The additional costs of CEO compensation: The effect of relative wealth concerns of employees*

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Abstract

Do employees who compare themselves to the CEO matter for executive compensation? We hypothesize employees who have relative wealth concerns and compare their wage to the CEO's pay. Using German establishment-level wage data, we indeed show that employee wages are increasing in CEO compensation. We use a regulatory shock to the public observability of German CEO compensation and establish causality by using a difference-in-difference approach. Moreover, we control for firm and establishment fixed effects. When CEO compensation increases by 1%, the median employee's wage increases by about 0.04%. Our findings suggest that relative wealth concerns of employees are an important driver of wages and significantly increase the costs of executive compensation.

JEL Classification: D63, G02, G34, J31

Keywords: CEO compensation, relative wealth concerns, employee wages, inequality aversion, pay inequality

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"Wide pay gaps between CEOs and other employees are associated with higher employee turnover, which can adversely affect a company's performance and thereby shareowner interests."

Investors and investor organizations collectively representing $3 trillion in assets under management in a letter to the SEC in support of the pay ratio disclosure.

1. Introduction

Some of the strongest opposition against high and increasing CEO pay comes from rank and file employees, in particular from employees within the same firm. It is difficult to explain this phenomenon with normative preferences, because formally CEOs are employees and paid by shareholders, so regular employees should, in principle, not object to them being overpaid. A potential explanation is that workers envy CEOs their higher pay, i.e., workers suffer disutility from the gap between their own pay and the CEO's pay. Formally, such preferences are called inequality aversion or relative wealth concerns (see Garcia and Strobl (2011), Liu and Sun (2016), and DeMarzo and Kaniel (2017)).[1]

We picture a principal-agent model where the principal designs a contract with two agents: the CEO and the employee who is subject to relative wealth concerns. The employee represents all employees in the firm. In such a model, the wage of the employee is an increasing function of the wage of the CEO. The reason is that employees experience an additional disutility when the CEO pay is raised, so that the firm raises the employees' pay to compensate them for this disutility and to prevent them from leaving the firm. We take this prediction to the data and ask whether an employee truly compares himself to the CEO. [2]

There can be direct and indirect channels through which CEO compensation affects employee wages. Through the direct channel, workers observe the compensation of CEOs from published reports. They derive disutility directly from comparison. This means that workers near the bottom

[1] It is widely accepted that the feeling of happiness does not only rely on someone's own material payoff, but also on the payoff of others. Schmitt and Marwell (1972) show that subjects withdraw from profitable experiments if they receive inequitable payoffs. Using data on British workers, Clark and Oswald (1996) show that the satisfaction levels of workers are negatively related to their comparison wage rates. Akerlof and Yellen (1990) show that the fair wage of workers is not only determined by the market clearing wage, but also by the comparison with salient others. Besides, Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) find that a simple model where someone's true payoff consists of her own pecuniary and own relative payoff explains many laboratory experiments.

[2] We include an example of such a principal-agent model in the Appendix.

of the hierarchy are more sensitive to increases in the CEO wage because the wage gap is larger. Another channel is indirect, which can also be referred to as a trickle-down effect. Top managers compare their wages to the CEO, and their disutility is compensated. Regular managers compare their wages to top managers, lower managers to regular managers, and regular employees compare their wages to lower managers. The effect of high CEO compensation gradually passes down to regular employees. Akerlof and Yellen (1990) argue that a possible reference group to which employees can compare their wages are agents with a higher income within the firm which is consistent with the indirect channel.

The main challenge in studying the effect of high CEO compensation on workers' pay is the availability of data. We construct a matched CEO-employee panel data set for German firms by combining a data set on CEO compensation with a data set on employee wages. Data on CEO compensation is hand-collected from firms' annual reports. Data on employee wages comes from the Research Data Center (FDZ) of the German Federal Employment agency (BA). This agency has established a complete record of employee wages in German establishments since 1975 (for East Germany since 1992). The matched panel data set contains more than 200,000 establishment-year observations, and is available from 2000 to 2011. This unique data set enables us to test several hypotheses on the relationship of CEO compensation and employee wages.

We find evidence that higher CEO compensation is positively related to employee wages across firms and across time. When CEO compensation increases by 1%, the median employee wage increases by 0.04%. This finding does not only hold in cross-sectional regressions but also when we control for time invariant unobserved characteristics of the firm and the establishment. To further alleviate potential endogeneity concerns, we adopt the difference-in-difference setting. In this analysis, we find that when CEO compensation becomes publicly observable, employees receive significantly higher wages. We also implement a triple-difference approach where we find that a higher CEO-management-board wage gap results in a higher increase in employees' pay upon disclosure. Moreover, using CEO abnormal compensation, we show results consistent with paying more than the fair wage to CEOs increases employees' envy, while paying less than the fair wage to CEOs mitigates employees' envy.[3]

The introductory quote ("Wide pay gaps between CEOs and other employees are associated

[3] This paper adds another behavioral bias to Edmans et al. (2017), who survey executive compensation.

with higher employee turnover, which can adversely affect a company's performance and thereby shareowner interests.") refers to Wade et al. (2006) who show that CEO overpayment is related to higher turnover for other managers (see also Bloom and Michel (2002)). What does the relation look like for rank-and-file workers? The investors from the introductory quote assume that employees are subject to relative wealth concerns, i.e., compare themselves to the CEO, and if the disutility becomes too large, draw the consequences and resign from the job. We do instead argue (with the principal-agent model from the Appendix in mind) that the firm anticipates the envy of the employees, pays them a larger wage, and thereby prevents employee turnover. The data allows us to measure turnover. Our results imply that increased wages for the employees overcompensate their envy and the employee turnover probability decreases in CEO pay. Therefore, it is not surprising that highly paid CEOs by paying higher employee wages might be able to drive down employee turnover.

These findings have far reaching consequences for executive compensation. Relative wealth concerns drive up the costs of executive compensation by increasing employee wages. Any additional dollar paid to the CEO for providing incentives also leads to higher employee wages to compensate employees for their (perceived) losses from envy. The average CEO in our sample receives €2.6 million a year. If a firm increases her pay by 1% (=€26,000 for the average CEO), then the firm will pay an additional compensation of €14.4 to the median employee with an average annual salary of €35,000.[4] For the average firm in our sample with 50,000 employees, this sums up to €720,000 per year, increasing the total wage bill by €746,000 per year. The ratio between expected additional labor cost and market capitalization is 0.17%.

We show that regular employee wages rise with lagged CEO compensation. This could also be explained by productivity dynamics and rent-extraction: In phases where productivity is high, the pressure on wages decreases and all wages are increasing. We do several tests in the paper to reduce this concern: First, we include ROA and market-to-book ratio as control variables which help capture changes in productivity. Second, we introduce industry × year and state × year fixed effects into the regression which filter out industry and state shocks. Third, changes in productivity cannot explain our differences-in-difference results.

There exist a few empirical studies which examine the relation between CEO compensation

[4] We use the pay increase of the median employee in this calculation because we can only observe the median but not the mean salary in our establishment data.

and employee wages or productivity. Cronqvist et al. (2009) work with Swedish data and relate managerial entrenchment to the wages of regular employees. They find that CEOs with more control pay higher employee wages, especially for employees close to the CEO (geographically and hierarchically). They argue that CEOs derive private benefits from treating colleagues in their vicinity nicely. Wade et al. (2006) regress CEO compensation on CEO's personal traits and firm variables, and use the residuals as a proxy for CEO over- or underpayment. They show that CEO overpayment is related to higher pay for other managers (see also Bloom and Michel (2002)).

We focus on the level of pay. However, there is a sizable literature on the incentives of employees. Mueller et al. (2017) finds that higher inequality between worker and employee improves productivity for British firms. For U.S. firms, Faleye et al. (2013) fail to find any significant effect of an increased pay gap on employee productivity except for firms where the tournament incentives are high. In the group of U.S. top managers, Kale et al. (2009) finds that the pay gap between CEO and senior managers increases firm performance. Note that these findings are no contradiction to our results: We show evidence that envy from employees drives up employees' wage, but it does not necessarily change the ordinal rank of the wage gaps across firms. The literature just discussed uses some kind of proxy for incentives to see whether employees are depressed or incentivized by a large wage gap. Both outcomes are consistent with relative wealth concerns.

Lin et al. (2016) investigate how employee representation on corporate boards of German firms affects executive compensation. They find that more employee representation increases executive compensation and employment protection of workers. However, they do not investigate employee wages. Our paper is - to the best of our knowledge - the first to show that there exists a positive relation between CEO and rank-and-file employee pay, and we ascribe this relation to the relative wealth concerns of employees.

The paper is organized as follows: Section 2 presents the data. Section 3 documents the relation between CEO compensation and employee wages consistent with our hypothesis that the employees are subject to relative wealth concerns. We also present evidence for the causality of CEO compensation on employee wages in Section 3. Section 4 considers two other explanations for our findings: envy towards the management team and CEO compassion. Section 5 contains our employee turnover results, Section 6 summarizes several robustness checks, and Section 7 concludes the paper. In addition, the Appendix contains an example for a principal-agent-model we have in mind.

2. Data

The sample contains all companies included in the two main German stock market indices, DAX and MDAX, between 2000 and 2011. We hand collect data on executive compensation and corporate governance from annual reports and Hoppenstedt company profiles. We do not include non-listed firms, because information on executive compensation is usually unavailable. Stock market data comes from *Datastream* and balance sheet and accounting data from *Worldscope*.

2.1 Workers' compensation

Employment and wage data at the establishment level is obtained from the Institute of Employment Research (IAB). The IAB is the research organization of the German federal employment agency, the Bundesagentur für Arbeit (BA). The BA collects worker and employer contributions to unemployment insurance and distributes unemployment benefits. All German businesses are required to report detailed information on employment and wages to the BA.[5] Individual-level data is aggregated at the establishment level, made anonymous, and offered for scientific use by the IAB (the Establishment History Panel). An establishment is any facility having a separate physical address, such as a factory, service station, restaurant, or office building. The IAB offers detailed establishment level data on industry, location, employment, employee education, age, nationality, and wages, and provides this data in the form of establishment-level statistics, such as sums, medians, and quartiles on wages and employment according to different classifications and breakdowns.

