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# Top management ties with board members: How they affect pay–performance sensitivity and IPO performance

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ABSTRACT

This paper is the first study on the effects of pay–performance sensitivity (PPS) on the performance of initial public offerings (IPOs) in the presence of social ties and family ties of the top managers with board members. We find that both social ties and family ties increase PPS. In turn, PPS improves IPO performance. More importantly, greater PPS increases the positive effect of social ties on IPO performance whereas it reduces the negative effect of family ties.



## 1. Introduction

The initial public offering (IPO) is a major transition in the life of the firm (Welbourne and Andrews, 1996) as it results in a separation of ownership and control, and hence a reduction in the incentives of the top management team (TMT) to work hard and expend the required effort to pursue the best interest of the shareholders. Pay-for-performance schemes, monitored by independent board members, may thus be one way to ensure, via increased pay–performance sensitivity (PPS), the alignment of interests between the TMT and the shareholders.

However, IPO firms tend to suffer from a major disadvantage when compared to more mature firms. As they are young firms they are less likely to attract independent board members with sufficient experience and expertise to perform effectively their service tasks. IPO firms are therefore more likely to rely on friends and families of the TMT to serve on the board of directors. The potential advantage of having friends and family on the board is the smoother interaction between the TMT and the board, which stems from the similarities in experiences and points of view between the two, brought about by homophily. McPherson et al. (2001, p. 416) define homophily as "the principle that a contact between similar people occurs at a higher rate than among dissimilar people". In other words, one's friends and family are likely to be similar to one-self, ensuring smoother social dealings. This also suggests that PPS for the TMT is likely to be higher in the presence of social ties and family ties, reflecting the greater alignment of interests between the former and the board of directors. However, the positive effect of pay-for-performance

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schemes may be reduced due to the board's lower monitoring efficiency caused by the social ties or family ties between top managers and board members. As such ties might reduce the effectiveness of the board of directors as a monitoring device, they might also result in lower firm performance. Put differently, the carrot (pay for performance) might have less of a positive effect if there is less of a stick (monitoring by the board).

The contributions of this paper to the literature are three-fold. First and most importantly, this is the first paper – to the best of our knowledge – to examine the effects on pay–performance sensitivity (PPS) of social ties and family ties of the top managers with board members for the case of IPO firms. Using a unique dataset of observations on 3613 TMT members in 500 IPO firms from 1997 to 2008, we measure family ties as the number of board members with whom a given TMT member has a family tie, expressed as a proportion of the total board size. Social ties are of the following four types: same origin (i.e., the same foreign nationality), same school (i.e., educational institution), same former employer, and same club or association membership. Similar to family ties, we measure the number of board members with whom the TMT member has at least one social tie, expressed as a proportion of the total board size. PPS is measured by taking into account all stock options as well as all shares owned by the TMT member immediately after the IPO. It measures the dollar change in the TMT member's compensation caused by a one-dollar change in the stock price. We find that both family ties and social ties increase PPS. More generally, our results indicate the conditions under which PPS alleviates possible conflicts of interests arising from the existence of family ties and social ties between executives and board members.

Second, this paper not only examines PPS in the context of social ties and family ties within IPO firms, but also does so for the entire TMT rather than just for the CEO as this is typically the case in the existing literature. Hence, it tests in a more holistic manner the validity of the managerial power theory, which is based on the premise that board structure is an important determinant of the effectiveness of board monitoring and of the alignment of executive pay with firm performance.

Third and in line with previous research by the authors (see Chahine and Goergen, 2013), social ties reduce IPO underpricing whereas family ties have the opposite effect. In terms of the other performance measures, social ties increase the IPO premium as well as the long-term buy-and-hold abnormal returns. In contrast, family ties have a negative effect on these alternative performance measures. Conversely, Hwang and Kim (2009) find that social ties destroy rather than create value for the case of mature firms. More importantly, the present paper proposes a way forward whereby firm owners can mitigate the value destroying effect of family ties or reinforce the value creating effects of social ties. Indeed, greater PPS is a way to ensure the agents act in the interest of the principal. We find that the negative effect of family ties on IPO performance is largely canceled out by greater PPS whereas the already positive effect of social ties is increased by greater PPS. Our evidence contrasts with Aggarwal and Samwick (2006), who do not find that PPS mitigates private benefits of control but rather mitigates private costs of investing. Indeed, our study finds that PPS helps reduce private benefits of control in family firms.[1]

In the next section, we review the literature and develop the conjectures. We then discuss the data and methodology. This is followed by the analysis of the empirical results. We then run robustness checks, and we draw conclusions in the final section.

## 2. Review of the literature and conjectures

### *2.1. The effect on PPS of family ties and social ties of the TMT with board members*

The role of the board of directors is to monitor the firm's managers in order to mitigate the agency conflicts that result from the separation of ownership and control (Fama and Jensen, 1983). Nonetheless, the role of the board typically goes beyond protecting shareholder interests as it extends to participation in the firm's strategic decision making as well as the setup of TMT pay-for-performance incentives (Dalton et al., 1998; Golden and Zajac, 2001).

Hwang and Kim (2009) examine the Fortune 100 firms, and hypothesize that social ties affect the ways directors monitor and discipline the CEO. They observe that a considerable percentage of boards currently classified as independent from the TMT are not so in practice. They adjust conventional board independence for social ties and study its impact on TMT compensation. They find that PPS is significantly lower and pay levels are significantly higher for CEOs of firms with boards that are socially dependent on the CEO. Therefore, social ties might be an advantage to the CEO, as well as the other TMT members, when negotiating their compensation with the board (Hwang and Kim, 2009). However, compared to mature firms, IPO firms face more uncertainty than mature firms, and principals are therefore less likely to have a strong sense of what actions an agent could and should be pursuing. Pay-for-performance incentives are thus likely to ensure that managers pursue shareholder interests (Grossman and Hart, 1983). Such incentives include stock options, which are a relatively cost-effective and straightforward means of aligning the TMT's incentives with those of the owners, as well as stock ownership.

In contrast, TMT members with family ties are likely to have a significant fraction of their wealth, via stock ownership, closely tied to the value of the firm (Jensen and Meckling, 1976; Schulze et al., 2003). As such, their pay – or more precisely the income they derive from their firm – is highly performance sensitive, thereby aligning their interests with those of the other owners. Put differently, TMT members with family ties are likely to have high PPS given their stock ownership. We arrive at the following conjecture.

[1] Kau et al. (2008) find that CEOs with greater PPS are more likely to listen to the market by reversing investment decisions once the market has reacted negatively to their announcement.

**C1.** *Pay–performance sensitivity (PPS) is higher for TMT members with family ties or social ties with board members than for those without any such ties.*

### 2.2. PPS and IPO performance

Engel et al. (2002) point out that governance issues, such as the CEO's incentives, are critical for firms going public and about to establish a formal separation of ownership and control. Since outside investors do not have any prior experience of the IPO firm, the IPO process is usually characterized by high levels of uncertainty and asymmetric information. While some studies suggest that higher PPS can exacerbate managerial risk aversion, leading to suboptimal risk-taking (see e.g. Lambert et al., 1993), there is relatively consistent evidence that PPS, on average, provides increased risk-taking incentives (see e.g. Rajgopal and Shevlin, 2002; Coles et al., 2006). Executive compensation schemes may thus be important in terms of aligning the interests of the executives with those of the shareholders. Stock options and stock ownership are means of making executive pay more sensitive to firm performance. In particular, a high degree of PPS ensures that insiders are well incentivized. More specifically, Certo et al. (2003) find that stock options have a positive effect on IPO valuation, whereas Jain and Kini (1994) find a positive effect of post-IPO insider stock ownership on firm performance.

**C2.** *IPO performance increases with pay–performance sensitivity (PPS) for the TMT member.*

### 2.3. The effect on IPO performance and PPS of family ties and social ties of the TMT members with board members

In what follows, we argue – similar to previous work by the authors (see Chahine and Goergen, 2013) – that family ties reduce IPO performance whereas social ties have the opposite effect. What is novel in the present study is that we argue that PPS reduces the negative effect of family ties and amplifies the positive effect of social ties on IPO performance. In detail, prior literature suggests that family ties provide firms with valuable resources which are likely to be a long-term source of competitive advantage (Sirmon and Hitt, 2003). Broadly speaking, family ties may increase cooperation, including altruism, and individual and firm performance. To the extent that firms with stronger family ties between the TMT and board members are more likely to be family firms, these firms are also less likely to suffer from agency problems arising from the separation of ownership and control. Indeed, for firms with strong family ties the moral hazard problem may be significantly mitigated because (1) the large shareholdings of the family alleviate the free rider problem inherent in firms with numerous atomistic investors (Demsetz and Lehn, 1985), (2) there exists less information asymmetry between the TMT and the board directors, thereby facilitating better monitoring by the board and the provision of better advice to the managers (Anderson and Reeb, 2003), and (3) family-run firms have longer investment horizons, thus attenuating stock market short-termism (e.g. Stein, 1989).

However in turn, family firms may be subject to conflicts of interests between controlling and non-controlling shareholders (e.g., Ali et al., 2007). Indeed, Cabrera-Suárez et al. (2001) argue that family culture, influenced by the history of the family, may make an organization inflexible and resistant to change (see also Hall et al., 2001). Family ties may, for example, lead to paternalism, whereby family members care excessively for the other employees of the firm, interfere with their decisions, and "protect" them while denying them responsibility and the freedom to make autonomous choices (Dyer, 1986). Villalonga and Amit (2006) find that the involvement in the management of family members, other than the founding CEO, has a negative effect on firm performance. Family ties may thus have negative consequences such as shareholder value destruction. In addition, founding families may enjoy considerable control and power due to their concentrated shareholdings in their firms, which in turn may facilitate the expropriation of minority shareholders and lead to poor performance (Gilson and Gordon, 2003). One can even argue that the danger of minority shareholders being expropriated by the controlling family is greater at the time of the IPO since outside investors have very limited knowledge about the firm at that time. In other words, while recent evidence suggests that family ownership and management has a positive impact on performance (McConaughy, 2000; Schulze et al., 2003), family bonds are likely to create incentives to behave opportunistically, and to cause moral hazard, including free riding and shirking (Lubatkin et al., 2005). The increase in TMT "familiness" within the upper echelon potentially enhances the misappropriation of the firm's resources by family top executives (Minichilli et al., 2010; Schulze et al., 2001). Nevertheless, greater PPS might reduce part of the negative effects of family ties on IPO performance. Put differently, the positive effect of PPS on IPO performance is likely to be lower in the presence of family ties.

