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DISCUSSION PAPER SERIES

IZA DP No. 15781

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ABSTRACT

The Gender Pay Gap in the CEOs' Labor Market*

We study the gender pay gap in the labor market for CEOs by analysing 1,174 outsider CEO successions over the past three decades across 18 countries. We find that male and female CEOs receive a similar compensation overall but this masks marked gender differences in the pay structure: namely, women CEOs receive a lower proportion of fixed to total compensation than comparable men. We interpret this outcome as the result of gendered risk preferences, which exacerbate the pay gap when there is bargaining over pay, and contribute a theoretical model of the CEO labor market to formalise this intuition. The model also suggests that a more balanced gender composition in companies' boards can help women close the gap in pay structure—an hypothesis that is empirically supported in our data.

JEL Classification: J16, J31, G39, M59

Keywords: CEO compensation, women CEOs, board diversity, corporate governance

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1. INTRODUCTION

Gender pay differences have been the subject of spirited and at times fraught debate. In recent decades researchers have increasingly focused on differences in compensation in professional and executive labor markets, including for Chief Executive Officers (CEOs) (Bertrand and Hallock, 2001; Edmonds et al., 2017; Frydman and Jenter, 2010). An anomaly has however become apparent: against overwhelming evidence that women typically receive less compensation than comparable men (Armstrong and Taylor, 2020; Blau and Kahn, 2003, 2020; Oostendorp, 2009), there is growing evidence that CEOs, particularly those in the United States, do not experience such penalty (Geiler and Renneboog, 2015; Gupta et al., 2018b; Leszczynska and Chandon, 2019). Arguments are made that this may occur because the CEO role is highly visible and transparent. Therefore boards and investors are careful not to be perceived to discriminate against women (Gupta et al., 2018a). Is the CEO labor market really an exception to the comprehensive evidence found for the rest of the labor market? If so, are there institutional features that explain such a result and that can be replicated to eliminate the gender pay gap?

We address these questions by studying CEO compensation and its composition by gender across several companies and countries. In particular, we investigate whether women and men CEOs receive similar pay and whether this translates to the proportion paid in cash, which is certain, or equity, which is less certain and generally related to performance (Beatty and Zajac, 1994; Palomino and Peyrache, 2013). In doing so we contribute a theoretical model that builds on established evidence about women's lower preference for risk (Croson and Gneezy, 2009; van Veldhuizen, 2022) in the context of firms' external competitive pressures and the nature of CEO compensation and bargaining with overwhelmingly male-dominated boards (Elkinawy and Stater, 2011; Quintana-García and Elvira, 2016; Shin, 2012).

We test the predictions of the model on newly appointed outsider CEOs in 1,147 CEO successions across 18 countries between 1992 and 2018 using company data sourced from Bloomberg matched with CEO and board composition information sourced from Bloomberg, BoardEx and the Standard & Poor's (S&P) Capital IQ databases.

We find no gender differences in the overall level of compensation, a result that is consistent with limited existing evidence (Adams et al., 2007; Bertrand and Hallock, 2001; Bugeja et al., 2012). However, women CEOs receive a lower proportion of their total pay in cash in countries where CEOs negotiate with boards to set their own compensation (Bebchuk and Fried, 2004; Boyd, 1994): the penalty is about 15 per cent in the United States and 23 per cent in the United Kingdom, Canada and Australia. This compositional difference is consistent with evidence of relative differences in bargaining positions and compensation expectations by gender, whereby women are found to have lower reservation wages—hence lower anchors in wage bargaining (Caliendo et al., 2017).

This result may also reflect that prospective women CEOs have fewer outside options relative to men (Babcock and Laschever, 2003; Booth et al., 2003; Nierdele and Vesterlund, 2007), and bargain over wages with male-dominated boards (Dreher et al., 2011; Quintana-García and Elvira, 2016; Shin, 2012). This phenomenon, referred to as "sticky floors" by some literatures, suggests that prospective women CEOs negotiate from a position where their reservation wage is 'stuck' at the lower bounds of accepted ranges for specific CEO positions.

The model predicts that greater board gender diversity can reduce this penalty because it rebalances women's bargaining position with the board (Quintana-García and Elvira, 2016; Shin, 2012). We find strong empirical evidence in support of this hypothesis.

The rest of the paper proceeds as follows: Section 2 summarises the related literature from which the theoretical model is developed. Section 3 discusses the theoretical model.

Section 4 presents the data while the results are discussed in Section 5. Section 6 presents some concluding remarks.

2. LITERATURE

2.1 CEO compensation and gender

CEOs' compensation by gender is studied by a growing literature, typically focusing on public company CEOs in the United States and the United Kingdom. This literature consistently finds no significant gender pay gap for CEOs (Geiler and Renneboog, 2015; Gupta et al., 2018b; Leszczynska and Chandon, 2019) once certain features, such as the transparency and visibility of the CEO role are taken into account (Bertrand and Hallock, 2001; Gupta et al., 2018a).

A smaller international literature finds instead that women CEOs can receive lower total compensation and wage, but the penalty is small (Chen et al., 2022; Keloharju et al., 2016; Lam et al., 2013).

While the determinants of compensation are commonly researched, optimal contracting to managerial power theories of CEO compensation do not explain why gender differences arise (Bebchuk and Fried, 2004; Frydman and Jenter, 2010; Lee and Isa, 2015). As such, the differences found are ascribed to situational circumstances. For instance, in their analysis of over 1,200 CEOs in the United States between 1996 and 2006, Hill, Upadhyay and Beekun (2015), find that women CEOs enjoy a premium, which the authors interpret as the result of female CEOs' relative scarcity (Wernerfelt, 1984). However, more recent analyses based on similar datasets have found no gender compensation differences (Gupta et al., 2018b).

Other studies focus instead on what company characteristics bear most on CEO compensation. Leszcynska and Chandon (2019), who reviewed *Fortune 1000* CEOs in the United States between 2013 and 2017, observe that women CEOs earn more in better ranked

companies and in specific industries such as Finance and Telecommunications (Harrigan, 1981). However, such effects disappear when wider controls for firm size, industry, age and tenure are incorporated (Geiler and Renneboog, 2015).

Chen, Torsin and Tsang (2022) find a modest international CEO gender compensation gap in the analysis of over 10,000 companies across 27 countries: women CEOs earn 3.3 per cent less than men where the difference is observed in the cash-based component of compensation. Further analyses of their data show that it is the developing countries in their sample that drives the difference. In Australia, Canada, the European Union and United States no gender differences in CEO compensation emerge—an observation attributed to different local cultures and practices.

