Wage gap and stock returns[☆]

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Abstract

We propose an asset pricing model in which the optimal wage gap between managers and workers increases with managerial skills. In a world with noise traders and short-sales constraints, we show that firms with lower wage gaps should trade at a premium, and the mispricing becomes even stronger if some investors exhibit inequality aversion. Using a unique data set of German firms, we provide strong support for the model's predictions. The results suggest that pay inequality within firms has important implications for asset prices.

JEL classification: G10, G12, G14, G32.

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

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1. Introduction

In recent years, pay inequality between managers and workers has received increasing attention from academics, regulators, and the media[1]. Notably, on October 17, 2015, The Securities and Exchange Commission adopted a new rule that requires US 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 fully justified by the facts at hand, at least on purely economic grounds. Recent research shows that firm performance actually increases with pay inequality (Cronqvist et al., 2009; Faleye et al., 2012; Mueller et al., 2017), which is in line with the conjecture that a larger wage gap reflects better

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[1]See, e.g., Crystal (1991), Pfeffer and Langton (1993), Main et al. (1995), Bertrand and Mullainathan (2000, 2001), Bloom and Michel (2002), and Wage et al. (2006).

managerial skills. It is not clear, however, whether investors recognize this information, as the relation between pay inequality and stock prices is not entirely understood (Mueller et al., 2017). In this paper, we shed light on this issue, both theoretically and empirically.

We propose an asset pricing model with noise traders and short-sales constraints, in which the optimal wage gap between the CEO and rank-and-file workers increases with managerial skills. In equilibrium, we show that firms with low wage gaps should be overpriced, and the effect should be even stronger in the presence of inequality-averse investors. Using a unique data set of German firms, we find strong evidence for the model's predictions. We show that a long-short portfolio of stocks with high and low wage gaps respectively yields positive and robust risk-adjusted returns, and the results are almost entirely driven by the short leg of the investment strategy.

The findings support the idea that pay inequality is not priced in the stock market (Mueller et al., 2017). However, we show that the relation between the wage gap and stock returns is inconsistent with a simple story on limits of arbitrage. The results suggest that market participants are actually able to observe (or infer) information on salaries, and incorporate it into their evaluations. In particular, the mispricing seems to be driven by investors who dislike pay inequality within firms.

To the best of our knowledge, this paper is the first to link Fehr and Schmidt's (1999) inequality aversion with investor behavior, and therefore contributes to the recent burgeoning literature on values in asset pricing (see, e.g., Hong and Kostovetsky, 2012). The paper also provides a specific mechanism through which investors process and trade on intangible information, which adds new insights to the recent literature on market learning (see, e.g., Edmans (2011) for an excellent review).

In our theoretical analysis, we consider a two-period economy in which the representative firm hires a manager to carry out a project, and seeks equity financing on the stock market. The matching between firms and managers is random, and managerial skills affect both the firm's productivity and the outcome of wage negotiations with workers. Such skills are known to the firm and the manager himself, but not to the market, which can only infer the quality of management using pay inequality as a signal.

Investors can be either sophisticated (arbitrageurs) or unsophisticated (noise traders). One way to make this distinction practical is to think of them as hedge funds and mutual funds respectively, where the latter face short-sales constraints (Chen et al., 2002). Sophisticated investors have unbiased evaluations. Unsophisticated investors, instead, can be of two types: uninformed traders, who do not recognize the informativeness of the wage gap, and do not incorporate it in their evaluations; and inequality-averse traders, who dislike pay inequality within firms, and evaluate low wage gap firms in a more favorable way than they do high wage gap firms.

As a result, noise traders' evaluations are below the fundamental value for high wage gap

stocks, which makes short-sales constraints binding. In equilibrium, then, their demand is zero, which implies no mispricing. On the contrary, firms with low pay inequality should trade at a premium, as unsophisticated investors are unable to rule out the possibility that such firms are run by smart managers, and inequality-averse investors evaluate these firms with a positive bias. In turn, this pricing error implies lower stock returns.

In the empirical analysis, we take these predictions to the data. The major issue to overcome in this respect is the lack of publicly available data on rank-and-file workers' compensation. In the US, disclosure of workers' wages is only discretionary and coverage is rather low, which seems to make the sample biased and not very representative[2] (about 18% of Compustat firm-year observations; see Cronqvist et al., 2009). Alternatively, there are some proprietary data sets for the US (Wade et al., 2006), the UK (Mueller et al., 2017), and Sweden (Cronqvist et al., 2009). However, the data come from surveys or only inlcude a fraction of the universe of firms.

In this paper, we use the "Establishment History Panel" database, maintained and made available by the German Federal Employment Agency (Bundesargentur für Arbeit, BfA). This is a unique data set that contains the annual gross wage for all workers employed in the 100 largest firms in Germany (as of year 2006), together with information on the local branch (i.e., establishment) they work for. The data set made available to researchers, however, aggregates all observations into medians and quartiles at the establishment level. Therefore, we define workers' compensation in a given company as the average establishment-level median wage, weighted by the number of employees in each branch.

The sample period is from January 2001 to December 2011, and therefore includes the recent German reform on executive compensation disclosure. Prior to the reform, only outside board members deciding on the compensation packages had access to this information, and listed companies only had to report the aggregate pay of their key corporate executives. Since corporations were not keen on reporting individual managers' pay, the Federal Government of Germany passed a bill in 2005 that made such disclosure mandatory starting in 2006.

Note that the reform covers executive compensation, but not the salary of employees. However, we argue that the a firm's policy on pay inequality can be observed by investors through three channels. First, companies with extreme wage gaps are subject to extensive media coverage, which constitutes public information (see, e.g., Wage et al., 2006). Second, firms are also under the scrutiny of labor unions, who release information on compensation schemes. Third, some sophisticated investors may have preferential access to firm-specific information, including managers and workers' pay.

[2]However, disclosure will become mandatory as of January 1, 2017, following a new rule adopted by the Security and Exchange Commission.

We complete our sample using company-level accounting and stock market data from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. The final data set includes 146 CEOs and 734 board members overall. The representative CEO receives an average annual compensation of €2.59 million, most of which is in cash (€2.01 million). On the other hand, the median wage at the establishment level for full-time rank-and-file workers is €35,167 per year. Therefore, the average ratio between CEO and workers' pay is 73.6. For non-CEO managers, the average wage gap is 40.8.

Following Cronqvist et al. (2009), we primarily define the wage gap as the log-difference between CEO and workers' pay, and calculate it 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, we acknowledge the fact that political and economic heterogeneity across German states may create noise in our wage gap estimates. With this restriction, we make sure that managers and workers face the same local government and costs of living.

To construct our test portfolios, we divide stocks into pay inequality quantiles. Then, we rebalance them at the beginning of each year, 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 portfolios, calculated during the year following the portfolio formation. To estimate risk-adjusted returns, we run time series regressions of the CAPM and Carhart's (1997) four-factor model. To this purpose, we consider European risk factors from Kenneth French's website, and their German counterparts from the Humboldt University of Berlin.

We find strong support for the model's predictions. In the European four-factor model, we find that the top 30% wage gap stocks earn a near-zero and insignificant alpha (0.10%, t-stat -0.18), while the bottom 30% wage gap stocks yield negative and significant risk-adjusted returns (-0.90%, t-stat -2.26). This results in a profitable long-short investment strategy (0.80%, t-stat 2.34). In particular, the model predicts that the pricing error introduced by noise traders' evaluations should increase when considering extreme wage gaps. In keeping with this hypothesis, we find that the long-short strategy yields 1.30% (t-stat 2.81) for the 20% portfolios, and 1.80% (t-stat 6.48) for the 10% portfolios.

This empirical pattern is quite robust. We find similar results when considering the German four-factor model, cash rather than total CEO compensation, the wage gap of the other members of the board excluding the CEO, and all establishments rather than only those located in the same state as the company headquarters. We also try forming the test portfolios in April rather than January, to acknowledge the fact most companies issues their reports at the end of the first quarter, and find analogous results. Finally, we estimate panel regressions from Brennan et al. (1998), and find again a positive relation between wage gap and stock returns.

It is important to understand whether these results are driven by uninformed or inequality-averse traders. To tease out the two stories, we exploit the German reform on executive compensation disclosure. We argue that uninformed investors would continue to neglect pay inequality even after 2006, while inequality-averse investors would be able to observe wage gaps with greater precision. We find that the estimates do not change in the reform period, and even become statistically stronger. This result suggests that the mispricing may be driven by inequality-averse traders.

To formally test this conjecture, however, we proceed as follows. Baker and Wurgler (2006, 2007) show that noise trader demand migrates to stocks that are perceived less favorably in times of high sentiment, because greater optimism makes "bad" stocks look better in the eyes of unsophisticated investors. In our setting, this implies that inequality-averse investors should shift their demand away from low wage gap stocks. On the contrary, we should observe no such pattern for uninformed investors, who evaluate high and low wage gap stocks equally.

