Corporate Culture in M&As:
Evidence from CEO Letters to Shareholders

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ABSTRACT

This paper examines the role of corporate culture for mergers and acquisitions. To quantify corporate culture, I run a textual analysis of the language used in CEOs' annual letters. This analysis categorizes firms into three different corporate cultures: collaborative, innovative, and customer-centric. Using the novel measure of corporate culture, I find that firms with more similar corporate cultures are more likely to merge. Second, buyers' announcement returns are higher if targets have more similar corporate cultures. Finally, the cultural integration of two merged firms is positively related to post-merger performance and is negatively associated with *ex post* divestiture. In sum, this paper shows that cultural differences have meaningful impacts on mergers.

JEL classification: M12, M14, G34, Z10.

This paper proposes a new measure of corporate culture and uses it to study M&A. Corporate culture is widely believed to be important for corporate performance and merger success. Corporate culture can be defined as the shared assumptions, values, and beliefs that help employees understand which behaviors are appropriate (Zingales (2015)). According to a survey of top executives, culture is one of the top three factors that affect firm value (Graham, Grennan, Harvey, and Rajgopal (2016, 2017))

A central challenge for research on corporate culture is that corporate culture is not directly observable. Theoretically, corporate culture can be understood as an incomplete contract between the firm and its employees (Gorton and Zentefis (2020)). Employment contracts may explicitly discipline employees with written agreements but cannot specify all possible contingencies due to contracting costs. Corporate culture helps resolve this difficulty by establishing a general rule for workers' appropriate actions. It can also help people understand what goals others in the organization are pursuing so that they can work effectively. However, since this shared assumption is not written in formal documents, outsiders cannot easily quantify corporate culture.

Corporate culture is likely to be a multidimensional concept, impacting everything from overall strategy to a company's treatment of employees and customers. This paper advances the idea that one aspect of culture can be inferred from the language used in Chief Executive Officers' (CEOs) letters in their annual reports. One reason to believe that a CEO's letter might reveal a company's culture is because it captures top management's view on how to run the company (Graham et al. (2016)). While the shared experience of group members creates culture, the leader is arguably the most influential figure in determining corporate culture (Cutler (2004)). She can attempt to reshape the culture by building consensus around a shared vision among the group members. CEO letters capture the CEO's view, namely "tone at the top," which most significantly influences the current corporate culture (Guiso, Sapienza, and Zingales (2015)). Another reason is that CEO letters are a written representation of a CEO who authorizes the document and has legal responsibility for the contents. A CEO shares her thoughts on the firm's performance as well as the values, attitudes, or mental models of the management team. Even if the letter contains some legal boilerplate, the CEO can convey meaningful messages on the culture or her personality in unconscious ways (Aktas, De Bodt, Bollaert, and Roll (2016)). Third, since CEOs issue letters annually, the letters capture yearly changes in the top management's mindset.

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The primary hypothesis I test is whether cultural similarity can provide an incremental explanation on merger match and merger success. Using the novel measure of corporate culture based on CEO letters, I explore the implications of corporate culture in M&A transactions among the public U.S. companies during 2004 - 2016. Unsuccessful M&A outcomes are often attributed to the difference in the cultures of the two combined firms. For example, analysts attributed the alleged failure of Amazon's $13.7 billion acquisition of Whole Foods Market in 2018 to misalignment of Amazon's rigid culture with Whole Foods Market's flexible culture. Despite the importance of the topic to academics and practitioners, there is a dearth of empirical evidence on the role of corporate culture in the merger market (Zingales (2015)).

I collect annual reports from four different data sources: Mergent Archives, ProQuest Historical Annual Reports, D&B Hoovers, and internet resources, including the website AnnualReports.com. Since annual reports do not have a consistent form across firms and even within a firm across different years, I manually locate and compile the CEO letters from each annual report.

I quantify cultural differences between acquirers and targets in two ways. First, I use cosine similarity of the vector representation of the text in each firm's CEO letters. Second, I implement a Bayesian topic analysis, called Latent Dirichlet Analysis (LDA) model. LDA is a machine learning algorithm and does not require much researcher-induced priors or bias.[1] The LDA model assumes that a document is generated from latent distributions over a collection of words, depending on the topics it delivers. LDA helps identify topics by flagging groups of words that appear in the same context. I find that the topics in CEO letters can be divided into three distinct groups: collaborative firms, innovative firms, and customer-centric firms. These three groups suggest three types of cultures.

To achieve an ideal laboratory setting to explore the causal implication of cultural aspects on merger activities, one should have randomly assigned corporate culture or merger match. In my analysis, however, neither corporate culture nor merger activity is random. One concern about measuring corporate culture using CEO letters is that the letters may capture firm-specific attributes, such as product types or industry characteristics, rather than corporate culture. I try to alleviate this concern in several ways. First, I control for product relatedness and industry of

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[1]LDA analysis has been used in many corporate finance papers, including Israelsen (2014), Hoberg and Lewis (2017), Hanley and Hoberg (2019), Calomiris and Mamaysky (2019), Lopez-Lira (2019), Bellstam, Bhagat, and Cookson (2019), and Lowry, Michaely, and Volkova (2020).

the buyer and the target using text-based measures developed by previous literature (Hoberg and Phillips (2010, 2016); Frésard, Hoberg, and Phillips (2019)). Second, I exclude words mentioned in the business description of a firm's 10-K, which describe the firm's product or industry.

To validate whether the LDA topic classification captures corporate culture, I correlate my LDA measures with various firm specifications. The correlation analysis finds that innovative firms hire younger CEOs, pay higher CEO compensation, and involve in more R&D activities. And customer-centric firms are scored higher in customer satisfaction scores.

Using my new measure of corporate culture, the first question I ask is whether corporate culture has any explanatory power on merger matches. Business practitioners believe that cultural fit is an important factor when they consider potential targets (Graham et al. (2016, 2017)). The cultural distance hypothesis argues that the cost of contracts among two groups is positively related to cultural differences (Hofstede (1980)).

To test this hypothesis, I match each target to a pseudo-target in the same primary two-digit SIC industry with similar assets, sales, and market value to alleviate the concern that omitted variables drive the association between culture and the likelihood of merger. Using this matched sample, I find that two firms were more likely to merge if their CEO letters were more similar. A one standard deviation increase in similarity increased the likelihood of a merger by 9.34 percent to 13.56 percent. Given the unconditional probability of being targeted in my matched sample was 50 percent, the estimated coefficients on cultural similarity was economically meaningful. The alternative similarity measure based on LDA analysis delivers consistent results. Thus, the empirical results support the hypothesis that greater cultural distance reduces the likelihood of merger.

I also investigate mitigating factors which are motivated by incomplete contract theory. The theory predicts that the target's labor intensity makes cultural alignment a more crucial consideration in M&A decisions. As an incomplete contract, corporate culture helps the employees choose the best action in unforeseen contingencies. It is more likely to face these contingent situations when the target's business involves employees' judgment. Empirical results confirm this prediction. The positive association of cultural similarity and merger match was stronger when the target has higher labor intensity. Second, if the potential target has multiple divisions, it is hard for the buyer's management team to control all of these distinct segments. Therefore, the existing corporate culture is likely to be more important. Consistent with this idea, I find that the inter-

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action between cultural similarity and the number of segments was positively associated with the likelihood of merger match.

Next, I investigate the relation between post-merger performance and post-acculturation. Like pre-acquisition characteristics, post-acquisition integration is critical in determining post-merger performance (Agrawal, Jaffe, and Mandelker (1992)). If two cultures are misaligned, the combined firms' employees may not coordinate well due to different assumptions, values, and beliefs on the best ways of conducting business. This can deteriorate productivity and increase employee turnover, harming post-merger performance and even leading to a divestiture. To test this prediction, I quantify post-merger integration by the degree to which the acquiring CEO's letter becomes similar to the target CEO's pre-merger letter. This integration measure was positively associated with post-merger performance, and a combined firm with a higher integration score was less likely to divest the acquisition.

In the final set of analysis, I test whether merger announcement returns are related to cultural similarity. If two organizations' cultures are misaligned, it may prevent the merged entity from realizing synergies. Corporate executives say that they would discount the acquisition premium of a culturally-disparate target by 10 percent to 30 percent (Graham et al. (2016, 2017)). Because culture is an unwritten value shared by insiders, it is not clear a priori how well outsiders can evaluate it and whether they in fact price it into merger transactions. If the merger market optimally chooses two firms to combine and these two firms design the merger contract in an equilibrium, we should not observe any association between the similarity measure and the announcement return. On the other hand, any potential biases, such as information asymmetry or agency conflicts, can generate systematic associations.

I find that buyers' announcement returns were positively associated with cultural similarity between the buyer and the target. This means that the capital market discounts mergers of culturally disparate firms. The positive association between cultural similarity and the market return was pronounced when a buyer faces severe information asymmetry towards a target. If information asymmetry is severe between the buyer and the target, the buyer cannot precisely comprehend the target's culture. While the imprecise evaluation can lead to both overpayment and underpayment in the merger premium, the target has an incentive to correct the mispricing only when the acquirer underpays the premium. As a result, the information asymmetry leads to an overpayment to the

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culturally misaligned target. On the other hand, agency costs did not explain this positive relationship. In terms of the combined announcement returns, the similarity measure did not provide an additional explanation. To sum up, although an acquirer may choose a target and design the merger contracts after considering the cultural aspects, the acquiring firm cannot fully incorporate the target's cultural difference and ends up overpaying the premium, attenuating its shareholder value.

This paper's central contribution is to provide a new, novel approach to measure time-varying firm-level corporate culture. Prior work uses other proxies to measure corporate culture, including interviews (Graham et al. (2016, 2017)), Glassdoor employee reviews (Grennan (2019)), earnings calls (Li, Mai, Shen, and Yan (2020)), corporate social responsibility scores (Bereskin, Byun, Officer, and Oh (2018)), and nationality (Ahern, Daminelli, and Fracassi (2015)). By offering an annual snapshot of CEO views on her company, CEO letters can capture an annual shift in attitude, value, or mental model. The time-varying measurement helps me identify post-merger acculturation. Also, this paper is one of the first works to show that corporate culture is related to merger outcomes in a meaningful way.

My work can adds beyond the existing literature in corporate culture, including the most closely related paper by Li, Mai, Shen, and Yan (2020). First, we use different methods in a different context. Li et al. (2020) implement a word embedding model and analyze what top executives elaborate in their discussion with analysts in earnings conference calls. In comparison, I exploit CEO letters to shareholders. There are at least three distinctions between conference calls and CEO letters: audience, extemporaneousness, and main objective. The primary goal of conference calls is to help the analysts form accurate predictions on the firm's capital market performance. Due to the interactive nature, the discussion during conference calls is steered by analysts to address their questions. On the other hand, CEO letters to shareholders have a broader audience and are scripted in advance. CEOs provide comprehensive information they want to emphasize, beyond financial performance, such as ethical values and shared goals. Second, while Li et al. (2020) also study mergers among other firm policies, I provide more comprehensive empirical evidence on M&A outcomes, including merger match, market reaction, and post-merger performance. In general, I view our papers as complementary.

This study also speaks to the literature on M&A transactions. Prior research illustrates factors

for successful merger activities or the potential synergy. They include national culture (Ahern et al. (2015)), information asymmetry (Moeller, Schlingemann, and Stulz (2007)), and product types (Hoberg and Phillips (2010, 2018); Frésard et al. (2019)). Existing research also shows that CEO characteristics can play a role in the takeover process as well, such as CEO narcissism (Aktas et al. (2016)). In this paper, I demonstrate that the similarity in CEO letters can be another important factor predicting merger success.

I.   Data Source and Cultural Similarity Measure

A.   CEO Letter and Similarity Measure

We often use the term annual reports and 10-K filings as interchangeable concepts. However, they are distinct from each other. To illustrate the difference, appendix A provides an example of 10-K filing and annual report of AT&T Incorporation for the fiscal year 2016. A publicly-traded company files its annual financial performance to the U.S. Securities and Exchange Commission (SEC) using 10-K reports. On the other hand, annual reports are for a public firm to describe its operations and financial conditions to its shareholders. Compared to 10-Ks, annual reports provide more visual assistance, using graphics or photos. Although 10-Ks provide the most detailed information on a firm's financial condition, annual reports deliver more comprehensive information on a firm's activities over the past year. Under the proxy rules, firms must send annual reports to their shareholders when they hold annual meetings to elect directors. If they may choose to use their 10-Ks in lieu of annual reports, there will not no separate annual report.

There are at least three challenges in retrieving CEO letters of merger firms. First, while the SEC's EDGAR database makes 10-Ks publicly available, we do not have a public database to store and retrieve annual reports. Second, it is especially hard to find annual reports and CEO letters for merger targets. Once they are acquired, they do not have a separate web presence. Third, even if there are some proprietary data sources for annual reports, any of these sources do not provide a complete list of reports. Bearing these difficulties in mind, I try to expand the sample size by complementing four different data sources: Mergent Archives, ProQuest Historical Annual Reports, D&B Hoovers, and internet resources, including a website AnnualReports.com.

I measure the corporate culture using CEO letters in annual reports. To be specific, I assume

that the CEO letters in the year $(t-1)$ reveal the target's and the buyer's corporate culture in the merger year t. Annual reports do not have a consistent form across firms and even within a firm across different years. Therefore, once the annual reports are collected, I manually locate and compile the CEO letters from each annual report. I then parse the words in the letters and remove numbers, punctuation, symbols, and stopwords[2]. Next, the stemming process groups the words with a similar underlying meaning into a root form. For example, the words, 'ran,' 'run,' 'runs,' and 'running,' are grouped into the stem word 'run.' After this cleaning process, the CEO letters of the buyers, the targets, and the control firms display 46,058 unique words. The histogram in figure 1 displays the number of unique words in CEO letters. The mean (median) number of unique words is 407 (377). The histogram is skewed to the right, with the maximum number of words 2,176.

