Corporate Culture and Industry-Fit: A Text Mining Approach

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Abstract

It is well established in the literature that corporate culture varies across industries. However, it is unclear whether it is beneficial or detrimental for firms to deviate from the average culture of their industry. To empirically test this, I gather over 800,000 employee reviews from Glassdoor.com, a career community website, and apply textual analysis on free texts of these reviews to measure corporate culture. Based on a sample of 540 Compustat-listed U.S. firms from 38 industries, I find that firms that differ strongly from the average culture of their industry exhibit lower productivity. This holds independently of whether culture is measured by the CVF or the OCP measurement framework. The results are consistent with the theoretical argument that deviations from industry averages reflect a poor fit with corresponding industry contingencies. However, the relationship between deviations from cultural industry averages and productivity is also contingent on business strategy: Firms with differentiated products suffer a lower decrease in productivity when deviating, which is consistent with the hypothesis that differentiated firms require different cultural traits in order to fit the corresponding form of differentiation.

Keywords: Organizational Identity, Corporate Strategy, Industry Analysis, Industry Dynamics

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INTRODUCTION

Corporate culture has been repeatedly linked with firm performance in organizational research and has been identified as a crucial element of the organizational system (Barney 1986, Chatman et al. 2014, Denison and Mishra 1995, Hartnell et al. 2011). Hence, not surprisingly, corporate culture remains a topic of interest for both scholars and practitioners (Chatman and O'Reilly 2016, Graham et al. 2017). Most studies on the culture-performance link focus on a linear relationship between culture and performance. For instance, a large body of research examines the association between certain value dimensions, such as market-orientation (Hartnell et al. 2011) or innovativeness (O'Reilly et al. 2014), and firm performance. However, recent findings suggest that the culture-performance link cannot be generalized as it is highly contingent on factors such as national culture (Fey and Denison 2003), industry belonging (Lee and Yu 2004), and business strategy (Hartnell et al. 2019), but also on interactions between different culture dimensions (Kotrba et al. 2012). Chatman and O'Reilly (2016) argue in their literature review that research on the effect of corporate culture on firm performance so far has fallen short of taking these interactions and contingencies into account.

This paper addresses this shortcoming by examining the role of industry belonging for the culture-performance link. Scholars have long argued that corporate culture is strongly shaped by industry requirements (Gordon 1991, Phillips 1994). In line with this, empirical findings suggest that corporate culture differs by industry (Chatman and Jehn 1994) and also that links between culture and performance vary across industries (Christensen and Gordon 1999, Lee and Yu 2004). However, there is also considerable variation in corporate culture within industries (Chatman and Jehn 1994).

Yet, the question of whether deviating from industry standards of culture is beneficial or detrimental for firm performance has not been addressed so far. The question is empirically interesting because theoretically the relationship is not self-evident. On the one hand, studies on industry cultures have long suggested that corporate culture needs to fit the industry environment (Gordon 1991, Phillips 1994). For instance, Gordon (1991) argues that "companies within an industry share certain cultural elements that are

required for survival" (p.396) and "for an organization to be successful, industry-driven assumptions must be widely shared" (p.398). Correspondingly, a deviation from industry cultural norms might reflect a poor fit with these industry-driven assumptions. On the other hand, deviations from average industry cultures might be necessary in order to fit firm-specific contingencies, such as strategy, structure, leadership style, or high-performance work practices (Hartnell et al. 2019). Moreover, Barney (1986) argues that a culture needs to be rare and imperfectly imitable in order to be a source of competitive advantage.

I introduce a new concept, named *cultural industry-deviation*, which measures the deviations of firms from the dominant cultural traits of their industry. In particular, this is measured by differences between firms' corporate culture and the average culture of their industry, but also alternative operationalizations are tested, such as deviations from the median industry culture. Testing the association between cultural industry-deviation and productivity requires a dataset with sufficiently many firms per industry to identify industry averages and to measure firms' deviations from these averages. Therefore, I follow recent text mining approaches (Moniz 2015, Popadak 2013) and construct a comprehensive dataset about the culture of 540 U.S. firms from 38 industries by web scraping over 800,000 employee reviews from the leading company review site Glassdoor.com. In support of this approach, Chatman and O'Reilly (2016) name big data and web scraping approaches as a promising way to study contingencies of the culture-performance link. More generally, George et al. (2016) outline the importance of big data for future management research.

The study is focused on the U.S. and therefore only uses reviews from employees working in the U.S. As a measure of corporate culture, I rely on two of the most established cultural measurement frameworks, the Competing Values Framework (CVF) (Quinn and Rohrbaugh 1983) and the Organizational Culture Profile (OCP) (O'Reilly, Chatman and Caldwell, 1991), which both group various attributes related to corporate culture in different cultural dimensions. To generate culture scores for these dimensions, I measure how strongly each CVF and OCP dimension is emphasized in the free texts of the online reviews by applying textual analysis. My approach also takes into account negations in texts. The measures of culture

are matched with data on firm characteristics and firm performance from Compustat. Throughout the paper, I use productivity, measured as Total Factor Productivity (TFP), as the main outcome variable.

In line with previous studies (Chatman and Jehn 1994, Christensen and Gordon 1999), I find that average cultures differ by industry. Moreover, consistent with the argument that industry requirements shape the necessity for certain cultural traits, I show that culture scores significantly correlate with three measures of industry characteristics: Industry dynamism, industry capital intensity, and industry product differentiation.

Generally, I find that firms that differ strongly from their industry's average culture exhibit significantly worse productivity. The effect is economically important, with a one standard deviation increase in an index of cultural industry-deviation, which combines deviations in all cultural dimensions, being associated with a decrease of 0.134 standard deviations in TFP or a decrease in TFP of 5.6 percent. For one culture dimension, the market dimension of the CVF, however, I find that when firms exceed their industry's average, this is associated with increased productivity. This is in line with the results from Bloom et al. (2016), who find that their management practices are positively and monotonically associated with productivity, regardless of the national and industrial environment. In fact, the market dimension of the CVF closely resembles the dimensions of management practices from Bloom et al. (2016), as they both emphasize clarity, high performance, goal-setting, and thorough planning.

When considering other measures of firm performance, I find that cultural industry-deviation is also associated with lower profitability (measured in overall profits and return on assets) but shows no correlation with forward-looking measures of firm performance (Tobin's Q and market-to-book ratio). This supports the interpretation that industry averages reflect cultural traits that are conducive for economic efficiency but not necessarily for explorative organizational outcomes, such as innovation.

Furthermore, I examine whether the link between cultural industry-deviation and productivity is contingent on the strategy of firms. Specifically, I hypothesize that the negative link will be weaker for those firms with a differentiation strategy because when firms sell differentiated products or services, they require

different cultural traits than their competitors. In line with this, I find that cultural industry-deviation interacts positively with R&D and advertisement expenditures, two common measures of product differentiation. Correspondingly, this paper shows the complex nature of corporate culture as its effectiveness depends on the fit with both industry requirements and business strategy.

Moreover, the longitudinal structure of my dataset allows me to study how changes in cultural industry-deviation affect productivity over time. I find that a cultural shift towards the industry average culture over time is associated with a modest increase in productivity in the subsequent year. This provides some evidence that the relationship between cultural industry-deviation and productivity is, in fact, causal. Therefore, this paper also adds to the so far limited evidence (Boyce et al. 2015, Sackmann 2011) on how changes in corporate culture over time affect firm performance.

CONCEPTUAL BACKGROUND

Corporate Culture

Definition and measurement. Scholars usually refer to corporate culture as the values, beliefs, or norms of organizations. In this paper, I rely on the definition of O'Reilly and Chatman (1996, p. 166), who define corporate culture as "a system of shared values (that define what is important) and norms that define appropriate attitudes and behaviors for organizational members (how to feel and behave)." Similarly, Denison (1990, p. 2) describes culture as the "underlying values, beliefs and principles" and Deshpande and Webster Jr (1989, p. 4) as "the pattern of shared values and beliefs".

Accordingly, approaches for measuring culture usually involve measuring values and behavioral norms (Kotrba et al. 2012) by identifying dominant culture types or culture dimensions that describe the content or substance of culture. In this paper, I rely on the Competing Values Framework (CVF) (Quinn and Rohrbaugh 1983) because it is widely used both in organizations and academic research (Chatman and O'Reilly 2016, Hartnell et al. 2011). The basic structure of the CVF consists of two orthogonal value

dimensions. The first "*structure"* dimension differentiates between a structure that values flexibility and discretion versus an organizational structure that emphasizes control and stability. The second "*focus*" dimension reflects whether the focus of an organization lies on internal capabilities, integration, and unity of processes or on external capabilities and opportunities (Cameron et al. 2014, Hartnell et al. 2011, Hartnell et al. 2019). From these two value dimensions, four quadrants/types of culture are derived: clan, adhocracy, market, and hierarchy, which represent the fundamental values that outline the taken organizational goals but also describe the desired means and behavior on how to achieve these organizational goals. Though the theoretical concept of the CVF implies contradictory values among the four culture types, a meta-analysis by Hartnell et al. (2011) reveals that there tends to be a positive correlation between the four culture types, suggesting a more complementary relationship between them. Hence, the four types of culture from the CVF are also often referred to as culture dimensions (Hartnell et al. 2019). In this paper, I follow this notation. Table 1 lists the four culture dimensions from the CVF with a common description of associated assumptions, beliefs, values, artifacts, and effectiveness criteria (Hartnell et al. 2011, Quinn and Kimberly 1984).

TABLE 1 ABOUT HERE

To provide robustness for my results, I also consider an additional prominent culture measure, the Organizational Culture Profile (OCP) (O'Reilly et al. 1991). The OCP measures culture by giving respondents 54 values statements that they have to sort into nine categories ranging from "most characteristic" to "least characteristic". By analyzing clusters of items the authors identify independent dimensions of culture. In various studies, scholars identified five to eight dimensions, which appear to be fairly consistent among studies (Berson et al. 2008, Borg et al. 2011, Chatman et al. 2014). In line with

Popadak (2013), I rely on the seven OCP dimensions from O'Reilly et al. (2012): Innovation[2], team-orientated[3], results-orientated, integrity, customer-oriented, detail-oriented, and transparency. Table A.A1, in Appendix A, shows these seven dimensions and their associated values and attributes. The empirical results for the OCP are summarized in the Robustness Checks section and all tables related to the OCP are reported in Appendix A.

Corporate culture and firm performance. Much of the culture-performance research focuses on identifying values or cultural traits that are associated with firm performance. For instance, a large body of research aims to link the cultural dimensions of the CVF with firm performance. Hartnell et al. (2011) provide a meta-analysis on this association and find a positive link between the culture types clan, adhocracy, market, and firm performance, with a market-oriented culture being most strongly linked with firm performance. Moreover, the innovation dimension of the OCP is positively correlated with firm performance (O'Reilly et al. 2014). Similarly, Denison and Mishra (1995) illuminate the cultural traits of an additional culture measurement framework, the Denison Organizational Culture Survey (DOCS), and find that each cultural trait of the DOCS, mission, adaptability, employee involvement, and consistency, are positively correlated with subjective and objective measures of firm performance.

Other studies on the culture-performance link examine the effects of having a "strong" culture, where strong does not describe positive or effective traits but rather measures if there are certain values and norms that are "widely shared and strongly held throughout the organization." (O'Reilly and Chatman 1996, p. 166). Gordon and DiTomaso (1992) and Burt et al. (1994) find that firms with a strong culture tend to outperform those firms with a weaker culture.

