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Finance Working Paper N° 348/2013
February 2013

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ECGI Working Paper Series in Finance

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While family ties may solve manager-owner conflicts of interests, they may also give rise to minority-shareholder expropriation and/or private benefits of control. Similarly, social ties may either create value or lead to entrenchment and excessive managerial power. Using q-analysis to measure the strength of top manager ties to board members, we find that IPO performance is positively related to the strength of social ties, but negatively to the strength of family ties. We also find that, controlling for social ties, board independence affects both IPO pricing and post-IPO operating performance. Further, we show that the association between IPO performance and ties depends on whether they are with inside or outside directors.

Keywords: Social tie; Family tie; Entrenchment; Alignment of interest; IPO performance; qanalysis

JEL Classifications: G32; G34; L14

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Forthcoming in the Journal of Corporate Finance

Abstract

This paper studies the two potentially contrasting effects on IPO pricing and post-IPO operating performance of family ties as well as social ties the top management has with board members. While family ties may solve manager-owner conflicts of interests, they may also give rise to minority-shareholder expropriation and/or private benefits of control. Similarly, social ties may either create value or lead to entrenchment and excessive managerial power. Using q-analysis to measure the strength of top manager ties to board members, we find that IPO performance is positively related to the strength of social ties, but negatively to the strength of family ties. We also find that, controlling for social ties, board independence affects both IPO pricing and post-IPO operating performance. Further, we show that the association between IPO performance and ties depends on whether they are with inside or outside directors.

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1. Introduction

Recent corporate governance reforms have emphasized the importance of the independence of the board of directors. For example, Nasdaq and NYSE listing rules require boards of directors to have a majority of independent directors. Nevertheless, the question remains whether so called independent board members are de facto independent. Listing rules (see e.g. the NYSE Listed Company Manual)[1] as well as existing research (see e.g. Bhagat and Black 2002) consider board members to be independent if they have neither financial (i.e. material) nor family ties with the CEO and the firm.[2] However, so called independent board members may still have social ties with the top managers – such as ties via the same country of origin, association and club membership, and former school – that might impair their independence. These social ties likely reflect mutual qualities and experiences which facilitate interactions and thereby encourage personal connections (Marsden, 1987; McPherson, Smith-Lovin, and Cook, 2001). Hence, it is important to take into account not only family and financial ties, but also social ties that the members of the top management team (TMT), whether board members or not, have with the (other) board members. Hwang and Kim (2009) report that such ties are not rare. For the Fortune 100 firms over 1996-2005, they report that, controlling for the social ties that board members have with the CEO, reduces conventionally measured board independence from 87.4% to 62.4%. More importantly, they find that social ties have a negative effect on operating performance.

[1] For example, Section 303A.02 Independence Tests states the following. "In particular, when assessing the materiality of a director's relationship with the listed company, the board should consider the issue not merely from the standpoint of the director, but also from that of persons or organizations with which the director has an affiliation. Material relationships can include commercial, industrial, banking, consulting, legal, accounting, charitable and familial relationships, among others."

[2] See also the definition used by the Investor Responsibility Research Center, IRRC database.

This paper focuses on initial public offerings (IPOs) as the impact of social ties on firm performance is likely to be substantially different from that for mature firms. Indeed, IPO firms face more difficulties in identifying outside directors able to provide the required support, expertise, and independence that are critical factors for their success. Hence, social ties may be beneficial as they grant access to a pool of candidates for the top management jobs in the firm. In addition, as IPO firms usually face an inherently unstable business environment, collaborative information exchange and non-competitive behavior driven by shared affiliations are therefore likely to be more valuable than for large and well established firms. More generally, although executive ties may compromise arm's-length contracting, they may also improve cooperative exchanges between those involved (Uzzi, 1996), encourage friendly advice-seeking, and decrease the fear of compromising social status and disclosing information to board members (Westphal, 1999). Similarly, family ties may create value given that the traditional conflict of interests between owners and managers − as described by Berle and Means (1932) and formalized by Jensen and Meckling (1976) − does not occur in a family company.

Taking the opposite view, social ties and family ties may destroy rather than create value. Social ties may generate excessive managerial power, causing managerial entrenchment. Hence, such ties may not be in the best interest of the shareholders. Similarly, family managers may not be selected on a competitive basis and their appointment may therefore generate costs to the non-family shareholders (Levinson, 1971). Both managers and board members related to the controlling family may thus have secured their posts because of family ties rather than because of their professional abilities and skills.

The following four questions arise. Do ties between the TMT members and board members cause entrenchment or do they align the interests of the TMT with those of potential investors and are these effects different from those that have been observed for more mature firms? Do family ties have different effects from social ties? Does it matter whether the TMT's ties are with inside or outside directors? Finally, controlling for both social ties and family ties, does board independence still help improve IPO performance?

We focus on the different types of ties between individuals listed in the IPO prospectus as top managers, i.e. those with executive level titles (i.e. vice-president and above), and board members. Based on a dataset comprising observations on 3,613 TMT members for 500 IPO firms from 1997 to 2008, we find a positive link between IPO performance and social ties of the TMT members with board members for both the IPO pricing and post-IPO operating performance. However, we observe the converse for family ties. This suggests that family ties are the result of nepotism and/ or private benefits of control. Moreover, we find that, when controlling for social ties, board independence improves IPO performance. Interestingly, when we include both conventional (i.e. reported) board independence and social board independence in the same regression, the latter has a stronger positive effect on both IPO pricing and post-IPO operating performance than the former. This suggests that investors take into account these social ties when pricing IPOs. These results remain robust when controlling for potential endogeneity.

