Tournament Incentives and Firm Performance: Does Gender Matter?

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In this study, we integrate two approaches to understand non-CEO executives' response to CEO tournament incentives: tournament theory and gender role theory. Given the increasing number of firms that are becoming gender diverse in their top management team, we examine whether the association between tournament incentives and firm performance is dependent of non-CEO executives' gender composition. Using 3,160 firm-year observations in the U.S. from 2007 to 2016, we provide evidence that tournament incentives are motivational for all-male teams whereas such incentives do not work in mixed-gender teams. In additional analyses, we find that sub-group's tournament incentives in mixed-gender team are motivational but only under specific conditions (e.g., female executives' tournament incentives in mixed-gender team have motivational effect only when the CEO is a female). These empirical findings confirm the differences in males' and females' behavioural responses to competition found in laboratory experiments and field studies, indicating that tournament incentives are beneficial only when a firm's non-CEO executives consist of single gender individuals, with implications for the design of executive compensation.

Keywords: tournament incentives, non-CEO executives, gender, firm performance

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1. Introduction

The problem that modern corporations have been facing since the separation of ownership from control is how to incentivize their top executives to improve firm performance (Patel, Li, del Carmen Triana, & Park, 2018). Considerable research suggests that one of the powerful means to incentivize them is the compensation contract (Bizjak, Brickley, & Coles, 1993; Li, Yang, & Yu, 2015). A by-product of this contract is the compensation gap between the CEO and non-CEO executives in firm's top management team, known as the tournament incentives (Kale, Reis, & Venkateswaran, 2009; Kini & Williams, 2012). To date, a large body of literature addresses the effect of this tournament incentives on firm outcomes (e.g., Burns, Minnick, & Starks, 2017; Kale et al., 2009; Pissaris, Heavey, & Golden, 2017; Shen & Zhang, 2018). While an increasing number of firms have recently become gender-diverse in their top management team, little study considers the gender composition of the non-CEO executives (NCEOs hereinafter) who compete in a rank-order tournament. Bertrand and Hallock (2001), for example, find that only 2.5% of the five highest paid executives are women in their sample of large U.S. firms for years 1992-1997. However, in 2017 women held 23% of the senior roles in the U.S. firms (Grant-Thornton, 2018, p. 11).[1] Given the important role played by female executives, our study aims to examine whether, and if so, how the tournament incentives are affected by the NCEOs gender composition.

According to the tournament theory (Lazear & Rosen, 1981), the greater the tournament incentives, the stronger the motivation among the NCEOs to be promoted to the position of CEO. Based on this notion, prior studies implicitly or explicitly assume that regardless of NCEOs' gender composition, tournament incentives drive them to put forth high level of effort, resulting in a positive effect on firm performance.[2] However, gender role theory (Eagly, 1987) suggests that men and women are beholden to specific behavioural characteristics. Male exhibits greater competitive social values whereas female demonstrates cooperative ones (Sauers & Bass, 1990). These gender prescriptions not only determine how men and women behave at workplace but also affect how others perceive such a behaviour (Smith et al., 2013). Findings from laboratory experiments and field studies are largely consistent with these differentiations. For instance, men are found to be more aggressive in the

[1] In our sample, 32.41% of the firms have at least one female in a team of four highest paid non-CEO executives.

[2] According to Sauers and Bass (1990) tournament like competition can affect performance through four mechanisms: increase in effort; effective goal setting; development of appropriate strategies; and greater commitment to goals. However, in this study we build our arguments and explain results from the lens of the first mechanism (i.e., increase in effort) because this idea is consistent with the prediction of Lazear and Rosen's (1981) tournament theory.

tournament (Booth & Yamamura, 2018) and they have a higher preference to choose tournament-style compensation than women. In Niederle and Vesterlund (2007), 73% of the male participants select tournament compensation scheme while only 35% of the women made this choice in a task of adding up sets of five two-digit numbers. Similar difference in choosing tournament pay scheme is also documented in other experimental studies (e.g., Nabanita D. Gupta, Poulsen, & Villeval, 2005). Providing that these differences exist among the top executives in corporations, our broad conjecture is that the effect of tournament incentives on firm performance may not have even effect on a team of gender-diverse NCEOs. This study examines such a likelihood by classifying CEO tournaments into two groups: single-sex and mixed-sex.[3]

Our hypotheses are grounded on the interaction of tournament and gender role theory and are tested using a sample of 3,160 firm-year observations in the U.S. over the periods 2007 to 2016. Results support our prediction that gender-composition of the NCEOs' team matters. In particular, we find a significantly positive association between tournament incentives and firm performance in single-sex tournaments. Our results show that a one standard-deviation increase in tournament incentive increases firm performance by 9.79% in the following year. This result is consistent with the prediction of tournament theory. For a mixed-sex tournament, in general, we do not find a significant association between tournament incentives and firm performance which is inconsistent with tournament theory. These results are robust to a battery of tests and alternative explanations. Overall, our findings are consistent with the gender role theory that males are highly competitive in all-male group but they change their competitive orientation in mixed gender environment (e.g., Antonovics, Arcidiacono, & Walsh, 2009; Aries, 1976).

In additional analyses, we find that tournament incentives in mixed-sex contest works for a subgroup of executives under specific conditions. For instance, tournament incentives faced by female executives are positively related to firm performance only when the CEO is a female. We, however, find no such effect of CEO gender in single-sex tournaments.

We present the following possible explanations to our findings based on the related literature. *First*, our general explanation is that the NCEOs' behaviour of exerting high level of effort in CEO promotion tournaments

[3] Due to the absence of observations in our sample where all of the four highest paid NCEOs are female, we define a tournament as single-sex if all of the NCEOs are male; and as mixed-sex if at least one of them is a female.

differ according to their gender composition. This explanation is consistent with the differential effect of incentive travel contest on heterogeneous and homogeneous team of employees found in Backes-Gellner and Pull (2013). *Second,* male NCEOs extend their effort in response to tournament incentives when their team members are all-male. This could be because all-male setting creates greater pressure to establish oneself and a greater threat to one's identity, resulting in an increasing attempt to achieve power (Aries, 1976). Since the CEO position is associated with greater pay and power, male executives find no option but to exert high level of effort to win the tournament. *Third,* female executives either perform worse, or do not participate in a mixed-sex tournament. Therefore, although male executives are motivated to perform better, presence of female in the tournament increases their probability of winning and reduces motivation to work harder, resulting in no effect of tournament incentives. This is consistent with Aries (1976) that male shows little competitive behaviour in mixed-sex group than in single-sex settings.

This study contributes to the literature and to practice. *First,* while the impact of gender composition of participants in contests is recognized in laboratory experiments (e.g., Gneezy, Niederle, & Rustichini, 2003; Price, 2008) and in field studies (e.g., Booth & Yamamura, 2018), empirical research on the critical role of gender composition in corporate tournaments is scarce. Our paper fills this void in the literature by investigating the role of NCEOs' gender composition in CEO promotion tournaments. *Second,* while previous research considers tournament and other related theories (e.g., social comparison and equity theory) as mutually exclusive (e.g., Pissaris et al., 2017), ours is one of a limited number of studies that integrate the perspectives of tournament and gender role theories in understanding the effect of tournament incentives on firm outcomes. Such integration helps us to identify conditions under which tournament incentive is effective and under which it is not, an area of research which has had little attention in literature (Bunderson & Van der Vegt, 2018). *Third and finally,* we contribute to the literature in top management team (TMT hereinafter) diversity research. Our finding that the positive effect of gender diversity on firm performance does not come through the tournament incentives channel provides a deeper understanding on why gender diversity is seen as a "tricky issue" for firms to manage (Venkatesh, Challagalla, & Kohli, 2001, p. 13).

The rest of this paper proceeds as follows. In the next section, we introduce our hypotheses. In Section 3, we describe our data and variables measurement; in Section 4, we present our results; and in Section 5, we provide a summary and conclusion.

2. Literature review and Hypotheses

2.1 Theoretical Background

Tournament theory suggests that tournament incentives motivate NCEOs to go up in the hierarchy and enjoy increased pay, power, and prestige at the CEO level. Consequently, they put forth high level of effort, which in turn, results in an increased productivity and performance (Lazear & Rosen, 1981). At the firm level, this theoretical prediction has been supported by a number of empirical studies (e.g., Burns et al., 2017; Kale et al., 2009). However, other empirical studies document that the relationship between tournament incentives and firm performance is negative (Bebchuk, Cremers, & Peyer, 2011; Pissaris et al., 2017), curvilinear (Ridge, Aime, & White, 2015), and insignificant (Bugeja, Matolcsy, & Spiropoulos, 2017). Given this inconsistency in the literature, some studies argue that the association between tournament incentives and firm performance is conditional on firm and CEO characteristics, such as technological intensiveness (Siegel & Hambrick, 2005), industrial homogeneity and CEO age (Kale et al., 2009), and CEO gender (Vieito, 2012).

While the role of CEO characteristics has been heavily investigated, surprisingly little attention has been given to the NCEOs who actually participate in the tournament, especially the gender of the NCEOs. According to the gender role theory, men and women display distinct sets of behaviour (Eagly, 1987). Relative to women, men's characteristics are more associated with agentic behaviour such as assertiveness, dominance, and aggression. In contrast, communal characteristics such as sympathy, gentleness, and submissiveness are more associated with women's behaviour compared to men. Men and women who do not follow their gender-congruent behaviour not only get different evaluation at workplace but also face adverse effects (Dreher, Dougherty, & Whitely, 1989; Smith et al., 2013). For instance, women who engage in self-promotion (which is an agentic behaviour) are perceived as lacking interpersonal skills (Rudman & Glick, 1999) and seen as less likable and less hireable by the employers (Phelan, Moss-Racusin, & Rudman, 2008; Rudman, 1998).

Consistent with these different gender prescribed behavioural norms, laboratory experiments and field studies find a significant difference in men's and women's preferences to participate in tournament like competitions. Although there is no difference in their ability, men show strong positive reaction to competitive incentives (Gneezy et al., 2003) while women are more averse to competition (Croson & Gneezy, 2009) and tend to shy away from tournaments (Nabanita Datta Gupta, Poulsen, & Villeval, 2013; Niederle & Vesterlund, 2007). More important to our study, research finds that male's and female's performance in the tournament is sensitive to their peers' gender. For instance, men's performance (in solving memory games) is highest when they compete with women or when women are present in their team (Ivanova-Stenzel & Kübler, 2011). In a field study on speedboat racers in Japan, Booth and Yamamura (2018) examine how male and female performance and strategies in single-sex races differ from mixed-sex races. They document that women's performance, in terms of time and place in race, is lower in mixed-sex than in all-women races. Laboratory experiments also document that women do perform well but only when their peers are women (e.g., Gneezy et al., 2003). Given these findings, we also expect a difference in male and female NCEOs' competitive response in CEO tournaments depending on their peer' gender.