To define investors sentiment, we consider the consumer confidence index for Germany, the euro area, and the OECD. The results are similar across all three sets of tests. We find that low wage gap stocks are mispriced only in times of low sentiment, while most of the mispricing goes away in times of high sentiment. We find no such pattern, instead, for high wage gap stocks, whose risk-adjusted returns continue to be close to zero in times of both high and low sentiment. The results are therefore consistent with the inequality aversion story.

Finally, we address the potential concern that investors may actually dislike large CEO pay in and of itself, regardless of workers' pay. To test for this, we proceed in two ways. First, we repeat the analysis by forming our portfolios on CEO pay only, rather than the wage gap. Under the wage gap story, this alternative ranking should only be a noisy proxy for the ranking on firms on pay inequality, because the two measures are correlated but it is the latter that matters. Consistent with this conjecture, we find a similar empirical pattern for the wage gap portfolios, but the estimates are not as strong both in magnitude and significance.

We also devise a more formal test to tease out the two stories. We estimate panel regressions from Brennan et al. (1998), and introduce one dummy variable for the top 30% wage gap stocks and another for the top 30% CEO pay stocks, which allows us to control for firm-level variables such as size, book-to-market, liquidity, volume, and momentum. Following Mueller et al. (2017), we exclude the middle 40% wage gap stocks. We find that top wage gap stocks are associated with a 1.2% increase in returns (t-stat 1.85), while top CEO pay stocks are actually associated with a 1.6% decrease in returns (t-stat -2.28), which lends support to the wage gap story.

Overall, the results are consistent with the conjecture that the market is unable to correctly evaluate intangibles, such as R&D (Lev and Sougiannis, 1996; Chan et al., 2001), advertising (Chan et al., 2001), patent citations (Deng et al., 1999), and software development costs (Aboody

and Lev, 1998). These stocks, indeed, all earn higher long-run returns. Similarly, Edmans (2011) shows that the market does not fully incorporate public information on employee satisfaction into the stock price. In particular, such stocks exhibit positive risk-adjusted returns, due to the mispricing, but also higher valuations, just as our model predicts.

This paper also speaks to the literature that studies the impact of values on investor behavior (Grinblatt and Keloharju, 2001; Bhattacharya and Groznik, 2008; Morse and Shive, 2010; Kaustia and Torstila, 2011). Previous research shows that investors consider nonmonetary variables in their trading strategies, such as moral issues (Hong and Kacperczyk, 2009), or political affiliation (Hong and Kostovetsky, 2012). Our results extend this literature by providing evidence that investors, much like the general public, dislike pay inequality within firms.

The rest of the paper is organized as follows. Section 2 introduces the model. Section 3 illustrates the data. Section 4 explains the methodology. Section 5 discusses the empirical results. Section 6 concludes.

2. Model

We consider a two-period economy in which the representative firm seeks equity funding, and hires a manager with skills s to carry out a project. The matching is random, and the manager's type is known to both himself and the firm, but not the stock market. Managerial skills determine the firm's productivity $\theta_s > 0$ (with $\theta_s^{'} > 0$), which follows a uniform distribution between $\theta - h$ and $\theta + h$, and workers' wages $w_s > 0$ (with $w_s^{'} < 0$). The project has size K, and entails hiring L workers for the following production function:

$$y_s = \theta_s K^{1-\alpha} L^{\alpha}, \tag{1}$$

The representative firm solves:

$$\max_{\delta, L} \pi_s = y_s - w_s L - \delta w_s, \tag{2}$$

which yields the following two first-order conditions (see Appendix A.1):

$$\delta^* w_s = \frac{\epsilon_\theta y_s + |\epsilon_w| w_s L}{1 - |\epsilon_w|}, \tag{3}$$

$$L^* = \left(\frac{\alpha \theta_s}{w_s} \right)^{\frac{1}{1-\alpha}} K, \tag{4}$$

where $\epsilon_\theta, |\epsilon_w| \in (0, 1)$, and the latter is firm-specific, in the sense that managerial skills can affect wage negotiations in different ways depending on the firm's (peculiar) constraints[3]. Therefore, the optimal compensation for the manager has both a variable and a fixed component, calculated

[3]In other words, for any two firms a and b and a given level of managerial skills s, $w_a'(s) \neq w_b'(s)$. For example, this can be thought of as a case where the union sets the salary scale, but it is up to the firm to choose which salary scale to place a particular worker in. Note that this implies that firm's profitability does not fully reveal the wage gap, and therefore managerial skills.

as a fraction of the firm's cashflow and labor costs respectively. The firm's profits are then (see Appendix A.2):

$$\pi_s^* = K\theta_s^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{w_s}\right)^{\frac{\alpha}{1-\alpha}} \left(1 - \frac{\epsilon_\theta + \alpha(1+|\epsilon_w|)}{1-|\epsilon_w|})\right) \equiv \phi_s K, \tag{5}$$

where ϕ_s represents the profits per euro invested.

The stock market needs to evaluate firms, using the wage gap as a signal for managerial skills. Investors are risk-neutral and have unit mass. They are either sophisticated (arbitrageurs) or unsophisticated (noise traders), and can be thought of as hedge funds and mutual funds respectively (Chen et al., 2002). As such, the latter face short-sales constraints.

We identify two types of unsophisticated investors: uninformed traders and inequality-averse traders. The former are of size $\lambda_U \in (0,1)$ and neglect the wage gap, but do take into account other fundamental information about the firm. The latter are of size $\lambda_I \in (0,1)$ and dislike pay inequality within firms. Therefore, they evaluate low wage gap firms in a more favorable way than they do high wage gap firms.

We consider a stock market from Hong and Sraer (2013), where investor i solves:

$$\max_{n_{ij}} n_{ij}(E_i(v_j) - p_j) - \frac{1}{2}\frac{n_{ij}^2}{\gamma}, \tag{6}$$

where n_{ij} is the number of shares traded by investor of type i in stock j, γ captures transaction costs[4], p_j is the price of stock j, and $E_i(v_j)$ is investor i's subjective evaluation of the stock's cashflow. The discount rate is set to zero, without loss of generality. The first-order condition yields the following demand function for investor i in stock j:

$$n_{ij}^* = \gamma(E_i(v_j) - p_j), \tag{7}$$

Investors' evaluations are as follows. Arbitrageurs correctly estimate:

$$E_A(\pi_s^*) = \phi_s K. \tag{8}$$

Uninformed traders have "flat" evaluations and use $\phi(\theta)$ instead:

$$E_U(\pi_s^*) = \phi K. \tag{9}$$

Inequality-averse traders exhibit a cognitive bias:

$$E_I(\pi_s^*) = \phi K + b(\phi - \phi_s), \tag{10}$$

as they perceive stocks with high (low) wage gaps less (more) favorably than uninformed traders.

Given the presence of short-sales constraints, the equilibrium price depends on whether the flat prior ϕ is above or below the true value ϕ_s. For high wage gap stocks ($\phi < \phi_s$), short-sales constraints are binding. Therefore, given supply q, the equilibrium price is:

$$p_H^* = \phi_s K - \frac{q}{\gamma}. \tag{11}$$

[4]Note that 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.

Following Chen et al. (2002), we define returns as the difference between price and fundamental value, and therefore find that

Proposition 1. *Returns on high wage gap stocks are at par:*

$$E(r_H^*) = \frac{q}{\gamma}. \tag{12}$$

For low wage gap stocks ($\phi > \phi_s$), instead, short-sales constraints do not bind, and the equilibrum price is:

$$p_L^* = \phi_s K + K(\lambda_U + \lambda_I)(\phi - \phi_s) + \lambda_I b(\phi - \phi_s) - \frac{q}{\gamma}, \tag{13}$$

which includes two important elements: the overpricing introduced by noise trader demand overall, and overpricing introduced by inequality-averse traders only. This implies

Proposition 2. *Returns on low wage gap stocks are below par:*

$$E(r_L^*) = \frac{q}{\gamma} \underbrace{-K(\lambda_U + \lambda_I)(\phi - \phi_s) - \lambda_I b(\phi - \phi_s)}_{<0}, \tag{14}$$

which implies

Proposition 3. *Stocks with high wage gaps outperform stocks with low wage gaps. The return differential increases with the proportion of noise traders in the market ($\lambda_U + \lambda_I$), profitability (ϕ_s), and the inequality aversion bias (b):*

$$E(r_H^*) - E(r_L^*) = K(\lambda_U + \lambda_I)(\phi - \phi_s) + \lambda_I b(\phi - \phi_s), \tag{15}$$

2.1. Testable implications

In light of the Propositions above, we derive the following three hypotheses on stock returns:

Hypothesis 1 *Stocks with high wage gaps yield zero risk-adjusted returns.*

Hypothesis 2 *Stocks with low wage gaps yield negative risk-adjusted returns. The mispricing decreases (in absolute value) with the wage gap.*

Hypothesis 3 *A portfolio of stocks with a long-short position in high and low wage gap stocks respectively yields positive risk-adjusted returns. The profitability of the trading strategy increases with the difference in wage gaps.*

These hypotheses reflect the fact that short-sales constraints should be binding for high wage gap stocks, but not for low wage gap stocks. In particular, the lower the wage gap, the greater the (positive) bias in the evaluations of inequality-averse traders. In the empirical analysis, we take these predictions to the data.