This paper has five major contributions. The paper's main contribution is to study the impact of social ties on performance in IPO firms, a type of ties which to date has received little attention

from the existing literature.[3] IPO firms usually face a high level of uncertainty, and social ties may offer them additional means to improve communication and to enhance the cohesiveness and goals congruence among the senior management. These ties are thus likely to reduce asymmetric information and increase trust among the key parties involved in the IPO transaction (Harris and Helfat, 2007), as well as to improve the managing of complexity and mobilizing of resources (Numazaki, 2000). In line with our reasoning, Boone et al. (2007) report that boards of IPO firms tend to be much smaller and less independent than those of mature firms. What is embedded in our story is that, in contrast to large and mature firms that are able to attract prestigious board members, IPO firms are usually small businesses relying mainly on the connections and networks of their top managers to attract board members. Similarly, Cohen and Dean (2005) suggest that the most prestigious managers will avoid those ventures that do not have sufficient legitimacy, such as companies with founders who lack prestige. As a result, social ties may be crucial to attract professional managers, and may thus play a different role from the one observed in large firms. In line with this, we find that contrary to what is the case for mature firms (see Hwang and Kim, 2009) social ties in IPO firms, especially those with inside directors, create value rather than destroy it.

The second contribution concerns family ties. Although family firms have been studied in much detail (see e.g. Gomez-Mejia et al., 2001; Zahra and Sharma, 2004), to our knowledge there is as yet no research on the performance effects of family ties of top managers with board members in the IPO setting. The third contribution is of a methodological nature. With the help of q-analysis (Atkin, 1974 and 1977), we are able to account not only for the existence of social ties between

[3] Our work also contributes to the research that focuses on the external social ties of directors rather than their internal ties (Burt, 1980; Shropshire, 2010).

the TMT and the board of directors, but also for their *strength*. It is important to look at both the existence and strength of ties as the existence of a single tie – such as membership of the same association by two individuals – may be purely coincidental whereas the existence of several social ties between the same two individuals is unlikely to be purely a result of chance. Our fourth contribution is to the literature on the effects of board independence on firm value and performance. While the existing evidence regarding the performance consequences of board members' independence from management is as yet inconclusive (see e.g. Finkelstein and Hambrick, 1996; Bhagat and Black, 2002), we find that it is important to adjust conventionally measured board independence by the social ties between the TMT and the board. Finally, we also contribute to the literature on the link between board composition and types of firm (see e.g. Linck et al., 2008). This literature finds that smaller firms, high-tech firms, research and development (R&D)-intensive firms and firms operating in unregulated industries have less independent boards, suggesting that for these firms the advisory role of the board is more important than its monitoring role. We find that the argument is a much more nuanced one. Bearing in mind that social ties create value whereas family ties destroy value, we find that the former is only the case when the ties are with inside directors. In other words, board independence, i.e. independence of the outside directors from the management, still creates value.

This paper is structured as follows. The next section reviews the literature and develops a set of testable hypotheses. Section 3 is on the data and methodology followed by Section 4 which discusses the empirical results. We then test the robustness of our results in Section 5 and conclude the paper in Section 6.

2. Review of the Literature and Hypotheses

The two main roles of the board consist of monitoring and providing advice to the TMT (Pfeffer and Salancik, 1978; Adams and Ferreira 2007). Social ties of the TMT with the board may then enhance the latter's ability and incentives to carry out these roles. However, the effectiveness of these roles may also be severely compromised by such ties. The same applies to family ties.

Moreover, Baysinger and Butler (1985) suggest that outside directors and inside directors fulfill different roles. While the former primarily monitor the running of the firm, they rely on the latter as their main source of information. However, the monitoring role of the board may be severely compromised by the existence of family ties and social ties between executives and board members. Further, we expect that any positive effects of social ties, via the connections and networks they give access to, are more pronounced in some types of firms and industries than in others. In what follows, we shall elaborate on these arguments.

2.1. Ties of TMT Members and IPO Performance

2.1.1. Social ties

While prior research limits itself to financial and family ties to assess board independence, evidence suggests that a considerable percentage of board members classified as independent are socially tied and are thus unlikely to be independent (Hwang and Kim, 2009). Assuming that agents are not only driven by value maximization, social ties are a potentially rich source of a director's dependence vis-à-vis the TMT (Mills and Clark, 1982; Silver, 1990; Uzzi, 1996). One of the potentially detrimental effects of this dependence is the reduction in TMT oversight (Fama and Jensen, 1983; Hirsch, et al., 1987). Therefore, not only financial and family ties but also

social ties may increase the board's dependence vis-à-vis the TMT and thus compromise the board's monitoring and disciplinary role (Mills and Clark, 1982; Silver, 1990; Uzzi, 1996; Hwang and Kim, 2009). To sum up, social ties may adversely affect the way directors monitor and discipline the management.

However, Westphal (1999) argues that social ties with board members, such as friendships, encourage the CEO and other top managers to seek advice from the board. This is consistent with evidence from behavioral research that demonstrates how social ties among colleagues foster advice-seeking, decrease the fear of compromising social status as well as the fear of disclosing information. In addition, social ties facilitate mutual understanding and render communication more probable and comfortable (Marsden, 1987; McPherson, Smith-Lovin, and Cook, 2001). In particular, social dependence shifts normative expectations from exchange-based norms that promote "dispassionate reciprocation" to communal norms that promote care and trust (Mills and Clark, 1982; Silver, 1990). As such, social ties enhance communication, information sharing, and collaboration (Westphal, 1999), and act as important facilitators since people who share similar experiences, i.e. are socially tied, enjoy smoother interaction and easier contact (McPherson et al., 2001). Whether this is conscious or not, actors with social ties benefit from a higher degree of mutual understanding and are more comfortable with those with which they share similar characteristics and experiences (Marsden, 1987; McPherson et al., 2001). Social ties may solve information and incentive alignment problems that can create barriers to monitoring. A management-friendly board may thus be optimal for shareholders via its positive effects on firm performance (Westphal, 1999; Almazen and Suarez, 2003; Adams and Ferreira, 2007). Board members may also use their social network to set up a TMT of the highest possible

caliber, experience, and education. Hence, the effect of social ties on IPO performance may be either positive or negative depending on whether the alignment of interests mechanism or the agency problems dominate. We propose to test the following set of competing hypotheses.

Hypothesis 1a: If the alignment of interests mechanism dominates, IPO performance is positively related to the strength of social ties between members of the TMT and the board of directors.

Hypothesis 1b: If agency problems dominate, IPO performance is negatively related to the strength of social ties between members of the TMT and the board of directors.

