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Finance Working Paper N° 727/2021
February 2021

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ECGI Working Paper Series in Finance

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We thank Yakov Amihud, Martijn van den Assem, Nelson Camanho, William Forbes, Marc Gabarro, Juan-Pedro Gómez, Bharat Sarath, Geoffrey Tate, Walter Torous, Fernando Zapatero, and seminar participants at the Workshop on Corporate Governance and Investment at Oslo Metropolitan University, the Global Finance Conference at the ESSCA School of Management in Paris, the IFABS Asia Ningbo China Conference, the IFABS Corporate Finance Conference at the University of Oxford, the Finance Forum at Universitat Pompeu Fabra in Barcelona, the Behavioral Finance Working Group Conference at Queen Mary University of London, the Israel Behavioral Finance Conference at Tel Aviv University, and the Erasmus Finance brown bag for many insightful comments. We are grateful to Manfred Antoni and Benjamin Wirth for their precious help with data work at the German Federal Employment Agency. We acknowledge financial support from NWO through a Vici grant.

Abstract

Recent research shows that a high wage gap between managers and workers identifies better-performing firms, but the stock market does not seem to price this information. In this paper, we show that not all investors neglect pay inequality. Using a unique data set on German firms' employee compensation, we find that the wage gap is incorrectly priced only by unsophisticated traders. We also show that some of these investors seem to exhibit a preference for low pay inequality, which decreases the cost of capital for firms that adopt equitable pay schemes.

Keywords: Wage gap, Stock returns, Asymmetric information, Inequality aversion.

JEL Classifications: G10, G12, G14, G32

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Wage gap and stock returns: Do investors dislike pay inequality?[†]

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Abstract

Recent research shows that a high wage-gap between managers and workers identifies better-performing firms, but the stock market does not seem to price this information. In this paper, we show that not all investors neglect pay inequality. Using a unique data set on German firms' employee compensation, we find that the mispricing of the wage gap is driven by unsophisticated traders. Specifically, these investors seem to exhibit a preference for low pay-inequality. The results suggest that low-wage-gap firms face a lower cost of capital as a reward for their equitable pay schemes.

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This draft: January 2021.

1. Introduction

In recent years, pay inequality between managers and workers has received increasing attention from academics, regulators, and the media.[1] On October 17, 2015, the Securities and Exchange Commission adopted a new rule, effective from January 1, 2017, that requires U.S. companies to disclose the ratio of CEO pay to the median employee wage. In this regard, on May 11, 2016, the New York Times pointed out that *"(t)he strong case for the rule (...) keeps getting stronger"*, providing support to the idea that corporations should *"rein in"* the difference in pay between managers and workers.

Interestingly, the populist anger that meets high executive premia does not seem to be justified on

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[†]We thank Yakov Amihud, Martijn van den Assem, Nelson Camanho, William Forbes, Marc Gabarro, Juan-Pedro Gómez, Bharat Sarath, Geoffrey Tate, Walter Torous, Fernando Zapatero, and seminar participants at the Workshop on Corporate Governance and Investment at Oslo Metropolitan University, the Global Finance Conference at the ESSCA School of Management in Paris, the IFABS Asia Ningbo China Conference, the IFABS Corporate Finance Conference at the University of Oxford, the Finance Forum at Universitat Pompeu Fabra in Barcelona, the Behavioral Finance Working Group Conference at Queen Mary University of London, the Israel Behavioral Finance Conference at Tel Aviv University, and the Erasmus Finance brown bag for many insightful comments. We are grateful to Manfred Antoni, Benjamin Wirth, and Britta Gehrke for their precious help with data work at the German Federal Employment Agency. We acknowledge financial support from NWO through a Vici grant.

[1]See, e.g., Crystal (1991), Pfeffer and Langton (1993), Bloom and Michel (2002), Wade, O'Reilly, Pollock (2006), and Murphy and Jensen (2018).

economic grounds. Recent research shows that high pay-inequality does not hinder firm performance (Cronqvist, Heyman, Nilsson, Svaleryd, and Vlachos, 2009), and actually seems to improve it (Faleye, Reis, and Venkateswaran, 2013; Mueller, Ouimet, and Simintzi, 2017; Cullen and Perez-Truglia, 2018), which is in line with the conjecture that a larger wage gap reflects higher managerial effort. Despite the lower operating performance, however, low-wage-gap firms seem to trade at a premium (Mueller et al., 2017). In this paper, we shed new light on this issue.

To derive theoretical guidance, we propose an asset pricing model in which the optimal wage gap between the CEO and rank-and-file workers increases with managerial effort. We show that the mispricing of the wage gap arises from the presence of unsophisticated investors in the market. Using a unique data set on German firms' employee compensation, we provide support for the model's predictions. We find that the wage gap is incorrectly priced only by unsophisticated traders, because these investors seem to exhibit a preference for companies with low pay-inequality. The results suggest that while high-wage-gap firms achieve higher profitability, low-wage-gap firms face a lower cost of capital as a reward for their equitable pay schemes.

Our study unveils two important points. First, we show that not all investors are equally unable to incorporate the wage gap in their evaluations. Sophisticated traders seem to recognize the relevance of the wage gap. Second, we find evidence that unsophisticated investors, much like the general public, exhibit an aversion to high wage-gaps within firms, especially when country-wide income inequality is high. While inequality-averse preferences find substantial support in experimental research (see, e.g., Fehr and Schmidt, 1999), to the best of our knowledge this is the first paper to suggest that they also characterize investor behavior.

In our theoretical analysis, we consider a three-period economy in which the optimal wage gap between the CEO and rank-and-file workers increases with managerial effort. At time zero, the representative firm appoints a manager to hire workers and carry out a project. The firm engages in efficient contracting, and chooses the optimal level of managerial effort by solving the following trade-off: high effort costs more, but improves the firm's productivity through a more efficient employment of resources. At time one, the firm seeks funding on the stock market to pay workers' wages and start production. At time two, the firm liquidates. In equilibrium, a high wage-gap between CEO and regular workers is an indication of high effort and high profitability.

We consider a financial market with sophisticated and unsophisticated investors, where the latter face short-sales constraints.[2] One way to make this distinction practical is to think of them as hedge funds and mutual funds, respectively (Chen, Hong, and Stein, 2002; Hong and Sraer, 2016). Both investor types observe the wage gap, but unsophisticated traders also consider non-monetary arguments when investing (e.g., society's welfare). Specifically, they dislike high pay-inequality within firms.[3]

[2]The presence of short-sales constraints is without loss of generality, as any friction that prevents the revelation of negative opinions would produce the same results (see, e.g., Diether, Malloy, and Scherbina, 2002).

[3]For a discussion of inequality-averse preferences, see Fehr and Schmidt (1999), and Neilson and Stowe (2010). For empirical evidence, see Card, Mas, Moretti, and Saez (2012).

Such preferences lead inequality-averse traders to evaluate low-wage-gap stocks in a more favorable way than they do high-wage-gap stocks. As a result, they buy the former, and shun the latter. This creates asymmetric mispricing. Low-wage-gap stocks become overpriced, and yield negative abnormal returns when the firm liquidates. High-wage-gap stocks are correctly priced instead, and yield zero abnormal returns. The return differential between high- and low-wage-gap stocks increases with the difference in wage gaps, the proportion of inequality-averse traders, and their degree of inequality aversion.

In the empirical analysis, we take these predictions to the data. The major hurdle to overcome in this respect is the lack of publicly available data on rank-and-file workers' compensation. In the U.S., disclosure of workers' wages before January 1, 2017, was only discretionary, with low coverage. In this paper, we overcome this issue by using the "Establishment History Panel" database, maintained and made available by the German Federal Employment Agency. This is a unique data set that contains the annual gross wage for all workers in Germany from January 2001 to December 2011, together with information on the establishment in which they work.[4] With respect to previous literature on the wage gap, the advantage of this data set is that it does not come from surveys.

Our story hinges on the idea that there is a positive relation between the wage gap and managerial effort, which ultimately translates into higher profitability. To validate this assumption, we begin our empirical analysis by examining the relation between return on assets and the wage gap between the CEO and rank-and-file workers. Consistent with our conjecture, we find a positive association between pay inequality and return on assets. This result rules out the alternative hypotheses that a high wage-gap might reflect rent extraction, or that there might actually be no relation between the wage gap and managerial effort.

To construct our test portfolios, we divide stocks into pay inequality quantiles. Then, we rebalance them at the beginning of each month, and define high- and low-wage-gap portfolios, respectively, as the stocks that lie at the top and the bottom 30%, 20%, and 10% of the distribution. We define the dependent variable as monthly excess returns on the top, bottom, and top-minus-bottom (i.e., long-minus-short) portfolios. To estimate abnormal returns, we run time-series regressions of Carhart's (1997) four-factor model, using the European risk factors from Kenneth French's website.

Consistent with the model's predictions, we find an asymmetric mispricing pattern that increases with the size of the wage gap. When considering the 30% breakpoint, we find that low-wage-gap stocks yield negative and significant abnormal returns of 0.80% per month. For high-wage-gap stocks, instead, the alpha is close to zero and not significant. The difference between these returns is also significant, and therefore constitutes a profitable long-short investment strategy (0.90% per month). Arbitrage returns become even larger when considering the 20% threshold (1.60% per month), and the 10% threshold (1.70% per month), and the results are again driven by the short leg.[5]

[4]While the panel is publicly available, employees of the German Federal Employment Agency provided an anonymous match between 100 firms and establishments, making it accessible only to us.

[5]These empirical patterns are robust to a variety of alternative specifications, such as the German four-factor model from the Humboldt University of Berlin, alternative factor models from Pástor and Stambaugh (2003), Fama and French (2015),

The results suggest that the mispricing is related to the presence of unsophisticated investors, rather than lack of information on pay inequality. We also make this point more formally in our theoretical analysis. We show that if the wage gap is unobservable, all traders (sophisticated or unsophisticated) evaluate high- and low-wage-gap stocks equally. Mispricing is then symmetric. When the firm liquidates, abnormal returns are positive for high-wage-gap stocks, and negative for low-wage-gap stocks. The insignificant alpha on high-wage-gap stocks rules out this alternative story.

To provide further (and more direct) evidence on the relation between the mispricing of the wage gap and the presence of unsophisticated traders, we re-estimate our regressions in subsets of stocks that are difficult to evaluate and/or arbitrage. Specifically, we consider companies with low market capitalization and extreme book-to-market ratios (Baker and Wurgler, 2006, 2007; Baker, Wurgler, and Yuan, 2012). With a lower concentration of sophisticated investors, we expect the mispricing of the wage gap to be particularly pronounced among these stocks. We find that the negative abnormal returns of low-wage-gap stocks are indeed concentrated around small stocks (i.e., below-median market capitalization), and stocks with extreme book-to-market ratios (i.e., top and bottom 30%).

These findings raise the question whether the pricing error of unsophisticated investors is due to mere inattention, or actually reflects aversion to high pay-inequality. The asset pricing implications of these two competing stories are similar, as both imply overpricing for low-wage-gap stocks. However, there is one important difference. Under inequality-averse preferences, the mispricing of low-wage-gap stocks should vary with the degree of inequality aversion of unsophisticated investors.

To identify inequality-averse traders, we devise three sets of empirical tests. First, we look into the relation between the wage gap and valuations. The model suggests that if inequality-averse investors are present, the price differential between high- and low-wage-gap stocks should decrease with the degree of inequality aversion. The intuition is that a stronger preference for low-wage-gap firms bids up the price of these stocks, thus reducing the difference in valuations with high-wage-gap firms. To test this prediction, we hypothesize that aversion to managerial premia increases when German income inequality becomes large.[6] We find that the price differential between high- and low-wage-gap stocks indeed decreases when country-wide income inequality is high.

Second, we expect investors with a preference for fairness to be particularly sensitive to unjustified pay inequality, i.e., wage gaps that are not explained by economic fundamentals. To test for this, we follow Rouen (2020) and decompose CEO and workers' pay into an economically justified and an unjustified component. Under inequality-averse preferences, investors should reward firms that exhibit low unjustified wage gaps, and discriminate against other firms. The empirical evidence lends support to this conjecture. We find that

Novy-Marx (2013), and Stambaugh and Yuan (2017), Fama-MacBeth regressions from Brennan, Chordia, and Subrahmanyam (1998), cash rather than total CEO compensation, and the wage gap of the other members of the board excluding the CEO.