IAB does not have a firm identifier, which is why manual matching is necessary. At our request, the IAB matched our sample of listed firms with their establishment-level database using an automatic procedure, based on company name and address information (city, zip code, street, and house number). Additionally, we provided the IAB with names of major subsidiaries listed in the annual reports of our sample firms in 2006. All cases not unambiguously matched by the automatic

[5] German establishments are required to report salaries of their employees up to an upper earnings limit (social security contribution ceiling) that is annually adjusted (West German states: €52,800 in 2000 up to €66,000 in 2011. East German states: €43,600 in 2000 up to €57,600 in 2011). When this limit has been reached, establishments are only required to report the ceiling. In our data set, we delete 5.23% of the observations because the median average wage for the establishment was equal to the ceiling value for the respective year.

matching procedure are checked by hand to avoid mismatching. The matching was performed for 2004, 2005, and 2006. Firms are dropped if they do not exist during the period 2004 through 2006. All establishments are matched only once to our sample firms. This matching procedure does not allow us to identify changes in establishment ownership after 2006.[6] Thus, if an establishment is acquired before 2004 or sold to another firm after 2006, it will be treated as if it belonged to the matched firm after the acquisition or before the sale. This will blur the match between firms and establishments and potentially lead to an attenuation bias working against finding significant results. Table 1 provides an overview of our matching process.

While fiscal years of German firms are mostly from January to December, establishment years for IAB data are from July to June. Therefore, we lead all variables from *Worldscope* by six months relative to IAB years. Effectively, we assign year-end values from *Worldscope* to June 30 information on employment and wages of the same year.

2.2 CEO compensation

We hand-collected data on compensation for CEOs and other members of the management board from firms' annual reports. Before 2006, most firms only disclose the total compensation of the management board as a whole. Only a few firms reported the individual compensation. From 2006, the German Corporate Governance Code required firms to disclose the individual compensation of members of the management board in their annual reports.[7] Hence, data on individual compensation for the management board is available for most firms after 2006. If a firm discloses the individual compensation, we record the payment for each executive, while for all other firms the total compensation for the management board is recorded.

Managerial compensation consists of several components: fixed salary, remuneration in kind, annual bonus, and compensation from long-term incentive programs. The long-term incentive pro-

[6] At the time of matching establishments to firms, establishment data was not available for 2007 and subsequent years.

[7] The German Corporate Governance Code (2006), Clause 4.2.4, requires that "The 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, "Compensation 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.

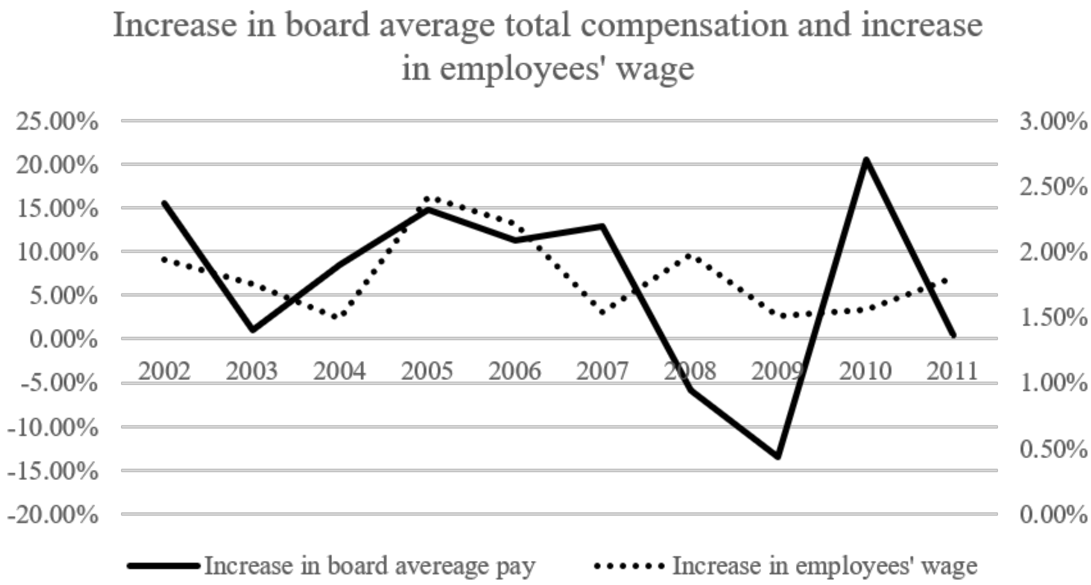

Figure 1: Yearly changes in average board compensation (solid line, left y-axis) and yearly changes in average employee wage (broken line, right y-axis).

grams include stock options, stock appreciation rights, and other stock based instruments. All these separate components of compensation are recorded if available. Our principle variable *CEO total* is the aggregate compensation that is mentioned in the Table "Board of Management Compensation - Aggregate Compensation" in the annual report. This is the aggregate value of the realized cash and bonus payments and the promised long-term compensation. It seems natural that the employees focus on this value because this is also usually reported in the press. Some executives in our panel data set join or leave the management board during the year. Their remuneration is then adjusted for the period in office to make them comparable to the standard annual compensation.

Table 2 presents summary statistics and variable definitions for firm-level variables (Panel A) and establishment-level variables (Panel B). The average firm year in our sample has sales of €15.8 billion, which shows that our sample mostly consists of large firms. The average CEO has a total annual compensation of €2.6 million and is 54 years old. The average median annual gross wage of full-time employees for our sample is €35,167.

Figure 1 contains a graphical representation of the yearly growth rate of average board compensation and the yearly growth rate of average employee wage over the years. The reason why we have board compensation instead of CEO compensation is that board compensation is available for all firms. The correlation is 0.21.

2.3 Institutional setting

Historically, wages in German firms were mostly set through collective bargaining agreements between trade unions and employers' associations. However, in the last three decades, a major shift away from industry-level agreements has taken place. Hassel (1999) reports that in 1995, 53.4% of the plants were covered by industry-level wage agreements, 8.2% by firm-level agreements, and 38.4% were not covered at all. Although their sample may not be fully comparable to that of Hassel (1999), Addison et al. (2010) report that only 47.3% of the German plants had industry-level agreements in 2000, a number that drops to 35.4% by 2008. Firm-level agreements were almost stable with 2.5% in 2000 and 2.7% in 2008, whereas the plants not covered by any collective bargaining agreement increased from 50.1% in 2000 to 61.9% in 2008. Over the same period, unionization also decreased considerably in Germany. Based on survey data, Schnabel and Wagner (2007) estimate it to be about 33% in 1992, declining to around 20% in 2004. If industry- or firm-level agreements exist, these agreements are binding for all workers as German law forbids discriminatory wage policies that disadvantage non-union members.

As a reaction to the declining popularity of collective bargaining agreements, trade unions and employers' associations are allowed so-called opening-clauses. Since the mid-1980s, labor regulation (including wage setting) has become increasingly flexible even for firms covered by collective bargaining agreements. Many areas of regulation are no longer determined at the industry level. Instead, works councils at the establishment level directly negotiate agreements with employers (Ellguth et al. (2012)). In particular, large firms (as in our sample) make use of these opening-clauses. Hassel and Rehder (2001) show that 55 of the 120 biggest companies in Germany negotiated a firm-level pact that deviates from the industry-level agreement during the 1990s.

However, even if firms do not use an opening-clause, they are free to deviate from the collective bargaining agreement as long as they pay wages above the level stipulated in the agreement. Collective bargaining agreements only determine minimum standards. Jung and Schnabel (2011) show that more than 43% of the establishments covered by a collective agreement pay wages above the level stipulated in the collective agreement. For these 43% of the establishments, average actual wages exceed wages that were stipulated by the collective bargaining agreement by about 10%. Both numbers increase with the size of an establishment, i.e. positive deviations are more likely for the large firms in our data set. Taken together, these studies show that wage setting is rather flexible (in both directions) at the firm level in Germany.

3. The relation between CEO compensation and employee wages

3.1 Baseline results

Employees who have relative wealth concerns experience an additional disutility when CEO pay increases. Thus, the firm raises the employees' salary to compensate them for this disutility and to prevent them from leaving the firm. This mechanism predicts a positive relationship between CEO compensation and employee's salary. We start by analyzing the relation between CEO compensation and employee wages using the following baseline regression model:

$$ln(Wage)_{ijt} = \alpha_t + \alpha_k + \alpha_s + \beta ln(CEO\ total)_{jt-1} + \gamma X_{ijt-1} + \varepsilon_{ijt} \quad (1)$$

The dependent variable, $ln(Wage)_{ijt}$, is the logarithm of the median annual wage in establishment i and year t, where j indexes firms. $ln(CEO\ total)_{jt-1}$ is the logarithm of the CEO's total compensation over the prior year $t-1$.[8] In our benchmark regressions, we control for year fixed effects, α_t, industry fixed effects of the establishment, α_k, and state fixed effects, α_s. X_{ijt-1} is a vector of control variables, which include establishment-level variables such as number, median age, qualifications, and the nationality of employees, and firm-level variables such as profitability, size, leverage, CEO ownership, and tenure. All explanatory variables are lagged by one year. We run fixed effects regressions and use White (1980) robust standard errors that allow for clustering at the firm level.

Table 3 presents our results. Specification (1) only includes industry, state, and year fixed effects. The following specifications slowly build the full model. First, adding establishment level controls in specification (2) and then stepwise firm-level controls (specifications (3) to (5)). Across all specifications, we observe that firms that pay their CEOs more also pay significantly higher wages to their other employees. In specifications (3) to (5), we also include ROA and market-to-book ratio which control for firm productivity.

In specification (6), which includes observations after 2005 and the full set of control variables,

[8] We use the pay increase of the median employee in this regression because we can only observe the median but not the mean salary in our establishment data.

the coefficient for *ln(CEO total)* is 0.041 ($t = 2.93$). This result means that if CEO compensation increases by 1%, the median employee's wage increases by 0.04%. This effect is economically sizable. The average CEO in our sample receives €2.6 million a year. If a firm increases its pay by 1% (=€26,000) for the average CEO, then the firm will pay an additional compensation of €14.4 to the median employee with an average annual salary of €35,000. For the average firm in our sample with 50,000 employees that sums up to €720,000 per year, this increases the total wage bill by €746,000 per year. When we take the ratio between expected additional labor cost and market capitalization, the value is 0.17%.

These results are obtained after controlling for observable characteristics known to influence employee wages. In particular, we control for establishment and firm size, employee characteristics, profitability, leverage, and union presence. As expected, employee wages are higher when employees are better educated, older, German, male, work in larger establishments or firms, have a higher risk of losing their jobs, the leverage is lower, a union member has a board seat, and the establishment is close to the headquarter (see, for example, Cronqvist et al. (2009), Brown and Medoff (1989)). In an untabulated robustness check, we adjust all nominal variables for inflation and find very similar results.