Following Loughran and McDonald (2011), I then calculate the weight of each stem word using the term frequency-inverse document frequency (TF-IDF) approach. TF-IDF approach discounts words that frequently appear across different documents, assuming those words do not provide unique semantic meaning. When the words exclusively appear in a specific firm's CEO letter but do not in most other letters, it assigns a high weight for those words.

Based on the words used by each firm's CEO letter, I calculate pairwise cosine similarity scores for the acquirer and the (pseudo-)target in a given merger. For a given merger transaction i, suppose the buyer's CEO letter has a word vector of B_i and the (pseudo-)target's CEO letter has a vector of T_i, which are both weighted by TF-IDF approach. The cosine similarity of the paired firms can be calculated as $\frac{B_i \cdot T_i}{||B_i|| \ ||T_i||} = \frac{\sum_{j=1}^{n} b_{ij} t_{ij}}{\sqrt{\sum_{j=1}^{n} b_{ij}^2} \sqrt{\sum_{j=1}^{n} t_{ij}^2}}$, where n represents the number of distinct words and b (t) is a vector element of B (T). The similarity measure ranges from zero to one: zero similarity implies no overlapping word in the pair. When two documents have the same word frequencies, the similarity will be one.

One concern in my attempt to measure the corporate culture using CEO letters is that they also depict other firm specifications, such as product or industry characteristics. To alleviate this concern, most of the empirical specifications exclude the words mentioned in the firm's 10-K product description. This process helps me focus on the words which are exclusively used in the CEO letters.

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[2]Stopwords are a set of commonly used words in any language, which do not convey semantic information. In English, examples include 'a,' 'an,' 'the,' and 'they.'

I collect the words in the 10-K product descriptions from the SEC EDGAR website.

B.   *Similarity Measure using LDA Analysis*

The Bayesian topic analysis, called the LDA model, helps me classify firms into different groups of the corporate culture. The LDA model is one of topic modeling methodologies that has been adopted in the finance literature using textual analysis (Israelsen (2014); Hoberg and Lewis (2017); Hanley and Hoberg (2019); Calomiris and Mamaysky (2019); Lopez-Lira (2019); Bellstam et al. (2019); Lowry et al. (2020)). It assumes that a document is generated from latent distributions over a collection of words, depending on the topics it delivers. Since a researcher cannot observe this latent distribution of words, LDA infers the distribution using Bayesian techniques from the observable texts in the collection of CEO letters. It perceives each document as a mixture of topics. And each word in a document is attributable to one of the document's topics. For example, suppose that a CEO wants to emphasize the cultural value of collaboration among stakeholders in her letter. Then, the CEO letter should be represented by a topic distribution that places high weights on certain words, such as teamwork or human capital. Relatively, a topic associated with innovation or high revenue will receive low weights in this particular CEO letter.

The strength of the LDA model is that a researcher can avoid subjective bias and priors by minimizing arbitrary parametric choice. This automated process provides a comparative advantage over the textual approaches that rely on researcher-selected lists of words. The only input I need to specify is the number of topics. Based on the rationale described in the following section II.F.1, I fit the model using three-topic specification.

With the given number of topics, LDA produces the following outcomes. First, it presents the list of words that are the most representative in each topic. Second, each document is assigned with the proportional distribution over the topic. Figure 2 illustrates the technical process and the outcomes of LDA analysis.

I use the LDA outputs to measure the cultural similarity of paired firms in two ways. First, I classify the firms into a topic in which they are assigned with the highest distribution. Then, the dummy variable indicates whether the two merging firms are assigned to the same topic.

Second, I calculate a pairwise cosine similarity score of the probability distribution over the topics for the acquirer and the target in a given merger. For a given merger transaction i, suppose

the buyer has a vector of probabilities BP_i and the (pseudo-)target has a vector of probabilities TP_i. Then, the cosine similarity of combined firms can be calculated as $\dfrac{BP_i \cdot TP_i}{||BP_i|| \; ||TP_i||} = \dfrac{\sum_{j=1}^{n} bp_{ij} tp_{ij}}{\sqrt{\sum_{j=1}^{n} bp_{ij}^2} \sqrt{\sum_{j=1}^{n} tp_{ij}^2}}$, where n represents the number of topics, and bp (tp) is a vector element of BP (TP).

C.   Merger Data

The initial sample for merger transactions includes all public mergers from the SDC Platinum database from 2004 through 2016. For each deal, I collect deal-specific information, such as contracting parties' CUSIPs, transaction values, and state locations. I then match CUSIPs to NCUSIPs of CRSP, then to GVKEY of COMPUSTAT, consequently. The data filter yields a sample of 803 mergers. For each merger deal, I find a control firm, which is matched to the target firm, using two-digit SIC industry code, total assets, sales, and market value. A control firm is from the COMPUSTAT universe with the same two-digit SIC codes as the matched target firm, with similar size, in terms of total assets, sales, and market value at the end of the same fiscal year.

Table I panel B presents the thirty cases of one-to-one matching results. Out of the sample where I can collect the CEO letters for both the target and the pseudo-target, the table shows the matching results with the highest merger transaction values. Panel C shows the matched result by comparing the mean value of balanced variables of the target and the pseudo-target, with the t-statistics. It shows that they are well-balanced and have statistically insignificant differences in every matching variables.

To investigate the market reaction to the merger announcement, I collect stock price data from CRSP. I calculate the acquirer's and the target's abnormal returns by subtracting the market return from the firm's daily return. Cumulative abnormal return (CAR) is the sum of abnormal return in the three ([-1, 1]) or five ([-2, 2]) days around the announcement dates. For the combined CAR, I use either the average of the acquirer's and the target's CAR or the weighted average using their market value.

D. Other Variables

Firm-year specific financial data is collected from COMPUSTAT. Based on previous studies, I construct a set of control variables, which are standard controls in the M&A literature. They include the natural logarithm of total assets, the natural logarithm of market value, the natural logarithm of sale, and book to market.

I also consider deal-specific information collected from the SDC Platinum. First, I control for the relative size of the transaction value to the buyer's market value. Moeller et al. (2007) find that the relative transaction value represents the bidding float. So, it is negatively associated with the announcement return. Second, I include a dummy to represent the cross-industry transaction.

I further control for the product types and industry groups of the target and the buyer. This paper assumes that the texts in CEO letters reveal the corporate culture. And corporate culture provides incremental explanatory factors in merger activities. One might concern that CEO letters mainly convey information about product types or industries of the firm. To alleviate this concern, I use the product types and industry groups measured by a firm's textual representations. First, I control the product relatedness between the target and the buyer. I consider the text-based vertical relatedness measure collected from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). They measure the vertical relatedness between firm-pairs using product descriptions in the 10-K and the Bureau of Economic Analysis Input-Output tables. Second, I include industry fixed effects in every specification using text-based industry groups (Hoberg and Phillips (2016)).

In the tests for CEO and firm characteristics for each LDA type, I use the following variables. For CEO and executive compensation data, I use the COMPUSTAT Executive dataset. R&D intensity is measured by research and development expense, scaled by the total asset. Stoffman, Woeppel, and Yavuz (2019) provide information on new patent issuance. And customer satisfaction scores are borrowed from the American Customer Satisfaction Index (ACSI) website (www.theacsi.org). I collect the brand value from the Interbrand website (www.interbrand.com). Since ACSI and Interbrand do not provide company-specific indicators, I manually match the company name to the COMPUSTAT universe.

For the cross-sectional tests in mechanism analysis, I collect the following data. First, COMPUSTAT Segments provides the data on the number of business segments of target firms. Second,

the target firm's labor intensity is calculated as the number of employment, divided by property, plant, and equipment. The relevant variables are compiled from COMPUSTAT.

I use three different measures of information asymmetry between the target and the outside market. The first is the (inverse of) number of analyst forecasts. The number of analysts following the stock represents the information intermediaries that alleviate information asymmetry. The second measure is the standard deviation among the forecasts on earnings per share (EPS). Disagreement among analysts is an indication of the lack of available information about the firm. Last, I use the forecast error in EPS, measured by the difference between the mean of forecast EPS and the actual EPS, scaled by the actual EPS. Firms with larger levels of information asymmetry are expected to have higher forecast errors.

To measure the inverse level of agency conflict between the buyer's top executives and the shareholders, I use the management's share ownership, the stock option value, and the long-term incentive payments for the executives. I obtain the executive compensation data from the Execu-Comp database.

The post-merger restructuring activities are measured by either divestiture flag or spin-off flag in the SDC Platinum database. The dummy variable for *ex post* restructuring equals one if the acquiring firm has any divestiture flag and spin-off flag in the following year of acquisition, and zero otherwise.

E. Summary Statistics

Table I presents the summary statistics for the final sample. While the similarity measure is the main variable of interest in this paper, there are three restrictions to have this observation. First, CUSIPs of both the buyer and the target should be matched to CRSP and COMPUSTAT. Second, I should locate the annual reports and CEO letters for both of the combining firms.

Panel A compares the firm specifications of the sample with and without a similarity measure. The comparison shows that the merger transaction in the final sample is conducted between bigger firms in terms of total assets, sales, and market value. Prior literature on M&A research also notes that due to data availability, the final sample is skewed towards larger companies (Moeller et al. (2007)). However, if we compare the relative size of total assets and sale, the relative size of two contracting parties is not systematically different between the two groups. For the relative market

value, the buyer's market value is marginally statistically smaller in the data with similarity measures than the sample without similarity measures. This implies that the final sample has targets with large market value which will become crucial component for the combined entity. Therefore, their culture can represent more critical consideration and determinant in M&A outcomes. This selection bias might inflate the estimated implications of the target's culture on the combined entity.

Panel C shows the firm characteristics of the actual target firms in the merger activities and the control firms, which are matched based on total assets, sales, and market value in the same two-digit SIC industry. It shows that the two groups are balanced in the matched covariates by having statistically insignificant differences.

Panel D displays the Pearson correlation coefficients between various pair-wise similarity measures, including my measures and the measures developed by existing literature. This paper constructs the measures, including (1) the cosine-similarity between every word in two CEO letters, (2) the cosine-similarity between words in two CEO letters, excluding terms mentioned in the 10-K business description, (3) the cosine-similarity of LDA topic distribution across three topics in two CEO letters, and (4) a dummy variable indicating whether two CEO letters have the highest probability mass on the same topic out of three topics. And I compare these measures to (5) the text-based product similarity measure (Hoberg and Phillips (2010, 2016)), (6) the buyer's text-based vertical related measure to the target (Hoberg and Phillips (2016)), and (7) the target's text-based vertical related measure to the buyer (Hoberg and Phillips (2016)). When the textual similarity in CEO letters considers every word, it is positively and statistically significantly correlated with the text-based product similarity measure. This implies that the CEO describes the firm's business and products in her letter. However, once I exclude the words for describing the business, the positive correlation between my measures and the product similarity measures become statistically insignificant. Overall, most correlations are modest, suggesting that my pair-wise similarities in CEO letters can depict incremental aspects of the firm besides industry or product type.

F. LDA Topic Analysis

F.1. LDA Topic Identified

In implementing LDA analysis, the only parameter a researcher needs to choose is the number of topics. To determine the topic number, I consider the following two aspects. The first feature is the coherence score. Although there is no definite consensus on how to choose the optimal number of topics, linguistic literature proposes to consider the coherence score. The coherence score measures the degree of semantic similarity between high scoring words in the topic. A high coherence score means that topics are semantically interpretable and are distinct from each other. Table II panel A shows the coherence scores for the topic numbers ranging from two to twenty. When the algorithm is assigned with three topic specification, it delivers the highest coherence score. Second, I balance interpretability and accuracy. One should have enough topics to distinguish between the topical context, meaning accurate prediction. However, too many topics will lose their interpretability since the same words start appearing in multiple topics.

Considering this trade-off and the coherence measure, I choose the topic number as three. In section VI, I explore a different set of specifications.

LDA helps me identify a group of words, which appear in the same context. Table II panel B illustrates the list of top-20 keywords for each topic. The first topic has some distinct words, including *team*, *people*, and *leadership*. Some unique words for the second topic are *transform*, *effici*, and *grew*. For the third topic, I notice the words, such as *custom*, *product*, *market*, and *servic*. For convenience, I name each topic as 'collaborative culture,' 'innovative culture,' and 'customer-centric culture,' henceforth. And, I classify the firms into a topic in which they are assigned with the highest distribution and name them as collaborative firms, innovative firms, and customer-centric firms, respectively.

Figure 3 shows the word clouds to illustrate groups of words which firms mention in their CEO letters. It is hard to specify a topical context in figure (a), which is the word cloud generated by every sample CEO letter. The word cloud in figure (b) for the first LDA topic, the words, such as team and people, become more outstanding, compared to figure (a). In figure (c), one can quickly notice the words, including transform or effici. Figure (d) highlights the words, such as custom or product.

Table II panel C presents the autocorrelation of corporate cultural value measures. In row (1), I show the correlation between the cultural type at year t and the following five years. Rows (2) - (4) present the correlation between the probabilities assigned to collaborative culture, innovative culture, and customer-centric culture at year t and the following five years. The correlations between year t and the lead years are statistically significant and positive. And they become smaller as time elapses. The autocorrelation results suggest that corporate culture is sticky and evolves slowly over time.

Next, I try to show the topics identified by LDA do not capture industry or product types but illustrate a firm's cultural aspects. First, the examples of actual CEO letters can illustrate LDA topics. Appendix B shows an excerpt from the CEO letter of Chesapeake Energy Corporation, which is classified as a collaborative firm. In its CEO letter, it emphasizes the importance of its human capital and talent. Appendix C is an excerpt from the CEO letter of Eli Lilly and Company, which is classified as an innovative firm. The CEO highlights the importance of innovation and invention in his CEO letter. In Appendix D, I present a part of the CEO letter of Omnicare Corporation. Omnicare Corporation is classified as a customer-centric firm. The letter mentions the firm's service mind to retain its customer group.