2.2 Hypothesis development

According to tournament theory, higher tournament incentives can motivate participants to exert a greater level of effort to win the competition. In other words, both male and female executives will work harder to succeed in the tournament when the prize for winning is greater. If tournament incentives indeed motivate NCEOs irrespective of their gender, we expect the positive association between tournament incentives and firm performance to be observed under both the single-sex and mix-sex team of NCEOs. Thus, our first set of alternative hypotheses are proposed as follows:

H_1: There is a positive association between tournament incentives and firm performance in a single-sex tournament.

H_{2a}: There is a positive association between tournament incentives and firm performance in a mixed-sex tournament.

On the other hand, if the gender role theory holds in our corporate setting, we expect a different effect of tournament incentives on firm performance in single-sex and mix-sex tournaments. In single-sex (all-male) tournament, we expect a positive association between tournament incentives and firm performance. Employees in the same gender group tend to show more individualistic behaviour (Wyer & Malinowski, 1972) and an increasing attempts to power and influence (Aries, 1976). Moreover, employees' valences for different rewards are likely to be similar in a single gender group, leading to greater interpersonal competition (Sauers & Bass, 1990). Possibly this is why male and female are incentivized to work harder when they are surrounded by peers of the same gender (e.g., Booth, 2009). Consistent with these arguments, prior research finds that males are better performers when competing against males than when competing in a mixed-gender environment (e.g., Nabanita D. Gupta et al., 2005). This is consistent with males' prescribed (aggressive) behaviour as identified by the gender role theory. Accordingly, we argue that individualistic and interpersonal competitive behaviour is likely to lead all-male team of executives to exert high level of effort in CEO promotion tournament, consistent with H1.

However, tournament incentives might have no effect on firm performance in mixed-sex CEO promotion tournament. According to the gender role theory, male and female have specific role behaviours that are distinct from each other. Research shows that if anyone, especially female, deviates from their gender specific norms then they face adverse effects on their career, for instance, a less likelihood of getting a promotion (Dreher et al., 1989; Smith et al., 2013). Therefore, there could be a tension between male and female executives' reaction and behavioural preferences in mixed-sex tournaments.

Prior research shows females and males react differently in a competitive environment. Females think less than males of power and achievement (Aries, 1976) and they tend to shy away from the competition (Gneezy et al., 2003; Niederle & Vesterlund, 2007). Moreover, females are less aggressive than males in mixed-gender contests (Booth & Yamamura, 2018), whereas showing aggressiveness is important in winning a tournament, such as the CEO promotion ones (Mohan, 2014). Niederle and Vesterlund (2010), for example, document that a gender gap in mathematics performance can be in part explained by the different responses of males and females toward competitive environments. In particular, they argue that in a mixed-sex setting women perform worse under pressure than men in competitive test-taking environments. In this sense, Fryer and Levitt (2010) promote

a single-sex education environment for female students, arguing that it allows girls to be more confident and to be free from stereotypical views of gender roles. Flory, Leibbrandt, and List (2015), for example, find that a compensation package which is heavily based on the individual's performance relative to a co-worker's performance attracts more male job applicants. The sex of job applicants is more balanced when the job is compensated based on team performance or only slightly determined by relative performance of individuals compared to peers' performance. In line with these findings on gender preference for competition, high tournament incentives in the mixed-sex setting would have an adverse effect on performance of female contestants by exerting unnecessarily high pressure on them and causing them to stay away from a competition itself.

On the other hand, male executives in a mixed-sex tournament may still be motivated by high tournament incentives to perform better. However, as argued above, the presence of female executives in the CEO tournament could reduce the intensity of the competition, leaving the contest among the male executives only. This reduction in the number of contestants would result in a higher probability of getting promotion among the males, which may demotivate them from exerting a maximum level of effort (e.g., Orrison, Schotter, & Weigelt, 2004). In addition, the effect of tournament incentives in mixed-sex tournaments may be weaker because of the contestants' risk-preferences. Although males prefer to invest in high-risk high-return projects, females are more averse to risk than males (Croson & Gneezy, 2009). Hence the presence of risk averse female executive(s) in the mixed-sex tournament may not support male executives' decision to invest in risky projects. Hence, tournament incentives could have different impacts on performance of female and male executives, i.e., negative and positive, respectively. This leaves an empirical question on which effect dominates in determining the overall firm performance. Thus, we present a null hypothesis (i.e., no effect of tournament incentives) in a mixed-sex setting and propose H_{2b} as follows.

> H_{2b}: There is no association between tournament incentives and firm performance in a mixed-sex tournament.

3. Data Sources, Variable Measurement, and Sample Description

3.1 The Sample

The sample consists of U.S. publicly listed companies in BoardEx from 2007 to 2016. We start our sample window in 2007 because of the SEC's implementation of CEO's and other four highest paid executives' compensation disclosure requirements in 2006. We obtain firm-level financial data from DataStream and the institutional ownership data from FactSet.

Our initial sample was 5,867 firm-years from 853 unique firms in BoardEx. From this sample, we exclude firms that belong to the utility industry because of their regulatory nature (Ridge et al., 2015).[4] Moreover, we exclude firm-years in which the CEO is not identifiable; BoardEx reports multiple CEOs in a firm-year; and the CEO received zero compensation. We keep only the firm-years for which the CEO's and four[5] highest paid NCEOs' compensation is available. We made this choice in line with the prior studies (e.g., Bugeja et al., 2017; Chen, Huang, & Wei, 2013; Ridge et al., 2015) and to ensures comparability of tournament incentives proxies across firms (Bebchuk et al., 2011). Furthermore, we exclude observations where the median total compensation of the four highest paid NCEOs is greater than the CEO's total compensation (Kubick & Masli, 2016; Park, 2017) as these are unlikely to be a good proxy for tournament incentives (Kini & Williams, 2012).[6] Then, we merge our compensation dataset with other financial data, and drop observations with missing variables. These result in a final sample of 3,160 firm-year observations from 548 unique firms that contain complete data on all variables for our main analyses. Table 1 Panel A reports a summary of this sample selection process.

[Insert Table 1 here]

We define a CEO as the individual who is identified with the title 'Chief Executive Officer' of the firm in BoardEx, and classify all other executives as NCEOs (see Kale et al., 2009). However, this approach of identifying NCEOs' team may include individuals who are actually not a member of the team or may omit members who are part of that team (Henderson & Fredrickson, 2001). Nevertheless, this should not be a serious

[4] Although financial firms are also highly regulated, we do not exclude observations from this industry because research on U.S. banks show that pay gap has an impact on their performance and risk-taking (Chircop, Hass, & Hribar, 2018) which is similar to findings of studies that use samples other than banks (e.g., Kini & Williams, 2012; Ridge et al., 2015). However, our baseline results are robust to excluding observations from financial industry (not reported).

[5] Although taking top four highest paid non-CEO executives' compensation is common in the U.S. tournament incentives literature; we check the robustness of our results by calculating tournament incentives as the difference between the CEO's total compensation and the median of top three highest paid non-CEO executives' total compensation, and find similar results (not reported).

[6] Research shows that tournaments without monetary incentives have significant positive effect on performance possibly because winning a tournament is associated with grater status and social recognition (e.g., see Delfgaauw, Dur, Sol, & Verbeke, 2013). Accordingly, we also run our baseline regression by keeping negative pay gap observations and find similar results (not reported). Note that, in doing so, we use absolute dollar difference in pay gap instead of log transformed value because log transformation of negative pay gap values are not possible.

issue because pay gaps among executives below the rank of CEO is much smaller and remain smaller if more executives are accounted for (Lambert, Larcker, & Weigelt, 1993).

In terms of NCEOs' gender, there could be two categories in single-sex tournament: (i) all-male; and (ii) all-female. Unfortunately, there is no observations in our sample where all of the NCEOs are female. Accordingly, we define a CEO tournament as single-sex if all of the NCEOs are male; and as mixed-sex if at least one of them is a female.[7]

Table 1 Panel B reports the breakdown of our sample by year. TMT positions (excluding the CEO) are male dominated, although the number of firms with at least one female executive in their top management has increased from 27.86% in 2007 to 35.35% in 2016. On an average, 32.41% firm-years had at least one female executive in their NCEOs' team in our sample. Panel C reports the distribution of our sample by two-digit GICS code. The largest sector in our sample is Information Technology (GICS code 45), followed by Consumer Discretionary (GICS code 25). Communication Services (GICS code 50) has the lowest number of observations in our sample. Overall, our sample appears to be evenly spread across the years and industries.

3.2 Variable Measurement

3.2.1 Measure of Tournament Incentives

We measure tournament incentives as the difference between the CEO's total compensation and the median[8] of four highest paid NCEOs' total compensation (Haß, Müller, & Vergauwe, 2015; Jia, 2017; Kale et al., 2009; Shen & Zhang, 2018). Because of skewness, following the previous studies we transform the absolute dollar difference in compensation into log as our main measure of tournament incentives (Jia, 2018; Kale et al., 2009; Phan, Simpson, & Nguyen, 2017). Total compensation of an executive is the sum of short-term and long-term compensation. Short-term compensation includes payment in the form of salary and bonus; while long-term compensation consists of value of restricted stock, stock options and other long-term incentive payouts.

3.2.2 Measure of Firm Performance

[7] Our baseline results remain qualitatively similar if we define a tournament as mixed-sex if at least two of the NCEOs are female (not reported).
[8] Our results are robust to using average compensation of the four highest paid NCEOs (not reported).

In this study, we use return on assets (ROA) to proxy for the firm's performance. ROA "captures the dimension of performance that is more closely related to top management team functioning" (Ridge et al., 2015, p. 624). It has widely been used as a measure of firm's financial performance in TMT (Georgakakis, Greve, & Ruigrok, 2017) and tournament incentives research (e.g., Banker, Bu, & Mehta, 2016; Pissaris et al., 2017). We define ROA as the firm's net income before extraordinary items and preferred dividends divided by total assets. As we focus on the effect of top-level executives' incentives on firm performance, we do not use any market-based performance measures since such measures are subject to forces that are beyond the executives' control (Georgakakis et al., 2017).

3.2.3 Control Variables

We include a number of control variables that are found to have an impact on firm performance or tournament incentives. We categorize these control variables into three broad categories: governance-; firm-; and executive-level characteristics.