2.1.2. Family ties

It is commonly accepted that family managers take a long-term view (Bertrand and Schoar, 2006), and are likely to sacrifice their personal interests to ensure the continuity of their business. Family firms are thus likely to be high-trust organizations where family ties ensure a greater alignment of interests and make the organization operate more efficiently (Daily and Dollinger, 1992; Anderson and Reeb, 2003).

However, Bertrand and Schoar (2006) argue that culture may make it difficult for a founder to dissociate the family from the firm. Strong family ties may also lead to nepotism and the building of a family legacy, resulting in the founders deriving utility from seeing their relatives involved in the business rather than more talented non-family managers (Barnett, 1960). In a similar vein, Levinson (1971) argues that family managers are not chosen in a competitive context. Although family managers may lack proper education and professionalism and are often not the best candidates for the post, they nevertheless benefit from an unfair advantage (Schulze et al., 2001). Hence, despite the positive effect created by the sense of belonging to the family

business, it is more difficult for a family to monitor and to assess objectively the work of relatives for the firm (Schulze et al., 2001).[4] The possible effect of family ties on IPO performance may thus be either positive or negative depending on whether agency problems have a stronger or weaker impact on IPO performance than the alignment of interests mechanism. This discussion leads us to our second set of competing hypotheses:

Hypothesis 2a: If the alignment of interests mechanism dominates, IPO performance is positively related to the strength of family ties between members of the TMT and the board of directors.

Hypothesis 2b: If agency problems dominate, IPO performance is negatively related to the strength of family ties between members of the TMT and the board of directors.

2.2. Conventional and Social Board Independence

Prior research suggests that the board of directors usually monitors the firm's managers and thereby mitigates agency conflicts (Fama and Jensen, 1983). Hence, the board improves firm performance and protects shareholder interests by monitoring and disciplining the TMT (Boyd, 1994; Rechner and Dalton, 1991; Westphal and Zajac, 1995). The absence of family ties and social ties then makes the board's monitoring more effective and reduces the potential for shareholder expropriation (Fama and Jensen, 1983: 315). Consequently, we propose the following hypothesis.

Hypothesis 3: IPO performance increases with conventional and social board independence.

[4] Family employees below managerial level may be even no different from simple employees and lose the feeling of being part of the business.

2.3. IPO Performance and the Differential Effect of Ties with the Type of Board Members

All of the above hypotheses examine the effect on IPO performance of social ties and family ties, without distinguishing as to whether these ties are with inside or outside directors. However, this distinction is important. Indeed, Baysinger and Butler (1985) point out that outside directors serve primarily to exercise control over the running of the firm whereas inside directors are in charge of running the day-to-day operations of the firm. Further, the former rely on the latter as their main source of information on strategic issues. While the presence of ties between the TMT and inside directors might improve the information flow, ties between the TMT and outside directors may reduce the latter's objectivity and managerial accountability. We arrive at our fourth hypothesis.

Hypothesis 4: The effect on IPO performance of the social ties and the family ties of TMT members with the board members depends on whether these ties are with outside directors or inside directors.

2.4. The Impact of the Type of Firm and Industry on the Performance Effect of Social Ties and Family Ties

Adams and Ferreira (2007) argue that, given the board's dual role of advice giving and monitoring, the CEO faces a trade-off when disclosing information to the former. If the board is given more information by the CEO this will increase the quality of advice it can provide. However, this will also increase its efficiency as a monitor. Adams and Ferreira show that for certain types of firms less independent boards, i.e. less stringent monitors, are optimal. More specifically, De Andrés and Rodríguez (2011) argue that in hi-tech firms the advisory role of the

board is much more important than its monitoring role. They find that in these firms the effectiveness of the former role has a greater impact on firm performance than the latter. Linck et al. (2008) find that high growth firms and firms with high spending on R&D have smaller as well as less independent boards. The same patterns apply to firms with high managerial ownership. Coles et al. (2008) confirm that the boards of firms with high R&D expenditures tend to be less independent. We argue that the effectiveness of the advisory role of the board improves with the TMT's ties with the board and that their positive effect on performance is likely to be more pronounced for firms operating in hi-tech industries.

Becher and Frye (2011) review the literature on the link between industry regulation and corporate governance. They conclude that there is as yet no conclusive evidence as to whether industry regulation is a substitute or complement for corporate governance. Still, a number of studies have found a link between regulation and corporate governance devices such as board independence. More specifically, Helland and Sykuta (2004) find that, for the case of the US natural gas industry, as the amount of regulation increases politicians are appointed to the board of firms operating in this industry. They interpret this as evidence that the advisory role of the board became more important as regulation increased and hence gradually more politicians were appointed to the board given their regulatory experience. Hence, the impact of social ties and family ties on IPO performance is likely to differ depending on whether the firm operates in a regulated industry or not. More generally, the firm's industry is likely to impact on the link between social ties or family ties and firm performance. This discussion leads to our final hypothesis.

Hypothesis 5: The impact on performance of social ties and family ties is affected by the type and industry of the firm.

3. Data and Methodology

We obtain the list of all IPOs from 1997 to 2008 in the US markets from the Securities Data Company (SDC). We then apply several filters. In line with prior research on IPOs (see e.g. Loughran and Ritter, 2002), we exclude real-estate investment trusts (REITs), unit offerings, and closed-end funds, American Depository Receipts (ADRs), foreign IPOs, and financial IPOs, and those with an offer price of less than five dollars. We also exclude carve-outs and spin-offs as these behave differently from regular IPOs given that they involve the flotation of parts of mature businesses. This reduces the number of IPOs to 2,082. We then randomly select 500 IPOs for which we collect data on the existence and type of family ties and social ties of the TMT with inside directors and outside directors from the IPO prospectuses.[5] Our sample represents about 20% of the IPO population.

