fatigue" with the ultimate goal of collecting more reviews. We have no reason to believe that the change in collection process would influence the mean value of reviews.
[3]

To examine this raw star data, we plot the frequency of 1 through 5 star reviews over time, shown in Figure 3. Note the vertical dashed line which indicates April, 2012, when Glassdoor.com changed its collection methodology. At this point, there seems to be a jump in the frequency of 5 star reviews and a drop in the frequency of 2-star reviews. Further, over the sample period from April 2012 through 2020, there is a pronounced increase in the frequency of 5-star reviews and a decline in the number of 3, 2, and 1-star reviews. The result of which is an increase in the mean star review rating for a company over time. This upward

[3]If the marginal poster is equally likely to give a review a positive, neutral, or negative review, we should expect there be no change in the mean value of reviews, also noting that the half star interval was never available on the overall star rating. Further if we assume that scaling of the ratings has no impact on the scores, we would expect to see no change in the mean value of reviews.

trend could be due to improvement in employee sentiment, as employers are responding to poor glassdoor reviews and improve working conditions. If this is the case, raw star ratings is an unbiased measure of employee satisfaction.

However, it is possible that the upward trend in mean review scores does not indicate increasing employee satisfaction but that companies have taken an active role in managing their Glassdoor reviews, resulting in biased scores. Evidence that companies are taking an active role in the management of their Glassdoor ratings comes from Glassdoor itself, which offers advice for companies trying to improve their star ratings. For example, Glassdoor suggests that employers can encourage other employees to post when they have negative reviews or even that companies have the option to take legal action to have negative reviews removed.

[4] Other anecdotal evidence suggests that companies have requested that employees give positive reviews Teoh (2018); Dube and Zhu (2021) . [5]

Empirically this presents a problem when using raw scores to examine the relationship between employee sentiment and company performance. However, we believe that while the number of stars that reviewers give has experienced inflation, the lexicon or terms and language used by reviewers to describe a good or bad work environment has not changed much during the time period 2008-2020.

Therefore, to obtain a consistent measure of employee sentiment, we use the textual analysis method, Multinominal Inverse Regression (MNIR), developed by Taddy (2013b). We utilize this method on the text found in "pro" and "con" section of each Glassdoor review to estimate employee sentiment. We describe the use of this estimator in Section 3.4.

3.2 Textual Analysis

3.2.1 Cleaning the messages

To conduct the analysis, we first clean the data to isolate the sentiment from each review. The process is as follows:

- Convert all text to lowercase characters.

[4] See https://help.glassdoor.com/s/article/I-m-an-employer-What-can-I-do-about-negative-reviews-on-Glassdoor?language=en_US

[5] See popular press article: https://www.wsj.com/articles/companies-manipulate-glassdoor-by-inflating-rankings-and-pressuring-employees-11548171977

- Remove all stop words. Stop words are common words that do not directly indicate sentiment including prepositions, articles, pronouns, etc.
- Remove all numbers and punctuation marks.

For example, if the text for a "pro" review is:

> THIS IS THE BEST PLACE TO WORK. I LOVE WORKING FOR THIS COMPANY!

The cleaned "pro" review becomes:

> best place work love working company

3.3 Comparison of Textual Analysis Methods

Prior literature has used two methods for quantifying the underlying tone of the corpus of documents. The first method utilizes a predefined dictionary made up of interchangeable words or phrases, called tokens, for each category. The sentiment of each document is then quantified as a simple count of the tokens. The second method utilizes a supervised machine learning algorithm where a weighted token dictionary is developed using a pre-coded training set of documents.

While the pre-defined dictionary method has been widely used in the literature, (Loughran and McDonald (2011); Chen et al. (2014); Jiang et al. (2019); Tsai et al. (2016); Jeon et al. (2021)), it has shortcomings which make its use impractical in this application. Firstly, as described by Loughran and McDonald (2016), the pre-defined dictionary must fit the document being analyzed. The use of stock pre-defined dictionaries, like the Harvard IV-4 (Harvard) word lists and the Loughran and McDonald (2011) finance specific dictionary (LM) without alteration can lead to incorrect scoring of documents. [6] Loughran and McDonald (2011) shows that the Harvard dictionary performs relatively inaccurately in determining the sentiment from 10-K documents, for example.

Loughran and McDonald (2016) notes while the LM dictionary is widely used in the literature to score texts (e.g., (Chen et al. (2014) in social media, and Tsai et al. (2016); Jeon et al. (2021) in popular press articles)), its use should be reserved for measuring sentiment in

[6]The Harvard IV-4 dictionaries are found `http://www.wjh.harvard.edu/~inquirer/homecat.htm`. The Loughran and McDonald (2011)finance specific dictionary is found `https://sraf.nd.edu/textual-analysis/resources/`

10-K documents only. The pre-defined dictionary is further limited in that definition of each token is assumed to provide the same amount of text information.[7] Moreover, modification of either dictionary to match it with the lexicon of Glassdoor.com posts would result in a significant loss of information and is not practical. Finally, because we wish to generate a comparable metric to mean stars as used by Green et al. (2019), five dictionaries, each matching the one through five stars, is needed. We note that it is impossible to identify unique tokens corresponding to each star categories a priori.

To solve the issues of the pre-defined methodology, textual analysis supervised machine learning algorithms have been developed. Particularly, to identify employee sentiment from Glassdoor.com, we employ the MNIR as developed in Taddy (2013b) and follow the same notation. This methodology is particularly useful because Glassdoor.com users identify and label the tone of each textual post when they provide the corresponding star scores. Posts labeled in this way offer an extremely useful feature when compared to other textual analysis applications where the data is not pre-labeled. In those cases, the researcher must use a training set of data to manually label a few categories and "guess" the intent of the original poster, possibly resulting in biased or arbitrary labels. For our data. valid tokens for each star classification are determined based on the user labeled training set, as discussed in Section 3.5. The MNIR method has been used to quantify text in real estate listing (Nowak and Smith (2017)),political sentiment from social media, Taddy (2013a), and legislator speeches,Gentzkow et al. (2019); Rheault and Cochrane (2020).

3.4 Multinomial Inverse Regression

After cleaning the data, we tokenize the text by unigrams and bigrams from all "pro" and "con" reviews. Following the previous example, Table 1 shows tokenized sample text.

Table 1: Tokenized Example Text

Tokenization	text
Unigram	best, place, work, love, working, company
Bigrams	best.place, place.work, work.love, love.working, working.company

Note: Table 1 provides an example of a tokenized text. Each token is separated by a comma(,).

Tokenization by bigrams is generally considered to be technically superior to tokenization

[7]Loughran and McDonald (2011, 2016) suggests using a token weighting algorithm based on frequency of token in all texts.

by unigrams because unigrams cannot account for the inclusion of negators and intensifiers. [8] Further it is assumed that tokens are exchangeable, which means that token order is not important for estimating sentiment. Therefore, we estimate employee sentiment by bigrams.

Each Glassdoor review can be thought of as a document and the counts of all of unigrams or bigrams can be transformed into a sparse vector:

$$x_i = [x_{1i}, ...x_{pi}]' \tag{1}$$

Where the total number of unique tokens in all Glassdoor reviews are p. In this study, we limit p to the 10,000 most used tokens. For the "Pro textbox," we estimate $\hat{p}$ to be 1716 unique tokens for unigrams and 2906 for bigrams. While for the "Con textbox," we estimate $\hat{p}$ to be 3773 for unigrams and 5168 for bigrams.

Frequency of each token in a given document is defined as:

$$f_i = \frac{x_i}{m_i}; \text{Where} m_i = \sum_{j=1}^{p} xij \tag{2}$$

Each tokenized document counts, x_i, can be thought of being represented by a sentiment variable y_i. In this study, y_i is represented by the number of stars given in any category in each Glassdoor review. We primarily focus on the "Overall Score" in our sentiment estimation, as such y_i is a 1×5 indicator variable. The ordering of class is not necessary but it is useful in our estimation.

Given that each x_i can be represented by y_i, documents can be collapsed by each possible discrete y value (where $y \in \mathcal{Y}$).

$$x_y = \sum_{i:y_i=y} x_i \tag{3}$$

x_y represents the sum of token document counts by each y. In this study, x_y is a $10,000 \times 5$ sparse matrix of the sum of document token counts by each y value.

From this a MNIR model can be constructed as:

[8] A partial solution would be combine negators and proceeding tokens in the cleaning process, and that while unigrams will most likely identify sentiment they fail to correctly account for sentiment intensity.

$$x_y \sim MN(q_y, m_y);\ \text{where } q_{yj} = \frac{exp[\alpha_j + y\varphi]}{\sum_{l=1}^{p} exp[\alpha_l + y\varphi_l]} \qquad (4)$$
$$j = 1, 2, ..., p;\ y_i \in \mathcal{Y}$$

There is a p dimensional multinomial distribution for each element of y. The size of the total token counts for all documents each multinomial distribution is m_y where $m_y = \sum_{i:y_i=y} m_i$. q_{yj} is the probability, conditional on y, of specific token, j, being in x_y.

α_j and φ_j are $y \times 1$ vectors of parameters for each class specific to each token j. Intuitively, α_j can be thought as a frequency parameter for token j. The more frequently that token j occurs, across all elements in y, the larger the estimate of α_j. Where φ_j is a parameter relating to relative frequency for each value in y.

A naïve approach to text sentiment predict would be to simply fit a multinomial logistic regression y conditional on x. As noted in Taddy (2013b), this approach is likely to lead to inefficient estimation and overparameterization, as p would be relatively large. To solve this issue, Taddy (2013b) shows that using a Laplace prior for each φ_j and maximizing the posterior likelihood given the priors leads to sufficient dimension reduction where many elements in $\varphi^{'}$ are equal to zero. Therefore only tokens relevant to predicting each element in y are used in sentiment estimation and the matrix φ is sparse. Further, by fitting the data on frequencies, MNIR can account for differences in document length avoiding incorrect sentiment estimation (Loughran and McDonald (2016)).

Taddy (2013b) shows that through the MNIR procedure, sentiment information for each document is described as a linear combination of $\varphi^{'} f_i$ equal to z_i, a vector of sentiment score for each element of y. In our study, the z represents the category specific sentiment scores for Glassdoor review.

3.5 Sentiment Estimation

With any supervised learning method, like the MNIR, a subset of data is trained (training set) and then used to estimate the entire sample. In other applications, like sentiment estimated from twitter (Taddy (2013a)), posters do not directly give a quantitative score relating

to the text. Under these circumstances, a training set is read manually and categorize by the researcher. Sarcasm in text and human error of the researcher can introduce a bias in sentiment estimated from the manual labeling of the training set.

One of the main advantages of using the data found on Glassdoor is that researchers do not need to manually create the training set and therefore will not introduce human bias or error. In this case, the reviewers themselves train the data by labeling each textual entry with star ratings. This fortunate pre-labeling of reviews has been used in other scenarios. For example, Renault (2017) utilizes a data set of social media posts from Stocktwits where text identified as "Bearish" or "Bullish" by the reviewers themselves is used as the training set.

On the one hand, because all Glassdoor reviews have an associated star rating, textual analysis may not be necessary. However, the interface change introduced by Glassdoor in 2012 makes, at a minimum, the reviews following the change incomparable to the those prior. Further, given the increased focus by firms on Glassdoor reviews (Dube and Zhu (2021)), we argue that raw scores are becoming less comparable (and possibly more biased) overtime. Therefore, we believe that the raw star review scores is an unreliable indicator of true employee sentiment.

To more accurately measure employee sentiment, we utilize a training set of text with associated star scores prior to the 2012 change.[9] This results in a training set of 137,802 reviews.

If star ratings are unbiased, we expect that our sentiment index will not significantly vary from the raw mean star scores. Further, any relationships between financial markets and employee sentiment will be similarly reflected in raw mean star scores and our sentiment index. In generating our own sentiment score, we only assume that the general lexicon used to describe employee sentiment is the same from the 2008-2012 period to 2012-2020 period. This training set is then used to estimate Equation 4.

In calculating our own sentiment score, we first estimate the probability that each textual Glassdoor review belongs to each star category. Then, we sum the estimated probability multiplied by the category score (1-5).