Second, panel D in Table II describe the firms' industrial distribution in each topic. Panel D explores two-digit SIC classification to describe the industry. None of the topics is clustered in specific industries. It suggests that the LDA topic captures some distinctive features within the industry.

In the internet appendix, I test correlations between my measure and two alternative measures of corporate culture in Table A1. The purpose of this experiment is to show that the measures used in this paper are corroborated with other cultural measurements, which are developed by some reliable resources. At the same time, it will demonstrate that my measures can quantify novel aspects of corporate culture, which are not captured by other proxies.

F.2. CEO & Firm Characteristics for Each LDA Topic

Table II panel E provides the descriptive statistics of firm specifications for each group of firms. And panel F compares the groups. The t-statistics imply that the topic groups have some significant differences in many aspects. The firms assigned for each type are not systematically different in

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terms of total assets. The firms with a collaborative culture and with a customer-centric culture have a similar size of sales and market value. Among the three groups of firms, innovative firms make the largest sales. And, their market value is the largest, as well. Book to market ratio is the highest in the customer-centric firms, followed by collaborative firms and the innovative firms. Innovative firms are the youngest. And the profitability, measured by ROA, is the highest in the firms with a customer-centric culture. Overall, the comparison shows that the innovative firms are the youngest entities with high growth opportunities. And the customer-centric firms have some contrasting features to the innovative firms, by being the most mature and having the highest book to market ratio. The collaborative firms are located somewhere between two groups. Although the comparison does not provide any causal implications, it reinforces the importance of including financial control variables when empirical analysis uses the LDA model results.

Table III is to show Pearson correlation coefficients between LDA topic distribution and characteristics of the firms and their CEOs. In the attempt to understand corporate culture using CEO letters, the underlying assumption is that CEOs are one of the most crucial players in defining corporate culture. They are not only the narrators who authorize the document but also the forerunner who can initiate the cultural change in the organization. In panel A, I try to infer CEOs' characteristics using their demographics and relative payroll. Innovative culture has a negative correlation with the CEO age. It corresponds with the prior literature, which finds that younger CEOs are more risk tolerant and are more likely to run innovative companies (Graham, Harvey, and Puri (2013)). CEOs in innovative firms are compensated more than the other executives in the organization. It implies that CEOs are more influential figures in the firms focusing on innovation. This association is aligned with the prior literature, which finds that CEO characteristics are an important determinant of the firm's innovative strategy (Kaplan, Klebanov, and Sorensen (2012)).

Panel B analyzes innovation activities, measured by R&D intensity and the total value of newly issued patents. The topic distribution on innovative culture is positively correlated with a firm's innovative activities. The positive associations between the LDA probabilities assigned to the innovative culture and the innovation activities may imply that when CEO emphasizes innovation in her letter, she indeed encourages innovative activities.

In panel C, I investigate the correlations between the cultural distribution and the customer relationship. When I proxy a firm's customer relationship with the ACSI score, the probabilities

assigned to customer-centric culture are positively correlated with the customer satisfaction. The brand value does not provide significant correlations with any cultural probabilities. The positive association between the LDA probabilities assigned to the customer-centric culture and the ACSI score may suggests that a firm placing high priority in customer relationship is assigned to customer-centric culture.

In the internet appendix, I repeat the correlation analysis for the alternative cultural measures for the interested readers. Table A3 investigates Pearson correlations with the scores developed by Li et al. (2020) and the firm specifications which I explore in this section. In Table A4, I repeat the experiment using the MIT Sloan measure.

Overall, my LDA measures correlate with external variables, such as CEO characteristics, innovation activities, and customer satisfaction scores. One thing I want to emphasize is that due to the absence of good instruments, I am unable to establish causality on the correlations between a firm behavior and its culture. Instead, I look at differences in culture and their implications on merger outcomes. Therefore, even if the labels are not perfect in predicting corporate behavior, it does not change your results.

II. Corporate Culture and Merger Volume

A. Corporate Culture Measured by Cosine Similarity

The cultural distance hypothesis predicts that the cost of contracts among the two groups is positively related to cultural differences (Hofstede (1980)). Cultural differences can also deteriorate productivity or increase employee turnover, leading to inferior post-merger performance or divestiture. Therefore, the increase in cultural misalignment will discourage a bidder from acquiring a potential target.

To test this prediction, Table IV presents the linear regression estimates of the implication of cultural similarity on the level of merger activities. In every column, I include year fixed effects and industry fixed effects.

Columns (1) - (2) explore the similarity in two contracting firms' CEO letters when I use every word mentioned in the documents. The similarity measures are estimated to be positive and statistically significant with and without including various control variables.

In CEO letters, CEO can deliver her thoughts on the values or attitudes with which employees should conduct their tasks. However, she can also describe the company's industry or products in the letter. To disentangle the message on cultural value from the message on other firm specifications, I exclude the words which are also used in the 10-K to describe their products and industry. In columns (3) - (4), the remaining words are used to construct the alternative cosine similarity scores. The analysis using this alternative measure also delivers the same message as columns (1) and (2). The coefficient estimates on the main explanatory variable are positive and statistically significant.

The results provide evidence that cultural similarities had a significant positive association with merger volume. The implication of cultural similarity was economically meaningful, as well. One standard deviation change in the similarity measure increased the likelihood of being a target company by 9.34% - 13.56%, depending on the specification. It confirms the theoretical prediction that cultural alignment can stimulate merger attempts.

B. Corporate Culture Measured by LDA Analysis

To see whether CEO letters depict not only a firm's business but also their cultural features, it is crucial to understand what precisely the CEO says about culture. In this section, I employ an LDA analysis to identify CEO letters' topical context.

Table V tests the relationship between the LDA topical context and the merger match. Panel A shows the topical distribution of the control firms and the target firms. A customer-centric firm was more likely to be a target. But the difference in distribution between the two groups is not statistically significant. It reaffirms that the matching process is valid to find a comparable control for a target.

Table V Panel B repeats the analysis of Table IV but uses the similarity measure constructed from LDA analysis. Columns (1) and (2) evaluate the cosine similarity of the probability distribution over the LDA topics. And in columns (3) and (4), I implement a dummy variable, representing whether the buyer and the target have the highest probability mass on the same topic.

The LDA topic similarity was positively related to the merger likelihood. In terms of economic significance, one standard deviation increased in the similarity of LDA topic distribution raises the probability of being targeted by 5.70% - 6.06%. And if two firms had the same topic with the

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highest probability, they were more likely to initiate M&A transactions by 13.08% - 13.68%.

This section finds that when the buyer and the potential target cover similar topics in CEO letters, they are more likely to conduct M&A transactions.

C.   Potential Mechanism

To show the relationship of corporate culture and merger activities, the ideal experiment would be where corporate culture is randomly assigned. However, corporate culture is not randomly established. One could be concerned that omitted organizational features, such as industry, profitability, or geographical location, can drive the results, while those features are proxied by CEO letters. Although I include various control variables, there is no perfect remedy for this identification concern.

Table VI addresses some of the concerns in an indirect way. I explore the factors that potentially amplify or mitigate the role of corporate culture as an incomplete contract between the acquirer and the target's employees. The main explanatory variables are the interaction terms between the similarity measure and the potential mechanism variables, which are indicated at the top of the table. The variables that I explore as potential mechanisms include the target's labor intensity and the target's number of business segments.

First, corporate culture helps the employees choose the most preferred action when there is no written policy on how to solve the contingencies. In an extreme case where a potential target is fully automated and does not entail any employees' subjective judgment, corporate culture does not play many roles. Columns (1) and (2) examine this prediction by investigating the target's labor intensity. The similarity measure has a positive estimate, weakly confirming the evidence in Table IV. The labor intensity of the potential target has a positive association with merger likelihood. The positive coefficient on the interactions term implies that cultural similarity became more critical in predicting merger activity when the potential target relied more on human capital than physical capital. At the mean level of cultural similarity, one standard deviation increase in labor intensity increased the likelihood of being targeted by 7.27% - 8.63%.

Columns (3) and (4) explore the second factor, the number of the target's business segments. Suppose the potential target has many separate divisions. In that case, it is hard for the buyer's management team to discipline all of these distinct segments, which might have different business

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models or operational objectives. Therefore, the existing corporate culture embedded can be crucial. As in columns (1) and (2), the coefficient of the similarity measure is estimated to be positive as in the main analysis. The number of business segments of the target was negatively related to the likelihood, implying that the target's business complexity may deter merger attempts. The positive and statistically significant point estimates for the interaction term provide suggestive verification on the prediction. The number of segments strengthened the positive association between cultural similarity and the merger volume. At the mean level of cultural similarity, one standard deviation increase in the number of business segments increased the likelihood of being targeted by 9.91% - 12.55%.

Overall, the mechanism test provides suggestive evidence that corporate culture can provide an incremental explanation on merger activities as an incomplete contract.

III.   Cultural Integration and Post-Merger Synergy Realization

In prior sections, I show that pre-acquisition cultural characteristics can provide an incremental explanation on merger volume. This section demonstrates that the post-acquisition process can also be critical in determining post-merger performance and stabilizing the combined entity. This empirical analysis is not free from endogeneity concern. Any omitted variables might simultaneously affect the variables, leading to spurious correlations. Or, reverse causality can be an issue if favorable post-merger performance can help the firm coordinate two distinct entities and employee groups. Therefore, one should interpret the results in this section as correlations, rather than causal relationships.

A.   Post-Merger Performance

If two corporate cultures are misaligned, two combined firms' employees may not coordinate well due to different assumptions, values, and beliefs on the best ways of conducting business. This can deteriorate productivity or increase employee turnover, leading to inferior post-merger performance.

Table VII tests this prediction. In panel A, I quantify the post-merger integration by the degree to which an acquirer's CEO changes her letter to be similar to the letter of the target's CEO. The

integration measure is estimated to have a positive and statistically significant association with post-merger performance, measured by the change in Tobin's Q, the change in return on assets, and the change in SG&A and sales ratio.

The relative firm size between the two merging firms will influence the integration process. Pre-merger firm size may represent the relative importance of the merged units in the combined firm. It can be optimal to maintain the culture of a relatively important organization. Even if the cultural integration is successfully implemented, it is more likely for the relatively substantial buyer to maintain its existing culture and not to move toward the target's culture. Considering the impact of relative size, I inflate the integration measure by the natural logarithm of the relative asset size of the acquirer and the buyer. Panel B implements this alternative integration measure. It finds comparable results as in panel A for Tobin's Q and return on assets. The results for SG&A and sales ratio becomes insignificant, but the directional prediction stays the same.

One standard deviation change in the integration measure could increase the change in Tobin's Q by 0.05 - 0.06 and the change in return on assets by 0.41 - 0.45. And it could decrease the change in SG&A and sales ratio by 0.12 - 0.13. Since the outcome variables' respective mean values are (−0.03), (−0.36), and 0.14, the results imply that the combined entity could revert performance deterioration into performance improvement by increasing the integration measure by one standard deviation.[3]

B. Post-Merger Divestiture

In the second set of analysis, I use the *ex post* restructuring decision after the M&A transactions. The failure to integrate two disparate cultures impedes the combined firms from realizing synergy and stabilizing the organization. This impediment will increase corporate restructuring activities after the merger.

As in the previous section, the post-merger integration is proxied by how much the acquiring CEO adapts her voice similar to the target CEO's voice. Table VIII regresses the integration measure on the likelihood of post-merger restructuring, including divestiture and spin-off. Columns

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[3]Untabulated results show that there is no statistically significant association between the pre-merger cultural similarity and the post performance. One potential explanation is that the merger match is optimally chosen in considering cultural status of two parties. So among these optimal matches, the one with better cultural alteration could outperform others.

(1) and (2) use the integration measure without considering the relative size of the acquirer and the target. Columns (3) and (4) exploit the measure after inflating the measure with the relative size. Across the different specifications, the test generates negative and statistically significant point estimates, implying the increase in CEO letter similarity decreased the restructuring magnitude.

One standard deviation increase in similarity change could decrease the likelihood of divestiture by 4.40% - 5.27%. Considering the unconditional mean of divestiture dummy is 14.30%, it is also economically meaningful.

IV.   Corporate Culture and Merger Gain

The previous sections show that the bidders select the target considering the cultural alignment. This section investigates how corporate culture is related to the merger gain of the buyer and the combined entity.

If two organizations' corporate culture is misaligned and hard to be integrated, it will deter the merged entity from fully realizing the synergies. Many top executives assert this argument by saying that they would walk away from a culturally misaligned target. And they would also discount the acquisition premium of the culturally-disparate target by 10% to 30% (Graham et al. (2016, 2017)). However, it is an empirical question of whether an acquiring firm can adequately price the transaction value after considering the target's underlying culture. Since mergers are not randomly assigned, the empirical studies analyzing merger gains can only use the selected subset. If restructuring decisions and merger contracts are optimally decided after considering cultural aspects, one would not observe any relationship in the reduced form analysis (Demsetz and Lehn (1985)).

A.   Buyer's Announcement Return

First, I investigate the association between cultural alignment and the buyer's market reaction. Figure 4 plots the relationship between the three-window (five-window) cumulative returns and the cultural similarity before the merger. The scatter plots look noisy, but linear regression lines suggests positive relationships.