The TMT is defined as all top-level executives including the chief executive officer (CEO), chief operating officer (COO), business unit heads and vice presidents (Finkelstein and Hambrick, 1996), as reported in the management section of the IPO prospectus. Some, but not all of the TMT members sit on the board of directors. We distinguish between these two types of TMT members. Later, we also distinguish between the ties the TMT members have with inside

[5] We further investigate the existence of family ties and social ties via an internet-based search of social networking websites, such as Facebook and Twitter. However, this does not generate further information to that already collected from the IPO prospectuses.

directors and those they have with outside directors. Data on family ties, social ties and board composition is collected from the IPO prospectuses.[6]

We distinguish between the following types of social ties: a) former employer ties, b) club membership ties, c) professional membership ties, d) former school (including university) ties, and e) origin ties.[7] *Former Employer Ties* formed when two individuals shared a place of employment in the past. *Club Membership Ties* are formed when two persons share membership of organizations such as charities, foundations, associations, and clubs. *Professional Membership Ties* are formed when two persons are members of the same professional association, such as the American Institute of Certified Public Accountants (AICPA), the Institute of Internal Auditors (IIA), and the American Certified Fraud Examiners (ACFE). *Former School Ties* are formed when two individuals are graduates of the same educational institution. Finally, *Origin Ties* are formed when two foreign nationals come from the same country. Appendix A shows how, for the example of digitalthink.com, a sample firm, the data on social ties and family ties has been collected from the IPO prospectuses.[8]

Table 1 compares the random sample of 500 IPOs covered by this study to the population of 2,082 IPOs. The sample has a similar distribution across years as the population (see Panel A). In addition, the distribution across industries and the percentage of hi-tech firms are very similar (see Panel B). Hence, the sample is representative of the population.

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[6] We consult the "MANAGEMENT" and "PRINCIPAL STOCKHOLDERS" tables as well as the footnotes to these tables to ensure the data is as accurate as possible.

[7] By their very nature, all of these ties originated before the IPO firm was founded. In other words, none of these ties emerged once the person in question had joined the IPO firm. Hence, the ties are not a reflection of friendliness (cronyism) that the person developed with the management or board once she or he had joined the firm.

[8] For that firm, seven members of the TMT share former school ties. In detail, three members of the TMT share the same alma mater, i.e. the University of California Berkeley, while another two went to the University of San Francisco and yet another two went to Columbia University.

[Table 1 About Here]

To examine the impact on IPO performance of social ties and family ties of TMT members with the board members, we estimate the following regression:

$$IPO\ Performance = \alpha + \beta_1\ Social\ Ties + \beta_2\ Family\ Ties + \beta_3\ Conventional\ and\ Social\ Board\ Independence + \beta_4\ Control\ Variables + e \quad (1)$$

where *IPO Performance* is measured by the premium, a measure of IPO pricing, or the return on assets (ROA), return on equity (ROE), and return on sales (ROS), one of our three measures for post-IPO operating performance. The IPO premium is equal to the ratio of the difference between the offer price and the book value per share over the offer price. It reflects the excess value investors are willing to pay over and above the book value of the shares. It uses "both accounting-based and stock price information in an effort to measure 'difficult to account for' assets of the firm" (Nelson, 2003: p.715).

In terms of post-IPO operating performance, we use the ROA, which is equal to net income over total assets, the ROE, which is equal to net income over equity, and the ROS, which is equal to net income over sales. All three relate to the first accounting year which ends after the IPO date.[9]

3.1. The Measurement of the Strength of Family Ties and Social Ties

As stated in the introduction, it is important to account for both the existence and strength of ties as the existence of a single tie – such as membership of the same association by two individuals – may be down to chance whereas the existence of several social ties between the same two

[9] In further empirical investigations, we use the adjusted operating performance, adjusted by the median of comparable firms with the same 4-digit SIC code and with the same (+/-25%) market capitalization at the IPO date. When this measure is used the results are qualitatively the same. These results are available upon request from the authors.

individuals is unlikely to be purely coincidental. In contrast to our data, most network data are based on only one set of social units with links between these social units. For example, Renneboog and Zhao (2011) study the links that CEOs have with the members of boards of directors of other companies via joint board membership. For such one-mode network data, the focus is typically on the importance or the *centrality* of each social unit within the network. The centrality of a social unit can be assessed via various measures including its *degree* centrality (the number of links the social unit has with other social units), the *closeness* (the sum of the geodesic distances between the social unit and all the other social units it is linked to directly or indirectly), the *betweenness* centrality (how many of all the links between any pair of social units pass through the social unit under consideration), and the *eigenvector* centrality of the social unit (the proportion of times a given social unit is passed on the way from any other social unit to another one).

Our data is in the form of a two-mode network as it consists of two sets of social units. The first set consists of the TMT members and the second one consists of the different types of social ties (as detailed above) each TMT member has with the members of the board.[10] Atkin (1974)[11] not only introduces the analytical concepts (the q-analysis) to study two-mode networks, but he also defines the language to describe such networks. Atkin's fundamental concepts of social interactions are the social *backcloth* and the *traffic* on that backcloth. The backcloth is the space

[10] A two-mode network can be described as $N=(U_1,U_2,R,w)$ where $U_1=\{u_{1,1},u_{1,2},\ldots,u_{1,n1}\}$ is the first set of social units and $U_2=\{u_{2,1},u_{2,2},\ldots,u_{2,n2}\}$ the second one. $U_1 \cap U_2 = \varnothing$ by definition and $R \subseteq U_1 \times U_2$ defines the set of relations between U_1 and U_2 (Doreian et al., 2004).The parameter w is a weight that is mapped as $w : R \rightarrow \Re$. While we assume a weight w of 1 across all our network data, Doreian et al. (2004) give examples of network data with differential weights. Such examples include customers (U1) consuming various services or goods (U2) in various quantities (w). The classic example of a two-mode network and also the most studied such dataset is the Davis et al. (1941) dataset of Deep South women attending social events over a nine-month period.

[11] See also Freeman's (1980) application of q-analysis to the structure of friendship choices.

within which the individuals interact and establish ties with each other whereas the traffic consists of the social interactions of these individuals on that backcloth.[12] The basic building block for two-mode networks is what Atkin (1974) calls the *simplex*. Simplices can be identified on both the backcloth and the traffic. A simplex on the backcloth consists of two or more individuals that all share a linking event or *tie*. The complexity of a simplex increases with the number of individuals it links. Figure 1 shows an example of the simplest form of simplex, two individuals linked by the same event. Figure 2 depicts a more complex simplex, i.e. a simplex of dimension 3 or a quadrahedron. This consists of four individuals sharing the same linking event. In other words, a simplex that links two individuals is a line of dimension 1, one that links three individuals is a trihedron of dimension 2, and so forth. More generally, the polyhedron that links *n* individuals will have *n*-1 dimensions.