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[2] In some studies the innovation dimension is also labeled as adaptiveness (Chatman and O'Reilly 2016). However, adaptiveness does not refer to adaption of industry standards but rather measures the willingness to adapt new product or processes through experimentation, innovation and risk-taking. As this paper analyzes adaption to industry standards, I label this dimension as "innovation" in order to avoid confusion.

[3] The team-orientation dimension is also labeled as collaboration.

However, various findings suggest that there is no "one-size-fits-all" solution for culture and that culture is contingent on both external and internal factors. Fey and Denison (2003) report that for Russian firms adaptability was more strongly related to firm performance than for U.S. firms, for which mainly a mission-oriented culture was associated with strong firm performance. This suggests that aligning national and corporate culture may be important for firm performance. Moreover, the culture-performance link seems to be contingent on the business strategy of firms. Hartnell et al. (2019) find that corporate culture is associated with other elements of the organizational system, such as strategy and structure, and argue that culture needs to be strategically aligned with these other components to foster organizational effectiveness. Similarly, Gupta (2011) compares the business strategy of 32 Indian companies with their dominant CFV culture type and find that firms with a defender and reactor strategy were high on hierarchy and clan culture, while a prospector strategy was associated with an adhocracy culture.

Contingency View on Corporate Culture and Industries

The previous subsection suggests that culture is important for organizational effectiveness, but that the link is contingent on different factors. In this subsection I outline, backed by contingency theory, in more detail, why one should expect that corporate culture is also related to companies' industry environment.

Industry contingencies. Developed in the late 1960s (Lawrence and Lorsch 1967), contingency theory is still a dominant and widely applied theory in management research. The basic idea is that there is no "one-size-fits-all" model to manage organizations and that the effectiveness of different management instruments depends on the fit with a firm's contextual conditions, also referred to as contingencies. Besides several internal contingencies, such as firms' strategy, size, leadership, and structure (Burton et al. 2002, Hambrick 1981), many scholars have outlined the importance of fitting management instruments to the industrial environment (Porter 1980). Firms within the same industry share various common contingencies: For example, the regulatory environment, the degree of product differentiation, the level of dynamism, consumer tastes, market trends, and the labor market (Baron and Kreps 1999, Hambrick 1981). Moreover,

firms of the same industry produce similar products and, therefore, they also have a similar production function (also referred to as "technology"). For example, the complexity of the production process or the level of interconnectivity between workers should be similar. Various empirical findings suggest that industry contingencies influence the effectiveness of management instruments. For instance, Datta et al. (2005) find that the level of industry capital intensity, growth, and dynamism moderate the effect of High-Performance Work Systems on labor productivity. Similarly, the negative effects of downsizing on firm profitability are particularly strong in industries with high expenditures on research and development (R&D), high growth rates, and low capital intensity (Guthrie and Datta 2008). Moreover, Hambrick (1981) argues that environmental requirements influence the distribution of power within the top management.

Corporate culture and industries. Given the central role of industrial requirements for organizational design, not surprisingly, various scholars have also outlined the importance of industries for corporate culture. Gordon (1991) argues that corporate culture arises and is influenced by industry-driven assumptions and characteristics, such as customer requirements, societal expectations, and the competitive environment. In line with this, several empirical studies find that industry belonging is a central determinant of corporate culture. For instance, Chatman and Jehn (1994) analyze cultures in four different industries and find that organizational culture varies more across industries than within. Moreover, they find that some cultural values were associated with levels of industry technology and industry growth. Similarly, Christensen and Gordon (1999) analyze 77 firms in six industries and identify the existence of industry-specific cultures.

Other research suggests that this difference in average levels of cultural values is related to the moderating effect industry contingencies have on the link between corporate culture and firm performance. Sørensen (2002) reports that the positive effect of a strong culture on performance stability decreases for firms operating in volatile industries because a strong culture might hinder the flexibility of a company, which is important in a volatile environment. Similarly, Chatman et al. (2014) suggest that a culture of adaptability is particularly important for high-technology firms. On the contrary, healthcare organizations,

for which failure avoidance is particularly important, should rely on a culture that outlines safety (Nieva and Sorra 2003). Also, Christensen and Gordon (1999) compare the correlations between culture dimensions and sales growth for different industries and find that the link differs by industry.

Cultural Industry-Deviation and Productivity

Given that specific industry cultures exist, are deviations from industry-specific cultural values associated with increased or decreased productivity? On the one hand, the above-mentioned literature that outlines the importance of industries for organizational design and corporate culture suggests that industry cultures exist, because firms will adopt cultural practices that fit the particular environment. For instance, Lee and Yu (2004, p. 355) hypothesize that "industry dynamics inevitably 'coerce' everyone to adopt the same set of traits and values." Correspondingly, a strong deviation from industry averages of corporate culture might reflect that firms fail to adopt suitable cultural values that fit the corresponding industry and its contingencies. In line with this, Gordon (1991) argues that an alignment between culture and industry-driven assumptions is crucial for firm survival. Bertels et al. (2016) provide a well-documented example for the Canadian oil producer *Oilco* that demonstrates how problems can arise when firms deviate from standard industry cultures. Oilco had an entrepreneurial culture with low levels of bureaucracy, which encouraged employees to "get things done", in contrast to their competitors, which tended to be more security-aware. The outlined cultural traits of Oilco are generally associated with a strong performance in the literature as they are closely related to an adhocracy culture. However, Oilco faced reliability issues that hindered their productivity. In turn, they were pressured by investors to reduce their risks, potentially, because its culture lacked the security awareness of its competitors.

On the other hand, there might be rational reasons for firms to deviate from industry standards of culture. Though firms within the same industry share various attributes and contingencies, they are naturally not homogenous. As contingency theory does not only outline the importance of industry contingencies but also firm-specific contingencies, firms might deviate from industry standards of culture to fit these firm-specific contingencies, such as firm-size, strategy, leadership, or product characteristics. Correspondingly,

a high cultural industry-deviation might reflect a good fit with internal contingencies, whereas the non-deviating firms might fail to achieve internal consistency.

Moreover, industries are not stable over time and changes in industry requirements, such as changes in consumer tastes or new technologies, might require adjustments in corporate culture. Correspondingly, those firms that deviate from established industry cultures might do so to adapt quickly to industrial changes. This is in line with Christensen and Gordon's (1999) hypothesis that culture-premia arise when the industrial environment changes. Hence, firms might experience increased productivity when they deviate to react to industrial changes. In line with this, Barney (1986) argues that a culture needs to be rare and imperfectly imitable in order to be a source of competitive advantage.

Finally, there also exists an economic literature that discusses why there is within-industry heterogeneity in corporate culture. For instance, Kosfeld and Siemens (2011) develop a model with workers who have heterogeneous social preferences. They show that there always exists a separating equilibrium in which workers sort into firms with suitable monetary incentives and levels of cooperation. Furthermore, Kreps (1990) argues that culture can be a tool to coordinate on one equilibrium when multiple equilibria, with potentially equally efficient outcomes, exist. In both cases, deviations from the average industry culture are not necessarily associated with better or worse productivity.

Given that the theoretical examination allows making different predictions about the association between deviations from the dominant industry culture and productivity, I leave it as an open research question:

RQ: What is the association between cultural industry-deviation and productivity?

Cultural Industry-Deviation and Product Differentiation

As mentioned above, the underlying idea for why industry requirements should matter for corporate culture is that within industries, firms sell similar products and, therefore, share various contingencies, such as customer tastes. However, a common business strategy for firms is to distinguish themselves from competitors by selling differentiated products (Porter 1980). Dickson (1997, p. 333) defines product

differentiation as “the act of distinguishing a product from its competitors on one or more basic performances or image features”. Correspondingly, firms can differentiate in different ways. For instance, firms might differentiate by offering quicker services, technological superiority, higher reliability, or increased safety. When firms differentiate this means that some of the above-described industry contingencies, such as the production function/technology or customer expectations, differ depending on the type of differentiation. Hence, I argue that a highly differentiated firm also requires different cultural traits to achieve a fit with the desired differentiation. For example, a firm that differentiates by offering high reliability and safety might require a stronger emphasis on hierarchical values, whereas firms that differentiate via technological superiority need values related to the adhocracy dimension. Similarly, an emphasis on customer service might require market-oriented values. Therefore, I hypothesize that deviations from the average industry culture are comparably more beneficial for differentiated firms.

H1: The link between cultural industry-deviation and productivity is mediated by firm-level product differentiation such that the interaction between cultural industry-deviation and product differentiation is positive.

METHODS

In order to analyze the relationship between firms’ divergence from industry-specific culture types and their productivity, I match online employee reviews from the career community website Glassdoor with performance data from Compustat. In the analysis, I only consider firms that are included in the Compustat database and I only analyze reviews written by workers employed in the U.S.

Online Employee Reviews

The measures of corporate culture are generated from employee reviews from Glassdoor.com, an employee review site. In this subsection, I explain the data source and its advantages, provide some evidence for the validity of employee reviews, and discuss how I deal with potential issues, such as fake reviews.

Prior studies on corporate culture usually conducted surveys to measure culture. Relying on online reviews instead of surveys has two main advantages: First, it allows gathering a large sample of firms from different industries. A second advantage is that it includes a more diverse set of respondents. Studies that rely on surveys to measure culture usually include executives and high educated participants, such as business school alumni (Chatman et al. 2014), top managers (Lee and Yu 2004), or top executives, who measure their own culture or the culture of competitors (Heskett and Kotter 1992, Sørensen 2002). However, top executives might describe their own or their competitor's culture in the way it is advertised and not how it is actually perceived by employees. Yet, advertised values might not reflect the actual culture. For instance, Guiso, Sapienza, and Zingales (2015) find that advertised values could not be linked with firm performance in contrast to perceived values.

On Glassdoor, employees and former employees can anonymously review their employer by giving them "star-ratings" for the overall satisfaction with their employer but also for the following sub-categories: work/life balance, culture and values, career opportunities, compensation and benefits, and performance of the senior management[4]. These star ratings are natural numbers, ranging from 1 to 5, where a rating of 5 corresponds to the highest satisfaction level. In addition to these ratings, employees can describe in a free text what they do and do not like about working at their employer and they can give advice to the senior management about what to improve in the company. Though reviewers remain anonymous, they have the opportunity to state their job title, and 84 percent of the reviewers in my sample do so. I rely on data from Glassdoor although there are numerous similar career community websites for several reasons:

First, the website is the largest of its kind in the U.S. and therefore benefits from a very diverse audience (Moniz 2015, Popadak 2013). In Appendix B, I discuss how the characteristics of Glassdoor visitors differ from the general population and provide evidence that the characteristics match fairly-well.

[4] There is large multicollinearity between these sub ratings and the overall rating (correlations of sub ratings with overall ratings range between 74 and 93 percent). Therefore, if anything, I include the overall rating as a control.

Similarly to website visitors, Liu et al. (2017) suggest that also the demographics of users who provide reviews on Glassdoor match the characteristics of the general working population in the U.S. equally well. In addition, I scrutinize information from job titles to compare how the occupational roles of the reviewers in my sample match with the whole U.S. workforce. To do so, I use the Occupational Information Network (O*NET), which is an online platform for occupational information developed under the sponsorship of the U.S. Department of Labor/Employment and Training Administration. For each job title stated by reviewers, I conduct and occupational search on O*NET. Based on a comprehensive list of possible job titles, tasks, and job descriptions for all occupational categories of the Standard Occupational Classification (SOC), O*NET suggests which standardized occupational role fits best with search entries[5]. Figure A.B1 in the Appendix shows how the job titles of Glassdoor reviewers are distributed among the major occupational categories of the SOC and compares it with employment shares obtained from the U.S. Bureau of Labor Statistics (2018) for the year 2016. The correlation between the share of employment by occupation group of Glassdoor reviewers and all U.S. employees is 75.2 percent (p-value < 0.001) suggesting that reviewers are fairly representative of all U.S. employees. Moreover, part of the differences in the share of employment might be explained by the fact that the sample consists of large Compustat-listed firms. For instance, similar to the comparison in Figure A.B1, a report by the Small Business Administration (2018) suggests that in large firms managers, administrative workers, and information services are overrepresented, while construction workers and food services are underrepresented. In the Robustness Checks section, I scrutinize these data on occupational roles to test the robustness of my results against differences in occupational composition and differences in corporate culture between occupational categories.