In Table IX, the similarity in CEO letters is estimated to have positive estimates. It is also

statistically significant in some specifications. In terms of economic magnitude, one standard deviation rise in the similarity measure increased the three-day (five-day) window CAR by 0.83% - 2.11% (1.09% - 1.19%). In dollar terms, this implies a range of roughly $136.11 million to $346.46 million ($178.18 million to $195.50 million) for the median-size firms.[4] The analysis shows that buyers' announcement returns were positively associated with the cultural similarity measure in CEO letters between the buyer and the target.

B. Combined Announcement Return

Next, I test the association of corporate culture on the combined announcement return. Table A5 exploits the combined announcement return. The combined announcement return is either the simple average (panel A) or the weighted average (panel B) of the announcement return of the target and the buyer.

The empirical analysis delivers the same message in both specifications. The similarity in CEO letters did not have incremental explanatory power on the combined merger gain. Since the mean and the median value of the combined CAR was positive,[5] the results show that the merger transactions occurred only when they could create positive synergy and that the cultural similarity was also considered in this optimal endogenous decision.

C. Potential Mechanism

In the previous section, I find a positive association between the cultural similarity measure and the buyer's market return. This finding implies that acquiring firms bid higher (lower) premiums for the culturally disparate (similar) targets. The following alternative theories can explain these findings. First, agency cost theory (Jensen (1986)) argues that acquiring firms' empire-building motives lead to value-destructive takeover deals. Second, hubris theory (Roll (1986)) attributes the buyer's market reaction to its valuation mistakes. The valuation error can be substantial in the context of the corporate culture. Organizational culture is an unwritten value shared by insiders, so it is hard to evaluate from outside. That is, cultural misalignment can be a factor

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[4]The mean (median) of the buyer's three-day window CAR was -0.97% (-0.38%). The mean (median) of the buyer's five-day window CAR was -1.03% (-0.35%).

[5]The mean (median) of the three-day window average CAR was 7.97% (5.14%). The mean (median) of the five-day window average CAR was 8.05% (5.39%). The mean (median) of the three-day window weighted-average CAR was 2.66% (1.51%). The mean (median) of the five-day window weighted-average CAR was 2.75% (1.47%).

which raises the manager's mispricing in M&A transaction. And the assessment from outside will be more challenging if there is more information asymmetry between insiders and outsiders, leading to higher misevaluation.

Table X tests the two theories. In panel A, I explore the hubris theory. In particular, the valuation error of the acquiring firm will be pronounced when information asymmetry between the target and the outsiders is severe. Information asymmetry is estimated by the three proxies, measured by the analyst forecasts following the target stock: the (inverse of) number of analyst following; the standard deviation in analyst forecasts on EPS; and the analyst forecast error on EPS. The main variable of interest is the interaction term between the similarity measure and information asymmetry level. In columns (1) and (2), the interaction term is estimated to have negative and statistically significant coefficients. It implies that information transparency decreased the positive association between the similarity measure and the buyer's announcement return. At the mean level of cultural similarity, one standard deviation increases in the analyst followings decreased the three-day window CAR by 1.17% - 1.30%. Columns (3) - (6) estimate positive coefficients for the interaction between the similarity measure and information asymmetry proxies. The cultural similarity has the prediction power when the buyer faced high information asymmetry. At the mean level of cultural similarity, one standard deviation increase in the standard deviation in analyst forecasts (analyst forecast errors) increased the three-day window CAR by 2.28% - 2.35% (0.27% - 0.25%).

Panel B investigates agency cost theory. I measure the inverse level of managerial incentive misalignment, using three measures: equity ownership stake, as a percentage of the total management equity; stock option compensation; and long-term incentive payments, which is the amount paid to the executive under the company's long-term incentive plan. These measures are inversely related to agency costs. The main variable of interest is the interaction term between the similarity measure and the inverse measure of agency conflicts. In every specification, the coefficients are not statistically significant. The findings suggest that agency costs could not explain the mispricing.

The cultural difference in the target may increase the valuation mistake of the buyer. If information asymmetry is severe between the buyer and the target, the buyer cannot precisely comprehend the target's culture. While the imprecise evaluation can lead to both overpayment and underpayment in the merger premium, the target has an incentive to correct the mispricing only when the

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acquirer underpays the premium. As a result, the information asymmetry leads to an overpayment to the culturally misaligned target. The findings in this section collectively imply that the acquiring firm cannot fully incorporate the cultural difference of the target and ends up overpaying the premium, attenuating its shareholder value.

V.   Robustness Checks

A.   LDA Analysis using Different Topic Numbers

In section III.B, I use three topics in LDA analysis. In this section, I want to show that the main findings in section III are robust to different parametric choices on the number of topics. In particular, I fit the LDA model using two different specifications: four topics and seventy-five topics. First, I consider four topics, which has the second-highest coherence score, preceded by three topics. Second, I fit the model using seventy-five topics, following Ball, Hoberg, and Maksimovic (2015) and Hoberg and Lewis (2017). These previous studies run LDA analysis to investigate the contents in management discussion and analysis of 10-K filings using seventy-five topics.

Table A6 repeats the analysis in Table V. Columns (1) and (2) use four topic specification. And columns (3) and (4) fit the model using seventy-five topics. The findings deliver the same message as the analysis with three topic estimation. The similarity measure, using the probability distribution over the LDA topics, have positive estimates. The economic magnitude is also compatible. One standard deviation increase in the similarity of LDA distribution over four (seventy-five) topics raised the probability of being targeted by 4.20% - 6.53% (2.70% - 6.30%).

B.   Merger Volume with Li et al. (2020) Measure

In section D, I corroborate my measure of corporate culture with the measure developed by Li et al. (2020). The cross-validation using correlations implies that our measures capture unique aspects of culture and complement each other.

To show my measure provides incremental explanatory power for merger likelihood, Table A7 repeats Table IV and V, but includes the cosine similarity measure over Li et al. (2020) scores as an extra explanatory variable. The similarity in Li et al. (2020) scores is estimated to have positive coefficient with merger likelihood but is not statistically significant over the various specifications.

More importantly, the coefficient estimates on my cultural similarity measure remain positive. In some specifications, they lose statistical significance.

Overall, both measures are positively associated with merger volume, implying potential complementarity of two measures. Due to correlations between two measures, including Li et al. (2020) scores weakens the explanatory power of my measure. However, my measure has stronger statistical explanatory power on merger match than Li et al. (2020) scores.

C. CEO Change and Corporate Culture

This paper measures corporate culture using CEO letters. The underlying assumption is that we can infer the cultural aspects of a firm using the CEO's public speech. This attempt starts with the belief that a CEO is one of the most crucial figures to define the organizational norm and is a forerunner for cultural revision. As a way to verify this underlying assumption, it would be interesting to investigate how a CEO plays a role in defining corporate culture. Although it is beyond the scope of this paper, this section provides some suggestive evidence by exploring cultural changes around CEO changes.

C.1. CEO Change and Post-Merger Performance

First, I explore CEO changes around merger transactions to see whether CEO replacement can be a mechanism to drive cultural integration. Table XI tests the association between CEO changes and the post-merger cultural alteration. The first row explores the indicator variable of the acquiring firm's CEO change. The variable in the second row represents whether the target firm's pre-merger CEO remains as a combined entity's executive.

Across different specifications, the first dummy variable does not provide incremental explanation on the cultural integration. On the other hand, the coefficient estimates on the second row are larger and statistically more significant.

Overall, the analysis implies that the combined firm could be more successful in integrating two cultures by retaining the CEO of the newly integrated entity. As a mechanism to blend two cultures, both CEOs of two entities remained in the merged firm. The incumbent CEOs were associated with a higher post-merger cultural integration. Although it is beyond the scope of this paper, this finding also suggests that CEO is a crucial figure in establishing corporate culture.

C.2. Cultural Change around CEO Replacement

This section investigates cultural changes around CEO replacement in general. I first start with any CEO replacement for the period 2012 - 2016. ExecuComp yields 1,035 observations. For each CEO replacement episode in year t, I collect CEO letters written by the incumbent CEO at $(t-1)$ and the new CEO at t and $(t+1)$ to construct the cosine similarities of two letters in consecutive years: $\text{Similarity}_{(t-1),t}$ and $\text{Similarity}_{t,(t+1)}$.

First, I compare $\text{Similarity}_{(t-1),t}$ and $\text{Similarity}_{t,(t+1)}$. In that way, I can study how similar corporate culture was in the subsequent year, depending on whether the firm had the same CEO or not. The mean value of $\text{Similarity}_{(t-1),t}$ is 0.586. And the mean of $\text{Similarity}_{t,(t+1)}$ is 0.624. The latter is statistically significantly larger than the former by having t-statistics as 3.436. This implies that corporate culture evolved faster with CEO change.

Next, Table XII investigates potential factors which amplify or mitigate an association between a new CEO and cultural change. The unit of observation is a CEO replacement event. Due to missing variables, the total number of observations is 450, out of 1,035. I explore Pearson correlations between various firm specifications and $\text{Similarity}_{(t-1),t}$. Columns (1) - (6) investigate the idea that CEO styles or characteristics can be an important determinant in cultural change. Although it is not statistically significant, the positive coefficient in column (1) suggests that if a firm had a new CEO in the same gender, the culture did not change much. And in column (5), the positive estimate is the most significant when a female CEO replaced another female. Column (6) weakly implies that if a firm recruited a new CEO from one of the incumbent executives, it experienced less cultural change.

Although a CEO might play a role in infusing different culture, corporate culture was not solely defined by her. If a firm was well-established, then a CEO can only impose limited power to initiate cultural change. This is either because the incumbent culture is rigid or because a CEO does not need to replace well-performing culture. In columns (7) - (13), Pearson correlation coefficients between the similarity measure and the proxies for the firm size and profitability are positive and statistically significant. They suggest that a new CEO did not deviate from the existing culture if the size of the firm was big and if the firm performed well.

While the results in this section present some interesting insights, they should be interpreted

as correlations, not causality. Also, this analysis is not to present any long-term impact from CEO replacement, rather to suggest instant influence.

VI.   Conclusion

Business practitioners advocate that corporate culture is one of the key determinants for corporate performance and successful mergers. Despite the importance of the topic and call for the research evidence, the academic attempts to understand the role of corporate culture in the M&A market has just been started.

As the shared assumptions, values, and beliefs, corporate cultures help employees understand which behaviors are appropriate. Since this shared assumption is not written in formal documents, outsiders can only infer corporate culture from other sources. In this paper, I test the value of CEO letters as a measure of culture by examining a number of critical issues related to mergers: (i) Do firms seek partners with similar cultures? (ii) Does cultural integration benefit the combined entity? (iii) Does the capital market favor mergers with similar cultures?

The paper contributes to the growing literature studying corporate culture by providing a novel approach to measure time-varying firm-level culture. Benefited by this measure, this paper is one of the first works that show the corporate culture is related to merger outcomes in a meaningful way. The findings suggest that cultural difference deters firms' restructuring activities and decreases the acquirers' shareholder wealth. It also shows that the post-merger performance of combined firms is strongly associated with corporate culture integration. Collectively, this paper demonstrates that the similarity in CEO voice in their letters can be another important factor determining merger success and synergy realization.

Appendix A.   Example of 10-K Filing and Annual Report

This is the example of 10-K filing and annual report of AT&T Inc. for the fiscal year 2016. Panel A presents the first two pages of 10-K filings, collected from the SEC EDGAR. Panel B displays the first two pages of annual report, collected from the company's website.

Panel A: 10-K filing

Panel B: Annual report

Appendix B. Example of CEO Letter Classified in LDA Type 1 (Collaborative Culture)

This is an excerpt from the CEO letter of Chesapeake Energy Corporation from the 2006 annual report. Chesapeake Energy Corporation is classified as a firm with collaborative culture according to LDA topic analysis.

People

First and foremost, Chesapeake is a people company – our employees work creatively and enthusiastically for our shareholders to profitably produce an environmentally superior product millions of Americans rely on every day. In 2000, Chesapeake was one of the first companies to recognize that after 15 years of downsizing, the E&P industry was not prepared to meet the rising demand for natural gas. The average age of a petroleum geoscientist, landman or engineer in the U.S. is now more than 50 years and after a five-year increase in energy prices, the country is still graduating fewer than 3,500 petroleum geoscientists and engineers per year (compared to almost 44,000 new lawyers each year). Retirements are estimated to be running at almost the same level as new graduates are entering the industry, and these retirements will accelerate in the next 15 years as today's average-aged geoscientist, landman and engineer reaches traditional retirement age.

Because of Chesapeake's early recognition of this looming shortage of industry talent, we began aggressively hiring young technical talent. We now employ more than 200 degreed geoscientists, landmen and engineers under the age of 35, and the average age of our geoscience, land and engineering departments has dropped from 49 in 2000 to 40 today. Talent creates value and our company has an abundance of talented people creating value every day. Chesapeake now employs nearly 1,100 employees in its geoscience, land and engineering departments, of which 70% are degreed professionals.

In total, the company has approximately 5,000 employees, of whom approximately 60% work in our E&P operations and 40% work in our oilfield service operations. Chesapeake's people are a highly valued (and much coveted) resource and we are proud they have chosen our company as their professional home. Continuing a tradition we started in 1994, a complete list of our employees sorted by the year they joined the company begins on page 28 of this report.

Appendix C.   Example of CEO Letter Classified in LDA Type 2 (Innovative Culture)

This is an excerpt from the CEO letter of Eli Lilly and Company from the 2009 annual report. Eli Lilly and Company is classified as a firm with innovative culture according to LDA topic analysis.

Reinventing invention at Lilly

To build and accelerate our pipeline, we're innovating around innovation like no one else in the industry. We've moved beyond pilots and are now scaling up new models across our R&D enterprise.

We're accelerating the transition I described in my letter last year, from a fully integrated pharmaceutical company to a fully integrated pharmaceutical network, or FIPNet. Through FIPNet, we're building additional R&D capacity that leverages what we do well, while attracting molecules, funding, and expertise from partners.