We control for several governance related characteristics that might affect firm performance. Long-tenured CEO asserts particular influence on firm's strategies (Henderson & Fredrickson, 2001) which in turn affects firm performance (Kale et al., 2009). The CEO tenure (*CEO_TEN*) is measured as the number of years since the CEO took office (Fredrickson, Davis-Blake, & Sanders, 2010). Similarly, CEOs holding the position of board chair have greater influence over the corporate strategies and decisions (Hart, David, Shao, Fox, & Westermann-Behaylo, 2015). This greater influence could be beneficial or detrimental to firm performance (Yang & Zhao, 2014). Thus, we control for CEO duality (*CEO_DUAL*), coded as 1 if the CEO is also the chair of the board, 0 otherwise (Fredrickson et al., 2010). In addition, the CEO age (*CEO_AGE*) can be connected to managerial ability and firm's success (Cline & Yore, 2016).

We also include insider ownership[9] (*INSIDER_OWN*) and institutional ownership (*INST_OWN*) in our analyses. When managers held a large faction of total shares outstanding, they are likely to take decisions that maximize their and other shareholders' wealth (i.e., firm value). However, there may be an entrenchment effect which could affect firm performance negatively (Gugler, Mueller, & Yurtoglu, 2008). Similarly, institutional

[9] Similar to Burns et al. (2017), we took the percentage of insider ownership from DataStream.

investors have the incentive and expertise to impose additional monitoring mechanisms on firm's management. This additional monitoring is likely to result in improved firm performance. However, institutional investors could be short-term investors or index followers. In this case, they may take the passive role and institutional ownership may not be related to firm performance (Elyasiani & Jia, 2010). Board size (*BOD_SIZE*) is measured as the total number of directors serving on the firm's board, and board independence (*BOD_IND*) is calculated as the ratio of outsider directors to total board members (Al-Najjar, Ding, & Hussainey, 2016). Earlier studies show that board size and board independence are associated with the level of tournament incentives (Burns et al., 2017), agency costs and firm performance (Al-Najjar et al., 2016; Liu, Miletkov, Wei, & Yang, 2015).

We control for several firm-level characteristics as well. Prior studies show that there is a link among firm size, tournament incentives, and firm performance. Firm size (*FIRM_SIZE*) is measured as the natural logarithm of total assets (Jaskiewicz, Block, Miller, & Combs, 2014). We also include firm's leverage (*LEV*) and capital expenditure intensity (*CAPEX*) in our regression model. Leverage is defined as the ratio of firm's total debt to total assets (Al-Najjar et al., 2016); and capex intensity as the ratio of capital expenditure to total assets (Bebchuk et al., 2011). Firm's cash ratio (*CASH_RATIO*) may have an impact on firm performance (Burns et al., 2017). We measure cash ratio as the firm's total cash divided by total assets. Firm performance could also be affected in the year when a new CEO takes the office (Pissaris et al., 2017). We control for this effect by adding a dummy variable (*NEW_CEO*) that equals to 1 if a firm experience a change in CEO in a firm-year, 0 otherwise. Because current year firm performance may be correlated to last year's performance (Ridge et al., 2015), we include control for prior year's financial performance (*PRIOR_PERF*) as well. Moreover, TMT's compensation level (Shi, Connelly, & Sanders, 2016) and firm performance (Burns et al., 2017) are likely to be affected by its market value. We measure a firm's market value (*MAR_VALUE*) as the year-end share price multiplied by the number of shares outstanding.

In addition, executive-level controls are added in our analyses. Employees working in a firm not only compare their compensation with employees within the same firm but also with employees from other similar competing organizations. Therefore, employees may adjust their efforts and cooperation based on whether they are underpaid or overpaid relative to employees of similar other firms (Ridge, Hill, & Aime, 2017). This adjustment is likely to affect firm performance as well (Pissaris et al., 2017). Therefore, we control for the

NCEOs' market pay (*MAR_PAY*), measured as the median of the NCEOs' median pay for firms in the same two-digit GICS code and same size quartile (excluding the focal firm).[10] We also include pay dispersion (*PAY_DIS*), measured as the coefficient of variation in pay among the NCEOs. Research shows that pay dispersion among the NCEOs create within-group comparisons and feelings of inequity (Ridge et al., 2017), which affects firm performance (Pissaris et al., 2017; Ridge et al., 2015). NCEOs' average tenure (*NCEOs_TEN*) exhibits their eligibility to be promoted to the CEO position, and it may impact firm's strategies and performance (Ridge et al., 2015). Finally, NCEOs compensation level (NCEOs_PAY) is measured as the median of their total compensation. It is possible that highly performing firms pay higher compensation to their executives, and thus any observed association between tournament incentives and firm performance could be an artefact of their compensation levels (Fredrickson et al., 2010).

3.3 Summary Statistics and Correlation

Table 2 presents summary statistics of all our variables for the full and sub-samples. All continuous variables are winsorized at the 1st and 99th percentile levels to minimize the effects of outliers.[11] In the full sample, on an average, a firm has a PAY_GAP of 6.82.[12] The average firm has ROA and firm size of 6.02% and 7.08[13], respectively. CEO holds the position of board chair in 69% of firms. On average, CEO in our sample is 56.8 years old and has been the CEO of the firm for 4.9 years.

[Insert Table 2 here]

Compared to the sample in single-sex tournament, tournament incentives in mixed-sex tournament is significantly higher. This result is consistent with the gender pay gap literature that female executives in the TMT receive less compensation than their male colleagues do (see Carter, Franco, & Gine, 2017; Perryman, Fernando, & Tripathy, 2016). Hence, presence of female executive results in a higher pay gap between the

[10] We measure non-CEO executives' market pay at two-digit GICS rather than four-digit GICS because there are limited observations in each four-digit GICS when we distribute the observations per size quartile and year.
[11] Our baseline results are robust to not winsorizing the variables.
[12] This is comparable to 7.1 in Haß et al. (2015) and 7.37 in Kubick and Masli (2016).
[13] ROA in this study is comparable to 6.43% in Ridge et al. (2015) and firm size to 7.24 in Kubick and Masli (2016).

NCEOs' team and the CEO.[14] However, relative to single-sex sample, mixed-sex sample firms have lesser CEO and NCEOs tenure but there is no difference in their performance, firm size and other control variables.

Table 3 presents correlation matrix for the full sample. Of our particular interest is the positive and significant correlation between tournament incentives proxy (PAY_GAP) and firm performance (ROA). This implies that higher tournament incentives lead to greater firm performance. We check for multicollinearity by running ordinary least squares (OLS hereinafter) regression (excluding year and industry dummies), and find an average VIF of 1.49 with a highest value of 3.29 for firm size.[15] The VIF of our variable of interest, PAY_GAP, is 1.50. Therefore, multicollinearity does not appear to be an issue in our analyses.

[Insert Table 3 here]

3.4 Data Analysis

Our objective is to examine the association between tournament incentives and firm performance in single-sex and mixed-set tournaments. Accordingly, we estimate the following baseline regression model for the full sample but also for the single-sex and mixed-sex sub-samples to compare if accounting for NCEOs team's gender-mix in CEO promotion tournament makes a difference.

$$\begin{aligned} ROA_{i,t} = a &+ \beta_1 PAY\ GAP_{i,t-1} + \beta_2 CEO\ TEN_{i,t} + \beta_3 CEO\ DUAL_{i,t} + \beta_4 BOD\ SIZE_{i,t} + \beta_5 BOD\ IND_{i,t-1} \\ &+ \beta_6 CEO\ AGE_{i,t} + \beta_7 NCEOs\ TEN_{i,t} + \beta_8 FIRM\ SIZE_{i,t} + \beta_9 MAR\ VALUE_{i,t} + \beta_{10} LEV_{i,t} \\ &+ \beta_{11} CAPEX_{i,t} + \beta_{12} NEW\ CEO_{i,t} + \beta_{13} INST\ OWN_{i,t} + \beta_{14} INSIDER\ OWN_{i,t} \\ &+ \beta_{15} CASH\ RATIO_{i,t} + \beta_{16} PAY\ DIS_{i,t-1} + \beta_{17} PRIOR\ PERF_{i,t} + \beta_{18} MAR\ PAY_{i,t-1} \\ &+ \beta_{19} NCEOs\ PAY_{i,t-1} + Year\ Dummies + \varepsilon \ldots \ldots \ldots (1) \end{aligned}$$

Where ROA is a proxy for firm performance. PAY_GAP refers to the tournament incentives, calculated as the difference between the CEOs' total compensation and the median of four highest paid executives' total compensation. All the other variables are defined in Appendix A. Subscript *i* is the firm identifier, and *t* is the year. In Equation 1, our key variable of interest is the coefficient of PAY_GAP. According to the tournament

[14] Because male and female CEOs are remunerated at the similar levels (Bugeja, Matolcsy, & Spiropoulos, 2012), presence of female receiving lower compensation in the NCEOs' team would result in a higher pay gap irrespective of the CEO gender.
[15] The average VIF in single-sex and mixed-sex tournament sample is 1.49 and 1.56, respectively.

theory, we expect its coefficient be positive and statistically significant in both the single- and the mixed-sex tournaments. However, tournament incentives may have differential and offsetting effects on male and female executives' performance in mixed-sex tournaments, leading to a non-significant coefficient of PAY_GAP overall.

Following prior studies (e.g., Burns et al., 2017; Kale et al., 2009; Ridge et al., 2015), we control for governance, firm, and executive level characteristic. We also control for year fixed-effects by including year-dummies to account for the intertemporal variation. Hausman test comparing random effects and fixed effects estimators suggest that the use of fixed effects estimators is appropriate. In all the models, we compute heteroscedasticity-robust standard errors, clustered at firm level.[16]

To control for a reverse causality problem, we lag our tournament incentives proxy, PAY_GAP, by one year (noted as *t-1*) in all our regression model. Similar to PAY_GAP, we use a one-year lag for three of our compensation related control variables: MAR_PAY, PAY_DIS, and NCEOs_PAY. Firm performance (i.e., ROA) and all other variables are assessed at the focal year *t*. Although using lagged independent variable alleviates the issue of endogeneity to some extent, it may not eliminate it entirely (Kini & Williams, 2012). To account for this possibility, we run robustness tests by using an instrumental variables (IV hereinafter) approach, and a change specification in Section 4.3.2.