So far we have only looked at the median employee's wage, however, it could be that higher or lower income employees have a different sensitivity to CEO compensation. Since the IAB offers two more quartiles of employee wages at the establishment level, we rerun our specification (4) to (6) from Table 3 using the logarithm of the first and third quartile of annual wage in an establishment as a dependent variable in Table A1. Overall we find similar results across all three quartiles. For our benchmark specification, with all controls and only observations after 2005, we find a that the coefficient of *ln(CEO total)* decreases from 0.045 (for Q1 employee's wage) over 0.041 (for median employee's wage, which is our baseline regression in Table 3) to 0.029 (for Q3 employee's wage) across the three different wage quartiles. This result implies that the sensitivity of employee wages to CEO compensation slightly decreases with higher wages. About the reasons we can only speculate. Maybe lower income employees have stronger relative wealth concerns as implied by the direct channel of CEO compensation on employee wages described above, or firms tend to compensate employees rather with a lump-sum than a wage dependent increase.

3.2 Difference-in-difference regression

The main endogeneity concern with our baseline regression is omitted variable bias. If there is an unobserved characteristic (e.g., firm quality) which causes both CEOs and employees to be paid well, our OLS estimates would be biased. In order to overcome this concern, we will use a law change that is uncorrelated with any unobservable firm characteristic, like firm quality, but allows employees to observe CEO wages more accurately and more saliently.

Since 2002 the German Corporate Governance Code (GCGC) suggested to report individual compensation of management board members of listed firms. However, the majority of firms did not follow this suggestion and only reported the required aggregate compensation for all management board members together. Companies frequently explained they do not see how their shareholders can benefit from individual disclosure since the management board is collectively responsible for managing the company. After it became apparent in 2003 and 2004 that most firms were not complying with the GCGC a public debate started about making disclosure mandatory. Finally, in 2005 the federal parliament enacted a law that required firms to disclose individual compensation. It became effective in 2006. The law was motivated by the argument that it is necessary for shareholders to know the individual remuneration. Only detailed knowledge of compensation practices would allow shareholders to decide whether compensation is adequate with respect to the duties of the individual management board member and the situation of the company.[9] In their view individual disclosure is a shareholder protection device. This view is exemplified by the justice minister arguing: "When you're forced to disclose these things, it acts as a sort of self-control."[10] This regulation does not directly affect employee wages, but it changes the channel through which the employees observe their firm's CEO compensation. Before the regulation came into effect, the employees could generally only observe the aggregate remuneration of all members on the management board. After the regulation was adopted by the firms, the employees have been able to directly observe CEO compensation, which is on average 44% more than the compensation of an average management board member in 2006. Under the hypothesis that employees are subject to relative wealth concerns, we expect that employees in those firms that disclose their CEO compensation for the first time feel more disadvantaged and are paid more. Thus, we regard the change in policy as

[9] see Deutscher Bundestag printed matter 15/5577: http://dip21.bundestag.de/dip21/btd/15/055/1505577.pdf

[10] see Deutsche Welle from May 18, 2005: https://p.dw.com/p/6f1t

a natural experiment.

In the difference-in-difference setting, we select the firms that disclose their CEO compensation before 2003 (i.e., {2000, 2001, 2002}) as the control group. And we regard those firms that do not disclose their wage before 2003 but do disclose it in the year 2006 as the treatment group.[11] In Table 4 we test whether there are any significant differences between disclosing and non-disclosing firms. Treated firms are somewhat larger in terms of employees and sales, are more profitable and pay on average lower compensation to their executive board. However, none of these differences are statistically significant with p-values of at least 0.2.

Another potential concern is that this law change directly affected executive compensation because firms tried to renegotiate contracts fearing the public would learn about excessive compensation once the law became effective. We tested if there is any abnormal change in average executive board compensation around the first disclosure of individual compensation. The average (median) increase in executive board compensation is 10.3% (5.9%), which is similar and statistically insignificantly different to our overall sample average (median) of 14.2% (7.2%).

The independent variable *Treatment* equals 1 when an observation is in the treatment group, and *Post-2006* equals 1 when the year is in or after 2006. Table 5 presents the results in specifications (1) and (2). The coefficients on *Treatment* × *Post-2006* in both specifications are statistically significant at the 1% level. The results are also economically significant. When firms are required to make their CEO compensation publicly observable, they pay 11.5% higher wages to their employees. This value may seem large as compared to our baseline regression, where we found a coefficient on *ln(CEO pay)* of 0.041. The most likely explanation for this difference is the selection bias.

Selection bias: One concern about the difference-in-difference setting is the assumption of a random formation of the treatment and control groups. Before 2006, firms could choose whether to disclose their CEO compensation or not. From 2006, firms are required to disclose their CEO compensation, unless otherwise decided by the annual general meeting by a three quarters majority. Therefore, our difference-in-difference method might suffer from a potential selection bias: firms that did not expect any strong effects from publishing CEO salaries on employee wages might have self-selected into the control group and disclosed individual salaries before this was required by

[11] Our analysis in 3 assumes that CEO compensation is always available and discards the observations without CEO compensation. The difference-in-difference regression uses all of the data notwithstanding if CEO compensation is available or not.

the regulation. This leaves those firms which expected stronger effects on employee wages for the treatment group. Therefore, the estimated 11.5% treatment effect is probably overestimating the average effect on firms. However, the null-hypothesis is that employee wage and CEO compensation are independent from one another and this independence is clearly rejected.

We provide two additional tests to support our conjecture that CEO compensation influences employee wages.

Triple difference: Under the relative-wealth-concern hypothesis, employees' envy should be increasing in the wage gap between CEO and other management board members. We expect that the increase in employees' wage is positively related to the CEO-board wage ratio upon disclosure of CEO compensation. This hypothesis is based on the following reasoning: If only board compensation can be observed, as is the case before the new disclosure regulation, employees infer CEO compensation by rational expectations from average board compensation. As soon as CEO compensation becomes available, they revise their expectation. Note that downward wage rigidity plays a role here: Some employees are positively surprised about CEO compensation and their wages should be increased. However, the same is not true for employees who are negatively surprised: wage cuts are very unlikely for motivational reasons. Therefore, the more CEO compensation exceeds average board compensation the larger is the disutility employees suffer from relative wealth concerns.

To test this presumption, we adopt a difference-in-difference-in-difference (triple-difference) approach. *CEO-board ratio* is the percentage by which CEO compensation exceeds the average management board compensation for a given year. Table 5 presents the results in specifications (3) and (4). The coefficients on *Treatment* $\times$ *Post-2006* $\times$ *CEO-board ratio* are both statistically significant at the 1% level. So we indeed find that, after the new disclosure regulation has become effective, employee wages increase more in firms with a relatively higher CEO pay. The results are also economically significant. When firms start disclosing their CEO compensation publicly after the regulation change, they pay 0.35% higher wages to their employees if the *CEO-board ratio* increases by one percentage point.

Parallel trends: If our presumption that the disclosure of CEO pay led to an increase in employee wages is correct, we would expect no significant differences between the treatment and the control group before 2006 (parallel trends assumption) and an increase in the difference between both groups afterwards. We include yearly interaction effects with the treatment dummy in our regression. All independent variables are lagged by one year, so we lose the year 2011. We use 2010 as our base year. Table 6 presents the results. The coefficients on the yearly interaction effects become significantly different from zero after 2007, i.e., *Treatment* × *2007*, *Treatment* × *2008*, and *Treatment* × *2009* are significant at the 1% level. Over the years 2007 to 2009, the coefficients increase and the results become more significant. This might imply that the increase in workers' wages is rather gradual. Moreover, the insignificant coefficients on yearly interaction effects from 2000 to 2004 (except 2002) imply that the parallel-trend assumption holds.

The difference-in-difference analysis also helps us answer the question of whether the positive relationship between CEO pay and workers' wage is driven by workers' envy or by the CEO's compassion. Because the CEO always knows the wage of workers, the disclosure of the CEO pay does not affect the CEO's compassion towards normal workers. In contrast, workers do not always know the CEO pay, so the disclosure of the CEO pay will increase the workers' envy towards the CEO. The results from a difference-in-difference analysis confirm that the increase in the workers' pay is driven by the workers' envy.

In sum, we interpret these results as evidence for a causal effect of CEO compensation on employee wages consistent with the existence of relative wealth concerns of employees. These diff-in-diff results cannot be explained by the production dynamics hypothesis which states that the pressure on wages decreases if productivity is high.

3.3 Unobservables and fixed effects

A specific concern might be that the relationship between CEO compensation and employee wages is driven by firm-level or establishment-level unobservables. We address this concern using three approaches in Table 7. First, we include firm fixed effects instead of industry fixed effects. Second, we include both firm and industry fixed effects, which is possible since the industry differs across establishments. Finally, we control for establishment fixed effects. These tests are demanding on the data because the wages of both the CEO and the workers are rather sticky. The results are nevertheless reassuring. While we lose economic significance, coefficients of *ln(CEO total)* are, on average, about 50% smaller; however, the statistical significance remains intact.

Another concern may be that there are CEO-level unobservables. We investigate this possibility by adding CEO and CEO-firm fixed effects. Once more, we observe a reduction in economic significance but the statistical significance is largely unaffected.

Finally, we might be concerned that the reason why CEO compensation affects employees' wages might be driven by unobservable time-varying factors at the industry level, the firm level, or the state level. We include industry $\times$ year fixed effects, firm $\times$ year fixed effects, and state $\times$ year fixed effects. We find that neither economic nor statistical significance is materially affected. This analysis suggests that time-varying industry level, firm level and state level unobservables are not inducing our results.

3.4 Abnormal CEO compensation

It is possible that employees feel more envy towards CEOs who receive an abnormally high compensation as compared to similar peers. To address this slightly different interpretation of our results, we replace *CEO total compensation* with *CEO abnormal total compensation* as an explanatory variable. *CEO abnormal total compensation* is defined as the difference between actual and expected CEO compensation. Our hypothesis is: If the CEO abnormal compensation is positive, i.e., the CEO earns more than what she deserves to get, the employee have more relative wealth concerns. If the CEO abnormal compensation is negative, i.e., the CEO earns less than what she deserves to get, the employee have less relative wealth concerns.

The analysis takes three steps. In the first step, we calculate the CEO expected compensation. We adopt the model used by Gillan et al. (2009) in specifications (1) and (2): The CEO expected total compensation is predicted by regressing the log CEO total compensation on the ratio of EBIT to assets (ROA), log firms' total assets, the ratio of assets to firm value (book-to-market ratio), CEO tenure, as well as year and industry (2-digit SIC) fixed effects. In specifications (3) and (4), we replace the ROA with the total shareholder return. In the second step, we calculate the log CEO abnormal compensation. The log CEO abnormal total compensation is the difference between the actual log total compensation and the expected log total compensation. In the third step, we regress log workers' median wage on log CEO abnormal compensation and our standard set of control variables.