A simplex on the traffic consists of several linking events that are common to a person. Figure 3 shows examples of three such simplices. These simplices are formed by a set of three individuals – Mr D, Miss E and Mrs W – interacting on the same backcloth. Mr D is a trihedron or a simplex of dimension 2, i.e. Mr D = {Tie 1, Tie 2, Tie 3}. Miss E is a line of dimension 1, i.e. Miss E = {Tie 2, Tie 3}. Finally, Mrs W is a dot of dimension 0, i.e. Mrs W = {Tie 1}. Mr D has three ties (1, 2, and 3) which he shares with the other two individuals – Miss E and Mrs W – on the same backcloth. In other words, the simplex for Mr D and that for Miss E have two *faces* in common (i.e. ties 2 and 3) whereas the simplices for Mr D and Mrs W only share one face (tie 1).

[12] According to Atkin (1974), traffic and the resulting interpersonal trust and closeness will only happen if the backcloth is stable in the sense that individuals interact regularly with other individuals on the backcloth or did so in the past.

The aim of the q-analysis is exactly that, i.e. to study the faces that simplices on the backcloth share with those on the traffic. In other words, q-analysis studies how these two sets of simplices are connected via larger structures, so called *simplicial complexes* which combine the simplices originating from the two sets of social units to form the two-mode network. Put differently, a simplicial complex is a set of simplices that have common faces and that are linked to form larger chains. Figure 4 shows an example of a simplicial complex and the underlying network data is reported in Table B.1 in Appendix B in the form of a matrix of 16 (persons) by 11 (ties). As Figure 4 suggests, Mrs R and Mr S are linked via tie 9, i.e. they are linked at dimension (q) 0 and share one face. Neither of them has any links with the other individuals interacting on the same backcloth. In contrast, Ms J is characterized by four linked events or ties, i.e. ties 2, 3, 4, and 5. Each of these ties is of dimension 0: while Ms J has ties with four other individuals (Mr H, Mr L, Ms M, and Mrs K), she only shares one linking event with each of these individuals. Similarly, Mr N has only ties of dimension 0. The only individuals with ties with a dimension of more than 0 are Dr T and Mr W. Both individuals share two ties, i.e. tie 10 and tie 11, and therefore are tied at dimension 1. It is the dimension of the ties that we shall focus on in what follows. By focusing on the dimension of the ties, we do not just account for the fact that a TMT member has a tie with a board member (which may be purely coincidental), but we also take into account the strength of that relation (which is less likely to be coincidental).[13] In what follows,

[13] The easiest way to calculate the dimensions or the q's for each individual is to multiply the $n_1 \times n_2$ matrix in Table B.1 – which we call M – by its $n_2 \times n_1$ transposition M' and then to subtract a $n_1 \times n_1$ matrix containing 1's everywhere – matrix Ω – from M×M' (Atkin, 1977). The result from doing so is reported in Table B.2. The values in the main diagonal (shaded in gray) are the highest dimension or q for each individual, i.e. this is the number of faces that individual shares with *all* the other individuals. These values are the dimensions of the so called *primary simplices*, i.e. our social units or individuals in U_1. In other words, the values on the main diagonal express each individual in terms of its different types of social ties or linking events. For example, Ms J has a q of 3, which means that she shares three faces with other individuals, but not necessarily with one single individual. The values which are off the main diagonal represent the faces shared between a specific pair of (different) individuals. Apart from Dr T and Mr

we use the average q – augmented by one – of the primary simplices as a proxy of the strength of TMT ties with board members:

$$\text{Average q of primary simplices} = \frac{1}{n_1}\sum_{i=1}^{n_1}(q_i + 1)$$

where n_1 is the number of individuals.

Our empirical analysis uses both *Social Ties* and *Family Ties*, which are equal to the average q (augmented by one) of the family ties and social ties, respectively, of the members of the TMT with board members, where q is the dimension of the ties a TMT member shares with all the (other) directors. The higher the average q, the stronger are the ties between the TMT member and the board of directors.

3.2. Board Independence

Prior research considers board members to be independent if they have neither financial nor family ties with the CEO and the firm (see e.g. Hwang and Kim, 2009). *Conventional Board Independence* is the percentage of board members that are independent from the CEO and the firm in that conventional sense. So called independent board members may nevertheless have social ties with the TMT which may compromise their independence vis-à-vis the latter. We therefore calculate *Conventional and Social Board Independence* as the percentage of outside directors who do not have any financial, family, *and* social ties with the TMT. It is thus equal to *Conventional Board Independence* after controlling for social ties between board members and TMT members. We also use *Reduction in Board Independence due to Social Ties* which is equal

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W who share a face (or a line which has a dimension of 1), all other individuals who are connected (e.g. Mr G and Mr H) have ties of dimension 0 only.

to the difference between *Conventional Board Independence* and *Conventional and Social Board Independence.* This variable is either zero (in the absence of any social ties) or positive (if there are such social ties).

3.3. Control Variables

The regressions on IPO performance control for firm size and industry. *Market Capitalization* measures firm size as market capitalization at the offer price. In the regressions, we use the natural logarithmic form, i.e. *Ln Market Capitalization*. Brav and Gompers (1997) argue that larger IPOs are better able to reap the benefits from their public listing than smaller IPOs. As such, we expect them to have a higher premium. Hi-tech firms are also likely to have greater growth potential and they should have a higher price at the IPO. We control for industry membership using a *Hi-Tech dummy* which is equal to one if the IPO firm is a hi-tech firm, and zero otherwise.[14] We add a *Loss dummy* that equals one if the firm has a net loss in the last year prior to the IPO, and zero otherwise. We also control for the effect of growth opportunities on the firm's performance using the price-to-book ratio. The *Price-to-Book Ratio* is the offer price over the book value per share at the IPO. However, since the IPO premium is also based on the offer price and the book value per share, the regression for the IPO premium does not include the *Price-to-Book Ratio*. As leverage plays a monitoring role (Jensen, 1986), it may improve IPO performance. *Pre-IPO Leverage* is pre-IPO long-term debt expressed as a percentage of pre-IPO total assets.