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 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 the 100 largest firms in Germany (as of year 2006), along with information on their employer and the local establishment they work for[5].

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.

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 is from January 2001 to December 2011, and therefore 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 bill in 2005 that made such disclosure mandatory.

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. On average, the number of firms in our sample is 95 per year. 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 average coverage of firms and establishments is then comparable to previous studies.

The industry breakdown shows that the most represented sector in the sample is post and telecommunication (24.34%), followed by financial intermediation (16.92%), and retail trade (9.46%). The distribution of establishments by states, on the other hand, shows that the most represented regions are "Nordrhein-Westfalen" (18.41%), followed by Bayern (15.74%), and Baden-Württemberg (12.43%). A significant proportion of establishments is located in the same state as the firms' headquarters (18%). Overall, as expected, the Western regions are the most represented in the sample.

The data set includes 146 CEOs and 734 board members overall. The representative CEO in our sample is 54 years old, with a tenure of approximately six years, and an average annual compensation of €2.59 million, of which €2.01 million in cash (see Table 1). CEO turnover is

[5]The matching between firms and establishments is also made in year 2006.

relatively low (9%), and a substantial portion of CEOs is hired inside the firm (43%). The average board includes five members and receives a total compensation of €1.43 million per year, which falls well short of that of the CEO. However, their pay is highly correlated with that of the CEO (80%).

The average firm employs 50,001 workers overall, and around 60 full-time employees per establishment, with a median age of 41 years. The overwhelming majority of such workers is German (97%). Most of them are highly qualified (73%), and have a white-collar job (61%). Women are well-represented in the sample (43%). Interestingly, in 95% of the cases there is a labor union within the firm.

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. Therefore, the average ratio between CEO and workers' pay is 73.6, which is high, but still six times lower than the average wage gap in the US (see, e.g., Faleye et al., 2012). For non-CEO managers, the average wage gap is 40.8.

4. Methodology

Following the previous literature, we define the wage gap as the log-difference between managers' pay and rank-and-file workers' wages. In our baseline specifications, we primarily define managerial compensation as the overall pay of the CEO, including both the variable and the fixed component. For robustness, we alternatively define it as the overall pay of the other members of the board. On the other hand, we define workers' compensation in a given company as the average establishment-level wage, weighted by the number of employees in each establishment[6].

To construct our test portfolios, we rank all stocks in pay inequality quantiles, as measured in the previous year. Then, we rebalance them at the beginning of each year, 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 our dependent variable as excess returns on the top portfolios, excess returns on the bottom portfolios, and returns on the top-minus-bottom portfolios.

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 the management and employees, we note that heterogeneity across German states may create noise in our wage gap estimates. Therefore, we make sure that local governments and costs of living are the same for both managers and workers.

To test the Hypotheses from the model, we primarily run time-series regressions. To this pur-

[6] All the results that follow are robust to using a simple arithmetic average across establishments.

pose, we use European financial data from Kenneth French's website[7]. First, we estimate simple CAPM regressions:

$$R_{it} = \alpha_i + \beta_i MKT_t + \epsilon_{it}, \tag{16}$$

where the dependent variable is the excess returns on portfolios of stocks with high ($i = H$) or low ($i = L$) wage gaps, or the returns on the long-short portfolio ($i = H - L$); the independent variable is excess returns on the market portfolio; the intercept captures abnormal risk-adjusted returns; and standard errors are calculated following Newey and West (1987) to correct for heteroskedasticity and serial correlation.

Hypothesis 1 implies no pricing errors for high wage gap stocks, and therefore $\alpha_H = 0$. Hypothesis 2 predicts that low wage gap stocks trade at a premium, i.e., $\alpha_L < 0$. In turn, Hypothesis 3 implies $\alpha_{H-L} > 0$. Following the theoretical guidance, we estimate the equation for all three thresholds (30%, 20%, 10%), and expect the mispricing to become stronger as we move towards the tails of the distribution.

To control for other well-known risk-factors, we also estimate Carhart's (1997) four-factor model:

$$R_{it} = \alpha_i + \beta_i MKT_t + s_i SMB_t + h_i HML_t + u_i UMD_t + \epsilon_{it}, \tag{17}$$

where the additional three regressors are the size, book-to-market, and momentum factor respectively. Of particular importance here is the coefficient 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 returns between high and low wage gap stocks does not simply reflect a size premium, but rather constitutes a separate effect. Following this line of reasoning, we expect the following loadings on the size factor: $s_H < 0$, $s_L > 0$, $s_{H-L} < 0$.

In robustness checks, we also estimate the following panel regressions:

$$R_{it} = \beta_0 + \beta_1 d_{it-1} + Z_{it} + \epsilon_{it}, \tag{18}$$

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 in the previous year is among the top 30% of the distribution; and Z_{it} is a vector of firm characteristics from Brennan et al. (1998), which 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

[7] In unreported tests, we find that all the results that follow are robust to using Germany-specific data from the Humboldt University of Berlin.

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 $t-2$; the log of the stock price at the end of month $t-2$. Following Mueller et al. (2017), we leave out the stocks that lie in the middle 40% of the wage gap distribution. In this specification, the model's predictions imply $\beta_1 > 0$.

5. Empirical results

Next, we take the model's predictions to the data. First, we estimate our baseline regressions from Eq. (16) and Eq. (17). Second, we test a variety of alternative specifications, including panel regressions from Eq. (18). Third, we look into whether the results are driven by uninformed or inequality-averse traders. Finally, we address the concern that investors may actually dislike large CEO pay regardless of workers' compensation.

5.1. Wage gap between CEO and workers

For our first batch of regressions, we consider the wage gap between CEO and workers. The results are in Table 2. In Panel A, we construct the portfolios using the 30% threshold. In columns (1) and (2), we consider the high-inequality portfolio. We find that the regression constant is small, negative, and marginally significant in the CAPM (-0.6%, t-stat -1.85), but close to zero both in magnitude and significance in the full four-factor model (-0.1%, t-stat -0.18). The market beta, instead, is highly significant and around one (0.998, t-stat 9.59). The coefficient is negative and marginally significant for book-to-market (-0.393, t-stat -1.91) and momentum (-0.260, t-stat -1.96). The coefficient of size, instead, is negative and highly significant (-0.767, t-stat -2.08), which shows that high-inequality 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.

In columns (3) and (4), we consider the low-inequality portfolio. We find that the alpha is indeed negative and highly significant both in the CAPM (-1.2%, t-stat 2.67) and in the four-factor model (-0.9%, t-stat 2.26). The CAPM beta is also highly significant, and below one (0.814, t-stat 6.60). Among the other regressors, the size factor has a positive but insignificant coefficient (0.192, t-stat 0.65), which is at least qualitatively consistent with the assortative matching hypothesis. The coefficient of the book-to-market factor is negative and also not significant (-0.249, t-stat -0.72), while the coefficient of the momentum factor is negative and significant (-0.379, t-stat -2.46).

In columns (5) and (6), we consider the long-short portfolio on top and bottom pay inequality stocks respectively. We find that the alpha is positive and significant both in the CAPM (0.7%, t-stat 1.87) and in the four-factor model (0.8%, t-stat 2.34). The difference in CAPM betas is positive and significant (0.184, t-stat 3.62), which indicates that high wage gap stocks comove more with the stock market. The coefficient of size is negative and highly significant (-0.960,

t-stat -2.23), which indicates that the two classes of stocks have indeed different exposures to the movements of large and small firms. The book-to-market coefficient is negative but not significant (-0.144, t-stat -0.60), while the coefficient of the momentum factor is positive and significant (0.119, t-stat 2.34).

In Panel B, we construct the portfolio using the 20% threshold. The results are similar, and become statistically stronger. For high wage gap stocks, the regression constant is not significant in the CAPM (-0.8%, t-stat -1.59), and drops to zero both in magnitude and significance in the full four-factor model (0.1%, t-stat 0.26). The market beta, instead, is highly significant and around one (1.06, t-stat 6.32). The coefficient is negative and significant for size (-1.444, t-stat -2.25), book-to-market (-0.831, t-stat -2.35), and momentum (-0.452, t-stat -2.16).

In columns (3) and (4), the alpha on the low inequality portfolio is negative and highly significant both in the CAPM (-1.6%, t-stat 3.22) and in the four-factor model (-1.2%, t-stat 2.96). The CAPM beta is is also highly significant, and below one (0.831, t-stat 6.03). Among the other regressors, the size factor has a positive but insignificant coefficient (0.368, t-stat 1.29). The coefficient of the book-to-market factor is negative and also not significant (-0.406, t-stat -1.10), while the coefficient of the momentum factor is negative and significant (-0.407, t-stat -2.77).