4. Results

4.1 Main Results

Table 4 presents the results of baseline model (1). Column 1 reports the regression results for the full sample while Column 2 and 3 represent results for the single-sex and mixed-set tournament, respectively. In Column 1 and 2, the coefficient of PAY_GAP is positive and significant at the 1% level. The coefficient of PAY_GAP is also economically significant where one standard-deviation increase in PAY_GAP leads to around 9.52% increase in ROA for the full sample and 9.79% increase in ROA for firms where the team of NCEOs

[16] We do not compute heteroscedasticity and autocorrelation consistent (HAC) standard errors because Arellano and Bond (1991) test for serial correlation in our instrumental variables regression for both the single-sex and mixed-sex tournament sample fails to reject the null hypothesis that the disturbance terms are not serially correlated.

consists of all-male.[17] These results are consistent with the tournament theory (Lazear & Rosen, 1981). Therefore, we find support to our hypothesis 1. The coefficient of PAY_GAP in Column 3, however, is statistically insignificant. These different results between the single- and mixed-sex groups are not consistent with the prediction of tournament theory (Lazear & Rosen, 1981) but support the gender role theory. Our results indicate that tournament incentives have no effect on overall firm performance if the team of NCEOs is gender-diverse, supporting H2b.[18] This is possibly because the tournament incentives' differential effects on performance of different gender executives (i.e., negative for females and positive effects for males) offset each other, leading to a non-significant change in firm performance overall. Moreover, upon the heightened competition in single-gender team male executives may pursue high-risk and high-return investment strategies, whereas in a mixed-sex team female executives, whose risk preferences are generally lower than their male counterparts, may curb excessive risk taking by male executives.

[Insert Table 4 here]

With respect to the control variables, we find that firm's size, institutional ownership, and leverage are significantly negatively associated with ROA, which are in line with the earlier studies (e.g., Al-Najjar et al., 2016; Kale et al., 2009; Pan, Huang, & Gopal, 2018). One possible explanation for the negative relation between firm size and performance could be the change in firm's objective function from profit maximization to the managerial utility maximization due to agency problems. As tightly monitoring the managerial decisions becomes harder for bigger firms, the agency problems may be higher for larger firms (see Amato & Wilder, 1985 for detailed discussion). The negative relation between institutional ownership and performance could be because of the presence of short-term investors who take passive role rather than actively monitoring the firm's management (Elyasiani & Jia, 2010). Consistent with prior studies (Burns et al., 2017; Ridge et al., 2015), we

[17] In single-sex tournament sample, our results suggest that a one standard-deviation increase in PAY_GAP results in a higher increase in ROA compared to the same standard-deviation increase in NCEOs compensation, which is around 6.73% [(3.83*0.1010/5.75].

[18] In contrast to ours, Bebchuk et al. (2011) use industry adjusted ROA to proxy for firm performance, possibly because of the decision-making power the CEOs have on firm's operations and financing (Rouen, 2019, in press). Empirical studies indeed find that higher tournament incentives leads to greater real activities manipulation (e.g., Park, 2017). Therefore, we follow Bebchuk et al. (2011) and replace ROA by the 2-digit GICS adjusted ROA as the dependent variable in our baseline regression. We find that our results of a positive and statistically significant relation between tournament incentives and firm performance in single-sex tournament, and an insignificant relation of the same in mixed-sex tournament continue to hold (not reported).

find a positive and statistically significant relationship of firm's market value and prior year's ROA with current year's ROA. Table 4 also posits that higher cash holding leads to better firm performance but only in mixed-sex tournament sample. Research finds that female executives tend to hold more cash within their firms than their male counterparts (Zeng & Wang, 2015). Higher cash holding can result in greater firm value (Phan et al., 2017) possibly through investing in profitable projects without raising external funds at high transaction costs (Martínez-Sola, García-Teruel, & Martínez-Solano, 2011).

4.3 Additional Tests

In this section, we present a number of robustness tests of our main results including alternative ROA measures, endogeneity controls and propensity score matching (PSM). Furthermore, this section presents additional tests to check various explanations for our results.

4.3.1 Alternative ROA measures

In our baseline regression, we find a positive effect (no effect) of tournament incentives of year *t* on firm performance at *t+1* for the single-sex (mixed-sex) tournament sample. However, because of the competitive environment tournament incentives create, its effect on executives' behaviour and hence on firm performance may persist for a longer period to time than just in one subsequent year. Accordingly, we regress PAY_GAP of year *t* on the subsequent two-, three-, four-, and five-year ahead ROA.[19] In untabulated results, we find that our observed association between tournament incentives and firm performance in the single-sex and mixed-sex tournament sample continues to hold for these long-term ROA measures.

4.3.2 Endogeneity

The endogeneity has always been a major concern in studies examining executives' compensation. As prior studies suggest, the board of directors takes into account firm performance in determining executives' compensation (Hermanson, Tompkins, Veliyath, & Ye, 2012). Therefore, there could be a potential feedback effect of firm performance on CEO's and NCEOs compensation as well as on their pay gap. To mitigate this

[19] This reduces the sample to 1,165 and 637 observations in the single- and mixed-set tournaments, respectively, at t+5.

concern we use one-year lag value of our independent variable of interest (i.e., PAY_GAP). This approach, however, may not entirely eliminate the endogeneity (reverse causality) concern (Kini & Williams, 2012). In addition, although we include a number of controls in our baseline regressions, there could be other unobservable factors that may affect the pay gap and firm performance at the same time. To address these possible endogeneity problems, we follow two approaches.

Our first approach is the IV method. We estimate IV regression treating the tournament incentives proxy, PAY_GAP, as endogeneous. In our analysis, we use three instruments. Given that the level and structure of executive compensation varies by firm size and industry, we use the industry executive compensation after adjusting for size effects. Following Kale et al. (2009), our first instrument, *IND_PAY_GAP*, is calculated as the median PAY_GAP for firms in the same two-digit GICS code, year and size quartile as the firm, excluding the focal firm.

We define our second instrument, *DIF_TSEXP*, as the difference between the CEO's tenure minus the average of NCEOs' tenures in years with the current job position in the focal firm. Prior studies document that executives' compensation increases with the increase in their task-specific experience (e.g., Slaughter, Ang, & Fong Boh, 2007). Given this, difference in CEO's and NCEOs' task-specific experience should be positively associated with their PAY_GAP. Our third and final instrument is the number of NCEOs reported by a firm, *#NCEOs*. As the number of NCEOs increases, individual executive's probability of winning the tournament declines. With this declining probability, a large pay gap is required in order to keep them motivated. Hence, the more the number of employees in the pool of contestants, the larger the tournament prize is (Bebchuk et al., 2011). We define *#NCEOs* as the number of executives, excluding the CEO (Kini & Williams, 2012; Phan et al., 2017) reported in BoardEx in a firm-year.

[Insert Table 5 here]

Table 5 represents the first- and second-stage results for the IV regressions. In the second-stage regressions, our main variable of interest, PAY_GAP, is replaced by its fitted value from the first-stage regression. The coefficients of the individual instruments in Column 1 and 3 are statistically significant in the

first-stage regressions, except for #NCEOs in mixed-sex tournament sample.[20] Furthermore, the *F*-statistics (unreported) at the first-stage regression are all greater than 10 and statistically significant at the 1% level. These suggest that our instruments are individually relevant. In Column 2, difference in Sargan *C*-statistic rejects the null hypothesis that our tournament incentives measure is exogenous to firm performance. This suggests that the estimations using OLS results can be biased and the IV approach is more appropriate. In Column 4, the difference in Sargan *C*-statistic fails to reject the null hypothesis that our tournament incentives measure is exogenous to firm performance, indicating that the OLS results are still reliable in this case. The Shea partial R^2 values and the *F*-statistic provide further support for the joint relevance of our instruments in the first-stage regressions and confirm that our instruments are not weak. Further, we present the Hansen *J*-statistic of over-identifying restrictions to test the validity of our instruments. In all the models, the Hansen *J*-statistic fails to reject the null hypothesis that our instruments are valid and their exclusion from the main model is appropriate.

In Table 5 we find that our results are consistent with Table 4 that the coefficient of our instrumented variable, PAY_GAP, for the single-sex tournament sample (Column 2) is positive and statistically significant at the 5% level, whereas it is still not significant in the mixed-sex tournament sample (Column 4).

Our second approach to the endogeneity problem is a change analysis. Specifically, we regress the change in firm performance (ΔROA) against the change in tournament incentives (ΔPAY_GAP), controlling for the changes in all control variables (ΔControls) and year fixed effects. In addition to using IV method, this approach has been widely used in tournament incentives literature to address the concern of endogeneity (e.g., Chen et al., 2013; Jia, 2017, 2018). Columns 1 and 2 in Table 6 present the results. The coefficient of PAY_GAP is positive and statistically significant at the 5% level in the single-sex tournament sample only, consistent with our main results.

[Insert Table 6 here]

4.3.3 Propensity Score Matching

[20] This is consistent with Vieito (2012) who finds that the determinants of tournament incentives in male and female CEO led firms are different.

One concern is that the different results for single- and mixed-sex groups are driven by the difference in characteristics of the two samples. As noted in our summary statistics (Table 2), single-sex tournament sample is statistically different from mixed-sex sample in some of its firm-, governance-, and executive-level characteristics. These differences could lead to a dissimilar relation between tournament incentives and firm performance that we observe earlier. To test if this concern is present, we rerun our baseline regression using a propensity score matching technique.

To construct a matched sample, we first estimate a logit regression for each firm-year separately. The dependent variable in the logit regression is single-sex dummy equals to 1 if the firm's team of NCEOs consists of all-male, and 0 if at least one of them is a female. The independent variables include all the explanatory variables from our baseline model excluding our experimental variable. This logit regression generates a predicted probability of having a single-sex team of NCEOs for each firm-year. We then match (without replacement[21]) each treatment firm (firm with all-male team of NCEOs) with a control firm (firm with mixed-sex team of NCEOs) having the closest propensity score and using a caliper of 0.02.[22] This procedure results in a sample of 902 matched pairs (1,804 firm-year observations). In unreported *t* test, we find no statistically significant difference between the treatment and control groups in terms of their firm-, governance-, and executive-level characteristics after matching.

Using the matched sample, we rerun our baseline regression model for both the single-sex and mixed-sex tournaments. Column 3 and 4 in Table 6 present the results. The coefficient of PAY_GAP in the single-sex tournament sample in Column 3 is positive and statistically significant at the 1% level. However, the coefficient of PAY_GAP for the mixed-sex sample in Column 4 is not statistically significant. These results corroborate our earlier evidences, and confirm that the differences in characteristics between the single- and mixed-sex tournament samples do not drive our observed association between tournament incentives and firm performance.

[21] Although matching without replacement results in superior performance than matching with replacement (Austin, 2014), it may result in lower-quality matching and smaller sample size (Shipman, Swanquist, & Whited, 2017). Therefore, we also match pairs with replacement and find similar results (not reported).

[22] Although various algorithms can be used to match pairs, it is recommended that a caliper width equal to 0.2 of the standard deviation of the propensity score not only minimizes the mean square error of the estimated treatment effect but also eliminates 98% of the bias in estimator (Austin, 2011a, 2011b). Therefore, we match pairs using a caliper of (0.2*0.093) = 0.02 where 0.093 represents the standard deviation of the propensity scores. However, our results are robust to using a caliper of 0.01 and 0.05, as well as without using any caliper (not reported).