[9]Note we only argue that the training set be limited to a certain period of time. We choose to use the 2012 as a sample split date.

$$E[ES_{tji}] = \sum y_i q_{yj} \tag{5}$$

Each identified firm is assigned a monthly score as the mean of the estimated sentiment measure from all reviews logged that month. We also estimate the monthly change in expected sentiment score by firm, as consistent with Green et al. (2019). [10]

Table 2 shows the largest estimated coefficients from the MNIR procedure for the unigram tokenization and Table 3 show the same for bigram tokenization. Panel A (B) shows the n-grams with the largest coefficients (φ_j) for the positive (negative) class, i.e. the list of pros (cons) from the reviewer. These are presented for the five categories, 1-5 stars.

Figure 4 shows a graph of the mean raw star scores and mean expected star scores across all firms over time. While there is an overall increase in our estimated expected scores over the sample period, it is relatively modest compared to the increase seen in raw mean scores. This suggests that while the lexicon used to describe firms has been more positive over time, the trend is not as strong as we would expect by examining raw scores alone.

3.6 Stock Prices and Returns

Monthly stock returns, R_{it}, obtained from CRSP, are calculated as the holding period return including dividends for firm i at time t. [11] Excess returns, ER_{it}, are then estimated as monthly returns minus the risk free rate, $ER_{it} = R_{it} - R_{ft}$. The risk free rate is proxied by the one month t-bill rate obtained from Kenneth French's website. [12]

We also estimate two measures of abnormal returns: AR, and $AR3F$. We estimate AR as the difference between ER_{it} and the rolling five year (60 month) expected excess returns, $E[ER_{it}]$, which is estimated using the CAPM. All firms with at least one year of available returns are included. Specifically, we estimate the following five year rolling CAPM model for each stock i:

[10] If the previous month does not have any reviews, the change is then considered missing and that observation is dropped.

[11] Observations where the absolute value of monthly returns is greater than 25% were not included in our data set.

[12] See link for data found from Kenneth French's website `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`

$$E[ER_t] = \hat{\alpha_{0,t}} + \hat{\alpha_{1,t}} ER_{mt} \tag{6}$$

AR is estimated as:

$$AR_{it} = ER_{it} - E[ER_{it}] \tag{7}$$

$AR3F$ is estimated as the abnormal returns from the five year rolling Fama-French Model or the difference between ER_t and the expected excess returns from the Fama-French three factor model, $E[ER_{FF,t}]$, for each firm i.

$$E[ER_{FF,t}] = \hat{\alpha_{0,t}} + \hat{\alpha_{1,t}} ER_{mt} + \hat{\alpha_{2,t}} SMB_t + \hat{\alpha_{3,t}} HML_t \tag{8}$$

Included in the model is the Glassdoor average daily rating given on day t, the equally weighted return on the market, and the two Fama-French factors introduced in Eugene and Kenneth (1993), SML and HML Eugene and French (1992).
SMB and HML are the two additional Fama-French factors. SMB represents the excess returns due to size and HML represents the excess return due to book-to-market value. As with $E[ER_{it}]$, we include observations where at least one year of returns available.

$AR3F$ is estimated as:

$$AR3F_{it} = ER_{it} - E[ER_{FF,it}] \tag{9}$$

We merge the expected Glassdoor ratings, with ER and the estimated AR and $AR3F$ using firm tickers. This resulted in a total of 121,087 monthly individual firm observations from 2008-2020.

3.7 Descriptive Statistics

Table 4 shows descriptive statistics for firms in the sample. Panel A shows descriptive statistics for company characteristics including returns measured as monthly Excess Returns (ER), and Abnormal Returns (AR and AR_{3F}). $Size, \$mil$ is monthly market capitalization in millions and $Vol, \$thou$ is the monthly volume of shares traded in thousands.

The mean returns are 0.855% for ER, -0.5% for AR, and -0.05% for $AR3F$. [13] The mean negative values for AR and $AR3F$ indicate lower than expected returns after accounting for

[13]Note we drop observations where excess returns are greater than 25% or less than -25 % in a given month.

market risk and Fama-French Factors. Size, as measured by market capitalization, ranges from $1.9 million to $1.2 trillion with a mean of $16.8 billion.

Panel B shows the descriptive statistics for the Glassdoor reviews for each firm by month.$\#Helpful$ represents the number of (other) Glassdoor users that have labeled the review as "helpful" as of our data collection date. $\#Helpful$ has a mean of 1.5 and can be thought of as second-level labeling, giving a vote of confidence to a specific review.

ES, the raw employee sentiment score, has a mean of 3.242 and standard deviation of 0.913. This mean is higher than the means of expected employee sentiment generated using both the "Pro textbox" ($E[ES]_p$, mean of 3.117), and the "Con textbox"($E[ES]_c$, mean of 3.158). Further, the standard deviations for the expected measures are also lower; 0.275 for $E[ES]_p$ and 0.345 for $E[ES]_c$. This is not surprising given the relative stability of the expected measures over time versus the upward trend in the raw measure (See Figure 4). Note, the Δ prior to a variable name indicates the month to month raw change in the variable. The positive mean of 0.004 for ΔES points to the upward trend in the variable while $\Delta E[ES]_c$ has a smaller mean of 0.001 and $\Delta E[ES]_p$ has a negative mean of -0.004.

In contrast to the raw overall measure, almost all of the means of the excepted subcategories are larger compared to the raw mean subcategories with only expected compensation benefits from the "Pros" textbox ($E[CB]_p$) having a slightly smaller mean. The means in the change in all subcategories are similar to the overall measures, with the raw means being all positive (except for the change in Work Life which is negative), the expected "Pros" being negative, and the expected "Cons" being positive but approximately zero.

In order to understand the relationship between the overall employee sentiment rating and the listed subcategories, we estimate the following equation using ordinary least squares (OLS).

$$ES_{it} = \beta_0 + \beta_1 SM_{it} + \beta_2 CB_{it} + \beta_3 CO_{it} + \beta_4 WL_{it} + \beta_5 ER_{it} + \beta_6 Size_{it} + \mu_{FE} + \epsilon_{it} \quad (10)$$

ES_{it} represents the employee sentiment measure, including the raw and expected measures and their change at time t as a function of all the subcategories: $Senior\ Management$, SM_{it}, $Compensation\ Benefits$, CB_{it}, $Career\ Opportunities$, CO_{it}, and and $Work\ Life$, WL_{it}, for time t. μ_{FE} represents industry fixed effect and u_{it} is the i.i.d. error term.

Results are presented in Table 5. Each column represents Equation 10 estimated for a different employee sentiment measure (raw, expected, levels or change). For each measure, the coefficients for the four subcategories are positive and significant at the 1% level. These results are expected and indicate that higher subcategory scores are assocated with higher overall employee sentiment scores. Interestingly, the coefficients for CB and WL are relatively lower than the other two subcategories (SM and CO) with relatively similar standard errors. This indicates that changes in how employees feel about advancement opportunities (CO) and their feelings regarding senior leadership (SM) are more strongly related to overall employee sentiment.

In the model we also control for two firm characteristics - excess returns (ER) and market capitalization ($Size$). We find evidence that the coefficient of ER is not different from zero, indicating a low likelihood of reverse causality. Higher excess returns does not relate to higher employee sentiment, i.e. firm success does not lead to happier employees.

The coefficient on $Size$ is statistically significant at the 1% level for both ES and $E[ES]_p$, although with opposite signs. The coefficient for the ES model is negative; a one standard deviation increase in market capitalization (46.5 billion) is related to a drop in employee sentiment of 0.02 stars. In contrast, the coefficient of $E[ES]_p$ is positive but economically insignificant with a one standard deviation increase in market capitalization (46.5 billion) related to a 0.0007 increase in expected employee sentiment. Note the standard deviation of expected employee sentiment is approximately one third of raw employee sentiment.

4 Empirical Method

We utilize ordinary least squares to estimate three empirical models for excess returns, abnormal returns, and abnormal returns from the three factor model. Each model is examined utilizing the three measures of employee sentiment levels and the changes in each.

$$ER_{it} = \beta_0 + \beta_1 ER_{mt} + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 ES_{it} + \mu_{FE} + \epsilon_{it} \tag{11}$$

Equation 11 describes the expected returns model, where ER_{it} is the excess return for stock i on month t. This model includes the three market factors: ER_{mt}, SMB_t, and HML_t and one employee sentiment measure (six in total), calculated as a raw score (ES), expected

employee sentiment using the "Pro textbox" - $E[ES]_p$, and expected employee sentiment using the "Con textbox" - $E[ES]_c$, and monthly change at time t for each.

$$AR_{it} = \beta_0 + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 ES_{it} + \mu_{FE} + \epsilon_{it} \tag{12}$$

Equation 12 describes the abnormal returns model, where AR_{it} is the abnormal return for stock i on month t (as estimated by Equation 7)). This model is the same as Equation 12 except that ER_{mt} is not included. [14]

$$ARFF_{it} = \beta_0 + \beta_1 ES_{it} + \mu_{FE} + \epsilon_{it} \tag{13}$$

Equation 13 describes the abnormal returns three factor model, where $ARFF_{it}$ is the abnormal return for stock i on month t (as estimated by Equation 8). Note this model is similar to Equation 12 except that the two Fama-French factors are not included. [15]

In each of these models μ_{FE} represents industry fixed effect and u_{it} is the i.i.d. error term.

5 Results

Results are presented in Table 6. Panel A shows the estimated results from the ER model as estimated from Equation 12. Panel B shows the estimated results from the AR model as estimated from Equation 13. Finally, Panel C shows the estimated results from the $AR3F$ model as estimated from Equation 14. The first three columns show the results estimated with employee sentiment levels: raw - ES, expected employee sentiment using the "Pro textbox" - $E[ES]_p$, and expected employee sentiment using the "Con textbox" - $E[ES]_c$. The last three columns show the results estimated with the change in employee sentiment: ΔES, $\Delta E[ES]_p$, and $\Delta E[ES]_c$. Note each model estimated only has one employee sentiment measure.

Our results indicate that higher employee sentiment (either levels or change) is positively related to abnormal returns. For levels, we find a positive and statistically significant relationship between the coefficients of all employee sentiment measures and expected and abnormal returns. Further all coefficients are significant at the 1% level except for $E[ES]_p$ for the AR model which is significant at the 10 % level and $E[ES]_c$ at the 5 % level for the

[14] Note the impact of ER_{mt} was subtracted out as through the estimation of abnormal returns.

[15] Note the impact of ER_{mt} and the two Fama-French factors are subtracted out through the estimation of abnormal returns three factors.

ER and $AR3F$ models.

For the changes in employee sentiment, we find evidence that our expected employee sentiment measure estimated using the "Pro textbox"($\Delta E[ES]_p$) is related to expected and abnormal return. Specifically, the coefficient of $\Delta E[ES]_p$ is positive and statistically significant for all models at the 1% level. Results for changes in the both raw and "Con textbox" estimated employee sentiment measures are not significant.

Our results indicate that the positive relationship found between change in raw (star-only) employee sentiment and returns in Green et al. (2019) does not hold in this setting. We offer a few possible reasons for this difference. Firstly, we are using a different sample. The Green et al. (2019) sample covers 2008 - 2015 and includes 1,023,217 reviews for 1238 firms. The number of Glassdoor reviews in our sample for that time period is 730,751 for 1843 unique firms. Further, Green et al. (2019) uses quarterly results.

Secondly, the raw measure is potentially biased due to the change in how Glassdoor conducted reviews in 2012 and the upward trend in raw star scores. [16] Thirdly, there may be survivor bias in our data compared to Green et al. (2019). While there is only four years of additional financial data, some firms in the original Green et al. (2019) Glassdoor data set are no longer public. [17] Glassdoor handles mergers by keeping only the reviews of the surviving firm.

Finally, over the sample period, some firms have made an effort to manage their Glassdoor overall star rating. This is through firms incentivizing employees to post positive reviews and, conversely, actively trying to get negative reviews removed. Companies can employ other firms (e.g., `https://removebadreviews.com/`, `https://www.reputationdefender.com/`, etc) which specialize in getting negative reviews removed from review websites. Specifically `https://removebadreviews.com/` promises to get all 1, 2, and 3 star reviews removed.