For example, in June we launched Lilly's Phenotypic Drug Discovery Initiative—or "PD^2"—where Lilly tests, free of charge, compounds submitted by outside researchers in four assays representing diseases of interest to us. In return, we retain first rights to negotiate a collaboration or licensing agreement with the submitters. Since the launch of this initiative, 130 universities and biotechs in 21 countries have joined the program, and we're now evaluating literally thousands of molecules.

A key part of FIPNet is Chorus, our virtual development team charged with getting to clinical proof of concept—which is early evidence that a drug works in humans—more efficiently.

Chorus is managing a steady state of 15 molecule programs with a dedicated staff of only 29 scientists. This cross-disciplinary group designs, interprets, and oversees the development work through a network of organizations outside Lilly walls. Because of the lean development model used, Chorus is able to reach proof of concept about 12 months earlier and at half the cost compared to the current industry model. So far, Chorus has delivered data on 14 molecules, six of which resulted in positive proof-of-concept decisions, saving Lilly approximately $100 million.

In December we announced the next step in extending this model. We have established a new venture fund, which will enable the acquisition of high-quality

Appendix D. Example of CEO Letter Classified in LDA Type 3 (Customer-Centric Culture)

This is an excerpt from the CEO letter of Omnicare Corporation from the 2008 annual report. Omnicare Corporation is classified as a firm with customer-centric culture according to LDA topic analysis.

we made operationally as well as financially during the year.

Since mid-2007, we put in place new sales management, nearly doubled the size of the sales force and initiated programs to enhance the effectiveness of our sales team. We have also invested in training and increased incentives for our pharmacy operations designed to increase net bed growth and have added marketing resources to reinforce the value proposition that Omnicare brings to its customers. The results have been encouraging. In fact, new contract signings in 2008 were 30% higher than in the prior year.

We recognize the value of complementing our effective sales force with a service-minded customer retention group. We doubled the size of this specialized retention team in 2008 and our

investment produced substantial returns. This group retained approximately 48,000 beds, or more than triple the number of beds it retained in the prior year. Moreover, these client accounts represented approximately $250 million in annualized revenues retained, or 4% of total pharmacy services revenues. We plan to continue adding high-caliber individuals to this team to support our retention and renewal efforts in 2009.

Our retention team has been running in tandem with our organization-wide effort to enhance service levels. We have invested in training and development programs for a wide range of our employees who interface with customers in a number of different ways. In addition to our focus on organic growth, we have the most active acquisition program in the industry, and 2008 was no

LEVERAGING OUR OPERATIONAL STRENGTHS

Throughout 2008, we implemented strategies and made investments in initiatives that we believe will drive growth, improve profitability and enhance shareholder value. The results of these efforts were reflected in the substantial progress

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Figure 1.
Histogram of Number of Words in CEO Letter

This figure illustrates the frequency distribution of unique words in CEO letters of the buyers, the targets, and the control target firms.
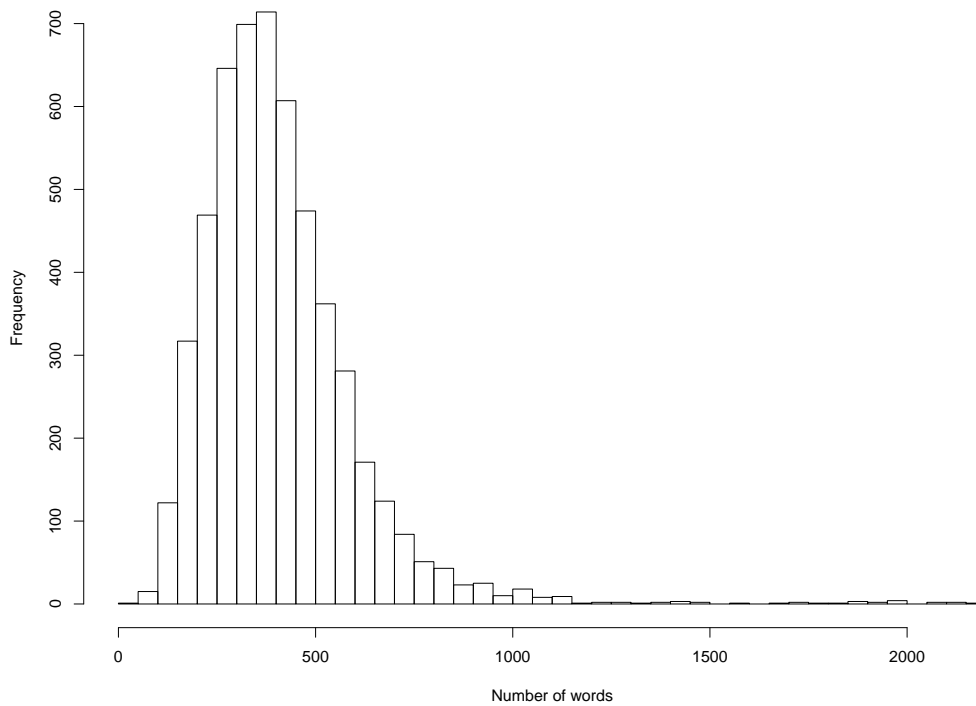
Figure 2.
LDA Analysis Illustration

This figure illustrates the technical process of LDA analysis.

Figure 3.
Word Cloud

This figure illustrates the word cloud of unique words in CEO letters of the buyers, the targets, and the control target firms. Figure (a) includes CEO letters of every sample firms. Figures (b) - (d) include unique words belonging to topic 1, topic 2, and topic 3.

(a) Words in CEO Letter

(b) Words in LDA Type 1 (Collaborative Culture)

(c) Words in LDA Type 2 (Innovative Culture)

(d) Words in LDA Type 3 (Customer-Centric Culture)

Figure 4.
Similarity in CEO Letters and Buyer's Announcement Return

This figure illustrates the scatter plots of the cumulative abnormal return of buyers around the merger announcement and the similarity measures, accompanied with linear approximations. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The y-axis is the cumulative abnormal return of buyers around the merger announcement. The x-axis is the similarity measures for M&A at t. It represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0, 1)$. Figure (a) uses cumulative abnormal return over the three-day window around the merger announcement. Figure (b) uses cumulative abnormal return over the five-day window around the merger announcement.
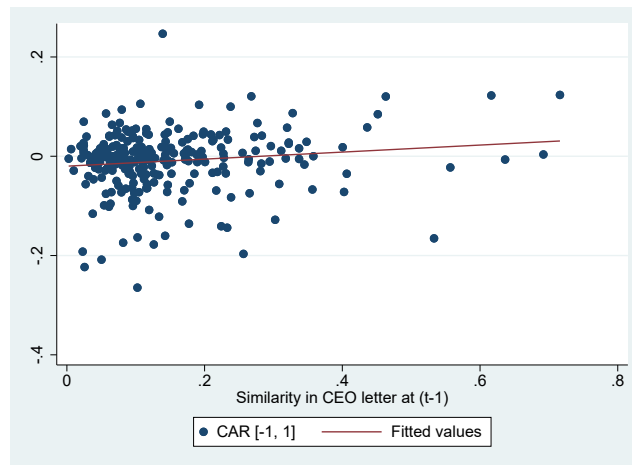
(a) CAR over the Three-day Window
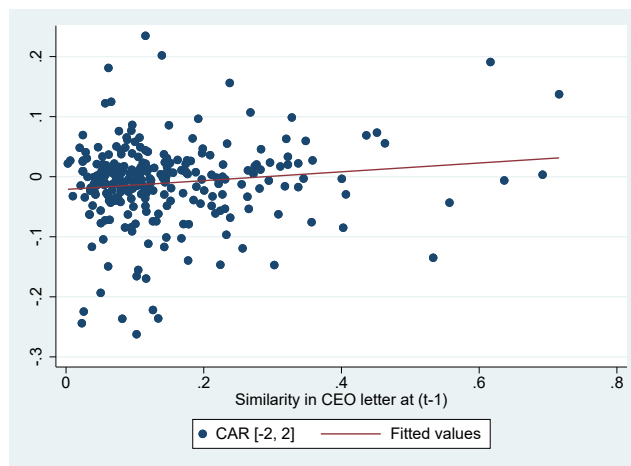
(b) CAR over the Five-day Window

Table I
Summary Statistics

This table summarizes firm-year specific covariates in M&A transactions during the period 2004 - 2016. The unit of observation is a public merger, of which both buyer and target are matched to COMPUSTAT and CRSP. Panel A compares the observations with and without similarity measures. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. Panel B exhibits the examples of matched target and pseudo-target firms, which I can collect both of the firms' CEO letters and have the highest merger transaction values. Panel C compares target firms and control firms, which are matched to target firms, using industry, total assets, sales, and market value. Columns (1) and (2) represent the mean value of each group. Column (3) shows the mean difference between two groups with statistical significance indicators. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. Panel D displays Pearson correlation coefficients between pair-wise similarity between the acquirer and the (pseudo-)target, including (1) the cosine-similarity between every word in two CEO letters, (2) the cosine-similarity between words in two CEO letters, excluding terms mentioned in the 10-K business description, (3) the cosine-similarity of LDA topic distribution across three topics in two CEO letters, (4) a dummy variable indicating whether two CEO letters have the highest probability mass on the same topic out of three topics, (5) the text-based product similarity measure (Hoberg and Phillips (2010, 2016)), (6) the buyer's text-based vertical related measure to the target (Hoberg and Phillips (2016)), and (7) the target's text-based vertical related measure to the buyer (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: M&A Transactions with and without Similarity Measure

	With Data Mean (1)	Without Data Mean (2)	Difference (3)
Buyer's vertical upstream potential relatedness to target	0.01	0.01	−0.00
Buyer's Log(Total Assets)	9.99	8.74	−1.25***
Buyer's Log(Sale)	8.96	7.61	−1.35***
Buyer's Log(Market Value)	9.55	8.19	−1.36***
Buyer's Book to Market	0.56	0.54	−0.02
Target's vertical upstream potential relatedness to buyer	0.01	0.01	−0.00
Target's Log(Total Assets)	8.47	6.96	−1.51***
Target's Log(Sale)	7.48	5.91	−1.57***
Target's Log(Market Value)	8.05	6.53	−1.52***
Target's Book to Market	0.57	0.58	0.01
Log(Buyer's Total Assets/Target's Total Assets)	1.90	2.05	0.16
Log(Buyer's Sale/Target's Sale)	1.85	1.99	0.14
Log(Buyer's Market Value/Target's Market Value)	1.91	2.10	0.19*
Number of observation	297	506	

Panel B: Example of Matched Target and Pseudo-Target Firm

Deal Year	Deal Value ($ bil)	Target	Target SIC	Pseudo-Target	Pseudo-Target SIC
2016	79.41	Time Warner Inc	4888	Rogers Communications	4812
2004	66.75	Disney (Walt) Co	4888	At&T Corp	4813
2015	55.64	Time Warner Cable Inc	4841	Liberty Global Plc	4841
2004	38.98	Nextel Communications Inc	4812	Telmex-Telefonos de Mexico	4813
2005	35.4	Burlington Resources Inc	1311	Conocophillips	1311
2014	35.27	Baker Hughes Inc	1381	Canadian Natural Resources	1311
2005	27.86	Guidant Corp	3841	Garmin Ltd	3812
2015	27.54	Norfolk Southern Corp	4011	CSX Corp	4011
2006	26.29	Caremark RX Inc	5912	Medco Health Solutions Inc	5912
2006	25.83	Phelps Dodge Corp	3330	Essar Steel Algoma Inc	3312
2010	23.9	Genzyme Corp	2836	CF Industries Holdings Inc	2870
2011	18.08	Goodrich Corp	3728	Boeing Co	3721
2006	16.61	Caesars Entertainment Corp	7990	MGM Resorts International	7990
2008	15.51	Rohm and Haas Co	2821	Newmarket Corp	2860
2015	15.44	Jarden Corp	3089	Nike Inc	3021
2015	13.57	Starwood Hotels&Resorts World	7011	Hilton Worldwide Holdings	7011
2004	12.29	Public Service Enterprise Group Inc	4931	TC Energy Corp	4922
2005	11.3	Constellation Energy Group Inc	4931	Duke Energy Corp	4931
2004	10.9	Sears Roebuck & Co	5311	Macy's Inc	5311
2007	9.75	Trane Inc	3585	LAM Research Corp	3559
2016	9.31	Valspar Corp	2851	Glaxosmithkline Plc	2834
2014	9.16	Family Dollar Stores	5331	Macy's Inc	5311
2007	8.64	Commerce Bancorp Inc	6020	National City Corp	6020
2016	8.2	B/E Aerospace Inc	2531	Knoll Inc	2522
2007	7.95	Navteq Corp	7370	Global Payments Inc	7374
2015	7.94	Southern Co Gas	4924	Pinnacle West Capital Corp	4911
2006	7.42	Keyspan Corp	4931	Uns Energy Corp	4911
2016	6.85	Great Plains Energy Inc	4911	Black Hills Corp	4911
2012	6.45	Freeport McMoRan Oil&Gas	1311	Canadian Natural Resources	1311
2004	6.33	Caesars Entertainment Inc	7990	MGM Resorts International	7990

Panel C: Target and Pseudo-Target Firm

	Target Firms Mean	Pseudo-Target Firms Mean	Difference
	(1)	(2)	(3)
Log (Total Assets)	7.45	7.48	0.02
Log (Sale)	6.44	6.46	0.03
Log (Market Value)	6.97	7.06	0.09