[14] 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, 3677-3679 (electronics), 3812 (navigation equipment), 3823, 3825-3827, 3829 (measuring and controlling devices), 3841, 3845 (medical instruments), 4812, 4813 (telephone equipment), 4899 (communications services), and 7371-7375, 7378, and 7379 (software).

In line with Bebchuk et al. (2009), we calculate the *E-Index* to measure managerial entrenchment. It is a counter variable indicating the presence of the following six provisions in our IPO firms: (1) a staggered board, (2) limits to shareholder bylaw amendments, (3) poison pills, (4) golden parachutes, (5) supermajority requirements for mergers, and (6) supermajority requirements charter amendments. Bebchuk et al. (2009) find a negative association between the index level and firm valuation. We expect similar effects for the IPO firms.

In line with Hwang and Kim (2009), we also use a *Family Firm dummy* that equals one if at least one relative of the founder is an officer, a director, or blockholder holding at least 5% (either individually or as a group) of the firm, and zero otherwise. We expect descendent-run firms to have significant lower firm value (see Villalonga and Amit, 2006). We also control for the potential effects of *TMT Size* on ties and performance.

Lock-up Period is the number of days between the IPO date and the lock-up expiry date, during which the initial owners have agreed not to sell their shares, signaling their commitment to the IPO firm. The length of the lock-up period may therefore be positively related to IPO performance. Many IPOs involve venture capital firms (VCs). VCs monitor their portfolio companies and offer them management advice, which is likely to increase operating performance in the future.[15] We control for the presence of VCs using *VC dummy* that is equal to one if the IPO firm is VC-backed, and zero otherwise.

Similar to Hwang and Kim (2009), we control for CEO and board characteristics. *CEO Post-IPO Ownership* is measured immediately following the IPO date, and *CEO Duality*, a dummy that

[15] However, VCs may also grandstand and take their portfolio companies public at an early stage in order to build their reputation via creating a track record of successful exits from their investee firms (Gompers, 1996). This may explain why existing studies find contrasting effects of VCs on IPO performance.

equals one, if the CEO also serves as the chair of the board, and zero otherwise. *CEO Tenure* is the number of years the CEO has been in office. *Board Size* is the total number of board members. *Old Directors* is the fraction of directors over the age of 69. *Busy Board* is a dummy variable that equals one if the board is busy, i.e. if a majority of the independent directors concurrently serve on three or more boards, and zero otherwise. *Director Ownership* is the percentage of shares owned by the directors immediately following the IPO date. *CEO from Other Company* is a dummy that equals one if at least one of the directors is the CEO of another firm, and zero otherwise.

Underwriter Reputation is calculated as in Loughran and Ritter (2004), with more reputable underwriters expected to certify the quality of managed offerings and thus increasing IPO performance. This variable potentially ranges from 0 to 9.1, i.e. from the least to the most prestigious underwriter. We also control for the effect of market momentum via *Market Return* and year dummies. *Market Return* controls for momentum in stock prices. It is the compounded return of the equally-weighted CRSP index over the 20 trading days preceding the IPO day (Loughran and Ritter, 2002).[16]

[16] Although not tabulated, we also look at the effect of the *bubble period 1999-2000* to examine the effect of the "irrational exuberance" by outside investors during the internet bubble which might have pushed underpricing to high levels, thus resulting in a lower aftermarket performance (Loughran and Ritter, 2002, Lowry and Schwert, 2004).

4. Empirical Results

4.1. Descriptive Statistics for the 500 IPO Firms

Table 2 reports descriptive statistics for the 500 IPO firms. The average IPO premium is 72.4%, and the average ROA, ROE, and ROS for the first accounting year ending after the IPO date are equal to -2.3%, -2.5%, and -1.3%, respectively.

In terms of firm characteristics, the average market capitalization is $455 million, leverage is on average 25.6%, and the lock-up period lasts on average 160 days. Moreover, 36.4% of IPOs are hi-tech firms, 9.8% are family businesses, 62% are VC-backed, and 10.6% have losses during the last accounting year prior to the IPO. The price-to-book ratio is on average 2.7, the entrenchment index is 2.77, and the average top management team comprises 7.36 members. The average for underwriter reputation is equal to 7.36.

In terms of CEO characteristics, the CEO on average owns 14.8% of the post-IPO shares outstanding, and has 6 years of experience in the IPO firm. Almost half of the CEOs also act as chair of the board of directors. Moving onto board characteristics, on average there are 6.76 members in the boardroom, who own 31.6% of the post-IPO shares outstanding. Further, 3.2% of board members are more than 69 years old, 7.6% of IPOs have busy boards, and 50.4% of outside board members are CEOs of other firms. Finally, the average positive market return preceding the IPO is 1.4%.[17]

[Table 2 About Here]

[17] Although not reported in Table 2, 35.2% of the firms went public during the bubble period 1999-2000. Further, the variance inflation factors (VIFs) for all our variables are lower than 2, which rejects multicollinearity concerns (O'Brien, 2007).

Table 3 indicates that the average IPO firm has a TMT consisting of roughly seven members, and almost the same number of board members. The q-analysis indicates that the average q for social ties is high with 0.496. Former employer ties and former school ties are the most frequent and strongest types whereas *Origin*, *Club Membership* and *Professional Membership* ties are much less frequent and also weaker types of ties. In contrast, the q-analysis indicates an average dimension of only 0.056 for the family ties that TMT members have with board directors. This suggests that family ties are the exception rather than the norm. However, as the maximum value of 0.667 suggests there are some firms with strong TMT family ties. Moreover, there is evidence that social ties with inside directors are stronger than those with outside directors. Similarly, family ties with inside directors are stronger than those with outside directors.

[Table 3 About Here]

Outside directors make out on average 68.1% of the board members. If independent directors are defined as those outside directors without a financial link with the IPO firm, this percentage decreases to 36.7%. Conventional board independence drops to 36% on average when controlling for both financial and family affiliations with the IPO firm. Interestingly, 16.8% of board directors have social affiliations with the TMT members. Conventional and social board independence is equal to 28.5% on average, which reflects an average reduction in board independence due to social ties of 7.5% (36.0%-28.5%).