**C3.** *While IPO performance is negatively affected by family ties, this effect is mitigated by greater PPS.*

Similar arguments may be made for the case of social ties. Indeed, boards influence firm performance and protect shareholder interests by monitoring and disciplining TMT members (Boyd, 1994; Rechner and Dalton, 1991; Westphal and Zajac, 1995). In particular, outside directors, provided they are independent from the firm, monitor managers' decision making to ensure the maximization of shareholder wealth (Adams and Ferreira, 2007). Hence, the absence of social ties makes the board's monitoring more effective (Fama and Jensen, 1983, p. 315), whereas their existence might create barriers to monitoring which affect the quality of board performance (Hirshleifer and Thakor, 1994). This argument is supported by empirical evidence suggesting that social ties have a negative effect on TMT oversight (Hirsch et al., 1987).

In contrast, Westphal (1999) argues that social ties, such as friendships, encourage CEOs as well as other top managers to seek advice from the board. Evidence from behavioral research suggests how social ties among colleagues foster advice seeking,

decrease the fear of compromising one's social status and of disclosing information. In addition, Westphal (1999) cites research which shows that friendships enhance communication, information sharing, and collaboration through trust, and that they do not hinder the board's monitoring and oversight of the CEO. As such, social ties with similar others, influence firm performance since people with similar experiences enjoy smoother interaction (McPherson et al., 2001). In other words, social ties facilitate mutual understanding and render communication more likely and comfortable (Marsden, 1987; McPherson et al., 2001). In particular, social dependence shifts normative expectations from exchange-based norms that promote "dispassionate reciprocation" to communal norms that promote care and trust (Clark and Mills, 1979; Silver, 1990).

There is evidence that social ties create a positive predisposition and mitigate competitive behavior, thus directly affecting measurable economic outcomes (Hwang and Kim, 2009). Accordingly, these shared qualities and experiences, through the ties with similar others within the firm, facilitate interactions and thereby foster personal connections. Whether this is conscious or not, those concerned enjoy a higher degree of mutual understanding and are more comfortable with others who have similar characteristics and experiences (Marsden, 1987; McPherson et al., 2001). Prior research in the area of leader-member exchange theory, which focuses on the two-way relationship between supervisors and subordinates, shows that social ties between superiors and subordinates yield better performance (Bauer and Green, 1996). A management-friendly board may thus be optimal for shareholders (Adams and Ferreira, 2007; Almazan and Suarez, 2003; Westphal, 1999) given the positive effect of social ties on firm performance (Westphal, 1999).[2]

In addition to social ties, the choice of adequate incentive schemes is likely to establish a consensus and improve collaboration between the boardroom and the TMT, which in turn improves firm performance. We argue that IPO firms with TMT members with social ties with board members have a shared purpose and consensus vision and are thus likely to implement sufficiently articulated strategies to generate better IPO performance. Therefore, the positive effects of PPS on IPO performance are likely to be greater in the presence of social ties as compared to the presence of family ties.

**C4.** *IPO performance is positively affected by social ties, and this effect is amplified by greater PPS.*

## 3. Data and methodology

### 3.1. Data sources

We start with the list of all IPOs in the US markets from 1997 to 2008, obtained from the Securities Data Company (SDC) database. In line with prior research on IPOs (see e.g. Loughran and Ritter, 2002), we eliminate real-estate investment trusts (REITs), American Depository Receipts (ADRs), closed-end funds, foreign IPOs, unit offerings, financial IPOs, and those with an offer price of less than five dollars. We also eliminate carve-outs and spin-offs as these are different from regular IPOs given that they are flotations of parts of mature businesses (see e.g. Chahine and Goergen, 2011). We end up with 2082 IPOs. To keep within limits the highly labor-intensive data collection, we then randomly select 500 of these IPOs for our final sample, which represents about 20% of the IPO population. The TMT consists of those individuals listed in the IPO prospectus as top managers, i.e. those with executive level titles (i.e. vice-president and above).

The data on family ties, social ties, stock options, stock ownership, fixed salary, bonus and IPO characteristics is collected from the IPO prospectuses. The board's composition is also collected from the IPO prospectuses, by consulting the sections on the "MANAGEMENT" and "PRINCIPAL STOCKHOLDERS" as well as the footnotes to these sections to ensure the data is as accurate as possible. An additional data source is the proxy statements for the fiscal year of the IPO, which are available from the Securities and Exchange Commission's (SEC's) Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). In addition to the data on IPO stock options which are usually issued on (or a few days before) the offering date, data is also collected on all stock options granted *prior* to the IPO period as well as stock ownership. This enables us to determine overall PPS for the TMT members in place immediately after the IPO.

Table 1 compares the random sample of 500 IPOs covered by this study to the population of the 2082 IPOs. Panel A shows that, although some years are over-represented in the sample, the sample roughly follows the peaks and troughs of the population. Panel B suggests that the distribution across industries is similar to the population. Finally, Panel C shows that the sample and population have similar market capitalizations, percentages of hi-tech firms, percentages of VC-backed firms and similar first-day underpricing. Hence, we are confident that our sample is representative of the population of IPOs.

### 3.2. Methodology

To examine 1) the impact of family ties and social ties on PPS and 2) the impact of PPS as well as family ties and social ties for individual TMT members on IPO performance, we estimate the following system of two equations:

$$\begin{aligned} Pay\text{-}Performance\ \ Sensitivity_{i,j} = {} & \alpha_0 + \alpha_1 \times Family\ \ Ties_{i,j} + \alpha_2 \times Social\ \ Ties_{i,j} \\ & + \alpha_3 \times control\ \ variables_i + \varepsilon_i \end{aligned} \quad (1)$$

[2] Westphal (1999) finds that the board's monitoring of the CEO, as well as the exchange of information between the CEO and the board, has a positive effect on firm performance as measured by the market-to-book ratio and the return on equity.

**Table 1**
Data representativeness. Panel A compares the distribution across time of the IPO sample with that of the IPO population. Panel B performs the equivalent comparison across industry sectors, and Panel C compares the key IPO characteristics as well as underpricing for the sample with those for the entire IPO population. *Market Capitalization* is calculated in million of USD at the offer price. In line with Loughran and Ritter (2004), hi-tech stocks are defined as those with SIC codes 3571, 3572, 3575, 3577, 3578 (computer hardware), 3661, 3663, 3669 (communications equipment), 3671, 3672, 3674, 3675, 3677, 3678, 3679 (electronics), 3812 (navigation equipment), 3823, 3825, 3826, 3827, 3829 (measuring and controlling devices), 3841, 3845 (medical instruments), 4812, 4813 (telephone equipment), 4899 (communications services), and 7371, 7372, 7373, 7374, 7375, 7378, 7379 (software). *VC dummy* is equal to one if the IPO firm is VC-backed, and zero otherwise. *Underpricing* is equal to the difference between the price at the end of the first day of trading and the offer price over the latter. It is calculated for the sample as well as the population, i.e. all the IPOs for which data is available in SDC Platinum (i.e. 1822 IPOs). Due to the presence of outliers for underpricing, we winsorize the available data for the population at the 1st and the 99th percentile. Tests for difference in proportions are included in Panels A and B, and t-tests for differences in means are included in Panel C.

Panel A — number and percentage of IPOs per year

| Year | Sample | | Population | | Test for diff. in probs. |
|---|---|---|---|---|---|
| | Number | % | Number | % | |
| 1997 | 169 | 33.80 | 429 | 20.61 | 0.000 |
| 1998 | 48 | 9.60 | 237 | 11.38 | 0.214 |
| 1999 | 87 | 17.40 | 408 | 19.60 | 0.006 |
| 2000 | 89 | 17.80 | 318 | 15.27 | 0.002 |
| 2001 | 6 | 1.20 | 54 | 2.59 | 0.051 |
| 2002 | 7 | 1.40 | 53 | 2.55 | 0.127 |
| 2003 | 8 | 1.60 | 51 | 2.45 | 0.232 |
| 2004 | 13 | 2.60 | 138 | 6.63 | 0.004 |
| 2005 | 21 | 4.20 | 122 | 5.86 | 0.126 |
| 2006 | 15 | 3.00 | 120 | 5.76 | 0.043 |
| 2007 | 33 | 6.60 | 133 | 6.39 | 0.769 |
| 2008 | 4 | 0.80 | 19 | 0.91 | 0.606 |
| Total | 500 | 100.00 | 2082 | 100.00 | |

Panel B — number and percentage of IPOs per industry

| Industry classification | Sample | | Population | | Test for diff. in probs. |
|---|---|---|---|---|---|
| | Number | % | Number | % | |
| Consumer products and services | 55 | 11.00 | 241 | 11.58 | 0.717 |
| Consumer staples | 13 | 2.60 | 62 | 2.98 | 0.652 |
| Energy and power | 17 | 3.40 | 102 | 4.90 | 0.151 |
| Healthcare | 91 | 18.20 | 345 | 16.57 | 0.383 |
| Software & IT consulting services | 183 | 36.60 | 737 | 35.40 | 0.615 |
| Industrials | 38 | 7.60 | 158 | 7.59 | 0.993 |
| Materials | 15 | 3.00 | 62 | 2.98 | 0.979 |
| Media and entertainment | 19 | 3.80 | 100 | 4.80 | 0.337 |
| Retail | 24 | 4.80 | 122 | 5.86 | 0.357 |
| Telecommunications | 45 | 9.00 | 150 | 7.20 | 0.173 |
| Transportation | 0 | 0.00 | 3 | 0.14 | 0.396 |

Panel C — firm characteristics and IPO underpricing

| | Mean | S.D. | Mean | S.D. | Test for diff. in means |
|---|---|---|---|---|---|
| Market capitalization | 511.536 | 920.344 | 572.081 | 2552.477 | 0.602 |
| Hi-tech IPOs | 0.364 | 0.482 | 0.373 | 0.484 | 0.717 |
| VC dummy | 0.620 | 0.486 | 0.597 | 0.491 | 0.336 |
| Underpricing | 0.291 | 0.513 | 0.363 | 0.536 | 0.349 |

$$\begin{aligned} IPO\ Performance_i = {} & \beta_0 + \beta_1 \times Family\ Ties_{i,j} + \beta_2 \times Social\ Ties_{i,j} \\ & + \beta_3 \times Pay\text{-}Performance\ Sensitivity_{i,j} \\ & + \beta_4 \times Family\ Ties_{i,j} \times Pay\text{-}Performance\ Sensitivity_{i,j} \\ & + \beta_5 \times Social\ Ties_{i,j} \times Pay\text{-}Performance\ Sensitivity_{i,j} \\ & + \beta_6 \times control\ variables_i + \eta_i. \end{aligned} \quad (2)$$

Eq. (1) tests the validity of Conjecture 1 whereas Eq. (2) tests the validity of Conjectures 2, 3 and 4. We first estimate the regressions at the level of the *individual* TMT member (represented by index *j* in the above two equations) for each IPO firm (represented by index *i*). All the regressions control for firm fixed effects as the observations for the individual TMT members of the same firm are not independent of each other. This is done by clustering the regression errors by IPO firms. Later, in the robustness section, we re-estimate the regressions at the IPO firm level by aggregating the social ties and family ties of individual TMT members. In that section, we also re-estimate the regressions at the CEO level only.