As a test of robustness, we estimate our model using data from 2008-2015 and find similar results. Specifically, the change in the raw employee sentiment measure is not related to abnormal stock returns over the sample period. Further, the change in estimated expected employee sentiment from the "Pro's textbox" is still related to higher abnormal returns,

[16] Because Green et al. (2019) uses a quarterly Glassdoor sample from 2008-2015 the impact of the biases may have been limited in their study.

[17] This could due to merger, privatization, or delisting due to bankruptcy or failure to meet listing requirements.

although at a 5% level of significance. These results can be found in the online Appendix.

The ability and incentive for firms to get "negative" reviews removed and firms actively encouraging positive reviews may also explain why the change in "Pro's textbox" estimated expected employee sentiment produces significant results while the change in "Con's textbox" measure does not. Because reviews with negative comments are more likely to get removed, remaining negative reviews may not be as informative, particularly if employees are providing valuable information through the textual feedback.

In general, we find that raw (star-only) employee sentiment levels have a stronger association with stock returns than do the changes in these measures. We posit that the culture of organization would not change much in the short run and that employee sentiment is formed over a longer time horizon. For example, the US Bureau of Labor Statistics survey found that the mean tenure at a job in the United States is approximately 4.1 years [18]. Further, low job satisfaction might lead the most qualified employees (holding all else constant) to obtain employment elsewhere. If lower firms are hiring lower quality employees this might cause profits and then returns to be lower compared to their competitors. In addition, prospective employees might care less about how employee sentiment has improved compared to the current conditions on the firm. This would lead to levels being more important for understanding returns compared to levels.

However, in contrast to the above discussion, we note that the level of and change in expected employee sentiment, as measured by textual analysis, is strongly related to abnormal return. It could be argued that our change measure doesn't suffer from the same biases as does the raw measure, and that sentiment as measured by textual analysis does a superior job of measuring employee satisfaction.

5.1 Deciles

In this section we test whether the impact of employee satisfaction is different for firms based on size. Therefore, we split our sample into deciles by size and use OLS to estimate Equation 12-14 including only raw star sentimate and the "Pros" textbox estimated employee sentiment. [19] Results by size deciles can be found in Tables 8-11.

[18] See: https://www.bls.gov/news.release/tenure.nr0.htm

[19] The results from the "Con" textbox is available upon request.

As shown in Table 9 and 10, the relationship between employee sentiment and returns is strongest for firms in the third and fifth deciles. We begin, however, with deciles one and two. For decile one, the raw score is positive and significant at the 10% level for the ER and AR models and at the 5% level for the $ARFF$ model. For decile two, $E[ES]$ is significant for the $AR3F$ model. For the third decile, both the coefficients for $E[ES]$ and $\Delta E[ES]$ are statistically significant and positive at the one percent level for all three models (except for $E[ES]$, at the 5% level for the AR model). In contrast, the coefficient for raw ΔES is significant at the 10% and 5% levels for the AR and $ARFF$ models, respectively. For the fifth decile, the coefficient for $E[ES]$ is positive and significant at the 1% level for all three models. Further, the coefficient for $\Delta E[ES]$ is significant and positive for the ER model at the 10 % level.

The results indicate that the estimated expected employee sentiment measures appear to perform marginally better compared to the raw estimates. These results are consistent with our cross sectional findings and suggest that employee sentiment and stock returns is strongest for smaller vs larger, firms.

Interestingly, we find negative coefficient estimates in some higher deciles. For example, we find negative coefficients for the raw ES for some models in the sixth, ninth and tenth deciles. For the eighth and seventh decile, the coefficient for $E[ES]$ is significant and negative for the AR model at the 5 % significance level. These results may give evidence to the theory presented in Baker and Wurgler (2007). The intuition follows that sentiment impacts asset prices for smaller size/harder to value firms positively and larger firms/bond like stocks negatively during times of high sentiment and vise-versa for periods of lower sentiment. Decile results provide evidence for this although not perfectly. We find contradictory evidence for the tenth decile, where the coefficient for $\Delta E[ES]$ is significant and positive for the ER and $ARF3$ model at the 10% level.

5.2 Subcategories

Employee Sentiment can be thought as a function of several factors relating to work place satisfaction. As noted before, Glassdoor.com allows reviewers to rate employers one to five on a number of subcategories including: $Senior\ Management$, $Compensation\ Benefits$, $Career\ Opportunities$, and $Work\ Life$. [20]

[20] As discussed before in Section 3.1, prior to 2012 providing scores for these subcategories were mandatory for completing the review. Further, subcategories could be given half stars and ranged from 0.5 to 5 stars

A priori, employee sentiment derived from a specific subcategories may have a different relationships with the cross section of returns. For example, opinions on senior management, $Senior Management$, might provide information regarding how rank-and-file employees view decisions made by firm leaders, however, some senior management decisions may be unpopular with employees but best for long-run profitability. Additionally, lower perceived compensation, as measured by $Compensation\ Benefits$, may deter more productive employees from applying but also may decrease operating costs.

To better understand the relationship between employee sentiment from the subcategories, we utilize the MNIR procedure as described in Section 3.4, to obtain expected employee sentiment. We use the same training set, all reviews from the period 2008-2012. Although our identifiers are split into nine half star categories form 0.5 to 5. The MNIR does not only have the same advantage of providing a more comparable score across time, it also allows us to estimate the subcategory scores when the reviewer did not complete the optional Glassdoor section.

We estimate the following models to determine the relationship between the employee sentiment subcategories and returns utilizing OLS.

$$ER_{it} = \beta_0 + \beta_1 ER_{mt} + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 SM_{it} + \beta_5 CB_{it} + \beta_6 CO_{it} + \beta_7 WL_{it} + \mu_{FE} + \epsilon_{it} \tag{14}$$

Equation 14 describes the expected returns model for employee sentiment subcategories. All variables are the same as Equation 12 except where SM, CB, CO, and WL represent the firm specific(i) subcategories at time t.

$$AR_{it} = \beta_0 + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 SM_{it} + \beta_4 CB_{it} + \beta_5 CO_{it} + \beta_6 WL_{it} + \mu_{FE} + \epsilon_{it} \tag{15}$$

Equation 15 describes the abnormal returns model for employee sentiment subcategories. All variables are the same as Equation 12 except where SM, CB, CO, and WL represent the firm specific(i) subcategories at time t.

$$ARFF_{it} = \beta_0 + \beta_1 SM_{it} + \beta_2 CB_{it} + \beta_3 CO_{it} + \beta_4 WL_{it} + \mu_{FE} + \epsilon_{it} \tag{16}$$

Equation 16 describes the abnormal returns three factor model for employee sentiment

subcategories. All variables are the same as Equation 13 except where SM, CB, CO, and WL represent the firm specific(i) subcategories at time t.

For Equation 14-16 SM, CB, CO, and WL are either raw or expected or level or monthly change at time t. In each of these models μ_{FE} represents industry fixed effect and u_{it} is the i.i.d. error term.

5.2.1 Subcategories Results

Table 7 shows the empirical Subcategories results. Each column represents the model estimated using the employee sentiment subcategories using the levels and change in raw, "Pro textbox", and "Con textbox" measures. Panel A shows the results estimated using the ER model from Equation 14. The strongest results are found for both the $E[ES]_p$ and $\Delta E[ES]_p$ subcategory measures. These results are consistent with the overall employee sentiment results where the measure is found to be significant at the 1% level.

For $E[ES]_p$ measures the coefficients for two subcategories, CB and WL, are positive and significant at the 10% level and 5% level respectively. While for the $\Delta E[ES]_p$, the coefficients for the subcategories, SM and CO, are found to be significant at the 5 % level. Although the coefficient for CO is estimated to be negative. This result could thought to be consistent with the results found in DeVaro and Morita (2013) which finds evidence that holding the number of managers constant having more subordinates is associated with higher profitability. While DeVaro and Morita (2013) does find having more subordinates leads to more internal hires, this could still be thought of less advanced as the number of managerial positions are controlled for. So it could be argued that less career advancement opportunities for the rank-and-employees is then associated with more profits. It is important to note unlike DeVaro and Morita (2013) that we are unable to control for employee quality and other employee characteristics (e.g., education and years of experience).

Panel B shows the results estimated using the AR model from Equation 15. Only the ES, $E[ES]_p$, and $\Delta E[ES]_p$ with significant positive coefficients with WL at the 1% level for ES and $E[ES]_p$ and SM at the 5% level for $\Delta E[ES]_p$.

Finally, Panel C shows the results estimated using the $AR3F$ model from Equation 16. Similar to the AR model very few coefficients are found to significant. Particularly only the $\Delta E[ES]_p$ measure has a coefficient, SM, that is positive and significant at 5% level.

The results from the subcategories are limited compared to the overall employee senti-

ment results. Broadly only coefficients on the WL and SM subcategories are significant across the three estimated models. This suggests that employees with a more favorable view of their work life balance may be more creative, productive, or efficient, and thus able to drive higher returns. Further, employee opinions regarding senior management may provide information about future profitability.

6 Employee Satisfaction Portfolios

6.1 Portfolio Methods

Following the literature (Green et al. (2019); Sheng (2019), we determine if information from our employee satisfaction measure would be useful investment strategy. As such we create monthly portfolios based on both levels of and the change in expected employee satisfaction based on the "Pro" textbox.[21]. For comparison with Green et al. (2019), we also estimate portfolios based on the change in raw mean employee satisfaction scores.

We utilize the following portfolio creation procedure. For each month, we sort our sample into quintiles based on levels or change of expected employee satisfaction scores. Firms with less than two reviews in the previous month are removed. [22] For each quintile, equally weighted and value weighted portfolios are created and returns are tracked for the proceeding month. Portfolios with less than five stocks are not estimated. [23] Portfolios are then re-balanced in the proceeding month. Following this procedure we obtain ten portfolios (five equally weighted and five value weighted) created for each employee satisfaction measure (levels and changes for raw mean and expected employee satisfaction measure).

To empirically test the validity of each portfolio, we estimate the following models:

$$ER_t = \alpha + \epsilon_t \tag{17}$$

In Equation 17, ER_t refers to the excess returns, measured as the returns from the portfolio

[21]Results utlizing expected employee satisfaction estimated from the "Con" textbox are similar and available upon request

[22]We follow a similar similar screen as Green et al. (2019) which limits each portfolio to only stocks with at least 10 reviews in a quarter and Sheng (2019) which limits each portfolio to firms with at least nine reviews over the sample period 2008 - 2018. Alternative screens were employed and results were relatively similar. Results can be provided upon request.

[23]Due to limited number of reviews for firms in the beginning of the sample, the first three months in 2008 are missing.

minus the risk free rate, from the individual portfolio. α is the mean return of the portfolio.

$$ER_{it} = \alpha + \beta_1 ER_{mt} + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_{it} \tag{18}$$

In Equation 17 is the Fama-French 3 Factor model. ER_t refers to the excess returns, measured as the returns from the portfolio minus the risk free rate, from the individual portfolio. ER_{mt}, SMB, and HML are the three Fama-French Factors. α represents the risk adjusted mean excess return.

Equations 17 and 18 are estimated for each portfolio utilizing OLS and Newey-West standard errors with three lags.

6.2 Portfolio Results

Tables 13 - 16 shows the empirical portfolio results. In all of these tables, Panel A shows the results from the Excess Returns model, Equation 17 and Panel B shows the results from the 3 Factor Fama-French model, Equation 18.

Table 13 shows the equally weighted portfolio results for the levels of raw mean employee satisfaction and expected employee satisfaction estimated using the "Pro" textbox. As shown in Panel A, the mean excess returns for all portfolios are positive and significant at the 5% level. Results are relative similar across all portfolios. This result is consistent with the equally weighted change in employee satisfaction portfolios, found in 15 Panel A, where excess returns are all statistically different from zero and similar and positive.

Once accounting for the Fama-French factors, as shown by the results in Table 13 Panel B, the portfolios sorted by the levels of expected employee satisfaction performs slightly better where four out of the five portfolio have significant risk adjusted returns at the 5% level. This is compared to the raw mean employee satisfaction portfolios where only three portfolios have significant risked adjusted returns. The results from the equally weighted change in employee satisfaction portfolios, found in Table 15 Panel B, are relatively similar. The change in expected employee satisfaction portfolios perform slightly better than the change in the raw mean employee satisfaction portfolios. Where four out of the five portfolios having risk adjusted excess returns being significantly different from zero compared to three for the change in the raw mean employee satisfaction portfolios.