[6]For example, income inequality has turned executive bonuses into a campaign issue in Germany (see Jennen, Buergin, and Delfs, "Executive bonuses targeted by Merkel rivals in German campaign", *Bloomberg*, 2017. For U.S. evidence, see, e.g., Wolfers, "All you need to know about income inequality, in one comparison", *New York Times*, 2015). Also, there seems to be a direct link between country-level and within-firm pay variation (Song et al., 2019).

the mispricing of pay inequality is confined to firms that have low unjustifed wage gaps.

Third, we analyze the relation between the mispricing of the wage gap and investor optimism. Stambaugh, Yu, and Yuan (2012) find that asset pricing anomalies are stronger following high levels of sentiment, because optimistic investors bid up the prices of lower-performing stocks. Under inequality-averse preferences, we expect the mispricing of the wage gap to follow a similar pattern, but with the opposite sign. If inequality-averse investors are present, their aversion should increase when they are pessimistic about the economy.[7] As a result, they should reward low-wage-gap companies especially when sentiment is low. Consistent with this line of reasoning, we find that the overpricing of low-wage-gap stocks is entirely concentrated in times of low sentiment. Overall, these empirical patterns are hard to reconcile with a simple story of investor inattention or lack of information.

This paper speaks to the literature that studies the impact of values on investor behavior (see, e.g., Grinblatt and Keloharju, 2001; Bhattacharya and Groznik, 2008; Morse and Shive, 2010). Previous research shows that investors consider non-monetary variables in their trading strategies, such as moral issues (Hong and Kacperczyk, 2009), or political affiliation (Kaustia and Torstila, 2011; Hong and Kostovetsky, 2012). Our results extend these findings by providing evidence that investors dislike pay inequality within firms, rewarding companies that adopt equitable pay schemes.

Germany provides a unique setting for our analysis. There is ample evidence that German investors care about non-monetary values. In a 2016 Socially Responsible Investment (SRI) study, for example, Eurosif shows that Germany is one of the two European countries that invest the most in SRI stocks (along with France).[8] Labor rights constitutes one of the dimensions through which firms are evaluated. In light of this, it is plausible that some of these investors may indeed be inequality-averse, either to cater to their clientele's preferences, or because they may actually be prone to such a bias themselves (see, e.g., Hong and Kostovetsky, 2012; DeVault, Sias, and Starks, 2019).

German investors are able to observe the wage gap at least indirectly. On the one hand, compensation for the CEO and other members of the managerial board is officially disclosed in the company's annual report. On the other hand, employee pay is informally reported by two main sources. First, media coverage provides a detailed ranking of firms on a number of relevant economic dimensions, including workers' salaries.[9] Second, online job adverts provide an indication of the pay range that prospective employees can expect (see, for example, Gehalt.de).

Our findings also contribute to a more general literature on market learning. Previous work shows that

[7] Plenty of anecdotal evidence shows that managerial premia spark public outrage during bad economic times. During the recent financial crisis, for example, German chancellor Angela Merkel called the payment of large managerial bonuses "irritating" (see Hall and Benoit, "Merkel supports bonus curbs", *Financial Times*, 2009). Similarly, U.S. President Obama called financial institutions "shameful" for giving themselves nearly $20 billion in bonuses in the midst of the crisis (see Stolberg, "Obama calls Wall Street bonuses shameful", *New York Times*, 2009).

[8] Specifically, there is large participation of German institutional investors with a focus on societal values. Pension funds account for nearly half (48%) of all assets under management invested in SRI, followed by religious institutions and charities (24%), and foundations (12%).

[9] See, e.g., arbeitgeber-ranking.de/rankings/studenten/faktor/hohes-einstiegsgehalt.

the market is unable to correctly evaluate intangibles, such as R&D (Lev and Sougiannis, 1996; Chan, Lakonishok, and Sougiannis, 2001), innovative efficiency (Hirshleifer, Hsu, and Li, 2018), advertising (Chan et al., 2001), patent citations (Deng, Lev, and Narin, 1999), software development costs (Aboody and Lev, 1998). Similarly, Edmans (2011) finds that investors do not fully incorporate public information on employee satisfaction into the stock price. We show that pay inequality is a further mechanism.

The rest of the paper is organized as follows. Section 2 introduces the model. Section 3 describes the data. Section 4 discusses the empirical results. Section 5 concludes.

2. Model

We consider a three-period economy. At time zero, the representative firm appoints a manager who exerts effort e to negotiate workers' wages w, hire L workers, and carry out a project of size K. Managerial effort cannot be contracted upon by the firm. The manager receives compensation $W(e)$ to induce him to exert the target effort. At time one, the firm seeks funding on the stock market to pay workers' wages and start production. At time two, the firm liquidates and pays off investors.

Managerial effort is costly. The manager's cost function $C(e)$ is known to himself and the firm, but not to outsiders. We assume $C'(e) > 0$ and $C''(e) > 0$. Under efficient contracting, the firm maximizes profits π by eliciting the level of effort that is also individually optimal for the manager:

$$\max_{e,L} \pi(e, L) = y(e, L) - w(e)L - W(e), \tag{1}$$

where $y(e, L) \equiv \theta(e)K^{1-\alpha}L^{\alpha}$ is the firm's output, with $\theta(e)$ indicating productivity. We assume $\theta^{'}(e) > 0$ and $w^{'}(e) \leq 0$. The firm's choice of optimal managerial effort (e^*) reflects the following trade-off: high effort costs more ($W^{'}(e) > 0$), but also makes the firm's employees more valuable ($\theta^{'}(e) > 0$), and can yield better outcomes in salary negotiations ($w^{'}(e) \leq 0$). In Appendix A, we show that a high wage-gap between CEO and regular workers is an indication of high effort and high profitability.

The CEO skill varies across firms. The stock market then evaluates managers using the wage gap as a signal for effort. Investors can be either sophisticated or unsophisticated, where the latter face short-sales constraints (Chen et al., 2002). All investors are risk neutral and trade in a stock market from Hong and Sraer (2013). The total mass of investors' capital is normalized to one, and the proportion of unsophisticated investors' capital in the economy is $\lambda \in [0, 1]$.

We distinguish between two types of unsophisticated investors, which we refer to as naive and inequality-averse, respectively. We classify naive traders as investors that just neglect pay inequality, as they do not recognize its informativeness. As a result, they evaluate low-wage-gap firms and high-wage-gap firms equally. On the other hand, we classify inequality-averse traders as investors that observe the wage gap, but dislike high pay-inequality within firms. Inequality-averse preferences imply that the evaluation of low-wage-gap firms is higher than the evaluation of arbitrageurs, and vice versa for high-wage-gap firms. If inequality-averse investors short-sell high wage-gap stocks, however, they will make a loss on average, because high wage-gap firms are more productive than low wage-gap firms. For this reason, we assume that they refrain

from short-selling, i.e., for these investors the short-sale constraint is binding (just like for noise traders).

The equilibrium price depends on whether short-sales constraints are binding. In Appendix B, we solve the model for each investor type, and show:

Proposition 1. *Wage gap and stock returns.*

a) *High-wage-gap stocks are correctly priced, as unsophisticated traders face binding short-sales constraints. Abnormal returns on high-wage-gap stocks are then equal to zero.*
b) *Low-wage-gap stocks are overpriced, as short-sales constraints are not binding. As a result, abnormal returns on low-wage-gap stocks are negative.*
c) *Stocks with high wage-gaps outperform stocks with low wage-gaps.*
Proof: See Appendix B.

Corollary 1. *The return differential between high- and low-wage-gap stocks increases with:*
a) *the difference in wage gaps;*
b) *the proportion of unsophisticated investors in the market;*
c) *the inequality aversion bias.*
Proof: See Appendix B.

The short-term equilibrium prices can then deviate from fundamental values (see, e.g., Hirshleifer and Teoh (2003) for a discussion of this mechanism). In particular, the mispricing is asymmetric. When the firm liquidates, abnormal returns are negative for low-wage-gap stocks, but zero for high-wage-gap stocks.

To further separate naive investors from inequality-averse investors, we also obtain the following result:

Proposition 2. *The difference in market prices between stocks with high and low wage-gaps decreases when the inequality-aversion bias increases.*

Proof: See Appendix B.

Investors with a high degree of inequality aversion bid up the price of low-wage-gap stocks, which can mitigate or eliminate the price differential with high-wage-gap stocks.

Although the model focuses on short-sales constraints, any friction that prevents the revelation of negative opinions would produce the same results. For example, a large literature shows that unsophisticated investors tend to leave the market when they hold pessimistic beliefs (see, e.g., Chen, Hong, and Stein, 2002; Diether, Malloy, and Scherbina, 2002; Lamont and Thaler, 2003; Amromin and Sharpe, 2009; Grinblatt and Keloharju, 2009; Antoniou, Doukas, and Subrahmanyam, 2016). Also, investors may shun stocks on moral grounds regardless of the valuation (Hong and Kacperczyk, 2009; Hong and Kostovetsky, 2012).

We also consider one alternative setup that is not mentioned yet, in which the wage gap is unobservable to all traders (see Appendix B). We show that the price differential between high- and low-wage-gap stocks is

zero in this case, as neither arbitrageurs nor inequality-averse traders can incorporate the wage gap in their evaluations. The mispricing is then symmetric. When the firm liquidates, abnormal returns are positive for high-wage-gap stocks, and negative for low-wage-gap stocks.

Note that the allocation of different types of unsophisticated investors (naive or inequality-averse) to separate cases is for simplicity and without loss of generality. We obtain similar results when considering a framework with arbitrageurs, naive investors, and inequality-averse traders all together (unreported). In the empirical analysis that follows, we disentangle the inequality-aversion story from these alternative setups by testing their different predictions on returns and valuations.

3. Data

The main hurdle in studies of workers' wages is the lack of publicly available data. In this paper, we overcome this issue by using the "Establishment History Panel" database, maintained and made available for the period from January 2001 to December 2011 by the German Federal Employment Agency (Bundesargentur für Arbeit, BfA). This is a unique data set that reports the annual gross wage for all rank-and-file workers in Germany, along with information on the local establishment in which they work. In years 2004 to 2006, the data set was matched by the agency itself with stock market data for 100 firms from the two stock market indices DAX and MDAX.[10]

The database also contains individual characteristics such as nationality, age, gender, qualification, and type of work. While the complete database contains all these variables for each employee, the data set made available to researchers aggregates these variables across all workers at the establishment level. Our data set then contains the median and quartiles of the wage distribution in any given establishment, but not the wage of each individual worker.

With respect to previous literature on the wage gap, the advantage of this data set is that it does not come from surveys. For example, Mueller et al. (2017) use a combination of paid work and survey data for British companies during the period 2004-2013, which implies a number of potential biases.[11] The average firm appears 3.7 times in their sample compared with yearly observations in our sample. Also, the firms in their sample are smaller, with an average of 10,014 employees (p. 3614). Conversely, our sample contains 100 listed firms in Germany, with an average of 50,019 employees (Table 2). On the other hand, Faleye et al. (2013) rely on discretionary disclosure of U.S. companies from Compustat during the period 1993-2006, which implies a potential self-selection bias. In contrast, we use a time series of comparable length (2001-2011), but our sample selection is exogenous. The lower level of noise in our data translates into a high

[10] It is worth noting that while the number of firms may seem small, it actually represents a large proportion of all listed firms in Germany. Also, these are rather heterogeneous companies in terms of size (see Table 2).

[11] Mueller et al. (2017) provide an excellent discussion on this issue, on pp. 3612-3613. Furthermore, the response rate for the survey is not reported.

goodness of fit in all the statistical tests that follow.[12]

In addition to workers' wages, we complement our data set using company-level accounting and stock market data from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. The sample period includes the recent German reform on executive compensation disclosure. Before the reform, listed companies only had to report the aggregate pay of their key corporate executives. Since corporations were not keen on providing information on individual managers' pay, the Federal Government of Germany passed a regulation effective 2006 that made such disclosure mandatory.[13]

The number of firms at the start of the sample period is 66, peaking to 100 in 2005, and slowly decreasing to 84 by 2011. The number of establishments follows a similar pattern, starting at 16,471, peaking to 25,767 in 2006, only to slowly decrease to 15,607 by the end of the sample period.