Additionally, Glassdoor tries to prevent fake reviews and roughly 15 percent of reviews are rejected or deleted because they violate the guidelines (Moniz 2015). Naturally, there remain concerns about the validity of online reviews. However, one would expect that fake reviewers either give overwhelmingly

[5] Only 2 percent of all job titles could not be classified by O*NET.

positive or negative ratings. Therefore, I check how many of the reviewers gave their employer either the highest or the lowest rating in all of the available categories in the star rating. I find that of the 831,730 reviews, I gathered, only 4.3 percent gave the highest rating in all categories and 3.4 percent the lowest rating in all categories. Yet, fake reviewers might deviate in at least one subcategory from their overall rating to prevent suspicion about the validity of their review. To provide evidence that my results are not driven by fake reviewers or the extreme ends of the satisfaction distribution within firms, I run a robustness check, where all reviews with an overall rating of 1 or 5 are excluded. When I do so, results only vary marginally. In fact, 54 percent of raters give an overall rating of 3 or 4 and the average rating is 3.2. Figure 1 shows the distribution of the overall rating, which reflects general satisfaction with employers. This provides evidence that raters, actually, give sophisticated reviews and do not simply use Glassdoor as a tool to show frustration and anger about their employer.

FIGURE 1 ABOUT HERE

A third advantage of using Glassdoor data is the rich content of the reviews. The free texts from the reviews allow extracting how corporate culture is perceived: Which values do many employees outline and how are they described? Furthermore, reviews contain exact dates, which allows me to construct a panel dataset. Moreover, there are other studies that suggest that content on Glassdoor is, in fact, informative. Popadak (2013) finds a positive correlation between Glassdoor ratings and the Fortune's 100 Best Place to Work Indicator as well as the KLD Employee Relations Index. Furthermore, Glassdoor reviews have been linked with firm performance (Huang et al. 2015), CEO personality (O'Reilly et al. 2014), and shareholder governance (Popadak 2013).

As this study is focused on the U.S., I extract only those reviews that have been generated by employees who work or used to work in a location in the U. S. Interns and part-time workers are excluded. Finally, I only include the reviews from those firms that are in the Compustat database and have overall at least 100 reviews from the group of reviewers just described.

Yet, some of the firm-year observations are generated by only very few reviews. Finding a cutoff level that determines the minimum amount of reviews that are required to include a firm-year observation in the study involves a tradeoff: On the one hand, culture scores that are generated by only a few reviews might create a very noisy measure of culture. On the other hand, a low cutoff level includes more firm-year observations. To determine an industry standard of culture and to analyze within-industry variation, a sufficient sample of firms for each industry is required. Taking this tradeoff into account, I first drop those observations that are generated by less than 50 reviews[6]. In the main regressions, I apply the industry classification from the Global Industry Classification Standard (GICS) and drop industries with less than 5 firms. Under these restrictions, I end up with a sample of 540 firms from 38 industries with 2,151 firm-year observations. To provide evidence that the number of reviews is not driving the results, I pursue two strategies: First, I include the number of reviews for each firm-year observation as a control. Second, I show in the Robustness Checks section that my results neither depend on the cutoff of 50 nor on the level of industry classification.

Measures of Corporate Culture

My measures of corporate culture are based on the free text of Glassdoor reviews. The free text field consists of one positive ("Pros") and one negative ("Cons") comment section, in which reviewers can describe what they like and do not like about the company. Moreover, reviewers can give advice to the management about what to change in the company. I excluded these "advice" comments from the analysis because some reviewers outline what the company is lacking (e.g. "more transparency in communication"), while other reviews describe what they particularly like ("continue transparency in communication"). The "Pros" and "Cons" comments on the contrary usually contain descriptions about the firm. I do not distinguish between positive and negative comments for two reasons. First, positive and negative comments tend to describe companies' culture in a similar way (Corritore et al. 2019). Second, I want to remain close to the definition

[6] Liu et al. (2017) and Corritore et al. (2019) apply the same cutoff level.

of corporate culture as "shared values" that only describes which values are prevalent in the organizations, but not whether employees experience these values as desirable or not. For the same reason, I also do not include the overall satisfaction level to measure corporate culture.

To construct measures of corporate culture based on free texts from employee reviews, I follow a similar approach as Popadak (2013), which measures the relative usage of words related to different cultural dimensions. I measure corporate culture based on two common frameworks, the Competing Values Framework (CVF) and the Organizational Culture Profile (OCP). As a basis to measure the CVF, I use the words that describe the associated assumptions, beliefs, values, artifacts (behaviors), and effectiveness criteria from Quinn and Kimberly (1984), as shown in Table 1. For the OCP, I rely on the associated values and attributes of the seven value dimensions shown in Table A.A1. For all dimensions of the two measurement frameworks, I first create a master text by finding synonyms and hyponyms[7] of the related words using the WordNet library. An obvious caveat of measuring the relative occurrence of words is that it does not take into account negations in reviews. For instance, when many reviewers write that a company is "not innovative", the company would get a high score on the adhocracy dimension (or innovation dimension of the OCP). As an extension to Popadak (2013), I take into account negations by constructing two master texts for each culture dimension: An affirmative master text, which contains the synonyms and hyponyms of the corresponding dimensions, and one negated master text. These negated master texts contain antonyms ("opposite words") of the words from the affirmative master texts, gathered from WordNet, if available. For instance, for the clan and team-orientation dimension, this includes words like "uncooperative" or "unsupportive". Moreover, to capture the use of words in combination with negation words, the negated master texts also contain the words from the affirmative master texts with a negation

[7] A Hyponym is "a word of more specific meaning than a general or superordinate term applicable to it. For example, spoon is a hyponym of cutlery." (Oxford Dictionaries 2018)

marker ("not_innovative"), and affirmative master texts, in turn, include all antonyms with a negation marker ("not_uncooperative").

These negation prefixes are applied in the following way: I split each review into sentences and sub-sentences, where sub-sentences are identified by punctuations and a list of conjunctions such as "and", "but", and "although"[8]. Splitting reviews into sub-sentences is crucial because it allows capturing, for instance, that the statement "not innovative but very supportive" only emphasize the lack of innovation/adhocracy, but not a lack of teamwork within the firm. When a text contains a negation word, such as "not", "never", or "don't",[9] all following words are marked as negated words until the (sub-)sentence ends or another negation term occurs by prefixing a "not_" in front of these words (e.g. "innovative" becomes "not_innovative").

As it is common for computational linguistic techniques, after negations were marked, stop words (for example, "a", "and", "the") are removed and the remaining words are stemmed, which reduces words to their linguistic word stem ("manager" and "management" become "manag"). After this cleaning process, I measure the text similarity between the employee reviews and both the affirmative and the negated master texts by calculating the share of words from the reviews that appear in the corresponding master text. The similarity score with the negated master text is then subtracted from the similarity score of the corresponding affirmative master text. Table 2 shows examples of reviews with the raw culture scores for each dimension, which simply reflect the share of words that belong to the corresponding master text. Words that affect one of the dimensions are printed in bold letters. Similarly, Table A.A2 in the Appendix shows these examples for the OCP. For better comparability of the different culture dimensions, they are standardized and transferred into Z-scores and all following analyses refer to these standardized culture scores.

TABLE 2 ABOUT HERE

[8] A list of conjunctions was gathered from *YourDictionary.*
[9] A list of negation terms was gathered from *Grammarly.*

Variables

Productivity. As the main outcome variable, I rely on productivity, measured as Total Factor Productivity (TFP). Conceptually, TFP aims to measure how efficient firms manage their inputs. Technically, I determine TFP by using the residuals of a regression of revenues on employment size and working capital (all variables are logged) (Syverson 2011)[10]. For better interpretation, this measure is standardized. Productivity is a central organizational outcome and is widely used in the management literature (Bloom and van Reenen 2007, Datta et al. 2005). An advantage of relying on productivity as an outcome variable is that it is directly affected by the workforce (Delery and Shaw 2001, Ichniowski et al. 1997). In particular, this study aims to measure how employees perceive corporate culture and, correspondingly, how culture affects their performance. Moreover, raw accounting measures, such as return on assets (ROA), are subject to accounting policies, which may distort the true value creation (Hawawini et al. 2003).

Cultural Industry-Deviation. The main variables of interest scrutinize the culture scores derived from employee reviews and measure how strongly they deviate from average industry scores in all culture dimensions. However, firms might deviate in each dimension by either undercutting or exceeding the industry average. To distinguish between the two forms of deviation, I construct two separate measures for each dimension. One measure only captures when a firm's culture score exceeds the average industry score (*positive deviation*), and the other when firms undercut their average industry culture (*negative deviation*). Hence, culture deviations in dimension j in year t of firm i, which operates in industry k, are defined in the following way:

$$Positive\ Deviation_{i,j,t} = Max(Culture_{i,j,t} - Industry\ Average_{k,j,t}, 0) \quad (1)$$

$$Negative\ Deviation_{i,j,t} = Max(Industry\ Average_{k,j,t} - Culture_{i,j,t}, 0) \quad (2)$$

[10] TFP is similar to "labor productivity", which is often applied in management research and can be measured, for instance, as the log of the ratio between firm sales to employees (Datta et al. 2005). When using this measure of productivity, I receive similar results. However, TFP also incorporates the value of working capital.

Correspondingly, positive values for positive (negative) deviations indicate that the firm's culture score is higher (lower) than the industry average in the corresponding dimension.

Moreover, I construct an index that combines both positive and negative deviation for all dimensions into one measure, labeled c*ultural deviation index*. The index is the sum of deviations in all culture dimensions, regardless of the direction.

Naturally, there are various alternative ways to measure differences to a "standard industry culture". For instance, one might measure deviations to the median culture and not the average culture. Furthermore, the effect of deviations might differ depending on the degree of cultural heterogeneity within industries. For example, a deviation by one unit might be more substantial when all other firms hold the exact same culture scores, compared to a situation where the variation in culture is generally large between firms. Correspondingly, one might scale the magnitude of deviations by a measure of within-industry cultural heterogeneity, such as the standard deviation of cultural dimensions. For simplicity, I conduct the main regressions by measuring simple differences to the industry average, as described above. In Table A.C1 in the Appendix, I show that the main result also holds for different operationalizations of cultural industry-deviation.

An alternative approach to analyze the fit between culture and industry requirements could have been to examine how various industry characteristics, such as industry dynamism, industry capital intensity, or the regulatory environment, moderate the effect of culture on firm performance. Yet, many industry characteristics, such as the regulatory environment, customer tastes, or the production function, would be hard to quantify. Industry averages of culture, however, already incorporate reactions to all forms of industry requirements that matter for corporate culture.

Controls. I control for firm size, measured by the number of employees (in logs), the value of working capital (in logs), and I measure firm age as the difference between the first year a firm was listed in Compustat and the corresponding year. Moreover, I control for general characteristics of reviews: The

number of reviews, the average text lengths of reviews, and the share of reviews that were generated by former employees. Note that I do not include company ratings as a control as they are a potential outcome of culture. However, when I include company ratings, estimates are virtually unchanged. Additionally, I control for year and industry fixed-effects.