The value weighted portfolio results, found in Table 14 and 16, differ from the equally weighted portfolios. No portfolio is able to produce a significant risk adjusted excess returns.

Unlike the results found in Green et al. (2019); Sheng (2019), there is not a noticeable increase in portfolio returns with an increase in quintile. The results found here are relatively flat or high lower and upper quintiles and lower middle three quintiles. The difference in results could be due to a number of reasons - different sample period, frequency, and data sets [24] with Green et al. (2019) or different metric being studied with Sheng (2019).

7 Conclusion

In this paper we investigate the relationship between employee sentiment and stock returns. Similar to other research using employee satisfaction and stock returns, (Green et al. (2019); Edmans (2011)) we find a positive and significant relationship between employee satisfaction and stock returns. This work builds upon recent research that investigates whether crowd sourced information is related to stock returns (Green et al. (2019); Sheng (2019)). Further, our results support research by Green et al. (2019) which finds that data from Glassdoor, which relies on crowdsourced employee reviews, contains valuable information for investors.

We expand this research by using machine learning to decode textual reviews from posters and generate an estimated sentiment score. When results from the estimated sentiment score generated using textual analysis are compared to results relying on star ratings alone, we find that this measure has an even stronger relationship with abnormal stock returns. This relationship holds across market models and implies that there is more information offered in the textual reviews of employees versus using a limited methodology of simply 'counting stars'.

This measure is necessitated by the idea that textual review contains superior information and the fact that Glassdoor has changed its data collection processes. Prior to 2012, the company allowed for fractional star ratings in review subcategories such as career opportunities, compensation and benefits, culture and values, etc. Although there is no a priori reason to believe that this change in collection methodology would change the company's overall star ratings, a graph of ratings overtime shows a jump in overall start ratings at the collection change. Further, the trend in star ratings has increased overtime.

[24] Reviews have been deleted since their sample was taken in 2016, either through mergers, users deleting reviews, or other reasons. Due to this unless the data set from Green et al. (2019) was obtained there study or any study going forward is not replicable.

Reading textual reviews for employee sentiment eliminates possible biases in star ratings and star trends over time. Our results support the idea that there is more information in textual reviews versus stars only. In short, investors using stars only to glean information about the prospects of a company are leaving information on the table.

Future research in this area includes analysis of portfolios based on employee sentiment. Other areas of employee satisfaction and company productivity, as measured by company safety, patent generation, and costs of equity and debt would be areas that lend itself to the textual analysis procedure outlined here.

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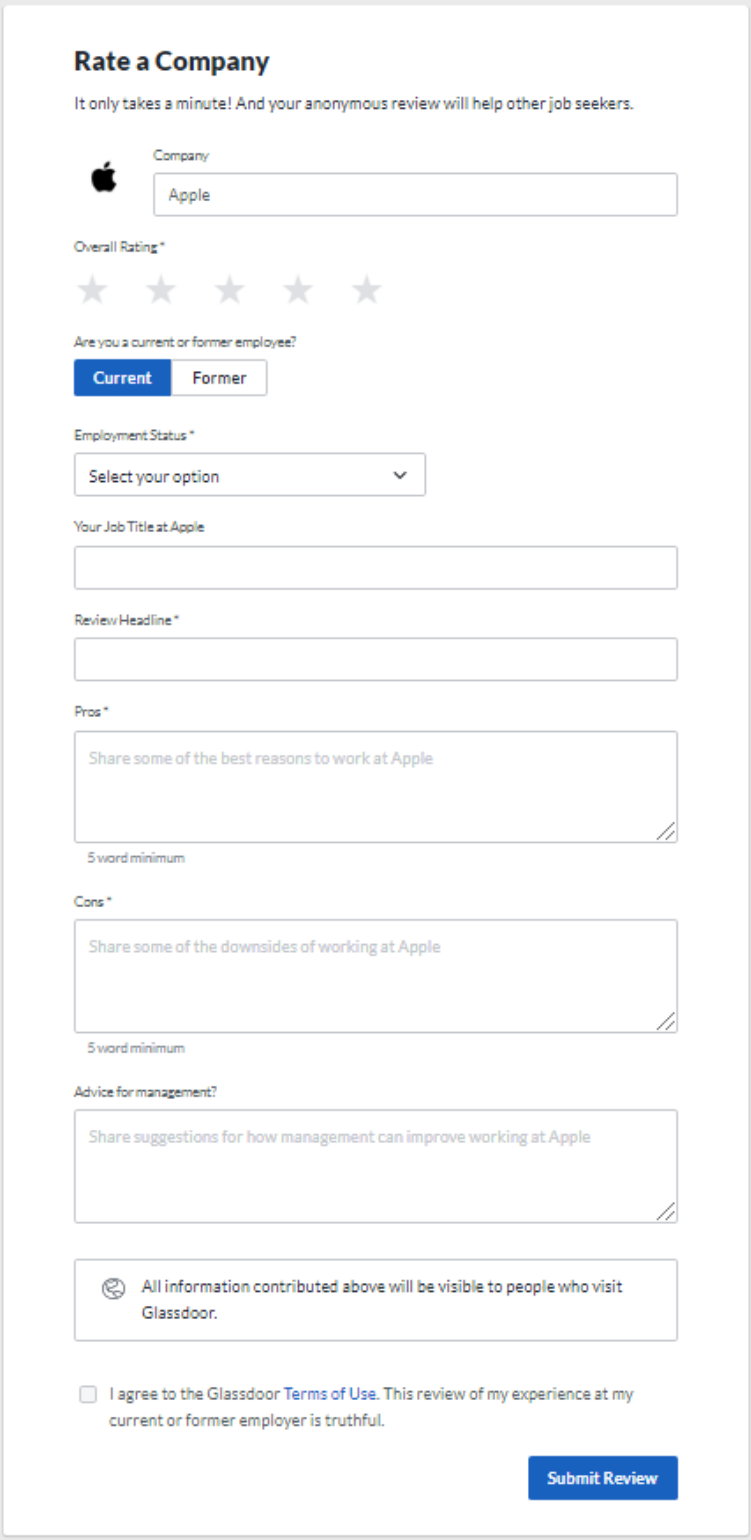
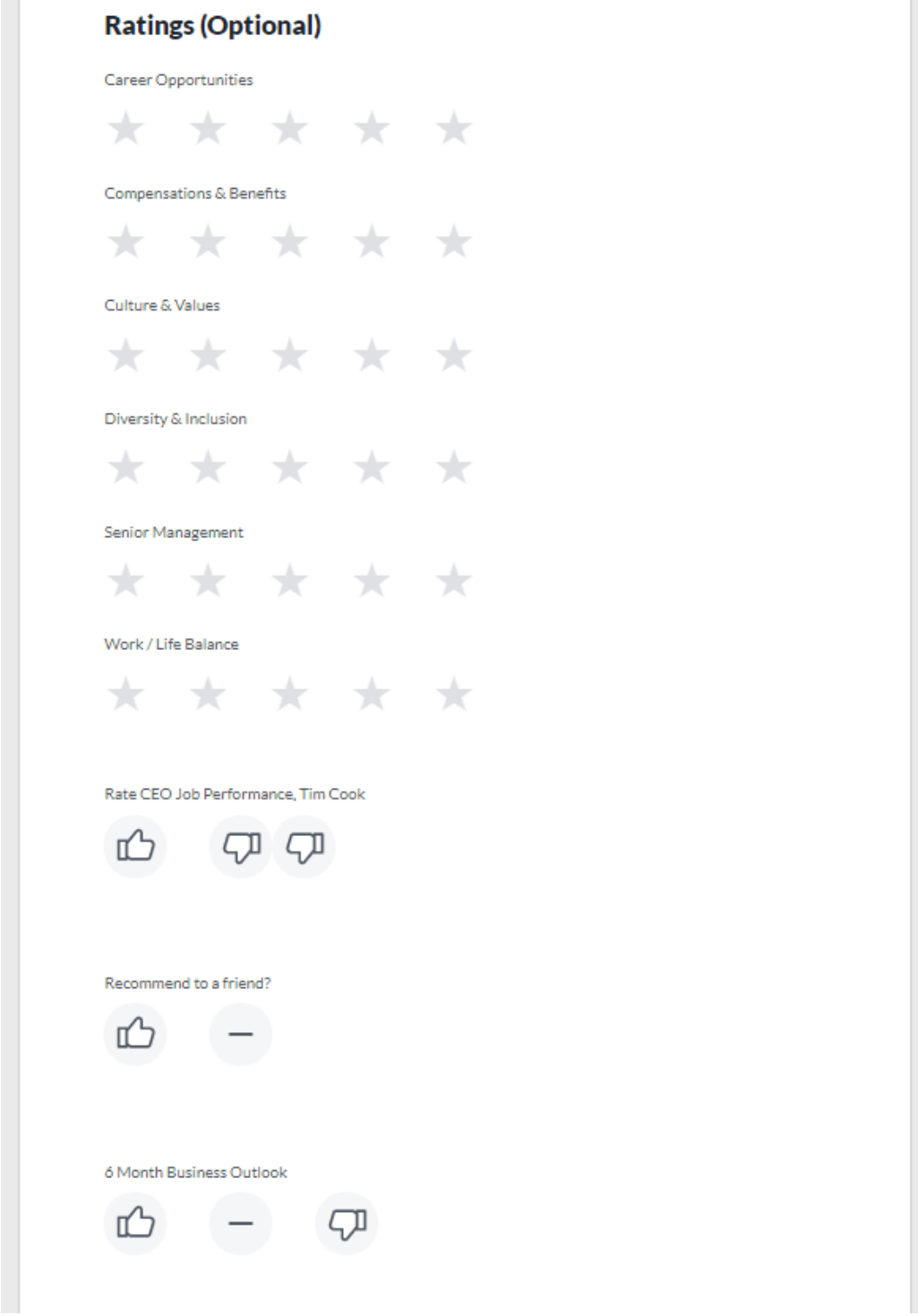
Figure 1: Example -Mandatory Glassdoor Review Submission



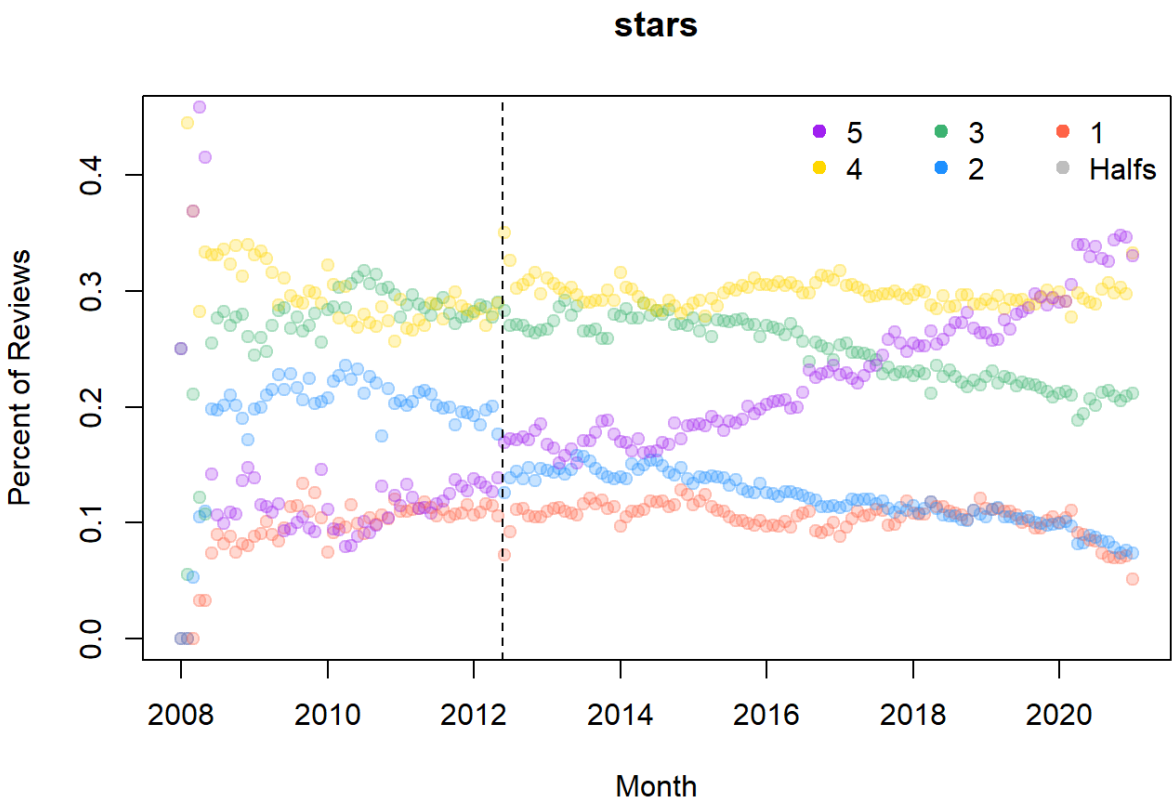
Note: Figure 1 shows an example of the mandatory review submission page on Glassdoor. Mandatory components are denoted by *. Overall rating is shown by stars, one through five. The drop down menu for Employment Status includes "Full-Time, Part-Time, Contract, Internship, Freelance." The "Pros" and "Cons" textbox require at least five words to complete. Note these textboxes are prohibited to contain exactly the same text. Community submission rules are omitted for brevity.