The industry breakdown shows that the most represented sector in the sample is post and telecommunication (24%), followed by financial intermediation (17%), and retail trade (9%). The distribution of establishments by states, on the other hand, shows that the most represented regions are Nordrhein-Westfalen (18%), followed by Bayern (16%), and Baden-Württemberg (12%). A significant proportion of establishments is located in the same state as the firms' headquarters (18%).

The data set includes 146 CEOs and 734 executive board members overall. On average, the management board includes five members. The representative CEO in our sample is 54 years old, with a tenure of approximately six years. CEO turnover is relatively low (9%), and a substantial portion of CEOs is hired inside the firm (43%). On the other hand, the median worker's age is 41 years. The overwhelming majority of workers is German (97%). Most of them are highly qualified (73%), and have a white-collar job (61%).

In the empirical tests that follow, we define the wage gap as the log-difference between managers' pay and rank-and-file workers' wages. In any given company, we primarily define managerial compensation as the overall CEO pay, including both the variable and the fixed component, and workers' compensation as the average establishment-level median wage, weighted by the number of employees in each establishment (equal-weighting yields similar results).

In our baseline specifications, we follow Cronqvist et al. (2009) and calculate the wage gap only using the establishments that are located in the same state as the firm's headquarters. In addition to their argument on proximity and ease of interaction between management and employees, we acknowledge the fact that political and economic heterogeneity across German states may create noise in our wage gap estimates.

[12]For example, the R-squared from our baseline Fama-MacBeth regressions is 53.4% (Table 6, column (1), p. 32), while in Mueller et al. (2017) it is 0.3% (their Table 10, column (3), p. 3630).

[13]The German Corporate Governance Code (2006), Clause 4.2.4, requires that "[t]he total compensation of each member of the Management Board is to be disclosed by name, divided into non-performance-related, performance related, and long-term incentive components, unless decided otherwise by the General Meeting by three quarters majority." This means that the disclosure of the compensation of each member of the management board is mandatory from 2006 as long as the general annual meeting has not decided otherwise with three quarters majority. Compare that to the German Corporate Governance Code (2005), Clause 4.2.4, which states that "[c]ompensation of the members of the Management Board shall be reported in the Notes of the Consolidated Financial Statements subdivided according to fixed, performance-related and long-term incentive components." According to the Code, the word "shall" is used as a recommendation but not a regulation.

With this restriction, we make sure that managers and workers face the same local government and costs of living (the estimates are analogous using all establishments).

In Table 1, Panel A, we report the summary statistics on managerial compensation for the full sample. The average CEO has an annual compensation of €2.65 million, of which €2.06 million in cash. Each non-CEO member receives an average total compensation of €1.45 million per year, of which €1.16 million in cash. Note that the salary of non-CEO managers is highly correlated with that of the CEO (80%).

The median wage at the establishment level for full-time rank-and-file workers is €35,167 per year, while the first and third quartiles of the distribution are, respectively, €31,678 and €37,301. The average ratio between CEO and workers' pay is 48.4, which is high, but still about nine times lower than in the U.S. (see, e.g., Faleye et al., 2013). The average wage gap is 29.4 for non-CEO managers.

In Table 1, Panels B and C, we propose a breakdown into high- and low-wage-gap firms, respectively. Companies that rank at the top 30% of the wage gap distribution pay their average CEO €5.30 million, whereas those at the bottom 30% pay €0.81 million. The average wage gap is 157.6 among the former and 16.1 among the latter.

In Table 2, Panel A, we report the summary statistics on firm-level variables for the full sample. The average firm has total assets of €57.08 billion, and employs 50,019 workers overall.[14] The average Tobin's q, defined as enterprise value (debt plus market value of equity) divided by book value (debt plus book value of equity), is 1.27. The average return on assets, defined as EBITDA divided by total assets, is 6.03%.

In Panels B and C, we split the sample again into high- and low-wage-gap firms, respectively. The breakdown shows that high-wage-gap firms are much larger, with average total assets of €170.88 billion and 138,565 employees. These numbers are €12.32 billion and 8,228, respectively, for low-wage-gap firms. Finally, high-wage-gap firms exhibit a higher return on assets than low-wage-gap firms (7.93% vs. 2.78%), and a higher Tobin's q (1.58 vs. 1.24).

To construct our test portfolios, each month we rank all stocks in pay inequality quantiles.[15] We define high- and low-wage-gap portfolios, respectively, as the stocks that lie at the top and the bottom 30%, 20%, and 10% of the distribution. Our variables of interest are then the returns on the top portfolios, the bottom portfolios, and the top-minus-bottom portfolios. The summary statistics for stock returns, in Table 3, show that the difference in average returns between high- and low-wage-gap stocks is positive, and increases with the wage gap.

[14] The minimum value of 2 employees comes from a firm that is in bankruptcy proceedings.

[15] We opt for monthly rebalancing because the fiscal year starts in different months across firms, and the information on workers' pay may actually be observed throughout the year as it becomes available. The results that follow are similar with annual rebalancing.

4. Empirical results

First, we provide empirical support to the idea that a high wage-gap represents compensation for better management skills. In the second subsection we estimate abnormal returns, and look into whether the results are driven by all investors or unsophisticated traders only. In the third subsection, we explore whether unsophisticated traders merely neglect the wage gap, or exhibit an aversion to it. The fourth and final subsection provides results for a variety of alternative specifications.

4.1. Firm performance

As a preliminary test, we validate the model's assumption that high-wage-gap firms are run better than low-wage-gap firms. This is an important test also to rule out the alternative hypotheses that the wage gap might be uninformative or represent agency issues. To this purpose, we estimate the following panel regressions:

$$y_{it} = \alpha_t + \beta_1 w_{it-1} + \gamma S_{it} + \epsilon_{it}, \tag{2}$$

where y_{it} is the return on assets for company i in year t, α_t is year fixed-effects, w_{it-1} is the wage gap of stock i in the previous year, and S_{it} is the logarithm of the company's number of employees as a proxy for size. Standard errors are clustered by firm.

The results are in Table 4, Panel A. In a restricted specification without controls, we find that a ten-percent increase in the total wage gap is associated with a 0.25% increase in return on assets, whereas the effect is 0.37% for cash compensation. In the unrestricted model with controls, a ten-percent increase in the wage gap is associated with a 0.27% increase in return on assets when considering cash compensation, whereas the coefficient is positive but not significant for total compensation.

In Panel B, we find that these estimates actually hide interesting cross-sectional effects. We split the sample into firms that belong in competitive vs. non-competitive industries, defined as those whose Herfindahl-Hirschmann index takes on below- and above-median values, respectively.[16] The results indicate that the coefficient of the wage gap is positive and significant only in highly competitive industries, which supports our conjecture that high-wage-gap firms are indeed better managed.

In unreported tests, we address a number of potential concerns. First, these regressions may be affected by reverse causality. A key ingredient of the wage gap, CEO pay, may depend on past realizations of ROA, which in turn might be persistent over time. Reassuringly, however, we find that the wage gap is not explained by several lags of ROA (up to four). Second, the estimates may be driven by some specific industries. However, we find that the results are robust to using industry-adjusted ROA, constructed by subtracting the industry median across all firms in Amadeus in the same two-digit SIC industry and year. Finally, we find that the results are robust to firm and year fixed-effects, with clustering by firm and year, and when replacing the Herfindahl-Hirschmann index with the Lerner index.

[16] The Herfindahl-Hirschmann index is the sum of squared market shares in a given industry and year. Industries are based on two-digit SIC codes. Market shares are based on firms' sales using all German firms in Amadeus.

4.2. Sophisticated vs. unsophisticated traders

We first look into the presence of arbitrageurs' activity. In subsequent tests, we go on to distinguish between different types of unsophisticated investors (i.e., naive and inequality-averse traders).

Four-factor model

In our first set of time-series regressions, we test Proposition 1. To this end, we use European financial data from Kenneth French's website.[17] Our main test equation is Carhart's (1997) four-factor model, which allows us to control for a number of well-known risk factors:

$$R_{it} = \alpha_i + \beta_i MKT_t + s_i SMB_t + h_i HML_t + u_i UMD_t + \epsilon_{it}, \tag{3}$$

where the dependent variable is the excess returns on equal-weighted portfolios of stocks with a high ($i = H$) or low ($i = L$) wage gap between CEO and workers, or the returns on the long-minus-short portfolio ($i = H - L$). The independent variables are excess returns on the market portfolio (MKT), and factor-mimicking portfolios for size (SMB), book-to-market (HML), and momentum (UMD). The intercept captures abnormal returns. Proposition 1a implies zero abnormal returns for high-wage-gap stocks ($\alpha_H = 0$), Proposition 1b predicts that low-wage-gap stocks trade at a premium ($\alpha_L < 0$), and Proposition 1c implies positive abnormal returns on the long-short portfolio ($\alpha_{H-L} > 0$). Standard errors are calculated following Newey and West (1987) to correct for heteroskedasticity and serial correlation.

Of particular importance is the inclusion of the size factor, because pay inequality seems to be related to firm size. The idea is that executive ability is worth more to firms that own a larger amount of resources. This mechanism leads to "assortative matching", where better managers are hired by larger firms (Terviö, 2008; Gabaix and Landier, 2008). Therefore, we need to make sure that any difference in abnormal returns between high- and low-wage-gap stocks does not simply reflect a size premium, but rather constitutes a separate effect.

The results are in Table 5. In Panel A, we construct the portfolios using the 30% threshold. In columns (1) to (3), we consider total compensation. We find that the alpha is negative and highly significant for the low-inequality portfolio (-0.8%), while close to zero and insignificant for the high-inequality portfolio (0.1%). As a result, the long-short portfolio yields positive and significant abnormal returns of 0.9% per month. This pattern is in line with the model's predictions. The estimates are virtually unchanged when considering cash compensation only, in columns (4) to (6). In untabulated tests, we find analogous results when we consider total managerial pay excluding the CEO.

The regressions of the arbitrage portfolio provide two other interesting insights. First, the coefficient of size is negative and highly significant for high-inequality stocks (-0.9), which shows that these stocks tend to co-move positively with the returns on large firms. This is consistent with the idea that pay inequality is positively related to firm size. Second, the market beta is positive and significant for the long-short portfolio

[17] All the results that follow are robust to using German risk factors from the Humboldt University of Berlin.

(0.16), which indicates that high-wage-gap stocks tend to exhibit stronger co-movement with the market.

Interestingly, the pattern and magnitude of these first results are similar to those from Mueller et al. (2017), even though they consider terciles (instead of the 30% threshold), and data from a different country (the U.K.). In their analysis of returns, they find that an equal-weighted portfolio of low-wage-gap stocks earns negative and significant abnormal returns of 0.8% per month in Carhart's (1997) four-factor model, while abnormal returns are insignificant for high-wage-gap stocks (0.2%). As a result, their arbitrage portfolio yields positive and significant abnormal returns of 1.0% per month.

Corollary 1a states that the mispricing of pay inequality should increase when considering larger wage gaps. To test for this, we set a progressively higher threshold for the construction of our wage gap portfolios. Consistent with the prediction, the estimates increase in magnitude. In columns (1) to (3), the long-short portfolio yields positive and significant returns of 1.6% per month for the 20% threshold (Panel B), and 1.7% per month for the 10% threshold (Panel C).[18] We obtain similar estimates when considering cash compensation only, in columns (4) to (6).

Fama-MacBeth regressions

We acknowledge that factor models may not entirely capture systematic risk. In particular, the wage gap may be correlated with other firm characteristics that affect stock returns in their own right. To address this concern, we estimate Fama-MacBeth regressions from Brennan et al. (1998), in which we control for a large number of firm characteristics:

$$R_{it} = \beta_0 + \beta_1 d_{it-1} + \delta^{'} Z_{it} + \epsilon_{it}, \tag{4}$$

where R_{it} is the return on stock i in month t; d_{it-1} is a dummy variable that takes on value one if the wage gap of stock i at the beginning of the month is among the top 30% of the distribution; and Z_{it} is a vector of firm characteristics that includes: size (defined as the log of market capitalization at the end of month $t-2$), the log of the book-to-market ratio (calculated each July and held constant through the following June), the ratio of dividends in the previous fiscal year to market value at calendar year-end (calculated each July and held constant through the following June), the log of cumulative returns over months $t-3$ through $t-2$, months $t-6$ through $t-4$, and months $t-12$ through $t-7$, the log of the dollar volume of trading in the stock in month $t-2$, and the log of the stock price at the end of month $t-2$. To compare extreme wage gaps, we leave out the stocks that lie in the middle 40% of the wage gap distribution. In Fama-MacBeth regressions of this sort, the coefficient of the dummy variable can be interpreted as abnormal returns (Gompers, Ishii, and Metrick, 2003; Mueller et al., 2017).