Table 8 shows across the specifications a statistically significant effect (1% level) of CEO abnormal total compensation on employee wages. A 1% increase of *CEO abnormal total* results in a 0.03% increase in the median employee's wage.

4. Other Explanations

4.1 Envy towards the management team

This subsection presents evidence that employees have relative wealth concerns to the CEO rather than the whole management team. Before 2006, firms were not required to publish management board compensation individually. Even today, the German Corporate Governance Code still allows that management board compensation is not disclosed at the individual level, if the annual general meeting approves the non-publication with a three-quarter majority. This means that employees cannot observe the CEO's compensation for many German firms before 2006 and for some after 2006. If inequality aversion is indeed the driver for the reason that CEO compensation affects employees' wages, we expect two effects from the regulatory change in 2006: (1) for firms that do not disclose management compensation individually before and after 2006, the impact of *ln(Board total)* on employee wages is largely unchanged and similar to the impact of *ln(CEO total)* for firms that disclose CEO compensation; (2) for firms that disclose management compensation individually after 2006, *ln(Board total)* becomes insignificant.

That is exactly what we observe in our subsample analysis in Table 9. Only looking at firms that do not disclose management compensation individually (column (1)), we find a positive and significant coefficient on *ln(Board total)*. The economic effect is cut by more than half and statistical significance disappears, if we look at the sample of firms disclosing management compensation individually (column (2)). Both effects are even more pronounced for the non-disclosing firms before 2006 (column 4) and the disclosing firms after 2006 (column 5). This result is also confirmed when we use both measures *ln(other total)* and *ln(CEO total)* in a horse race in the same regression (columns (3) and (6)). The negative coefficients for *ln(other total)* are most likely caused by collinearity with *ln(CEO total)*. The correlation between both variables is 0.81.

These findings suggest that employees benchmark their own salaries towards the most salient management compensation figure available. If compensation is disclosed individually, employees seem to only compare their wage to the CEO's compensation but not to that of other executives. If CEO compensation is not available, the closest proxy, average management board compensation, is used as a benchmark. In sum, these empirical patterns lend strong support to the hypothesis that relative wealth concerns is an important driver in setting wages for rank-and-file employees.

4.2 CEO compassion

It might be that the CEOs feel compassionate about the rank-and-file employees. We have to distinguish between two stories of compassion from CEOs: First, true compassion where the observation of their compensation is not important. If true compassion had driven our results, then the effects in our diff-in-diff analysis would have been insignificant. They are not and indicate there are significant relative wealth concerns among employees. We do not see a way that true compassion can be formally ruled out; it can be part of the full story.

Second, CEO's feel compassionate *because* the firm discloses their compensation and they feel bad about this. To analyze this, we use a identification strategy used by Cronqvist et al. (2009) that argues that CEOs feel more compassionate about employees who are geographical nearer to them. Therefore, we insert a cross-effect of the state variable where the headquarter is situated (*Close to head*) with $ln(CEO\ total)$ as an additional variable in our baseline regressions. Table 10 shows the results for four models. In each of the models, the coefficient of the interaction term is positive but not statistically significant and the total compensation ($ln(CEO\ total)$) is highly significant. So there could be an effect of compassion but it is not very strong. We conclude that you need employee envy to explain all of our results.

5. Employee turnover

Wade et al. (2006) show that CEO overpayment is related to a higher turnover for other managers (see also Bloom and Michel (2002)). What does the relation look like for rank-and-file workers? One important task of the CEO is to keep the employee turnover low because excessive turnover can result in shareholder value losses. We test this hypothesis using the employee inflow/outflow data provided by the IAB. We define two employee turnover variables: (1) *Outflow* as *Outflow of* $employees_t/\#Employees_{t-1}$ and (2) *Inflow* as *Inflow of* $employees_t/\#Employees_{t-1}$.

Table 11 presents the results. We observe that *Outflow* and *Inflow* are negatively correlated with CEO compensation. This result holds for all employees and for the subsample of white-collar employees. However, it is only significant for *Outflow* at the 5% level. This finding implies that employees are, on average, overcompensated for their relative wealth concerns, thus leading to a reduction in turnover because the outside options are relatively less attractive.

6. Robustness Checks

6.1 Timing and alternative measures of CEO compensation

In order to better understand the relationship between CEO and employee compensation, we analyze different time lags of CEO total compensation. The most salient measure of CEO compensation for employees should be the total compensation from the last fiscal year, because that number is published during year t. The hypothesis is: If the firm anticipates relative wealth concerns of its employees and therefore offers them an increased wage proactively, $ln(CEO\ total)_{t-1}$ will have the largest impact. If instead lengthy negotiations between employees and the firm take place, then a higher order lag of CEO compensation may be more relevant. Table 12 Panel A shows exactly the hypothesized result. $ln(CEO\ total)_{t-1}$ exhibits the highest t-statistic independent of whether we use lagged or contemporaneous control variables. In fact, the contemporaneous CEO compensation only has a marginally significant impact on employee wages. It is consistent with the idea that the firm anticipates relative wealth concerns of its rank-and-file workers and that no lengthy negotiations are needed.

In a second step, we analyze the impact of different measures of executive compensation. If the correlation between CEO and employee compensation were to be mainly driven by unobservables (e.g., some dimension of profitability not captured by our other controls, i.e., *ROA*, or *Market to book ratio*), we would expect a similar correlation between average board or other executive compensation and employee wages. However, as shown by Panel B of Table 12, this is not the case. Other executives than the CEO (*ln(Other total)*) are insignificantly related to employee wages. CEO compensation has significantly more explanatory power than alternative measures of executive compensation. The explanatory power even increases if we use the CEO premium (i.e., the difference between CEO and average other executive compensation).

6.2 Wage changes

To further test whether our model is robust, we ask whether the increases in employee wages are associated with the increases in CEO pay. The regression of changes on changes removes the effect of time-invariant unobservables. The change of the independent variable *ln(CEO total)* is the annual growth rate in CEO total compensation, and the change of the explanatory variable *ln(Wage)* is the annual growth rate in employees' wages. In order to rule out the possibility that the increase in employees' wages is driven by fast growing establishments, we drop the observations where the yearly growth rate of the number of employees in an establishment is above the 95% percentile. Specifications (2) to (5) in Table 13 show that the coefficients on *CEO total increase* are still statistically significant at the 10% level. The coefficient can be interpreted as: when the annual growth rate of the CEO total compensation is increased by 1 percentage point, then the annual growth rate of the employees' wages will increase by 0.004 percentage points.

We split the change in CEO compensation in increases ($= max CEO\ total\ change, 0$) and decreases ($= min CEO\ total\ change, 0$) in unreported results. We have in total 283 increases and 180 decreases. The increases were almost borderline significant and the decreases were far from significant; both coefficients are positive, which means both increases and decreases contribute to the overall effect we observe.

6.3 Additional controls

While we control for a number of variables in the regressions in Table 3, other, potentially unobservable, variables may be driving our results. To minimize any such concerns, we report further results with additional firm-level controls in Table 14. First in column (1), we add the firm's annual *Stock return* as an alternative measure of firm performance. The results show that employees' wages are hardly influenced by stock returns above and beyond what is already captured in our other control variables. The statistical and economic significance of the coefficient on *ln(CEO total)* is not affected. Second, we add *Board size*, defined as the number of members on the executive board. Once more, we do not observe any significant effect on employees' wages or the coefficient on *ln(CEO total)*. Third, we add additional CEO characteristics: (1) *CEO switch* equals one if a new CEO is appointed in t-1; (2) *CEO age* in years; (3) *CEO out-hiring* equals one if the CEO is recruited from outside the firm. None of these CEO characteristics has a significant influence on employee pay. Fourth, we add *ln(R&D to sales)*. The results in Table 14 show that firms with higher R&D expenditures (relative to sales) pay lower employee wages. However, the coefficient on *ln(CEO total)* is hardly affected even though we lose more than 60% of the observations. Fifth, we split up the dummy variable *Union* into four dummy variables to control separately for the influence of the four largest German unions (IG Metall, ver.di, IG BCE, and IG BAU). We find that firms with one of the four largest unions on their supervisory board pay their employees more on average but there is no significant difference between these four unions. The coefficient for *ln(CEO total)* is not materially affected.

7. Conclusion

In this paper, we document a positive effect of CEO compensation on the wages of rank-and-file employees. This pattern is not explained by established determinants of employee wages and is unlikely to be caused by unobservables at the industry, firm, CEO, establishment, or state level. Difference-in-difference, triple-difference, and the analysis of CEO abnormal compensation suggest a causal interpretation of our findings. The evidence is most consistent with firms paying higher wages to their employees in order to compensate them for the disutility caused by the pay gap to the CEO. The most likely driver underlying this phenomenon are relative wealth concerns of employees. This paper also shows that employee turnover decreases with higher CEO pay, which implies that employees, on average, are overcompensated for their relative wealth concerns.

An obvious open question is whether we can generalize results obtained for Germany to other countries, for example, the US. The US is known to have larger wage gaps between CEOs and rank-and-file employees as well as more social tolerance for inequality. This is consistent with the relative wealth concerns of employees: In Germany, envious behavior is larger than in the US. Therefore, the CEOs in the Germany are compensated less than in the US. Therefore an interesting extension of our work would be a cross-country comparison. In countries that experience higher inequality aversion the executive pay (all else equal) should be lower. Gabaix and Landier (2008) test this hypothesis using the World Value Survey. However, they have only 17 observations and find insignificant results. A promising research project might be to have a larger data set that enables the researcher to sufficiently control for all known effects on pay levels, e.g., firm size.

Our evidence of relative wealth concerns of employee implies that managerial compensation incurs additional "inequality costs", which need to be taken into consideration when determining the optimal contracts for both CEOs and employees. Any additional dollar paid to the CEO for providing incentives also leads to higher employee wages to compensate employees for their (perceived) losses from relative wealth concerns. These costs must be taken into account by shareholders to arrive at the additional cost of CEO compensation.

Appendix A: Principal-agent model

We model a principal (i.e., the firm) who contracts with two agents: the CEO and one employee. The employee represents all employees in the firm. The employee is subject to relative wealth concerns:

$$U\left(W_T^w, W_T^c\right) = V^w\left(W_T^w\right) - \alpha S\left(W_T^c - W_T^w\right), \tag{2}$$

where W_T^w is the employee's wage, W_T^c is the CEO's wage, $V^w(\cdot)$ is a risk-averse utility function, $S(\cdot)$ an inequality function, and α the inequality parameter.[12] The employee's effort is observable and contractible. Hence, employees only add a participation constraint to the principal's problem. The CEO is rational and risk averse. Her effort is not observable, so she adds a participation constraint and an incentive compatibility constraint to the principal problem. Exerting effort e leads to private costs $C(e)$ that are increasing and convex in e.