Figure 2: Example -Optional Glassdoor Review Submission



Note: Figure 1 shows an example of the optional review submission page on Glassdoor. This includes all subcategories ranging from one to five stars. "Rate CEO job performances" has three choices positive, neutral, and negative shown by thumbs symbol. "Recommend for a friend" has two choices yes and no. Finally, "sixth month outlook" has three choices positive, neutral, and negative shown by thumbs symbol. Community submission rules are omitted for brevity.

Figure 3: Frequency of Raw Employee Sentiment Scores (2008-2020)



Note: Figure 3 shows the monthly frequency of reviews by each category (i.e., $\star - \star\star\star\star\star$ labeled $1 - 5$) over the sample period 2008 - 2020. A vertical bar is provided in April 2012 to denote the change in the Glassdoor review procedure. Prior to April 2012, reviewers were required to fill out all subcategories and text boxes to post a valid review. While after only Overall stars and some text boxes needed to filled out.

Table 2: Top 10 Unigrams

Panel A: Pro Textbox - Largest Coefficient				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
jacksonville	culture	accomodation	superstar	bla
injured	rewarded	shall	workgreat	catalyst
cybersecurity	grow	taxi	integrations	warmth
dogfriendly	growth	luxurious	sprints	brew
molina	communication	penalty	aiming	medallia
forecast	cares	quantitative	relevance	arista
cricket	internship	threats	ordering	icing
racial	atmosphere	cherish	athlete	rave
meh	feedback	july	optics	solves
defines	attitudes	mi	wamu	tournament
Panel B: Pro Textbox - Smallest Coefficient				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
culture	culture	paycheck	ok	bla
ll	rewarded	cares	paycheck	catalyst
opportunities	grow	intern	trenches	warmth
balance	growth	only	theory	brew
growth	communication	honestly	unfortunately	medallia
communication	atmosphere	everyone	okay	arista
enviroment	internship	pass	some	icing
interns	cares	engagement	facebook	rave
environment	feedback	ncr	parking	solves
advancement	advancement	participation	incompetent	tournament
Panel C: Con Textbox - Largest Coefficient				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
sykes	scandal	mattered	maturing	cras
coty	monroe	supplemental	diversified	ijp
crude	brake	plano	pharmaceutical	idk
learnings	vet	stuffy	slight	paycom
nationality	systematically	handcuffs	constraint	progressed
favoritisms	misaligned	printer	faint	rightfully
therapy	oldest	intensely	physicians	installations
therapist	ping	gratis	slowmoving	callouts
brothers	reigns	kt	outings	linear
vto	patch	rut	discretionary	phenomenal
Panel D: Con Textbox - Smallest Coefficients				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
elephant	sometimes	faint	unethical	poor
boast	bit	cons	horrible	joke
sometimes	conns	con	unprofessional	horrible
pipe	downside	humanity	terrible	compensations
rvp	downsides	suspicion	toxic	management
academy	somewhat	dirt	no	terrible
logged	mac	dysfunctional	backstabbing	respect
hawk	rapid	promises	treated	favoritism
asms	differentiate	downsides	respect	morale
untrue	misuse	unethical	joke	behemoth

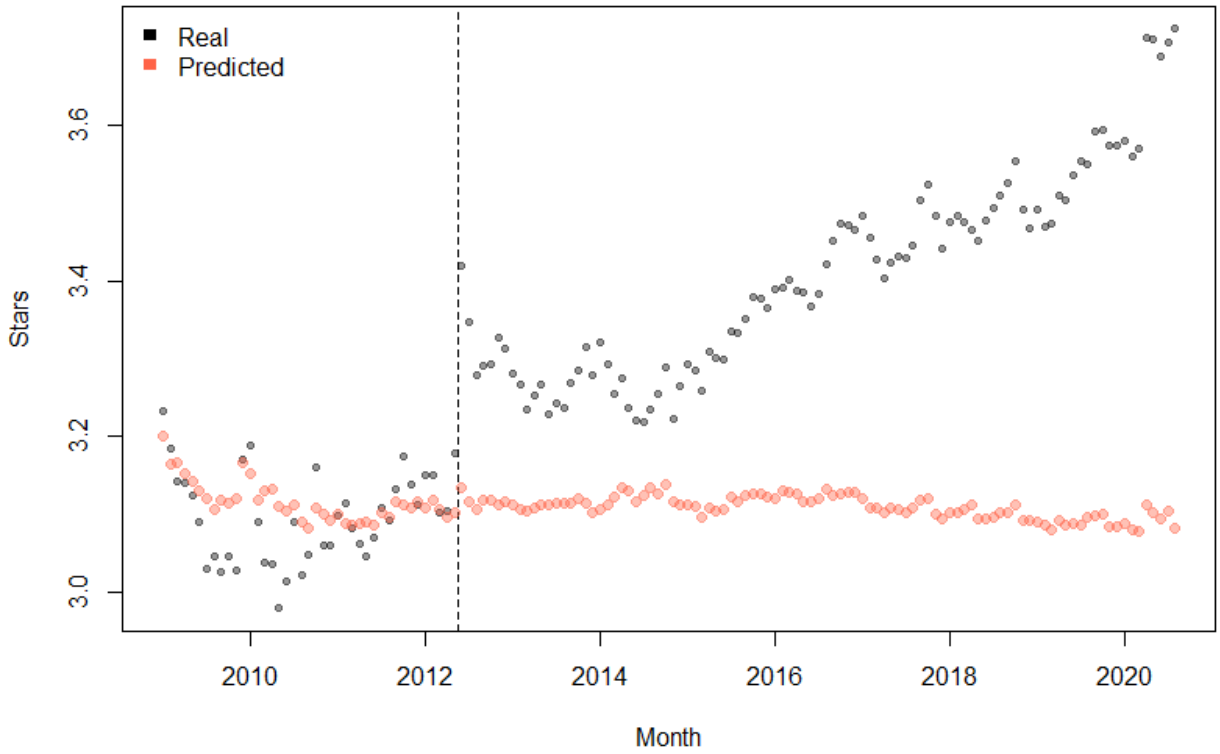
Note: Table 2 shows the unigram tokens with the ten largest and most negative frequency coefficient for each overall star categories (i.e.$\star - \star\star\star\star\star$) and textbox estimated using the MNIR procedure. Panel A and B detail the results from the"Pro" textbox. While Panel C and D detail the results from the "Con" textbox. Panel A and C show the unigram tokens with the largest coefficients. Panel B and D shows the unigram tokens with the most negative (smallest) coefficients. Coefficients and a list of all estimates can be provided upon request.

Table 3: Top 10 Bigrams

Panel A: Pro Textbox - Largest Coefficient				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
the residents	overtime opportunities	meet cool	great internship	looks employees
no pros	training staff	it ok	like culture	awesome environment
there none	keep head	going environment	as intern	love culture
good leave	easy place	ok place	tons opportunity	great collaborative
hours okay	there still	bad place	always ready	very employee
unlimited pto	loved job	from home	opportunities expand	amazing leadership
there pros	due high	company start	people environment	focus employees
nothing good	i suppose	good start	great communication	fun workplace
at first	timing good	certain departments	employees career	focus people
worst company	stay away	decent work	happy working	very understanding
Panel A: Pro Textbox - Smallest Coefficient				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
great culture	great culture	values employees	its job	met amazing
worklife balance	great atmosphere	great leadership	much else	decent benefits
friendly environment	treats employees	great internal	nothing else	used great
career opportunities	growth opportunities	i love	decent discount	good resume
good management	strong leadership	cares employees	good reasons	bad place
opportunity advancement	the opportunities	great culture	pay check	some managers
company culture	great management	best company	good resume	generally nice
growth opportunities	as intern	i can	used good	some good
many opportunities	good management	feel appreciated	pay ok	good place
great atmosphere	career growth	works together	can think	stepping stone
Panel A: Con Textbox - Largest Coefficient				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
horrible culture	no help	much scope	nothing now	none come
awful management	pay training	work and	working night	i cons
they lie	lack teamwork	direction changes	always clear	none cons
management lies	mental health	much competition	level pay	none great
many list	management puts	short breaks	may difficult	no negative
worked paid	never anything	hour i	can tricky	nothing specific
no future	no work	management lot	dont see	no downsides
set fail	anything get	not lot	can wear	there cons
first month	negative culture	much politics	hard progress	nothing great
poor treatment	company poor	very slow	faint heart	balance better
Panel A: Con Textbox - Smallest Coefficients				
⋆	⋆⋆	⋆⋆⋆	⋆⋆⋆⋆	⋆⋆⋆⋆⋆
large corporation	can bit	can think	poor employee	poor management
someone new	sometimes difficult	unprofessional management	terrible management	poor leadership
lot customers	can sometimes	everything else	no career	incompetent management
can difficult	can difficult	downside i	no proper	low morale
large company	can slow	management incompetent	many list	lack leadership
big company	can stressful	i ever	no worklife	very political
can sometimes	large company	many downsides	poor management	poor communication
like it	little low	like dirt	bad management	poor compensation
retail hours	at times	treated like	no recognition	care employees
can stressful	stressful times	respect employees	management joke	lack respect

Note: Table 3 shows the bigram tokens with the ten largest and most negative frequency coefficient for each overall star categories (i.e.$\star - \star\star\star\star\star$) and textbox estimated using the MNIR procedure. Panel A and B detail the results from the"Pro" textbox. While Panel C and D detail the results from the "Con" textbox. Panel A and C show the bigram tokens with the largest coefficients. Panel B and D shows the unigram tokens with the most negative (smallest) coefficients. Coefficients and a list of all estimates can be provided upon request.

Figure 4: Expected Employee Sentiment and Raw Employee Sentiment (2008-2020)



Note: Figure 4 shows the mean monthly overall star ratings and the mean estimated monthly overall star ratings using the MNIR method. A vertical dotted line is shown to denote both the end of the training sample and the change in the Glassdoor review procedure.