Product Differentiation. In both the management literature (Chauvin and Hirschey 1993) and the literature on industrial organizations (Bloch and Manceau 1999, Motta 1992) scholars commonly describe advertisement and R&D as means to achieve product differentiation. In support of this, Hoberg and Phillips (2016) find that their text-based measure of firm differentiation is correlated with advertisement and R&D expenditures. Hence, I use advertisement and R&D expenditures as proxies for product differentiation. I measure R&D (advertisement) expenditures as the ratio of R&D (advertisement) expenditures to total sales relative to the industry average of this ratio[11].

RESULTS

Corporate Culture

Table 3 shows a correlation matrix of CVF and OCP culture scores, firm characteristics, and TFP. The correlations between the culture dimensions and TFP are generally in line with the literature on the link between culture dimensions and firm performance. For the CVF, similar to Hartnell et al.'s (2011) meta-analysis, the market, clan, and adhocracy dimensions are positively associated with firm performance, with the strongest correlation appearing for the market dimension. The negative correlation between the hierarchy dimension and TFP, however, is not consistent with Hartnell et al. (2019). For the OCP, the results-orientation dimension, which is closely related to the market dimension from the CVF (Hartnell et al. 2011),

[11] As both measures have strong outliers, I winsorize both variables at the 1st and 99th percentile.

shows the strongest positive correlation with TFP. Moreover, in line with Guiso et al. (2015) the integrity dimension is strongly and positively correlated with firm performance. Also, correlations between the cultural dimensions and the overall star ratings from Glassdoor, which measure employee satisfaction, provide further face validity for the culture measures. Similar to Berson et al. (2008)[12], the clan and adhocracy dimension of the CVF and the innovation and team dimension of the OCP are positively and significantly associated with employee satisfaction. Similar to Huang et al. (2015), I find strong positive correlations between the Glassdoor overall rating and firm performance. This positive association between employee satisfaction and firm performance is also in line with studies that measure employee satisfaction with survey data (Ostroff 1992, Ryan et al. 1996).

TABLE 3 ABOUT HERE

Culture scores across sectors and industries. Figure 2 and Table 4 focus on the variation in corporate culture between industries. Figure 2 demonstrates average culture scores of the four CVF dimensions at the sector level of the GICS. Note that the sector classification is rather broad and that the main analysis relies on the more granular industry classification of the GICS. Figure 2 illustrates that culture varies by sector. For example, in the consumer staples and consumer discretionary sector, hierarchy is particularly emphasized and in the health care sector the clan dimension. In line with the image of "loose and open" start-up cultures in the IT sector (Xiao and Dasgupta 2005), IT firms score on average the lowest in the hierarchy dimension and second highest in the adhocracy dimension. The illustrative example of Oilco (Bertels et al. 2016) outlines the importance of security in the energy sector. In line with this, the energy sector scores the lowest on adhocracy. Moreover, it scores the highest on market-orientation. On the one hand, the planning and goal-orientation aspect of the market dimension are in line with the description of

[12] Note that for an innovative culture, Berson et al. (2008) find a positive correlation of 0.36 with employee satisfaction, which is, however, not significant.

security awareness, while, on the other hand, the aggressiveness and competitiveness facets do not match this description.

TABLE 4 AND FIGURE 2 ABOUT HERE

Table 4 presents average industry scores of culture at the more granular GICS industry level and conducts a series of MANOVAs. MANOVAs reveal that for 37 out of 38 industries, the average industry culture differs significantly at the 1 percent level from the culture of all other industries. Moreover, for each culture dimension, ANOVAs are conducted to analyze how the corresponding culture dimension differs between industries. For all culture dimensions, culture differs more strongly between than within industries, and industry belonging explains 15 to 40 percent of the variation in the CVF dimensions. As a comparison, regional variation, measured by dummies for the state of companies' headquarter, only explain 5 to 13 percent of the variation in the cultural dimensions. Thus, in line with previous studies (Chatman and Jehn 1994, Christensen and Gordon 1999), industry belonging appears to be an important determinant of corporate culture.

Naturally, firms may differ strongly within industries. Potentially, there could be even a bimodal or multimodal distribution where different clusters of industry cultures exist. To test, this I conduct

Additionally, I evaluate whether firms within industries cluster around an

Corporate culture and industry characteristics. As additional support for the importance of industrial requirements for corporate culture and also to provide additional evidence for the face validity of my measures of corporate culture, I show in this subsection that scores of corporate culture in the four CVF dimensions are associated with certain industry characteristics. To do so, similar to Datta et al. (2005), I utilize common measures of industry characteristics: Industry dynamism, industry capital intensity, and

industry product differentiation[13]. Industry dynamism is measured as the antilogs of the standard errors of a simple regression of total industry sales on a time trend; industry capital intensity is defined as the average ratio of fixed assets to total assets; and, finally, industry product differentiation is measured as the average ratio of R&D expenditures compared to total sales. For easier interpretation, all of these industry characteristics are measured in standard deviations.

Table 5 presents the association between these industry characteristics and the four culture dimensions of the CVF. Industry dynamism is positively correlated with the market and adhocracy dimension. This is in line with the idea that in dynamic industries firms need to adapt quickly to a changing environment and changing customer demands (Datta et al. 2005). Similarly, in differentiated industries firms need to address different customer preferences, whereas in undifferentiated industries firms mainly aim to achieve low-costs and efficiency (Hambrick and Lei 1985, Porter 1980). Consistent with this, market and adhocracy cultures are positively and the hierarchy dimension is negatively associated with industry product differentiation[14]. Finally, industry capital intensity increases the importance of structured processes and automation, while human elements become less central (Guthrie and Datta 2008). In line with this, the hierarchy dimension is strongly and positively associated with industry capital intensity, whereas all other CVF dimensions are negatively correlated. Correspondingly, by and large, culture scores appear to be consistent with the necessities certain industry characteristics impose.

TABLE 5 ABOUT HERE

[13] Datta et al. (2005) additionally consider industry growth. However, industry growth is strongly correlated with industry dynamism. When I include industry growth in the regressions of Table 5, none of the coefficients for industry growth are significant.

[14] The positive associations between market and adhocracy cultures and industry dynamism and industry product differentiation also fit well conceptually to the basic structure of the CVF because on the focus dimension market and adhocracy cultures lie on the side that focuses on external orientation and differentiation.

Cultural Industry-Deviation and Productivity

The previous section shows that cultures vary considerably between industries and are strongly shaped by industry characteristics. Yet, there is also substantial variation within industries. On average firms differ by 0.63 units (standard deviations) from their industry's average culture in each of the CVF dimensions. In this subsection, I scrutinize this within-industry variation in culture to measure its impact on productivity. Table 6 measures the association between cultural industry-deviation and TFP using pooled OLS (POLS). Standard errors in all POLS regressions are robust against heteroscedasticity and serial correlation at the firm level as standard errors are clustered at the firm level (Acemoglu et al. 2008, Wooldridge 2010). Column (1) considers the index of cultural deviation, which combines deviations from industry averages in all directions and all dimensions. This index is strongly negatively and significantly correlated with productivity. A one standard deviation increase in the cultural deviation index is associated with a decrease of 0.134 standard deviations in TFP or a decrease in TFP of 5.6 percent. Note that the coefficient is virtually unaffected when controlling for the direct effect of the four culture dimensions, see Table A.C1 Column (2) in the Appendix, suggesting that cultural industry-deviation predicts productivity beyond direct effects of cultural dimensions. Moreover, Table A.C1 shows that this effect size is also similar when deviations are scaled by the degree of within-industry heterogeneity of culture and also when deviations are measured relative to the median industry culture, instead of the average.

Columns (2) – (5) consider deviations separately for each CVF dimension and distinguishes between positive and negative deviations. Negative deviations in the market dimensions are negatively associated with productivity, but positive deviations are positively associated with firm performance. This suggests that for the market dimension deviations are not generally associated with reduced productivity, but, instead, that productivity is monotonically increasing in market culture. For the other dimensions, however, deviations in neither directions lead to increased productivity. For the hierarchy and clan dimension, deviations in both directions are significantly correlated with reduced productivity. Moreover, for both dimensions, the effects are fairly symmetric, with magnitudes ranging between 0.10 – 0.14 standard

deviations. Finally, for the adhocracy dimension, negative deviation is strongly negatively associated with productivity, whereas positive deviation in this dimension is not significantly correlated with TFP.

TABLE 6 ABOUT HERE

Product Differentiation as Mediator

According to Hypothesis 1, the effect between cultural-industry deviation and productivity is mediated by product differentiation, such that the negative association between cultural industry-deviation and firm performance is weaker for highly differentiated firms. To test this, I interact the index of cultural deviation with two measures of product differentiation, relative R&D and advertisement expenditures. Table 7 reports these regressions. As hypothesized, both measures of product differentiation interact positively with cultural industry-deviation. According to Column (1), the association between the cultural deviation index and productivity is zero for firms with R&D expenditures that lie one standard deviation above the industry average. Correspondingly, for higher R&D expenditures, cultural deviation is even positively associated with firm performance. Similarly, the negative association between the cultural deviation index and productivity disappears for firms with advertisement expenditures 1.5 standard deviations, or more, above their industry average.

TABLE 7 ABOUT HERE

Culture Changes over Time

Corporate culture is usually described as a dynamic phenomenon that only changes slowly over time (Schein 2010). In line with this view, I find that the correlation between firms' culture scores and their culture scores in the previous period is on average 0.45, suggesting that there is continuity in corporate culture but also considerable variation over time. Nevertheless, the literature on the culture-performance link rarely takes into account variation over time (Boyce et al. 2015). In this section, I analyze how shifts in corporate culture towards, or away from, the industry average translate into changes in productivity. There are two possibilities for why firm x's deviation from the industry average may change over time. On the one hand,

firm x can shift their cultural values towards (away from) those of its competitors. On the other hand, cultural industry-deviation also changes when other firms "copy" the culture of (shift their culture away from) firm x. To distinguish these two forms of changes in cultural industry-deviation over time, I construct two separate variables. *Firm Culture Change* only measures how firm x changes its culture compared to the industry average. To do so, the average industry culture of the previous period is held constant, and it is measured whether firm x moved closer or shifted away from this average culture. Positive (negative) values indicate that firms shifted their culture away from (towards) the average industry culture. Conversely, *Industry Culture Change* measures how all other firms in the industry changed their culture compared to firm x. This time, firm x's culture of the previous period is held constant. Again, negative values would indicate that competitors adopted the cultural values of firm x. Both measures combine culture changes for all dimensions.

To analyze whether these changes in culture lead to changes in productivity, I include firm fixed-effects, which control for unobserved time-invariant factors. Moreover, I examine how estimators change when including a lag of TFP as an independent variable. On the one hand, this is necessary when current values of the dependent variable strongly depend on values from the previous period. On the other hand, including a lagged dependent variable can bias the results due to correlation with the error term (Nickell 1981). Table 8 reports the results with and without a lag of TFP as an independent variable. Coefficients are virtually unaffected by including a lag of TFP, supporting the robustness of the results and validity of the model. All coefficients for Firm Culture Change point in a negative direction and three out of four are significant at the 10% level (the other coefficient in Column (1) is marginally not significant; p-value = 0.103). This suggests that when firms adopt the average cultural traits of their industry, they experience increases in productivity in the subsequent period. However, the magnitude of the effect is much smaller compared to the main effect, reported in Table 6, with coefficients ranging in magnitude between 0.004 and 0.005. On the contrary, when cultural-industry deviation shrinks over time due to convergences from other firms, measured by Industry Culture Change, coefficients point in a positive direction, suggesting that, if

anything, it is detrimental for productivity when a firm's culture is copied by its competitors. However, none of the coefficients is significant.