2.2 CEO/board wage bargaining and the composition of CEO compensation

Against the lack of clear results about overall pay differences for CEOs by gender, the composition of compensation is generally under-researched. However, distinct streams of work offer relevant testable hypotheses. Several studies find that the lowest compensation that an individual will be willing to accept a new role (the reservation wage) plays an important role in the determination of both expected (Brown and Taylor, 2013) and realised compensation (van Ophem et al., 2011). Reservation wages contribute to the gender pay gap because they anchor wage bargaining (Caliendo et al., 2017). In other words, employees believe their external market value is associated with their current wage which affects how they bargain when they seek out new positions in the external labor market (ELM) (Jäger et al., 2021). If prospective women CEOs negotiate from a lower reservation wage, then they will likely receive a lower pay offer than comparable men even if they pursue identical bargaining strategies.

A related explanation is the presence of a “sticky floor” whereby women do not pursue as many outside career opportunities as men because they simply do not exist (Booth

et al., 2003; Nierdele and Vesterlund, 2007). This disadvantage in initial conditions is accentuated when women negotiate with predominantly male-dominated board committees, as they may systematically apply out-group bias and gender discrimination (Altonji and Blank, 1999; Dreher et al., 2011; Shin, 2012). The lack of women on boards and in top management teams may therefore disadvantage women executives when it comes to the awarding of compensation (Beckman and Phillips, 2005; Bell, 2005; Quintana-García and Elvira, 2016).

Women CEOs may be also adversely affected in negotiating the structure of their compensation when there are general prejudicial cultural biases against women—a result observed by Chen et al. (2022) in the case of some low-income countries.

Together, these elements suggest that women and men prospective CEOs may negotiate with company boards for their pay package from different bargaining positions. These differences likely affect both the overall level and composition of compensation. However, the visibility of the CEO role and the transparency of paid compensation in company annual reports for public companies may constrain boards and investors to pay particular attention to appear as not discriminating against women CEOs (Gupta et al., 2018a). As a result, boards may be open to offer a similar total compensation, but bargain on its cash vs. equity composition, especially when there are a lack of women directors (Cohen and Broschak, 2013; Dreher and Cox, 2000; Shin, 2012). We formalise these hypotheses in a theoretical model (the essential structure and intuition of the model are given in the next section, whilst details are given in the appendix).

3. A THEORETICAL MODEL OF BARGAINING AND RESERVATION WAGES

Setting the scene

Consider a company that is in the market for a new CEO and assume that the company's board has decided to go to the 'external labor market' (ELM) rather than recruit internally. In the ELM for CEOs, the company can only secure the services of a competent CEO if it offers a competitive package in expected-dollar terms, conditional on certain known parameters such as industry type, company size, and location. Naturally, the company has no reason to pay an amount more than the minimum so long as it can incentivize the new CEO to work in a manner aligned with the company's interests.

Let the value of the CEO's compensation be denoted by: Y, which is a normally distributed random variable reflecting the vagaries of the company's performance and the pay scheme that the company implements (to be discussed below). Specifically, $Y \sim N(\bar{Y}, \sigma_Y^2)$, where $\bar{Y}$ Is the mean value of the package, and σ_Y^2 is its variance.

By assumption, Y is characterized by three variables: the profits of the firm, π (itself a random variable, $\pi \sim N(\bar{\pi}, \sigma_\pi^2)$); the share of profits accruing to the CEO, s; and the proportion of the CEO's package that is in the form of performance bonuses (for simplicity, shares in the company), θ. That is to say: $s\pi = \theta Y$.

Thus, for any given amount of company profits distributed to the CEO, (i.e., for a given amount, $s\pi$), θ describes the composition of the package between cash-salary (the fixed component) and performance-based pay. If $\theta = 0$, then the entire package is paid as cash-salary (with zero performance-based pay); conversely, if $\theta = 1$, then the entire package is paid in the form of performance bonuses (and the cash-salary component is zero). The greater is the proportion of a pay package paid as bonuses, the more aligned are the CEO's and the company's interests.

For analytical convenience, we also use an alternative characterization of the structure of CEO income so that total pay, Y, is the sum of a fixed component, α, and a performance-based component, $s.\pi$ (as defined above) such that: $Y = \alpha + s\pi$. Evidently, $\alpha = (1 - \theta)Y$.

The prospective CEO maximisation problem

The CEO's utility function standardly takes as its arguments the CEO's income and effort, and the CEO's decision program is:

$$\max_{Y,e} \quad U(Y,e) \qquad\qquad s.t. \quad s\pi(e) + \alpha = Y$$

where $U =$ (von Neumann) utility taking as arguments Y (i.e., income as a random variable) and e (effort); s and α are treated parametrically by the CEO, and the 'production function of profits', $\pi(.)$, is known. The optimum is denoted by, (Y^*, e^*).

We define, $\hat{\theta}$ as θ: $s\pi(e^*) = \theta Y^*$.

The company's maximization problem

The company has full knowledge that the CEO will act in the manner just described. Its objective is then to maximize expected profits net of CEO payments by selecting the optimal (profit maximizing) share-payment ratio, s, taking α as given (the optimal amount of α is determined by the bargaining process described below); hence we have for the firm:

$$\max_{s} \quad \mathbf{E}[\pi(e^*) - Y] = \bar{\pi}(e^*) - \bar{Y} = \left(1 - \frac{s}{\hat{\theta}}\right)\bar{\pi}(e^*(s)) \qquad s.t. \quad (Y^*, e^*) = argmax \; U(.)$$

where $\mathbf{E} =$ the expectation operator, and a bar ($\bar{}$) over a random variable denotes its expected value, and $\pi =$ profits (before CEO pay is deducted).

Bargaining

Given the optimizing behavior of both the CEO and the company, the bargaining problem confronting both parties is over how much of the overall compensation package should be paid as cash-salary and how much should be paid as share-bonuses. The resolution of this bargain—coupled with the above-stated optimizing behavior—then fully determines the CEO's package.

The bargaining problem is defined by two boundaries: $\left(\hat{\theta}, e\right)^{min}$ and $\left(\hat{\theta}, e\right)^{max}$.

At $(\hat{\theta}, e)^{min}$, the proportion of the CEO's income paid as share bonuses is at its lowest, the CEO's effort is at its lowest, utility is at its maximum, and net profits is at the minimum level acceptable to the firm (the firm walks away from negotiations at lower levels of profits).

At $(\hat{\theta}, e)^{max}$, the proportion of the CEO's income paid as share bonuses is at its greatest, the CEO's effort is at its greatest, net profits are at their maximum, and utility is at the minimum level acceptable to the CEO.

If the company tries to make an offer with a lower proportion of the cash component of pay than that implied by $(\hat{\theta}, e)^{max}$, then the CEO walks away from negotiations and takes up an outside option (the outside options are: the CEO's existing job (as a senior, non-chief executive), or the set of alternative CEO jobs available in the ELM—the CEO takes whichever option maximizes their utility).