Table 4: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Panel A: Firm Characteristics					
ER	121,087	0.855	8.428	−25.000	24.999
AR	121,087	−0.499	7.418	−44.471	48.253
AR_{3F}	121,087	−0.047	7.229	−47.871	42.715
$Size, \$mil$	121,087	16,841	46,520	1.9	1,187,463
$Vol, \$thou$	121,087	617	2,292	0.000	190,032
Panel B: Glassdoor Reviews					
$\#Helpful$	121,085	1.520	2.406	0.000	90.455
ES	121,087	3.242	0.913	1.000	5.000
$E[ES]_p$	121,087	3.117	0.275	1.069	4.919
$E[ES]_c$	121,087	3.158	0.345	1.027	4.782
ΔES	119,372	0.004	1.133	−4.000	4.000
$\Delta E[ES]_p$	119,372	−0.001	0.347	−2.440	2.326
$\Delta E[ES]_c$	119,372	0.001	0.445	−2.860	2.770
$Senior\ Management$	73,669	2.862	1.094	1.000	5.000
$Compensation\ Benefits$	75,317	3.295	0.920	1.000	5.000
$Career\ Opportunities$	75,309	2.970	0.998	1.000	5.000
$Work\ Life$	75,556	3.284	1.028	1.000	5.000
$E[Senior\ Management]_p$	121,087	2.929	0.248	1.349	4.873
$E[Compensation\ Benefits]_p$	121,087	3.292	0.198	1.011	4.539
$E[Career\ Opportunities]_p$	121,087	3.002	0.229	1.119	4.836
$E[Work\ Life]_p$	121,087	3.440	0.228	1.056	4.908
$E[Senior\ Management]_c$	121,087	2.968	0.335	1.033	4.199
$E[Compensation\ Benefits]_c$	121,087	3.337	0.193	1.346	4.256
$E[Career\ Opportunities]_c$	121,087	3.056	0.273	1.100	4.260
$E[Work\ Life]_c$	121,087	3.481	0.238	1.148	4.424
$\Delta Senior\ Management$	57,006	0.003	1.439	−4.000	4.000
$\Delta Compensation\ Benefits$	58,746	0.002	1.160	−4.000	4.000
$\Delta Career\ Opportunities$	58,744	0.005	1.333	−4.000	4.000
$\Delta Work\ Life$	59,013	−0.003	1.339	−4.000	4.000
$\Delta E[Senior\ Management]_p$	119,372	−0.001	0.315	−2.543	2.406
$\Delta E[Compensation\ Benefits]_p$	119,372	−0.001	0.244	−2.509	1.535
$\Delta E[Career\ Opportunities]_p$	119,372	−0.001	0.293	−2.316	2.093
$\Delta E[Work\ Life]_p$	119,372	−0.001	0.285	−2.902	2.045
$\Delta E[Senior\ Management]_c$	119,372	0.002	0.434	−2.435	2.561
$\Delta E[Compensation\ Benefits]_c$	119,372	0.001	0.246	−1.985	2.061
$\Delta E[Career\ Opportunities]_c$	119,372	0.001	0.355	−2.415	2.368
$\Delta E[Work\ Life]_c$	119,372	0.000	0.306	−2.619	2.629

Note: Table 4 shows the monthly descriptive statistics for Firms including Excess Returns (ER), Abnormal Returns (AR), Abnormal Returns 3 Factor Model (AR_{3F}) found in Panel A and the raw and expected ES measures and the four associated subcategories found in Panel B. Summary statistics include the mean, standard deviation, minimum and maximum.The ES estimates range from one to five stars. Expected ES estimated using the "Pros" textbox are denoted by the subscript p. While expected ES estimated using the "Cons" textbox are denoted by the subscript c. Data ranges from 2008 to 2020.

Table 5

	Dependent variable:					
	ES	E[ES]p	E[ES]c	dES	dE[ES]p	dE[ES]c
	(1)	(2)	(3)	(4)	(5)	(6)
Senior Management	0.383***	0.592***	0.475***	0.373***	0.580***	0.469***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.002)
Compensation Benefits	0.151***	0.135***	0.163***	0.144***	0.135***	0.161***
	(0.003)	(0.001)	(0.002)	(0.004)	(0.001)	(0.002)
Career Opportunities	0.330***	0.294***	0.397***	0.329***	0.301***	0.401***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)
Work Life	0.177***	0.238***	0.269***	0.185***	0.241***	0.264***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
ER	0.000	−0.0000	−0.000	0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size, $*bil*	−0.450***	0.014***	0.001	−0.032	0.0002	0.001
	(0.047)	(0.002)	(0.002)	(0.067)	(0.002)	(0.003)
Constant	0.025**	−0.759***	−0.945***	0.001	0.0001	−0.00004
	(0.011)	(0.005)	(0.007)	(0.012)	(0.001)	(0.001)
N	71775	121087	121087	54874	119372	119372
R2	0.783	0.963	0.962	0.751	0.956	0.955

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: Empirical Results: Employee Satisfaction and Returns

Panel A: Excess Returns (ER)						
SMB	0.450***	0.449***	0.450***	0.448***	0.448***	0.448***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
HML	0.137***	0.137***	0.137***	0.135***	0.135***	0.135***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
R_{mkt}	0.904***	0.905***	0.904***	0.907***	0.907***	0.907***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ES	0.097***					
	(0.025)					
$E[ES]_p$		0.365***				
		(0.082)				
$E[ES]_c$			0.160**			
			(0.066)			
ΔES				0.023		
				(0.020)		
$\Delta E[ES]_p$					0.171***	
					(0.065)	
$\Delta E[ES]_c$						0.048
						(0.051)
N	121,087	121,087	121,087	119,372	119,372	119,372
R^2	0.227	0.227	0.227	0.225	0.225	0.225
Panel B: Abnormal Returns (AR)						
SMB	0.312***	0.312***	0.312***	0.309***	0.309***	0.309***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
HML	0.073***	0.073***	0.073***	0.076***	0.076***	0.076***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
ES	0.066***					
	(0.025)					
$E[ES]_p$		0.145*				
		(0.083)				
$E[ES]_c$			0.174***			
			(0.066)			
ΔES				0.029		
				(0.020)		
$\Delta E[ES]_p$					0.194***	
					(0.065)	
$\Delta E[ES]_c$						0.053
						(0.051)
N	121,087	121,087	121,087	119,372	119,372	119,372
R^2	0.012	0.012	0.012	0.012	0.012	0.012
Panel C: Abnormal Returns 3 Factor($AR3F$)						
ES	0.099***					
	(0.024)					
$E[ES]_p$		0.345***				
		(0.081)				
$E[ES]_c$			0.162**			
			(0.065)			
ΔES				0.028		
				(0.020)		
$\Delta E[ES]_p$					0.198***	
					(0.064)	
$\Delta E[ES]_c$						0.053
						(0.050)
N	121,087	121,087	121,087	119,372	119,372	119,372
R^2	0.002	0.002	0.002	0.002	0.002	0.002

Table 6 shows the empirical results of the models with using the monthly level and change in employee sentiment estimated from the "Cons" textbox. The first columns represents the independent variables in each estimated model. These include the three Fama-French factors, R_{mkt}, SMB, HML, and the monthly level or change in the employee sentiment measures. The second through fifth columns show the estimated cross sectional results for the excess returns model. The sixth through ninth columns show the estimated cross sectional results for the Abnormal Returns model. The final four columns show the estimated cross sectional results for the Abnormal Returns 3 Factor Fama-French Model. ES represents the raw mean overall star score by firm by month and ΔES represents the month to month change in ES. Note results for ES and ΔES are repeated from Table **??** for direct comparison. $E[ES]_c$ represents the expected mean overall star score by firm by month estimated using the "Cons" textbox and $\Delta E[ES]_c$ represents the month to month change in $E[ES]_c$. Alpha results are omitted for brevity. All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 7: Empirical Results: Employee Satisfaction Subcategories and Returns

			Panel A:			
	ES	$E[ES]_p$	$E[ES]_c$	ΔES	$\Delta E[ES]_p$	$\Delta E[ES]_c$
Senior Management	0.034	0.395	0.270	−0.017	0.453**	−0.066
	(0.042)	(0.269)	(0.187)	(0.034)	(0.198)	(0.137)
Compensation Benefits	0.018	0.291**	0.171	0.022	0.176	0.148
	(0.041)	(0.140)	(0.172)	(0.035)	(0.108)	(0.130)
Career Opportunities	−0.009	−0.374	−0.191	−0.007	−0.396**	−0.041
	(0.044)	(0.264)	(0.230)	(0.036)	(0.192)	(0.167)
Work Life	0.062*	0.297*	−0.030	0.054*	0.044	0.154
	(0.037)	(0.167)	(0.164)	(0.031)	(0.125)	(0.125)
N	71775	121087	121087	54874	119372	119372
R2	0.243	0.227	0.227	0.257	0.225	0.225
			Panel B:			
	ES	$E[ES]_p$	$E[ES]_c$	ΔES	$\Delta E[ES]_p$	$\Delta E[ES]_c$
Senior Management	−0.043	−0.010	−0.057	−0.005	0.413**	−0.032
	(0.042)	(0.273)	(0.188)	(0.035)	(0.201)	(0.138)
Compensation Benefits	0.044	0.073	0.142	0.034	0.103	0.117
	(0.041)	(0.140)	(0.172)	(0.035)	(0.108)	(0.130)
Career Opportunities	−0.027	−0.351	0.032	−0.012	−0.299	−0.018
	(0.044)	(0.267)	(0.230)	(0.036)	(0.195)	(0.167)
Work Life	0.118***	0.582***	0.247	0.045	0.065	0.105
	(0.037)	(0.168)	(0.164)	(0.032)	(0.127)	(0.126)
N	71775	121087	121087	54874	119372	119372
R2	0.013	0.012	0.012	0.013	0.012	0.012
			Panel C:			
	ES	$E[ES]_p$	$E[ES]_c$	ΔES	$\Delta E[ES]_p$	$\Delta E[ES]_c$
Senior Management	0.066	0.404	0.355*	−0.017	0.408**	−0.158
	(0.042)	(0.266)	(0.186)	(0.034)	(0.195)	(0.136)
Compensation Benefits	−0.019	0.199	−0.105	0.029	0.103	0.062
	(0.040)	(0.136)	(0.169)	(0.034)	(0.105)	(0.127)
Career Opportunities	0.018	−0.186	−0.077	0.008	−0.303	0.087
	(0.043)	(0.260)	(0.227)	(0.035)	(0.188)	(0.164)
Work Life	0.032	0.107	−0.116	0.036	0.075	0.212*
	(0.037)	(0.163)	(0.161)	(0.031)	(0.124)	(0.124)
N	71,775	121,087	54,874	119,372	121,087	119,372
R^2	0.003	0.002	0.002	0.003	0.002	0.002

Note: Table 7 shows the empirical results for the Abnormal Returns 3 Factor model for each subcategories of employee satisfaction. Results for the Excess Returns and Abnormal Returns models are omitted for brevity. Results are available upon request. The first columns represents the independent variables in each estimated model. Each result column represents the different method each subcategory is estimated by. The second column shows the results by the raw subcategories (ES). The third column shows the results by the expected subcategories estimated by using the "Pros" textbox ($E[ES]_p$). The fourth column shows the results by the expected subcategories estimated by using the "Cons" textbox ($E[ES]_c$). The fifth column shows the results by the change in raw subcategories (ΔES). The sixth column shows the results by the change expected subcategories estimated by using the "Pros" textbox ($\Delta E[ES]_p$). The seventh column shows the results by the change in expected subcategories estimated by using the "Cons" textbox ($\Delta E[ES]_c$). All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 8: Empirical Results: Employee Satisfaction and Returns (Decile 1 & 2)

	Panel A: Decile 1											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	0.144*				0.139*				0.163**			
	(0.079)				(0.080)				(0.081)			
$E[ES]$		0.262				0.301				0.177		
		(0.257)				(0.263)				(0.265)		
ΔES			0.095				0.097				0.108*	
			(0.062)				(0.063)				(0.063)	
$\Delta E[ES]$				0.235				0.290				0.257
				(0.200)				(0.206)				(0.207)
N	11,383	11,383	10,927	10,927	11,383	11,383	10,927	10,927	11,383	11,383	10,927	10,927
R^2	0.16	0.16	0.157	0.157	0.028	0.028	0.028	0.028	0.005	0.005	0.005	0.005
	Panel A: Decile 2											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	−0.036				0.005				0.024			
	(0.071)				(0.073)				(0.072)			
$E[ES]$		0.321				0.241				0.541**		
		(0.233)				(0.240)				(0.234)		
ΔES			−0.058				−0.018				−0.056	
			(0.055)				(0.056)				(0.055)	
$\Delta E[ES]$				0.060				0.233				0.166
				(0.183)				(0.190)				(0.184)
N	11,819	11,819	11,491	11,491	11,819	11,819	11,491	11,491	11,819	11,819	11,491	11,491
R^2	0.211	0.212	0.21	0.21	0.037	0.037	0.038	0.038	0.008	0.008	0.008	0.008