4.2. Ties of TMT Members and Firm Characteristics: A Comparative Analysis

Table 4 compares the 77 IPOs whose TMT members have no social ties and family ties with the board with the remaining 423 IPOs. The premium for IPOs whose TMT members have ties with

board members is significantly higher than the one for IPOs without tied TMTs (at the 5% level). While the ROS is slightly higher for firms whose TMT members have ties than that for IPOs without tied TMTs (at the 10% level), the ROA and ROE are not significantly different.

Firms whose TMT members have social ties and family ties with board members are significantly larger (at the 10% level), are significantly less leveraged (at the 1% level), and are significantly more likely to be VC-backed (at the 5% level). These firms are also more likely to be family firms (at the 1% level), they have significantly shorter lock-up periods (at the 1% level), have more reputable underwriters (at the 5% level), and have larger TMTs (at the 1% level). In addition, they have larger boards (at the 10% level), but have significantly lower conventional and social board independence than firms with TMT members without ties (at the 1% level). All the other variables do not differ significantly between firms with and those without ties.[18]

[Table 4 About Here]

Table 5 focuses on IPO pricing, i.e. the IPO premium (Panel B), and post-IPO operating performance, i.e. *ROA* (Panel C) *ROE* (Panel D), and *ROS* (Panel E). The table studies pricing and operating performance across four sub-samples of IPO firms depending on whether or not they have social ties and/ or family ties. Panel A shows that TMT members in the vast majority of firms, i.e. 329 firms out of the 500 sample firms, have social ties but no family ties with the board of directors. In contrast, firms with TMT members with the two types of ties with the board or firms with TMT members that do not have either type of tie are relatively rare with only

[18] Although not tabulated, the percentage of firms with tied TMT members that went public during the bubble period 1999-2000 is significantly higher (at the 10% level) with 36.9% than the percentage of firms with TMT members without ties which is only 26%.

79 firms and 77 firms, respectively, out of the 500 firms. Finally, there are only 15 firms with TMT members having family ties with the board but no social ties.

[Table 5 About Here]

Panel B indicates that the premium for IPOs with TMTs with social ties but without family ties is significantly higher (at the 1% level) than for those IPOs where the TMT does not have any ties, and for those where the TMT has family ties only. This suggests that the presence of social ties increases the IPO premium.

Panel C compares the ROA across the four sub-samples. There is evidence of a negative link between underpricing and the ROA. Indeed, the firms with the highest underpricing in Panel B, i.e. the 15 firms with family ties but no social ties, also have the worst ROA and those with the lowest underpricing, i.e., those with social ties only, have the best operating performance. Moreover, the ROA of firms with social ties only is significantly higher than that of firms with both social ties and family ties (at the 1% level) and that of firms with family ties only (at the 10% level). Firms without ties have a significantly lower operating performance than firms with both ties (at the 10% level) and those with family ties only (at the 5% level).

Panel D shows that firms with TMT members with social ties but without family ties have the highest ROE of -0.3%, followed by those firms with TMT members without any ties (-4.3%). In contrast, firms whose TMT members have family ties with the board – whether they have social ties or not – have relatively low ROE of approximately -8%. In terms of significance, firms with social ties only have a significantly higher ROE than those with both ties (at the 1% level), and this is also higher than those without any ties and those with family ties and without social ties

(at the 10% level). All in all, this suggests that firms with social ties have a significantly higher ROE than other sub-samples. The results in Panel E for the ROS are consistent those in Panel C. Specifically, IPOs with TMT members with social ties but without family ties have significantly higher ROS that those IPOs with TMT members with both ties (at the 1% level), family ties only (at the 10% level), and those firms where TMT members do not have any ties (at the 5% level).

To sum up Table 5, while family ties tend to reduce both IPO pricing and post-IPO operating performance social ties have the opposite effect. Hence, the evidence points in favor of Hypothesis 1a and against the competing Hypothesis 1b for the case of social ties. Further, there is evidence in favor of Hypothesis 2b at the detriment of competing Hypothesis 2a for the case of family ties.

4.3. IPO Performance and TMT Ties

Tables 4 and 5 show evidence that is contrary to Hwang and Kim (2009) who find that, for the Fortune 100 firms, social ties compromise the board's role of monitoring and disciplining the CEO. What are the reasons behind the contrasting effect of social ties on firm performance? Given that social ties create rather than to destroy value in IPO firms, it is also likely that they are driven by different factors than social ties in mature, Fortune 100 firms.

Table 6 tests the validity of this conjecture by replicating Hwang and Kim's (2009, p.145) Table 3. The table not only examines the determinants of social ties (see regression (1)) as Hwang and Kim do, but it also examines the determinants of family ties (see regression (2)). Our dependent variable is also somewhat different, reflecting the different focus of our paper: Hwang and Kim use the proportion of directors who are socially dependent to the CEO whereas we use the

average q (i.e. the average strength of ties TMT member shares with all (other) directors). Hence and in contrast to Hwang and Kim, our dependent variable does not only reflect the existence of ties with the CEO, but it also reflects 1) ties with other board directors and 2) the (average) strength of the ties. We also distinguish between social board dependence and family board dependence whereas Hwang and Kim only look at the former.

Regression (1) indicates that social ties are stronger when there is CEO duality (at the 5% level), and are also stronger in family firms (at the 10% level). However, they are weaker when the proportion of old directors on the board is higher (at the 5% level), and when the entrenchment index is higher (at the 10% level). Regression (2) shows that the strength of family ties increases with CEO ownership (at the 1% level), board size (at the 10% level), and the family firm dummy (at the 1% level), and it falls with the busyness of the board (at the 1% level), and the presence of a board member who holds a CEO position outside the IPO firm (at the 5% level). Interestingly, our results for social ties are in contrast with those in Hwang and Kim (2009) who show that social dependence is positively related to CEO tenure, board busyness, and the proportion of old directors on the board. They justify their results by arguing that the board tends to be more socially dependent on the CEO when the latter is more powerful. Hence, our results suggest that IPO firms are different from mature firms, and as such, the effect on firm performance of social ties and family ties is also likely to be different.[19]

[19] Reflecting the somewhat different focus of this paper (we focus on ties with the entire board) as compared to Hwang and Kim (2009) (they focus on the CEO), we rerun the two regressions replacing CEO tenure by 1) cumulative board tenure and 2) average board tenure. As is the case for CEO tenure, neither is significant.