In columns (5) and (6), the alpha on the long-short portfolio is positive and significant both in the CAPM (0.8%, t-stat 1.76) and in the four-factor model (1.3%, t-stat 2.81). The difference in CAPM betas is positive and significant (0.230, t-stat 2.41). The coefficient of size is negative and highly significant (-1.812, t-stat -2.82). The coefficients of book-to-market and momentum, instead, are both negative but not significant (t-stats -1.60 and -0.47 respectively).

In Panel C, we construct the portfolio using the 10% threshold. The results become even stronger in terms of both magnitude and significance. In columns (1) and (2), the regression constant for the high inequality portfolio is not significant and close to zero both in the CAPM (0.0%, t-stat 1.14) and the four-factor model (0.2%, t-stat 0.62). The market beta, instead, is highly significant and below one (0.703, t-stat 7.74). The coefficient is negative and highly significant for size (-0.582, t-stat -3.60). The coefficients of book-to-market and momentum are not significant (t-stats 1.47 and -1.49 respectively).

In columns (3) and (4), the alpha on the low inequality portfolio is negative and highly significant both in the CAPM (-1.6%, t-stat 2.83) and in the four-factor model (-1.6%, t-stat 3.60). The CAPM beta is is also highly significant, and below one (0.712, t-stat 4.64). The size factor has a positive and significant coefficient (0.775, t-stat 2.36). The coefficient of the book-to-market factor is positive but not significant (0.270, t-stat 0.78), while the coefficient of the momentum factor is negative and significant (-0.238, t-stat -2.60).

In columns (5) and (6), the alpha on the long-short portfolio is positive and significant both in the CAPM (1.7%, t-stat 3.44) and in the four-factor model (1.8%, t-stat 6.48). The difference

in CAPM betas is close to zero and not significant (-0.009, t-stat -0.05). The coefficient of size is negative and highly significant (-1.357, t-stat -3.80). The coefficients of book-to-market and momentum, instead, are well outside the rejection region (t-stats 0.35 and 0.57 respectively).

Overall, then, we find strong evidence for the model predictions, and also for the assortative matching hypothesis.

5.2. Alternative specifications

Next, we test a variety of alternative specifications, in which we consider: non-CEO managers; cash-only compensation; portfolio formation in April rather than January; all establishments rather than same-state establishments only; and panel regressions.

In Table 3, we repeat the analysis for non-CEO managers. The results are similar, both in magnitude and significance. We find that high wage gap stocks yield near-zero risk-adjusted returns for the portfolios with 30% (0.1%, t-stat 0.30), 20% (-0.1%, t-stat -0.12), and 10% (0.2%, t-stat 0.48) thresholds. On the contrary, low wage gap stocks yield negative and significant risk-adjusted returns, increasing in absolute value across the thresholds of 30% (-0.8%, t-stat -2.02), 20% (-1.0%, t-stat -2.37), and 10% (-1.9%, t-stat -4.55). As a result, the long-short portfolios yield positive and significant alphas increasing from 0.9% for the 30% portfolios (t-stat 2.15) to 2.1% for the 10% portfolios (t-stat 5.88).

Among the other coefficients, as expected, the size factor is the one which retains the highest explanatory power. High wage gap stocks exhibit a negative and significant loading across the 30% (-1.20, t-stat -2.04), 20% (-1.318, t-stat -1.99), and 10% (-0.551, t-stat -2.84) thresholds. For low wage gap stocks, the loading on size is again positive but not significant for the 30% (0.351, t-stat 1.42) and 20% (0.336, t-stat 1.12) portfolios, while it is positive and highly significant for the 10% portfolios (0.866, t-stat 3.67). The difference between these two coefficients, however, is negative and significant for all thresholds (t-stats -2.54, -2.36, and -5.26 respectively), which is in line with the assortative matching hypothesis.

One potential concern is that the variable component of CEO pay makes the wage gap a function of the firm's past performance. To allay this concern, we redefine pay inequality using managers' cash compensation only. The results are in Table 4, and look quite similar. The alpha on high wage gap stocks is close to zero for the portfolios with 30% (0.1%, t-stat 0.44), 20% (0.3%, t-stat 0.48), and 10% (-0.1%, t-stat -0.27) thresholds. Low wage gap stocks, instead, yield negative and significant risk-adjusted returns, increasing in absolute value across the thresholds of 30% (-0.8%, t-stat -2.24), 20% (-1.0%, t-stat -2.28), and 10% (-1.7%, t-stat -2.78). As a result, the long-short portfolios yield positive and significant risk-adjusted returns increasing from 0.9% for the 30% portfolios (t-stat 2.91) to 1.6% for the 10% portfolios (t-stat 4.11).

Among the other factors, the coefficient of size is the one with the highest explanatory power.

High wage gap stocks exhibit a negative and significant loading across the 30% (-0.815, t-stat -2.23), 20% (-1.331, t-stat -1.97), and 10% (-0.300, t-stat -1.76) thresholds. For low wage gap stocks, the loading on size is again positive but not significant for the 30% (0.189, t-stat 0.67) and 20% (0.211, t-stat 0.67) portfolios, while it is positive and marginally significant for the 10% portfolios (0.591, t-stat 1.69). The difference between these two coefficients, however, is negative and significant for all thresholds (t-stats -2.38, -2.06, and -2.32 respectively).

Since company reports are typically released around the end of the first quarter, one additional concern is that our portfolios are formed too early. To address this issue, we move the formation period from January to April. The results are in Table 5, and again hardly change. The alpha on high wage gap stocks is near-zero for the portfolio thresholds of 30% (0.0%, t-stat 0.00), 20% (0.2%, t-stat 0.30), and 10% (0.3%, t-stat 0.69). Low wage gap stocks, instead, yield negative and significant risk-adjusted returns, increasing in absolute value across the thresholds of 30% (-0.9%, t-stat -2.48), 20% (-1.1%, t-stat -2.86), and 10% (-1.3%, t-stat -2.05). As a result, the long-short portfolios yield positive and significant risk-adjusted returns increasing from 0.9% for the 30% portfolios (t-stat 2.43) to 1.7% for the 10% portfolios (t-stat 3.59).

High wage gap stocks exhibit a negative and significant loading on the size factor across the 30% (-0.781, t-stat -2.14), 20% (-1.467, t-stat -2.20), and 10% (-1.580, t-stat -2.50) thresholds. For low wage gap stocks, the loading on size is again positive but not significant for the 30% (0.234, t-stat 0.79) and 20% (0.347, t-stat 1.23) portfolios, while it is positive and highly significant for the 10% portfolios (0.953, t-stat 3.31). The difference between these two coefficients, however, is negative and significant for all thresholds (t-stats -2.26, -2.71, and -3.31 respectively). The results are virtually unchanged when reestimating these coefficients using April cash-only wage gaps (unreported).

Restricting the wage gap calculation to same-state establishments implies that we only consider compensation for 18% of workers in the sample. For robustness, then, we repeat the analysis using workers from all establishments to calculate wage gaps. The results are in Table 6, and remain unchanged. High wage gap stocks exhibit near-zero risk-adjusted returns for all thresholds including 30% (0.1%, t-stat 0.31), 20% (0.3%, t-stat 0.65), and 10% (0.4%, t-stat 1.54). Low wage gap stocks, instead, yield negative and significant risk-adjusted returns, moderately increasing in absolute value from the 30% (-0.9%, t-stat -2.73) to the 10% threshold (-1.3%, t-stat -1.91). As a result, the long-short portfolios yield positive and significant risk-adjusted returns increasing from 1.0% for the 30% portfolios (t-stat 3.40) to 1.7% for the 10% portfolios (t-stat 3.01).

High wage gap stocks exhibit a negative and significant loading on the size factor across all thresholds (t-stats -2.70, -2.69, and -5.56 respectively). For low wage gap stocks, the loading on size is again positive but not significant for the 30% (t-stat 0.60) and 20% (t-stat 1.18) portfolios, while it is positive and significant for the 10% portfolios (t-stat 2.15). The difference between

these two coefficients, however, is negative and significant all throughout (t-stats -3.09, -3.20, and -4.10 respectively). For robustness, we repeat the analysis using only wages from workers from establishments in states other than the headquarters', and obtain the same results (unreported).

Finally, we look into the relation between wage gap and stock returns in the panel, by estimating Eq. (18). The results are in Table 7. In columns (1) and (2), we run Fama-MacBeth regressions, with unadjusted and robust standard errors respectively. In both cases, we find that the top 30% wage gap stocks earn 1.2% higher returns than the bottom 30% (t-stats 1.74 and 1.80 respectively). In columns (3) and (4), we estimate simple ordinary least squares and fixed effects regressions respectively. The coefficients are still positive, but outside the rejection region (t-stats 0.41 and 1.19). The results, then, are in line with the previous tests, and also consistent with the findings from Mueller et al. (2017).