TABLE 8 ABOUT HERE

Other Measures of Firm Performance

The main outcome of this paper is productivity. In this subsection, I present results for additional measures of firm performance: Overall Profits, return on assets (ROA), Tobin's Q, and the market-to-book ratio. On the one hand, profits and ROA capture, similar to productivity, current economic efficiency. The latter two variables, on the other hand, measure the market's expectation for future firm growth. Correspondingly, they also capture the potential for (disruptive) innovation. When using the distinction between exploitative and explorative firm performance (March 1991), profits, ROA, and productivity mainly relate to exploitation, whereas Tobin's Q and the market-to-book ratio also include explorative performance (Corritore et al. 2019).

The overall profits are measured in logs, ROA is the ratio of overall profits to total assets[15], Tobin's Q is measured with the approximation from Chung and Pruitt (1994), and the market-to-book ratio is the simple ratio of market value to total assets. Table 9 reports the regressions with these outcome variables and the culture deviation index as the explanatory variable of interest. Cultural industry-deviation is significantly associated with lower profitability. A one standard deviation increase in the culture deviation index is associated with a decrease in overall profits of 2.8 percent and a decrease in ROA of one percentage point. Tobin's Q and the market-to-book ration, however, are not significantly associated with the index of cultural industry-deviation.

TABLE 9 ABOUT HERE

[15] Profits are measured with gross proftis because it is a cleaner measure of economic performance (Novy-Marx 2013). However, as it might not fully capture the costs arising from fixed assets, I additionally control for the total value of fixed assets in regressions with profits. ROA is winsorized at the 1st and 99th percentile due to outliers.

ROBUSTNESS CHECKS

Organizational Culture Profile

The main regressions of the paper are conducted with the CVF, because of its wide usage. As a first robustness check, I redo the main analysis for an additional measurement framework that is widely applied, the OCP. An advantage of the OCP is that it aims to solely measure values and norms within organizations (Chatman and O'Reilly 2016). Hence, by relying on the OCP, one remains close to the definition of corporate culture as a "set of values". Moreover, with its seven dimensions, it arguably covers additional cultural component that might have been missed out by the CVF. A downside, however, is that some of the OCP dimensions are rarely mentioned in the Glassdoor free texts. For instance, only roughly 0.1% of all words in the free texts are related to the detail-orientation and integrity dimension, whereas for the CVF at least 1% of all words are related to each dimension, respectively. Hence, the results might be distorted due to the rare occurrence of certain dimensions. Given these advantages and disadvantages, I report the results for both measurement frameworks. Table A.A3 shows that the overall effect of deviating from the industry average of culture is similar when applying the OCP compared to the results obtained using the CVF. When considering each OCP dimension individually, only for the team-orientation and transparency dimension deviations in both directions are associated with reduced productivity. For innovation, integrity, customer-orientation, and results-orientation, only one of the deviation directions is negatively and significantly correlated with TFP. For the detail-orientation dimension, no form of deviation shows a significant association with TFP. However, for the OCP there is no positive association between any form of deviation in any dimension. This suggests that also for the OCP, cultural deviations are generally associated with reduced productivity but this effect is not necessarily symmetric for positive and negative deviations.

Furthermore, when using the OCP to measure culture, the interaction effect between cultural industry-deviation and R&D expenditures is positive and significant, similar to the CVF. Advertisement expenditures, however, do not mediate the effect between cultural industry-deviation and TFP (Table A.A4). The effects of changes in culture over time (Table A.A5) are similar as for the CVF.

Composition of Reviewers and Occupational Subcultures

Though the occupational roles of reviewers are similar to the U.S. workforce (see Figure A.C1 in the Appendix), they are naturally not a random sample of workers. Yet, it may be the case that the composition of workers who decide to write an online review affects how culture is described in reviews. For instance, managers and HR practitioners might tend to describe more desirable cultural traits.

Furthermore, a common criticism of measuring corporate culture at the firm level is that culture might be highly heterogeneous across different departments and job roles (Stanford 2010). For instance, the values of accountants might be very different compared to those of salespeople within the same firm. In fact, Hofstede (1998) documents that corporate culture varies considerably between different units in the same firm. Potentially, cultural industry-deviation might confound with differences in culture between different units. For example, cultural industry-deviation might be partly driven by single units that deviate strongly from both their organizational and industry culture.

To deal with these two issues, I first exploit information about job titles by categorizing them into the major occupation groups of the SOC using O*NET, as described above, and include the share of reviews from each occupation group as a control, where the share of reviewers from SOC group 11, i.e., managers, is the reference group. Second, I include a control that measures the firm-level variance between the group means of all occupation groups. Table A.C2 shows that the effect of cultural industry-deviation remains robust when including these controls. The variation in corporate culture between occupation groups itself is not associated with productivity[16].

[16] Ehnes and Pasch (2019) discuss in more detail the association between cultural heterogeneity and firm performance.

Technical Robustness Checks

In this subsection, I test whether the main results are sensitive to technical specifications, such as the minimum number of reviews required to include a firm-year observation, the level of industry classification, and the exclusion of sentences with negations.

In the main regressions, I only included firm-year observations with at least 50 reviews, with the cutoff level resulting from a tradeoff between sample size and data accuracy. Therefore, I test whether the main results still hold when varying this cutoff-level. In Table A.C3 in the Appendix, I redo the baseline regressions of Table 6, Column (1), with the cutoff levels 0 and 100. Naturally, with increasing cutoff levels, the sample size decreases considerably. Though samples vary considerably among these different specifications coefficients barely change across regressions with different cutoff levels.

Similar as for these cutoff-levels, choosing an industry classification involves a tradeoff: When the classification is broad (GICS sector classification), firms' business environment potentially differ too strongly to compare their cultures, while for a granular classification (GICS sub-industry classification), there are fewer firms in the same industry to determine deviation from the industry standard, as I only include industries with minimum 5 firms. Therefore, Table A.C3 in the Appendix also redoes the main analysis with the GICS sector and sub-industry classifications for the cutoff-levels 0, 50, and 100. Hence, in these regressions, the cultural deviation index refers to the deviation from the average culture of all firms in the same sector or sub-industry, respectively. All coefficients are negative and significant and they lie in a similar magnitude as the baseline effect.

Next, I test whether the results are sensitive to negations in reviews. So far, I relied on an approach that marks words that occur after a negation. Yet, there are cases where this approach does not capture the meaning of the sentence. For instance, the sentence "Nothing more important than to innovate" would give a negative loading in the adhocracy/innovation dimension although the sentence clearly outlines the importance of innovation within the firm. To provide evidence that incorrect negation handling like this is not driving the main result, I conduct a robustness check in Column (1) of Table A.C4 in the Appendix,

where all sentences and sub-sentences that contain a negation, are excluded from the analysis. The coefficient for the cultural deviation index is virtually unchanged providing evidence that wrong negation handling is not affecting the results.

Moreover, I address a common concern that online reviews are more commonly generated by employees who are either highly satisfied or dissatisfied with their employer or even by fake reviewers who want to boost the own company's rating or shrink the rating of competitors. Therefore, I excluded all reviews with either the highest or lowest overall rating, 1 or 5. The results of this robustness check are presented in Table A.C4, Column (2). Again, results are fairly robust compared to the baseline regressions. Finally, in Column (3), I exclude all reviewers who identify themselves as "Former Employees". Though the coefficient drops in magnitude, it is still negative and significant.

DISCUSSION

Similar to previous studies, this paper shows that industry belonging and industry characteristics strongly shape corporate culture. Building on this, the paper analyzes in how far industry averages provide a good benchmark for suitable cultures, or, on the contrary, if firms can gain by deviating from their industries' average culture. For all culture dimensions, except one, I find that deviations from industry averages of culture are not associated with increased productivity and for most forms of deviation I find a negative relationship with productivity. The only exception is the market dimension of the CVF, where positive deviations are associated with increased productivity. This is not surprising, as many components of the market dimension closely resemble dimensions of the management practices examined by Bloom and van Reenen (2007), such as clarity, the promotion of high performance, goal-setting, and thorough planning. Bloom et al. (2016) document for various different industries and countries that these management practices are positively and monotonically associated with TFP.

Generally, however, the results indicate that deviations from industry averages reduce productivity. This supports the theoretical argument that industry averages are shaped by industry requirements. In fact, it appears that cultural deviators fail to adapt their culture to industry contingencies (Gordon 1991). Moreover, these results provide evidence against the resource-based view of Barney (1986), who argues that culture can only be a source of competitive advantage when it is rare (dissimilar to other firms). On the contrary, the opportunities to develop rare cultural traits seem to be strongly limited by industry requirements.

When industry averages provide good benchmarks for suitable cultural traits, why do some firms deviate from their industry's average? One potential explanation, which has been examined in this study, is that some firms are strongly differentiated and, hence, require different cultural traits that might support the corresponding form of differentiation. I find empirical support for this hypothesis, suggesting that the culture-productivity link is not only contingent on industry-belonging but also on strategy. Again, this outlines the contingent and complex nature of the culture-performance relationship. However, product differentiation does not explain all cultural industry-deviations as also some undifferentiated firms deviate from the average industry culture.

Common explanations for why firms choose unsuitable cultural traits include the following arguments (Note that similar arguments are also raised in general discussions for why firms choose unsuitable management policies (Ichniowski et al. 1997)): First, managers may lack the knowledge about suitable actions. In particular, Christensen and Gordon (1999) hypothesize that a cross-industry movement of managers can lead to problems when the basic cultural values of the new industry contradict those of the old one. Second, culture is difficult and costly to change (Schein 2010, Gibbons and Henderson 2012). Moreover, it might take some time until suitable cultural changes lead to productivity increases. In line with this, when firms shift their culture towards the average industry culture, the increases in productivity are small after one year, compared to the baseline effect.

Some firms, however, might also deviate because they react quickly to changes in their environment. Similarly, firms might deviate to achieve disruptions in their industry. For example, Google's disruptive success is often linked with its highly open and flexible corporate culture (Travica 2015). In fact, my results suggest that industry averages reflect cultural traits that are mainly conducive to current operational efficiency as I find negative effects of deviations on productivity and profitability. However, for explorative measures of firm performance, which also capture forward-looking aspects (March 1991), such as innovation and discovering new markets, I find no significant relationship.

Taken together, this leads to two striking follow-up questions, which might be addressed in future research: (i) When do industry cultures change over time? (ii) When do "culture-premia" arise within industries and how persistent are they? Industry requirements can shift over time, for instance, due to demand shocks, regulatory changes, or technological disruptions. However, it might take some time for firms to adapt to these changes. Those firms that quickly adapt their culture to the changed environment might experience, at least temporarily, a culture-premium. Similarly, Christensen and Gordon (1999) argue that culture-premia might arise when industry requirements change. However, when most firms adopt the cultural traits that have been associated with a premium, these traits become the new standard industry culture and, correspondingly, the culture-premium disappears.

Limitations

The results suggest that having a culture that is different from industry competitors' is associated with worse productivity. In addition, analyses of culture change over time provide some evidence for a causal relationship. However, there still might be other confounding factors that vary over time, such as business strategy, CEO effects, or HR management systems. For instance, Hartnell et al. (2019) suggest that culture is associated with other elements of the organizational system.

Using online reviews to measure corporate culture has two major advantages: First, it allows gathering a large sample of firms and therefore to analyze within-industry variation. Second, it includes a more diverse set of employees since surveys regarding corporate culture are usually conducted with

executives only. However, there are also two main downsides of relying on online reviews. First, there remains some doubt if reviewers provide a representative sample of employees and if they give honest descriptions about their employer. Second, there are also unresolved issues in automated textual analysis, such as multiple meanings of words and dealing with negations. I rely on two established culture measurement frameworks, the CVF and the OCP, because they are easily interpretable and allow comparison with previous studies. A downside, however, is that it could neglect aspects of culture mentioned in the reviews that are not directly related to the items of the two measurement frameworks.