Since family ties and social ties are likely to affect both PPS and IPO performance, and PPS is hypothesized to affect IPO performance, our empirical results might be affected by the endogeneity of PPS. There is thus a need to control for the potentially

endogenous determination of PPS. The Hausman (1978) specification test confirms the endogeneity of PPS at the 1% significance level. We shall thus use 3-stage least squares (3SLS) regressions, which are more efficient and are based on the full information set compared to the 2-stage least squares (2SLS) estimation procedure, which uses less information about the error structure. In a first instance, we do so by using the TMT member's board membership as an instrumental variable. *Board Member dummy* is set to one if the TMT member holds a board seat, and is zero otherwise. The Appendix discusses the validity of this instrument in detail. Further, for the CEO regressions in the robustness section we need to use different instruments as all CEOs sit on the board. In that same section, we also use a different way of adjusting for the potential endogeneity of PPS. In addition, in that section, we also adjust for the possible endogeneity of social ties and family ties in two different ways. Below, we present our dependent variables and the independent variables.

### 3.3. Dependent variables

*Pay–Performance Sensitivity* (PPS) is determined for every TMT member. It takes into account both stock options, granted at the time of IPO or during the years preceding the IPO, and stock ownership. It is calculated using the Black–Scholes model and is equal to delta times the shares represented by the option awards divided by the total number of shares outstanding immediately following the IPO. Delta is the change in the Black–Scholes option value caused by a one-dollar change in the stock price. Delta provides an estimate of the change in the value of the stock-option awards for a one-dollar change in the value of the firm's common equity (Yermack, 1995).[3] We then add to that figure the number of shares owned by the TMT member divided by the total number of shares outstanding, both being measured immediately following the IPO. Hence, PPS measures the change in the TMT member's compensation, via his stock options and stock ownership, caused by a one-dollar change in the stock price.[4] In the robustness section, we rerun the regressions for the CEOs only. This enables us to include the bonus into the calculation of PPS and to control for the fixed salary, two data items that are frequently not disclosed for the other TMT members.

*IPO Performance* is measured in the short run by first-day underpricing and the IPO premium, and in the long run by the buy-and-hold abnormal return (BHAR) over the one-year, two-year and three-year period following the close of the first day of trading. In line with prior literature, *Underpricing* is the difference between the price at the end of the first day of trading and the offer price over the offer price. *IPO Premium* is the difference between the offer price and the book value per share expressed as a fraction of the offer price (Nelson, 2003). *BHAR 1Y*, *BHAR 2Y* and *BHAR 3Y* is the one-year period, the two-year period and the three-year period (starting with the close of the market on the first day of trading) aftermarket performance, respectively. All three are adjusted by the equally-weighted return of $5 \times 5$ benchmark portfolios based on market capitalization and book-to-market ratio.[5]

### 3.4. Independent variables

*Family Ties* and *Social Ties* are TMT-member level variables. *Family Ties* is defined as the number of board members with whom a given TMT member has a family tie, expressed as a proportion of the total board size. *Social Ties* is the number of board members with whom the TMT member has at least one social tie, expressed as a proportion of the total board size. Social ties are of the following types: same origin (i.e., the same foreign nationality), same school (i.e., educational institution), same former employer, and same club or association membership. Moreover, for a TMT member who has *both* family ties and social ties with the *same* board member, we class such a TMT member as having family ties.[6] The rationale for doing so is that family ties are based on blood connections which provide a "binding" type of social capital whereas social ties are based on friendship and therefore provide only a "bridging" type of social capital. Compared to social ties, "family ties are personal and involve relatives, self-experiences and a sense of self-identity" (Trevinyo-Rodríguez and Bontis, 2010, p. 421). Hence, the family represents "a strong tie, developed on the basis of trust, expectation and the family bond" (Jack, 2005, p. 1244). As such, family ties usually give a personal dimension of shared responsibility for the firm, generating a sense of belonging as well as intense emotions among family members. These emotions may influence the perceptions of family members, bind them together, keep them apart from others, and regulate "their behavior through guilt, shame and pride" (Massey, 2002, p. 20). Since family ties are more binding and thus more influential than social ties, we assume that their effect dominates the effect of social ties with the same board member. We check the validity of this assumption in the robustness section.

[3] We make the following assumptions. We use the offer price as the price of the underlying stock at the time of the awards. For the exercise price, we use the weighted average of the exercise price of all stock options held by the TMT member at the IPO. We then use the yield of the ten-year U.S. Treasury Bond whose maturity coincides with the life time of the options. We calculate the annualized volatility, defined as the square root of the sample variance of the daily logarithmic stock returns during the first 120 trading days following the closing of the first day of trading, multiplied by 254, the number of trading days in a typical year. The dividend rate effect is excluded from the model since none of our firms pays a dividend around its IPO.

[4] In an earlier version of the paper, PPS was based on stock options only. The regression results were qualitatively similar.

[5] We identify for each IPO firm a portfolio of stocks based on market capitalization and another one based on the book-to-market ratio. The benchmark portfolios are built at the end of each IPO trading date as part of the intersections of 5 portfolios based on size (market capitalization) and 5 portfolios based on the book-to market ratio (B/M). The size breakpoints for each IPO are the quintiles of all Compustat firms for which we have market equity data on the IPO date. The B/M breakpoints are the quintiles of the B/M of all Compustat firms with a positive book equity value on the last fiscal year end in $t - 1$. The B/M is equal to the book equity divided by the market capitalization for the last fiscal year end in $t - 1$.

[6] Prior research on mergers and acquisitions examines the case where one acquirer director and one target director serve on the same third-party board (the so-called "second-degree" board connectedness), and shows that this form of social tie increases acquirer returns (see e.g. Cai and Sevilir, 2012). We are not aware of any case of second-degree board connectedness for our sample.

Based on prior research (see e.g. Hanley, 1993; Loughran and Ritter, 2002), we argue that IPO performance mainly depends on firm characteristics and market conditions at the time of the IPO. Both Eqs. (1) and (2) control for firm size and industry. *Market Capitalization*, based on the offer price, is used as a proxy for firm size. We use the natural logarithm of market capitalization *Ln Size*, in the regressions and this is expected to increase compensation (Jensen and Murphy, 1990), and IPO performance (Beatty and Ritter, 1986). A *Hi-Tech dummy* is added to control for the presence of higher asymmetric information in high-technology firms. This dummy variable is equal to one if the IPO firm is a hi-tech firm, and zero otherwise.[7] In line with prior research by Ritter (1984), *Aftermarket Standard Deviation* is used as a proxy for the riskiness of the IPO firm. It is equal to the standard deviation of the stock returns over the first 100 days starting with the first trading day following the IPO day. In line with Yermack (1995), we control for tax loss carry-forwards since firms with tax loss carry-forwards have lower marginal tax rates, making stock options more attractive. These firms are also riskier, which may affect IPO performance. *Loss Carry-forward dummy* is equal to one for firms with a tax loss carry-forward, and zero otherwise. Jensen (1986) argues that leverage plays a monitoring role. It may thus substitute for low PPS and improve IPO performance. Hence, both equations control for leverage by including *Pre-IPO Leverage* which is equal to pre-IPO long-term debt expressed as a fraction of pre-IPO total assets, both measured in the year preceding the IPO date (Leone et al., 2007). We also control for the growth opportunities of the IPO firm, via the price-to-book ratio, as these are likely to affect the compensation scheme as well as IPO performance. Since the IPO premium is based on the offer price and the book value per share, the *Price-to-Book Ratio* is included in the regressions on all measures of IPO performance, except for the regression on the IPO premium (Loughran and Ritter, 2004). *Lock-up Period* is equal to the difference in days between the IPO date and the lock-up expiry date. We expect a longer lock-up period to signal the commitment of the pre-IPO owners to the firm and therefore to affect IPO performance positively (Brav and Gompers, 2003; Megginson and Weiss, 1991). *Social Board Independence* is the proportion of outside directors on the board with neither family ties nor social ties with the TMT members and also without financial ties with the latter as well as the IPO firm.