The interests of the two parties are opposed because as the proportion of income paid as bonuses ($\hat{\theta}$) rises from its lower bound ($(\hat{\theta}, .)^{min}$) to its upper bound ($(\hat{\theta}, .)^{max}$), work effort increases, net profits rise, and utility (for the CEO) falls.

Bargaining solutions

When bargaining over this domain, we suppose that as each party approaches their boundary of acceptability ($\hat{\theta} = \hat{\theta}^{max}$ for the CEO, and $\hat{\theta} = \hat{\theta}^{min}$ for the company), their resistance to further movements to those boundaries increases. Equivalently, as each party moves further from their own acceptable limit for $\hat{\theta}$, their bargaining forcefulness is diminished.

A bargaining equilibrium is attained when the bargaining forcefulness of the two parties are equalized. Figure 1 below depicts the situation.

[Insert Figure 1 about here]

Figure 2 shows what happens if the CEO's outside options improve. In that case, the tolerable upper limit for $\hat{\theta}$ falls—i.e., $\hat{\theta}^{max}$ falls from $\hat{\theta}^{max\prime}$ to $\hat{\theta}^{max\prime\prime}$—and the locus of the CEO's forcefulness shifts leftward. The equilibrium level of $\hat{\theta}$ falls—i.e., $\hat{\theta}^{*}$ falls from $\hat{\theta}'$ to $\hat{\theta}''$.

Also, worth noting is the fact that an exogenous improvement in the CEO's bargaining ability will also shift the CEO's forcefulness curve leftwards, resulting in an improved outcome for them.

[Insert Figure 2 about here]

Speaking with greater analytical precision, we can say that in this framework as each participant approaches the lower bound of their acceptable range, their resistance to further diminution in their preferred outcome increases at an exponential rate.

Conversely, as outcomes shift away from the lower bound of acceptability and move into more preferred terrain, forcefulness decays at an exponential rate (where resistance and forcefulness are equivalent but opposite measures of the bargainer's will power: i.e., resistance to being pushed backwards is the negative of forcefulness in pushing forwards).

In the terms of the model, we have:

$$(dF^{f}/F^{f}) = -\lambda^{f} d\hat{\theta}$$

$$(dF^{CEO}/F^{CEO}) = -\lambda^{CEO} d\left(\hat{\theta}^{max} - \hat{\theta}\right) = -\lambda^{CEO} d\eta$$

where F^{f} is the forcefulness or determination or bargaining will-power of the company or firm; λ^{f} is the rate of decay of the forcefulness of the firm as it gets more of its preferred outcome (higher levels of CEO compensation paid as share bonuses); F^{CEO} is the bargaining power of the CEO; and, λ^{CEO} is the rate of decay of the forcefulness of the CEO as they get more of their preferred outcome (lower amounts of compensation paid as bonuses and more paid as cash up front).

Equilibrium

In equilibrium, we have: $F^f = F^{CEO}$; and so:

$$\hat{\theta}^* = \frac{\Phi - \mathrm{K} + \lambda^{CEO}\hat{\theta}^{max}}{\lambda^{CEO} + \lambda^f}$$

where Φ and K are the constants of integration indicating the initial degrees of forcefulness of the company (Φ) and the CEO (K) when they are at their respective boundaries of acceptability.

Thus, we have the following relations:

$\partial\hat{\theta}^*/\partial\lambda^f < 0; \partial\hat{\theta}^*/\partial\lambda^{CEO} > 0$; and $\partial\hat{\theta}^*/\partial\hat{\theta}^{max} > 0$

In other words, the greater is the forcefulness of the company (i.e., the lower is its rate of decay of its bargaining will-power, λ^f), the greater is $\hat{\theta}^*$ (i.e., the greater is the proportion of the overall package paid as bonuses rather than cash-salary).

Conversely, the greater is the forcefulness of the CEO (i.e., the lower is their rate of decay of their bargaining will-power, λ^{CEO}), the lower is $\hat{\theta}^*$ (so more of their package is paid as cash-salary rather than bonuses).

And, finally, the smaller is the maximum bonus-ratio acceptable to the CEO, the lower is $\hat{\theta}^*$. This latter value—i.e., $\hat{\theta}^{max}$—is determined by the expected utility of the outside options available to the CEO as discussed earlier.

Hence, the greater the value of those outside options, the lower is $\hat{\theta}^{max}$, and therefore the lower is $\hat{\theta}^*$.

Testable hypotheses

From this discussion we can derive the following propositions:

- All else being equal, the more forceful a bargainer the company is, the lower will be the cash-salary component of the CEO's package
- All else being equal, the more forceful a bargainer the CEO is, the greater will be the cash-salary component of their CEO package

- All else being equal, the higher the CEO's current package, the greater will be the cash-salary component of their CEO package
- All else being equal, the higher the CEO's expectations are about attaining another CEO job, the greater will be the cash-salary component of their CEO package.

Corollaries

C1. Prospective women CEOs may be disadvantaged in ELM successions because they are likely to negotiate with male-dominated boards (Altonji and Blank, 1999). This bargaining disadvantage may be reduced where there are more women directors on the board. In terms of the theoretical model, a male-dominated board negotiating with a male CEO leads to low Φ and high λ^f resulting in low $\hat{\theta}$ (i.e. low bonus, high base cash salary). For a male-dominated board negotiating with a female CEO, there is high Φ and low λ^f leading to high θ (i.e. high bonus, low base cash salary).

However, where there is greater board gender diversity and a male CEO, there is high Φ and low λ^f leading to high $\hat{\theta}^*$ (i.e. high bonus, low base cash salary). Where the CEO is female, then there is low Φ and high λ^f, resulting in low $\hat{\theta}^*$ (i.e. low bonus, high cash salary).

C2. Comparisons of CEO compensation across countries have shown considerable differences in both the level and structure of compensation because of different national cultures, company ownership and governance structures as well as approaches to taxation and the influence of stock market or bank-based sources of financial intermediation (Core et al., 1999; Greckhamer, 2016). The greater dispersion of arms' length institutional ownership in the Anglo-American institutional model limits a board's ability to directly monitor management (Khurana, 2002). Instead, boards rely on the alignment of CEO/shareholder incentives through equity-based CEO compensation, board independence and a market for corporate control to discipline CEO behaviour (Oxelheim and Randøy, 2005). These

institutional arrangements and corporate governance settings add to a CEO's power to set their own compensation because they can bargain with dispersed arms' length investors. In this context, any gender, bargaining and board diversity effects may be more likely to be pronounced in these national jurisdictional and institutional environments.