Another caveat of this study is that the sample is restricted to firms with a sufficient amount of reviews, hence it is not a random sample. Yet, online platforms as Glassdoor became increasingly popular in recent years. Therefore, future studies supposedly are able to include an increasing number of firms.

CONCLUSION

This paper draws on a long-existing argument from the literature that industry requirements strongly shape corporate culture. Using a modern big data approach, it sheds new light on the question of how industry belonging influences the culture-performance link. The results indicate that industry averages of culture provide good benchmarks for suitable cultural traits. At the same time, this paper finds that the culture-performance link is not only contingent on industry belonging but also on business strategy. Specifically, the results indicate that highly differentiated firms do not exhibit reduced productivity when deviating from the average culture of the industry. Taken together, this study provides evidence for the highly contingent nature of the culture-performance link.

Hartigan, John A., and Pamela M. Hartigan. "The dip test of unimodality." *The annals of Statistics* 13, no. 1 (1985): 70-84.

FIGURES

FIGURE 1
Distribution of Glassdoor Ratings

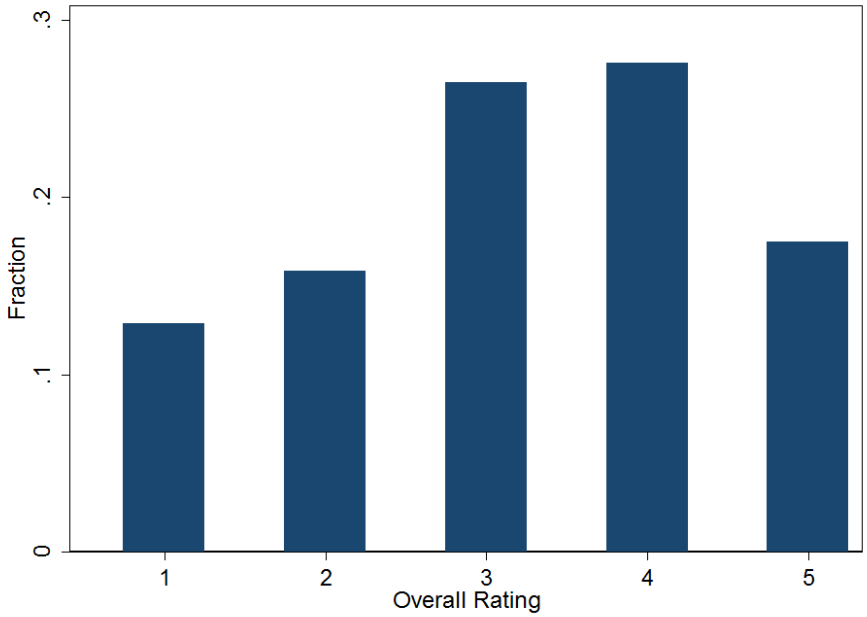
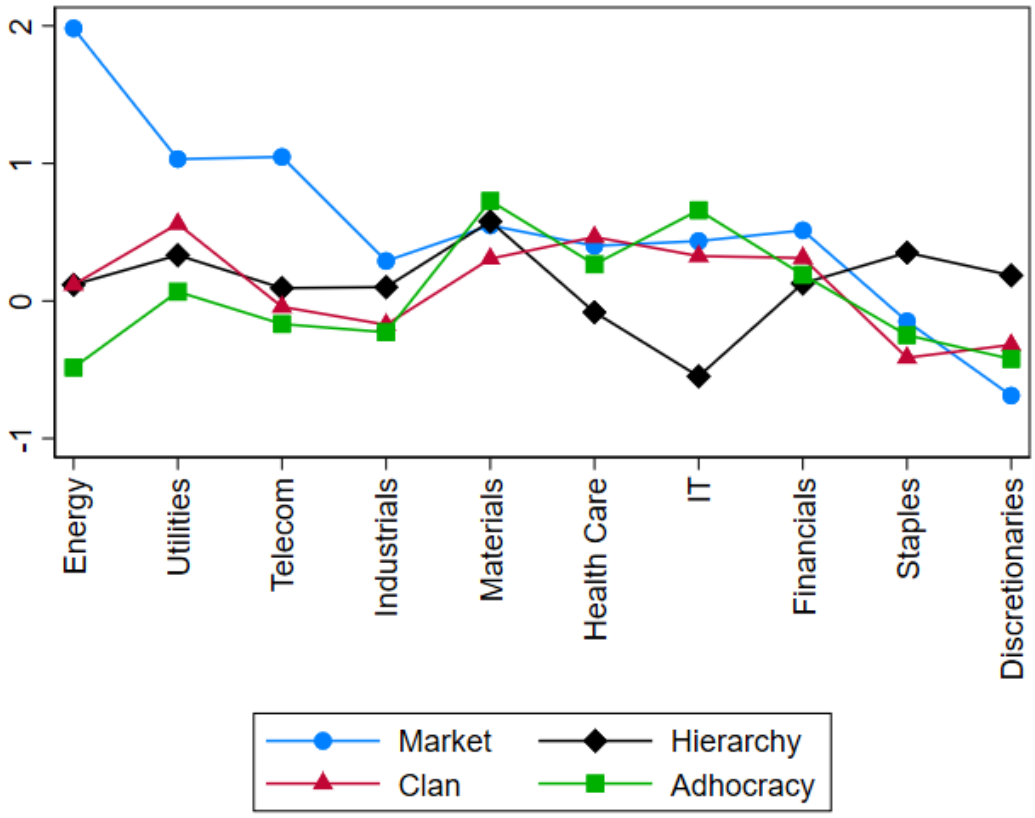


FIGURE 2
CVF Culture Scores by Sector



TABLES

TABLE 1
CVF Culture Dimensions and Associated Attributes

Culture Type	Assumptions	Beliefs	Values	Artifacts (behaviors)	Effectiveness Criteria
Clan	Human affiliation	People behave appropriately when they have trust in, loyalty to, and membership in the organization.	Attachment, affiliation, collaboration, trust, and support	Teamwork, participation, employee involvement, and open communication	Employee satisfaction and commitment
Adhocracy	Change	People behave appropriately when they understand the importance and impact of the task.	Growth, stimulation, variety, autonomy, and attention to detail	Risk-taking, creativity, and adaptability	Innovation
Market	Achievement	People behave appropriately when they have clear objectives and are rewarded based on their achievements.	Communication, competition, competence, and achievement	Gathering customer and competitor information, goal-setting, planning, task focus, competitiveness, and aggressiveness	Increased market share, profit, product quality, and productivity
Hierarchy	Stability	People behave appropriately when they have clear roles and procedures are formally defined by rules and regulations.	Communication, routinization, formalization, and consistency	Conformity and predictability	Efficiency, timeliness, and smooth functioning

Adopted from Table 13-1 in Quinn and Kimberly (1984) and Figure 2 in Hartnell et al. (2011).

TABLE 2
Examples of Online Reviews and Culture Scores (CVF)

Pros: Great training, lots of **help** *(pos. clan)* provided by management. Great opportunity for **growth** *(pos. adhocracy)* in the industry.

Cons: Typical restaurant downfalls, **inconsistent** *(neg. hierarchy)* pay, **unpredictable** *(neg. hierarchy)* schedule, uneven work load.

Market: 0 Hierarchy: -0.105 Clan: 0.053 Adhocracy: 0.053

Pros: Decent starting pay, good benefits, Company seems morally sound overall.

Cons: Not banker hours. Advancing **not** possible **without** large **sales goals** *(double negation -> pos. market)* being met. Certain locations have different customers, different quotas should be set

Market: 0.077 Hierarchy: 0 Clan: 0 Adhocracy: 0

Pros: has a very **diverse** *(pos. adhocracy)* culture. They believe in **supporting** *(pos. clan)* work-life balance for employees.

Cons: There are **innovative** *(pos. adhocracy)* solutions being **developed** (pos. adhocracy) and implemented daily. There is always something new to learn.

Market: 0 Hierarchy: 0 Clan: 0.052 Adhocracy: 0.158

The Table shows examples of free texts from online reviews. Bold letters indicate that the word contributed to one of the culture scores. Parentheses explain to which of the culture dimensions the word relates. Pos. indicates that the word increased the corresponding culture score, while neg. demonstrates a negative association.

TABLE 3
Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Hierarchy	1.00																
2. Clan	-0.10***	1.00															
3. Adhocracy	-0.11***	0.30***	1.00														
4. Market	-0.06***	0.24***	0.40***	1.00													
5. Innovation	0.04*	0.18***	0.59***	0.13***	1.00												
6. Team	-0.12***	0.68***	0.25***	0.12***	0.14***	1.00											
7. Customer	0.12***	-0.13***	-0.22***	-0.34***	-0.03	-0.06***	1.00										
8. Detail	-0.02	0.10***	0.10***	0.18***	0.05**	0.11***	-0.13***	1.00									
9. Integrity	-0.07***	0.16***	0.19***	0.29***	0.05**	0.09***	-0.20***	0.08***	1.00								
10. Results	-0.15***	0.26***	0.35***	0.54***	0.12***	0.21***	-0.19***	0.15***	0.16***	1.00							
11. Transp.	-0.06***	0.43***	0.13***	0.35***	0.05**	0.22***	-0.03	0.14***	0.08***	0.21***	1.00						
12. Log Emp	0.25***	-0.21***	-0.11***	0.00	0.10***	-0.24***	0.05**	-0.03	-0.03	-0.11***	-0.07***	1.00					
13. Log Capital	-0.16***	0.16***	0.21***	0.16***	0.08***	0.13***	-0.15***	0.08***	0.02	0.30***	0.09***	-0.24***	1.00				
14. Firm Age	0.17***	-0.10***	0.03	0.17***	0.09***	-0.14***	-0.05**	-0.01	0.14***	-0.00	0.02	0.45***	-0.12***	1.00			
15. R&D	-0.07**	0.04	0.04	0.00	-0.01	0.06**	-0.06**	0.04	0.01	0.07**	0.03	-0.09***	0.23***	-0.10***	1.00		
16. Advert.	-0.02	-0.06**	0.01	0.08***	-0.07**	-0.01	-0.09***	-0.02	0.00	0.04	0.00	-0.09***	-0.06*	-0.02	0.05	1.00	
17. Rating	0.04*	0.41***	0.41***	0.34***	0.36***	0.37***	-0.16***	0.12***	0.08***	0.30***	0.14***	-0.08***	0.22***	-0.05**	0.13***	0.03	1.00
18. TFP	-0.10***	0.13***	0.27***	0.56***	0.08***	0.06**	-0.37***	0.08***	0.26***	0.38***	0.13***	-0.09***	0.14***	0.11***	0.02	0.08***	0.23***
N	2151																

Observations are gathered at the firm-year level
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 4
Industry Averages and MANOVA