The principal proposes a contract that is signed by the CEO and the worker at time $t = 0$. After that, the CEO makes her effort decision e. At time $t = T$, the consequences of the CEO's effort become apparent in the distribution of the firm's stock price $g(P_T \mid e)$. The principal maximizes:

$$\begin{aligned}
\max_{e, W_T^c(\cdot), W_T^w(\cdot)} \int_o^\infty & \left(P_T - W_T^c - W_T^w\right) g\left(P_T \mid e\right) dP_T \\
s.t. \quad \int_o^\infty & V^c\left(W_T^c\right) g\left(P_T \mid e\right) dP_T - C(e) \geq \overline{U}^c \\
\int_o^\infty & V^c\left(W_T^c\right) g_e\left(P_T \mid e\right) dP_T - C'(e) = 0 \\
\int_o^\infty & \left[V^w\left(W_T^w\right) - \alpha S\left(W_T^c - W_T^w\right)\right] g\left(P_T \mid e\right) dP_T \geq \overline{U}^w,
\end{aligned}$$

where $V^c(\cdot)$ is the CEO's utility function and $\overline{U}^c$and $\overline{U}^w$ are the outside options of the CEO and the employee, respectively. In Appendix A, we prove the following Proposition:

[12]The employee always earns less than the CEO, so $W_T^c - W_T^w$ never becomes negative. Therefore, we need not specify an extra parameter if the employee is ahead of the CEO. The results are the same notwithstanding if the employee is compassionate (i.e., dislikes being ahead) or competitive (i.e., likes being ahead).

Proposition 1: If $S(\cdot)$ is convex, the employee's wage increases with the CEO's wage:

$$\frac{dW_T^w}{dW_T^c} = \frac{\alpha S''\left(W_T^c - W_T^w\right)}{\alpha S''\left(W_T^c - W_T^w\right) - V^{w\prime\prime}\left(W_T^w\right)} > 0.$$

When $S(.)$ is concave, then further assumptions are needed.

Proof: The Lagrangian is:

$$\begin{aligned}
\mathcal{L} &= \int_o^\infty \left(P_T - W_T^c - W_T^w\right) g\left(P_T \mid e\right) dP_T \\
&\quad + \lambda_{PCC}\left(\int_o^\infty V^c\left(W_T^c\right) g\left(P_T \mid e\right) dP_T - C(e) - \overline{U}^c\right) \\
&\quad + \lambda_{ICC}\left(\int_o^\infty V^c\left(W_T^c\right) g_e\left(P_T \mid e\right) dP_T - C'(e)\right) \\
&\quad + \lambda_{PCW}\left(\int_o^\infty \left[V^w\left(W_T^c\right) - \alpha S\left(W_T^c - W_T^w\right)\right] g\left(P_T \mid e\right) dP_T - \overline{U}^w\right)
\end{aligned}$$

To use the implicit function theorem, we define

$$G(W_T^c, W_T^w) = \frac{d\mathcal{L}}{dW_T^w} = -1 + \lambda_{PCW}\left[V^{w\prime}\left(W_T^w\right) + \alpha S'\left(W_T^c - W_T^w\right)\right].$$

$$\begin{aligned}
\frac{\partial G}{\partial W_T^w} &= \lambda_{PCW}\left[V^{w\prime\prime}\left(W_T^w\right) - \alpha S''\left(W_T^c - W_T^w\right)\right] \\
\frac{\partial G}{\partial W_T^c} &= \lambda_{PCW}\alpha S''\left(W_T^c - W_T^w\right) \\
\Rightarrow \frac{dW_T^w}{dW_T^c} &= -\frac{\partial G/\partial W_T^c}{\partial G/\partial W_T^w} \\
&= \frac{\alpha S''\left(W_T^c - W_T^w\right)}{\alpha S''\left(W_T^c - W_T^w\right) - V^{w\prime\prime}\left(W_T^w\right)}
\end{aligned}$$

This expression is positive if $S(\cdot)$ is convex, which proves Proposition 1.

A limitation of our model is that it does not have an incentive compatibility constraint (IC) for employees. Grund and Sliwka (2005) and Neilson and Stowe (2010) feature an additional (IC) constraint for two identical agents that are inequality averse when analyzing tournament structures.

They discriminate two different effects. On the one hand, an agent will work harder if she is envious (incentive effect). On the other hand, the more inequality averse the agent is, the more the principal needs to compensate the negative utility from inequality (participation effect). These papers find that agents with inequality aversion exert higher efforts than those who are purely self-interested under certain tournament structures. Faleye et al. (2013) find evidence for this result.

The model closest to ours is Dur and Glazer (2008) who analyze a principal-agent problem when the agent feels envy toward his principal. They show that envy tightens the employees' participation constraint and causes higher pay or a lower workload. The authors also show that workers and firms can benefit from profit-sharing programs because they reduce the expected disutility from envy. In contrast to Dur and Glazer (2008), we consider contracts written by shareholders with *two* agents: the CEO and the representative employee.

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TABLE 1

Sample

This table displays the number of firms and establishments in the sample for each year between 2000 and 2011.

Year	Firms	Establishments
2000	35	3,486
2001	47	7,261
2002	59	8,329
2003	66	16,471
2004	98	20,814
2005	100	23,783
2006	99	25,767
2007	97	24,436
2008	95	21,310
2009	83	19,246
2010	84	16,924
2011	84	15,607

TABLE 2

Summary statistics

Panel A displays definitions and descriptive statistics for the main firm-level variables used in our analysis. Panel B displays definitions and descriptive statistics for the main establishment-level variables used in our analysis.

Panel A: Summary statistics for main firm-level variables

Variable name	Definition	Mean	Std.	Obs.
Compensation				
CEO total	Annual total compensation of the CEO	2,564,779	2,395,251	555
CEO cash	Annual cash income of the CEO	2,002,491	1,657,132	555
Board total	Average annual compensation for all management board members: total compensation for the board / board size	1,411,901	1,096,341	939
Other total	Average annual total compensation for management board members excluding the CEO	1,421,626	1,073,914	554
CEO premium	ln(CEO total - Other total)	13.43	1.21	524
CEO pay ratio	CEO total / Other total	1.85	1.29	554
CEO-board ratio	CEO total / Board total - 1	0.48	0.64	555
CEO characteristics				
CEO tenure	Time since first appointed as the CEO (year)	6.41	6.00	536
CEO ownership	=1 if the CEO holds more than 1% of the firm outstanding shares	0.01	0.07	551
CEO switch	=1 if another person takes over the CEO position	0.09	0.29	555
CEO age	Age of CEO (in years)	54.05	6.91	527
CEO out-hiring	=1 if the CEO is hired from outside the firm	0.43	0.50	536
Firm-level characteristics				
ROA	Return on asset	0.10	0.12	910
ROE	Return on equity	0.34	0.30	910
Market to book ratio	Market to book ratio	2.33	2.45	931
Size (millions)	Total sales of the firm	15,844	27,976	924
Leverage	Total debt / total asset	0.63	0.20	932
# Firm employees	Number of employees working for the firm in Germany	49,899	90,643	934
Employee risk	Standard deviation of change in number of employees at the firm level	0.13	0.09	935
Union	=1 if one of the major German labor unions has representatives on the firm's supervisory board	0.95	0.22	939
Disclosure	=1 if the compensation of the CEO is disclosed in annual reports	0.59	0.49	939
Stock return	Total annual stock return calculated using the return index provided by Datastream	0.15	0.49	838
Board size	Number of members on the executive board	4.74	2.11	939
R&D to sales	R&D to sales ratio	9.58	42.07	623

Panel B: Summary statistics for main establishment-level variables

Variable name	Definition	Mean	Std.	Obs.
Wage structure				
Wage	Median gross average daily wage for full-time employees × 365	35,167	13,428	158,545
Q1 wage	First quartile gross average daily wage for full-time employees × 365	31,678	12,554	163,531
Q3 wage	Third quartile gross average daily wage for full-time employees × 365	37,301	13,967	142,865
Employee structure				
# Establishment employees	Total number of full-time employees at the establishment	64.79	691.72	203,434
Female %	Proportion of full-time female employees	0.43	0.36	167,296
Low qualified %	Proportion of full-time low-qualified employees	0.04	0.12	167,296
Qualified %	Proportion of full-time median-qualified employees	0.73	0.33	167,296
Highly qualified %	Proportion of full-time high-qualified employees	0.08	0.19	167,296
German %	Proportion of German employees	0.97	0.10	167,296
Manager %	Proportion of managers	0.03	0.13	167,296
White-collar %	Proportion of white-collar workers	0.61	0.46	167,296
Employees age	Median age of full-time employees at the establishment level	41.46	8.29	203,434
Other variables				
Close to head	=1 if the establishment is located in the same federal state as the firm's headquarter	0.18	0.38	203,434
Outflow	Outflow of employees$_t$ / # Establishment employees$_{t-1}$	0.21	0.22	76,616
Outflow white-collar	Outflow of white-collar employees$_t$ / # Establishment employees$_{t-1}$	0.14	0.22	76,616
Inflow	Inflow of employees$_t$ / # Establishment employees$_{t-1}$	0.42	5.68	76,616
Inflow of white-collar	Inflow of white-collar employees$_t$ / # Establishment employees$_{t-1}$	0.29	4.33	76,616
Industry	2-digit NACE code (economic division) of the the establishment (edition: 2003)			
State	Federal state where the establishment is located			