4.3.4 Effect of Sub-Group Incentives in Mixed-Sex Tournament

In our previous analyses for the mixed-sex tournament sample, we find no association between tournament incentives and firm performance. However, the effect of tournament incentive faced by male executives could be different from the female executive in such a tournament. Accordingly, in this section we re-examine the association between tournament incentives and firm performance by calculating PAY_GAP between the CEO and male NCEOs (PAY_GAP_M), and between the CEO and female NCEOs (PAY_GAP_F) separately. We also examine the moderating effect of CEO gender (CEO_GEN[23]) for both of these sub-groups as well as for the single-sex tournament sample. Table 7 presents the results.

[Insert Table 7 here]

In Column 1, the coefficient of PAY_GAP_M is positive and significant at the 10% level but PAY_GAP_F is not statistically significant. However, when we introduce an interaction of CEO gender in our model, the coefficient of PAY_GAP_M becomes significantly negative while the coefficient of PAY_GAP_F turns into positive and marginally significant (Column 2). These results suggest that in mixed-sex tournaments, tournament incentives motivate a subgroup of executives under specific conditions. In particular, tournament incentives faced by male NCEOs does enhance firm performance but this effect reduces significantly if the incumbent CEO is a female. Similarly, tournament incentives faced by female NCEOs enhance firm performance only if the incumbent CEO is a female. These results confirm the findings of Vieito (2012) that CEO gender has an impact on the association between tournament incentives and firm performance. We, however, find no such differential effect of CEO gender in single-sex tournament sample (Column 3).

4.3.5 Presence of Female and the Effect of Tournament Incentives in Mixed-Sex Tournament

In explaining our result of the mixed-sex tournament sample, we argue that while tournament incentives motivate male NCEOs to pursue high-risk and high-return investment projects, the presence of female in that team whose risk preferences are generally lower than the males curb investing in such projects, leading to an offsetting and insignificant effect of tournament incentives on firm performance. If this argument is true then the

[23] CEO_GEN is a dummy variable equals to 1 if the CEO is a female, and 0 if male.

effectiveness of tournament incentives in a team with two female executives is expected to be less pronounced than in a team with one female executives. In this section, we test this prediction first by creating a dummy variable named MMFF equals to 1 if two of the top four highest paid NCEOs are female, and 0 if only one of them is a female; and then by introducing an interaction of MMFF with the tournament incentives proxy (i.e., PAY_GAP). To account for the effect of the differences in sample size (843 vs only 181 observations) and characteristics between the control and treatment groups, in addition to the full sample analysis we use propensity score matched sample. To construct a matched sample, similar to our approach in Section 4.3.3 we run a logit regression using all the explanatory variables from our baseline regression model and putting MMFF as the dependent variable. We then match (without replacement) each treatment firm with a control firm.[24] Using this matched as well as the unmatched sample, we run our baseline regression model where is the coefficients of PAY_GAP*MMFF is of our interest. To hold our argument, we expect the coefficient of this interaction term to be negative and statistically significant. Table 8 presents the results.

[Insert Table 8 here]

The coefficients of the interaction between PAY_GAP and MMFF for tests on the full and matched sample in Column 1 and 2 are negative and significant at the 10% and 5% level, respectively. This result suggests that the effect of tournament incentives on firm performance in a team with two female executives is significantly lower than that of in a team with only one female, supporting our argument that the effectiveness of tournament incentive reduces with the increase in female executives in NCEOs team who are risk averse in general.

Furthermore, the significantly positive coefficients MMFF in Column 1 and 2 are of our particular interest. These coefficients suggest that increasing gender diversity in NCEOs team enhances firm performance. Therefore, we conclude that although tournament incentives are not effective under gender diverse team of NCEOs, gender diversity in such a team has a positive effect on firm performance, possibly through other channels such as reduced agency costs (Jurkus, Park, & Woodard, 2011) and increased job satisfaction (Venkatesh et al., 2001). Therefore, we provide evidence on why gender diversity has been seen as a tricky issue for firms to manage (Venkatesh et al., 2001).

[24] This time we did not use any caliper because of the small sample size.

4.3.6 Alternative Measure of Tournament Incentives and Firm Performance

Our proxy for the tournament incentives, PAY_GAP, could be affected by the firm's size (Burns et al., 2017; Park, 2017). For instance, larger firms may pay higher compensation to their CEOs, resulting in greater tournament incentives. In addition, larger firms could also be highly profitable. Therefore, our may observe a spurious relationship between tournament incentives and firm performance driven by firm size. This effect can be controlled for by using the 2SLS method with IV presented in Section 4.3.2. To further rule out the size effect, we employ an alternative measure of tournament incentives, which is calculated in a relative term: CEO pay slice (CPS hereinafter). We define CPS as the percentage of total compensation of the top five executives, including the CEO, which goes to the CEO (Bebchuk et al., 2011).

We also repeat our baseline regression model using an alternative measure of firm' performance: operating income to total assets (OITA hereinafter). OITA is an alternative measure of firm performance used in earlier research (e.g., Al-Najjar et al., 2016; Burns et al., 2017; Denis & Denis, 1995; Huson, Malatesta, & Parrino, 2004).

In unreported results, we find that our main findings are robust to using CPS as a proxy for tournament incentives, and OITA as a proxy for firm performance both in the single-sex and in mixed-sex tournament samples.

4.3.7 Possible Effect of New CEO Appointment

In calculating PAY_GAP, we did not consider additional rewards or compensation for part of the appointing year in case of new CEOs. In the appointing year, a CEO could get sign-on bonuses and other incentives (Bugeja et al., 2017) or may receive compensation for part of the year only (Bebchuk et al., 2011). Presence of these situations would result in artificially higher or lower size of pay gap (i.e., tournament incentives) and accordingly may affect our results. Therefore, we repeat our baseline model by calculating tournament incentives after excluding those firm-years in which the CEO is appointed. We identify a CEO's appointing year if BoardEx reports the CEO tenure as less than a year. In unreported results, we find that our main findings are robust to the exclusion of CEO appointing year observations.

4.3.8 Alternative Explanations

In the baseline regression, we find an insignificant association between tournament incentives and firm performance in the mixed-sex tournament sample. One explanation of this result is that although tournament incentives motivate male executives to pursue high-risk and high-return investment strategies to increase their likelihood of promotion, the presence of female executives whose risk preference is different to those strategies offsets the overall effectiveness of tournament incentives. In other words, relative to their male colleagues, female executives do not respond to incentives in competitive setting. However, female executives' non-response to tournament incentives could simply be a reflection of 'glass ceiling' and/or absence of 'role models' in the firm.

Under the tournament setting, female executives may not have the incentive to taking high risk strategies that essentially could increase their change of getting promotion because their employing firm has always appointed a male as the CEO, or there is no role model for them in their employing firm. Prior studies suggest that women feel less threatened to compete and they perform well when there are more women in their environment (e.g., Price, 2008). This suggests that female NCEOs are likely to do their best when a female has already broken the glass and reached the CEO position; and when female directors are present on firm's board as their role models. In other words, if the glass ceiling or role model effect is driving our finding of an insignificant association between tournament incentives and firm performance in mixed-sex tournament then we expect this association to be different when the (i) CEO is a female and (ii) firm's board has female representation. In untabulated results, we find that the presence of female CEO and female director on firm's board does not change the insignificant association between tournament incentives and firm performance in mixed-sex tournaments. In such situations, the insignificant association could be driven by the male executives' reduced response to tournament incentives that we observe in Section 4.3.4 when the CEO is a female. Hence, we reject the alternative explanation of our result that the female executives' non-response to tournament incentives in mixed-sex tournaments is guided by the glass ceiling and role model notions.

5. Summary and Conclusion

In this study, our objective is to investigate whether the association between CEO tournament incentives and firm performance is dependent on gender composition of the NCEOs' team. Our hypotheses are grounded on the perspective of tournament theory (Lazear & Rosen, 1981) that predicts a positive association between tournament incentives and firm performance, and of gender role theory (Eagly, 1987) which suggests a difference in men's and women's behavioural response at workplace. Building on these two perspectives, we argue that the association between CEO tournament incentives and firm performance is dependent on gender composition of the NCEOs' team. To test this, we disaggregate our sample into two groups: one, when all of the NCEOs are male (single-sex tournament); and two, when at least one of them is a female (mixed-sex tournament). We hypothesize that tournament incentives are effective in single-sex tournament, however, it may or may not be effective in mixed-sex tournament. We test these hypotheses on a sample of 3,160 firm-year observations in the U.S. publicly listed firms for the periods 2007 to 2016.

By measuring tournament incentives as the pay gap between the CEO's total compensation and the median of four highest paid NCEOs' total compensation in the firm, we find support to our predictions. Specifically, we find a significantly positive association between tournament incentives and firm performance in single-sex tournament but an insignificant association in mixed-sex tournament. These results are robust to a battery of robustness tests. Therefore, we confirm the effectiveness of tournament incentives and the view of tournament theory only when the executives participating in the tournament are all-male. These findings are important not only in understanding the effect of tournament incentives on firm outcomes but also in identifying the condition under which tournament incentives are beneficial, with implications for the board of directors in designing executives compensation.

The results of this study, however, should be viewed in light of some potential limitations. *First*, there could be unobservable factors related to firm's decision to maintain a single-gender or mixed-gender team of NCEOs. Although we use fixed effect regressions and one-year lagged value of our tournament incentives proxy, we cannot completely rule out the possibility that our results are not driven by unobservable factors rather than by the NCEOs' gender-composition. *Second*, women's preference to not bringing their ability into full play in mixed-sex tournament may results from socialization that discourage them from competing with men (Booth, 2009; Price, 2008). Therefore, this lens could also explain our results in mixed-sex tournament. Future research

may examine how social and cultural factors come into play in female NCEOs' response in CEO promotion tournament. *Last but not the least*, the gender proportion in our mixed-sex tournament sample is skewed towards men. Therefore, one should be careful in generalizing our results in mixed-sex tournaments where the team of NCEOs is skewed towards women. As research documents, women respond more positively to competition when a larger fraction of their peers in the team is women (Gneezy et al., 2003; Price, 2008). Hence, in contrast to our findings, the association between tournament incentives and firm performance in female dominated mixed-sex tournament could be different. We leave this to test in future research.

Limitations aside, we contribute to the literature and to practice. *First*, we extend the line of research that examines the role of contestants' gender composition in predicting individual or group level outcomes either in the laboratory or in the field (e.g., Booth & Yamamura, 2018; Gneezy et al., 2003; Price, 2008). *Second*, this is one of the limited number of studies that integrate the perspectives of gender role theory and tournament theory, and thereby show that NCEO's gender composition matters in understanding the effect of CEO tournament incentives on firm outcomes. *Third*, our findings that gender diversity has a positive effect on firm performance but not through the tournament incentives channel provides a deeper understanding on why firms become gender diverse in their TMT and how this diversity is tricky to manage.