The results are in Table 6. We find again a positive and significant association between the wage gap and stock returns. When considering the total wage gap, the top 30% wage-gap stocks earn 1.0% higher abnormal returns than the bottom 30%. For the cash wage gap, the return differential between top and bottom 30%

[18] For the 10% threshold, we do not have enough stocks for the first year of the sample.

stocks is 0.8%. The coefficients increase, in both magnitude and significance, for the 20% threshold (2.4% and 4.0%, respectively).[19] Altogether, the results of the two test equations that lead to our findings in Tables 4 and 5 are similar.

Overall, the evidence supports Proposition 1 and Corollary 1a. The important implication of these results is that the mispricing seems to be driven by unsophisticated traders, and not by sophisticated ones.

Double-sorted portfolios

To provide more direct evidence on the relation between the mispricing of the wage gap and the presence of unsophisticated investors, we turn to Corollary 1b, which states that the pricing error should decrease in the presence of a higher proportion of sophisticated traders in the market. This is an important test because if the wage gap is not observed by any investors, the mispricing should be orthogonal to variations in unsophisticated trader demand, as neither sophisticated nor unsophisticated investors are able to price the wage gap correctly.

In our first test, we repeat the analysis in subsets of stocks that are difficult to evaluate and/or arbitrage. Examples of such companies are those of small size, defined as low market capitalization, and with extreme book-to-market ratios.[20] With a lower concentration of sophisticated investors, we expect the mispricing of the wage gap to be particularly pronounced among these stocks. To test this conjecture, we double-sort our stocks in portfolios formed on these measures and the wage gap. In the first sort, we distinguish between stocks with above- and below-median market capitalization, or stocks with middle 40% and extreme (i.e., top or bottom) 30% book-to-market, respectively. In the second sort, we identify stocks with top and bottom 30% wage gaps.

It is important to note that despite the relatively small number of firms, there is wide variation in both market capitalization and the book-to-market ratio in our sample. Market capitalization varies between €4.7 million and €233.3 billion, with a standard deviation of €2.4 billion. The book-to-market ratio varies from a minimum of 0.38 to a maximum of 1.84, with a standard deviation of 0.12. These estimates suggest that there is enough heterogeneity among our firms for the double sorting to be meaningful.

This methodology, however, presents two hurdles in our data. First, both sorts use market prices, and might then reflect similar information. To tackle this concern, we consider the cash wage gap for these tests. Second, we have relatively few stocks to construct four separate monthly portfolios because some monthly observations are missing, and firm coverage is rather low in the first few years of our sample. To address this concern, we start our analysis in 2005, and rebalance our portfolios annually rather than monthly.

The results, in Table 7, lend support to our conjecture. Abnormal returns on the long-short portfolio are positive and highly significant among small stocks (1.8%), while close to zero and not significant among large stocks (0.2%). Similarly, the long-short portfolio yields positive and highly significant abnormal returns for

[19] The magnitude, however, needs to be interpreted with caution due to the lower number of degrees of freedom.

[20] See Baker and Wurgler (2006, 2007) for evidence from the U.S., and Baker, Wurgler, and Yuan (2012) for international evidence.

extreme book-to-market stocks (1.1%), but near-zero abnormal returns for middle book-to-market stocks (0.1%).

Value-weighted returns

Baker and Wurgler (2006) show that value-weighting tends to obscure mispricing patterns in the analysis of returns, because large firms are characterized by a larger presence of sophisticated investors. If such investors evaluate the wage gap correctly, then we expect our results to become weaker when forming value-weighted instead of equal-weighted portfolios. In Table 8, we provide evidence consistent with this line of reasoning. We find that abnormal returns on value-weighted arbitrage portfolios are lower and all outside the rejection region.

Overall, the findings suggest that sophisticated investors can observe and trade on the wage gap.

4.3. Inequality aversion

Next, we try to establish whether unsophisticated investors are inequality-averse, or simply neglect the wage gap altogether. Both stories imply overpricing for low-wage-gap stocks. Under inequality-averse preferences, however, the mispricing of low-wage-gap stocks should vary with the degree of inequality aversion of unsophisticated investors (Proposition 2). To identify inequality-averse traders, we devise three sets of empirical tests.

Valuations and income inequality

First, we look into the relation between the wage gap and valuations. Proposition 2 predicts that an increase in the inequality aversion bias brings the prices of high- and low-wage-gap stocks closer to each other than they should be from a rational standpoint. To test for this mechanism, we study how the effect of the wage gap on company valuations varies with income inequality. Specifically, we re-estimate Equation (2) using Tobin's q as a dependent variable. On the right-hand side, we add an interaction term between the wage gap and a dummy that takes on value one if income inequality in Germany increases, and zero otherwise. The intuition is that public criticism of managerial pay increases when income inequality is high, which should map into a greater aversion to within-firm pay inequality.

To define income inequality, we follow Joyce, Pope, and Roantree (2019) and consider the top 1% fiscal income share. As they note, most of the public discourse about economic inequality is concerned with the top 1% earners, and whether policymakers should tax them more aggressively. We retrieve data on income inequality in Germany from the World Inequality Database, and express the series in changes due to its high persistence. Note that the standalone inequality dummy is absorbed by the year fixed-effects.

The results, in Table 9, lend support to our theoretical arguments in two ways. First, we find that the there is no unconditional difference in valuations between high- and low-wage-gap stocks, as the coefficient of the wage gap as a standalone variable is not significant in specifications (1) and (2) of either panel. Second, we find that the difference in valuations between high- and low-wage-gap stocks becomes indeed significant

when conditioning on income inequality in specification (3) of both panels. High-wage-gap stocks trade at a higher price than low-wage-gap stocks in times of low inequality, whereas the prices become closer to each other when income inequality is high.

These empirical patterns are consistent with the idea that high inequality-aversion bids up the prices of low-wage-gap stocks, and hard to reconcile with a simple story of investor inattention or lack of information. Therefore, inequality-averse investors seem to be present in the stock market.

Justified pay vs. unjustified pay

Second, we decompose CEO and workers' pay into an economically justified and an unjustified component. Following Rouen (2020), the justified component is a linear combination of firm characteristics, so that unjustified pay represents the part of compensation that is not explained by economic fundamentals, i.e., the difference between the actual wage gap and the explained wage gap. This is an important breakdown, because investors with a preference for fairness should be particularly sensitive to unjustified pay inequality.

Following our theoretical arguments, we expect sophisticated investors to observe the wage gap, whether justified or unjustified, and price it correctly. Naive traders, on the other hand, should neglect both types of wage gap, and then price neither one correctly. Finally, inequality-averse investors do not distinguish between these two types of wage gap in our model, so formally they would behave as noise traders here. However, if we replace the unconditional wage gap with the unjustified wage gap, then inequality-averse investors will only misprice the unjustified wage gap and price the justified wage gap correctly.[21]

As a result, our priors are as follows. In the presence of sophisticated investors only, there should be no abnormal returns on the long-short portfolio for either the justified or the unjustified wage gap. In a setup with sophisticated and naive investors, we should observe positive abnormal returns in both specifications. The same prior applies to a setup with sophisticated and inequality-averse-investors, if the latter dislike large pay inequality regardless of whether it is explained by the company's fundamentals. If inequality-averse investors only care about economically unjustified pay, instead, we should only observe abnormal returns for the unjustified wage gap specification.

The results are in Table 10. We separate the analysis in CEO total pay (Panel A) and CEO cash pay (Panel B). The long-minus-short portfolio exhibits near-zero abnormal returns for justified total pay (0.2%, Panel A), and exactly zero for justified cash pay (0.0%, Panel B). Conversely, abnormal returns on the arbitrage portfolio are positive for unjustified total pay, even though small and outside of the rejection region (0.5%), while positive, large, and significant for unjustified cash pay (1.0%). The results are in line with the hypothesis that unsophisticated investors are inequality averse and only care about the unjustified wage-gap.

The different findings in Panel A and Panel B might be due to the fact that cash pay is more salient to inequality-averse investors. For example, cash compensation is arguably easier to understand, and also

[21] This can be seen by replacing the wage gap (W_j/w_j) with the unjustified wage gap in Case 3 in Appendix B.

represents a large component of total managerial pay (78%, see Table 1). Overall, the results suggest that the findings from Table 5 seem to be mainly driven by economically unjustified cash compensation.

Sentiment

Third, we analyze how the mispricing of the wage gap varies with investor optimism. Stambaugh, Yu, and Yuan (2012) find that a large number of asset pricing anomalies become stronger when beginning-of-period sentiment is high, because naive investors overbid for lower-performing stocks. The find that high sentiment is followed by negative abnormal returns on the short leg of the investment strategy. The long leg, however, remains unaffected, as naive investors face short-sales constraints.

Under inequality-averse preferences, we expect the mispricing of the wage gap to follow a similar pattern, but with the opposite sign. Large managerial premia spark public outrage when agents become more pessimistic about the economy. Therefore, inequality-averse investors should bid up low-wage-gap companies especially in times of low sentiment. This means that high sentiment should be followed by positive abnormal returns on the short leg on the investment strategy.

Following this line of reasoning, we test for structural breaks in abnormal returns in times of low consumer sentiment, which can be thought of as a measure of economic expectations (see, e.g., Carroll, Fuhrer, and Wilcox, 1994). We retrieve country-specific consumer sentiment data for Germany from the OECD, and express it in changes rather than levels due to the high persistence of the series. In the empirical tests, we introduce a dummy variable that equals one if German consumer sentiment increases at the end of the previous month and zero otherwise.

The results, in Table 11, show that the mispricing of the wage gap indeed increases in times of low sentiment. The coefficient of the sentiment dummy is not significant for high-wage-gap stocks, which lends further support to the idea that unsophisticated investors shun these stocks. Conversely, the coefficient is positive and significant for low-wage-gap stocks, indicating that these stocks decrease in value as unsophisticated traders become more pessimistic about the economy. As a result, the coefficient is negative and significant for the long-minus-short portfolio. The results further show that the alpha coefficient nearly offsets the coefficient of the sentiment dummy, so the mispricing is entirely confined to times in which German consumers expect the economy to do worse. In times of optimism, the wage gap is correctly priced.

One potential concern with these results is that high- and low-wage-gap firms may simply differ in their response to economic shocks. Since pay inequality tends to grow with firm size, the mispricing of low-wage-gap stocks may reflect their comparatively higher difficulty to cope in bad economic times. However, this explanation is unlikely because the Fama-French factors already contain information on the state of the economy (Liew and Vassalou, 2000; Fama and French, 2004). A potentially different response to economic shocks between high- and low-wage-gap stocks is then already captured by the coefficients of the risk factors, rather than the regression constant (i.e., abnormal returns).

Overall, the findings provide support to Corollary 1c, which states that the return differential between high- and low-wage-gap stocks increases with the inequality aversion bias.

4.4. Robustness checks

In the last part of the paper, we re-estimate a number of alternative specifications for our time-series regressions. First we start with a simple CAPM, rather than the four-factor model, to check whether the results are also present in simple regressions that exclude factor-mimicking portfolios. The estimates, in Table 12, are similar to those from our baseline specification. Low-wage-gap stocks exhibit negative and significant abnormal returns, while high-wage-gap stocks are correctly priced. As a result, the long-minus-short portfolio exhibits a positive and significant alpha. Abnormal returns increase when considering larger wage gaps, and the results are similar when considering cash compensation.

Second, we acknowledge that the four-factor model actually leaves out other factors that are also known to affect returns. For this reason, we repeat the baseline regressions by including the liquidity factor from Pástor and Stambaugh (2003), or the investment and profitability factors from Fama and French (2015). Unfortunately, we can only use the U.S. version of these factors, as they are not available for Germany or Europe. Financial markets integration, however, allays the concern that the results might be spurious (see, e.g., Pástor and Veronesi, 2018).

The estimates are in Table 13, Panel A. We find that neither set of regressors alters any of the previous findings. In the regressions with the liquidity factor from Pástor and Stambaugh (2003), abnormal returns on the long-minus-short portfolios are positive and highly significant, and equal to 0.9%, 1.5%, and 1.6%, respectively, for the three thresholds introduced above, which addresses the concern that the return differential might represent a liquidity premium. The results are similar when introducing the investment and profitability factors from Fama and French (2015), with arbitrage returns equal to 1.0%, 1.6%, and 1.9%.