Note: Table 8 shows the empirical results of the models with using the monthly level and change in employee sentiment estimated from the "Pros" textbox for the first and second decile by size. Note the decile results by size for ES estimated using the "Cons" textbox are omitted for brevity. These results can be provide upon request. The first columns represents the independent variables in each estimated model. These include the three Fama-French factors, R_{mkt}, SMB, HML, and the monthly level or change in the employee sentiment measures. The second through fifth columns show the estimated cross sectional results for the excess returns model. The sixth through ninth columns show the estimated cross sectional results for the Abnormal Returns model. The final four columns show the estimated cross sectional results for the Abnormal Returns 3 Factor Fama-French Model. ES represents the raw mean overall star score by firm by month and ΔES represents the month to month change in ES. $E[ES]_p$ represents the expected mean overall star score by firm by month estimated using the "Pros" textbox and $\Delta E[ES]_p$ represents the month to month change in $E[ES]_p$. All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 9: Empirical Results: Employee Satisfaction and Returns (Decile 3 & 4)

	Panel A: Decile 3											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	0.034				0.092				0.099			
	(0.070)				(0.071)				(0.069)			
$E[ES]$		0.615***				0.492**				0.760***		
		(0.234)				(0.237)				(0.230)		
ΔES			0.082				0.103*				0.116**	
			(0.055)				(0.055)				(0.054)	
$\Delta E[ES]$				0.717***				0.742***				0.832***
				(0.180)				(0.182)				(0.176)
N	12,007	12,007	11,768	11,768	12,007	12,007	11,768	11,768	12,007	12,007	11,768	11,768
R^2	0.238	0.238	0.234	0.234	0.037	0.038	0.037	0.038	0.006	0.007	0.007	0.008
	Panel B: Decile 4											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	0.058				0.069				0.095			
	(0.071)				(0.071)				(0.070)			
$E[ES]$		0.117				0.041				0.096		
		(0.227)				(0.230)				(0.230)		
ΔES			0.025				0.032				0.040	
			(0.055)				(0.054)				(0.053)	
$\Delta E[ES]$				0.108				0.116				0.066
				(0.176)				(0.177)				(0.174)
N	12,157	12,157	11,964	11,964	12,157	12,157	11,964	11,964	12,157	12,157	11,964	11,964
R^2	0.24	0.24	0.237	0.237	0.026	0.026	0.026	0.026	0.007	0.006	0.006	0.006

Note: Table 9 shows the empirical results of the models with using the monthly level and change in employee sentiment estimated from the "Pros" textbox for the third and fourth decile by size. Note the decile results by size for ES estimated using the "Cons" textbox are omitted for brevity. These results can be provide upon request. The first columns represents the independent variables in each estimated model. These include the three Fama-French factors, R_{mkt}, SMB, HML, and the monthly level or change in the employee sentiment measures. The second through fifth columns show the estimated cross sectional results for the excess returns model. The sixth through ninth columns show the estimated cross sectional results for the Abnormal Returns model. The final four columns show the estimated cross sectional results for the Abnormal Returns 3 Factor Fama-French Model. ES represents the raw mean overall star score by firm by month and ΔES represents the month to month change in ES. $E[ES]_p$ represents the expected mean overall star score by firm by month estimated using the "Pros" textbox and $\Delta E[ES]_p$ represents the month to month change in $E[ES]_p$. All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 10: Empirical Results: Employee Satisfaction and Returns (Decile 5)

	Panel A: Decile 5											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	0.105				0.112				0.110			
	(0.072)				(0.072)				(0.070)			
$E[ES]$		0.765***				0.488**				0.614***		
		(0.240)				(0.239)				(0.230)		
ΔES			0.053				0.044				0.012	
			(0.056)				(0.056)				(0.055)	
$\Delta E[ES]$				0.345*				0.271				0.239
				(0.184)				(0.186)				(0.181)
N	12,165	12,165	12,025	12,025	12,165	12,165	12,025	12,025	12,165	12,165	12,025	12,025
R^2	0.259	0.259	0.258	0.258	0.024	0.024	0.023	0.023	0.006	0.006	0.005	0.006
	Panel B: Decile 6											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	−0.136*				−0.154**				−0.108			
	(0.071)				(0.070)				(0.069)			
$E[ES]$		−0.156				−0.309				−0.042		
		(0.239)				(0.236)				(0.236)		
ΔES			−0.075				−0.067				−0.032	
			(0.056)				(0.056)				(0.054)	
$\Delta E[ES]$				−0.191				−0.129				−0.029
				(0.183)				(0.182)				(0.180)
N	12,213	12,213	12,117	12,117	12,213	12,213	12,117	12,117	12,213	12,213	12,117	12,117
R^2	0.266	0.266	0.264	0.264	0.016	0.016	0.016	0.016	0.005	0.004	0.005	0.005

Note: Table 10 shows the empirical results of the models with using the monthly level and change in employee sentiment estimated from the "Pros" textbox for the fifth decile by size. Note the decile results by size for ES estimated using the "Cons" textbox are omitted for brevity. These results can be provide upon request. The first columns represents the independent variables in each estimated model. These include the three Fama-French factors, R_{mkt}, SMB, HML, and the monthly level or change in the employee sentiment measures. The second through fifth columns show the estimated cross sectional results for the excess returns model. The sixth through ninth columns show the estimated cross sectional results for the Abnormal Returns model. The final four columns show the estimated cross sectional results for the Abnormal Returns 3 Factor Fama-French Model. ES represents the raw mean overall star score by firm by month and ΔES represents the month to month change in ES. $E[ES]_p$ represents the expected mean overall star score by firm by month estimated using the "Pros" textbox and $\Delta E[ES]_p$ represents the month to month change in $E[ES]_p$. All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 11: Empirical Results: Employee Satisfaction and Returns (Decile 7)

	Panel A: Decile 7											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	−0.058				−0.102				−0.056			
	(0.074)				(0.073)				(0.072)			
$E[ES]$		−0.117				−0.517**				−0.164		
		(0.250)				(0.247)				(0.240)		
ΔES			−0.005				−0.002				0.006	
			(0.058)				(0.057)				(0.056)	
$\Delta E[ES]$				−0.194				−0.222				−0.146
				(0.188)				(0.185)				(0.182)
N	12,275	12,275	12,194	12,194	12,275	12,275	12,194	12,194	12,275	12,275	12,194	12,194
R^2	0.279	0.279	0.276	0.276	0.011	0.012	0.011	0.012	0.007	0.007	0.007	0.007
	Panel B: Decile 8											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	0.097				0.029				0.026			
	(0.079)				(0.077)				(0.076)			
$E[ES]$		−0.155				−0.582**				−0.341		
		(0.265)				(0.257)				(0.252)		
ΔES			0.083				0.051				0.047	
			(0.063)				(0.061)				(0.060)	
$\Delta E[ES]$				−0.087				−0.133				−0.176
				(0.208)				(0.199)				(0.195)
N	12,309	12,309	12,236	12,236	12,309	12,309	12,236	12,236	12,309	12,309	12,236	12,236
R^2	0.267	0.267	0.266	0.266	0.002	0.003	0.002	0.002	0.006	0.006	0.006	0.006

Note: Table 11 shows the empirical results of the models with using the monthly level and change in employee sentiment estimated from the "Pros" textbox for the seventh decile by size. Note the decile results by size for ES estimated using the "Cons" textbox are omitted for brevity. These results can be provide upon request. The first columns represents the independent variables in each estimated model. These include the three Fama-French factors, R_{mkt}, SMB, HML, and the monthly level or change in the employee sentiment measures. The second through fifth columns show the estimated cross sectional results for the excess returns model. The sixth through ninth columns show the estimated cross sectional results for the Abnormal Returns model. The final four columns show the estimated cross sectional results for the Abnormal Returns 3 Factor Fama-French Model. ES represents the raw mean overall star score by firm by month and ΔES represents the month to month change in ES. $E[ES]_p$ represents the expected mean overall star score by firm by month estimated using the "Pros" textbox and $\Delta E[ES]_p$ represents the month to month change in $E[ES]_p$. All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 12: Empirical Results: Employee Satisfaction and Returns (Decile 9)

	Panel A: Decile 9											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	−0.067				−0.188**				−0.089			
	(0.086)				(0.082)				(0.081)			
$E[ES]$		0.029				−0.415				−0.044		
		(0.281)				(0.269)				(0.259)		
ΔES			−0.050				−0.075				−0.046	
			(0.071)				(0.067)				(0.066)	
$\Delta E[ES]$				0.022				−0.028				0.088
				(0.227)				(0.216)				(0.210)
N	12,359	12,359	12,290	12,290	12,359	12,359	12,290	12,290	12,359	12,359	12,290	12,290
R^2	0.267	0.267	0.265	0.265	0.005	0.005	0.005	0.004	0.007	0.007	0.007	0.007
	Panel B: Decile 10											
	Expected Returns				Abnormal Returns				Abnormal Returns 3 Factor			
ES	0.003				−0.186*				−0.057			
	(0.102)				(0.100)				(0.097)			
$E[ES]$		0.474				−0.409				0.290		
		(0.381)				(0.373)				(0.359)		
ΔES			0.063				0.019				0.032	
			(0.100)				(0.099)				(0.096)	
$\Delta E[ES]$				0.581*				0.489				0.501*
				(0.319)				(0.312)				(0.297)
N	12,400	12,400	12,360	12,360	12,400	12,400	12,360	12,360	12,400	12,400	12,360	12,360
R^2	0.296	0.296	0.295	0.295	0.006	0.006	0.006	0.006	0.004	0.004	0.004	0.004

Note: Table 12 shows the empirical results of the models with using the monthly level and change in employee sentiment estimated from the "Pros" textbox for the ninth decile by size. Note the decile results by size for ES estimated using the "Cons" textbox are omitted for brevity. These results can be provide upon request. The first columns represents the independent variables in each estimated model. These include the three Fama-French factors, R_{mkt}, SMB, HML, and the monthly level or change in the employee sentiment measures. The second through fifth columns show the estimated cross sectional results for the excess returns model. The sixth through ninth columns show the estimated cross sectional results for the Abnormal Returns model. The final four columns show the estimated cross sectional results for the Abnormal Returns 3 Factor Fama-French Model. ES represents the raw mean overall star score by firm by month and ΔES represents the month to month change in ES. $E[ES]_p$ represents the expected mean overall star score by firm by month estimated using the "Pros" textbox and $\Delta E[ES]_p$ represents the month to month change in $E[ES]_p$. All coefficients are estimated using OLS. Standard errors, shown in parenthesis, are clustered by the Fama-French 30 industries. Industry fixed effects are also used. *p<0.1; **p<0.05; ***p<0.01. Data ranges from 2008 to 2020.

Table 13: Portfolio Results: Employee Sentiment - Equally Weighted

	Panel A: Portfolio Excess Returns									
	ES_1	ES_2	ES_3	ES_4	ES_5	$E[ES]_1$	$E[ES]_2$	$E[ES]_3$	$E[ES]_4$	$E[ES]_5$
Alpha	1.189**	1.213**	1.082**	1.263***	1.300**	1.371**	1.119**	1.203**	1.069**	1.294**
	(0.561)	(0.506)	(0.521)	(0.467)	(0.522)	(0.547)	(0.483)	(0.496)	(0.521)	(0.527)
	Panel B: Portfolio Abnormal Returns 3 Factor									
	ES_1	ES_2	ES_3	ES_4	ES_5	$E[ES]_1$	$E[ES]_2$	$E[ES]_3$	$E[ES]_4$	$E[ES]_5$
R_{mkt}	1.157***	1.109***	1.109***	1.070***	1.086***	1.086***	1.081***	1.100***	1.140***	1.113***
	(0.042)	(0.034)	(0.028)	(0.032)	(0.030)	(0.037)	(0.031)	(0.024)	(0.038)	(0.032)
SMB	0.705***	0.529***	0.442***	0.372***	0.609***	0.800***	0.438***	0.426***	0.442***	0.558***
	(0.062)	(0.074)	(0.051)	(0.040)	(0.049)	(0.085)	(0.052)	(0.057)	(0.052)	(0.048)
HML	0.270***	0.295***	0.215***	0.124***	0.178***	0.333***	0.242***	0.244***	0.172***	0.090**
	(0.051)	(0.053)	(0.053)	(0.034)	(0.048)	(0.067)	(0.038)	(0.057)	(0.039)	(0.044)
Alpha	0.199	0.266*	0.144	0.347***	0.290***	0.373***	0.195**	0.279**	0.097	0.320***
	(0.145)	(0.147)	(0.103)	(0.111)	(0.088)	(0.139)	(0.089)	(0.123)	(0.109)	(0.111)
N	139	139	139	139	139	139	139	139	139	139
$Size, \$mil$ (mean)	5,384	12,457	24,357	32,802	25,837	6,573	15,451	28,976	32,045	15,561
$Vol, \$thou$ (mean)	300	730	889	1,071	597	350	738	1,057	961	483
ES (mean)	2.148	2.872	3.337	3.721	4.358	2.564	3.028	3.310	3.547	3.916
$E[ES]$ (mean)	2.926	3.037	3.108	3.195	3.337	2.808	2.991	3.100	3.215	3.462
$\#Reviews$ (mean)	6.644	15.195	29.214	23.307	11.474	8.692	21.840	29.215	18.472	8.515