Fourth and finally, this study has implications for the firm's board of directors. Our results suggest that board of directors can place CEO tournament incentives in their list of motivational mechanisms for their firm's top executives (excluding the CEO) if they are of single gender (all-male). However, we find in our additional analyses that gender diversity in the NCEOs' team has a positive impact on firm performance. We argue that this positive effect promotes firms to have a gender diverse team of executives in their top management, although motivational mechanisms such as the tournament incentives do not work in such a condition. Therefore, we suggest that the board can make most out of maintaining gender diversity in firm's TMT by employing mechanisms other than designing tournament incentives in their compensation. However, the board of directors need to consider the benefits and costs of expected pay gap at the time of designing and implementing a particular compensation plan. Research shows that higher tournament incentives result in higher cost of equity capital (Chen et al., 2013) and greater stock price crash risk (Jia, 2018; Sun, Habib, & Huang, 2019). Therefore, the

costs of tournament incentives from a particular compensation plan may exceed its benefits. We expect future research to investigate such a trade-off effect.

In conclusion, depending on peers' gender there is a difference in male and female NCEOs' behavioural response to tournament incentives in CEO promotion tournament. This difference leads to a different firm-level outcomes such as the financial performance. Therefore, we suggest future studies to account for contestants' gender composition while investigating the consequences of corporate tournament incentives. We hope our work provides a reference point for this line of research.

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Appendix A

Variables, Data Sources and Definitions

Variable	Source	Definition
Tournament Incentives		
CEO Pay Gap *(PAY_GAP)*	BoardEx	Log (CEO's total compensation *minus* median of non-CEO executives' total compensation)
CEO Pay Slice *(CPS)*	BoardEx	Total compensation of the CEO/total compensation of the top five executives, including the CEO
PAY_GAP_M	BoardEx	Log (CEO's total compensation *minus* average of male non-CEO executives' total compensation)
PAY_GAP_F	BoardEx	Log (CEO's total compensation *minus* average of female non-CEO executives' total compensation)
Firm Performance		
Return on Assets *(ROA)*	DataStream	Net income before extraordinary items and preferred dividends/total assets
Operating Income to Total Assets *(OITA)*	DataStream	Operating income/total assets
Control Variables		
CEO Tenure *(CEO_TEN)*	BoardEx	Number of years since the CEO took office
CEO Duality *(CEO_DUAL)*	BoardEx	Dummy = 1 if the CEO is also the board chair, 0 otherwise
Board Size *(BOD_SIZE)*	BoardEx	Number of directors on the firm's board
Board Independence *(BOD_IND)*	BoardEx	Outsider directors/total number of directors on the board
CEO Age *(CEO_AGE)*	BoardEx	Age of the CEO at the end of a firm-year
Non-CEO Executives' Tenure *(NCEOs_TEN)*	BoardEx	Average number of years since the non-CEO executives are in current position
Leverage *(LEV)*	DataStream	Total debt/total assets
Capex Intensity *(CAPEX)*	DataStream	Capital expenditure/total assets
Firm Size *(FIRM_SIZE)*	DataStream	Log of total assets
New CEO *(NEW_CEO)*	BoardEx	Dummy = 1 for first year as the CEO, 0 otherwise

Market Value *(MAR_VALUE)*	DataStream	Number of shares outstanding X year-end share price
Institutional Ownership *(INST_OWN)*	FactSet	The percentage of shareholding by the institutional investors
Insider Ownership *(INSIDER_OWN)*	DataStream	The percentage of strategic share holdings of 5% or more held by employees, or by individual investors
Cash Ratio *(CASH_RATIO)*	DataStream	Cash/total assets
Pay Dispersion *(PAY_DIS)*	BoardEx	Coefficient of variation in total compensation of the non-CEO executives
Prior Year Performance *(PRIOR_PERF)*	DataStream	Firm performance at year t-1
Non-CEO Executives' Market Pay *(MAR_PAY)*	BoardEx	Median value of non-CEO executives' median pay of firms in the same two-digit GICS code and same size quartile, excluding the focal firm
Non-CEO Executives' Total Compensation (NCEOs_PAY)	BoardEx	Median value of non-CEO executives' total compensation in a firm-year)
Instrumental Variables		
Industry Pay Gap *(IND_PAY_GAP)*	BoardEx	Median *PAY_GAP* of firms in the same two-digit GICS code, year and size quartile, excluding the focal firm
Difference in Task-Specific Experience *(DIF_TSEXP)*	BoardEx	Difference between the CEO's current tenure and the average of NCEOs' current job tenure in years
Number of Non-CEO Executives *(#NCEOs)*	BoardEx	Number of non-CEO executives reported in BoardEx in a firm-year
Other Variables		
CEO Gender *(CEO_GEN)*	BoardEx	Dummy = 1 if the CEO is female, 0 otherwise
Female Director *(FEM_BOD)*	BoardEx	Dummy = 1 if at least one female director is present on the board, 0 otherwise
MMFF		Dummy variable equals to 1 if two of the four highest paid NCEOs are female, and 0 if only one of the four highest paid NCEOs is a female

Table 1

Sample Selection and Distribution

The table presents the process of sample selection (Panel A); sample distribution by year (Panel B) and by 2-digit GICS sector (Panel C). The final sample includes 3,160 firm-year observations (2,136 in single-sex and 1,024 in mixed-sex tournament) from 2007 to 2016.

Panel A: Sample Selection Process

	No. of Obs.	Running Total No. of Obs.
Initial sample (firm-years)		5,867
Less: Observations from utility industry	747	5,120
Less: Observations with non-identifiable CEO	112	5,008
Less: Observations with multiple CEOs	45	4,963
Less: Observations with zero CEO compensation	54	4,909
Less: Observations with less than five executives compensation reported in BoardEx	161	4,748
Less: Observations with negative pay gap	193	4,555
Less: Observations with non-matching values in DataStream and FactSet	72	4,483
Less: Observations with missing values of all required variables	1,323	**3,160**

Panel B: Sample Distribution by Year

Year	Total Obs.	Single-Sex	Percentage	Mixed-Sex	Percentage
2007	402	290	72.14	112	27.86
2008	346	250	72.25	96	27.75
2009	325	236	72.62	89	27.38
2010	285	195	68.42	90	31.58
2011	286	191	66.78	95	33.22
2012	299	202	67.56	97	32.44
2013	303	205	67.66	98	32.34

2014	313	194	61.98	119	38.02
2015	304	181	59.54	123	40.46
2016	297	192	64.65	105	35.35
Total	**3,160**	**2,136**	**67.59**	**1,024**	**32.41**

Panel C: Sample Distribution by Sector

GICS Code	Sector	Total Obs.	Single-Sex	Percentage	Mixed-Sex	Percentage
15	Materials	212	147	69.34	65	30.66
20	Industrials	469	360	76.76	109	23.24
25	Consumer Discretionary	491	290	59.06	201	40.94
30	Consumer Staples	266	179	67.29	87	32.71
35	Health Care	420	241	57.38	179	42.62
40	Financials	432	291	67.36	141	32.64
45	Information Technology	536	388	72.39	148	27.61
50	Communication Services	158	106	67.09	52	32.91
60	Real Estate	176	134	76.14	42	23.86
	Total	**3,160**	**2,136**	**67.59**	**1,024**	**32.41**

Table 2

Summary Statistics

This table presents summary statistics for the variables used in the study. All variables are defined in Appendix A. All continuous variables are winsorized at the 1st and 99th percentile levels. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Variable	Full Sample					Single-Sex			Mixed-Sex			Mean Diff.
	Obs.	Mean	SD	p25	p75	Obs.	Mean	SD	Obs.	Mean	SD	
PAY_GAP_{t-1}	3160	6.82	0.43	6.59	7.10	2136	6.80	0.44	1024	6.85	0.42	***
ROAt	3160	6.02	7.28	2.27	9.72	2136	5.96	7.25	1024	6.14	7.36	
CEO_TEN_t	3160	4.88	4.14	1.70	6.90	2136	4.97	4.21	1024	4.69	3.99	*
CEO_DUAL_t	3160	0.69	0.46	0.00	1.00	2136	0.69	0.46	1024	0.67	0.47	
BOD_SIZEt	3160	10.79	2.17	9.00	12.00	2136	10.80	2.23	1024	10.78	2.03	
BOD_IND_t	3160	0.87	0.07	0.85	0.91	2136	0.86	0.07	1024	0.88	0.06	***
CEO_AGE_t	3160	56.76	6.05	53.00	61.00	2136	56.66	5.94	1024	56.98	6.27	
$NCEOs\_TEN_t$	3160	3.75	2.18	2.20	4.78	2136	3.90	2.32	1024	3.45	1.83	***
$FIRM\_SIZE_t$	3160	7.08	0.65	6.63	7.46	2136	7.07	0.65	1024	7.08	0.64	
$MAR\_VALUE^A_t$	3160	24.13	36.10	5.17	24.48	2136	23.33	34.33	1024	25.79	39.49	*
LEV_t	3160	0.27	0.20	0.12	0.38	2136	0.27	0.20	1024	0.27	0.19	
$CAPEX\_IN_t$	3160	0.04	0.03	0.01	0.05	2136	0.04	0.03	1024	0.04	0.03	
NEW_CEO_t	3160	0.15	0.36	0.00	0.00	2136	0.15	0.36	1024	0.16	0.36	
$INST\_OWN_t$	3160	0.83	0.18	0.75	0.93	2136	0.83	0.18	1024	0.83	0.18	
$INSIDER\_OWN_t$	3160	0.01	0.05	0.00	0.00	2136	0.01	0.04	1024	0.02	0.06	***
$CASH\_RATIO_t$	3160	0.08	0.10	0.01	0.13	2136	0.08	0.09	1024	0.09	0.10	
PAY_DIS_{t-1}	3160	0.33	0.22	0.17	0.44	2136	0.33	0.22	1024	0.33	0.22	
$PRIOR\_PERF_{t-1}$	3160	6.10	7.19	2.41	9.88	2136	6.00	7.21	1024	6.31	7.13	
$MAR\_PAY^A_{t-1}$	3160	3.79	2.07	2.33	4.60	2136	3.71	2.02	1024	3.97	2.18	***
$NCEOs\_PAY^A_{t-1}$	3160	4.49	3.77	2.12	5.50	2136	4.54	3.83	1024	4.37	3.65	

[A] in million US$

Table 3: Pairwise Correlation Matrix (Full Sample)