On the other hand, the mispricing of the wage gap might be driven by other well-known behavioral biases (i.e., different than inequality aversion). To address this point, we also consider the profitability factor from Novy-Marx (2013), and the management and performance factors from Stambaugh and Yuan's (2017) behavioral factor model. The results are in Table 13, Panel B. We find that abnormal returns on the long-minus-short portfolios are positive and significant, and equal to 0.7%, 1.0%, and 1.5%, respectively, with the Novy-Marx (2013) model, and equal to 0.9%, 1.4%, and 2.1%, respectively, with the Stambaugh and Yuan (2017) model. The results from our baseline regressions are then robust to these alternative factor models.

The 2005 German reform on executive compensation disclosure substantially improved the quality of the information on managerial pay. One concern, then, is that our sample period includes two different regulatory frameworks. To address this issue, re-estimate our baseline regressions in the post-reform subsample only, i.e., from year 2006. The results, in Table 14, are similar. The arbitrage portfolios yield abnormal returns of 0.5%, 1.0%, and 2.2%, respectively, for the three progressive thresholds we consider.

5. Conclusion

Recent research shows that a high wage-gap between managers and workers identifies better-performing firms, but the stock market does not price this information. In this paper, we shed new light on this issue. To

derive theoretical guidance, we propose an asset pricing model in which the optimal wage gap between the CEO and rank-and-file workers increases with managerial effort. In the presence of unsophisticated traders and short-sales constraints, firms with low wage-gaps become overpriced and yield negative abnormal returns. Using a unique set of German firms' employee compensation, we provide support for the model's predictions.

Our findings contribute to the wage gap literature in two ways. First, we show that sophisticated investors seem to recognize the relevance of the wage gap, and correctly incorporate it in their evaluations. Second, we find evidence that unsophisticated investors exhibit an aversion to high pay-inequality within firms. This mechanism leads to overbidding for low-wage-gap stocks. In particular, the overpricing is driven by the economically unjustified component of the wage gap, and only takes place in times of high income inequality and low sentiment. To the best of our knowledge, this is the first paper to show that investors exhibit a preference for fairness.

In our theoretical analysis, we model inequality aversion as a preference rather than a bias in expectations. The difference is mostly cosmetic, however, as the latter specification yields the same asset pricing predictions. That is, inequality-averse traders still bid up the prices of low-wage-gap firms, but do not recognize that such firms are actually less profitable. A way to filter out expectations from preferences would be to look at analysts' earnings surprises. Unfortunately, this approach does not work for our German sample.[22] While the analysis of earnings surprises would indicate whether beliefs play a role, it still would not rule out the preference channel. In light of our analysis, in which we identify inequality-averse investors through income inequality in Germany, the economically unjustified component of the wage gap, and low sentiment, preferences are much easier to justify, in our view, than the use of expectations.

This paper can pave the way to future studies. It will be instructive to conduct this type of research on U.S. data in a few years' time, in light of the SEC new rule requiring firms to disclose the pay ratio between CEO and employees as of January 1, 2017. This regulatory change will also allow researchers to work with a much larger set of stocks.

Appendix A Firm's problem

Firms' first-order conditions

If contracting is efficient, the objective function can be expressed as:

$$\max_{e,L} \pi(e,L) = \theta(e)K^{1-\alpha}L^{\alpha} - w(e)L - W(e), \tag{A.1}$$

The first-order condition with respect to e is:

$$\frac{d\pi(e,L)}{de} = \frac{d\theta\,(e)}{de}K^{1-\alpha}L^{\alpha} - \frac{dw\,(e)}{de}L - \frac{dW\,(e)}{de} = 0 \tag{A.2}$$

Using the following elasticity definitions:

$$\epsilon_{\theta} \equiv \frac{\partial\theta(e)}{\partial e}\frac{e}{\theta(e)} > 0, \tag{A.3}$$

[22] Using IBES data, we find too little coverage for the firms in the sample to estimate our baseline regressions.

$$\epsilon_W \equiv \frac{\partial W(e)}{\partial e}\frac{e}{W(e)} > 0, \tag{A.4}$$

$$\epsilon_w \equiv \frac{\partial w(e)}{\partial e}\frac{e}{w(e)} < 0, \tag{A.5}$$

which we assume to be constant, then optimal managerial compensation is:

$$W\left(e^*\right) = \frac{\epsilon_\theta y\left(e^*, L\right) - \epsilon_w w\left(e^*\right) L}{\epsilon_W} \equiv \frac{\epsilon_\theta y\left(e^*, L\right) + |\epsilon_w| w\left(e^*\right) L}{\epsilon_W}, \tag{A.6}$$

where ϵ_W represents the price of managerial effort. The first-order condition with respect to labor is:

$$\frac{\partial \pi(e, L)}{\partial L} = \alpha L^{\alpha-1}\theta(e)K^{1-\alpha} - w(e) = 0, \tag{A.7}$$

which yields

$$L^* = \left(\frac{\alpha\theta(e^*)}{w(e^*)}\right)^{\frac{1}{1-\alpha}} K. \tag{A.8}$$

Optimal managerial compensation can then be expressed as

$$\begin{aligned} W\left(e^*\right) = \frac{\epsilon_\theta}{\epsilon_W} \underbrace{\theta\left(e^*\right)\left(\frac{\alpha\theta\left(e^*\right)}{w\left(e^*\right)}\right)^{\frac{\alpha}{1-\alpha}} K}_{\equiv\, y(e^*,\, L^*)} + \frac{|\epsilon_w|}{\epsilon_W} \underbrace{w\left(e^*\right)\left(\frac{\alpha\theta\left(e^*\right)}{w\left(e^*\right)}\right)^{\frac{1}{1-\alpha}} K}_{\equiv\, w(e^*)L^*} = \\ = K\left(\theta\left(e^*\right)\right)^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{w\left(e^*\right)}\right)^{\frac{\alpha}{1-\alpha}} \frac{\epsilon_\theta + |\epsilon_w|\alpha}{\epsilon_W}. \end{aligned} \tag{A.9}$$

In particular, the firm chooses the optimal level of effort e^* by trading off the cost of managerial effort (ϵ_W) with its benefits ($\epsilon_\theta, |\epsilon_w|$).

Using the two first-order conditions, the firm's profits can be expressed as:

$$\begin{aligned} \pi(e^*, L^*) = \underbrace{\theta(e^*)\left(\frac{\alpha\theta(e^*)}{w(e^*)}\right)^{\frac{\alpha}{1-\alpha}} K}_{\equiv\, y(e^*,\, L^*)} - \underbrace{w(e^*)\left(\frac{\alpha\theta(e^*)}{w(e^*)}\right)^{\frac{1}{1-\alpha}} K}_{\equiv\, w(e^*)L^*} + \\ \underbrace{- K\left(\theta\left(e^*\right)\right)^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{w\left(e^*\right)}\right)^{\frac{\alpha}{1-\alpha}} \frac{\epsilon_\theta + |\epsilon_w|\alpha}{\epsilon_W}}_{\equiv\, W(e^*)} = \\ = K\left(\theta\left(e^*\right)\right)^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{w\left(e^*\right)}\right)^{\frac{\alpha}{1-\alpha}}\left(1 - \alpha - \frac{\epsilon_\theta + |\epsilon_w|\alpha}{\epsilon_W}\right) \equiv \phi\left(e^*\right) K, \end{aligned} \tag{A.10}$$

where $\phi(e^*)$ represents the profits per euro invested. Note that $\phi(e^*) \geq 1$ for the project to be started.

The firm's profits and the manager's salary both increase with effort:

$$\frac{\partial \pi(e^*, L^*)}{\partial e} \equiv \frac{\partial W(e^*)}{\partial e} \propto \frac{1}{1-\alpha}\left(\frac{\theta(e)}{w(e)}\right)^{\frac{1}{1-\alpha}} \frac{w}{e}\Big(\epsilon_\theta + \alpha|\epsilon_w|\Big) > 0, \tag{A.11}$$

and so does the wage gap, defined as the ratio between the manager's compensation and workers' wages:

$$\frac{\partial W(e^*)/w(e^*)}{\partial e} \propto \frac{1}{1-\alpha}\left(\frac{\theta(e)}{w(e)}\right)^{\frac{1}{1-\alpha}} \frac{1}{e}(\epsilon_\theta + |\epsilon_w|) > 0. \tag{A.12}$$

Then high managerial effort leads to an increase in profitability, managerial compensation, and pay inequality with respect to rank-and-file workers.[23]

[23] This result also holds also when we relax the assumption $\epsilon_w < 0$, namely, if the firm hires workers in a perfectly competitive labor market ($\epsilon_w = 0$), or if managerial effort actually increases workers' wages ($\epsilon_w > 0$), but the manager brings comparatively more value to the firm ($\epsilon_\theta > \epsilon_w$).

Appendix B Investors' problem

Setup

After establishing that the wage gap is a signal for profitability, we consider three scenarios for the stock market. First, the wage gap is unobservable to all traders. Second, arbitrageurs observe the wage gap and correctly interpret it as a signal for managerial effort, while naive traders just neglect pay inequality. Third, all traders observe the wage gap, but unsophisticated ones dislike high pay-inequality within firms. Therefore, the latter exhibit an inequality-aversion bias: their evaluation of low-wage-gap firms is higher than the evaluation of arbitrageurs, and vice versa for high-wage-gap firms.

Investor i is risk-neutral and trades in a stock market from Hong and Sraer (2013). To incorporate inequality-averse preferences, we assume that agents dislike a large difference in pay between managers and workers (Dur and Glazer, 2008). As a result, they hold a more favorable view of firms that pay low wage-gaps. The objective function is then:

$$\max_{n_{ij}} \; u_0 = n_{ij}\Big(E_i(\pi_j) - p_j - \alpha max\Big(\frac{W_j}{w_j} - v, 0\Big) + \beta max\Big(v - \frac{W_j}{w_j}, 0\Big)\Big) - \frac{1}{2}\frac{n_{ij}^2}{\gamma}, \tag{B.1}$$

where n_{ij} is the number of shares traded by an investor of type i in stock j, W_j is CEO pay, w_j is workers' pay, $E_i(\pi_j)$ is investor i's subjective evaluation of the stock's cash flow, p_j is the price of stock j, v is the reference point of inequality-averse investors, $\alpha \geq 0$ and $\beta \geq 0$ are parameters that capture the degree to which inequality-averse investors dislike high inequality and like low inequality, respectively, and γ captures transaction costs.[24] For arbitrageurs and naive traders there is no inequality aversion bias, i.e., $\alpha = \beta = 0$. The discount rate is set to zero, without loss of generality.

The intuition behind parameters α and β is that some individuals tend to consider relative payoffs in their evaluations (see, e.g., Loewenstein, Thompson, and Bazerman, 1989). For example, Rabin (1993) shows that people have a strong impulse to reward those who are fair, and punish those who are not. In turn, the perception of kindness or hostility depends on the equitability of the payoff distribution induced by the action.

The definition of reference point v is ultimately an empirical question. In Bolton and Ockenfels (2000), for example, it is defined as an average calculated over all the individuals that belong in the same group. Here we follow the same approach, and set the reference point equal to the unconditional average of the wage gap.

Equilibrium prices

The first-order condition yields the following demand function for investor i in stock j:

$$n_{ij}^* = \gamma\Big(E_i(\pi_j) - p_j - \alpha max\Big(\frac{W_j}{w_j} - v, 0\Big) + \beta max\Big(v - \frac{W_j}{w_j}, 0\Big)\Big). \tag{B.2}$$

[24] A type of transaction cost that is characterized by such a convex function is the bid-ask spread, as larger trades are typically associated with more unfavorable price movements.