5.3. Uninformed vs. inequality-averse traders

To tease out which category of noise traders drives the results, we primarily exploit the fact that our sample includes the recent German reform on executive pay 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 bill in 2005 that made such disclosure mandatory. The inclusion of the reform is particularly important to test the inequality aversion story, as uninformed investors would continue to neglect pay information even after the disclosure rule, while inequality-averse investors would be able to observe wage gaps with greater precision.

To test this story, we leave out half of the pre-reform years from our sample, starting our regressions in 2003. The choice of this sample period reflects the trade-off between identifying the reform period, but also keeping a large enough number of observations. The results are in Table 8. We find that the alpha on high wage gap stocks is close to zero for all thresholds including 30% (-0.3%, t-stat -1.11), 20% (-0.3%, t-stat -1.23), and 10% (-0.1%, t-stat -0.50). Low wage gap stocks, instead, yield negative and significant risk-adjusted returns, with an increase in absolute value from the 30% (-1.0%, t-stat -3.08) to the 10% threshold (-1.9%, t-stat -7.21). As a result, the long-short portfolios yield positive and significant risk-adjusted returns increasing from 0.06% for the 30% portfolios (t-stat 3.19) to 1.8% for the 10% portfolios (t-stat 8.50).

The coefficient of the size factor is negative for high wage gap stocks across all thresholds (t-stats -1.13, -2.77, and -3.31 respectively). For low wage gap stocks, the loading on size is again positive but not significant for the 30% portfolio (t-stat 1.52), while it is positive and significant for the 20% (t-stat 2.34) and the 10% portfolios (t-stat 2.26). The difference between these two coefficients is negative and significant all throughout (t-stats -2.19, -5.62, and -3.89 respectively). The estimates, then, remain similar to those from the full sample, but become statistically stronger.

This is indicative that the mispricing may be driven by inequality-averse traders.

To devise a more formal test, we proceed as follows. Baker and Wurgler (2006, 2007) document that when sentiment among investors is high, the demand of unsophisticated traders migrates to stocks that are generally perceived less favorably, because greater optimism makes bad stocks look better. In our setting, this story implies that inequality-averse investors should shift their demand away from low wage gap stocks. On the contrary, we should observe no such cross-sectional pattern for uninformed investors, who do not incorporate wage gaps into their evaluations.

To define investors sentiment, we primarily consider the Germany-specific consumer confidence index. For robustness, however, we also consider consumer confidence for the whole the euro area, and the OECD. Given the high persistence of all three indices, we consider them in changes, and define a trading period as one with high sentiment if the consumer confidence index has increased in value over the previous month, and low sentiment otherwise. Then, we re-estimate our time series regressions from Eq. (16) and Eq. (17) conditioning on high and low sentiment periods.

The results are in Table 9. In Panel A, we consider the consumer confidence index for Germany. In columns (1) and (2), we find that high wage gap stocks exhibit no significant variation in risk-adjusted returns in times of high sentiment, either in the CAPM (-0.2%, t-stat -0.12) or the four-factor model (1.1%, t-stat 1.28). In columns (3) and (4), low wage gap stocks exhibit an interesting pattern. In times of low sentiment, they yield negative and highly significant risk-adjusted returns (-2.1%, t-stat -4.97; -2.0%, t-stat -3.66). In times of high sentiment, instead, their risk-adjusted returns significanly increase (1.6%, t-stat 1.76; 2.3%, t-stat 2.81). In columns (5) and (6), the long-short portfolio exhibits a similar pattern. Risk-adjusted returns are positive and significant in times of low sentiment (1.7%, t-stat 2.87; 1.4%, t-stat 2.47), only to decrease sharply in times of high sentiment (-1.8%, t-stat -2.48; -1.1%, t-stat -1.97).

In Panels B and C we consider consumer confidence for the euro area and the OECD respectively, and obtain similar results. The alpha of high wage gap stocks continues to be close to zero all throughout. Low wage gap stocks exhibit negative and significant risk-adjusted returns in times of low sentiment, but most of the mispricing goes away in times of high sentiment. Symmetrically, the long-short portfolio yields positive and significant risk-adjusted returns in times of high sentiment, but the alphas significantly decrease in times of high sentiment. Overall, then, the empirical patterns are consistent with Baker and Wurgler's (2006, 2007) mechanism, and lend support to the idea that it is indeed inequality-averse traders that drive the results.

5.4. Wage gap vs. CEO pay

Finally, we address the potential concern that investors may actually dislike large CEO pay per se, regardless of workers' pay. To test for this, we proceed in two ways. First, we repeat the analysis by forming our portfolios on CEO pay only, rather than the wage gap. Under the wage

gap story, this alternative ranking should only be a noisy proxy for the ranking on firms on pay inequality, because the two measures are correlated but it is actually the latter that matters in the eyes of investors.

The results are in Table 10. In Panel A, we consider the 30% threshold. In columns (1) and (2), the regression constant for the high CEO pay portfolio is not significant and close to zero both in the CAPM (-0.4%, t-stat -1.63) and the four-factor model (0.0%, t-stat 0.09). In columns (3) and (4), the low CEO pay portfolio yields negative and significant risk-adjusted returns both in the CAPM (-1.4%, t-stat -2.52) and in the four-factor model (-0.9%, t-stat 2.08). In columns (5) and (6), the alpha on the long-short portfolio is positive and significant both in the CAPM (1.0%, t-stat 2.29) and in the four-factor model (1.0%, t-stat 2.92).

The results are similar in Panels B and C, for the 20% and 10% thresholds respectively. High wage gap stocks yield near-zero risk-adjusted returns all throughout. Low wage gap stocks, instead, yield a negative alpha of 1.1% (t-stat -2.26) and 1.3% (t-stat -2.30) respectively. Similarly, the long-short portfolio has a positive and significant alpha of 1.4% (t-stat -3.18) and 1.2% (t-stat -2.58).

If compared with Table 2, two features are worthy of notice. First, the R-squared of the CEO pay regressions are higher than that of wage gap regressions. This is closely related to risk-adjusted returns, as larger mispricing means that the model has less explanatory power. Second, and more importantly, the alphas (and t-stats) differ sharply in the extreme (10%) portfolios. This seems to reflect the fact that the overlap between high CEO pay and high wage gap stocks decreases as we move towards the tails of the two distributions. In light of this, the evidence seems to indicate that the results are driven by the wage gap rather than CEO pay alone.

Again, we also devise a more formal test to tease out the two stories. We estimate panel regressions from Eq. (18), and introduce an additional dummy variable that takes on value one for the top 30% CEO pay stocks. The results are in Table 11. In columns (1) and (2), we consider total CEO compensation. We find that that the top wage gap stocks still outperform low wage gap stocks by 1.4%, but the coefficient is slightly outside the rejection region (t-stat 1.62). On the other hand, top CEO pay stocks seem to underperform low CEO pay stocks by 0.4%, but the coefficient is not significant (t-stat -0.57).

For multicollinearity concerns, we also consider portfolios formed on cash compensation only. The results are in columns (3) and (4). We find that that the top wage gap stocks outperform low wage gap stocks by 1.2%, and the coefficient is marginally significant (t-stat 1.85). Top CEO pay stocks, instead, underperform low CEO pay stocks by 1.6%, and the coefficient is significant (t-stat -2.28). The evidence, then, lends support to the idea that it is the wage gap that matters to investors, rather than CEO pay only.

6. Conclusion

We explore the hypothesis that the difference in pay between managers and workers constitutes a signal on the quality of management, and ultimately of the company. We propose an asset pricing model with noise traders and short-sales constraints, in which the optimal wage gap between the CEO and rank-and-file workers increases with managerial skills. We show that firms with lower wage gaps should trade at a premium, and the mispricing becomes even stronger if some investors dislike pay inequality within firms.

Using a unique data set of German firms, we find strong evidence for the model's predictions. Stocks with low pay inequality earn negative, large, and highly significant risk-adjusted returns, both in CAPM regressions and in Carhart's four-factor model, with magnitude roughly between 1% and 1.5% per month. Stocks with high pay inequality, instead, exhibit no mispricing. As a result, a portfolio with a long position in stocks with high wage gaps and a short position in stocks with low wage gaps earns positive and significant risk-adjusted returns.

The present work contributes to the debate over pay inequality within firms, which has received significant attention from academics, regulators, and the media (see, e.g., Wage et al., 2006). Recent research shows that pay inequality increases with managerial skills (Cronqvist et al., 2009; Faleye et al., 2012; Mueller et al., 2017), but this information is not fully impounded in the stock price (Mueller et al., 2017). In this paper, we show that the relation between the wage gap and stock returns is inconsistent with a simple story on limits of arbitrage, according to which the mispricing would be caused by lack of information.