The regressions also include a *VC dummy* which is equal to one if the IPO firm is VC-backed, and zero otherwise (Barry et al., 1990; Hamao et al., 2000; Lowry and Murphy, 2007; Megginson and Weiss, 1991). We also control for the reputation of the underwriter managing the offering. *Underwriter Reputation* is calculated as in Carter and Manaster (1990) and Loughran and Ritter (2004), with more reputable underwriters expected to certify the quality of managed offerings and to increase IPO performance. *Market Return* is the compound return of the equally-weighted CRSP index over the 20 trading days preceding the IPO date. It controls for market momentum and is expected to increase underpricing (Hanley, 1993; Loughran and Ritter, 2002). All the regressions include year dummies to control for cycles in IPO activity.[8]

The underpricing regression, which is based on Eq. (2), controls for an additional variable commonly used in the IPO literature, namely price revision. *Price Revision* is equal to the ratio of the difference between the offer price and the mid-point of the initial price range to the latter, and is used as a proxy for investor feedback during the pre-IPO period (Hanley, 1993).[9]

## 4. Empirical results

Table 2 presents the descriptive statistics for the 500 IPOs forming our sample. The average market capitalization is $455.4 million. The average aftermarket standard deviation of daily stock returns over the 100 days following the IPO (excluding the first day return) is 2.3%. On average, pre-IPO leverage is 25.6%, the price-to-book ratio is just under 2.7 and the lock-up period is 160 days. On average only 28.5% of outside directors are socially independent as evidenced by the absence of social, financial and family ties with the TMT members and the firm. Around 36.4% of the sample firms belong to hi-tech industries, 62.0% are VC-backed, and 35.2% went public during the bubble period of 1999–2000. The average market return preceding the IPO is 1.4%. On average, underwriter's reputation is equal to 7.345 within the Loughran and Ritter (2004) ranking.

The average price revision is positive with 3.6% and underpricing is 29.1%. The average premium amounts to 73.4% and the long-run aftermarket abnormal performance averages −2.4% over the one-year period, −14.2% over the two-year period and −5.9% over the three-year period following the IPO. Finally, there are on average 7.236 TMT members per IPO firm.

Table 3 reports the descriptive statistics for the 3613 TMT members in the 500 IPOs covered by this study. In a first instance, it compares the 2124 TMT members without any ties with the 1489 TMT members with ties, whether family ties or social ties. In a second instance, it compares the 169 TMT members with family ties with the 1320 TMT members with social ties. The table suggests that, while family ties are a relatively rare occurrence, they tend to be stronger than social ties. Indeed, the average TMT member with family ties has such ties with 38% of the board members. In contrast, social ties are a frequent occurrence but they involve only 25% of board members.

The table also shows that the proportion of TMT members that have stock options is significantly lower for those without ties (0.347) than for those with ties (0.572) ($p = 1\%$). TMT members without ties also hold on average significantly fewer stock options as well as stock options with a lower value than TMT members with ties ($p = 1\%$). Moreover, the proportion of TMT

[7] In line with Loughran and Ritter (2004), hi-tech stocks are defined as those with SIC codes 3571, 3572, 3575, 3577, 3578 (computer hardware), 3661, 3663, 3669 (communications equipment), 3671, 3672, 3674, 3675, 3677, 3678, 3679 (electronics), 3812 (navigation equipment), 3823, 3825, 3826, 3827, 3829 (measuring and controlling devices), 3841, 3845 (medical instruments), 4812, 4813 (telephone equipment), 4899 (communication services), and 7371, 7372, 7373, 7374, 7375, 7378, 7379 (software).

[8] The previous version of the paper included a *Bubble Period dummy*, instead of the year dummies. It controlled for the internet bubble of 1999–2000. Our results were qualitatively similar with this dummy.

[9] Although not shown in the paper, we calculated the variance inflation factors (VIFs) for all the variables. All VIFs are below 1.43, which suggests that our data does not suffer from severe multicollinearity (O'Brien, 2007).

**Table 2**
Descriptive statistics for the IPO firms. This table presents the descriptive statistics for the entire sample of 500 IPOs from 1997 to 2008. *Market Capitalization* is based on the offer price. *Hi-tech dummy* is equal to one if the IPO is a hi-tech firm, and zero otherwise (see also notes to Table 1). *Aftermarket Standard Deviation* is equal to the standard deviation of stock returns over the 100-day window starting with the trading day following the IPO date. *Pre-IPO Leverage* is equal to pre-IPO long-term debt as a fraction of pre-IPO total assets, both measured in the year preceding the IPO date. *Price-to-Book Ratio* is equal to the offer price over the book value per share at IPO. *Lock-up Period* is equal to the difference in days between the IPO date and the lock-up expiry date. *VC dummy* is equal to one if the IPO firm is VC-backed, and zero otherwise. *Social Board Independence* is the proportion of outside directors who do not have any financial, family, and social ties with one of the TMT members and with the IPO firm. *Underwriter Reputation* is calculated based on the ranking of Loughran and Ritter (2004). *Market Return* is the compound daily return of the equally-weighted CRSP index over the 20 trading days preceding the day of the offer. *Price Revision* is equal to the ratio of the difference between the offer price and the mid-point of the price range over the latter. *Underpricing* is equal to the ratio of the difference between the closing price at the end of the first day of trading and the offer price over the offer price. *IPO Premium* is equal to the difference between the offer price and the book value per share at IPO, expressed as a fraction of the offer price. The long-run buy-and-hold abnormal returns are calculated using the equally-weighted return of (5 × 5) benchmark portfolios formed based on market capitalization and book-to-market ratio. It is calculated based on the 12 months (*BHAR 1Y*), the 24 months (*BHAR 2Y*) *and* the 36 months (*BHAR 3Y*) following the closing price of the first day of trading after the IPO. Data required for calculating *BHAR 2Y* (BHAR 3Y) is available for 493 (456) of the 500 sample firms. *TMT Size* is the total number of executives as listed in the prospectus of each IPO firm.

| Variable | Mean | Median | S.D. | Min | Q1 | Q3 | Max |
|---|---|---|---|---|---|---|---|
| *Firm and market characteristics* | | | | | | | |
| Market capitalization | 455.42 | 236.94 | 927.54 | 9.073 | 98.52 | 472.96 | 11139.09 |
| Aftermarket standard deviation | 0.023 | 0.019 | 0.015 | 0.000 | 0.012 | 0.030 | 0.107 |
| Pre-IPO leverage | 0.256 | 0.120 | 0.439 | 0.000 | 0.000 | 0.372 | 6.184 |
| Price-to-book ratio | 2.695 | 1.904 | 3.298 | 0.358 | 1.409 | 2.807 | 42.692 |
| Lock-up period | 160.19 | 180.00 | 113.86 | 0.000 | 180.00 | 180.00 | 1080.00 |
| Social board independence | 0.285 | 0.286 | 0.202 | 0.000 | 0.143 | 0.400 | 1.000 |
| Hi-tech dummy | 0.364 | 0.000 | 0.482 | 0.000 | 0.000 | 1.000 | 1.000 |
| VC dummy | 0.620 | 1.000 | 0.486 | 0.000 | 0.000 | 1.000 | 1.000 |
| Market return | 0.014 | 0.018 | 0.041 | −0.128 | −0.014 | 0.042 | 0.145 |
| Underwriter reputation | 7.345 | 8.100 | 2.278 | 0.000 | 7.100 | 9.100 | 9.100 |
| *IPO price discovery and performance* | | | | | | | |
| Price revision | 0.036 | 0.000 | 0.248 | −0.500 | −0.119 | 0.143 | 1.000 |
| Underpricing | 0.291 | 0.125 | 0.513 | −0.709 | 0.008 | 0.320 | 3.373 |
| Premium | 0.734 | 0.750 | 0.168 | 0.040 | 0.644 | 0.845 | 1.778 |
| BHAR 1Y | −0.024 | −0.058 | 0.563 | −1.184 | −0.453 | 0.341 | 2.264 |
| BHAR 2Y | −0.142 | −0.160 | 0.735 | −1.682 | −0.686 | 0.331 | 5.364 |
| BHAR 3Y | −0.059 | −0.186 | 0.498 | −1.113 | −0.364 | 0.183 | 2.489 |
| *TMT members* | | | | | | | |
| TMT size | 7.236 | 7.000 | 2.948 | 1.000 | 5.000 | 9.000 | 22.000 |

members with stock options is significantly higher for those with social ties (0.580) than for those with family ties (0.509) ($p = 10\%$). TMT members with social ties also hold significantly more stock options as well as stock options with a higher value compared to TMT members with family ties ($p = 1\%$).

There are also significant differences in terms of stock ownership. Compared to TMT members with ties, TMT members without ties are significantly less likely to have stock ownership and have significantly less post-IPO ownership ($p = 1\%$). TMT members with family ties are more likely to have stock ownership and have more post-IPO ownership ($p = 1\%$) than those with social ties. As a consequence of these differences in stock option ownership as well as stock ownership, PPS of TMT members without ties is significantly lower than that of TMT members with ties ($p = 1\%$). This provides support for Conjecture 1. Finally, PPS of TMT members with family ties is higher than PPS of those with social ties ($p = 1\%$).[10]

TMT members without ties are also less likely to sit on the board ($p = 1\%$) whereas TMT members with family ties are more likely to be board members ($p = 1\%$) compared to TMT members with social ties.[11] As to the price discovery process at the time of the IPO, Table 3 does not show any significant differences in the price revision between TMT members with ties and those without ties as well as between those with family ties and those with social ties. However, TMT members without ties are associated with lower IPO performance, i.e. higher underpricing, a lower premium, and lower aftermarket long-run performance, than those with ties ($p = 5\%$ or better). Finally, TMT members with family ties are associated with lower IPO performance than TMT members with social ties ($p = 1\%$ or better); this is the case for all five performance measures.

Table 4 reports the results from the 3SLS estimation of Eqs. (1) and (2), adjusting for the possible endogeneity of PPS. Regression (1) is based on Eq. (1), the PPS equation, whereas regressions (2) to (4c) are based on Eq. (2). As the average TMT size is 7 (see Table 2) we have repeat observations for each IPO firm, which are clearly not independent of each other, and hence the

[10] If stock ownership is omitted from PPS, TMT members with social ties have significantly higher PPS than those with family ties ($p = 10\%$).

[11] Although not shown in Table 3, TMT members without ties are less likely to have a PhD ($p = 5\%$), have shorter tenure ($p = 1\%$), are less likely to be CEOs ($p = 1\%$), and more likely to be a finance, marketing, engineering, R&D, and/or human resources officer ($p = 10\%$ or better). Moreover, TMT members with family ties are more likely to be female ($p = 10\%$), have longer tenure ($p = 1\%$), are more likely to be the CEO ($p = 1\%$), and are also less likely to be finance officers, engineering officers, research and development (R&D) officers, and division general managers ($p = 10\%$ or better) than TMT members with social ties.