TABLE 3

CEO compensation and employee wages: Regression results

This table presents results for regressions with the log median annual wage of full-time employees as the dependent variable. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. In specification (6), we consider the observations after 2005 only. We use the White (1980) robust standard errors clustered at the firm level. The *t*-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(CEO total)	0.051**	0.046**	0.039***	0.037***	0.038***	0.041***
	2.14	2.22	3.6	3.71	3.71	2.93
ROA			-0.303*	-0.16	-0.109	-0.219*
			-1.82	-1.2	-0.81	-1.87
Price to book ratio			-0.019*	-0.020*	-0.024**	-0.025**
			-1.81	-1.97	-2.16	-2.13
ln(Size)			0.009	-0.03	-0.021	-0.039
			0.5	-1.17	-0.83	-1.42
Leverage			-0.133	-0.195*	-0.268*	-0.279*
			-1.31	-1.83	-1.92	-1.81
Union				0.121*	0.127*	0.153**
				1.91	1.93	2.32
ln(# Firm employees)				0.038*	0.032	0.049**
				1.78	1.56	2.15
Employee risk				0.485**	0.505**	0.609**
				2.25	2.42	2.62
CEO ownership					-0.009	0.007
					-0.19	0.14
CEO tenure					0.003*	0.004**
					1.84	2.07
ln(# Estab. Employees)		0.045***	0.044***	0.044***	0.044***	0.050***
		3.65	3.67	3.73	3.72	4.19
Female %		-0.280***	-0.262***	-0.274***	-0.274***	-0.277***
		-3.73	-3.68	-3.7	-3.67	-3.54
low qualified %		-0.011	-0.013	-0.011	-0.008	-0.018
		-0.19	-0.24	-0.2	-0.15	-0.33
Qualified %		0.220***	0.220***	0.213***	0.212***	0.212***
		5.48	5.79	5.84	5.78	5.25
Highly qualified %		0.504***	0.513***	0.509***	0.510***	0.503***
		11.2	12.49	13.37	13.41	12.9
German %		0.256***	0.252***	0.251***	0.255***	0.250***
		5.33	5.25	5.38	5.43	5.05
Manager %		0.017	0.024	0.04	0.043	0.047
		0.63	0.88	1.52	1.52	1.44
White collar %		0.167***	0.161***	0.175***	0.176***	0.190***
		7.71	6.85	8.33	8.36	9.1
Employee age		0.004**	0.004**	0.004**	0.004**	0.004**
		2.49	2.55	2.6	2.58	2.21
Close to head		0.031**	0.028**	0.029**	0.030**	0.031**
		2.41	2.23	2.2	2.24	2.48
Industry, state, and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.52	0.618	0.61	0.613	0.615	0.622
Number of observations	108363	106341	103961	103960	103581	68356

TABLE 4

Summary statistics for the treatment group and the control group at the disclosure

This table presents the summary statistics for the treatment group and the control group at the year of disclosure. We take the value for the treatment group when they disclose. We take the average of 2004, 2005, and 2006 for the control group. We also perform the t-test between the treatment and the control groups, which is presented in the last column. For establishment-level variables, observations are first aggregated at the firm level by taking average, and then the t-test is performed.

	Treatment group)		Control group		t-test
	N	mean	N	mean	p-value
Firm level					
CEO total	65	2,016,456	8	2,596,846	0.441
CEO cash	65	1,576,664	8	1,758,977	0.708
Board total	65	1,288,441	8	1,636,098	0.352
Other total	65	1,107,625	8	1,474,014	0.273
ln(CEO total)	65	14.088	8	14.180	0.817
ln(CEO cash)	65	13.931	8	13.978	0.897
ln(Board total)	65	13.808	8	13.886	0.791
ln(Other total)	65	13.666	8	13.708	0.885
ln(Size)	64	7.853	8	7.599	0.737
CEO pay ratio	65	1.793	8	1.984	0.652
CEO-board ratio	65	0.422	8	0.473	0.830
CEO tenure	62	5.887	8	6.250	0.864
CEO ownership	64	0.063	8	0.000	0.474
CEO switch	65	0.123	8	0.042	0.495
CEO age	61	52.525	8	53.250	0.788
CEO out-hiring	62	0.387	8	0.250	0.457
ROA	63	0.112	8	0.073	0.506
ROE	63	0.362	8	0.240	0.304
Price to book ratio	65	2.800	8	3.188	0.727
Size (millions)	64	13,697.280	8	16,261.070	0.809
Leverage	65	0.600	8	0.563	0.648
# Firm employees	65	46,313.060	8	28,381.790	0.580
ln(# Firm employees)	65	9.231	8	8.733	0.497
Employee risk	65	0.136	8	0.124	0.756
Total shareholder return	64	0.288	8	0.121	0.244
Board size	65	4.497	8	0.121	0.740
R&D to sales	40	12.709	8	0.121	0.892
Establishment level					
Median Wage	11,217	33,342.950	496	26,994.890	0.386
Q1 wage	11,487	82.226	523	69.858	0.257
Q3 wage	10,276	97.757	453	74.530	0.509
ln(Median Wage)	11,217	10.297	496	9.901	0.755
ln(Q1 wage)	11,487	10.188	523	9.851	0.616
ln(Q3 wage)	10,276	10.361	453	9.890	0.994
# Branch Employees	13,232	76.674	767	60.213	0.826
Female %	11,648	0.428	541	0.568	0.456
Low qualified %	11,648	0.044	541	0.042	0.343
Qualified %	11,648	0.761	541	0.604	0.353
Highly qualified %	11,648	0.087	541	0.145	0.106
German %	11,648	0.972	541	0.968	0.424
Manager %	11,648	0.035	541	0.052	0.872
White-collar %	11,648	0.717	541	0.974	0.011
Employees age	13,232	39.891	767	41.038	0.327
Close to head	13,232	0.172	767	0.248	0.644

TABLE 5

Difference-in-difference and triple-difference regressions

This table presents results for regressions in a difference-in-difference setting (specifications 1 and 2) and a triple-difference setting (specifications 3 and 4) with the log median annual wage of full-time employees as the dependent variable. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. The control group contains the firms which disclose the compensation of the CEO before 2003 (i.e., {2000, 2001, 2002}). The treatment group contains the firms which do not disclose the compensation of the CEO before 2003, but do disclose it in the year 2006. The independent variable *Treatment* equals 1 when an observation is in the treatment group. *Post*-2006 equals 1 when the year is in or after 2006. *CEO-board ratio* is the percentage that the CEO earns more than the board average compensation. We use the White (1980) robust standard errors clustered at the firm level. The t-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)			
	(1)	(2)	(3)	(4)
Treatment × Post-2006 × CEO-board ratio			0.303***	0.348***
			2.92	3.03
Treatment × Post-2006	0.124***	0.115***	0.000	-0.021
	3.26	3.28	0.01	-0.36
Treatment × CEO-board ratio			-0.279***	-0.307***
			-3.32	-3.35
Post-2006 × CEO-board ratio			-0.170**	-0.229***
			-2.39	-2.65
Treatment	-0.029	-0.037	0.075***	0.075**
	-1.04	-0.99	2.77	2.23
CEO-board ratio			0.232***	0.273***
			3.33	3.48
ROA	-0.124	-0.143	-0.088	-0.108
	-1.05	-1.3	-0.59	-0.78
Price to book ratio	-0.025**	-0.020**	-0.034***	-0.028***
	-2.61	-2.22	-3.35	-2.94
ln(Size)	0.024*	0.009	0.022	0.015
	1.86	0.32	1.49	0.48
Leverage	-0.452***	-0.432***	-0.420***	-0.398***
	-3.53	-3.2	-3.15	-2.91
Union		0.108*		0.124*
		1.88		1.87
ln(#Firm Employees)		0.006		-0.006
		0.19		-0.18
Employee risk		0.172		0.127
		0.7		0.51
ln(#Branch Employees)	0.053***	0.053***	0.057***	0.057***
	4.55	4.59	4.21	4.22
Female %	-0.382***	-0.387***	-0.379***	-0.384***
	-9.21	-9.51	-8.29	-8.73
Low qualified %	-0.008	-0.008	-0.014	-0.014
	-0.11	-0.12	-0.19	-0.2
Qualified %	0.196***	0.191***	0.238***	0.240***
	4.71	4.77	3.94	4
Highly qualified %	0.510***	0.509***	0.511***	0.509***
	12.62	12.92	10.36	10.7
German %	0.222***	0.222***	0.194***	0.188***
	4.9	4.93	4.27	4.35
Manager %	0.05	0.053	0.071**	0.074**
	1.61	1.64	2.24	2.27
White-collar %	0.176***	0.180***	0.160***	0.163***
	5.38	5.36	4.98	4.95
Employee age	0.003*	0.003*	0.003	0.003
	1.77	1.8	1.46	1.49
Close to head	0.017	0.018	0.018	0.019
	1.3	1.38	1.36	1.42
Time, region, industry dummies	Yes	Yes	Yes	Yes
Adjusted R^2	0.619	0.62	0.631	0.632
Number of observations	82751	82751	65517	65517

TABLE 6

Difference-in-difference with yearly interaction terms

This table presents results for regressions in a difference-in-difference setting with yearly interaction terms. The dependent variable is the log median annual wage of full-time employees. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. The control group contains the firms which disclose the compensation of the CEO before 2003 (i.e., {2000, 2001, 2002}). The treatment group contains the firms which do not disclose the compensation of the CEO before 2003, but do it disclose in the year 2006. The independent variable *Treatment* equals 1 when an observation is in the treatment group. *Post*-2005 equals 1 when the year is in or after 2005. We use the White (1980) robust standard errors clustered at the firm level. The t-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)	
	(1)	(2)
Treatment × 2000	0.042	0.051
	0.84	0.99
Treatment × 2001	-0.084*	-0.065
	-1.8	-1.3
Treatment × 2002	-0.109**	-0.103**
	-2.32	-2.29
Treatment × 2003	-0.076	-0.069
	-1.23	-1.2
Treatment × 2004	-0.034	-0.029
	-0.79	-0.68
Treatment × 2005	0.029	0.035
	0.9	1.02
Treatment × 2006	0.043	0.045*
	1.6	1.67
Treatment × 2007	0.088***	0.087***
	3.43	3.14
Treatment × 2008	0.113***	0.111***
	4.97	4.94
Treatment × 2009	0.147***	0.144***
	6.14	5.56
Treatment	0.015	0
	0.39	-0.01
ROA	-0.114	-0.132
	-0.97	-1.22
Price to book ratio	-0.025***	-0.020**
	-2.67	-2.28
ln(Size)	0.024*	0.009
	1.86	0.3
Leverage	-0.451***	-0.431***
	-3.5	-3.17
Union		0.107*
		1.87
ln(#Firm Employees)		0.007
		0.2
Employee risk		0.174
		0.71
Establishment variables	Yes	Yes
Industry, state, and year FE	Yes	Yes
Adjusted R^2	0.619	0.62
Number of observations	82751	82751