In what follows, we refer to firms that exhibit $W_j/w_j > v$ as high-wage-gap firms, and those with $W_j/w_j \leq v$ as low-wage-gap firms. Given supply equal to q for all stocks, the market clearing condition for high-wage-gap stocks is:

$$\begin{cases} q = (1-\lambda)\gamma\phi K + \lambda\gamma\phi K & \text{(Case 1)} \\ q = (1-\lambda)\gamma\phi(\bar{e})K + \lambda\gamma\phi K & \text{(Case 2)} \\ q = (1-\lambda)\gamma\phi(\bar{e})K + \lambda\gamma\Big(\phi K - \alpha\Big(\frac{W_j}{w_j} - v\Big)\Big) & \text{(Case 3),} \end{cases} \tag{B.3}$$

where ϕ represents investors' estimate of the firm's profitability when effort is not observed, which implies $\phi(\bar{e}) > \phi > \phi(\underline{e})$. Then the unconstrained equilibrium price is:

$$p_u^*(\bar{e}) = \begin{cases} \phi K - \frac{q}{\gamma} & \text{(Case 1)} \\ \phi(\bar{e})K - \lambda(\phi(\bar{e}) - \phi)K - \frac{q}{\gamma} & \text{(Case 2)} \\ \phi(\bar{e})K - \lambda\alpha\Big(\frac{W_j}{w_j} - v\Big) - \frac{q}{\gamma} & \text{(Case 3).} \end{cases} \tag{B.4}$$

On the other hand, the market clearing condition for low-wage-gap stocks is:

$$\begin{cases} q = (1-\lambda)\gamma\phi K + \lambda\gamma\phi K & \text{(Case 1)} \\ q = (1-\lambda)\gamma\phi(\underline{e})K + \lambda\gamma\phi K & \text{(Case 2)} \\ q = (1-\lambda)\gamma\phi(\underline{e})K + \lambda\gamma\Big(\phi K + \beta\Big(v - \frac{W_j}{w_j}\Big)\Big) & \text{(Case 3),} \end{cases} \tag{B.5}$$

which yields the following unconstrained equilibrium price:

$$p^*(\underline{e}) = \begin{cases} \phi K - \frac{q}{\gamma} & \text{(Case 1)} \\ \phi(\underline{e})K + \lambda(\phi - \phi(\underline{e}))K - \frac{q}{\gamma} & \text{(Case 2)} \\ \phi(\underline{e})K + \lambda\beta\Big(v - \frac{W_j}{w_j}\Big) - \frac{q}{\gamma} & \text{(Case 3).} \end{cases} \tag{B.6}$$

Short-sales constraints are binding for unsophisticated traders, because their evaluations of high-wage-gap stocks lie below the unconstrained equilibrium price (due to $\phi(\bar{e}) - \phi > 0$ for naive investors, and $\frac{W_j}{w_j} - v > 0$ for inequality-averse traders). Taking this into account, the constrained equilibrium price for high-wage-gap stocks can be expressed as:

$$p_c^*(\bar{e}) = \begin{cases} \phi K - \frac{q}{\gamma} & \text{(Case 1)} \\ \phi(\bar{e})K - \frac{q}{\gamma} & \text{(Cases 2 and 3).} \end{cases} \tag{B.7}$$

Subtracting (case by case), we obtain Proposition 2. The price differential between high- and low-wage-gap stocks is:

$$p_c^*(\bar{e}) - p^*(\underline{e}) = \begin{cases} 0 & \text{(Case 1)} \\ (\phi(\bar{e}) - \phi)K + (1-\lambda)(\phi - \phi(\underline{e}))K & \text{(Case 2)} \\ (\phi(\bar{e}) - \phi(\underline{e}))K - \lambda\beta\Big(v - \frac{W_j}{w_j}\Big) & \text{(Case 3).} \end{cases} \tag{B.8}$$

Returns

Following Chen et al. (2002), we define returns as the difference between fundamental value and market price. We first derive Proposition 1a. For high-wage-gap stocks, abnormal returns are positive if the wage gap is unobservable, and zero otherwise, due to binding short-sales constraints:

$$r_c^*(\bar{e}) = \begin{cases} \frac{q}{\gamma} + (\phi(\bar{e}) - \phi)K & \text{(Case 1)} \\ \frac{q}{\gamma} & \text{(Cases 2 and 3).} \end{cases} \tag{B.9}$$

Then, we derive Proposition 1b. For low-wage-gap stocks, short-sales constraints are never binding, and then abnormal returns are always negative:

$$r^*(\underline{e}) = \begin{cases} \frac{q}{\gamma} - (\phi - \phi(\underline{e}))K & \text{(Case 1)} \\ \frac{q}{\gamma} - \lambda(\phi - \phi(\underline{e}))K & \text{(Case 2)} \\ \frac{q}{\gamma} - \lambda\beta\Big(v - \frac{W_j}{w_j}\Big) & \text{(Case 3).} \end{cases} \tag{B.10}$$

As a result, we obtain Proposition 1c. Stocks with high wage-gaps outperform stocks with low wage-gaps:

$$r_c^*(\bar{e}) - r^*(\underline{e}) = \begin{cases} (\phi(\bar{e}) - \phi(\underline{e}))K & \text{(Case 1)} \\ \lambda(\phi - \phi(\underline{e}))K & \text{(Case 2)} \\ \lambda\beta\Big(v - \frac{W_j}{w_j}\Big) & \text{(Case 3).} \end{cases} \tag{B.11}$$

Finally, we derive Corollary 1, as the return differential between high- and low-wage-gap stocks (case 3) increases with the difference in wage gaps, the proportion of unsophisticated investors in the market, and the inequality aversion bias.

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Table 1. Summary statistics: Managerial compensation

Summary statistics for managerial compensation in our sample. CEO and managers' pay are defined as the total annual compensation, including cash and stocks, or cash compensation only. The wage gap is defined as the ratio between CEO total annual compensation, including cash and stocks, and workers' wages, calculated as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% of the distribution at the beginning of a given month. We consider the full sample in Panel A, high-wage-gap stocks in Panel B, and low-wage-gap stocks in Panel C. CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. The sample period is from 2002 to 2011.

Panel A. Full sample

Variable	Observations	Mean	Std. Deviation	Min	Max
CEO pay (€m)	607	2.65	2.47	0.02	16.60
CEO cash (€m)	607	2.06	1.71	0.02	12.90
Manager pay (€m)	606	1.45	1.07	0.02	8.17
Manager cash (€m)	606	1.16	0.79	0.00	6.87
CEO wage gap	605	48.42	2.94	0.55	5,324.11
CEO cash wage gap	605	40.04	2.75	0.55	2,779.43
Manager wage gap	604	29.37	2.64	0.61	2,835.58
Manager cash wage gap	601	25.03	2.41	3.19	1,863.11

Panel B. High wage-gap

Variable	Observations	Mean	Std. Deviation	Min	Max
CEO pay (€m)	174	5.30	3.02	1.30	16.60
CEO cash (€m)	174	3.81	2.06	0.76	12.90
Manager pay (€m)	174	2.50	1.14	0.65	8.17
Manager cash (€m)	174	1.83	0.78	0.45	5.62
CEO wage gap	174	157.59	2.32	62.80	5,324.11
CEO cash wage gap	174	114.43	2.32	12.68	2,779.43
Manager wage gap	174	76.71	2.46	19.30	2,835.58
Manager cash wage gap	174	57.40	2.46	7.54	1,863.11

Panel C. Low wage-gap

Variable	Observations	Mean	Std. Deviation	Min	Max
CEO pay (€m)	193	0.81	0.41	0.02	2.01
CEO cash (€m)	193	0.74	0.36	0.02	1.70
Manager pay (€m)	192	0.58	0.34	0.02	2.87
Manager cash (€m)	192	0.51	0.26	0.00	1.38
CEO wage gap	193	16.12	1.95	0.55	36.23
CEO cash wage gap	193	14.88	1.93	0.55	36.23
Manager wage gap	192	11.70	1.84	0.61	109.95
Manager cash wage gap	189	11.13	1.60	3.19	34.47

Table 2. Summary statistics: Accounting variables

Summary statistics for the accounting variables in our sample. We consider the full sample in Panel A, high-wage-gap stocks in Panel B, and low-wage-gap stocks in Panel C. The wage gap is defined as the ratio between CEO total annual compensation, including cash and stocks, and workers' wages, calculated as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% of the distribution at the beginning of a given month. Return on assets (ROA) is defined as EBITDA divided by total assets. Tobin's q is defined as enterprise value (debt plus market value of equity) divided by book value (debt plus book value of equity). Return on assets and stock returns are expressed in percentage points, total assets in billion euros, market capitalization in million euros, and trading volume in million shares. Company-level accounting and stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. The sample period is from 2002 to 2011.

Panel A. Full sample

Variable	Observations	Mean	Std. Deviation	Min	Max
ROA (%)	914	6.03%	11.06%	-73.65%	42.37%
Tobin's q	821	1.27	2.51	0.01	34.65
Total assets (€b)	920	57.08	214.34	0.03	2,193.95
Employees	922	50,019	91,628	2	536,350
Stock returns (%)	921	0.02%	10.38%	-50.97%	57.08%
Book-to-market	821	0.91	0.12	0.38	1.84
Dividend yield	668	0.02	2.29	0.00	2.51
Market cap (€m)	920	2,368.47	7.17	4.66	233,281.23
Trading volume (millions)	900	0.19	6.61	0.00	323.76

Panel B. High wage-gap

Variable	Observations	Mean	Std. Deviation	Min	Max
ROA (%)	173	7.93%	7.61%	-28.07%	28.97%
Tobin's q	154	1.58	3.68	0.02	26.48
Total assets (€b)	174	170.88	369.08	0.14	2,155.37
Employees	174	138,565	145,932	171	536,350
Stock returns (%)	174	0.58%	8.89%	-40.76%	26.03%
Book-to-market	154	0.90	0.08	0.64	1.03
Dividend yield	147	0.02	2.05	0.00	0.06
Market cap (€m)	174	18,769.72	3.32	915.99	233,281.23
Trading volume (millions)	171	0.45	4.57	0.01	174.16

Panel C. Low wage-gap

Variable	Observations	Mean	Std. Deviation	Min	Max
ROA (%)	192	2.78%	15.71%	-73.65%	34.29%
Tobin's q	162	1.24	1.95	0.01	16.39
Total assets (€b)	193	12.32	71.34	0.03	750.73
Employees	193	8,228	14,504	2	122,600
Stock returns (%)	192	0.11%	10.54%	-33.57%	44.54%
Book-to-market	162	0.92	0.17	0.38	1.84
Dividend yield	96	0.02	2.14	0.00	0.09
Market cap (€m)	192	566.80	5.53	4.71	45,706.69
Trading volume (millions)	187	0.11	6.96	0.00	169.02

Table 3. Summary statistics: Stock returns

Summary statistics for stock returns in our sample. We consider portfolio returns in Panel A, and European factor data in Panel B. Portfolio returns are equal-weighted and calculated on stocks with a high wage-gap between CEO and workers, stocks with a low wage-gap, and a portfolio with a long position in high-wage-gap stocks and a short position in low-wage-gap stocks. The wage gap is defined as the log-difference between CEO total annual compensation, including cash and stocks, and workers' wages, calculated as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. In any given month, we define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30%, 20%, and 10% of the distribution. European factors data include the returns on the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) factors. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, workers' data are from the German Federal Employment Agency, and factor-mimicking portfolios are from Kenneth French's website. The sample period is from January 2002 to December 2011.