**Table 3**
Descriptive statistics for TMT members. This table presents the descriptive statistics for the sub-sample of TMT members with family and social ties with board members and the sub-sample of TMT members without such ties. *Family Ties* is the proportion of board members with whom a TMT member has a family link, and *Social Ties* is the proportion of board members with whom a TMT member has *Origin* (i.e. nationality), *School* (i.e. educational institution), *Former Employer Ties*, and/or *Club Membership Ties*. *TMT Members with Stock Options* is a dummy variable that equals one if the TMT member has stock options at the time of the IPO, and zero otherwise. *No. of Stock Options* is equal to the total number of stock options (in '000s) held by the TMT member at the time of the IPO. *Stock Options Value* is calculated using the Black–Scholes model and is in million USD. It is equal to the difference between the theoretically calculated value and the exercise price of the stock options. *TMT Members with Stock Ownership* is a dummy variable that equals one if the TMT member has stock ownership immediately after the IPO, and zero otherwise. *Post-IPO Ownership* is the number of shares held by the TMT member as a proportion of the total number of shares outstanding, both measured immediately after the IPO. *Value Stock Ownership* (*in $ mill.*) is the TMT member's stock ownership at the offer price. *Pay–Performance Sensitivity* (×100) is calculated based on the Black–Scholes model and is equal to delta × (shares represented by option award / shares outstanding following the IPO date), where delta is the first derivative of the Black–Scholes option value (i.e. the change in the Black–Scholes option value over the change in the stock price). We then add to that figure the number of shares owned by the TMT member divided by the total number of shares outstanding, both being measured immediately following the IPO. The PPS values are multiplied by 100 to better show the level of the sensitivity of TMT pay to $100 of performance. *Board Member dummy* is a dummy variable that is equal to one if the TMT member holds a board seat, and zero otherwise. All other variables are defined in Table 2. ***, **, and * denote significance at the 1%, 5%, and 10% level (for the two-sided test for difference in means/proportions), respectively.

| (Per TMT member) | TMT members | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Without ties (N = 2124) | | With ties (N = 1489) | | Ties vs. no ties | Family ties (N = 169) | | Social ties (N = 1320) | | Family ties vs. social ties |
| | Mean | S.D. | Mean | S.D. | Prob. t-test | Mean | S.D. | Mean | S.D. | Prob. t-test |
| *Ties* | | | | | | | | | | |
| Family ties | | | 0.033 | 0.110 | | 0.379 | 0.184 | | | |
| Social ties | | | 0.221 | 0.175 | | | | 0.251 | 0.165 | |
| *Stock options and stock ownership* | | | | | | | | | | |
| TMT members with stock options | 0.347 | 0.476 | 0.572 | 0.495 | 0.000*** | 0.509 | 0.501 | 0.580 | 0.494 | 0.077* |
| No. of stock options (in '000s) | 68.668 | 193.695 | 181.432 | 424.421 | 0.000*** | 97.165 | 197.078 | 192.220 | 444.117 | 0.006*** |
| Stock options value (in $ mill.) | 0.824 | 3.700 | 2.109 | 6.230 | 0.000*** | 0.967 | 2.545 | 2.255 | 6.540 | 0.011** |
| TMT members with stock ownership | 0.494 | 0.500 | 0.674 | 0.469 | 0.000*** | 0.886 | 0.319 | 0.646 | 0.478 | 0.000*** |
| Post-IPO ownership | 0.020 | 0.068 | 0.052 | 0.124 | 0.000*** | 0.169 | 0.204 | 0.037 | 0.100 | 0.000*** |
| Value stock ownership (in $ mil) | 6.280 | 46.549 | 24.545 | 121.907 | 0.000*** | 70.469 | 201.041 | 18.368 | 105.505 | 0.000*** |
| Pay–performance sensitivity (×100) | 2.392 | 6.944 | 5.876 | 12.731 | 0.000*** | 17.450 | 20.594 | 4.319 | 10.330 | 0.010*** |
| *TMT characteristics* | | | | | | | | | | |
| Board member dummy | 0.177 | 0.382 | 0.430 | 0.495 | 0.000*** | 0.751 | 0.433 | 0.389 | 0.488 | 0.000*** |
| *IPO price discovery and performance* | | | | | | | | | | |
| Price revision | 0.050 | 0.251 | 0.046 | 0.262 | 0.582 | 0.044 | 0.223 | 0.046 | 0.267 | 0.919 |
| Underpricing | 0.380 | 0.573 | 0.310 | 0.552 | 0.000*** | 0.447 | 0.699 | 0.292 | 0.528 | 0.001*** |
| Premium | 0.725 | 0.162 | 0.747 | 0.175 | 0.000*** | 0.714 | 0.167 | 0.751 | 0.176 | 0.010*** |
| BHAR 1Y | −0.064 | 0.542 | 0.004 | 0.576 | 0.000*** | −0.224 | 0.460 | 0.033 | 0.583 | 0.000*** |
| BHAR 2Y | −0.193 | 0.656 | −0.142 | 0.709 | 0.026** | −0.459 | 0.618 | −0.101 | 0.710 | 0.000*** |
| BHAR 3Y | −0.104 | 0.446 | −0.023 | 0.489 | 0.000*** | −0.157 | 0.468 | −0.005 | 0.489 | 0.000*** |

regressions include firm fixed effects. In line with Conjecture 1, regression (1) suggests that PPS increases with the TMT member's family ties and social ties with the board of directors. A Wald test (not tabulated) shows that the two coefficients are significantly different from each other ($p = 1\%$). We also find that PPS is higher for TMT members who have board membership (the instrumental variable). PPS is also higher for those TMT members who work for smaller firms. In line with Yermack (1996), TMT members of firms with a loss carry-forward and lower leverage have greater PPS. PPS also decreases with social board independence. The latter two results confirm our expectations that leverage and social board independence act as substitutes for PPS. Contrary to our expectations, TMT members of VC-backed firms have greater PPS.

As per Conjecture 1, regression (1) suggests that PPS is higher for TMT members with family ties or social ties as compared to TMT members without any such ties.[12] We also find that PPS is higher for TMT members who have board membership (the instrumental variable). PPS is also higher for those TMT members who work for smaller firms. In line with Yermack (1996), TMT members of firms with a loss carry-forward and lower leverage have greater PPS. PPS also decreases with social board independence. The latter two results confirm our expectations that leverage and social board independence act as substitutes for PPS. Contrary to our expectations, TMT members of VC-backed firms have greater PPS.

Further, all five regressions (2) to (4c) show evidence of a positive association between IPO performance and PPS, which is consistent with Conjecture 2. In line with prior research by the authors, regressions (2) to (4c) show that family ties reduce both short-term and long-term IPO performance, whereas social ties improve performance. More importantly, the interaction term between family ties and PPS as well as that between social ties and PPS is significant (except for the interaction effect with family ties in regression (3)) ($p = 10\%$) and both improve IPO performance. An untabulated Wald test indicates no significant difference

[12] A Wald test (not tabulated) shows that the two coefficients are significantly different from each other ($p = 1\%$).

**Table 4**
TMT member ties, pay–performance sensitivity and IPO performance. The table presents the 3-stage least squares (3SLS) regressions of pay–performance sensitivity of all stock options held by the TMT member and the IPO performance for the sample of 3613 TMT members. All the regressions are estimated using 3SLS, controlling for the endogenous choice of the pay–performance sensitivity. Firm fixed effects are included to cluster the errors by IPO firms. All variables are defined as in Tables 2 and 3. Heteroskedasticity-consistent standard errors are reported in italic beneath the coefficient estimates. ***, **, and * denotes significance at the 1%, 5%, and 10% level (for the two-sided t-test), respectively.

| | Pay–performance sensitivity | Underpricing | Premium | BHAR 1Y | BHAR 2Y | BHAR 3Y |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4a) | (4b) | (4c) |
| Constant | 0.036 | 0.489*** | 0.465*** | −0.496*** | −0.543*** | −0.505*** |
| | *0.023* | *0.089* | *0.042* | *0.120* | *0.157* | *0.098* |
| Pay–performance sensitivity (PPS) | | −0.490** | 0.055* | 0.426* | 0.732** | 0.301* |
| | | *0.251* | *0.094* | *0.231* | *0.325* | *0.163* |
| Family ties | 0.251*** | 0.453*** | −0.051* | −0.472*** | −0.552** | −0.125* |
| | *0.021* | *0.123* | *0.031* | *0.170* | *0.222* | *0.068* |
| Family ties × PPS | | −0.208* | 0.119 | 0.206* | 0.345** | −1.199* |
| | | *0.116* | *0.101* | *0.116* | *0.160* | *0.825* |
| Social ties | 0.044*** | −0.117** | 0.067*** | 0.198*** | 0.286*** | 0.209*** |
| | *0.010* | *0.050* | *0.019* | *0.070* | *0.091* | *0.056* |
| Social ties × PPS | | −0.291* | 0.374* | 1.071* | 1.386* | 0.533* |
| | | *0.677* | *0.211* | *0.623* | *0.816* | *0.321* |
| Price revision | | 0.771*** | | | | |
| | | *0.031* | | | | |
| Ln Size | −0.007*** | −0.078*** | 0.053*** | 0.115*** | 0.097*** | 0.057*** |
| | *0.001* | *0.008* | *0.003* | *0.011* | *0.014* | *0.008* |
| Hi-tech dummy | 0.002 | 0.126*** | 0.041*** | 0.036* | 0.052* | 0.037 |
| | *0.003* | *0.016* | *0.006* | *0.022* | *0.037* | *0.028* |
| Aftermarket standard deviation | 0.184 | 3.426*** | 1.100*** | 2.306** | 2.828** | 1.602** |
| | *0.014* | *0.678* | *0.250* | *0.929* | *1.215* | *0.763* |
| Loss carry-forward | 0.007** | −0.003 | 0.016** | −0.097*** | −0.130*** | −0.045** |
| | *0.003* | *0.017* | *0.006* | *0.023* | *0.030* | *0.019* |
| Pre-IPO leverage | −0.005* | −0.018* | −0.001 | −0.035* | −0.095*** | −0.076*** |
| | *0.003* | *0.011* | *0.006* | *0.020* | *0.028* | *0.018* |
| Lock-up period | | −0.000 | 0.000 | 0.000 | 0.000*** | 0.000 |
| | | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Social board independence | −0.027*** | −0.080** | 0.033** | 0.297*** | 0.434*** | 0.036 |
| | *0.008* | *0.037* | *0.014* | *0.052* | *0.068* | *0.043* |
| Price-to-book ratio | 0.001* | 0.017*** | | −0.007** | −0.013*** | −0.016*** |
| | *0.000* | *0.002* | | *0.003* | *0.004* | *0.005* |
| VC dummy | −0.007** | 0.088*** | −0.014** | 0.067*** | 0.002 | 0.020 |
| | *0.004* | *0.017* | *0.006* | *0.024* | *0.031* | *0.005* |
| Underwriter reputation | | 0.012** | −0.005*** | −0.015** | 0.001 | 0.007 |
| | | *0.005* | *0.002* | *0.006* | *0.008* | *0.005* |
| Market return | | 0.766*** | 0.078* | 0.044 | −0.174 | −0.057 |
| | | *0.169* | *0.045* | *0.232* | *0.305* | *0.197* |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R2 | 0.252 | 0.417 | 0.184 | 0.102 | 0.093 | 0.101 |
| Chi2 | 1219.050 | 2629.540 | 813.970 | 358.980 | 338.340 | 376.1 |
| Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of observations | 3613 | 3613 | 3613 | 3613 | 3560 | 3236 |