Panel D: Correlation in Pair-Wise Similarity Measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Similarity in CEO letter, including every word	1.00						
(2) Similarity in CEO letter, excluding words in 10-K business description	0.22***	1.00					
(3) Similarity in LDA topic distribution	0.09	0.18**	1.00				
(4) Dummy = 1 if having the same highest LDA topic	0.02	0.08	0.80***	1.00			
(5) Text-Based Network Industries similarity score	0.25***	0.10	0.06	−0.13*	1.00		
(6) Buyer's vertical upstream potential relatedness to target	−0.00	0.08	−0.06	−0.07	0.09	1.00	
(7) Target's vertical upstream potential relatedness to buyer	−0.02	0.10	−0.03	−0.04	0.08	0.97***	1.00

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table II
Bayesian Topic Modeling using Latent Dirichlet allocation (LDA)

This table shows the empirical analysis using the LDA approach. For panels A, B, C, and D, the unit of observation is a CEO letter for buyers, targets, and pseudo-targets. Panel A reports the coherence scores for LDA analysis for different choice of the number of topics. Panel B shows the top 20 keywords for each of three topics, constructed by LDA mechanism. Panel C exhibits the autocorrelation of LDA topic assignment at year t and the following five years. Row (1) is the autocorrelation of the topic type with the highest probability mass. Row (2) - (4) is the autocorrelation of the probabilities assigned to type 1, type 2, and type 3, respectively. Panel D presents the industrial distribution over two-digit SIC code of the firms which are assigned to the topic with the highest probability mass. Panel E summarizes firm specifications of those assigned firms. Panel F compares the firm specifications of the firms which are assigned to the topic with the highest probability mass. Column (1) shows the mean difference between the type 1 firms and the type 2 firms with statistical significance indicators. Column (2) shows the mean difference between the type 2 firms and the type 3 firms with statistical significance indicators. Column (3) shows the mean difference between the type 3 firms and the type 1 firms with statistical significance indicators. Financial data is collected from COMPUSTAT. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: Topic Number and Coherence Score

Topic Number	Coherence Score	Ranking
2	0.267	3
3	0.291	1
4	0.280	2
5	0.237	4
6	0.211	6
7	0.210	7
8	0.205	9
9	0.228	5
10	0.205	9
11	0.197	14
12	0.202	11
13	0.193	16
14	0.199	13
15	0.202	11
16	0.197	14
17	0.206	8
18	0.183	18
19	0.188	17
20	0.162	19

Panel B: Top 20 Keywords

Topic Description	Type 1 Collaborative Culture (1)	Type 2 Innovative Culture (2)	Type 3 Customer-Centric Culture (3)
	percent	network	year
	strong	financi	million
	team	percent	growth
	sharehold	signific	continu
	peopl	fiscal	custom
	challeng	profit	product
	great	first	new
	build	effici	compani
	help	benefit	market
	today	offi	increas
	grow	phone	improv
	leadership	grew	invest
	last	confid	valu
	work	liberti	posit
	best	effect	bank
	money	billion	revenu
	grew	excit	success
	just	transform	share
	goal	strong	servic
	cultur	great	oper

Panel C: Autocorrelations of LDA Corporate Culture Type

	(1)				
	Year $t+1$	Year $t+2$	Year $t+3$	Year $t+4$	Year $t+5$
(1) LDA Type	0.51***	0.43***	0.43***	0.34***	0.27***
(2) LDA Probability assigned to Type 1	0.65***	0.54***	0.50***	0.49***	0.44***
(3) LDA Probability assigned to Type 2	0.69***	0.61***	0.55***	0.58***	0.54***
(4) LDA Probability assigned to Type 3	0.63***	0.57***	0.52***	0.40***	0.35***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel D: Industry Description for Each Topic

Industry Description	Type 1 Collaborative Culture		Type 2 Innovative Culture		Type 3 Customer-Centric Culture		Total	
	No.	%	No.	%	No.	%	No.	%
Agriculture, Forestry, and Fishing (SIC 01 - 09)	1	50.0	1	50.0	0	0	2	100
Mining (SIC 10 - 14)	138	77.1	22	12.3	19	10.6	179	100
Construction (SIC 15 - 17)	19	90.5	0	0	2	9.5	21	100
Manufacturing (SIC 20 - 39)	847	67.4	334	26.6	75	6	1,256	100
Transportation and Public Utilities (SIC 40 - 49)	320	60.3	170	32	41	7.7	531	100
Wholesale Trade (SIC 50 - 51)	52	85.2	6	9.8	3	4.9	61	100
Retail Trade (SIC 52 - 59)	112	61.2	46	25.1	25	13.7	183	100
Finance, Insurance, and Real Estate (SIC 60 - 67)	849	84.1	99	9.8	62	6.1	1,010	100
Services (SIC 70 - 89)	277	66.7	126	30.4	12	2.9	415	100
Nonclassifiable Establishments (SIC 99)	20	64.5	4	12.9	7	22.6	31	100
Total	2,635	71.4	808	21.9	246	6.7	3,689	100

Panel E: Firm Specification for Each Topic

Topic Description	Type 1 Collaborative Culture		Type 2 Innovative Culture		Type 3 Customer-Centric Culture		Total	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Log (Total Assets)	8.56	2.13	8.47	1.94	8.44	2.36	8.53	2.10
Log (Sale)	7.53	2.17	7.85	2.01	7.56	2.35	7.60	2.15
Log (Market Value)	8.06	2.04	8.48	1.90	8.00	2.24	8.15	2.03
Book to Market	0.59	0.70	0.45	0.48	0.61	0.42	0.56	0.65
Age	27.81	18.52	25.44	16.88	33.72	18.34	27.68	18.26
ROA	0.01	0.14	0.03	0.14	0.31	2.94	0.04	0.77

Panel F: t-Statistics Comparing types

	(Type 1)-(Type 2)	(Type 2)-(Type 3)	(Type 3)-(Type 1)
Log (Total Assets)	0.10	0.03	-0.12
Log (Sale)	-0.32***	0.30*	0.03
Log (Market Value)	-0.41***	0.47***	-0.06
Book to Market	0.14***	-0.16***	0.02
Firm age	2.37***	-8.28***	5.91***
ROA	-0.01**	-0.28***	0.29***

Table III
LDA Topic Culture and CEO & Firm Characteristics

This table displays Pearson correlation coefficients between LDA topic distribution and various CEO and firm characteristics. LDA analysis assigns each CEO letter with probabilities on three topics. The variable of interest is indicated at the top of the table. The unit of observation is a CEO letter of buyers, targets, and pseudo-targets around the years of merger transactions that occurred during the period 2004 - 2016. Panel A shows the correlation coefficients on CEO characteristics. CEO and executive compensation data are collected from Compustat Executive dataset. CEO's relative compensation is CEO compensation divided by the average compensation of executives or by sales amount. Panel B shows the innovation activity, using R&D intensity, and the sum of new patent value. R&D intensity is measured by research and development expense, scaled by total asset. Patent data is collected by Stoffman et al. (2019). Panel C shows a firm's customer relationship, using the American Customer Satisfaction Index (ACSI) score and brand value. ACSI score is collected from www.theacsi.org. And I collect the brand value from www.interbrand.com. I manually match the company name to the GVKEY universe. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: CEO Characteristics

	(1)	(2)	(3)	(4)
	Dummy = 1 if female CEO	CEO age	CEO compensation relative to other executives compensation	CEO compensation, divided by sales
Probabilities assigned to collaborative culture	0.02	0.06**	−0.10***	0.01
Probabilities assigned to innovative culture	−0.01	−0.07***	0.13***	0.03
Probabilities assigned to customer-centric culture	−0.03	−0.00	−0.05*	−0.06**

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Innovation Activity

	(1) R&D intensity	(2) Sum of new patents value
Probabilities assigned to collaborative culture	0.03	0.00
Probabilities assigned to innovative culture	0.06**	0.03
Probabilities assigned to customer-centric culture	−0.17***	−0.06*

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel C: Customer Relationship

	(1) ACSI score	(2) Brand value (in billion)
Probabilities assigned to collaborative culture	0.01	−0.06
Probabilities assigned to innovative culture	−0.12	0.09
Probabilities assigned to customer-centric culture	0.21*	−0.07

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IV
Similarity in CEO Letters and Likelihood of Being Targeted

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is a dummy variable to indicate whether the company pair is merged. The control target is constructed by matching the target firm, using industry, total assets, sales, and market value. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. In columns (1) and (2), the similarity measure incorporates every word from CEO letters. In columns (3) and (4), words mentioned in the 10-K business description are excluded when the similarity measure is constructed. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	Similarity including every word		Similarity excluding words in 10-K business description	
	(1)	(2)	(3)	(4)
Similarity in CEO letter at $(t-1)$	0.792***	0.793***	0.682**	0.597**
	(0.223)	(0.221)	(0.283)	(0.298)
Buyer's vertical upstream potential relatedness to target		−15.644		−26.015*
		(11.633)		(14.302)
Buyer's Log (Total Assets)		−0.033		−0.046
		(0.053)		(0.063)
Buyer's Log (Sale)		−0.025		−0.045
		(0.043)		(0.050)
Buyer's Log (Market Value)		0.071		0.119*
		(0.052)		(0.066)
Buyer's Book to Market		0.255***		0.343***
		(0.085)		(0.094)
Target's vertical upstream potential relatedness to buyer		11.312		29.784**
		(11.679)		(14.199)
Target's Log (Total Assets)		0.041		−0.009
		(0.038)		(0.042)
Target's Log (Sale)		−0.012		−0.005
		(0.033)		(0.037)
Target's Log (Market Value)		−0.013		0.003
		(0.037)		(0.040)
Target's Book to Market		−0.071		−0.058
		(0.084)		(0.093)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	464	389	305	291
Adjusted R^2	0.025	0.036	0.027	0.031

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table V
LDA Topic Similarity and Likelihood of Being Targeted

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is a dummy variable to indicate whether the company pair is merged. The control target is constructed by matching the target firm, using industry, total assets, sales, and market value. Panel A compares the target and the matched control in terms of the distribution over the LDA topic. A firm is assigned to one of the LDA topics with the highest probability. In panel B, the similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, in terms of topical distribution. In columns (1) and (2), the main explanatory variable is the cosine similarity of LDA topic distribution across three topics. In columns (3) and (4), the main explanatory variable is a dummy variable, which represents whether the buyer and the target have the highest probability mass on the same topic out of three topics. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). The financial controls include the buyer's and the target's vertical upstream potential relatedness to the counterparty, the logarithm of total assets, the logarithm of sales, and the logarithm of market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: LDA Topic Distribution across Target and Control-Target Firms

Target LDA Type	Pseudo-Target Firm			Target Firm			Total		
	No.	%	%	*No.*	%	%	*No.*	%	%
Type 1 (Collaborative Culture)	110	78.6	50.5	108	77.1	49.5	218	77.9	100.0
Type 2 (Innovative Culture)	19	13.6	51.4	18	12.9	48.6	37	13.2	100.0
Type 3 (Customer-Centric Culture)	11	7.9	44.0	14	10.0	56.0	25	8.9	100.0
Total	140	100.0	50.0	140	100.0	50.0	280	100.0	100.0

Panel B: LDA Topic Similarity and Likelihood of Being Targeted

	Similarity in LDA topic distribution		Dummy $= 1$ if having the same highest LDA topic	
	(1)	(2)	(3)	(4)
Similarity in LDA topic at $(t-1)$	0.189*	0.201*	0.137**	0.131*
	(0.099)	(0.104)	(0.065)	(0.068)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Financial Controls	Yes	Yes	Yes	Yes
Observations	305	291	305	291
Adjusted R^2	0.027	0.036	0.030	0.036

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VI
Merger Volume and Mechanism Test

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is a dummy variable to indicate whether the company pair is merged. The control target is constructed by matching the target firm, using industry, total assets, sales, and market value. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. Potential mechanisms are measured by three proxies and indicated at the top of the table. Columns (1) and (2) use the target firm's labor intensity. Labor intensity is calculated as the number of employment, divided by property, plant, and equipment. The relevant variables are compiled from COMPUSTAT. Columns (3) and (4) use the logarithm of the number of business segments of target firms, divided by the market value. The number of business segments is compiled from COMPUSTAT Segments. The financial controls include the buyer's and the target's vertical upstream potential relatedness to the counterparty, the logarithm of total assets, the logarithm of sales, and the logarithm of market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	Target's labor intensity		Target's business segment	
	(1)	(2)	(3)	(4)
Similarity in CEO letter at $(t-1)$	0.551*	0.403	0.381	0.417
	(0.295)	(0.306)	(0.372)	(0.419)
Mechanism	−0.285	−0.324	−17.183*	−21.765
	(0.586)	(0.666)	(9.119)	(14.633)
Similarity in CEO letter at $(t-1)$	8.411*	9.973*	150.714*	190.922*
× Mechanism	(4.313)	(5.126)	(89.875)	(113.423)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes
Observations	286	272	220	209
Adjusted R^2	0.023	0.030	0.035	0.066

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VII
Change of Similarity in CEO Letters and Post-Merger Performance

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is the post-merger performance. In panel A, change in similarity measures for M&A at t represent how much an acquiring firm's CEO letter at $(t+1)$ becomes similar to a target firm's CEO letter at $(t-1)$, scaled by the similarity at $(t-1)$. In panel B, similarity change is scaled by the natural logarithm of the relative asset size of the buyer and the target. Columns (1) and (2) use the change in Tobin's Q to measure post-merger performance. Columns (3) and (4) use the change in return on assets to measure post-merger performance. Columns (5) and (6) use the change in SG&A and sales ratio to measure post-merger performance. The financial controls include the buyer's and the target's vertical upstream potential relatedness to the counterparty, the logarithm of total assets, the logarithm of sales, and the logarithm of market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: Before Considering Relative Size