In particular, the asymmetry of mispricing between high and low wage gap stocks suggests that at least some sophisticated market participants are able to infer information on salaries, and correctly incorporate it into their evaluations. Given the ample coverage that pay inequality receives in the media, however, this information may also be available to some unsophisticated investors, who could use it to discriminate against firms with high wage gaps and reward firms with low wage gaps. The empirical patterns we document are consistent with this conjecture.

To the best of our knowledge, this is the first paper to show that investors exhibit inequality aversion in Fehr and Schmidt's (1999) sense. Therefore, the present work contributes to the recent literature on values in asset pricing, which shows that investors also consider nonmonetary values in their investment strategies (see, e.g., Hong and Kostovetsky, 2012). The paper also provides a specific mechanism through which investors incorporate intangible information in the stock price, which adds new insights to the recent literature on market learning (see, e.g., Edmans, 2011).

This paper can be extended in at least two ways. First, it would be interesting to analyze which categories of stocks are the ones for which the wage gap is priced less efficiently. For example, it could be stocks that are harder to evaluate and/or arbitrage (Baker and Wurgler, 2006, 2007). Second, it will be instructive to conduct this type of research on US 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. These two points are somehow related, as the regulatory change in the US will allow researchers to work with a much larger set of stocks.

Appendix A

A.1. Proof of Eq. (3)

The first-order condition with respect to δ is:

$$\frac{\partial \pi_s}{\partial \delta} = \frac{\partial \theta_s}{\partial \delta} K^{1-\alpha} L^{\alpha} - \frac{\partial w_s}{\partial \delta} L - w_s - \delta \frac{\partial w_s}{\partial \delta} = 0. \tag{A.1}$$

Using the fact that:

$$\epsilon_\theta \equiv \frac{\partial \theta_s}{\partial \delta} \frac{\delta}{\theta_s} > 0, \tag{A.2}$$

$$\epsilon_w \equiv \frac{\partial w_s}{\partial \delta} \frac{\delta}{w_s} < 0, \tag{A.3}$$

and replacing Eq. (A.2) and Eq. (A.3) into Eq. (A.1), yields Eq. (3).

A.2. Proof of Eq. (5)

First, we replace Eq. (3) and Eq. (4) into Eq. (2):

$$\begin{aligned} \pi_s^* = \underbrace{\theta_s K^{1-\alpha} \left(\frac{\alpha \theta_s}{w_s}\right)^{\frac{\alpha}{1-\alpha}} K^{\alpha}}_{\equiv y_s^*} - \underbrace{w_s \left(\frac{\alpha \theta_s}{w_s}\right)^{\frac{1}{1-\alpha}} K}_{\equiv w_s L^*} - \underbrace{\left(\frac{\epsilon_\theta}{1-|\epsilon_w|} y_s^* + \frac{\epsilon_{|\epsilon_w|}}{1-|\epsilon_w|} w_s L^*\right)}_{\equiv \delta^* w_s} = \\ K \left(1 - \frac{\epsilon_\theta}{1-\epsilon_w}\right) \theta_s \left(\frac{\alpha \theta_s}{w_s}\right)^{\frac{\alpha}{1-\alpha}} - K \frac{1+\epsilon_w}{1-\epsilon_w} w_s \left(\frac{\alpha \theta_s}{w_s}\right)^{\frac{1}{1-\alpha}}. \end{aligned} \tag{A.4}$$

Multiplying and dividing the second addend by α, and then factoring out K, yields Eq. (5).

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Table 1. Summary statistics

Summary statistics for board (Panel A) and firm-level (Panel B) variables in our sample. CEO and managers' pay are defined as the total annual compensation, including cash and stocks. Wage gaps are calculated with respect to workers wages, which we measure 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. The statistics for compensation and total assets are expressed in euros. The sample period is from January 2002 to December 2011.

Panel A

Variable	Observations	Mean	Std. Deviation	Min	Max
CEO pay	5,765	2,483,037	2,278,701	21,000	15,900,000
CEO cash	5,765	1,948,553	1,572,420	21,000	11,300,000
Managers pay	5,753	1,398,419	1,056,128	16,000	8,167,500
Managers cash	5,753	1,127,304	777,751.8	0	6,870,275
CEO wage gap	5,765	4.09	0.99	-0.22	6.68
Managers wage gap	5,753	3.61	0.86	-0.52	5.55
CEO cash wage gap	5,765	3.91	0.92	-0.22	6.33
Managers cash wage gap	5,717	3.47	0.74	1.57	5.55

Panel B

Variable	Observations	Mean	Std. Deviation	Min	Max
ROA	9,095	3.96	10.32	-76.38	78.81
ROE	9,167	5.89	42.47	-724.97	444.25
Price-to-book	9,191	2.38	2.51	0.21	28.57
Total assets	9,179	55,593.04	188,520.70	38.37	2,193,953.00
Employees	9,203	47,403.8	87,571.3	2	536,350
Returns	10,715	0.0007	0.1314	-1.8971	1.0369

Table 2. CEO-workers wage gap

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 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, 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. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.048***	0.998***	0.907***	0.814***	0.141*	0.184***
	5.54	9.59	5.58	6.60	1.89	3.62
SMB		-0.767**		0.192		-0.960**
		-2.08		0.65		-2.23
HML		-0.393*		-0.249		-0.144
		-1.91		-0.72		-0.60
UMD		-0.260*		-0.379**		0.119**
		-1.96		-2.46		2.19
Constant	-0.006*	-0.001	-0.012***	-0.009**	0.007*	0.008**
	-1.85	-0.18	-2.67	-2.26	1.87	2.34
Adj. R-squared	0.627	0.692	0.539	0.576	0.024	0.176
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.128***	1.060***	0.905***	0.831***	0.222	0.230**
	3.58	6.32	5.06	6.03	1.05	2.41
SMB		-1.444**		0.368		-1.812***
		-2.25		1.29		-2.82
HML		-0.831**		-0.406		-0.425
		-2.35		-1.10		-1.60
UMD		-0.452**		-0.407***		-0.045
		-2.16		-2.77		-0.47
Constant	-0.008	0.001	-0.016***	-0.012***	0.008*	0.013***
	-1.59	0.26	-3.22	-2.96	1.76	2.81
Adj. R-squared	0.446	0.594	0.484	0.529	0.024	0.268
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	0.819***	0.703***	0.843***	0.712***	-0.024	-0.009
	9.79	7.74	4.07	4.64	-0.12	-0.05
SMB		-0.582***		0.775**		-1.357***
		-3.60		2.36		-3.80
HML		0.363		0.270		0.093
		1.47		0.78		0.35
UMD		-0.185		-0.238***		0.053
		-1.49		-2.60		0.57
Constant	0.000	0.002	-0.016***	-0.016***	0.017***	0.018***
	0.14	0.62	-2.83	-3.60	3.44	6.48
Adj. R-squared	0.530	0.571	0.347	0.376	-0.009	0.112
Observations	108	108	108	108	108	108

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Managers-workers wage gap

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high inequality between managers' and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 and 6). Pay inequality is defined as the log-difference in earnings between managers and workers. Managerial compensation is calculated as the overall annual pay of the members of the board, excluding the CEO, 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. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.193***	1.107***	0.900***	0.810***	0.293	0.297**
	4.47	6.80	6.43	7.67	1.40	2.41
SMB		-1.200**		0.351		-1.551**
		-2.04		1.42		-2.54
HML		-0.689*		-0.131		-0.559**
		-1.89		-0.50		-2.36
UMD		-0.459***		-0.328***		-0.131
		-3.06		-3.10		-1.45
Constant	-0.007	0.001	-0.010**	-0.008**	0.003	0.009**
	-1.60	0.30	-2.48	-2.02	0.68	2.15
Adj. R-squared	0.547	0.673	0.569	0.601	0.066	0.333
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.207***	1.128***	0.906***	0.815***	0.301	0.312***
	4.03	6.88	4.90	5.64	1.51	3.14
SMB		-1.318**		0.336		-1.653**
		-1.99		1.12		-2.36
HML		-0.743**		-0.370		-0.373
		-2.12		-0.97		-1.38
UMD		-0.455**		-0.433***		-0.023
		-2.27		-2.94		-0.22
Constant	-0.010**	-0.001	-0.015***	-0.010**	0.005	0.010*
	-2.07	-0.12	-2.70	-2.37	1.11	1.87
Adj. R-squared	0.482	0.603	0.471	0.517	0.051	0.245
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	0.855***	0.705***	0.697***	0.649***	0.158	0.056
	11.86	9.20	3.97	5.04	0.90	0.35
SMB		-0.551***		0.866***		-1.416***
		-2.84		3.67		-5.26
HML		0.477**		0.021		0.457
		2.19		0.06		1.16
UMD		-0.225*		-0.112		-0.114
		-1.94		-0.98		-0.64
Constant	-0.000	0.002	-0.018***	-0.019***	0.018***	0.021***
	-0.02	0.48	-3.15	-4.55	3.61	5.88
Adj. R-squared	0.539	0.590	0.320	0.354	0.010	0.163
Observations	108	108	108	108	108	108