By contrast, continental Europe and Asia are considered "insider" or "control-oriented" economic systems (Angblad et al., 2002; Pan and Zhou, 2018; Sapp, 2008). In these institutional environments, companies are often owned and controlled by a smaller number of large private or family shareholding groups and can monitor CEOs directly, with less scope for CEOs to negotiate their own compensation (Luo, 2015; Pan and Zhou, 2018; Sun et al., 2010). Consequently, in these environments, the impact of CEO bargaining and board diversity ties on the structure and composition of CEO compensation may be lessened.

4. DATA AND EMPIRICAL APPROACH

4.1 Data

The empirical analysis uses data sourced from Bloomberg, Compustat, Datastream and BoardEx. Outsider CEOs appointed are identified using Bloomberg yielding a global sample of 1,855 companies.

Compensation data including Salary, Bonus, Stock Granted, Total Value of Options, Option Awards, Total Annual Cash Compensation, Other Annual Compensation and Total Compensation were collected for the full first financial year of the newly appointed CEOs using Bloomberg, Compustat and Datastream (company data) and Bloomberg[1], Execucomp[2] and the S&P CIQ[3] database (CEO compensation).

Information regarding company size and industry sector was based on market capitalisation (US dollars) at the time of data collection along with the relevant Morgan Stanley Capital International (MSCI), Global Industry Classification Standard (GICS) sector to which a company belonged. The MSCI GICS framework incorporates eleven industry

sectors spanning Communication Services, Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Real Estate and Utilities.

The sample incorporates of 18 countries: Australia, Belgium, Canada, China (including Hong Kong), Denmark, Finland, France, Germany, India, Italy, Japan, the Netherlands, Norway, South Africa, Sweden, Switzerland, the United Kingdom and the United States. All companies in the sample are publicly owned and therefore information on CEOs, directors and company characteristics, including CEO compensation, is available.

Biographical and résumé data are drawn from BoardEx using the *Connections* and *Matching* functions. This database also enabled us to identify overlapping tenures at prior employers between the newly appointed, outsider CEOs and members of the board that were actively serving as directors in the year that the new CEO is appointed. Where a prior work connection existed between the new CEO and an individual board director, the CEO was marked as a Connected CEO. If the outsider CEO had been found to have previously worked for the target company, at an earlier stage in their career, and then had subsequently been hired back as a newly appointed outsider CEO, that information is also recorded. Only prior work connections, where a CEO and director overlapped at the same company, are considered relevant. Non-work-related connections, for example studying at the same university during at least some of the same years, are not considered a relevant professional connection.

4.2 Sample

The working sample consists of 1,147 companies with 52 led by women CEOs (5 per cent) and 1,122 by men. 660 companies are headquartered in the United States, 112 in India, 106 in the United Kingdom, 99 in Australia, 49 in Canada, 37 in China (including Hong Kong), 32 in France, 27 in South Africa, 16 in Italy, nine in Switzerland, seven in Germany, six in

Finland, five in Sweden, three in Norway, two in both Denmark and Japan and one each in Belgium and the Netherlands. Most of the sample consists of small- to mid-cap-sized companies with many companies in the Consumer Discretionary, Financials, Health Care, Industrials and Information Technology GICS sectors.

Descriptive statistics and correlations are provided in Table 1 and a summary of average Salary and Total Compensation data by gender and country are provided in Table 2.

[Table 1 about here]

[Table 2 about here]

4.3 Empirical model and estimation

The baseline regression is performed by Ordinary Least Squares (OLS) on the functional form:

$$Y_{it} = \beta_0 + \beta_1 Gender_{it} + \beta_2 Board\ Diversity_{it} + \beta_3 Connected\ CEO_{it} + \beta_4 Board\ Size_{it} + \beta_5 Company\ Health + \beta_6 Company\ Size_{it} + \beta_7 Industry_{it} + C_i + Y_t + e_{it}$$

where:

Dependent variables[4]. Two continuous compensation metrics *Total Compensation* and *Base Salary Ratio* are incorporated as dependent variables in distinct regressions. These are both exclusively focused on the first full-year compensation for the newly appointed incoming CEO. This approach proxies first-year compensation for the incoming CEO's starting compensation on appointment. All compensation values are reported in USD adjusted for inflation to 2019 USD values using International Monetary Fund (IMF) national average consumer price-based per cent change inflation rates (IMF, 2021).

Compensation for non-US CEO successions is converted to USD using the Organisation for Economic Co-operation and Development (OECD), Purchasing Power Parity (PPP) exchange rate index (OECD, 2021).

Underlying measures of compensation that are used to develop the *Base Salary Ratio* dependent variable include Salary[5], defined as the total amount of salary compensation, including compensation that is earned, but for which payment will be deferred.

Total Compensation[6] represents the total amount of compensation the company paid to the CEO or equivalent and includes stock grants, option awards and other compensation such as the use of aircraft, vehicles, 401K payments (United States only), club memberships, insurance, tax reimbursements, and severance amounts. *Total Compensation* is used as a dependent variable and as the denominator in the calculation of the *Base Salary Ratio* dependent variable.

The *Base Salary Ratio* is calculated as Salary divided by *Total Compensation*. It reflects the structure and composition of CEO compensation.

Key independent variable. The key independent variable is the gender of the incoming, externally appointed, CEO. *Gender* is coded as 0 for a man and 1 for a woman.

Control variables

Board Diversity is a continuous variable that accounts for the proportion of women directors on the board.

Connected CEO is a dichotomous variable that controls for whether the incoming, externally appointed CEO has previously worked with at least one member of the board at another company (= 1), and zero otherwise.

Board Size is a continuous variable that represents the total number of directors on the employing company's board.

Company Health is a continuous variable about investors' judgements with respect to the vitality and prospects of the company prior to each new CEO's start. It is calculated as the focal company's market-to-book (MTB) value divided by the relevant GICS sector median MTB at the close of the fiscal year prior to each CEO's start.

Company Size is a categorical variable based on market capitalization at the time of data collection. Categories of *Company Size* are nano-cap (<USD50m), micro-cap (USD50m – USD300m), small-cap (USD300m – USD2b), mid-cap (USD2b – USD10b), large-cap (USD10b – USD200b) and mega-cap (>USD200b).

Industry is a vector identifying the MSCI GICS sector to which the focal company belongs. *Country* is a categorical variable reflecting each of the 18 countries where the focal company is incorporated.

Year is a categorical variable that captures macroeconomic effects.

Limitations include a lack of qualitative data on the backgrounds and experience of incoming outsider CEOs (Withisuphakorn and Jiraporn, 2017). We also lack information on the proportion of independent directors and the presence of compensation committees and details such as company anti-takeover provisions which are known to affect CEO compensation (Core et al., 1999; O'Reilly III et al., 1988; Renneboog and Zhao, 2011).