	Change in Tobin's Q		Change in ROA		Change in SG&A and sales ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Change in CEO letter similarity	0.012***	0.013***	0.101***	0.094***	−0.029*	−0.030**
	(0.001)	(0.002)	(0.016)	(0.034)	(0.016)	(0.013)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes	No	Yes
Observations	211	210	211	210	130	130
Adjusted R^2	0.299	0.359	0.030	0.079	0.056	0.214

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel B: After Considering Relative Size

	Change in Tobin's Q		Change in ROA		Change in SG&A and sales ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Change in CEO letter similarity	0.006***	0.007***	0.053***	0.049***	−0.002*	−0.001
	(0.001)	(0.001)	(0.008)	(0.016)	(0.001)	(0.001)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes	No	Yes
Observations	211	210	211	210	130	130
Adjusted R^2	0.297	0.352	0.030	0.079	0.061	0.118

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VIII

Change of Similarity in CEO Letters and Post-Merger Divestiture

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is the dummy to indicate whether the acquiring firms undergo any divestiture or spin-off in the first year after the M&A transaction. In columns (1) and (2), change in similarity measures for M&A at t represents how much an acquiring firm's CEO letter at $(t+1)$ becomes similar to a target firm's CEO letter at $(t-1)$, scaled by the similarity at $(t-1)$. In columns (3) and (4), similarity change is scaled by the natural logarithm of the relative asset size of the buyer and the target. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	Change in similarity before considering relative size		Change in similarity after considering relative size	
	(1)	(2)	(3)	(4)
Change in CEO letter similarity	−0.010**	−0.012**	−0.005**	−0.005**
	(0.004)	(0.005)	(0.002)	(0.002)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes
Observations	211	210	211	210
Adjusted R^2	0.016	-0.005	0.012	0.009

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table IX
Similarity in CEO Letters and Buyer's Announcement Return

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is the cumulative abnormal return of buyers around the merger announcement. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. Columns (1) and (2) use cumulative abnormal return over the three-day window around the merger announcement. Columns (3) and (4) use cumulative abnormal return over the five-day window around the merger announcement. The financial controls include the ratio of transaction value to buyer's market value, the buyer's and the target's vertical upstream potential relatedness to the counterparty, the logarithm of total assets, the logarithm of sales, and the logarithm of market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	CAR[-1,1]		CAR[-2,2]	
	(1)	(2)	(3)	(4)
Similarity in CEO letter at $(t-1)$	0.055	0.140**	0.072**	0.079
	(0.034)	(0.056)	(0.037)	(0.071)
Financial Controls	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	232	75	232	75
Adjusted R^2	0.055	0.189	0.004	0.080

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table X

Buyer's Announcement Return and Mechanism Test

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is the cumulative abnormal return of buyers over the three-day window around the merger announcement. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. In panel A, the target's information asymmetry level is measured by three proxies and indicated at the top of the table. Columns (1) and (2) use the natural logarithm of the number of analyst following. Columns (3) and (4) use the standard deviation in analyst forecasts on EPS. Columns (5) and (6) use the analyst forecasts error in EPS, scaled by the actual EPS. I collect the data on the analyst forecasts from IBES database. In panel B, the buyer's agency costs are measured by the inverse of incentive alignment between the shareholders and the management team, which are measured by three proxies and indicated at the top of the table. Columns (1) and (2) use the percentage of managerial equity ownership. Columns (3) and (4) use the stock option values granted to executives. Columns (5) and (6) use the long-term incentive payouts for the management team. I collect the data on the executives' compensation from the ExecuComp database. The financial controls include the buyer's and the target's vertical upstream potential relatedness to the counterparty, the logarithm of total assets, the logarithm of sales, and the logarithm of market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: Information Asymmetry

	Log (Number of analyst following)		Standard deviation in analyst forecasts		Analyst forecast error	
	(1)	(2)	(3)	(4)	(5)	(6)
Similarity in CEO letter at $(t-1)$ ×	−0.104**	−0.115**	0.172**	0.167**	0.022	0.020
Information asymmetry	(0.052)	(0.054)	(0.068)	(0.079)	(0.014)	(0.016)
Similarity in CEO letter at $(t-1)$	Yes	Yes	Yes	Yes	Yes	Yes
Mechanism Variable	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes	No	Yes
Observations	192	191	172	171	187	186
Adjusted R^2	0.062	0.058	0.046	0.026	0.037	0.026

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Agency Costs

	Percentage of total shares owned		Options granted black scholes		Long-term incentive plan payouts	
	(1)	(2)	(3)	(4)	(5)	(6)
Similarity in CEO letter at $(t-1)$	0.002	0.002	0.003	0.000	−0.017	−0.026
× Incentive alignment	(0.005)	(0.006)	(0.011)	(0.011)	(0.018)	(0.016)
Similarity in CEO letter at $(t-1)$	Yes	Yes	Yes	Yes	Yes	Yes
Mechanism Variable	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes	No	Yes
Observations	189	187	189	187	189	187
Adjusted R^2	0.051	0.124	0.053	0.124	0.061	0.140

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table XI
Change of Similarity and CEO Changes

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is indicated at the top of the table. In columns (1) and (2), change in similarity measures for M&A at t represents how much an acquiring firm's CEO letter at $(t+1)$ becomes similar to a target firm's CEO letter at $(t-1)$, scaled by the similarity at $(t-1)$. In columns (3) and (4), similarity change is scaled by the natural logarithm of the relative asset size of the buyer and the target. The dummy variable for CEO replacement equals to one if the acquirer's CEO leave the company during the merger year or the following year. The dummy variable related to the target firm's CEO equals to one if the target firm's CEO at $(t-1)$ stays in the combined firm as an executive as of $(t+1)$. The financial controls include the buyer's and the target's vertical upstream potential relatedness to the counterparty, the logarithm of total assets, the logarithm of sales, and the logarithm of market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	Change in similarity before considering relative size		Change in similarity after considering relative size	
	(1)	(2)	(3)	(4)
Dummy = 1 if acquiring firm replaces CEO during t or $t+1$	0.045	0.099	−0.099	−0.208
	(0.327)	(0.364)	(0.498)	(0.573)
Dummy = 1 if target firm's CEO stays as of $t+1$	1.296	1.456	1.528*	1.917**
	(0.923)	(0.971)	(0.872)	(0.945)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Financial Controls	No	Yes	No	Yes
Observations	141	140	141	140
Adjusted R^2	0.113	0.119	0.173	0.157

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table XII
Cultural Change around CEO Change

This table displays Pearson correlation coefficients between the CEO letter similarity before and after a change in CEO and various CEO and firm characteristics. The unit of observation is a CEO replacement during the period 2012 - 2016, which are collected from ExecuComp database. The total number of observations is 450. Similarity measures between before and after the CEO change at t represents how close a firm's CEO letter at t is to its CEO letter at $(t-1)$, lying in the interval of $(0,1)$. CEO data on age and gender are collected from Compustat Executive dataset. COMPUSTAT database provides the financial information measured at $(t-1)$. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	(1) Dummy = 1 if replaced by same gender	(2) Dummy = 1 if male to female	(3) Dummy = 1 if male to male	(4) Dummy = 1 if female to male	(5) Dummy = 1 if female to female	(6) Dummy = 1 if replaced by insider
CEO letter similarity before and after CEO replacement	0.009	-0.002	-0.010	-0.014	0.089*	0.014

	(7) Total assets$_{t-1}$	(8) Market value$_{t-1}$	(9) Sales$_{t-1}$	(10) Tobin's Q$_{t-1}$	(11) ROA$_{t-1}$	(12) ROE$_{t-1}$	(13) ROI$_{t-1}$
CEO letter similarity before and after CEO replacement	0.018	0.083*	0.097**	0.078*	0.139***	0.146***	0.133***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Internet Appendix to
"Corporate Culture in M&As: Evidence from CEO Letters to Shareholders"

A. LDA Topic Validation Tests

There are some existing measures of corporate culture developing by previous literature. One might wonder how my measure is distinct from theirs. Table A1 provides correlations between my measure and two alternative measures of corporate culture. The purpose of this experiment is to show that the measures used in this paper are corroborated with other cultural measurements, which are developed by some reliable resources. At the same time, it will demonstrate that my measures can quantify novel aspects of corporate culture, which are not captured by other proxies.

First, Li et al. (2020) implement a word embedding model and analyze what top executives elaborate in their discussion with analysts in earnings conference calls. They create five corporate cultural values of innovation, integrity, quality, respect, and teamwork. There are both commonalities and differences between my approach and their approach. They focus on the messages delivered by top management, as I do in this paper. However, their method is distinct from mine by using CEO conversations aimed to different audiences and purposes. In conference calls, the management team and the analysts discuss the firm performance. The discussion's primary goal is to help the analysts form accurate predictions on the firm's capital market performance. Also, due to the interactive nature, the discussion is steered by analysts to address their questions. In comparison, CEO letters to shareholders have a broader audience and are scripted more carefully. Second, CEO letters allow CEOs to provide comprehensive information they want to emphasize, beyond financial performance, such as ethical values and shared goals.

Panel A tests the correlations between my LDA measure and the corporate culture measure developed by Li et al. (2020). Overall, my LDA measure and the measure developed by Li et al. (2020) seem to provide both confirming and contradicting results. The collaborative culture has positive correlations with integrity scores and respect scores. And the innovative culture is positively related to their innovation scores. However, collaborative culture is negatively associated with teamwork scores. And the customer-centric culture has a negative coefficient with quality scores.

Second, MIT Sloan Management Review provides a cultural measure for a subset of large

companies.[6] It scores nine corporate cultural values of agility, collaboration, customer-driven, diversity, execution, innovation, integrity, performance, and respect, using a data set of 1.4 million employee reviews from Glassdoor. It defines a list of words for each cultural value and calculates the percentage of a firm's reviews that discuss those words. There are several dissimilarities between my measure and MIT Sloan measure. First, my measure and MIT Sloan's measure have different underlying assumption on corporate culture. I consider corporate culture defined by the top-down approach, while MIT Sloan potentially captures the bottom-up culture. For instance, the MIT Sloan measure might help understand the corporate culture shared by employees by analyzing their anonymous comments on the firm. Second, the MIT Sloan measure does not provide time-specific measures about corporate culture, whereas my measure provides yearly measures of culture. Last, the MIT scores are based on an arbitrary word list, defined by researchers. Therefore, it might be sensitive to the their subjective choice. By using an unsupervised machine learning algorithm, I can be free from researcher-induced prejudice.

In panel B, I explore the cultural measures provided by the MIT Sloan Management Review. Like the results in panel A, my LDA measure confirms the measure developed by the MIT Sloan Management Review in some cases but also provides distinct features of the corporate culture. The collaborative culture has positive associations with collaboration scores and integrity scores. The innovative culture is positively related to agility scores and innovation scores. However, the customer-centric culture does not have a positive coefficient with customer scores.

Although cross-validating alternative corporate culture measures is beyond the scope of this paper, the internet appendix provides some analysis for the interested readers. Table A2 correlates Li et al. (2020) scores and the MIT Sloan measures.

Overall, my LDA measures correlate well with the MIT Sloan measures. In some cases, they do not seem to correlate with the Li et al. (2020) scores. This might be because we use different methods in a different context.

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[6]https://sloanreview.mit.edu/culture500/

Table A1
LDA Topic Cross-Validation

This table displays Pearson correlation coefficients between LDA topic distribution and various CEO and firm characteristics. LDA analysis assigns each CEO letter with probabilities on three topics. The variable of interest is indicated at the top of the table. The unit of observation is a CEO letter of buyers, targets, and pseudo-targets around the years of merger transactions that occurred during the period 2004 - 2016. Panel A investigates the measure developed by LDA analysis and the cultural value score developed by Li et al. (2020). Li et al. (2020) score the five corporate cultural values of innovation, integrity, quality, respect, and teamwork, using earnings conference calls. Panel B analyzes the cultural measure for some large companies, deveopled by MIT Sloan Management Review (https://sloanreview.mit.edu/culture500/). It scores the nine corporate cultural values of agility, collaboration, customer-driven, diversity, execution, innovation, integrity, performance, and respect, using a data set of 1.4 million employee reviews from Glassdoor. I manually match the corporate names to GVKEY in COMPUSTAT universe. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: Li et al. (2020) Measure

	(1) Integrity score	(2) Teamwork score	(3) Innovation score	(4) Respect score	(5) Quality score
Probabilities assigned to collaborative culture	0.16***	−0.04**	−0.27***	0.08***	−0.21***
Probabilities assigned to innovative culture	−0.13***	0.09***	0.32***	−0.05***	0.26***
Probabilities assigned to customer-centric culture	−0.05***	−0.07***	−0.06***	−0.06***	−0.06***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: MIT Sloan Culture 500 Measure

	(1) Agility score	(2) Collaboration score	(3) Customer score	(4) Diversity score	(5) Execution score	(6) Innovation score	(7) Integrity score	(8) Performance score	(9) Respect score
Probabilities assigned to collaborative culture	−0.12	0.30***	0.23***	0.09**	−0.01	−0.16***	0.12***	−0.02	0.05
Probabilities assigned to innovative culture	0.20***	−0.35***	−0.23***	−0.15***	0.04	0.21***	−0.13***	0.06*	−0.03
Probabilities assigned to customer-centric culture	−0.13***	0.07*	−0.02	0.10**	−0.06	−0.08**	0.01	−0.08**	−0.04

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2
Li et al. (2020) Scores and MIT Sloan's Scores