TABLE 7

Different sets of fixed effects

This table presents results for regressions with the log median annual wage of full-time employees as the dependent variable. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. The table displays results for regressions with different sets of fixed effects. The unreported control variables are the same as in specifications (1), (2), (3), (4), and (5) of Table 3. We use the White (1980) robust standard errors clustered at the firm level. The t-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)				
	(1)	(2)	(3)	(4)	(5)
Firm, year and state fixed effects					
ln(CEO total)	0.019**	0.018**	0.015**	0.016**	0.016**
	2.14	2.45	2.45	2.45	2.36
Adjusted R^2	0.401	0.553	0.550	0.550	0.550
Number of observations	108,589	106,538	104,150	104,149	103,770
Firm, industry, year and state fixed effects					
ln(CEO total)	0.018*	0.017*	0.017**	0.017**	0.017**
	1.91	1.93	2.17	2.10	2.16
Adjusted R^2	0.566	0.646	0.638	0.638	0.638
Number of observations	108,363	106,341	103,961	103,960	103,581
Establishment and year fixed effects					
ln(CEO total)	0.015**	0.016**	0.013*	0.013**	0.013*
	2.18	2.26	1.98	2.00	1.96
Adjusted R^2	0.922	0.926	0.927	0.927	0.927
Number of observations	108,589	106,538	104,150	104,149	103,770
CEO, year and state fixed effects					
ln(CEO total)	0.021**	0.022***	0.020***	0.020***	0.020***
	2.03	2.70	3.25	3.21	3.22
Adjusted R^2	0.401	0.553	0.550	0.550	0.550
Number of observations	108,547	106,496	104,108	104,107	103,770
CEO × firm, year and state fixed effects					
ln(CEO total)	0.021**	0.022***	0.020***	0.020***	0.020***
	2.03	2.70	3.25	3.21	3.22
Adjusted R^2	0.401	0.553	0.550	0.550	0.550
Number of observations	108,589	106,538	104,150	104,149	103,770
Industry × year and state fixed effects					
ln(CEO total)	0.053**	0.048**	0.039***	0.037***	0.037***
	2.04	2.07	3.23	3.29	3.27
Adjusted R^2	0.524	0.620	0.612	0.615	0.617
Number of observations	108,363	106,341	103,961	103,960	103,581
State × year and firm fixed effects					
ln(CEO total)	0.018*	0.017**	0.015**	0.016**	0.015**
	1.97	2.31	2.3	2.36	2.27
Adjusted R^2	0.404	0.554	0.552	0.552	0.552
Number of observations	108,589	106,538	104,150	104,149	103,770

TABLE 8

CEO abnormal total compensation

This table presents results for regressions with the log median annual wage of full-time employees as the dependent variable. The independent variable is the logarithmic CEO abnormal total compensation. We measure the CEO abnormal total compensation using the method adopted by Gillan et al. (2009). The logarithmic CEO abnormal total compensation is the difference between the CEO actual logarithmic compensation and the expected logarithmic total compensation. The expected logarithmic total compensation in (1) and (2) is calculated by regressing the logarithmic CEO total compensation on the *ratio of EBIT to assets (ROA)*, logarithmic firms' total assets, the ratio of assets to firm value (book-to-market ratio), CEO tenure, the two-digit SIC of the firm, and the year of the observation. In (3) and (4), the expected logarithmic total compensation is calculated by regressing the logarithmic CEO total compensation on *total shareholder return (TSR)*, logarithmic firms' total assets, the ratio of assets to firm value (book-to-market ratio), CEO tenure, the two-digit SIC of the firm, and the year of the observation. All independent variables are lagged by one year. The establishment variables are the same as in specification (5) of Table 3. See Table 2 for a detailed overview of variable definitions. We use the White (1980) robust standard errors clustered at the firm level. The t-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)			
0	(1)	(2)	(3)	(4)
CEO abnormal total	0.028***	0.033***	0.029***	0.030***
	3.16	3.89	2.85	2.99
ROA	-0.317*	-0.107	-0.350**	-0.117
	-1.81	-0.79	-2	-0.84
Price to book ratio	-0.018	-0.023**	-0.016	-0.023*
	-1.62	-2.04	-1.43	-1.95
ln(Size)	0.022	-0.006	0.023	-0.007
	1.27	-0.23	1.3	-0.25
Leverage	-0.119	-0.261*	-0.136	-0.265*
	-1.11	-1.88	-1.3	-1.89
Union		0.121*		0.121*
		1.84		1.81
ln(# Firm employees)		0.031		0.032
		1.44		1.44
Employee risk		0.550***		0.546**
		2.71		2.58
CEO ownership		-0.006		-0.004
		-0.12		-0.08
CEO tenure		0.004*		0.004*
		1.99		1.96
ln(# Establishment Employees)	0.044***	0.044***	0.044***	0.044***
	3.64	3.72	3.57	3.65
Female %	-0.262***	-0.275***	-0.264***	-0.279***
	-3.66	-3.66	-3.58	-3.57
low qualified %	-0.016	-0.01	-0.017	-0.012
	-0.29	-0.19	-0.31	-0.22
Qualified %	0.515***	0.511***	0.221***	0.213***
	12.31	13.37	5.73	5.76
Highly qualified %	0.220***	0.212***	0.520***	0.516***
	5.8	5.81	12.01	13
German %	0.255***	0.256***	0.257***	0.258***
	5.31	5.48	5.26	5.44
Manager %	0.022	0.043	0.023	0.043
	0.79	1.5	0.81	1.52
White collar %	0.159***	0.176***	0.160***	0.176***
	6.71	8.43	6.77	8.58
Employee age	0.004**	0.004**	0.004**	0.004**
	2.54	2.59	2.53	2.61
Close to head	0.028**	0.029**	0.030**	0.031**
	2.24	2.22	2.24	2.22
Industry, state, and year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.609	0.614	0.6	0.605
Number of observations	103664	103581	100195	100112

TABLE 9

Envy towards the management team

This table presents results for regressions with the log median annual wage of full-time employees as the dependent variable. The "No disclosure" sample includes all establishment-year observations of firms not disclosing the individual CEO compensation in a given year, i.e., the sample consists of firms that only disclose the aggregated compensation of all members in the management board in a given year. The "Disclosure" sample includes all establishment-year observations of firms disclosing the individual CEO compensation in a given year. Since 2006, the German Corporate Governance Code requires firms to disclose the individual compensation of all management board members. The German Corporate Governance Code still allows the firm not to disclose management board compensation individually, if the firm's annual general meeting approves the non-publication with a three-quarter majority. All independent variables are lagged by one year. The firm variables and establishment variables are the same as in specification (5) of Table 3. See Table 2 for a detailed overview of variable definitions. We use the White (1980) robust standard errors clustered at the firm level. The *t*-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dep. variable:	ln(Wage)					
Sample:	No disclosure all	Disclosure all	Disclosure all	No disclosure before 2006	Disclosure after 2006	Disclosure after 2006
	(1)	(2)	(3)	(4)	(5)	(6)
ln(board total)	0.058**	0.021		0.075**	0.016	
	2.15	1.64		2.56	0.88	
ln(CEO total)			0.099***			0.111***
			3.88			3.82
ln(other total)			-0.080***			-0.101***
			-2.78			-2.8
Firm variables	Yes	Yes	Yes	Yes	Yes	Yes
Establishment variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry, state, year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.569	0.612	0.614	0.569	0.62	0.622
Number of obs.	21287	103960	103960	18746	68442	68442

TABLE 10

CEO compassion

This table presents results for regressions with the interaction term between ln(CEO total) and close-to-headquarter. All independent variables are lagged by one year. See Table 2 for a detailed overview of the variable definitions. We use the White (1980) robust standard errors clustered at the firm level. The t-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)			
	(1)	(2)	(3)	(4)
ln(CEO total)	0.043**	0.036***	0.034***	0.035***
	2.07	3.45	3.51	3.5
Close to head * ln(CEO total)	0.012	0.015	0.015	0.019
	0.81	1	1.04	1.22
ROA		-0.309*	-0.165	-0.116
		-1.86	-1.25	-0.87
Price to book ratio		-0.019*	-0.020*	-0.025**
		-1.82	-1.97	-2.17
ln(Size)		0.008	-0.03	-0.021
		0.48	-1.17	-0.84
Leverage		-0.135	-0.198*	-0.272*
		-1.35	-1.88	-1.97
Union			0.121*	0.128*
			1.92	1.93
ln(# Firm employees)			0.037*	0.032
			1.77	1.55
Employee risk			0.486**	0.504**
			2.26	2.42
CEO ownership				-0.012
				-0.23
CEO tenure	0			0.003*
	0			1.86
ln(# Establishment Employees)	0.045***	0.044***	0.044***	0.044***
	3.65	3.67	3.73	3.72
Female %	-0.279***	-0.261***	-0.273***	-0.273***
	-3.74	-3.68	-3.7	-3.67
low qualified %	-0.012	-0.014	-0.011	-0.009
	-0.2	-0.26	-0.21	-0.17
Qualified %	0.221***	0.220***	0.213***	0.212***
	5.48	5.8	5.85	5.78
Highly qualified %	0.504***	0.513***	0.509***	0.510***
	11.24	12.52	13.4	13.44
German %	0.255***	0.252***	0.251***	0.254***
	5.35	5.27	5.41	5.46
Manager %	0.017	0.025	0.041	0.044
	0.65	0.91	1.55	1.56
White collar %	0.167***	0.161***	0.175***	0.175***
	7.7	6.85	8.32	8.34
Employee age	0.004**	0.004**	0.004**	0.004**
	2.49	2.56	2.6	2.58
Close to head	-0.152	-0.198	-0.202	-0.251
0	-0.69	-0.89	-0.93	-1.11
Industry, state, and year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.618	0.61	0.613	0.615
Number of observations	106341	103961	103960	103581

TABLE 11

Employee turnover

This table presents results for regressions with different employee turnover variables as dependent variables. All independent variables are lagged by one year. See Table 2 for a detailed overview of the variable definitions. We use the White (1980) robust standard errors clustered at the firm level. The *t*-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	Outflow	Outflow white-collar	Inflow	Inflow white-collar
	(1)	(2)	(3)	(4)
ln(CEO total)	-0.023**	-0.016**	-0.041	-0.045
	-2.59	-2.61	-0.58	-0.66
ROA	-0.028	-0.038	-1.18	-1.123
	-0.44	-0.8	-1.04	-1.06
Price to book ratio	0.007	0.006*	0.106	0.108
	1.39	1.84	1.05	1.07
ln(Size)	0.008	-0.005	0.019	0.067
	0.68	-0.63	0.14	0.53
Leverage	-0.094	-0.062*	-1.277	-1.274
	-1.64	-1.76	-1.55	-1.57
Union	0.018	0.009	0.14	0.142
	0.82	0.48	0.61	0.63
ln(# Firm employees)	0.011	0.021**	0.092	0.03
	1.43	2.62	0.74	0.27
Employee risk	-0.158	-0.008	0.607	0.674
	-1.41	-0.08	0.74	0.84
CEO ownership	0.015	0.046*	-0.155	-0.203
	0.4	1.77	-0.47	-0.63
CEO tenure	-0.001	-0.001	-0.003	-0.002
	-1.05	-1.17	-0.54	-0.41
ln(# Estab. Employees)	-0.041***	-0.029***	-0.307***	-0.245***
	-22.7	-9.08	-4.48	-3.51
Female %	-0.043	-0.008	-0.336***	-0.242***
	-1.59	-0.9	-4.51	-3.26
Low qualified %	0.01	0.031*	0.234	0.095
	0.4	1.97	0.66	0.38
Qualified %	-0.031***	-0.01	0.021	-0.007
	-3.16	-0.84	0.12	-0.04
Highly qualified %	-0.028	-0.068***	1.154**	1.049**
	-1.56	-3.91	2.45	2.31
German %	-0.155***	-0.069***	-0.846*	-0.702
	-3.56	-4.8	-1.77	-1.46
Manager %	-0.007	-0.004	0.453	0.484
	-0.27	-0.18	0.73	0.81
White collar %	0.055	0.325***	0.174	0.314***
	1.6	23.51	1.49	2.69
Employee age	-0.002*	-0.001	0.007*	0.006*
	-1.78	-0.99	1.98	1.91
Close to head	0.006	0.005	0.185	0.18
	1.34	1.35	1.36	1.35
Establishment and year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.131	0.395	0.015	0.014
Number of observations	56922	56922	57601	57601