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. CEO-workers cash wage gap

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 and 6). Pay inequality is defined as the log-difference in earnings between CEO and workers. CEO compensation is calculated as the annual 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. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.011***	0.936***	0.897***	0.798***	0.114	0.137**
	5.28	8.54	5.50	6.45	1.34	2.07
SMB		-0.815**		0.189		-1.004**
		-2.23		0.67		-2.38
HML		-0.355		-0.237		-0.118
		-1.61		-0.70		-0.61
UMD		-0.309**		-0.388**		0.079
		-2.54		-2.46		0.99
Constant	-0.004	0.001	-0.012**	-0.008**	0.008**	0.009***
	-1.38	0.44	-2.50	-2.24	2.09	2.91
Adj. R-squared	0.610	0.693	0.533	0.572	0.013	0.180
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.082***	1.056***	0.925***	0.826***	0.156	0.230**
	3.31	5.97	5.19	6.29	0.67	2.19
SMB		-1.331**		0.211		-1.543**
		-1.97		0.67		-2.06
HML		-0.934**		-0.354		-0.580*
		-2.52		-0.95		-1.91
UMD		-0.389*		-0.441***		0.052
		-1.65		-3.25		0.40
Constant	-0.006	0.003	-0.014***	-0.010**	0.008	0.012**
	-1.20	0.48	-2.60	-2.28	1.57	2.43
Adj. R-squared	0.424	0.558	0.486	0.532	0.008	0.189
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	0.909***	0.800***	0.721***	0.537***	0.188*	0.263***
	9.98	9.96	4.62	5.93	1.82	3.35
SMB		-0.300*		0.591*		-0.891**
		-1.76		1.69		-2.32
HML		0.252		0.472		-0.220
		1.18		1.17		-0.64
UMD		-0.220*		-0.297***		0.077
		-1.90		-2.78		0.95
Constant	-0.003	-0.001	-0.018**	-0.017***	0.016***	0.016***
	-0.89	-0.27	-2.37	-2.78	2.66	4.11
Adj. R-squared	0.581	0.600	0.270	0.304	0.021	0.068
Observations	108	108	108	108	108	108

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. CEO-workers wage gap: April portfolios

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 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, 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 in April each year. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.052***	0.992***	0.905***	0.822***	0.148*	0.170***
	5.49	9.37	5.75	6.40	1.87	3.17
SMB		-0.781**		0.234		-1.015**
		-2.14		0.79		-2.26
HML		-0.378*		-0.301		-0.078
		-1.82		-0.81		-0.30
UMD		-0.281**		-0.375***		0.095*
		-2.10		-2.79		1.79
Constant	-0.005*	-0.000	-0.013**	-0.009**	0.008**	0.009**
	-1.76	-0.00	-2.50	-2.48	2.00	2.43
Adj. R-squared	0.627	0.697	0.537	0.575	0.025	0.176
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.125***	1.072***	0.896***	0.830***	0.229	0.242**
	3.49	6.03	4.83	5.84	1.03	2.24
SMB		-1.467**		0.347		-1.814***
		-2.20		1.23		-2.71
HML		-0.838**		-0.431		-0.407
		-2.23		-1.21		-1.54
UMD		-0.415**		-0.394**		-0.021
		-1.97		-2.42		-0.21
Constant	-0.007	0.002	-0.015***	-0.011***	0.008*	0.013***
	-1.40	0.30	-3.03	-2.86	1.80	2.67
Adj. R-squared	0.452	0.600	0.466	0.506	0.026	0.268
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.129***	1.021***	0.757***	0.696***	0.371	0.325
	3.30	4.72	4.18	4.75	0.86	1.11
SMB		-1.580**		0.953***		-2.533***
		-2.50		3.31		-3.31
HML		-0.714		0.214		-0.928*
		-1.63		0.83		-1.95
UMD		-0.523**		-0.132**		-0.391*
		-2.24		-2.00		-1.79
Constant	-0.006	0.003	-0.012	-0.013**	0.007	0.017***
	-1.00	0.69	-1.48	-2.05	0.58	3.59
Adj. R-squared	0.423	0.586	0.309	0.353	0.036	0.322
Observations	117	117	117	117	117	117

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6. CEO-workers wage gap: All establishments

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 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, while workers' pay is measured as the average annual wage paid in all establishments, 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. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.019***	0.949***	0.931***	0.845***	0.088	0.104*
	5.21	8.26	5.81	6.86	0.85	1.68
SMB		-0.891***		0.180		-1.071***
		-2.70		0.60		-3.09
HML		-0.307		-0.339		0.032
		-1.42		-0.84		0.12
UMD		-0.269**		-0.398**		0.129*
		-2.08		-2.56		1.88
Constant	-0.004	0.001	-0.014***	-0.009***	0.010***	0.010***
	-1.44	0.31	-2.71	-2.73	2.70	3.40
Adj. R-squared	0.618	0.700	0.544	0.586	0.004	0.182
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.111***	1.014***	0.963***	0.867***	0.148	0.147
	3.48	5.67	5.37	6.36	0.61	1.19
SMB		-1.626***		0.373		-1.999***
		-2.69		1.18		-3.20
HML		-0.704*		-0.307		-0.397
		-1.90		-0.78		-1.54
UMD		-0.466**		-0.422***		-0.043
		-2.30		-2.81		-0.41
Constant	-0.006	0.003	-0.017***	-0.013***	0.011**	0.016***
	-1.16	0.65	-3.37	-3.17	2.19	3.16
Adj. R-squared	0.435	0.605	0.498	0.539	0.005	0.276
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	0.739***	0.669***	0.980***	0.880***	-0.241	-0.211
	7.77	5.65	4.40	5.11	-0.98	-0.94
SMB		-0.827***		0.843**		-1.670***
		-5.56		2.15		-4.10
HML		0.249		-0.322		0.571
		1.00		-0.63		1.56
UMD		-0.109		-0.493		0.385
		-1.06		-1.45		1.19
Constant	0.002	0.004	-0.016**	-0.013*	0.018***	0.017***
	1.18	1.54	-2.37	-1.91	2.81	3.01
Adj. R-squared	0.547	0.619	0.354	0.403	0.021	0.179
Observations	108	108	108	108	108	108

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7. CEO-workers wage gap: Panel regressions

Panel 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% in the previous year, 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 $t-2$; the log of the stock price at the end of month $t-2$. We estimate Fama and MacBeth regressions in columns (1) and (2), ordinary least square regressions in column (3), and regressions with year fixed effects and robust standard errors in column (4). In all specifications, we exclude the middle 40% wage gap stocks. CEO compensation is measured as the CEO pay, including cash and stocks, while 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. Data on workers' wages are from the "Establishment History Panel" database. Company-level accounting and stock market data from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. Observations are monthly, and the sample period is from January 2002 to December 2011.

	(1)	(2)	(3)	(4)
	Ret	Ret	Ret	Ret
Wage gap (d)	0.012*	0.012*	0.003	0.005
	1.74	1.80	0.41	1.19
Book-to-market	-0.025	-0.025	0.043	0.007
	-1.04	-1.10	1.37	0.25
Dividend yield	-0.004	-0.004	-0.008**	-0.003
	-0.94	-0.90	-2.23	-1.46
CumRet (2,3)	0.011	0.011	0.027*	-0.031
	0.48	0.49	1.87	-0.69
CumRet (4,6)	0.032**	0.032**	0.056***	0.031
	1.99	1.99	4.65	1.68
CumRet (7,12)	0.033***	0.033***	0.004	0.015
	3.43	3.33	0.46	0.75
Size (-2)	0.001	0.001	-0.001	0.000
	0.21	0.25	-0.35	-0.07
Trading volume (-2)	-0.004	-0.004	0.001	-0.001
	-1.02	-1.25	0.62	-0.25
Stock price (-2)	-0.007	-0.007*	-0.004	0.000
	-1.56	-1.81	-0.97	-0.01
Constant	0.006	0.006	-0.052	-0.027
	0.16	0.17	-1.30	-1.05
Observations	2,331	2,331	2,331	2,450
Fama-MacBeth	Y	Y	Y	Y
Robust st. errors	N	Y	N	Y
Year fixed effects	N	N	N	Y

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8. CEO-workers wage gap: Post-2003 subsample

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 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, 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. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2004 to December 2011.