5. RESULTS

5.1 Baseline model

Results from the OLS estimations are presented in Tables 3 through 7. Results based on the overall sample do not reflect a gender compensation gap in either the level (Table 3) or composition (Table 4) of CEO compensation. This is consistent with the existing empirical evidence about CEOs' overall compensation (Adams et al., 2007; Bertrand and Hallock, 2001; Bugeja et al., 2012; Gupta et al., 2018b).

[Table 3 about here]

[Table 4 about here]

5.2 Propensity score matching (PSM)

A major limitation of the baseline analysis is that the reference group against which the effects are estimated is very dispersed relative to the treated companies. We restrict the

heterogeneity of the comparison group by applying propensity score matching and using a nearest neighbour approach with a 0.2 radius (Thoemmes and Kim, 2011).

This approach reveals gender differences in both the level and structure of CEO compensation. Women CEOs in the United Kingdom, Canada and Australia are paid more overall compensation (refer Table 5; β=.50) in their first full financial year at the new company – a result consistent with the hypothesis that compensation effects are likely to be observed in Anglo-American institutional environments (Corollary C2).

[Table 5 about here]

The PSM estimations also reveal gender differences in the composition of CEO compensation. Women CEOs in the United States (refer Table 6; β=.-15), United Kingdom, Canada and Australia (refer Table 6; β=.-23) are paid lower levels of fixed compensation as a ratio to overall compensation, in line with the model prediction that a pay gap would open in jurisdictions where wage bargaining is more common.

[Table 6 about here]

In contrast, we do not find any gender differences in total compensation or the composition of CEO compensation in 11 countries in Europe, Asia and other developing markets. Nor do we find that greater board diversity plays a significant role affecting CEO compensation or the likelihood of appointing a woman CEO in these environments. These jurisdictional results are consistent with existing evidence that there are boundary conditions that affect CEO/board wage bargaining (Fernandes et al., 2013; Pan and Zhou, 2018; Sun et al., 2010). That is, a country's approaches to corporate governance, embedded within differing institutional structures affect a CEO's ability to negotiate their own compensation. Our evidence is consistent with the hypothesis that in countries that are founded on English common law, possess stock market-based financial systems; maintain independent boards

and dispersed arms' length investors, CEOs are empowered to negotiate their compensation (Angblad et al., 2002; Boyd, 1994; Sapp, 2008).

The results also show that being a Connected CEO is associated with lower overall levels of total compensation but a greater compositional fixed to total compensation ratio (refer Tables 3, 4, 5 & 6). In other words, CEOs who have previously worked with board directors are able to leverage their relationships to enjoy a greater proportion of cash to total compensation.

5.3 Robustness to omitted variable bias

To ensure that these results are robust to omitted variable bias, we apply Oster's method to estimate the amount of unobserved heterogeneity required to nullify the effect of gender as a treatment (Oster, 2019). The results are reported in Table 7, and show that for Models 3, 4, and 5 the coefficients of interest would be nil if unobserved heterogeneity were 8.88 – 88.92 times higher than the variance explained by the observed covariates, which is highly unlikely.

The PSM results presented are therefore robust to omitted variable bias.

[Table 7 about here]

5.4 Board diversity and women CEO compensation

Finally, we carry out an additional analysis focusing on smaller and mid-cap-sized companies (where 32 (62 per cent) of the 52 women CEOs in the overall Pooled sample are located) to test whether the greater gender balance in these companies' board affects the composition of women CEOs' compensation. We find that greater board diversity (= more balanced gender ratio among directors) is associated with increased fixed compensation for women CEOs (Table 8) in the United States (ß=.01) and in the United Kingdom, Canada and Australia (ß=.01).

[Table 8 about here]

Consistent with previous studies (Bugeja et al., 2012; Chen et al., 2022; Matsa and Miller, 2011), we also find that more gender balance in the board is associated with an increased probability of appointing a woman CEO.

6. CONCLUDING REMARKS

Overall, we find that total compensation is similar for male and female outsider CEOs. However, the composition of compensation reveals strong penalties for women. These results do not disappear by adding country fixed effects, implying that national cultural biases do not fully explain the disadvantage women face in the CEO labor market, but can be reconciled considering gender bias in reservation wages and potential bargaining differences that penalise women. Consistent with this reasoning, we develop a theoretical model to show that the more forceful a bargainer the company is, the lower will be the cash-base salary component of the CEO's package. Where the CEO is a less forceful bargainer, as is possible in the case of a woman CEO, she will be paid a lower proportion of cash-base salary.

We also provide novel evidence that a more gender-balanced board is associated with an increased proportion of fixed to total compensation for women CEOs, especially in labor markets where CEOs directly negotiate their pay structure, such as in the United States, United Kingdom, Canada and Australia. This finding complements existing work showing that more board gender diversity positively affects women executives' compensation.