Industry (GICS)	Firms	Wilkins	Market	Hierarchy	Clan	Adhocracy
Aerospace & Defense	12	0.97+	0.87+	-0.06	-0.22	0.41+
Air Freight & Logistics	8	0.98+	-0.10	1.01+	-0.41	-0.81+
Airlines	5	1.00+	0.73	-0.24	-0.29	-0.28
Banks	19	0.95+	0.84+	0.28+	0.09	0.20
Capital Markets	15	0.99+	-0.04	-0.12	0.51+	-0.06
Chemicals	7	0.99+	0.55+	0.58+	0.31	0.73+
Commercial Services & Supplies	11	0.98+	-0.10	0.05	-0.42+	-0.80+
Communications Equipment	6	0.97+	1.12+	-0.59+	0.72+	1.48+
Construction & Engineering	5	1.00+	0.56	0.03	0.05	-0.28
Consumer Finance	6	0.99+	0.84+	-0.13	0.01	0.68+
Diversified Consumer Services	10	0.97+	-0.16	1.20+	0.70+	0.43
Diversified Telecommunication Services	6	0.98+	1.05+	0.09	-0.04	-0.17
Electric Utilities	5	0.99+	1.03+	0.33	0.56	0.07
Electrical Equipment	6	1.00	0.06	-0.05	-0.06	1.19+
Electronic Equipment, Instruments & Components	10	1.00+	0.12	-0.44	0.36	0.34
Food & Staples Retailing	17	0.98+	-0.28+	0.43+	-0.50+	-0.45+
Food Products	10	1.00+	0.32	0.06	-0.10	0.46
Health Care Equipment & Supplies	9	0.98+	1.23+	-0.24	0.66+	0.90+
Health Care Providers & Services	30	0.99+	0.09	-0.02	0.40+	-0.06
Hotels, Restaurants & Leisure	42	0.87+	-1.09+	0.22+	-0.55+	-0.49+
IT Services	35	0.97+	0.14	-0.51+	0.11	0.41+
Insurance	15	0.98+	0.61+	0.25	0.52+	0.40+
Internet & Catalog Retail	11	1.00+	-0.06	-0.38	0.00	0.13
Internet Software & Services	19	0.97+	0.00	-0.79+	0.73+	0.40+
Life Sciences Tools & Services	5	1.00+	0.56	-0.73	0.48	1.06
Machinery	8	0.99+	0.75+	-0.10	-0.07	0.14
Media	24	0.99+	-0.14	-0.05	-0.35+	-0.20
Multiline Retail	14	0.96+	-0.91+	0.22	-0.42+	-0.58+
Oil, Gas & Consumable Fuels	5	0.99+	1.98+	0.12	0.12	-0.48
Pharmaceuticals	5	0.98+	1.11+	-0.05	0.55	1.16+
Professional Services	14	0.99+	0.11	-0.20	0.63+	0.46+
REITs	6	0.99+	-0.15	0.19	1.38+	0.49
Road & Rail	13	0.96+	-0.13	0.32	-0.67+	-1.33+
Semiconductors & Semiconductor Equipment	10	0.98+	0.86+	0.04	-0.04	0.63+
Software	26	0.90+	0.76+	-0.67+	0.49+	1.07+
Specialty Retail	71	0.88+	-0.72+	0.22+	-0.32+	-0.58+
Technology Hardware, Storage & Peripherals	10	0.99+	0.49+	-0.60+	0.09	0.46+
Textiles, Apparel & Luxury Goods	10	1.00+	0.01	-0.16	0.28	0.05
ANOVA R2: Industry Dummies			0.44+	0.15+	0.18+	0.33+
ANOVA R2: State Dummies			0.13+	0.05+	0.07+	0.11+

+ $p<0.01$

TABLE 5
Culture Scores and Industry Characteristics

	(1) Market	(2) Hierarchy	(3) Clan	(4) Adhocracy
Industry Dynamism	0.092**	-0.024	0.009	0.062**
	(0.038)	(0.029)	(0.035)	(0.029)
Industry R&D	0.204***	-0.073**	0.025	0.248***
	(0.039)	(0.036)	(0.054)	(0.044)
Industry Capital Intensity	-0.409***	0.220***	-0.163***	-0.262***
	(0.062)	(0.045)	(0.044)	(0.045)
Year FE	Yes	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes	Yes
r2	0.358	0.151	0.233	0.378
N	1682	1682	1682	1682

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 6
Cultural Industry-Deviation and Productivity

	(1)	(2)	(3)	(4)	(5)
			TFP		
Cultural Deviation Index	-0.134***				
	(0.025)				
Negative Deviation Market		-0.646***			
		(0.069)			
Positive Deviation Market		0.200***			
		(0.064)			
Negative Deviation Hierarchy			-0.120***		
			(0.045)		
Positive Deviation Hierarchy			-0.107**		
			(0.045)		
Negative Deviation Clan				-0.115*	
				(0.059)	
Positive Deviation Clan				-0.142***	
				(0.044)	
Negative Deviation Adhocracy					-0.306***
					(0.062)
Positive Deviation Adhocracy					-0.018
					(0.055)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes	Yes	Yes
r2	0.488	0.569	0.477	0.478	0.489
N	1837	1837	1837	1837	1837

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Cultural Deviation Index refers to the sum of the absolute differences between a firm's culture and its industry average for all dimensions combined. Positive (Negative) Deviation refers to the differences to the average industry culture when firms exceed (undercut) the industry average. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.

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

TABLE 7
Product Differentiation as Mediator

	(1)	(2)
	TFP	
Cultural Deviation Index	-0.079***	-0.113***
	(0.025)	(0.026)
R&D	-0.003	
	(0.031)	
Cultural Deviation Index x R&D	0.073***	
	(0.024)	
Advertisement		0.062*
		(0.032)
Cultural Deviation Index x Advertisement		0.077***
		(0.028)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Firm & Review Controls	Yes	Yes
r2	0.547	0.586
N	1219	1156

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 8
Culture Change over Time

	(1)	(2)	(3)	(4)	(5)	(6)
			TFP			
Lag Firm Culture Change	-0.004	-0.004*			-0.004*	-0.005*
	(0.003)	(0.003)			(0.003)	(0.003)
Lag Ind. Culture Change			0.003	0.005	0.004	0.006
			(0.007)	(0.006)	(0.006)	(0.007)
Lag TFP		0.232**		0.231**		0.233**
		(0.098)		(0.099)		(0.099)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes	Yes	Yes	Yes
r2	0.114	0.152	0.112	0.150	0.115	0.153
N	936	936	936	936	936	936

Robust standard errors in parentheses. All regressions are estimated with Fixed-Effects. Firm controls include the number of employees (in logs), the value of working capital (in logs), and the firm age. Review controls include a control for the average number of words per review and the number of reviews. Industry refers to the industry classification of the GICS. Firm Change refers to culture changes by the firm. Industry Change refers to culture changes by all competitors. For both measures, positive values indicate that firms' shifted the culture away from each other. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 9
Cultural Industry-Deviation and Other Measures of Firm Performance

	(1) Log Profits	(2) ROA	(3) Tobin's Q	(4) Market-to-Book
Cultural Deviation Index	-0.028***	-0.010**	0.021	0.025
	(0.009)	(0.005)	(0.042)	(0.045)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Firms & Review Controls	Yes	Yes	Yes	Yes
r2	0.767	0.555	0.287	0.316
N	1837	1837	1698	1735

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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APPENDIX

Appendix A: Organizational Culture Profile (OCP)

TABLE A.A1
Dimensions and Attributes of the Organizational Culture Profile

Dimension	Associated Attributes
Innovation	Willing to experiment; fast-moving; quick to take advantage of opportunities; taking initiative; risk-taking; innovative
Team-oriented	Working in collaboration with others; team-oriented; cooperative; supportive; not aggressive; low levels of conflict
Customer-oriented	Being customer-oriented; listening to the customers; being market driven
Detail-oriented	Paying attend to detail; being precise; emphasizing quality; being analytical
Integrity	Having integrity; high ethical standards; being honest
Results-oriented	Being results-oriented; high expectations for performance; achievement oriented; not easy going; not calm
Transparency	Putting organization's goals before the unit; individual goals are transparent; sharing information freely

The Table shows the seven dimensions of the OCP (O'Reilly et al., 2012).

TABLE A.A2
Examples of Online Reviews and Culture Scores (OCP)

Pros: Great training, lots of **help** *(pos. team)* provided by management. Great opportunity for **growth** *(pos. innovation)* in the industry.

Cons: Typical restaurant downfalls, inconsistent pay, unpredictable schedule, uneven work load.

Innovation: 0.053 Team: 0.053 Customer: 0 Detail: 0 Integrity: 0 Results: 0 Transparency: 0

Pros: Decent starting pay, good benefits, Company seems **morally** *(pos. integrity)* sound overall.

Cons: Not banker hours. Advancing **not** possible **without** large sales **goals** *(double negation -> pos. transparency)* being met. Certain locations have different **customers** *(pos. customer)*, different quotas should be set

Innovation: 0 Team: 0 Customer: 0.038 Detail: 0 Integrity: 0.038 Results: 0 Transparency: 0.038

Pros: has a very diverse culture. They believe in **supporting** *(pos. team)* work-life balance for employees.

Cons: There are **innovative** *(pos. innovation)* **solutions** *(pos. results)* being developed and implemented daily. There is always something new to **learn** *(pos. innovation)*.

Innovation: 0.105 Team: 0.052 Customer: 0 Detail: 0 Integrity: 0 Results: 0.052 Transparency: 0

The Table shows examples of free texts from online reviews. Bold letters indicate that the word contributed to one of the culture scores. Parentheses explain to which of the culture dimensions the word relates. Pos. indicates that the word increased the corresponding culture score, while neg. demonstrates a negative association.

TABLE A.A3
Cultural Industry-Deviation and Productivity for OCP Dimensions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TFP							
Cultural Deviation Index	-0.117***							
	(0.028)							
Neg. Dev. Innovation		-0.159***						
		(0.058)						
Pos. Dev. Innovation		-0.029						
		(0.054)						
Neg. Dev. Integrity			-0.199***					
			(0.055)					
Pos. Dev. Integrity			0.025					
			(0.042)					
Neg. Dev. Customer				0.089				
				(0.082)				
Pos. Dev. Customer				-0.205***				
				(0.070)				
Neg. Dev. Results					-0.360***			
					(0.056)			
Pos. Dev. Results					0.078			
					(0.050)			
Neg. Dev. Detail						-0.055		
						(0.047)		
Pos. Dev. Detail						0.045		
						(0.032)		
Neg. Dev. Team							-0.110**	
							(0.054)	
Pos. Dev. Team							-0.178***	
							(0.044)	
Neg. Dev. Transparent								-0.208***
								(0.053)
Pos. Dev. Transparent								-0.080**
								(0.037)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
r2	0.484	0.478	0.481	0.488	0.507	0.475	0.481	0.479
N	1837	1837	1837	1837	1837	1837	1837	1837

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Cultural industry-deviation refers to the sum of the absolute differences between a firm's culture and its industry average for all dimensions combined. Positive (Negative) Deviation refers to the differences to the average industry culture when firms exceed (undercut) the industry average. Firm controls include the number of employees (in logs), the value of working capital, and the firm age. Review controls include a control for the average number of words per review and the number of reviews. Industry refers to the industry classification of the GICS.