Note: Table 13 results for the equally weighted portfolios developed by Quintile of levels of employee satisfaction. Results for portfolios sorted by raw mean employee satisfaction is denoted by ES, the second through sixth column. Results of the portfolios sorted by estimated expected employee satisfaction is denoted by $E[ES]$, the seventh through eleventh column. Specific quintiles are labeled by the subscript 1 through 5. Panel A shows the portfolio results for Excess Returns. Panel B shows the portfolio results for three factor (R_{mkt}, SMB and HML) Fama-French Model. Below the Panel B, shows the mean characteristics of the observations making up each portfolio. This includes Market Capitalization ($Size$ (mil))), Volume ($Vol, \$thou$), and employee satisfaction score. All coefficients are estimated using OLS. Newey-West standard errors with three lags are shown in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 14: Portfolio Results: Employee Sentiment - Value Weighted

	$ES_1$1	ES_2	ES_3	ES_4	ES_5	$E[ES]_1$	$E[ES]_2$	$E[ES]_3$	$E[ES]_4$	$E[ES]_5$
Panel A: Portfolio Excess Returns										
Alpha	0.699	0.924**	0.789*	0.972**	0.883**	0.920**	0.726**	0.993**	0.887**	0.773*
	(0.463)	(0.364)	(0.406)	(0.409)	(0.401)	(0.389)	(0.354)	(0.433)	(0.408)	(0.414)
Panel B: Portfolio Abnormal Returns 3 Factor										
	ES_1	ES_2	ES_3	ES_4	ES_5	$E[ES]_1$	$E[ES]_2$	$E[ES]_3$	$E[ES]_4$	$E[ES]_5$
R_{mkt}	1.032***	0.935***	0.976***	1.012***	1.006***	0.914***	0.900***	1.017***	1.017***	1.015***
	(0.036)	(0.035)	(0.034)	(0.031)	(0.026)	(0.025)	(0.029)	(0.043)	(0.024)	(0.037)
SMB	0.242***	0.026	−0.046	−0.196***	−0.105	0.238***	−0.074	−0.065	−0.178***	−0.067
	(0.069)	(0.049)	(0.044)	(0.036)	(0.064)	(0.046)	(0.054)	(0.046)	(0.044)	(0.065)
HML	−0.003	0.093*	0.172**	0.063**	−0.163***	0.021	0.060	0.225***	0.015	−0.162***
	(0.069)	(0.055)	(0.066)	(0.032)	(0.045)	(0.032)	(0.056)	(0.053)	(0.040)	(0.060)
Alpha	−0.198	0.138	−0.006	0.139	−0.059	0.068	−0.026	0.175	0.039	−0.113
	(0.141)	(0.120)	(0.119)	(0.093)	(0.110)	(0.100)	(0.109)	(0.110)	(0.091)	(0.123)
N	139	139	139	139	139	139	139	139	139	139
$Size, \$mil$ (mean)	5,384	12,457	24,357	32,802	25,837	6,573	15,451	28,976	32,045	15,561
$Vol, \$thou$ (mean)	300	730	889	1,071	597	350	738	1,057	961	483
ES (mean)	2.148	2.872	3.337	3.721	4.358	2.564	3.028	3.310	3.547	3.916
$E[ES]$ (mean)	2.926	3.037	3.108	3.195	3.337	2.808	2.991	3.100	3.215	3.462
$\#Reviews$ (mean)	6.644	15.195	29.214	23.307	11.474	8.692	21.840	29.215	18.472	8.515

Note: Table 14 results for the value weighted portfolios developed by quintiles of levels of employee satisfaction. Results for portfolios sorted by raw mean employee satisfaction is denoted by ES, the second through sixth column. Results of the portfolios sorted by estimated expected employee satisfaction is denoted by $E[ES]$, the seventh through eleventh column. Specific quintiles are labeled by the subscript 1 through 5. Panel A shows the portfolio results for Excess Returns. Panel B shows the portfolio results for three factor (R_{mkt}, SMB and HML) Fama-French Model. Below the Panel B, shows the mean characteristics of the observations making up each portfolio. This includes Market Capitalization ($Size$ (mil))), Volume ($Vol, \$thou$), and employee satisfaction score. All coefficients are estimated using OLS. Newey-West standard errors with three lags are shown in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 15: Portfolio Results: Change in Employee Sentiment - Equally Weighted

	ΔES_1	ΔES_2	ΔES_3	ΔES_4	ΔES_5	$\Delta E[ES]_1$	$\Delta E[ES]_2$	$\Delta E[ES]_3$	$\Delta E[ES]_4$	$\Delta E[ES]_5$
Panel A: Portfolio Excess Returns:										
Alpha	1.359***	1.073**	1.333**	1.304***	1.244**	1.369**	1.113**	1.331**	1.192**	1.327**
	(0.506)	(0.509)	(0.513)	(0.481)	(0.559)	(0.528)	(0.466)	(0.520)	(0.531)	(0.529)
Panel B: Portfolio Abnormal Returns 3 Factor										
	$\Delta ES1$	$\Delta ES2$	$\Delta ES3$	$\Delta ES4$	$\Delta ES5$	$\Delta E[ES]_1$	$\Delta E[ES]_2$	$\Delta E[ES]_3$	$\Delta E[ES]_4$	$\Delta E[ES]_5$
R_{mkt}	1.075***	1.124***	1.073***	1.077***	1.141***	1.099***	1.041***	1.085***	1.147***	1.112***
	(0.023)	(0.039)	(0.033)	(0.027)	(0.043)	(0.032)	(0.023)	(0.036)	(0.037)	(0.035)
SMB	0.679***	0.386***	0.451***	0.497***	0.668***	0.680***	0.512***	0.401***	0.441***	0.654***
	(0.060)	(0.057)	(0.059)	(0.038)	(0.058)	(0.052)	(0.052)	(0.088)	(0.053)	(0.051)
HML	0.229***	0.273***	0.242***	0.166***	0.162**	0.224***	0.194***	0.290***	0.175***	0.187***
	(0.042)	(0.062)	(0.049)	(0.033)	(0.068)	(0.037)	(0.045)	(0.070)	(0.034)	(0.065)
Alpha	0.362***	0.136	0.357**	0.309***	0.177	0.349***	0.224**	0.355**	0.138	0.291**
	(0.106)	(0.107)	(0.137)	(0.094)	(0.131)	(0.092)	(0.086)	(0.165)	(0.119)	(0.124)
N	138	138	138	138	138	138	138	138	138	138
$Size, \$mil$ (mean)	7,513	20,872	42,054	20,174	7,627	8,263	20,075	40,698	19,373	8,393
$Vol, \$thou$ (mean)	357	815	1,237	802	357	390	791	1,243	737	398
ΔES (mean)	−1.398	−0.408	0.007	0.425	1.442	−0.684	−0.199	−0.006	0.199	0.727
$\Delta E[ES]$ (mean)	−0.212	−0.062	−0.002	0.062	0.225	−0.419	−0.124	−0.0001	0.124	0.416
$\#Reviews$ (mean)	4.836	16.544	44.159	16.003	5.213	5.149	15.433	42.765	15.151	5.657

Note: Table 15 results for the equal weighted portfolios developed by quintiles of the change of employee satisfaction. Results for portfolios sorted by raw mean change in employee satisfaction is denoted by ΔES, the second through sixth column. Results of the portfolios sorted by estimated expected employee satisfaction is denoted by $\Delta E[ES]$, the seventh through eleventh column. Specific quintiles are labeled by the subscript 1 through 5. Panel A shows the portfolio results for Excess Returns. Panel B shows the portfolio results for three factor (R_{mkt}, SMB and HML) Fama-French Model. Below the Panel B, shows the mean characteristics of the observations making up each portfolio. This includes Market Capitalization ($Size$ (mil))), Volume ($Vol, \$thou$), and employee satisfaction score. All coefficients are estimated using OLS. Newey-West standard errors with three lags are shown in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 16: Portfolio Results: The Change in Employee Sentiment - Value Weighted

	Panel A: Portfolio Excess Returns									
	ΔES_1	ΔES_2	ΔES_3	ΔES_4	ΔES_5	$\Delta E[ES]_1$	$\Delta E[ES]_2$	$\Delta E[ES]_3$	$\Delta E[ES]_4$	$\Delta E[ES]_5$
Alpha	0.988**	0.931**	0.977**	0.927**	0.753*	1.044***	0.811**	1.036**	1.005**	0.835**
	(0.423)	(0.389)	(0.393)	(0.389)	(0.407)	(0.397)	(0.369)	(0.407)	(0.427)	(0.386)
	Panel B: Portfolio Abnormal Returns 3 Factor									
	ΔES_1	ΔES_2	ΔES_3	ΔES_4	ΔES_5	$\Delta E[ES]_1$	$\Delta E[ES]_2$	$\Delta E[ES]_3$	$\Delta E[ES]_4$	$\Delta E[ES]_5$
R_{mkt}	0.973***	0.955***	0.975***	1.006***	0.981***	0.975***	0.931***	0.969***	1.055***	0.960***
	(0.036)	(0.044)	(0.020)	(0.024)	(0.029)	(0.034)	(0.027)	(0.037)	(0.030)	(0.030)
SMB	0.202**	−0.060	−0.180***	−0.006	0.091	0.154**	−0.077*	−0.142**	−0.118***	0.155**
	(0.079)	(0.040)	(0.034)	(0.043)	(0.073)	(0.061)	(0.045)	(0.057)	(0.043)	(0.068)
HML	−0.005	0.164**	0.055	0.029	0.036	0.004	0.072*	0.157**	0.037	−0.025
	(0.074)	(0.075)	(0.035)	(0.047)	(0.061)	(0.053)	(0.041)	(0.073)	(0.035)	(0.054)
Alpha	0.080	0.154	0.104	0.009	−0.147	0.139	0.039	0.183	0.052	−0.060
	(0.144)	(0.127)	(0.072)	(0.101)	(0.119)	(0.128)	(0.107)	(0.144)	(0.089)	(0.110)
N	138	138	138	138	138	138	138	138	138	138
$Size, \$mil$ (mean)	7,513	20,872	42,054	20,174	7,627	8,263	20,075	40,698	19,373	8,393
$Vol, \$thou$ (mean)	357	815	1,237	802	357	390	791	1,243	737	398
ΔES (mean)	−1.398	−0.408	0.007	0.425	1.442	−0.684	−0.199	−0.006	0.199	0.727
$\Delta E[ES]$ (mean)	−0.212	−0.062	−0.002	0.062	0.225	−0.419	−0.124	−0.0001	0.124	0.416
$\#Reviews$ (mean)	4.836	16.544	44.159	16.003	5.213	5.149	15.433	42.765	15.151	5.657

Note: Table 16 results for the value weighted portfolios developed by quintiles of the change of employee satisfaction. Results for portfolios sorted by raw mean change in employee satisfaction is denoted by ΔES, the second through sixth column. Results of the portfolios sorted by estimated expected employee satisfaction is denoted by $\Delta E[ES]$, the seventh through eleventh column. Specific quintiles are labeled by the subscript 1 through 5. Panel A shows the portfolio results for Excess Returns. Panel B shows the portfolio results for three factor (R_{mkt}, SMB and HML) Fama-French Model. Below the Panel B, shows the mean characteristics of the observations making up each portfolio. This includes Market Capitalization ($Size$ (mil))), Volume ($Vol, \$thou$), and employee satisfaction score. All coefficients are estimated using OLS. Newey-West standard errors with three lags are shown in parenthesis. *p<0.1; **p<0.05; ***p<0.01.