This table displays Pearson correlation coefficients between Li et al. (2020) score and the cultural measure for some large companies, deveopled by MIT Sloan Management Review (https://sloanreview.mit.edu/culture500/). Li et al. (2020) score the five corporate cultural values of innovation, integrity, quality, respect, and teamwork, using earnings conference calls. MIT Sloan scores the nine corporate cultural values of agility, collaboration, customer-driven, diversity, execution, innovation, integrity, performance, and respect, using a data set of 1.4 million employee reviews from Glassdoor. I manually match the corporate names to GVKEY in COMPUSTAT universe. The unit of observation is a CEO letter of buyers, targets, and pseudo-targets around the years of merger transactions that occurred during the period 2004 - 2016. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	(1) Li et al. integrity score	(2) Li et al. teamwork score	(3) Li et al. innovation score	(4) Li et al. respect score	(5) Li et al. quality score
MIT agility score	-0.11^{***}	0.03	0.23^{***}	0.02	0.20^{***}
MIT collaboration score	0.10^{***}	-0.06	-0.06^{*}	-0.07^{*}	-0.19^{***}
MIT customer score	0.21^{***}	0.05	-0.10^{***}	-0.08^{**}	-0.20^{***}
MIT diversity score	0.06^{*}	0.03	0.01	-0.03	-0.10^{***}
MIT execution score	-0.15^{***}	0.07^{*}	0.20^{***}	-0.10^{***}	0.07^{**}
MIT innovation score	-0.03	0.22^{***}	0.27^{***}	-0.03	0.26^{***}
MIT integrity score	0.04	0.01	-0.15^{***}	-0.12^{***}	-0.09^{**}
MIT performance score	-0.09^{**}	-0.04	0.10^{***}	-0.09^{**}	0.05
MIT respect score	-0.04	0.07^{**}	0.07^{*}	-0.05	-0.01

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3
Li et al. (2020) Scores and CEO & Firm Characteristics

This table displays Pearson correlation coefficients between Li et al. (2020) score and various CEO and firm characteristics. Li et al. (2020) score the five corporate cultural values of innovation, integrity, quality, respect, and teamwork, using earnings conference calls. The unit of observation is a CEO letter of buyers, targets, and pseudo-targets around the years of merger transactions that occurred during the period 2004 - 2016. Panel A shows the correlation coefficients on CEO characteristics. CEO and executive compensation data are collected from Compustat Executive dataset. CEO's relative compensation is CEO compensation divided by the average compensation of executives or by sales amount. Panel B shows the innovation activity, using R&D intensity, and the sum of new patent value. R&D intensity is measured by research and development expense, scaled by total asset. Patent data is collected by Stoffman et al. (2019). Panel C shows a firm's customer relationship, using the American Customer Satisfaction Index (ACSI) score and brand value. ACSI score is collected from www.theacsi.org. And I collect the brand value from www.interbrand.com. I manually match the company name to the GVKEY universe. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: CEO Characteristics

	(1)	(2)	(3)	(4)
	Dummy = 1 if female CEO	CEO age	CEO compensation relative to other executives compensation	CEO compensation, divided by sales
Integrity score	0.03	0.09***	−0.03	−0.01
Teamwork score	0.02	−0.05**	0.10***	0.22***
Innovation score	0.11***	−0.10***	0.14***	0.04
Respect score	−0.01	0.02	0.05**	0.06**
Quality score	0.02	−0.04	0.07***	0.02

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Innovation Activity

	(1) R&D intensity	(2) Sum of new patents value
Integrity score	0.09***	−0.12***
Teamwork score	0.41***	−0.09***
Innovation score	0.14***	0.05*
Respect score	0.04*	−0.09***
Quality score	0.12***	0.02

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel C: Customer Relationship

	(1) ACSI score	(2) Brand value (in billion)
Integrity score	−0.17***	−0.28***
Teamwork score	−0.18***	−0.04
Innovation score	0.04	0.05
Respect score	−0.19***	−0.11
Quality score	−0.30***	0.12

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4
MIT Sloan's Scores and CEO & Firm Characteristics

This table displays Pearson correlation coefficients between the cultural measure for some large companies, deveopled by MIT Sloan Management Review (https://sloanreview.mit.edu/culture500/) and various CEO and firm characteristics. It scores the nine corporate cultural values of agility, collaboration, customer-driven, diversity, execution, innovation, integrity, performance, and respect, using a data set of 1.4 million employee reviews from Glassdoor. I manually match the corporate names to GVKEY in COMPUSTAT universe. The unit of observation is a CEO letter of buyers, targets, and pseudo-targets around the years of merger transactions that occurred during the period 2004 - 2016. Panel A shows the correlation coefficients on CEO characteristics. CEO and executive compensation data are collected from Compustat Executive dataset. CEO's relative compensation is CEO compensation divided by the average compensation of executives or by sales amount. Panel B shows the innovation activity, using R&D intensity, and the sum of new patent value. R&D intensity is measured by research and development expense, scaled by total asset. Patent data is collected by Stoffman et al. (2019). Panel C shows a firm's customer relationship, using the American Customer Satisfaction Index (ACSI) score and brand value. ACSI score is collected from www.theacsi.org. And I collect the brand value from www.interbrand.com. I manually match the company name to the GVKEY universe. Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: CEO Characteristics

	(1)	(2)	(3)	(4)
			CEO	
			compensation	CEO
	Dummy = 1 if		relative to other	compensation,
	female CEO	CEO age	executives	divided by sales
			compensation	
Agility score	−0.10**	−0.14***	0.09*	0.14***
Collaboration score	−0.02	−0.25***	−0.11**	0.17***
Customer score	−0.11**	−0.03	0.03	0.25***
Diversity score	0.15***	−0.08	−0.09**	−0.11**
Execution score	0.09**	−0.15***	0.02	0.05
Innovation score	0.01	−0.06	0.22***	0.14***
Integrity score	0.01	−0.22***	−0.09**	0.04
Performance score	−0.12**	−0.14***	0.08*	0.01
Respect score	−0.03	−0.20***	−0.03	0.05

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Innovation Activity

	(1) R&D intensity	(2) Sum of new patents value
Agility score	0.36***	−0.05
Collaboration score	0.22***	−0.11**
Customer score	0.36***	−0.19***
Diversity score	0.06	0.22***
Execution score	0.31***	0.15***
Innovation score	0.30***	0.16***
Integrity score	0.30***	0.06
Performance score	0.22***	−0.15***
Respect score	0.30***	−0.02

$^{*}\ p < 0.10,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Panel C: Customer Relationship

	(1) ACSI score	(2) Brand value (in billion)
Agility score	0.28***	0.11
Collaboration score	0.51***	−0.46***
Customer score	0.67***	−0.47***
Diversity score	0.24***	0.13*
Execution score	0.43***	0.32***
Innovation score	−0.10	0.44***
Integrity score	0.40***	0.01
Performance score	0.09	−0.18**
Respect score	0.34***	−0.12*

$^{*}\ p < 0.10,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Table A5
Similarity in CEO Letters and Combined Announcement Return

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is the cumulative abnormal return of buyers and targets around the merger announcement. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. Columns (1) and (2) use cumulative abnormal return over the three-day window around the merger announcement. Columns (3) and (4) use cumulative abnormal return over the five-day window around the merger announcement. Panel A uses the simple average of two firms' cumulative abnormal returns. Panel B uses the average of two firms' cumulative abnormal returns weighted by their market value. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

Panel A: Average CAR

	Combined CAR[-1,1]		Combined CAR[-2,2]	
	(1)	(2)	(3)	(4)
Similarity in CEO letter at $(t-1)$	−0.014	0.028	−0.011	−0.055
	(0.033)	(0.199)	(0.036)	(0.209)
Ratio of transaction value to buyer's market value		−0.014		−0.103
		(0.097)		(0.104)
Dummy=1 if in different text-based industry		−0.043		−0.066
		(0.055)		(0.059)
Buyer's vertical upstream potential relatedness to target		−1.907		−2.039
		(7.103)		(7.561)
Buyer's Log (Total Assets)		−0.048		−0.039
		(0.047)		(0.047)
Buyer's Log (Sale)		0.020		0.018
		(0.029)		(0.031)
Buyer's Log (Market Value)		0.050		0.030
		(0.057)		(0.059)
Buyer's Book to Market		0.112		0.088
		(0.069)		(0.073)
Target's vertical upstream potential relatedness to buyer		3.000		4.469
		(7.812)		(8.099)
Target's Log (Total Assets)		0.044		0.047
		(0.035)		(0.035)
Target's Log (Sale)		−0.007		−0.010
		(0.021)		(0.021)
Target's Log (Market Value)		−0.071*		−0.061
		(0.036)		(0.039)
Target's Book to Market		−0.108		−0.086
		(0.076)		(0.081)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	231	75	231	75
Adjusted R^2	0.004	-0.061	0.006	-0.084

Standard errors in parentheses

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* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Weighted Average CAR

	Combined CAR[-1,1]		Combined CAR[-2,2]	
	(1)	(2)	(3)	(4)
Similarity in CEO letter at $(t-1)$	0.038	0.044	0.041	−0.024
	(0.029)	(0.056)	(0.032)	(0.076)
Ratio of transaction value to buyer's market value		−0.018		−0.083*
		(0.038)		(0.045)
Dummy=1 if in different text-based industry		−0.030		−0.063***
		(0.018)		(0.023)
Buyer's vertical upstream potential relatedness to target		2.880		1.326
		(2.332)		(3.307)
Buyer's Log (Total Assets)		−0.036**		−0.025
		(0.015)		(0.018)
Buyer's Log (Sale)		0.014		0.018
		(0.012)		(0.015)
Buyer's Log (Market Value)		0.011		−0.014
		(0.019)		(0.024)
Buyer's Book to Market		0.024*		−0.002
		(0.013)		(0.018)
Target's vertical upstream potential relatedness to buyer		−1.054		0.320
		(2.310)		(3.153)
Target's Log (Total Assets)		0.015*		0.018*
		(0.009)		(0.011)
Target's Log (Sale)		−0.006		−0.009
		(0.007)		(0.008)
Target's Log (Market Value)		0.014		0.022*
		(0.010)		(0.013)
Target's Book to Market		−0.016		−0.011
		(0.014)		(0.019)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	229	75	229	75
Adjusted R^2	0.061	0.274	0.007	0.176

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A6
Robustness Check with Different LDA Topic Number

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is a dummy variable to indicate whether the company pair is merged. The control target is constructed by matching the target firm, using industry, total assets, sales, and market value. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, in terms of topical distribution. In columns (1) and (2), the main explanatory variable is the cosine similarity of LDA topic distribution across four topics. In columns (1) and (2), the main explanatory variable is the cosine similarity of LDA topic distribution across seventy-five topics. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	Similarity in LDA topic distribution with four topics		Similarity in LDA topic distribution with seventy five topics	
	(1)	(2)	(3)	(4)
Similarity in LDA topic at $(t-1)$	0.128	0.199**	0.095	0.222*
	(0.094)	(0.099)	(0.108)	(0.117)
Buyer's vertical upstream potential relatedness to target		−25.695*		−25.233*
		(13.969)		(13.892)
Buyer's Log (Total Assets)		−0.049		−0.063
		(0.064)		(0.063)
Buyer's Log (Sale)		−0.067		−0.050
		(0.048)		(0.048)
Buyer's Log (Market Value)		0.151**		0.150**
		(0.066)		(0.066)
Buyer's Book to Market		0.364***		0.359***
		(0.093)		(0.094)
Target's vertical upstream potential relatedness to buyer		30.827**		29.642**
		(13.661)		(13.682)
Target's Log (Total Assets)		−0.003		0.003
		(0.042)		(0.042)
Target's Log (Sale)		−0.015		−0.008
		(0.038)		(0.036)
Target's Log (Market Value)		0.003		−0.008
		(0.039)		(0.040)
Target's Book to Market		−0.067		−0.076
		(0.085)		(0.086)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	319	297	319	297
Adjusted R^2	0.004	0.046	0.001	0.045

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A7
Robustness Check Including Li et al. (2020) Measure

This table shows the estimates from linear regressions using various specifications. The unit of observation is a public merger during the period 2004 - 2016, of which both buyer and target are matched to COMPUSTAT and CRSP. The outcome variable is a dummy variable to indicate whether the company pair is merged. The control target is constructed by matching the target firm, using industry, total assets, sales, and market value. Similarity measures for M&A at t represent how close an acquiring firm's CEO letter is to a target firm's CEO letter at $(t-1)$, lying in the interval of $(0,1)$. In column (1), the similarity measure incorporates every word from CEO letters. In column (2), words mentioned in the 10-K business description are excluded when the similarity measure is constructed. In column (3), the main explanatory variable is the cosine similarity of LDA topic distribution across three topics. In column (4), the main explanatory variable is a dummy variable, which represents whether the buyer and the target have the highest probability mass on the same topic out of three topics. Similarity in Li et al. (2020) measure is the cosine similarity of Li et al. (2020) cultural scores over the five corporate cultural values. Li et al. (2020) score the five corporate cultural values of innovation, integrity, quality, respect, and teamwork, using earnings conference calls. The text-based vertical relatedness measure is from the Fresard-Hoberg-Phillips data library (Frésard et al. (2019)). Financial data is collected from COMPUSTAT. I include industry fixed effects by using text-based industry groups (Hoberg and Phillips (2016)). Significance levels are indicated: * = 10 percent, ** = 5 percent, *** = 1 percent.

	Similarity including every word	Similarity excluding words in 10-K business description	Similarity in LDA topic distribution	Dummy = 1 if having the same highest LDA topic
	(1)	(2)	(3)	(4)
Similarity in CEO letter at $(t-1)$	0.835***	0.501	0.109	0.107
	(0.265)	(0.342)	(0.135)	(0.084)
Similarity in Li et al. measure at $(t-1)$	0.097	0.277	0.327	0.331
	(0.403)	(0.435)	(0.444)	(0.446)
Year Fixed Effect	Yes	Yes	Yes	Yes
Text-Based Industry Fixed Effect	Yes	Yes	Yes	Yes
Financial Controls	Yes	Yes	Yes	Yes
Observations	243	192	192	192
Adjusted R^2	0.090	0.099	0.095	0.101

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$