Figure 1
Board & CEO bargaining equilibrium condition

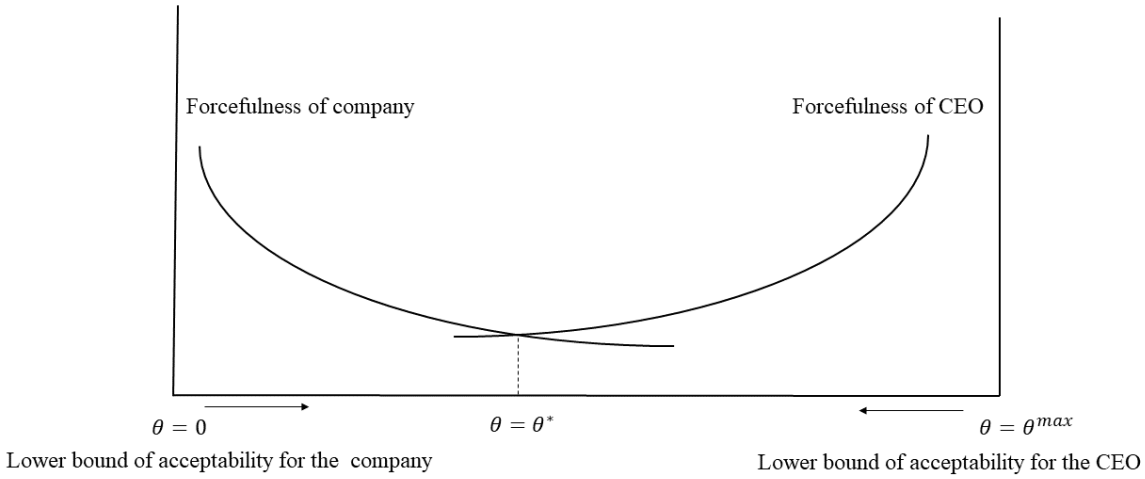

Figure 2
CEO bargaining condition where the CEO has more outside career options

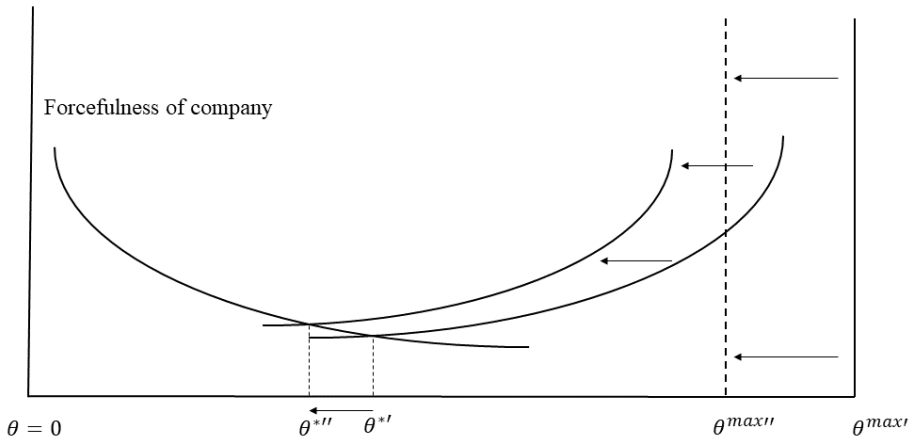

Table 1

Descriptive statistics and correlations

Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Gender													
(2) Board Diversity	.04	.20	1										
(3) Board Size	.11	.15	.12	1									
(4) Connected CEO	6.20	3.35	.02	.16	1								
(5) Company Health	.39	.49	.08	.06	.13	1							
(6) Company Size	.44	.69	.21	.08	.08	-.02	1						
(7) Year	2.42	1.12	.00	.21	.08	.03	.09	1					
(8) Industry	2010	4.98	.06	.17	.22	.01	.12	.00	1				
(9) Country	5.04	2.60	-.02	-.04	-.02	-.01	.02	.08	.01	1			
(10) Total Compensation	17.32	7.20	-.03	-.06	.11	-.02	-.03	-.22	-.15	-.07	1		
(11) Base Salary Ratio	14.38	.79	.02	.10	.30	.03	.06	.32	.20	-.05	.21	1	
	.44	.31	.02	.01	-.18	.01	-.04	-.04	-.20	-.02	-.23	-.73	1

Table 2
Average CEO compensation* by gender and country

Country	Gender	Observations	Salary (USD 2019 values)	Total Compensation (USD 2019 values)
Australia	Female (F)	7	546,742	1,268,265
	Male (M)	92	530,449	1,298,289
Belgium	F	-	-	-
	M	1	845,759	1,885,097
Canada	F	1	724,409	7,894,830
	M	48	529,943	3,517,955
China (inc Hong Kong)	F	3	875,998	2,345,391
	M	34	2,301,117	6,862,239
Denmark	F	-	-	-
	M	2	1,429,059	3,381,500
Finland	F	-	-	-
	M	6	1,257,958	2,765,382
France	F	-	-	-
	M	32	1,025,733	3,228,687
Germany	F	-	-	-
	M	7	1,439,542	4,764,860
India	F	6	2,414,075	2,829,337
	M	106	926,913	1,966,424
Italy	F	2	618,838	2,151,819
	M	14	1,112,501	2,917,603
Japan	F	-	-	-
	M	2	1,104,412	1,104,412
Netherlands	F	-	-	-
	M	1	1,500,966	3,503,645
Norway	F	-	-	-
	M	3	3,400,163	6,295,847
South Africa	F	2	1,566,202	4,714,182
	M	25	1,196,881	3,610,613
Sweden	F	-	-	-
	M	5	601,186	936,664
Switzerland	F	-	-	-
	M	9	1,505,083	6,975,688
United Kingdom	F	6	890,699	3,098,406
	M	100	854,390	2,967,459
United States	F	25	680,268	3,827,811
	M	635	619,716	3,712,569
Total dataset	F	52	930,481	3,246,204
	M	1,122	766,309	3,359,516

*reported in constant 2019 USD values. Compensation for non-US CEOs has been converted to USD using the Organisation for Economic Co-operation and Development, Purchasing Power Parity exchange rate. All compensation values have been inflated to 2019 values using the International Monetary Fund national average consumer price-based per cent change inflation rates.

Table 3
Comparative first full fiscal year Total Compensation for women outsider CEOs by geographic region.

Model 1: Total Compensation **Variables**	**Pooled**	**United States**	**Anglo-American[a]**	**Europe[b] & Rest of World[c]**
Gender (Women)	.11 (.09)	.03 (.09)	.03 (.09)	.11 (.23)
Board Diversity	-.00 (.00)	-.00 (.00)	-.00 (.00)	-.00 (.00)
Connected CEO	-.02 (.04)	-.10* (.05)	-.06 (.04)	.25* (.10)
Board Size	.03** (.01)	.03 (.01)	.05** (.01)	.06** (.01)
Company Health	.02 (.03)	-.03 (.04)	-.01 (.03)	.13 (.05)
Company Size	.38** (.02)	.40** (.03)	.36** (.02)	.19** (.05)
Country dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations (companies)	1,174	660	914	260
R^2	.41	.45	.39	.30

[a] Australia, Canada, the United Kingdom & United States; [b] Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden and Switzerland; [c] Brazil, China (inc Hong Kong), India, Japan & South Africa. All regressions apply the OLS estimator to data winsorized at the 2nd & 98th percentiles for the relevant indicator (dependent variable). The robust standard error of the point estimate is reported in brackets—the significance levels utilize two-tailed tests except the constant.
$^{+}p < .10$
$^{*}p < .05$
$^{**}p < .01$

Table 4
Comparative first full fiscal year Base Salary Ratio for women outsider CEOs by geographic region.

Model 2: Base Salary Ratio **Variables**	**Pooled**	**United States**	**Anglo-American[a]**	**Europe[b] & Rest of World[c]**
Gender	.01 (.03)	.00 (.04)	.01 (.04)	.09 (.08)
Board Diversity	.00* (.0)	.00 (.00)	.00 (.00)	.00 (.00)
Connected CEO	.02 (.02)	.04* (.02)	.01 (.02)	.07 (.05)
Board Size	-.00 (.00)	-.00 (.00)	-.01 (.00)	.00 (.01)
Company Health	-.01 (.01)	.01 (.01)	-.00 (.01)	-.03 (.02)
Company Size	-.09** (.01)	-.12**	-.09** (.01)	-.05** (.02)
Country dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations (companies)	1,174	660	914	259
R^2	.32	37	.24	.35

[a] Australia, Canada, the United Kingdom & United States; [b] Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden and Switzerland; [c] Brazil, China (inc Hong Kong), India, Japan & South Africa. All regressions apply the OLS estimator to data winsorized at the 2nd & 98th percentiles for the relevant indicator (dependent variable). The robust standard error of the point estimate is reported in brackets—the significance levels utilize two-tailed tests except the constant.
†p < .10
*p < .05
**p <.01