in the effects on IPO underpricing of the interaction term between PPS and social ties and that between PPS and family ties. However, the positive effect on the IPO premium is only significant in the case of the interaction term between PPS and social ties. Moreover, the positive effect of the former interaction on *BHAR 1Y*, *BHAR 2Y*, and *BHAR 3Y* is significantly higher than that between PPS and family ties ($p = 1\%$). In line with Conjectures 3 and 4, this suggests that PPS reduces the negative effect of family ties whereas it strengthens the positive effect of social ties on IPO performance. As to the economic effect of PPS, based on average PPS for TMT members with family ties (0.175 in Table 3) and the average family ties (0.379 in Table 3), the effect of family ties on IPO underpricing is reduced from 0.172 to 0.072, i.e. a 58% reduction. The positive effect of PPS on performance is even more pronounced when the latter is measured by the two-year BHAR (BHAR 2Y), with a decrease of −0.209 to −0.059, i.e. a 72% decrease.

As to the control variables, the results from the underpricing regression, i.e. regression (2), are consistent with the literature. Underpricing is positively related to price revision, aftermarket standard deviation, price-to-book ratio, underwriter reputation, and the market return prior to the IPO date ($p = 5\%$ or better), and it is negatively related to firm size, pre-IPO leverage, and social board independence ($p = 10\%$ or better). Underpricing is also higher in hi-tech firms, and VC-backed IPOs ($p = 1\%$ for both).

The IPO premium (see regression (3)) is positively related to firm size, aftermarket standard deviation, social board independence, and pre-IPO market return ($p = 10\%$ or better), and it is negatively related to underwriter reputation ($p = 1\%$).

The premium is also higher for hi-tech IPOs ($p = 1\%$), those with tax loss carry-forwards ($p = 5\%$), but is lower in VC-backed IPOs ($p = 5\%$). Long-run performance over the one-year period, the two-year period and the three-year period following the IPO is positively related to firm size, lock-up period (only in regression (4b)), and social board independence ($p = 1\%$, except in regression (4c)) whereas it is negatively related to tax loss carry-forwards ($p = 5\%$ or better). *BHAR 1Y* is lower if the IPO is underwritten by a more reputable underwriter ($p = 5\%$) and *BHAR 1Y*, *BHAR 2Y* and *BHAR 3Y* are lower if the firm has high leverage ($p = 10\%$ or better).

## 5. Robustness tests

This section carries out a battery of robustness tests. These tests adjust for the potential endogeneity of PPS in an alternative way; they allow for the potential endogeneity of family ties, and social ties; they check the validity of the assumption that, for TMT members that have both family ties and social with a given board member, the former dominate; they allow for industry cluster effects; and they check the robustness of the existing results via the estimation of 3SLS regressions at the CEO level. There is the possibility that in what precedes we may have drawn the wrong inferences as we may not have correctly adjusted for the endogeneity of PPS. Similarly, our results may be biased given that we have not allowed for the endogeneity of family ties and social ties. Hence, our inferences as to the validity of Conjectures 3 and 4 may be wrong.

### 5.1. The potential endogeneity of PPS and ties

In this section, we first test the robustness of our results by adjusting for the potential endogeneity of PPS in a different way from what was done above. We do so by first regressing PPS on social ties and family ties and then using the residuals from this regression as a proxy for PPS in the IPO performance regressions. PPS is thus no longer contaminated by the impact of social ties and family ties. Our results about the positive effect of social ties and the negative effect of family ties on IPO performance remain consistent and become even slightly more significant.[13] More importantly, our empirical tests show that the negative effect of family ties is mitigated by PPS whereas the positive effect of social ties is amplified by PPS, which is consistent with Conjectures 3 and 4.

Social ties and family ties may also be endogenous. In particular, the positive (negative) effect of social (family) ties on firm performance may reflect the endogeneity of these ties, relative to firm performance. For example, it may be the case that more capable managers with larger social networks, who run well-performing firms, attract closely tied board members. Although the Hausman (1978) test does not suggest that family ties and social ties are endogenous, we nevertheless test the robustness of our results by testing for the potential endogeneity of social ties and family ties in the following two ways.

First, we estimate 3SLS models with four equations (rather than just two) explaining family ties and social ties,[14] in addition to PPS and firm performance. Our results, which are not tabulated, are qualitatively similar.[15] This suggests that, even after controlling for the potential endogeneity of ties, the effects of PPS, and TMT ties as well as their interactions on IPO performance remain consistent.

Second, we also conduct a more involved test of dealing with the possible endogeneity of ties, focusing on possible differences in the drivers behind social ties and family ties. This test consists of matching TMT members with social ties with TMT members with family ties based on similar PPS (+/−10%), board membership, gender, pre-IPO ownership (+/−25%), and CEO status. In other words, we compare TMT members with social ties with TMT members with family ties that are as similar as possible in terms of their characteristics. We are able to match 110 TMT members with social ties with TMT members with family ties. Table 5 reports the results of this additional test. Panel A reports descriptive statistics. Compared to TMT members with family ties, TMT members with social ties come hand in hand with greater IPO performance, as measured by the IPO premium ($p = 10\%$), and *BHAR 1Y*, *BHAR 2Y* and *BHAR 3Y* ($p = 1\%$). Panel B reports the regressions for Eqs. (1) and (2). Regression (5) on PPS shows that family ties as well as social ties still increase PPS. Further, regressions (6) to (8c) suggest that family ties still reduce IPO performance whereas social ties increase IPO performance ($p = 10\%$ or better). This is the case for all five measures of IPO performance. The interactive effect between family ties and PPS and the equivalent interactive effect for social ties are significant ($p = 10\%$ or better) in all five regressions (except for the former in regression (7)) providing further support for Conjectures 3 and 4.

Although not tabulated, we also perform a less stringent matching consisting of matching TMT members with social ties with TMT members with family ties based on similar PPS (+/−50%), board membership, gender, pre-IPO ownership (+/−50%), and CEO status. This less stringent matching enables us to match 169 TMT members with social ties with an equivalent number of TMT members with family ties. We find virtually the same results as for the previous, more stringent matching. In particular and in line with Conjecture 1, family ties as well as social ties still increase PPS. Finally, in line with our empirical results in Table 4, we find evidence consistent with Conjectures 3 and 4. Specifically, although family ties are negatively associated with IPO performance, the effect is mitigated by greater PPS ($p = 10\%$ or better). Moreover, IPO performance is positively related to social ties and the effect is higher in firms with greater PPS ($p = 5\%$ or better). [16]

[13] These results are available upon request.
[14] The explanatory variables in the equations for family ties and social ties are gender, age, tenure and a *PhD dummy*.
[15] The results are available upon request.
[16] The results are not reported in tabular form, but are available upon request from the authors.

**Table 5**
TMT members with social ties matched with TMT members with family ties with similar characteristics. This table presents the 3SLS regressions of the total pay–performance sensitivity and the IPO performance for the sub-sample of TMT members with social ties matched with equivalent TMT members with family ties. The 110 TMT members with social ties are matched with TMT members with family ties based on similar PPS (+/−10%), board membership, gender, pre-IPO ownership (+/−25%), and CEO status. Panel A presents the descriptive statistics and Panel B contains the regression analysis. All variables are defined as in Tables 2 and 3. Heteroskedasticity-consistent standard errors are reported in italic beneath the coefficient estimates. ***, **, and * denote significance at the 1%, 5%, and 10% level (for the two-sided t-test), respectively.