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

TABLE A.A4
Product Differentiation as Mediator (OCP)

	(1)	(2)
	TFP	
Cultural Deviation Index	-0.057*	-0.050*
	(0.030)	(0.026)
R&D	-0.006	
	(0.031)	
Cultural Deviation Index x R&D	0.081***	
	(0.025)	
Advertisement		0.076**
		(0.034)
Cultural Deviation Index x Advertisement		0.023
		(0.023)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Firm & Review Controls	Yes	Yes
r2	0.545	0.570
N	1219	1156

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A.A5
Culture Change over Time (OCP)

	(1)	(2)	(3)	(4)	(5)	(6)
	TFP					
Lag Firm Change	-0.003**	-0.004**			-0.003**	-0.004**
	(0.002)	(0.002)			(0.002)	(0.002)
Lag Industry Change			0.004	0.007	0.006	0.007
			(0.004)	(0.005)	(0.004)	(0.005)
Lag TFP		0.232**		0.235**		0.237**
		(0.098)		(0.100)		(0.099)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes	Yes	Yes	Yes
r2	0.115	0.153	0.113	0.152	0.117	0.157
N	936	936	936	936	936	936

Robust standard errors in parentheses. All regressions are estimated with Fixed-Effects. Firm controls include the number of employees (in logs), the value of working capital (in logs), and the firm age. Review controls include a control for the average number of words per review and the number of reviews. Industry refers to the industry classification of the GICS. Firm Change refers to culture changes by the firm. Industry Change refers to culture changes by all competitors. For both measures, positive values indicate that firms' shifted the culture away from each other.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix B: Characteristics of Glassdoor Visitors

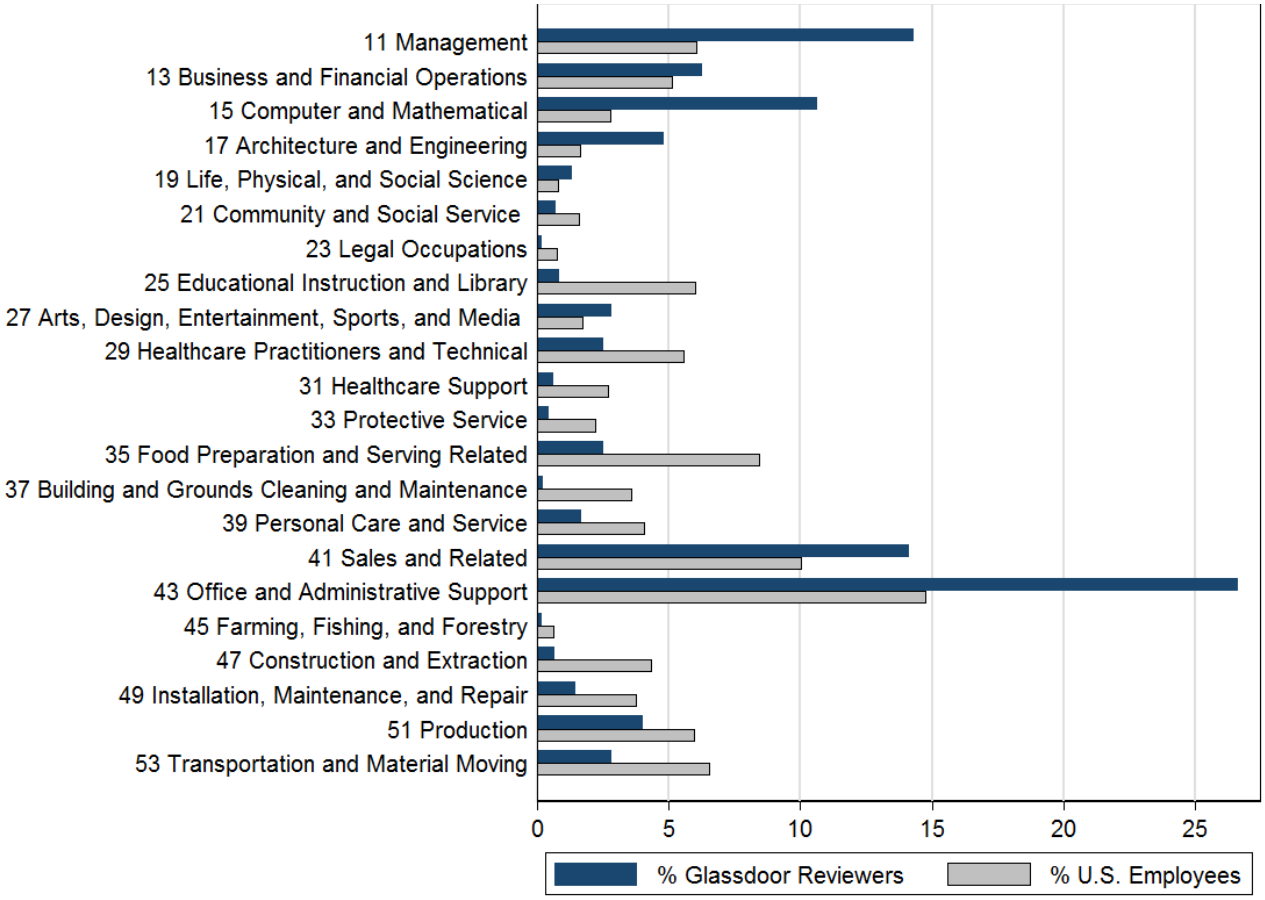
To assess the characteristics of users, I retrieve web traffic statistics from *Quantcast.com* similar to Moniz (2015). Quantcast is specialized on measuring the audience of a website by tracking cookies and clickstream of users. This allows Quantcast to estimate the demographical composition of websites' users, while the anonymity of users is retained. According to Quantcast, Glassdoor has 37.6 million unique monthly users, as of February 2018. Table A.B1 reports descriptive statistics on the profile of Glassdoor visitors. As can be seen, users are fairly distributed across various categories such as gender, income, education, and ethnicity. Quantcast also provides an index that shows how these demographics correspond to the general internet population, where an index of 100 represents an exact representation and an index below 100 an under- and above 100 an overrepresentation. Naturally, users below 18 and above 65 years are underrepresented, as they are predominantly not part of the workforce. Furthermore, high- educated users are overrepresented, which suggests that they are making more use of modern job searching tools. According to Quantcast, Caucasians are under-, while ethnic minorities, especially Asians, are overrepresented. The reason for this might be that ethnic minorities need to engage more strongly in job search because they are discriminated against in the hiring process (Altonji and Blank 1999, Bertrand and Duflo 2017).

TABLE A.B1
Characteristics of Glassdoor Users based on Quantcast

Characteristic	Composition	Index
Place		
United States	87%	
Rest of World	13%	
Gender		
Male	45%	90
Female	55%	110
Age		
<18	12%	67
18-24	20%	142
25-34	24%	150
35-44	20%	103
45-54	16%	92
55-64	7%	70
65+	1%	26
Household Income		
$0-50k	45%	88
$50-100k	30%	100
$100-150k	14%	119
$150k+	11%	147
Education Level		
No College	26%	55
College	52%	129
Grad School	22%	159
Ethnicity		
Caucasian	64%	83
African American	13%	157
Asian	9%	216
Hispanics	12%	125
Other	2%	116

The table shows characteristics of Glassdoor users, which were estimated by Quantcast in February 2018. Index shows how these demographics correspond to the general internet population, where an index of 100 represents an exact representation and an index above 100 an overrepresentation.

FIGURE A.B1
Share of Occupations: Glassdoor Reviews and whole U.S.



The y-axis shows the major categories of the SOC (SOC code and category label). % Glassdoor Reviewers demonstrates how the Glassdoor Reviewers of my sample are distributed among the SOC major groups. % U.S. Employees shows how all employees in the U.S. were distributed among these categories in 2016 based on data from the U.S. Bureau of Labor Statistics.

Appendix C: Additional Tables

TABLE A.C1
Cultural Deviation Index and Productivity

	(1)	(2)	(3)	(4)
Cultural Deviation Index	-0.134***			
	(0.025)			
Cultural Deviation Index		-0.138***		
(Controlling for Culture)		(0.022)		
Cultural Deviation Index			-0.111***	
(Scaled by Std. Dev.)			(0.024)	
Cultural Deviation Index				-0.128***
(Deviations from Median Culture)				(0.025)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Review Controls	Yes	Yes	Yes	Yes
r2	0.488	0.581	0.485	0.488
N	1837	1837	1837	1837

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Cultural Deviation Index refers to the sum of the absolute differences between a firm's culture and its industry average for all dimensions combined. Controlling for Culture adds additionally a linear effect for each cultural dimension as a control. Scaled by Std. Dev. means that deviations are divided by the standard deviation within industries for all culture dimensions. Deviations to Median measures cultural deviation to the industry median and not the industry average. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A.C2 Reviewer Composition and Subcultures

	(1) TFP
Cultural Deviation Index	-0.117***
	(0.021)
Variation Culture between Occ. Groups	0.017
	(0.027)
Share Occupation Group 13	0.956
	(0.769)
Share Occupation Group 15	1.200*
	(0.643)
Share Occupation Group 17	0.484
	(0.717)
Share Occupation Group 21	-1.374
	(1.409)
Share Occupation Group 19	-0.341
	(1.256)
Share Occupation Group 23	4.853
	(4.343)
Share Occupation Group 25	-1.071
	(0.844)
Share Occupation Group 27	0.879
	(0.918)
Share Occupation Group 29	-3.540***
	(1.210)
Share Occupation Group 31	-6.078***
	(2.302)
Share Occupation Group 33	-0.027
	(1.765)
Share Occupation Group 35	-1.628***
	(0.407)
Share Occupation Group 37	-1.288
	(2.674)
Share Occupation Group 39	-1.553***
	(0.551)
Share Occupation Group 41	-1.129**
	(0.470)
Share Occupation Group 43	-0.551
	(0.618)
Share Occupation Group 45	1.543
	(3.578)
Share Occupation Group 47	0.164
	(1.984)
Share Occupation Group 49	1.566
	(1.647)
Share Occupation Group 51	-1.275
	(0.825)
Share Occupation Group 53	-0.243
	(0.527)
Share Occupation Group 55	-3.189*
	(1.690)
Share Anonymous	0.909*
	(0.497)
Share not Classified	-0.453
	(0.832)
Year & Industry FE	Yes
Review Controls	Yes
r2	0.420
N	1545

Clustered standard errors in parentheses. Share Occupation Group refers to the share of reviewers that were matched into the corresponding SOC major groups. The reference group is SOC group 11. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A.C3
Cultural Deviation Index and Productivity. Different Cutoff Levels and Industry Levels

	(1)	(2)	(3)
GICS-Classfication	Sector	Industry	Subindustry
Cutoff = 0	-0.131***	-0.127***	-0.103***
	(0.019)	(0.018)	(0.016)
r2	0.287	0.477	0.577
N	7717	7331	6547
Cutoff = 50	-0.140***	-0.134***	-0.078***
	(0.031)	(0.025)	(0.029)
r2	0.281	0.488	0.581
N	2278	1837	1365
Cutoff = 100	-0.162***	-0.158***	-0.094**
	(0.040)	(0.039)	(0.047)
r2	0.374	0.545	0.641
N	1169	806	497
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Cutoff refers to the minimum amount of reviews required per firm-year to include the observation. All coefficients refer to the the effect of Cultural Deviation Index on TFP. Controls are identical to the controls of the baseline regression in Table 6. Cutoff refers to the minimum amount of reviews required per firm-year to include the observation. Sector, Industry, and Subindustry refer to the corresponding industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A.C4
Exclude Negations, Extreme Ratings, and Former Employees

	(1)	(2)	(3)
	Exclude Negations	Exclude Ratings 1&5	Exclude Former Employees
Cultural Deviation Index	-0.139***	-0.117***	-0.078**
	(0.026)	(0.025)	(0.038)
r2	0.489	0.484	0.478
N	1837	1837	1837
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Review Controls	Yes	Yes	Yes

Standard errors in parentheses. Standard errors are clustered at the firm level. All regressions are estimated by POLS. Cultural Deviation Index refers to the sum of the absolute differences between a firm's culture and its industry average for all dimensions combined. Exclude Negations means that sentences that contain negation words were excluded. Exclude Ratings 1&5 excludes all reviews with a rating of 1 or 5. Exclude Former Employees only considers the reviews of current employees and excludes former employees. Firm controls include the number of employees (in logs), the value of working capital (in logs), and firm age. Review controls include a control for the average number of words per review, the share of former employees, and the number of reviews. Industry refers to the industry classification of the GICS.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$