Table 5
Comparative first full fiscal year Total Compensation for women outsider CEOs by geographic region with PSM[a]

Model 3: Total Compensation Variables	**Pooled**	**United States**	**Anglo-American[b]**
Gender	.34 (.26)	.32 (.33)	.50* (.24)
Board Diversity	-.02 (.02)	-.04 (.02)	-.02 (.02)
Connected CEO	-.25 (.20)	-.46† (.25)	-.27 (.22)
Board Size	.01 (.02)	.05 (.04)	.02 (.03)
Company Health	-.14 (.29)	-.57 (.45)	-.11 (.36)
Company Size	.43** (.08)	.37** (.09)	.26** (.05)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations (companies)	155	99	121
R^2	.56	.49	.55

[a] Calipers set at 20 per cent of the standard deviation of the logit. [b] Australia, Canada, the United Kingdom & United States, All regressions apply the OLS estimator to data winsorized at the 2nd and 98th percentiles for the relevant indicator (dependent variable). The robust standard error of the point estimate is reported in brackets—the significance levels utilize two-tailed tests except the constant.
†p < .10
*p < .05
**p <.01

Table 6
Comparative first full fiscal-year Base Salary Ratio for women outsider CEOs by geographic region with PSM[a]

Model 4: Base Salary Ratio **Variables**	**Pooled**	**United States**	**Anglo-American[b]**
Gender	-.14 (.11)	-.15[†] (.08)	-.23[*] (.09)
Board Diversity	.01 (.01)	.01 (.01)	.01[†] (.01)
Connected CEO	.11 (.08)	.22[*] (.01)	.19[*] (.08)
Board Size	.02 (.02)	-.01 (.01)	-.02 (.01)
Company Health	.04 (.12)	.11 (.16)	.15 (.13)
Company Size	-.09[**] (.02)	-.09[*] (.03)	-.05[*] (.02)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations (companies)	149	95	118
R^2	.64	.50	.22

[a] Calipers set at 20 per cent of the standard deviation of the logit. [b] Australia, Canada, the United Kingdom & United States, All regressions apply the OLS estimator to data winsorized at the 2nd and 98th percentiles for the relevant indicator (dependent variable). The robust standard error of the point estimate is reported in brackets—the significance levels utilize two-tailed tests except the constant.
[†]$p < .10$
[*]$p < .05$
[**]$p < .01$

Table 7
Oster bounds for OLS regressions

Oster bounds[a]	Pooled	United States	Anglo-American	Europe & Rest of World
Model 1				
Delta	32.61	-4.71	-11.34	1.14
(Beta is set to zero)				
Model 2				
Delta	0.75	0.06	-1.93	-17.43
(Beta is set to zero)				
Model 3[b]				
Delta	5.31	-33.24	8.88	N/A
(Beta is set to zero)				
Model 4[c]				
Delta	17.17	88.92	70.97	N/A
(Beta is set to zero)				
Model 5[d]				
Delta	5.45	10.47	5.85	-1.72
(Beta is set to zero)				

[a] R^2 maximum was set at 33 per cent higher than the actual R^2 for each OLS model (reported in Tables 2 to 5); [b] based on regressions with PSM set at .20; [c] based on regressions with PSM at .20; [d]regression results available from the authors on request.

Table 8
Board diversity and its effect on women's CEO compensation by geographic region based on a sub-sample of smaller companies by geographic region

Model 6: Base Salary Ratio **Variables**	**Pooled**	**United States**	**Anglo-American[a]**
Gender & Board Diversity	.01 (.01)	.01[†] (.00)	.01[†] (.00)
Connected CEO	.02 (.02)	.05[*] (.03)	.02 (.02)
Board Size	-.01 (.01)	.01 (.01)	.00 (.00)
Company Health	-.01 (.01)	.02 (.01)	.01 (.01)
Company Size	-.14[**] (.02)	0 (omitted)	0 (omitted)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations (companies)	1,174	502	661
R^2	.27	.21	.18

[a] Australia, Canada, the United Kingdom & United States; All regressions apply the OLS estimator to data for the relevant indicator (dependent variable). The robust standard error of the point estimate is reported in brackets—the significance levels utilize two-tailed tests except the constant.
[†]p < .10
[*]p < .05
[**]p <.01

NOTES

[1] CEO compensation data were gathered manually from a Bloomberg terminal at the UNSW Sydney, Main Library for those companies outside the S&P 1000 index in the United States and not available from the S&P CIQ dataset. For international companies outside of the United States, all compensation data were converted to USD using the OECD PPP index. All compensation data was inflated to 2019 USD values using IMF national average consumer price-based per cent change inflation rates.

[2] CEO compensation data for those companies in the S&P 1000 index in the United States were collected from Execucomp. All compensation data were inflated to 2019 USD values using IMF national average consumer price-based per cent change inflation rates.

[3] CEO compensation data for companies outside the S&P 1000 index in the United States and for those in all other countries were sourced from the S&P CIQ database. For international companies outside of the United States, all compensation data were converted to USD using the OECD PPP index. All compensation data were inflated to 2019 USD values using IMF national average consumer price-based per cent change inflation rates.

[4] Log transformations of the *Total Compensation* and *Base Salary Ratio* dependent variables are performed, given the underlying measures are both zero bound. Compensation data has been winsorized at the 2nd and 98th percentiles. A *Variance Inflation Factor* test revealed no evidence of significant multicollinearity between the variables. *White* and *Breusch-Pagan* tests indicated some observed heteroskedasticity, most likely caused by the non-random nature of the sample. In light of the observed heteroskedasticity, the *Huber/White Sandwich Estimator* (using the Stata *robust* command) is applied.

[5] Salary is defined as the total amount of salary compensation, including compensation that is earned, but for which payment will be deferred.

[6] Total Compensation includes stock grants, option award and other compensation such as the use of aircraft, vehicles, 401K payments (United States only), club memberships, insurance, tax reimbursements and severance payments.

APPENDIX

In this appendix we deepen our explanation of the model in section 3.

We begin by recalling the CEO's decision problem:

$$\max_{Y,e} \quad U(Y,e)$$

$$s.t. \quad s.\pi(e) + \alpha \geq Y$$

The maximand, which is expressed in terms of von Neumann utility, can also be expressed using a Bernoulli utility function. If we let u denote Bernoulli utility, and suppose that the (Bernoulli) utility function is separably additive over dollar values (y) and rate of effort (e), then we can write in a standard way:

$$U(Y,e) = \mathbf{E}[u(y,e)] = \mathbf{E}[u_1(y) + u_2(e)] = \mathbf{E}[u_1(y)] + u_2(e) = u_1(y^c) + u_2(e)$$

Where $y^c =$ the certainty equivalent of Y. It is natural to assume that: $u_{1y} > 0$, $u_{1yy} < 0$, $u_{2e} < 0$, $u_{2ee} > 0$.