Panel A — descriptive statistics

| TMT | | Underpricing | Premium | BHAR 1Y | BHAR 2Y | BHAR 3Y |
|---|---|---|---|---|---|---|
| TMT members with social ties | Mean | 0.274 | 0.753 | 0.051 | 0.008 | 0.015 |
| (N = 110) | Median | 0.094 | 0.778 | −0.001 | −0.036 | −0.098 |
| | S.D. | 0.565 | 0.155 | 0.536 | 0.766 | 0.455 |
| TMT members with family ties | Mean | 0.388 | 0.715 | −0.199 | −0.319 | −0.179 |
| (N = 110) | Median | 0.230 | 0.754 | −0.226 | −0.377 | −0.236 |
| | S.D. | 0.562 | 0.161 | 0.478 | 0.550 | 0.437 |
| t-Test for difference | | 0.137 | 0.071* | 0.000*** | 0.000*** | 0.002*** |

Panel B — regression analysis (3SLS)

| | Pay–performance sensitivity | Underpricing | Premium | BHAR 1Y | BHAR 2Y | BHAR 3Y |
|---|---|---|---|---|---|---|
| | (5) | (6) | (7) | (8a) | (8b) | (8c) |
| Constant | −0.118 | 0.519 | 0.386*** | −0.453 | −1.104* | −0.163 |
| | *0.146* | *0.447* | *0.149* | *0.584* | *0.647* | *0.393* |
| Pay–performance sensitivity | | −0.291* | −0.145 | 0.359* | 0.344* | 0.140 |
| | | *0.157* | *1.130* | *0.201* | *0.192* | *0.131* |
| Family ties | 0.174** | 0.352** | −0.140** | −0.550* | −0.303** | −0.265** |
| | *0.070* | *0.158* | *0.060* | *0.331* | *0.141* | *0.118* |
| Family ties × PPS | | −0.125* | 0.212 | 0.118* | 0.112* | 0.135* |
| | | *0.068* | *0.189* | *0.063* | *0.057* | *0.076* |
| Social ties | 0.220** | −0.250*** | 0.040* | 0.287** | 0.246** | 0.186* |
| | *0.087* | *0.086* | *0.024* | *0.130* | *0.114* | *0.101* |
| Social ties × PPS | | −0.122* | 0.015* | 0.154** | 0.146* | 0.081* |
| | | *0.067* | *0.009* | *0.077* | *0.081* | *0.047* |
| Board member dummy | 0.168*** | | | | | |
| | *0.026* | | | | | |
| Price revision | | 1.133*** | | | | |
| | | *0.208* | | | | |
| Ln Size | −0.014* | −0.105*** | 0.057*** | 0.067** | 0.051* | 0.057* |
| | *0.008* | *0.040* | *0.013* | *0.032* | *0.029* | *0.034* |
| Hi-tech dummy | −0.011 | 0.088* | 0.057** | −0.055 | 0.038 | 0.097 |
| | *0.026* | *0.049* | *0.025* | *0.131* | *0.147* | *0.082* |
| Aftermarket standard deviation | −0.639 | 2.727* | 0.927 | 6.670* | 8.623** | 8.753*** |
| | *1.024* | *1.515* | *1.102* | *3.699* | *3.752* | *2.828* |
| Loss carry-forward | −0.050* | 0.165 | 0.030 | −0.235* | −0.274 | −0.232 |
| | *0.026* | *0.190* | *0.057* | *0.124* | *0.300* | *0.236* |
| Pre-IPO leverage | 0.011 | −0.009 | 0.015 | 0.023 | −0.258** | 0.227* |
| | *0.045* | *0.171* | *0.056* | *0.230* | *0.130* | *0.137* |
| Lock-up period | | −0.000 | 0.000 | 0.000* | 0.000* | 0.000* |
| | | *0.000* | *0.000* | *0.000* | *0.001* | *0.000* |
| Social board independence | 0.073* | −0.102* | −0.092 | 0.405** | 0.388** | 0.390* |
| | *0.044* | *0.059* | *0.080* | *0.212* | *0.192* | *0.211* |
| Price-to-book ratio | 0.007 | 0.036* | | 0.001 | 0.012 | 0.030* |
| | *0.006* | *0.020* | | *0.030* | *0.034* | *0.018* |
| VC dummy | 0.001 | 0.212** | 0.021 | −0.010 | −0.198* | −0.184** |
| | *0.027* | *0.104* | *0.034* | *0.135* | *0.112* | *0.084* |
| Underwriter reputation | | 0.022 | −0.011** | −0.047** | 0.003 | 0.026 |
| | | *0.020* | *0.006* | *0.019* | *0.033* | *0.021* |
| Market return | | 0.704** | 0.165 | 0.266 | −2.673* | −2.968** |
| | | *0.317* | *0.312* | *1.269* | *1.516* | *1.201* |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R2 | 0.288 | 0.553 | 0.296 | 0.136 | 0.191 | 0.182 |
| Chi2 | 89.000 | 289.020 | 92.280 | 43.310 | 53.710 | 48.100 |
| Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 |
| Number of observations | 220 | 220 | 220 | 220 | 220 | 201 |

Third, we use a two-step Heckman procedure in Table 6. The first-step regression (regression (9)) estimates the likelihood of a TMT member having social ties with the board members. We focus on social ties as family ties are relatively rare (see Table 3); family ties are omitted altogether from the Heckman procedure. The second-step regressions, i.e. regressions (10) to (12c), are based on Eq. (2), i.e. the performance equation. There is further support for Conjecture 2 of a positive effect of PPS on IPO

**Table 6**
Social ties vs. PPS and IPO performance: a two-step Heckman procedure. The table presents the two-step Heckman procedure for the case of social ties for the sample of 3613 TMT members. All the regressions are estimated using a two-step Heckman procedure. The first-step regression (regression (9)) estimates the likelihood of the TMT member having social ties with the board members. The second-step regressions (regressions (10)–(12c)) are based on Eq. (2), i.e. the performance equation. Firm fixed effects are included, i.e. the errors are clustered by IPO firm. All variables are defined as in Tables 2 and 3. Heteroskedasticity-consistent standard errors are reported in italic beneath the coefficient estimates. ***, **, and * denotes significance at the 1%, 5%, and 10% level (for the two-sided t-test), respectively.

| | Social ties dummy | Underpricing | Premium | BHAR 1Y | BHAR 2Y | BHAR 3Y |
|---|---|---|---|---|---|---|
| | (9) | (10) | (11) | (12a) | (12b) | (12c) |
| Constant | −0.807*** | 0.412* | 0.203*** | −0.702** | −0.851* | −0.451 |
| | *0.299* | *0.220* | *0.064* | *0.331* | *0.465* | *0.293* |
| Pay–performance sensitivity | | −0.053* | 0.057* | 0.239* | 0.394** | 0.212* |
| | | *0.029* | *0.032* | *0.141* | *0.191* | *0.112* |
| Social ties | | −0.028** | 0.092*** | 0.123** | 0.212** | 0.092* |
| | | *0.013* | *0.023* | *0.056* | *0.094* | *0.051* |
| Social ties × PPS | | −0.021** | 0.031*** | 0.031* | 0.064** | 0.034 |
| | | *0.010* | *0.010* | *0.017* | *0.025* | *0.021* |
| TMT characteristics | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm and offering characteristics | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Wald Chi2 | | 1031.856 | 421.363 | 268.451 | 254.314 | 329.413 |
| Probability | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

performance as the coefficient on PPS is significant ($p$ = 10% or better) in all five performance regressions (regressions (10) to (12c)). We also still find that the interaction term between PPS and social ties is positive and significant ($p$ = 10% or better), except in regression (12) on *BHAR 3Y*. This provides further support for Conjecture 4.

The above three tests suggest that our main results that PPS improves IPO performance and that PPS reduces the negative effect of family ties on IPO performance whereas it increases the positive effect of social ties are robust to different ways of adjusting for the potential endogeneity of ties.

### 5.2. The dominance of family ties over social ties

So far, we have assumed that family ties are stronger than social ties. In other words, if a TMT member has both family ties and social ties with a given board member, we have considered this TMT member to have family ties *only* with that board member. Whereas in what precedes we have argued that family relationships are typically the stronger of the two types of ties, one may argue the converse in the IPO context. Indeed, prior research suggests that TMT members with family ties are likely to be inward looking and likely to share information with each other only, thus providing less instrumental and more redundant resources than TMT members with social ties who usually provide diverse expertise (Wellman and Wortley, 1990). Social ties may thus be the stronger type of tie in the IPO environment. In particular, social ties may have a stronger effect on PPS and IPO performance than family ties.

As a robustness test, we run a 3SLS system using three types of ties rather than just two. Rather than assuming that family ties are stronger than social ties and classing TMT members with both types of ties as TMT members with family ties only we now distinguish TMT members with both types of ties from those with family ties only, those with social ties only, and those with neither type of ties. The results (which are not tabulated) confirm our existing findings.

### 5.3. Industry cluster effect

We also verify whether family ties and social ties are clustered in specific industries. Using the Fama–French industry classification,[17] we run a multinomial Logit regression to explain the likelihood of each of the two types of ties across different industries. The regression has little explanatory power as evidenced by the pseudo R-square of only 0.0098. The results (which are not tabulated) do not suggest that one type of ties or both are more likely in certain industries.[18]

### 5.4. Social ties, PPS, and IPO performance at the firm level and at the CEO level

We rerun the regressions from Table 4 at the IPO firm level by aggregating the social ties and family ties of individual TMT members. The regressions, which are not tabulated, confirm our previous results. We also re-estimate the regressions from Table 4 based on the observations for the CEOs only. This enables us to use a more complete measure of PPS, which includes

[17] We use the Fama and French industry classification that is based on the following 10 industries: Consumer Non Durables, Consumer Durables, Manufacturing, Energy, Hi-tech Business Equipment, Telecom, Retail, Healthcare, Utilities, and Others including Mines and Construction. See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html for more details.

[18] The results are available upon request from the authors.

bonuses and other one-off cash payments. While bonuses, other one-off cash payments and fixed salary are disclosed for the case of the CEO, this information is typically not available for the other TMT members. Hence, the CEO level regressions also include the fixed salary of the CEO (as a percentage of total assets) as a separate control variable while the bonus is added to PPS. We use CEO characteristics, i.e. *Female dummy*, *Age*, *PhD dummy*, and *Tenure*, as instrumental variables in a 3SLS system. The validity of these instruments is discussed in the Appendix. Table 7 reports the results, and they are consistent with those observed in Table 4.