	Variable	1	2	3	4	5	6	7	8	9	10
1	ROA	1									
2	PAY_GAP	0.1366*	1								
3	CEO_TEN	0.0267	0.0368*	1							
4	CEO_DUAL	0.0435*	0.1211*	0.1035*	1						
5	BOD_SIZE	-0.0512*	0.2265*	-0.0938*	0.1417*	1					
6	BOD_IND	-0.0549*	0.1922*	-0.0986*	-0.2201*	0.2550*	1				
7	CEO_AGE	0.0023	0.0769*	0.2850*	0.2215*	0.0804*	-0.0248	1			
8	NCEOs_TEN	0.0509*	-0.0544*	0.3371*	0.1112*	-0.0492*	-0.2023*	0.1869*	1		
9	FIRM_SIZE	-0.1415*	0.3538*	-0.0625*	0.2012*	0.5650*	0.2365*	0.1365*	-0.0047	1	
10	MAR_VALUE	0.1299*	0.3147*	-0.0177	0.1525*	0.3509*	0.1547*	0.0804*	-0.0136	0.6110*	1
11	LEV	-0.1502*	0.0254	0.0191	-0.0229	-0.0343	0.0617*	0.0603*	0.0005	-0.0042	-0.0067
12	CAPEX	0.1292*	-0.0458*	0.0560*	0.018	-0.1215*	-0.0804*	0.0088	0.0245	-0.2322*	-0.0574*
13	NEW_CEO	-0.0098	-0.0183	-0.4498*	-0.0234	0.0471*	0.0127	-0.1159*	-0.1449*	0.0335	0.0099
14	INST_OWN	0.0390*	-0.0456*	0.0712*	-0.0541*	-0.2515*	-0.0846*	-0.0445*	0.0382*	-0.2544*	-0.2623*
15	INSIDER_OWN	0.0171	-0.0545*	0.0567*	0.028	-0.0501*	-0.1789*	-0.0387*	0.0451*	-0.0961*	-0.0432*
16	CASH_RATIO	0.1454*	-0.0199	0.0099	-0.1739*	-0.1993*	-0.032	-0.1046*	-0.0683*	-0.3295*	-0.0587*
17	PAY_DIS	-0.0018	0.0899*	0.0076	-0.0125	-0.008	-0.1742*	-0.0115	-0.0176	-0.0537*	-0.0726*
18	PRIOR_PERF	0.6904*	0.1138*	0.0213	0.0675*	-0.0520*	-0.0730*	0.0078	0.0447*	-0.1439*	0.1114*
19	MAR_PAY	-0.0164	0.3563*	-0.0628*	0.1054*	0.3624*	0.1830*	0.0848*	-0.021	0.6474*	0.5653*
20	NCEOs_PAY	0.0418*	0.4925*	0.0215	0.1647*	0.3154*	0.0335	0.0730*	-0.0116	0.5325*	0.5783*

	Variable	11	12	13	14	15	16	17	18	19	20
11	LEV	1									
12	CAPEX	0.1725*	1								
13	NEW_CEO	-0.0187	-0.0059	1							
14	INST_OWN	0.0359*	0.0424*	-0.0207	1						
15	INSIDER_OWN	-0.0468*	0.0836*	-0.0105	-0.1712*	1					
16	CASH_RATIO	-0.0889*	-0.0417*	0.0116	0.1125*	0.0194	1				
17	PAY_DIS	0.0378*	0.0092	0.0236	0.0375*	0.0548*	0.0037	1			
18	PRIOR_PERF	-0.1324*	0.1504*	-0.006	0.0630*	0.0073	0.1176*	-0.0114	1		
19	MAR_PAY	0.0304	-0.0957*	0.0223	-0.2374*	-0.0611*	-0.1583*	-0.012	-0.0341	1	
20	NCEOs_PAY	-0.0081	-0.1142*	0.0279	-0.1223*	-0.0258	-0.0575*	0.0128	0.0332	0.4675*	1

* Significant at the 5% level or better

Table 4

OLS Regressions

The table reports results of baseline regressions for the full sample as well as for the disaggregated sample. In all the models, the dependent variable is ROA, and the independent variable of interest is PAY_GAP. All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are in parentheses, clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
	Full Sample	Single-Sex	Mixed-Sex
Dependent Variable	ROA	ROA	ROA
PAY_GAP	1.2933***	1.2848***	0.3370
	(0.3771)	(0.4530)	(0.6471)
CEO_TEN	-0.0030	-0.0085	0.0569
	(0.0451)	(0.0553)	(0.0662)
CEO_DUAL	-0.0146	-0.2094	-0.2006
	(0.4867)	(0.6766)	(0.6488)
BOD_SIZE	0.0354	0.0128	0.0941
	(0.0941)	(0.1169)	(0.1327)
BOD_IND	3.1622	1.1346	2.6912
	(3.0972)	(4.0213)	(5.4216)
CEO_AGE	-0.0429	-0.0381	0.0157
	(0.0326)	(0.0403)	(0.0479)
NCEOs_TEN	0.0800	0.0432	0.1466
	(0.0685)	(0.0820)	(0.1047)
FIRM_SIZE	-3.4294***	-4.1722**	-4.3394**
	(1.2881)	(1.8179)	(1.7324)
MAR_VALUE	0.0433***	0.0471***	0.0503***
	(0.0084)	(0.0125)	(0.0127)
LEV	-9.8891***	-8.2787***	-8.8698***
	(1.8804)	(1.9843)	(2.5765)
CAPEX	10.2524	3.9772	16.1248
	(8.0356)	(10.5448)	(13.1998)
NEW_CEO	-0.2267	-0.4624	0.0699
	(0.2884)	(0.4099)	(0.4501)
INST_OWN	-2.9935**	-3.2837**	-6.0925*
	(1.4776)	(1.5239)	(3.1458)
INSIDER_OWN	0.1309	7.9013	-5.1680
	(6.0686)	(14.6470)	(4.2013)
CASH_RATIO	3.1326	0.6766	7.8245**
	(2.3759)	(3.2988)	(3.3873)
PAY_DIS	0.8140*	0.5969	1.2209*
	(0.4709)	(0.6456)	(0.6862)
PRIOR_PERF	0.2144***	0.1890***	0.1034
	(0.0382)	(0.0490)	(0.0660)
MAR_PAY	0.0294	0.1248	-0.1955
	(0.0895)	(0.1260)	(0.1186)
NCEOs_PAY	0.0385	0.1010*	-0.1343

	(0.0448)	(0.0562)	(0.0861)
Constant	21.9989**	28.7463**	35.5214***
	(9.7890)	(13.4771)	(13.6044)
Year Dummies	Yes	Yes	Yes
Observations	3,160	2,136	1,024
Adjusted R^2	0.138	0.115	0.127

Table 5

Instrumental Variables Regression

This table reports the first- and second-stage results of the instrumental-variable regressions for the single-sex and mixed-sex tournament sample. We treat PAY_GAP as the endogenous variable and it is the dependent variable in first-stage regressions. We use three instruments: median PAY_GAP at the same two-digit GICS code and same size quartile (IND_PAY_GAP) excluding the focal firm; difference in task-specific experience between the CEO and non-CEO executives (DIF_TSEXP) in years; and the number of non-CEO executives (#NCEOs) reported in a firm-year. The dependent variable in the second-stage regressions is ROA, and the independent variable of interest is the fitted value of PAY_GAP from the first-stage regression. All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are in parentheses, clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Single-Sex		Mixed-Sex	
	(1)	(2)	(3)	(4)
	First-Stage	Second-Stage	First-Stage	Second-Stage
Dependent Variable	PAY_GAP	ROA	PAY_GAP	ROA
PAY_GAP		4.5912**		-1.7605
		(1.8776)		(4.3392)
CEO_TEN	-0.0078	-0.0457	-0.0048	0.0710
	(0.0049)	(0.0412)	(0.0062)	(0.0521)
CEO_DUAL	0.0686***	-0.5472	0.0472	0.9629**
	(0.0246)	(0.3469)	(0.0371)	(0.4580)
BOD_SIZE	-0.0071	0.0424	0.0079	0.0649
	(0.0069)	(0.0629)	(0.0098)	(0.1120)
BOD_IND	1.3735***	-5.8309*	0.2513	1.5886
	(0.2255)	(3.5178)	(0.3430)	(3.2546)
CEO_AGE	-0.0006	0.0154	0.0006	-0.0685**
	(0.0021)	(0.0256)	(0.0029)	(0.0328)
NCEOs_TEN	-0.0001	0.1355**	0.0188**	0.0764
	(0.0059)	(0.0553)	(0.0081)	(0.1143)
FIRM_SIZE	0.1497***	-2.9136***	0.1893***	-0.2612
	(0.0421)	(0.6039)	(0.0518)	(1.1917)
MAR_VALUE	-0.0018***	0.0335***	-0.0020***	0.0190
	(0.0005)	(0.0068)	(0.0006)	(0.0127)
LEV	-0.0523	-2.3156***	-0.0068	-3.4394***
	(0.0708)	(0.8874)	(0.0725)	(1.3200)
CAPEX	-0.4040	1.0701	-0.5883	14.1858*
	(0.3071)	(4.6011)	(0.6215)	(8.1624)
NEW_CEO	-0.0845***	-0.2817	-0.1083**	0.3680
	(0.0353)	(0.3816)	(0.0454)	(0.4802)
INST_OWN	0.0208	-0.0201	0.1177	0.4073
	(0.0649)	(0.6599)	(0.0971)	(1.3099)
INSIDER_OWN	-0.2431	1.3247	0.2818	2.3337
	(0.3572)	(3.5915)	(0.2339)	(2.9353)
CASH_RATIO	0.1796	2.6655	0.1736	3.2521
	(0.1248)	(2.1434)	(0.1709)	(3.0110)

PAY_DIS	0.2819***	-0.7260	0.1501**	0.9363
	(0.0562)	(0.7414)	(0.0723)	(1.0864)
PRIOR_PERF	0.0045***	0.5959***	0.0106***	0.6760***
	(0.0015)	(0.0431)	(0.0022)	(0.0709)
MAR_PAY	0.0009	0.0579	-0.0084	-0.0509
	(0.0088)	(0.0774)	(0.0106)	(0.1218)
NCEOs_PAY	0.0461***	-0.1237	0.0477***	0.0471
	(0.0057)	(0.1088)	(0.0070)	(0.2190)
Instrumental Variables				
IND_PAY_GAP	0.2162***		0.1728**	
DIF_TSEXP	0.0156***		0.0110**	
#NCEOs	-0.0606*		-0.0032	
Constant	3.1857***	-4.1790	3.5477***	13.5900
	(0.4527)	(8.7113)	(0.6185)	(20.1926)
Observations	2131	2,131	1021	1,021
Adjusted R^2	0.392	0.473	0.364	0.511
Year and Industry Dummies	Yes	Yes	Yes	Yes
Difference in Sargan C (chi^2)		3.2721*		0.5697
Shea partial R^2		0.0204		0.0092
F-statistic		9.8200***		2.8118**
Hansen J-statistic (p-value)		3.0234 (0.2205)		0.5591
				(0.7561)