Panel A. Portfolio returns

Variable	Observations	Mean	Std. Deviation	Min	Max
R30 High	120	-0.0006	0.0795	-0.3693	0.3152
R30 Low	120	-0.0086	0.0749	-0.3109	0.2076
R30 High-Low	120	0.0080	0.0474	-0.1368	0.2279
R20 High	120	-0.0015	0.1029	-0.5642	0.5422
R20 Low	120	-0.0127	0.0829	-0.3019	0.2585
R20 High-Low	120	0.0112	0.0785	-0.2623	0.4613
R10 High	108	0.0062	0.0608	-0.1986	0.1787
R10 Low	108	-0.0101	0.0997	-0.3518	0.4647
R10 High-Low	108	0.0163	0.0840	-0.2860	0.2828

Panel B. Factor returns

Variable	Observations	Mean	Std. Deviation	Min	Max
MKT	120	0.0034	0.0615	-0.2503	0.1291
SMB	120	0.0019	0.0204	-0.0719	0.0474
HML	120	0.0033	0.0208	-0.0471	0.0719
UMD	120	0.0081	0.0486	-0.3006	0.1293

Table 4. CEO-workers wage gap and firm performance

Panel regressions of firms' return on assets, defined as EBITDA divided by total assets, on the wage gap between CEO and workers, lagged one year and expressed in logs, and the logarithm of the firm's employees. CEO compensation is measured as total annual pay, including cash and stocks, in columns (1) and (2), and as cash only in columns (3) and (4). Workers' pay is measured as the annual wage paid in establishments that are located in the same state as the firm's headquarters, calculated as a weighted average across establishments, where the weights are represented by the number of employees in each establishment. All specifications include year fixed-effects, and standard errors are clustered by firm. In Panel A, we consider the full sample. In Panel B, we split the sample into firms that belong in competitive vs. non-competitive industries, defined as those whose Herfindahl-Hirschmann index takes on below- and above-median values, respectively. Company-level accounting and stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, workers' data are from the German Federal Employment Agency. Observations are annual, and the sample period is from 2002 to 2011. The numbers below the coefficients are t statistics, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A

Dep. variable: ROA	Total pay		Cash pay	
	(1)	(2)	(3)	(4)
Wage gap (-1)	0.025*	0.012	0.037**	0.027**
	1.87	0.83	2.44	2.21
Employees		0.012		0.008
		1.17		0.95
Constant	-0.043	-0.110	-0.081	-0.126
	-0.74	-1.19	-1.28	-1.30
Year FE	Y	Y	Y	Y
Clustering	Firm	Firm	Firm	Firm
Adj. R-squared	0.040	0.066	0.080	0.091
Observations	552	552	552	552

Panel B

Dep. variable: ROA	Total pay		Cash pay	
	(1)	(2)	(3)	(4)
	High HHI	Low HHI	High HHI	Low HHI
Wage gap (-1)	0.000	0.024*	0.017	0.029**
	0.03	1.76	1.16	2.14
Employees	0.017	0.002	0.014	0.000
	1.60	0.15	1.49	0.04
Constant	-0.112	-0.050	-0.144	-0.052
	-1.27	-0.47	-1.39	-0.49
Year FE	Y	Y	Y	Y
Clustering	Firm	Firm	Firm	Firm
Adj. R-squared	0.094	0.065	0.106	0.077
Observations	284	299	284	299

Table 5. CEO-workers wage gap: Portfolio returns

Carhart's (1997) four-factor model regressions of equal-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 4), a portfolio of stocks for which such inequality is low (columns 2 and 5), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 3 and 6). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the overall annual pay, including cash and stocks, in columns (1-3), and as cash pay in columns (4-6). Workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% (Panel A), 20% (Panel B), and 10% (Panel C) of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A

30% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	0.001	-0.008**	0.009***	0.001	-0.008**	0.010***
	0.33	-2.42	3.12	0.37	-2.47	2.87
MKT	0.951***	0.790***	0.160**	0.913***	0.776***	0.137
	8.40	7.05	2.27	7.70	6.74	1.55
SMB	-0.899***	0.181	-1.080***	-0.914***	0.163	-1.077***
	-2.75	0.66	-3.09	-2.63	0.62	-2.96
HML	-0.322	-0.134	-0.188	-0.317	-0.115	-0.203
	-1.51	-0.41	-0.99	-1.36	-0.36	-1.35
UMD	-0.269**	-0.383**	0.114*	-0.275**	-0.399***	0.125*
	-2.11	-2.49	1.66	-2.08	-2.62	1.69
Adj. R-squared	0.701	0.584	0.223	0.695	0.575	0.202
Observations	120	120	120	120	120	120

Panel B

20% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R20 High	R20 Low	R20 High-Low	R20 High	R20 Low	R20 High-Low
Alpha	0.004	-0.012***	0.016***	0.005	-0.012***	0.017***
	0.82	-2.97	3.06	1.03	-2.58	3.31
MKT	1.025***	0.842***	0.182	1.009***	0.858***	0.152
	5.76	5.69	1.39	5.37	5.99	1.01
SMB	-1.625***	0.303	-1.928***	-1.462**	0.198	-1.660**
	-2.69	0.99	-3.06	-2.31	0.62	-2.39
HML	-0.722*	-0.295	-0.427*	-0.793**	-0.240	-0.553***
	-1.95	-0.77	-1.68	-2.09	-0.62	-2.68
UMD	-0.457**	-0.433***	-0.024	-0.481**	-0.383**	-0.098
	-2.27	-2.94	-0.22	-2.44	-2.33	-0.86
Adj. R-squared	0.608	0.528	0.265	0.588	0.522	0.211
Observations	120	120	120	120	120	120

Panel C

10% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R10 High	R10 Low	R10 High-Low	R10 High	R10 Low	R30 High-Low
Alpha	0.004	-0.013*	0.017***	0.005	-0.011	0.016***
	1.53	-1.82	2.83	1.16	-1.49	3.45
MKT	0.669***	0.864***	-0.196	0.607***	0.633***	-0.025
	5.63	4.68	-0.83	6.44	4.6	-0.17
SMB	-0.820***	0.678*	-1.499***	-0.700***	0.472	-1.172***
	-5.48	1.81	-3.71	-3.84	1.09	-3.65
HML	0.254	-0.294	0.547	0.267	0.063	0.203
	1.02	-0.59	1.51	0.91	0.11	0.43
UMD	-0.108	-0.514	0.406	-0.034	-0.623**	0.589***
	-1.05	-1.55	1.31	-0.22	-1.99	3.08
Adj. R-squared	0.619	0.394	0.156	0.446	0.351	0.190
Observations	108	108	108	108	108	108

Table 6. CEO-workers wage gap: Fama-MacBeth regressions

Fama-MacBeth regressions from Brennan et al. (1998) of returns on German stocks on a dummy variable that takes on value one if firm i's wage gap is among the top 30% (columns 1 and 3) or 20% (columns 2 and 4) at the beginning of the month, and a vector of firm characteristics, which includes: the log of the book-to-market ratio (calculated each July and held constant through the following June), the ratio of dividends in the previous fiscal year to market value at calendar year-end (calculated each July and held constant through the following June), the log of cumulative returns over months $t-3$ through $t-2$, months $t-6$ through $t-4$, and months $t-12$ through $t-7$, size (defined as the log of market capitalization at the end of month $t-2$), the log of the dollar volume of trading in the stock in month $t-2$, and the log of the stock price at the end of month $t-2$. In columns (1) and (3), we exclude the middle 40% wage-gap stocks. In columns (2) and (4), we exclude the middle 60% wage-gap stocks. CEO compensation is measured as total pay in columns (1) and (2), and cash pay in columns (3) and (4). Workers' pay is measured as the annual wage paid in establishments that are located in the same state as the firm's headquarters, calculated as a weighted average across establishments, where the weights are represented by the number of employees in each establishment. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Observations are monthly, and the sample period is from January 2002 to December 2011. The numbers below the coefficients are t statistics, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Dep. variable: Returns	Total pay		Cash pay	
	(1)	(2)	(3)	(4)
	30% Threshold	20% Threshold	30% Threshold	20% Threshold
Wage gap (d)	0.010**	0.024***	0.008*	0.040***
	2.08	2.65	1.95	2.65
Book-to-market (-1)	-0.001	-0.009	-0.011	0.063
	-0.03	-0.28	-0.45	0.77
Dividend yield (-1)	-0.010**	-0.011**	-0.007	-0.022**
	-2.04	-2.01	-1.53	-2.33
CumRet (2,3)	0.036	0.024	0.014	0.131
	1.42	0.83	0.59	1.63
CumRet (4,6)	0.030	0.045*	0.027	0.139
	1.53	1.67	1.18	1.24
CumRet (7,12)	0.026**	0.028	0.041***	0.030
	2.29	1.23	3.42	1.55
Size (-2)	-0.001	0.002	-0.001	-0.03
	-0.30	0.36	-0.13	-1.32
Stock price (-2)	-0.002	-0.004	-0.001	0.005
	-0.79	-0.78	-0.38	0.36
Trading volume (-2)	-0.003	-0.006*	-0.002	0.019
	-1.07	-1.71	-0.86	1.06
Constant	-0.041	-0.074*	-0.030	0.091
	-1.22	-1.66	-0.91	0.59
R-squared	0.534	0.704	0.528	0.697
Observations	2,722	1,774	2,718	1,761

Table 7. CEO-worker wage gap: Double-sorted portfolios

Carhart's (1997) four-factor model regressions of equal-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 4), a portfolio of stocks for which such inequality is low (columns 2 and 5), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 3 and 6). In Panel A we consider stocks whose market capitalization is below the median (columns 1-3), or above the median (columns 4-6). In Panel B we consider stocks whose book-to-market ratio lies in the extreme (i.e., top and bottom) 30% of the distribution (columns 1-3), or in the middle 40% (columns 4-6). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the cash salary, while workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each year. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2005 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A

30% Threshold		Small stocks			Large stocks	
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	0.011	-0.007**	0.018***	-0.002	-0.005	0.002
	1.60	-2.19	2.69	-0.94	-0.66	0.45
MKT	0.991***	0.499***	0.493***	0.748***	0.822***	-0.074
	14.18	6.25	4.11	12.31	6.54	-0.70
SMB	0.399	0.182	0.217	-0.298***	0.383**	-0.682***
	1.24	0.62	0.81	-2.59	2.02	-4.37
HML	-0.321	0.493*	-0.814	0.186	0.351	-0.165
	-0.61	1.70	-1.50	0.94	0.95	-0.58
UMD	-0.284**	-0.116	-0.168**	0.023	-0.129	0.152
	-2.16	-0.99	-1.98	0.20	-0.96	0.92
Adj. R-squared	0.561	0.463	0.175	0.684	0.598	0.100
Observations	84	84	84	84	84	84

Panel B

30% Threshold		Extreme B/M			Middle B/M	
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	0.002	-0.009**	0.011***	-0.003	-0.004	0.001
	0.80	-2.33	3.58	-0.92	-1.00	0.41
MKT	0.791***	0.553***	0.238***	0.762***	0.738***	0.024
	13.29	6.62	3.30	11.43	5.68	0.17
SMB	-0.341**	-0.074	-0.268	-0.069	1.063***	-1.131***
	-2.34	-0.28	-1.18	-0.57	6.61	-7.62
HML	-0.068	0.422	-0.490*	0.419	0.345	0.075
	-0.33	1.26	-1.75	1.63	1.10	0.23
UMD	-0.058	-0.144	0.086	-0.048	-0.101	0.053
	-0.47	-1.26	1.14	-0.45	-0.95	0.43
Adj. R-squared	0.646	0.466	0.041	0.675	0.591	0.170
Observations	84	84	84	84	84	84

Table 8. CEO-workers wage gap: Value-weighted returns

Carhart's (1997) four-factor model regressions of equal-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 4), a portfolio of stocks for which such inequality is low (columns 2 and 5), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 3 and 6). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the overall annual pay, including cash and stocks, in columns (1-3), and as cash pay in columns (4-6). Workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

30% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	0.006	0.002	0.004	0.006	0.000	0.006
	1.30	0.69	0.80	1.34	0.10	1.29
MKT	0.886***	0.614***	0.272**	0.829***	0.714***	0.115
	4.35	5.07	2.53	3.68	7.57	0.68
SMB	-1.700***	-0.178	-1.522***	-1.779***	-0.089	-1.690***
	-3.14	-0.73	-3.40	-3.20	-0.51	-3.67
HML	-0.489	-0.013	-0.476**	-0.416	-0.121	-0.296
	-1.22	-0.04	-2.43	-0.95	-0.47	-1.05
UMD	-0.420*	-0.332**	-0.088	-0.426*	-0.335**	-0.091
	-1.86	-2.06	-1.03	-1.85	-2.31	-0.85
Adj. R-squared	0.567	0.506	0.322	0.543	0.560	0.280
Observations	120	120	120	120	120	120

Table 9. CEO-workers wage gap, income inequality, and valuations

Panel regressions of firms' Tobin's q, defined as enterprise value (debt plus market value of equity) divided by book value (debt plus book value of equity), on the wage gap between CEO and workers, lagged one year and expressed in logs, the logarithm of the firm's employees, and an interaction term between the wage gap and a dummy that takes on value one if income inequality, defined as the top 1% fiscal income share in Germany, has increased over a given year, and zero otherwise. CEO compensation is measured as total annual pay, including cash and stocks, in Panel A, and as cash only in Panel B. Workers' pay is measured as the annual wage paid in establishments that are located in the same state as the firm's headquarters, calculated as a weighted average across establishments, where the weights are represented by the number of employees in each establishment. All specifications include year fixed-effects, and standard errors are clustered by firm. Company-level accounting and stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, workers' data are from the German Federal Employment Agency, and income inequality data are from the World Inequality Database. Observations are monthly. The sample period is from 2002 to 2011. The numbers below the coefficients are t statistics, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A. Total pay