To complete the characterization of the CEO's behavior, we observe that the CEO has outside options available which are for them to return to their existing job (as a senior, non-CEO) or to take their chances seeking another CEO job. The utility of the former option is denoted by $U(.)_0$; and the utility of the latter option is given by the expression:

$$\mathbf{E}[u(.)]_{\neg 1} = \mathbf{E}\,[u(y,e)]_{\neg 1}$$

The subscript, $\neg 1$, denotes the fact that the expectation is taken over all the available CEO jobs other than the one currently under consideration (which is indexed as: 'CEO position no.1'). Thus, the CEO forms expectations about the probability of getting another CEO job and calculates the expected utility of those alternative CEO positions. The utility delivered by the employment conditions of the current CEO job offer must exceed the expected utility of alternative CEO jobs for which the CEO can apply. Those conditions must also exceed the potential CEO's current package. Hence, the utility of the job offer must satisfy:

$U(Y, e) \geq \max\ \{U(.)_0, \mathbf{E}\ [u(.)]_{\neg 1}\}$

The company's objective is to maximize expected profits net of CEO payments. Hence, we have the maximand for the company:

$\mathbf{E}[\pi - Y] = \bar{\pi}(e) - \bar{Y} = \bar{\pi} - \left(\frac{s}{\theta}\right)\bar{\pi} = \left(1 - \frac{s}{\theta}\right).\bar{\pi}$

Where we assume that: $\bar{\pi}_e > 0$, $\bar{\pi}_{ee} = 0$, i.e., effort increases profits linearly.

We suppose that the company has a threshold level of net profits that it wishes to obtain:

$\mathbf{E}[\pi - Y] \geq \mathbf{E}[\pi - Y]_0 > 0$

The company's decision program assumes that the CEO has control of the CEO's rate of effort (e), and the CEO is presumed to choose that rate of effort to optimize their utility function above. The company then aims to set the share of profits to be paid as bonuses so as to maximize profits:

$\max_s\ \ \left(1 - \frac{s}{\bar{\theta}}\right).\bar{\pi}(e^*(s))$

$s.t.\ \ (Y^*, e^*) = argmax\ \ U(.)$

This program describes the situation for any given value of $\alpha \geq 0$.

We suppose that for any increase in α, the value of s that solves the firm's decision program, s^*, falls (which is to say that as the fixed component of a CEO's pay rises, the optimal share of profits paid to the CEO falls). Moreover, as α rises, the CEO's rate of effort falls (owing to reduced incentive to work as s falls); and utility rises. Profits net of CEO pay falls as gross profits decline faster than the (expected value of the) CEO's income.

The boundaries for the bargaining problem confronting the CEO and the company are then defined as follows. For the CEO, there is a minimum acceptable utility for the CEO, defined by the equality: $U(Y, e) = \max\ \{U(.)_0, \mathbf{E}\ [u(.)]_{\neg 1}\}$. This level of utility is associated with the effort level, $e^{max} = e\colon (e = e^*\ |\ s = s^*, \alpha = \alpha')$ where α' is the level of α which

ensures that $U(Y^*, e^*) = \max\ \{U(.)_0, \mathbf{E}\ [u(.)]_{\neg 1}\}$. Conversely, e^{min} is the minimum amount of work that is consistent with minimum acceptable profits being earned by the company (i.e., $\mathbf{E}\big[\pi(e^{min}) - Y\big] = \mathbf{E}[\pi - Y]_0$).

We consider different states corresponding to situations of: 1) maximum bargaining power for the company; 2) maximum bargaining power for the CEO; and, 3) an 'interior' solution reflecting some bargaining power for each participant.

Case I: the company acts as a monopsonistic buyer of CEO services

In this case, the company has all the bargaining power and acts to maximize its net profits subject to the participation constraint set by the CEO. Specifically, the company takes the above two-stage optimization program (where the CEO maximizes utility, and then the company maximizes net profits taking the CEO's behavoiur into account), and selects $\hat{\theta}$ so as to maximize profits subject to meeting the CEO's participation constraint:

$$\max_{\hat{\theta}} \quad \left(1 - \frac{s^*}{\hat{\theta}}\right).\bar{\pi}(e^*(s^*))$$

$$s.t. \quad U(Y^*, e^*) \geq \max\ \{U(.)_0, \mathbf{E}\ [u(.)]_{\neg 1}\}$$

In words, the company dials in $\hat{\theta}$ to the point where the CEO's boundary condition is satisfied as an equality. At that point, the company will extract the maximum feasible work effort from the CEO and its profits will be (conditionally) maximized.

Now consider the opposite extreme, where the CEO has all the bargaining power.

Case II: the CEO acts as a monopoly supplier of CEO services

In this case the CEO gains a degree of freedom, and the decision program is:

$$\max_{\hat{\theta}} \quad U(Y^*, e^*; \hat{\theta})$$

$$s.t. \quad \mathbf{E}[\pi^* - Y^*] \geq \mathbf{E}[\pi - Y]_0$$

In words, the CEO chooses the least work and highest cash-payment combination consistent with the two-stage decision program; and they thereby select the lowest profit

consistent with the company's boundary constraint. The pair of values that satisfies the profit constraint is denoted by $\left(\hat{\theta}, e\right)^{min}$.

Case III: bilateral bargaining over the compensation for the delivery of CEO services

In this scenario, neither player is in a position to make a take-it-or-leave-it offer to the other party. Instead, they must engage in a bilateral bargaining process to determine a mutually agreeable outcome. This is the situation described in section 3. In that section we had the following set of differential equations:

$(dF^f/F^f) = -\lambda^f . d\hat{\theta}$

$(dF^{CEO}/F^{CEO}) = -\lambda^{CEO} . d\left(\hat{\theta}^{max} - \hat{\theta}\right) = -\lambda^{CEO} . d\eta$

Integration of both equations gives:

$\ln F^f = -\lambda^f . \hat{\theta} + \Phi$

$\ln F^{CEO} = -\lambda^{CEO} . \eta + \mathrm{K} = -\lambda^{CEO} . \left(\hat{\theta}^{max} - \hat{\theta}\right) + \mathrm{K}$

We suppose that the constants of integration satisfy: $\Phi \approx \mathrm{K}$, i.e., the company and the CEO are equally firm in resisting the breach of their boundary conditions.

In equilibrium, we have: $F^f = F^{CEO}$ at $\hat{\theta}^*$; hence, solving the (logarithmic) equations yields:

$$\hat{\theta}^* = \frac{\Phi - \mathrm{K} + \lambda^{CEO} . \hat{\theta}^{max}}{\lambda^{CEO} + \lambda^f}$$

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