Panel A	(1) H	(2) H	(3) L	(4) L	(5) H−L	(6) H−L
MKT	0.852***	0.838***	0.759***	0.641***	0.093	0.197***
	11.90	11.35	6.34	7.50	1.39	3.10
SMB		-0.158		0.378		-0.536**
		-1.13		1.52		-2.19
HML		0.085		0.452		-0.367*
		0.39		1.48		-1.66
UMD		-0.001		-0.078		0.077
		-0.01		-0.74		1.24
Constant	-0.004	-0.003	-0.010***	-0.010***	0.007***	0.006***
	-1.09	-1.11	-2.90	-3.08	2.77	3.19
Adj. R-squared	0.719	0.713	0.558	0.577	0.017	0.115
Observations	96	96	96	96	96	96

Panel B	(1) H	(2) H	(3) L	(4) L	(5) H−L	(6) H−L
MKT	0.793***	0.784***	0.747***	0.638***	0.046	0.146
	13.83	13.96	4.88	5.89	0.37	1.45
SMB		-0.438***		0.552**		-0.990***
		-2.77		2.34		-5.62
HML		0.047		0.328		-0.281
		0.26		0.96		-1.18
UMD		-0.036		-0.123		0.087
		-0.43		-1.20		1.31
Constant	-0.004*	-0.003	-0.014***	-0.014***	0.011***	0.011***
	-1.76	-1.23	-4.33	-5.01	4.53	4.89
Adj. R-squared	0.707	0.720	0.506	0.533	-0.006	0.183
Observations	96	96	96	96	96	96

Panel C	(1) H	(2) H	(3) L	(4) L	(5) H−L	(6) H−L
MKT	0.757***	0.689***	0.813***	0.687***	-0.057	0.002
	12.77	7.42	3.64	4.02	-0.26	0.01
SMB		-0.566***		0.672**		-1.238***
		-3.31		2.26		-3.89
HML		0.318		0.305		0.014
		1.29		0.73		0.04
UMD		-0.069		-0.195*		0.126*
		-0.76		-1.74		1.85
Constant	-0.002	-0.001	-0.021***	-0.019***	0.018***	0.018***
	-1.18	-0.50	-5.93	-7.21	5.41	8.50
Adj. R-squared	0.619	0.658	0.407	0.433	-0.007	0.129
Observations	96	96	96	96	96	96

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9. CEO-workers wage gap and sentiment

CAPM regressions (columns 1, 3, and 5) and Carhart's (1997) four-factor model regressions (columns 2, 4, and 6) of equally-weighted returns on a portfolio of stocks with high inequality between CEO and workers' pay (columns 1 and 2), a portfolio of stocks for which such inequality is low (columns 3 and 4), and a portfolio with a long position in high-inequality stocks and a short position in low-inequality stocks (columns 5 and 6). The regressions include a dummy variable that equals one if sentiment has increased over the previous month and zero otherwise, where sentiment is defined as the measure of consumer confidence published by the OECD for Germany (Panel A), the eurozone area (Panel B), and the OECD area (Panel C). 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 year. In any given year, 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
Sentiment	-0.002	0.011	0.016*	0.023***	-0.018**	-0.011**
	-0.12	1.28	1.76	2.81	-2.48	-1.97
Constant	-0.005	-0.007	-0.021***	-0.020***	0.017***	0.014**
	-0.82	-0.90	-4.97	-3.66	2.87	2.47
Controls	Y	Y	Y	Y	Y	Y
Adj. R-squared	0.624	0.694	0.546	0.593	0.049	0.182
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
Sentiment	-0.006	0.004	0.019***	0.021***	-0.026***	-0.016**
	-0.62	0.68	2.74	4.14	-3.36	-2.55
Constant	-0.002	-0.003	-0.024***	-0.020***	0.022***	0.017***
	-0.38	-0.52	-4.85	-4.81	3.92	3.01
Controls	Y	Y	Y	Y	Y	Y
Adj. R-squared	0.625	0.690	0.549	0.588	0.078	0.194
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
Sentiment	-0.004	0.010	0.018**	0.020**	-0.023***	-0.010*
	-0.39	1.28	2.22	2.29	-2.93	-1.95
Constant	-0.003	-0.006	-0.022***	-0.019***	0.019***	0.013***
	-0.70	-1.03	-4.59	-3.33	3.56	2.85
Controls	Y	Y	Y	Y	Y	Y
Adj. R-squared	0.624	0.693	0.548	0.587	0.067	0.179
Observations	120	120	120	120	120	120

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10. CEO compensation

CAPM and Carhart's (1997) four-factor model regressions of equally-weighted returns on a portfolio of stocks with high CEO pay (columns 1 and 2), a portfolio of stocks with low CEO pay (columns 3 and 4), and a long-short portfolio in high and low CEO pay respectively (columns 5 and 6). CEO compensation is calculated as the overall annual pay, including cash and stocks. To construct our test portfolios, we rank all stocks in CEO pay quantiles and rebalance them at the beginning of each year. In any given year, we define high and low CEO pay 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. Data on workers' wages are from the "Establishment History Panel" database. Stock market data are from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. All the regressors are from Kenneth French's website and refer to Europe. Observations are monthly, and the sample period is from January 2002 to December 2011.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	0.996***	0.915***	0.966***	0.892***	0.030	0.023
	6.15	8.90	6.27	8.17	0.36	0.30
SMB		-0.891***		0.267		-1.158***
		-3.78		0.88		-4.71
HML		-0.171		-0.442		0.271*
		-0.62		-1.14		1.70
UMD		-0.237**		-0.415***		0.178*
		-2.50		-2.91		1.74
Constant	-0.004	0.000	-0.014**	-0.009**	0.010**	0.010***
	-1.63	0.09	-2.52	-2.08	2.29	2.92
Adj. R-squared	0.656	0.738	0.561	0.609	-0.007	0.226
Observations	120	120	120	120	120	120

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	1.069***	1.015***	0.938***	0.844***	0.131	0.171*
	4.06	6.20	5.82	8.21	1.05	1.68
SMB		-1.349***		0.342		-1.691***
		-3.08		1.20		-3.62
HML		-0.708*		-0.293		-0.415**
		-1.71		-0.87		-2.16
UMD		-0.368***		-0.411***		0.044
		-2.67		-2.80		0.66
Constant	-0.006	0.002	-0.015***	-0.011**	0.010*	0.014***
	-1.37	0.41	-2.61	-2.26	1.72	3.18
Adj. R-squared	0.517	0.671	0.492	0.531	0.006	0.282
Observations	120	120	120	120	120	120

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
	H	H	L	L	H−L	H−L
MKT	0.714***	0.648***	0.900***	0.816***	-0.186	-0.168
	6.10	5.21	7.12	5.90	-0.86	-0.70
SMB		-0.813***		0.865**		-1.678***
		-4.89		2.20		-5.29
HML		0.347		0.123		0.224
		1.19		0.33		0.55
UMD		-0.037		-0.167		0.130
		-0.36		-1.18		0.99
Constant	-0.002	-0.001	-0.013**	-0.013**	0.011	0.012**
	-0.43	-0.12	-2.00	-2.30	1.50	2.58
Adj. R-squared	0.445	0.499	0.395	0.422	0.011	0.153
Observations	108	108	108	108	108	108

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11. Wage gap, CEO pay, and stock returns

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% in the previous year, a dummy variable that takes on value one if firm i's CEO pay is among the top 30% in the previous year, and a vector of firm characteristics, which 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 $t-2$; the log of the stock price at the end of month $t-2$. In all specifications, we exclude the middle 40% wage gap stocks. CEO compensation is measured as the CEO pay, including cash and stocks, in columns (1) and (2), and total cash compensation 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 either as a weighted average across establishments, where the weights are represented by the number of employees in each establishment. Data on workers' wages are from the "Establishment History Panel" database. Company-level accounting and stock market data from Worldscope and Datastream, and CEO compensation data from the companies' annual reports. Observations are monthly, and the sample period is from January 2002 to December 2011.

	CEO pay		**CEO cash**	
	(1)	(2)	(3)	(4)
	Ret	Ret	Ret	Ret
Wage gap (d)	0.014	0.014	0.012*	0.012*
	1.63	1.62	1.78	1.85
CEO pay (d)	-0.004	-0.004	-0.016**	-0.016**
	-0.57	-0.57	-2.25	-2.28
BM (-1)	-0.022	-0.022	-0.025	-0.025
	-0.86	-0.89	-0.99	-1.06
DY (-1)	-0.004	-0.004	-0.002	-0.002
	-1.00	-0.99	-0.45	-0.45
CumRet (2,3)	-0.001	-0.001	0.022	0.022
	-0.04	-0.04	1.00	0.96
CumRet (4,6)	0.033*	0.033*	0.020	0.020
	1.83	1.94	1.22	1.29
CumRet (7,12)	0.036***	0.036***	0.026**	0.026**
	3.09	2.92	2.32	2.28
Size (-2)	0.001	0.001	0.000	0.000
	0.24	0.27	-0.09	-0.10
Price (-2)	-0.006	-0.006	0.002	0.002
	-1.22	-1.39	0.63	0.75
Volume (-2)	-0.004	-0.004	0.000	0.000
	-0.91	-1.12	0.12	0.14
Constant	-0.002	-0.002	0.007	0.007
	-0.05	-0.05	0.18	0.19
Observations	2,331	2,331	2,327	2,327
Fama-MacBeth	Y	Y	Y	Y
Robust st. errors	N	Y	N	Y

t statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$