Dep. variable: Tobin's q	(1)	(2)	(3)
Wage gap	0.314	0.727	0.948*
	0.92	1.61	1.83
Employees		-0.397**	-0.402**
		-2.24	-2.27
Wage gap x Inequality (d)			-0.277*
			-1.77
Constant	0.087	2.278**	2.248*
	0.07	2.01	1.98
Year FE	Y	Y	Y
Clustering	Firm	Firm	Firm
Adj. R-squared	0.048	0.110	0.110
Observations	525	525	525

Panel B. Cash pay

Dep. variable: Tobin's q	(1)	(2)	(3)
Wage gap	0.228	0.625	0.970*
	0.59	1.37	1.82
Employees		-0.358**	-0.363**
		-2.29	-2.33
Wage gap x Inequality (d)			-0.439**
			-2.26
Constant	0.467	2.427*	2.359*
	0.36	1.88	1.86
Year FE	Y	Y	Y
Clustering	Firm	Firm	Firm
Adj. R-squared	0.039	0.089	0.092
Observations	525	525	525

Table 10. CEO-workers wage gap: Justified vs. unjustified pay

Following Rouen (2020), we construct an economically justified wage gap (columns 1-3), and an unjustified one (columns 4-6). The justified component is a linear combination of a large set of firm characteristics from Rouen (2020). For CEO pay, the explanatory variables are return on assets, average stock returns over the previous year, the logarithm of CEO tenure, the logarithm of CEO age, a dummy variable that takes on value one for years with negative income (defined as EBIT), the logarithm of total assets, the book-to-market ratio, and the ratio between total debt and total assets. For workers' pay, the explanatory variables are the proportion of highly qualified workers, the proportion of women, workers' median age, a dummy variable that takes on value one if the establishment is in the same region as the firm's headquarters, the percentage change in the number of employees from the previous year, state fixed-effects, the logarithm of total assets, return on assets, the ratio between sales and the number of employees, the book-to-market ratio, and the ratio between total debt and total assets. Unjustified pay represents the part of compensation that is not explained by economic fundamentals, i.e., the difference between the actual wage gap and the explained wage gap. The table reports Carhart's (1997) four-factor model regressions of equal-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 4), a portfolio of stocks for which such inequality is low (columns 2 and 6), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 3 and 6). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the overall annual pay, including cash and stocks, in Panel A, and as cash pay in Panel B. Workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% of the distribution. Company-level accounting and stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2005 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A

30% Threshold	Justified **total** pay			Unjustified **total** pay		
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	0.000	-0.002	0.002	0.000	-0.005	0.005
	0.00	-0.51	0.32	0.01	-1.59	1.49
MKT	1.029***	0.783***	0.247	0.858***	1.058***	-0.200*
	5.85	12.50	1.56	16.45	7.80	-1.78
SMB	-1.321***	0.136	-1.457***	-0.216**	-0.269	0.053
	-2.85	0.52	-3.07	-2.05	-0.66	0.15
HML	-0.526	0.156	-0.682**	0.077	-0.546	0.623
	-1.28	0.50	-2.07	0.42	-1.31	1.39
UMD	-0.377***	-0.298***	-0.079	-0.128*	-0.439***	0.311***
	-3.11	-4.07	-0.67	-1.72	-3.15	2.76
Adj. R-squared	0.707	0.606	0.315	0.680	0.641	0.104
Observations	120	120	120	120	120	120

Panel B

30% Threshold	Justified **cash** pay			Unjustified **cash** pay		
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	0.000	-0.001	0.000	0.004	-0.005*	0.010**
	-0.09	-0.19	0.03	0.93	-1.81	2.09
MKT	1.071***	0.821***	0.250	1.069***	0.897***	0.171
	6.44	11.49	1.59	5.82	10.38	0.91
SMB	-1.270***	0.153	-1.422***	-1.241*	0.280**	-1.521**
	-2.73	0.66	-3.06	-1.87	2.12	-2.53
HML	-0.620	0.090	-0.710**	-0.710*	-0.092	-0.618***
	-1.58	0.30	-2.21	-1.78	-0.42	-2.71
UMD	-0.360***	-0.266***	-0.094	-0.519***	-0.234***	-0.285*
	-2.92	-4.06	-0.82	-2.64	-4.38	-1.83
Adj. R-squared	0.710	0.635	0.321	0.591	0.692	0.249
Observations	120	120	120	120	120	120

Table 11. CEO-workers wage gap and sentiment

Carhart's (1997) four-factor model regressions of equal-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 4), a portfolio of stocks for which such inequality is low (columns 2 and 5), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 3 and 6). The regressions include a dummy variable that equals one if German consumer sentiment has increased over the previous month and zero otherwise. Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the overall annual pay, including cash and stocks, in columns (1-3), and as cash pay in columns (4-6). Workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Consumer confidence data are from the OECD. Observations are monthly, and the sample period is from January 2002 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

30% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	-0.003	-0.018***	0.015***	-0.004	-0.018***	0.014***
	-0.56	-3.50	3.17	-0.61	-3.54	3.33
Sentiment (d)	0.009	0.019**	-0.011**	0.009	0.019**	-0.009*
	1.12	2.25	-1.97	1.20	2.21	-1.94
MKT	0.935***	0.754***	0.181***	0.896***	0.742***	0.154*
	7.55	6.20	2.73	6.97	5.98	1.85
SMB	-0.938***	0.093	-1.031***	-0.955***	0.080	-1.035***
	-3.04	0.36	-2.96	-2.93	0.32	-2.82
HML	-0.345*	-0.186	-0.159	-0.342	-0.164	-0.178
	-1.66	-0.59	-0.86	-1.53	-0.52	-1.17
UMD	-0.283**	-0.414***	0.131**	-0.290**	-0.430***	0.140**
	-2.42	-3.16	2.13	-2.40	-3.28	2.08
Adj. R-squared	0.701	0.596	0.228	0.696	0.585	0.204
Observations	120	120	120	120	120	120

Table 12. CEO-workers wage gap: CAPM regressions

CAPM regressions of equal-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 4), a portfolio of stocks for which such inequality is low (columns 2 and 5), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 3 and 6). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the overall annual pay, including cash and stocks, in columns (1-3), and as cash pay in columns (4-6). Workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% (Panel A), 20% (Panel B), and 10% (Panel C) of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A

30% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High	R30 Low	R30 High-Low	R30 High	R30 Low	R30 High-Low
Alpha	-0.004	-0.012***	0.008**	-0.004	-0.012***	0.008**
	-1.42	-2.66	2.39	-1.35	-2.68	2.00
MKT	1.019***	0.904***	0.115	0.985***	0.899***	0.085
	5.21	5.98	1.02	4.91	5.71	0.66
Adj. R-squared	0.618	0.546	0.014	0.604	0.534	0.003
Observations	120	120	120	120	120	120

Panel B

20% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R20 High	R20 Low	R20 High-Low	R20 High	R20 Low	R20 High-Low
Alpha	-0.005	-0.016***	0.011**	-0.005	-0.016***	0.011*
	-0.99	-3.20	2.10	-0.82	-2.83	1.83
MKT	1.115***	0.945***	0.17	1.094***	0.954***	0.14
	3.51	5.09	0.70	3.40	5.30	0.58
Adj. R-squared	0.439	0.487	0.009	0.43	0.494	0.004
Observations	120	120	120	120	120	120

Panel C

10% Threshold		Total wage gap			Cash wage gap	
	(1)	(2)	(3)	(4)	(5)	(6)
	R10 High	R10 Low	R10 High-Low	R10 High	R10 Low	R10 High-Low
Alpha	0.002	-0.015**	0.018***	0.004	-0.015*	0.018***
	1.15	-2.39	2.79	1.15	-1.89	2.62
MKT	0.738***	0.974***	-0.235	0.659***	0.838***	-0.180
	7.76	4.32	-0.94	5.85	4.66	-1.02
Adj. R-squared	0.548	0.350	0.020	0.408	0.285	0.013
Observations	108	108	108	108	108	108

Table 13. CEO-workers wage gap: Alternative factor models

Factor model regressions of equal-weighted returns on a portfolio with a long position in stocks with high pay-inequality between CEO and workers, and a short position in a portfolio of stocks for which such inequality is low. In Panel A, columns (1), (3), and (5), we consider Carhart's (1997) European four-factor model from Kenneth French's website and augment it with the U.S. liquidity factor from Pástor and Stambaugh (2003), while in columns (2), (4), and (6), we consider the European three-factor model from Kenneth French's website, and augment it with the U.S. investment and profitability factors from Fama and French (2015). In Panel B, columns (1), (3), and (5), we consider the European market, book-to-market, and momentum factors from Kenneth French's website, and add the U.S. profitability factor from Novy-Marx (2013), while in columns (2), (4), and (6), we consider the European market and size factors from Kenneth French's website, and add the U.S. management and performance factors from Stambaugh and Yuan (2017). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the overall annual pay, including cash and stocks, while workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% (columns 1-2), 20% (columns 3-4), and 10% (columns 5-6) of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Observations are monthly, and the sample period is from January 2002 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A

	R30 High-Low		R20 High-Low		R10 High-Low	
	(1)	(2)	(3)	(4)	(5)	(6)
Alpha	0.009***	0.010***	0.015***	0.016***	0.016***	0.019***
	3.10	3.65	2.91	3.83	2.68	4.24
Pástor and Stambaugh (2003)	Y	N	Y	N	Y	N
Fama and French (2015)	N	Y	N	Y	N	Y
Adj. R-squared	0.218	0.214	0.263	0.272	0.152	0.115
Observations	120	120	120	120	108	108

Panel B

	R30 High-Low		R20 High-Low		R10 High-Low	
	(1)	(2)	(3)	(4)	(5)	(6)
Alpha	0.007**	0.009***	0.010*	0.014***	0.015**	0.021***
	2.14	4.14	1.71	4.23	2.00	4.90
Novy-Marx (2013)	Y	N	Y	N	Y	N
Stambaugh and Yuan (2017)	N	Y	N	Y	N	Y
Adj. R-squared	0.016	0.221	0.043	0.263	0.037	0.129
Observations	120	120	120	120	108	108

Table 14. CEO-workers wage gap: Post-reform subsample

Carhart's (1997) four-factor model regressions of equal-weighted returns on a portfolio with a long position on stocks with high inequality between CEO and workers' pay, and a short position on stocks for which such inequality is low. Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is measured as total pay in columns (1) to (3), and cash pay in columns (4) to (6). Workers' pay is measured as the average annual wage paid in establishments that are located in the same state as the firm's headquarters, weighted by the number of employees in each establishment. To construct our test portfolios, we rank all stocks in pay inequality quantiles and rebalance them at the beginning of each month. We define high- and low-wage-gap stocks, respectively, as the stocks that lie at the top and the bottom 30% (columns 1 and 4), 20% (columns 2 and 5), and 10% (columns 3 and 6) of the distribution. Company-level stock market data are from Worldscope and Datastream, CEO compensation data are from the companies' annual reports, and workers' data are from the German Federal Employment Agency. Factor-mimicking portfolios are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2006 to December 2011. Heteroskedasticity and autocorrelation-robust t-statistics are below the coefficients, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Total wage gap			Cash wage gap		
	(1)	(2)	(3)	(4)	(5)	(6)
	R30 High-Low	R20 High-Low	R10 High-Low	R30 High-Low	R20 High-Low	R10 High-Low
Alpha	0.005***	0.010***	0.022***	0.007**	0.015***	0.018***
	3.22	3.61	7.22	2.03	3.51	3.02
MKT	0.152	0.109	-0.18	0.130	0.057	0.085
	1.52	0.69	-0.61	1.07	0.34	0.49
SMB	-0.760***	-1.054***	-1.207***	-0.621***	-0.670***	-1.033***
	-2.85	-5.38	-4.60	-3.38	-3.26	-5.15
HML	-0.317*	-0.186	0.414	-0.188	-0.220	-0.269
	-1.65	-0.68	1.13	-1.26	-0.97	-1.02
UMD	0.101	0.177	0.208	0.179*	0.114	0.455***
	1.26	1.47	1.27	1.72	0.81	4.17
Adj. R-squared	0.173	0.185	0.133	0.135	0.05	0.209
Observations	72	72	72	72	72	72

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