Table 6

Change Regression and Propensity Score Matching

This table reports results of change regression and propensity score matching for the single-sex and mixed-sex tournament sample. In models 1 and 2, the dependent variable is change in ROA (ΔROA); and the independent variable of interest is the change in PAY_GAP (ΔPAY_GAP). Models 3 and 4 represent results of baseline regression using a propensity score matched sample. To construct the matched sample, we first estimate a logit regression for each firm-year in which the dependent variable is single-sex dummy equals to 1 if the firm's team of NCEOs consists of all-male, and 0 otherwise. The independent variables include all the explanatory variables except PAY_GAP from our baseline model in Table 4. This regression generates a predicted probability of being a single-sex team of NCEOs for each firm-year. We then match (without replacement) each treatment firm (firm with all-male team of NCEOs) with a matching firm (firm with mixed-sex team of NCEOs) having the closest propensity score and using a caliper of 0.02. This procedure results in a sample of 902 matched pairs. In both the models, the dependent variable is ROA, and the independent variable of interest is PAY_GAP. All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are in parentheses, clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Change Regression		**Propensity Score Matching**	
	(1)	(2)	(3)	(4)
	Single-Sex	Mixed-Sex	Single-Sex	Mixed-Sex
Dependent Variable	ROA	ROA	ROA	ROA
PAY_GAP	0.9211**	0.4344	2.2130***	0.2179
	(0.3718)	(0.5018)	(0.6942)	(0.6601)
CEO_TEN	-0.1038	-0.0049	0.0061	0.0610
	(0.0842)	(0.1508)	(0.0803)	(0.0736)
CEO_DUAL	-0.3370	-2.2774	0.7087	-0.3385
	(1.0614)	(1.6627)	(0.9991)	(0.7153)
BOD_SIZE	0.0321	0.1946	0.0058	0.1017
	(0.1874)	(0.2629)	(0.1883)	(0.1431)
BOD_IND	4.9276	3.6718	-0.5751	4.3189
	(6.2364)	(9.8276)	(8.3516)	(5.5872)
CEO_AGE	-0.0190	0.0778	-0.0317	-0.0131
	(0.0695)	(0.1386)	(0.0700)	(0.0577)
NCEOs_TEN	0.1713	0.3009*	-0.0777	0.1369
	(0.1407)	(0.1684)	(0.1417)	(0.1068)
FIRM_SIZE	13.7053**	-7.1871*	-6.7439**	-3.2563*
	(6.7267)	(4.2068)	(3.0623)	(1.7694)
MAR_VALUE	-0.0281	0.0175	0.0459*	0.0356***

	(0.0217)	(0.0187)	(0.0274)	(0.0129)
LEV	-17.8761***	-4.5729	-5.2355	-9.7843***
	(5.0312)	(6.6965)	(3.1810)	(2.7421)
CAPEX	22.5300	21.0464	26.7752	13.1573
	(14.4817)	(15.1205)	(18.3192)	(13.2429)
NEW_CEO	-0.3188	0.8040	-0.5433	0.1245
	(0.5155)	(0.7012)	(0.6875)	(0.4748)
INST_OWN	0.3617	-2.0659	-0.3572	-6.3200*
	(5.2572)	(3.6681)	(3.0877)	(3.2491)
INSIDER_OWN	-2.1450	-0.6918	5.7470	-5.1309
	(24.0259)	(4.7646)	(25.3769)	(4.4479)
CASH_RATIO	1.7859	4.9863	0.8236	8.6512**
	(5.3132)	(5.4381)	(4.4051)	(3.6265)
PAY_DIS	1.0084	-0.2236	-0.4528	1.3075*
	(1.0767)	(0.8980)	(1.1016)	(0.7416)
PRIOR_PERF	-0.2129**	-0.3067***	0.0063	0.1001
	(0.0915)	(0.0971)	(0.0767)	(0.0701)
MAR_PAY	-0.0147	-0.2376*	0.1039	-0.2898***
	(0.1943)	(0.1428)	(0.1112)	(0.1107)
NCEOs_PAY	-0.0376	-0.0496	0.0191	-0.0136
	(0.0653)	(0.1211)	(0.0961)	(0.0599)
Constant	-6.7360***	-2.8266	39.6004*	29.6099**
	(2.4813)	(3.2483)	(20.8296)	(14.0189)
Year Dummies	Yes	Yes	Yes	Yes
Observations	841	406	902	902
Adjusted R^2	0.133	0.228	0.084	0.117

Table 7

Tournament Incentives, CEO Gender, and Sub-Group Incentives

This table reports results for the single- and mixed-sex tournament sample. The dependent variable is ROA. In Model 1, the variables of interest are: PAY_GAP between the CEO and male NCEOs (PAY_GAP_M), and between the CEO and female NCEOs (PAY_GAP_F); and their interaction with CEO gender (CEO_GEN) in Model 2. The variable of interest in Model 3 is the interaction of PAY_GAP and CEO gender. All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are in parentheses, clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
	Mixed-Sex	Mixed-Sex	Single-Sex
Dependent Variable	ROA	ROA	ROA
PAY_GAP_M	1.6622*	2.0584**	
	(0.9183)	(0.9584)	
PAY_GAP_M*CEO_GEN		-10.0482**	
		(4.0701)	
PAY_GAP_F	-0.5839	-1.0148	
	(1.0086)	(1.1315)	
PAY_GAP_F*CEO_GEN		3.2686*	
		(1.7798)	
PAY_GAP			1.2463***
			(0.4656)
PAY_GAP*CEO_GEN			0.0133
			(1.1647)
CEO_GEN		45.7170**	-4.5587
		(20.6463)	(8.8241)
CEO_TEN	0.1090	0.1018	-0.0171
	(0.0716)	(0.0698)	(0.0555)
CEO_DUAL	-0.3723	-0.4007	-0.2832
	(0.7343)	(0.7679)	(0.6909)
BOD_SIZE	0.0059	0.0223	0.0064
	(0.1512)	(0.1542)	(0.1178)
BOD_IND	8.9096	7.6582	1.0512
	(6.1537)	(5.8549)	(4.0363)
CEO_AGE	-0.0310	-0.0220	-0.0306
	(0.0547)	(0.0570)	(0.0415)
NCEOs_TEN	0.1739	0.1768	0.0430
	(0.1088)	(0.1113)	(0.0828)
FIRM_SIZE	-3.9403*	-3.7513*	-4.3583**
	(2.0468)	(2.0756)	(1.8800)
MAR_VALUE	0.0550***	0.0492***	0.0473***
	(0.0139)	(0.0139)	(0.0126)
LEV	-7.3254***	-7.0237***	-8.4197***
	(2.5858)	(2.5902)	(1.9858)
CAPEX	10.8953	11.0879	2.8585
	(13.7090)	(13.7602)	(10.8932)
NEW_CEO	0.6058	0.6724	-0.4815
	(0.5024)	(0.5117)	(0.4078)
INST_OWN	-5.7936*	-5.9430*	-3.4261**

	(3.3451)	(3.4145)	(1.5369)
INSIDER_OWN	-3.1910	-2.8244	6.2063
	(4.1337)	(4.2746)	(13.0457)
CASH_RATIO	4.8320	4.5706	0.7829
	(3.2038)	(3.2319)	(3.2302)
PAY_DIS	1.7512**	1.9744**	0.6150
	(0.7996)	(0.8352)	(0.6461)
PRIOR_PERF	0.1187**	0.1183**	0.1872***
	(0.0599)	(0.0599)	(0.0485)
MAR_PAY	-0.2424*	-0.2717*	0.1182
	(0.1450)	(0.1423)	(0.1255)
NCEOs_PAY	-0.1109	-0.0806	0.1037*
	(0.1047)	(0.1009)	(0.0563)
Constant	25.3591	24.7701	30.4482**
	(17.1947)	(17.3362)	(14.1307)
Year Dummies	Yes	Yes	Yes
Observations	788	788	2,136
Adjusted R^2	0.145	0.149	0.119

Table 8

Presence of Female and the Effect of Tournament Incentives in Mixed-Sex Tournament

This table reports results for the full (Model 1) and propensity score matched (Model 2) mixed-sex tournament sample. The dependent variable is ROA. The independent variable of interest is the interaction of PAY_GAP and MMFF (a dummy variable equals to 1 if two of the four highest paid NCEOs are female, and 0 if one of the top four highest paid NCEOs is a female). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are in parentheses, clustered by firm. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Mixed-Sex	Mixed-Sex
Dependent Variable	ROA	ROA
PAY_GAP	0.9001	2.8218
	(0.5851)	(1.8677)
PAY_GAP*MMFF	-1.8723*	-4.3705**
	(0.9753)	(2.1135)
MMFF	12.9480*	30.3815**
	(6.6960)	(14.6861)
CEO_TEN	0.0524	-0.0631
	(0.0657)	(0.1675)
CEO_DUAL	-0.1942	-0.6603
	(0.6458)	(1.2575)
BOD_SIZE	0.0793	-0.0466
	(0.1323)	(0.3475)
BOD_IND	3.4863	-5.9398
	(5.5801)	(12.2120)
CEO_AGE	0.0222	0.0864
	(0.0482)	(0.1400)
NCEOs_TEN	0.1554	0.3080*
	(0.1044)	(0.1696)
FIRM_SIZE	-4.5073***	-4.0161**
	(1.7108)	(1.9369)
MAR_VALUE	0.0527***	0.0544*
	(0.0133)	(0.0328)
LEV	-8.7887***	-7.6097
	(2.5921)	(4.7715)
CAPEX	14.6808	23.4564
	(12.4661)	(21.3857)
NEW_CEO	0.0768	-1.1162
	(0.4460)	(1.3431)
INST_OWN	-6.0231*	-16.6405***
	(3.1202)	(5.7035)
INSIDER_OWN	-5.4922	-0.4669
	(4.1989)	(8.4368)
CASH_RATIO	7.8180**	8.6560
	(3.4172)	(6.2704)
PAY_DIS	1.1515*	1.3589
	(0.6946)	(1.2890)
PRIOR_PERF	0.1002	0.0561

	(0.0666)	(0.0826)
MAR_PAY	-0.1902	-0.5031
	(0.1190)	(0.4496)
NCEOs_PAY	-0.1431*	-0.1462
	(0.0854)	(0.1800)
Constant	31.9354**	29.4614
	(13.4144)	(20.7123)
Year Dummies	Yes	Yes
Observations	1,024	362
Adjusted R^2	0.130	0.188