TABLE 12

Timing and alternative measures of CEO compensation

This table presents results for regressions with the log median annual wage of full-time employees as the dependent variable. Panel A displays results for regressions with different time lags for independent variables: (1) no lag, (2) all independent variables are lagged by 1 year (baseline specification), (3) all independent variables are lagged by 2 years, (4) all independent variables are lagged by 3 years, (5) only *ln(CEO total)* is lagged by 1 year, (6) only *ln(CEO total)* is lagged by 2 years. Panel B displays results for regressions when alternative measures of executive compensation are used as independent variables. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. We use the White (1980) robust standard errors clustered at firm level. The *t*-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Panel A: Different time lags

Dependent variable:	ln(Wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(CEO total)	0.021*					
	1.68					
ln(CEO total) (t-1 for all)		0.038***				
		3.71				
ln(CEO total) (t-2 for all)			0.032***			
			3.36			
ln(CEO total) (t-3 for all)				0.039***		
				3.65		
ln(CEO total) (t-1)					0.025**	
					2.27	
ln(CEO total) (t-2)						0.022**
						2.06
Firm variables	Yes	Yes	Yes	Yes	Yes	Yes
Establishment variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry, state, and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.617	0.615	0.606	0.598	0.624	0.62
Number of observations	125173	103581	84815	67029	107880	89112

Panel B: Alternative measurements of top executives' compensation

Dependent variable:	ln(Wage)				
	(1)	(2)	(3)	(4)	(5)
ln(Board total)	0.022*				
	1.68				
ln(Other total)		0.010			
		0.65			
ln(CEO cash)			0.037***		
			2.76		
CEO premium				0.039***	
				5.33	
CEO pay ratio					0.098***
					3.89
Firm variables	Yes	Yes	Yes	Yes	Yes
Establishment variables	Yes	Yes	Yes	Yes	Yes
Industry, state, and year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.600	0.614	0.614	0.616	0.616
Number of observations	125,247	103,581	103,581	102,702	103,581

TABLE 13

Change in CEO compensation and change in employee wages

This table presents results for regressions with the annual change in the median annual wage of full-time employees as the dependent variable. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. The variable *CEO total change* is the annual change in CEO total compensation. We only use the observations where the yearly changes of the numbers of employees at the establishment level is below the 95% percentile. We use the White (1980) robust standard errors clustered at the firm level. The *t*-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	Wage change				
	(1)	(2)	(3)	(4)	(5)
CEO total change	0.005	0.004*	0.004*	0.004*	0.004*
	1.61	1.68	1.74	1.73	1.68
ROA			-0.04	-0.032	-0.026
			-1.42	-1.27	-1.11
Market to book ratio			0.002	0.002	0.001
			1.15	1.45	0.92
ln(Size)			0.001	0.000	0.001
			0.83	0.04	0.33
Leverage			0.008	0.003	0.006
			0.53	0.18	0.3
Union				0.014*	0.011
				1.98	1.59
ln(# Firm employees)				0.000	-0.001
				0.04	-0.17
Employee risk				0.044	0.042
				1.13	1.09
CEO ownership					0.020*
					1.99
CEO tenure					0.000
					0.67
ln(# Estab. employees)		-0.002***	-0.002***	-0.002***	-0.002***
		-4.74	-4.83	-5.1	-5.17
Female %		0.026***	0.024***	0.023***	0.023***
		3.6	3.14	3.03	2.97
Low qualified %		0.023*	0.022*	0.023*	0.023*
		1.88	1.89	1.84	1.88
Qualified %		-0.010***	-0.009***	-0.010***	-0.010***
		-3.58	-3.76	-3.85	-3.84
Highly qualified %		-0.015**	-0.016**	-0.016**	-0.016**
		-2.17	-2.27	-2.3	-2.32
German %		-0.025***	-0.023**	-0.024**	-0.024**
		-2.83	-2.59	-2.58	-2.6
Manager %		-0.029***	-0.030***	-0.029***	-0.028***
		-4.78	-4.51	-4.5	-4.54
White-collar %		0.007***	0.008***	0.009***	0.010***
		3.02	2.86	3.5	4.27
Employee age		-0.001***	-0.001***	-0.001***	-0.001***
		-4.29	-4.32	-4.35	-4.21
Close to head		-0.000	-0.000	-0.000	-0.000
		-0.07	-0.19	-0.12	-0.06
Industry, state, and year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.002	0.005	0.005	0.006	0.006
Number of observations	85,660	85,660	85,546	85,546	85,348

TABLE 14

Robustness checks with additional controls

This table presents results for regressions with the log median annual wage of full-time employees as the dependent variable using additional control variables: (1) Stock return, (2) board size, (3) additional CEO characteristics, (4) R&D to sales, and (5) union variables. All independent variables are lagged by one year. See Table 2 for a detailed overview of the variable definitions. We use the White (1980) robust standard errors clustered at the firm level. The *t*-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Wage)				
	(1)	(2)	(3)	(4)	(5)
ln(CEO total)	0.038***	0.039***	0.036***	0.034**	0.039***
	2.99	3.91	3.23	2.03	4.21
Stock return	-0.008				
	-0.58				
Board size		0.005			
		0.80			
CEO switch			0.002		
			0.14		
CEO age			0.001		
			0.40		
CEO out-hiring			-0.016		
			-0.65		
ln(R&D to sales)				-0.019**	
				-2.29	
IGBAU					0.179**
					2.57
IGBCE					0.109*
					1.77
IGMetall					0.115
					1.48
Verdi					0.133*
					1.81
Firm variables	Yes	Yes	Yes	Yes	Yes
Establishment variables	Yes	Yes	Yes	Yes	Yes
Industry, state, and year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.605	0.615	0.615	0.496	0.615
Number of observations	100,112	103,581	103,574	40,952	103,581

TABLE A1

Robustness check: Regression with other quartiles of employees' wages

Specification (1) to (3) presents results for regressions with the log Q1 annual wage of full-time employees as the dependent variables. Specification (4) to (6) presents results for regressions with the log Q3 annual wage of full-time employees as the dependent variables. In specification (3) and (6), we consider the observations after 2005 only. All independent variables are lagged by one year. See Table 2 for a detailed overview of variable definitions. We use the White (1980) robust standard errors clustered at the firm level. The t-statistics are reported below the estimates. ***, ** and * indicate that the value is significantly different from zero at the 1%, 5% and 10% levels.

Dependent variable:	ln(Q1 Wage)			ln(Q3 Wage)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(CEO total)	0.038***	0.039***	0.045***	0.026**	0.027**	0.029
	3.71	3.76	3.21	2.06	2	1.64
ROA	-0.177	-0.114	-0.248**	-0.126	-0.093	-0.202
	-1.23	-0.75	-2.09	-0.9	-0.72	-1.57
Price to book ratio	-0.015	-0.020*	-0.025**	-0.025**	-0.028**	-0.028**
	-1.53	-1.81	-2.09	-2.45	-2.46	-2.34
ln(Size)	-0.021	-0.012	-0.034	-0.041	-0.028	-0.041
	-0.92	-0.55	-1.39	-1.43	-0.96	-1.27
Leverage	-0.209*	-0.259*	-0.271*	-0.253**	-0.401***	-0.438***
	-1.98	-1.91	-1.83	-2.27	-2.88	-2.78
Union	0.105*	0.106*	0.118**	0.138*	0.158**	0.192**
	1.83	1.75	2.02	1.87	2.05	2.41
ln(# Firm employees)	0.036	0.03	0.051**	0.049**	0.044*	0.058**
	1.65	1.44	2.22	2.2	1.95	2.35
Employee risk	0.433*	0.447**	0.561**	0.513**	0.558**	0.638**
	1.91	2.01	2.36	2.28	2.6	2.62
CEO ownership		0.017	0.046		-0.062	-0.057
		0.35	0.96		-1.24	-1.22
CEO tenure		0.003	0.004**		0.005**	0.005***
		1.61	2.12		2.63	2.96
ln(# Estab. Employees)	0.034***	0.034***	0.040***	0.059***	0.059***	0.066***
	3.03	3.02	3.55	3.99	3.98	4.33
Female %	-0.293***	-0.293***	-0.295***	-0.257***	-0.257***	-0.261***
	-4.14	-4.11	-3.98	-3.37	-3.33	-3.19
low qualified %	0.009	0.012	0.012	0.001	0.005	-0.012
	0.18	0.22	0.23	0.02	0.09	-0.21
Qualified %	0.239***	0.238***	0.236***	0.193***	0.193***	0.192***
	5.84	5.79	5.42	5.89	5.85	5.23
Highly qualified %	0.570***	0.570***	0.562***	0.407***	0.411***	0.405***
	14.86	14.93	14.69	13.08	13.04	12.14
German %	0.253***	0.257***	0.239***	0.246***	0.249***	0.256***
	5.81	5.87	5.13	4.5	4.57	4.45
Manager %	0.038	0.039	0.046	-0.009	-0.005	0
	1.28	1.31	1.4	-0.33	-0.18	-0.01
White collar %	0.155***	0.157***	0.180***	0.183***	0.182***	0.194***
	5.72	5.77	7.45	9.63	9.75	9.57
Employee age	0.006***	0.006***	0.006***	0.002	0.002	0.002
	3.77	3.75	3.43	1.49	1.46	1.06
Close to head	0.035***	0.037***	0.040***	0.023*	0.023*	0.024*
	2.7	2.75	3.18	1.71	1.69	1.93
Industry, state, year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.557	0.559	0.563	0.597	0.599	0.606
Number of observations	107550	107162	70779	93636	93293	61095