**Table 7**
PPS, family ties and social ties and IPO performance: a CEO level study. This table presents the 3-stage least squares (3SLS) regressions of the CEO pay–performance sensitivity and the IPO performance for the sample of 500 IPOs. *Pay–Performance Sensitivity* measures the one-dollar change in compensation, including stock options, stock ownership, and bonus, based on a one-dollar change in the stock price. *CEO Female dummy* is equal to one if the CEO is a female, and zero otherwise. *CEO Age* is measured in years. *CEO PhD dummy* is equal to one if the CEO has a PhD, MD or JD, and zero otherwise. *CEO Tenure* is equal to the number of years since the CEO has joined the IPO firm. *CEO Salary* (*% Total Assets*) is the CEO's fixed salary expressed as a percentage of total assets at the end of the last fiscal year prior to the IPO date. All variables are defined as in Tables 2 and 3. Heteroskedasticity-consistent standard errors are reported in italic beneath the coefficient estimates. ***, **, and * denote significance at the 1%, 5%, and 10% level (for the two-sided t-test), respectively.

| | Pay–performance sensitivity | Underpricing | Premium | BHAR 1Y | BHAR 2Y | BHAR 3Y |
|---|---|---|---|---|---|---|
| | 3SLS | 3SLS | 3SLS | 3SLS | 3SLS | 3SLS |
| | (13) | (14) | (15) | (16a) | (16b) | (16c) |
| Constant | 0.094 | −0.111** | 0.439*** | −1.818* | −2.033*** | −0.347** |
| | *0.081* | *0.664* | *0.093* | *1.016* | *0.684* | *0.162* |
| Pay performance sensitivity (PPS) | | −1.356** | 0.310* | 3.819** | 4.610** | 0.425 |
| | | *0.677* | *0.169* | *1.549* | *2.052* | *0.484* |
| Family ties | 0.374*** | 0.494* | −0.046* | −1.129* | −2.154** | −0.065* |
| | *0.070* | *0.265* | *0.028* | *0.606* | *1.076* | *0.038* |
| Family ties × PPS | | −0.157** | 0.091 | 0.656* | 0.909* | 0.077 |
| | | *0.073* | *0.076* | *0.355* | *0.517* | *0.244* |
| Social ties | 0.241*** | −0.466** | 0.065* | 0.668*** | 0.971** | 0.607** |
| | *0.052* | *0.213* | *0.036* | *0.974* | *0.433* | *0.305* |
| Social ties × PPS | | −0.153** | 0.131** | 0.247* | 0.522* | 0.138* |
| | | *0.067* | *0.058* | *0.143* | *0.297* | *0.077* |
| Female dummy | 0.026 | | | | | |
| | *0.036* | | | | | |
| Age | 0.002*** | | | | | |
| | *0.001* | | | | | |
| PhD dummy | 0.022** | | | | | |
| | *0.010* | | | | | |
| CEO tenure | −0.002* | | | | | |
| | *0.001* | | | | | |
| Salary (% total assets) | −0.001 | | | | | |
| | *0.481* | | | | | |
| Price revision | | 0.783*** | | | | |
| | | 0.091 | | | | |
| Ln Size | −0.026*** | −0.106*** | 0.038*** | 0.175*** | 0.169*** | 0.059*** |
| | *0.008* | *0.024* | *0.008* | *0.036* | *.047* | *0.011* |
| Hi-tech dummy | −0.010 | 0.114** | 0.044*** | 0.005 | −0.020 | 0.075 |
| | *0.017* | *0.047* | *0.015* | *0.071* | *0.094* | *0.132* |
| Aftermarket standard deviation | 0.067 | 0.775 | 0.593 | 3.117 | 3.944 | 2.978*** |
| | *0.664* | *2.025* | *0.627* | *3.050* | *4.061* | *0.954* |
| Loss carry-forward | −0.063*** | 0.119 | 0.030* | 0.123 | 0.171 | −0.020 |
| | *0.017* | *0.112* | *0.016* | *0.171* | *0.226* | *0.053* |
| Pre-IPO leverage | 0.043** | −0.100 | 0.004 | −0.150 | −0.224 | 0.034 |
| | *0.017* | *0.082* | *0.018* | *0.126* | *0.169* | *0.039* |
| Lock-up period | | −0.000 | 0.000*** | 0.000** | 0.000** | 0.000* |
| | | *0.000* | *0.000* | *0.000* | *0.001* | *0.000* |
| Social board independence | 0.128*** | −0.141** | 0.013 | 0.151** | 0.321** | 0.197** |
| | *0.040* | *0.058* | *0.043* | *0.066* | *0.156* | *0.082* |
| Price-to-book ratio | 0.004* | 0.024*** | | −0.017 | −0.024* | −0.027* |
| | *0.002* | *0.007* | | *0.010* | *0.014* | *0.016* |
| VC dummy | −0.056*** | 0.185* | −0.002 | 0.255* | 0.427** | 0.027 |
| | *0.018* | *0.099* | *0.023* | *0.151* | *0.202* | *0.047* |
| Underwriter reputation | | 0.021 | −0.001 | 0.001 | 0.018 | −0.006 |
| | | *0.018* | *0.005* | *0.028* | *0.038* | *0.009* |
| Market return | | 0.631** | 0.110 | 0.187 | −0.023 | 0.370 |
| | | *0.299* | *0.168* | *0.696* | *0.946* | *0.236* |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R2 | 0.305 | 0.282 | 0.265 | 0.154 | 0.142 | 0.178 |
| Chi2 | 671.150 | 291.600 | 178.980 | 47.170 | 55.940 | 55.033 |
| Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Number of observations | 500 | 500 | 500 | 500 | 492 | 456 |

In particular, we confirm the existence of a positive effect of family ties and social ties on PPS ($p = 10\%$). We also confirm our previous results that PPS reduces the negative effect of family ties on IPO performance and strengthens the positive effect of social ties. The relevant interaction terms are significant in all of the regressions ($p = 10\%$ or better), except for family ties in regressions (15) and (16c). All in all, the regression results corroborate our results at the TMT member level and suggest that IPO firms are inherently different from mature firms (see Hwang and Kim, 2009).[19]

## 6. Conclusion

Organization theorists acknowledge the importance of the IPO milestone as the "re-birth" of the organization (see e.g. Finkle, 1998). The IPO is a crucial event in the life-cycle of the firm as it moves from a relatively unknown private company to a public company, seeking capital from a large pool of potential investors to finance its expansion (Certo et al., 2009). Corporate governance scholars are increasingly recognizing the complexity of this IPO event and the role played by effective governance mechanisms in helping IPO firms align the interests of the managers with those of the shareholders (Bruton et al., 2010). This study explores the link between two corporate governance mechanisms, namely pay-for-performance schemes and board independence, and their effect on IPO performance. Specifically, we investigate the link between pay–performance sensitivity (PPS) for the top management team (TMT) and family ties or social ties between TMT members and board members at the IPO.

While board members are expected to support the organization via their advice, external networking, and monitoring (Johnson et al., 1996; Zahra and Pearce, 1989), the personal ties they have with the top management may impede board effectiveness. Indeed, board members with personal ties may have a lax attitude towards monitoring the managers with whom they have ties (Fredrickson et al., 1988). The effectiveness of the board of directors might thus be compromised by the lack of independence. In contrast, one may argue that social ties and family ties reduce frictions between the TMT and the board of directors, making the latter's role easier and increasing the likelihood that the former seeks advice from the latter (see e.g. Westphal, 1999). Further, any negative effects of ties might be reduced when managers are incentivized by adequate compensation packages, reflected by greater PPS, whereas any positive effects may be amplified.

We contribute to the literature by differentiating between social ties and family ties at the time of the IPO, a time when such ties are likely to have a particularly high impact, and by examining their effects on both PPS and IPO performance. Our study reveals that both PPS and board independence have a significant effect on both short-term and long-term IPO performance. In line with previous work by the authors (see Chahine and Goergen, 2013), we find a significantly different impact of social ties and family ties on IPO performance. More importantly, we find that PPS reduces the negative effect of family ties on IPO performance whereas it increases the positive effect of social ties.

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## Appendix. Appropriateness of the instruments in the 3SLS regressions

PPS may not be exogenous to firm performance. Indeed, while PPS is hypothesized to improve IPO performance, PPS as well as IPO performance is also hypothesized to be affected by family ties and social ties. Hence, it may be the case that PPS depends on IPO (firm) performance. Put differently, the literature on the impact of managerial ownership on firm performance (managerial ownership is included in the calculation of PPS) suggests that the former is not endogenous (see e.g. Himmelberg et al., 1999).

There is thus a need to control for the potentially endogenous determination of PPS. We do so by using the TMT member's board membership as an instrumental variable. *Board Member dummy* equals one if the TMT member sits on the board, and is zero otherwise. Prior research suggests that managers may use their seat on the board to reduce PPS and to increase their fixed salary (Conyon and Peck, 1998; Hwang and Kim, 2009). However for the instrument to be valid, it should not affect IPO performance. In support of our choice of instrument, we fail to find conclusive evidence of an effect of board membership on IPO performance. Still, one may argue that the TMT member's board membership affects firm performance, and as such it may not be an appropriate instrument for PPS. For example, to the extent that the *Board Member dummy* captures executive experience, capability and reputation, this variable is likely to affect firm performance. However, this means that *all* TMT members appointed to the board would help their firm increase performance, and there is no evidence of that.

We also compare our instrument with other potential candidates, i.e. additional TMT member characteristics. They include a female dummy, the TMT member's age, a PhD dummy, tenure, a CEO dummy, a finance dummy for accounting, finance and treasury

[19] Since our choice of instruments may be subject to criticism, we also run OLS regressions at the IPO level. The OLS results are consistent with the findings in Table 7. These results are available upon request.

managers, a marketing dummy for marketing and sales managers, an engineering dummy for engineering and operations managers, an R&D dummy for research and development managers, a division general manager dummy, and a human resources dummy for human resources and legal affairs managers, respectively. We run an exclusion test for the instruments in an over-identified system, i.e. a Sargan test, and the results show the validity of the *Board Member* dummy as it is the most orthogonal instrument with the IPO performance measures. Further, support for our choice of instrument is provided by the very low correlation coefficients between the *Board Member dummy* on one side and the various IPO performance measures on the other side. These correlation coefficients range from only −0.034 to only 0.003. Finally, the strength and the reliability of our instrument are also confirmed by the high R-square and F-test in the relevant regressions (see Staiger and Stock, 1997, for a discussion on the appropriateness of instruments).[20]

Finally, in the CEO-based regressions in Table 7, we use a different set of instruments given that all CEOs sit on the board of directors. We use *Female dummy*, *Age*, *PhD dummy*, and *Tenure* as instrumental variables. The latter seem to be appropriate instruments as there is no clear evidence of the effects of these variables on IPO performance. In contrast, PPS might be affected by the differences in risk-taking attitudes between male and female CEOs; it might also be affected by CEO age, and tenure in the firm, as well as by the CEO's education. The Hausman (1978) specification test using the latter four variables confirms the endogeneity of PPS at the 1.93% significance level. It also confirms the strength and the reliability of our instruments, mainly CEO age, and this is consistent with the high F-test of 15.07.

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[20] The R-square is 0.295 and the F-test is 36.3.

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