4.4. IPO Performance and TMT Ties

Table 7 shows the results for the multivariate regressions for the IPO premium controlling for the effects of social ties, family ties, and board independence. Regression (3a) controls for conventional board independence, considering only those outside directors without financial and family ties with the IPO firm to be truly independent. In contrast, regression (3b) controls for conventional *and* social board independence, considering only those outside directors without financial, family, and social ties with the IPO firm as independent. Finally, regression (3c) allows for potentially different effects on performance of conventional board independence and the reduction in board independence due to social ties.

[Table 7 About Here]

There is consistent evidence across all the regressions that social ties increase IPO performance. Specifically, social ties increase the IPO premium (at the 1% level), which is consistent with Hypothesis 1a. In contrast, family ties decrease IPO premium (at the 5% level), and this negative effect is consistent with Hypothesis 2b.

Interestingly, regression (3a) suggests no association of IPO premium with conventional board independence whereas there is a positive association with *Conventional and Social Board Independence* in regression (3b). This suggests that the effectiveness of the board's monitoring role, as reflected by better IPO performance, increases with the social independence of outside directors. This is consistent with Hypothesis 3. Regression (3c) also controls for the reduction in board independence due to social ties. The IPO premium decreases with the latter (at the 1% level). This provides further support to Hypothesis 3.

In terms of the control variables, the IPO premium is higher for larger IPO firms (at the 1% level), firms with greater CEO ownership (at the 5% level), and those with a higher pre-IPO market return (at the 10% level), whereas it decreases with underwriter reputation (at the 10% level), CEO tenure (at the 10% level), and the entrenchment index (at the 5% level or better). It is higher for hi-tech IPOs (at the 10% level), VC-backed IPOs (at the 5% level or better), whereas it is lower in family firms (at the 10% level). All in all, these patterns are consistent with the existing literature.

Table 8 presents the regression results for post-IPO operating performance using *ROA*, *ROE*, and *ROS*. As in Table 7, there are three sets of three regressions, for each one of our dependent variables, with one regression controlling for the effects of conventional board independence (regressions (4a), (5a), and (6a)), one controlling for the effects of conventional and social board independence (regressions (4b), (5b), and (6b)), and one controlling for the reduction in board independence due to social ties (regressions (4c), (5c), and (6c)).

[Table 8 About Here]

All of the regressions in Table 8 suggest that post-IPO operating performance increases with the strength of social ties (at the 1% level), which is in line with Hypothesis 1a. Moreover, consistent with Hypothesis 2b, there is evidence of a significantly negative effect of family ties on post-IPO operating performance (at the 5% level or better). In line with the results from Table 7, post-IPO operating performance increases with *Conventional and Social Board Independence* (at the 10% level or better) and decreases with the reduction in board independence due to social ties (at the 10% level or better).

In terms of the control variables, all three measures of operating performance increase with firm size and CEO outside directorships, whereas they are lower for hi-tech firms. Moreover, the *ROE* and *ROS* are lower for firms with a loss in the last accounting year prior to the IPO date, whereas they increase with the board busyness. Finally, the *ROA* and *ROE* decrease with the entrenchment index.

4.5. IPO Performance and the Nature of Board Members

While Tables 7 and 8 suggest that social ties play a positive role in IPOs and family ties a negative one, the tables make no distinction as to whether these ties are with inside or outside directors. A priori, this distinction seems important as ties with inside directors may reflect the input the latter had into building up the TMT whereas the ties the TMT members have with outside directors may reduce the effectiveness of the monitoring by the board.

Table 9 examines this issue. The table indicates that the strength of the social ties of the TMT members with the inside directors increases the IPO premium, the *ROA,* the *ROE,* and the *ROS* (at the 10% level or better), but there is no such effect for social ties with outside directors. This provides support for Hypothesis 4. In contrast, the IPO premium, the *ROA*, the *ROE*, and the *ROS* decrease with family ties with inside directors (at the 5% level or better), but not if these ties are with outside directors. This provides further support for Hypothesis 4. Overall, the results from Table 9 explain the somewhat contradictory results in Tables 7 and 8 of the positive effect of both social ties and social board independence on performance.

[Table 9 About Here]

4.6. IPO Performance and the Nature and Industry of the Firm

Tables 7 and 8 examine the overall effects of family ties and social ties on IPO performance, but fail to clearly explain in which contexts family ties destroy value and social ties add value. Table 10 extends the analysis in Tables 7 and 8 using the interaction with firm-level variables, including the *VC dummy* (Panel A), *Hi-tech dummy* (Panel B), above median price-to-book ratio (Panel C), intangible assets as a percentage of total assets (Panel D), *R&D* as a percentage of total assets (Panel E), *Regulated Industry dummy*[20] (Panel F), and firm size as measured by *Ln Market Capitalization* (Panel G). Social ties increase performance in VC-backed IPOs, hi-tech IPOs, and in IPOs with an above-median price-to-book ratio whereas family ties reduce performance in hi-tech IPOs, IPOs with above median price-to-book ratio, IPOs with above median intangibles, and IPOs with above median R&D.

[Table 10 About Here]

Further regressions including the interaction with the industry dummies[21] reveal that family ties reduce IPO performance in Software & IT Consulting Services, Industrial Firms, Media and Entertainment, and Telecommunications, whereas they increase performance in Retail. Overall, there is support for Hypothesis 5.[22]

[20] In line with Becher and Frye (2011), and since financial IPOs are already excluded, we define regulated firms as IPOs with an SIC code of 4900–4939 (electric and gas), 1300 (oil and gas extraction); and 6710–6719 (holding companies), 4000–4700 (transportation), 4800 (telecommunications), and 4950–4959 (sanitary services).
[21] Due to space constraints, these results are not tabulated. However, they are available upon request from the authors.
[22] In further empirical investigations, we examine the effect of social ties and family ties on IPO underpricing and the long-run aftermarket performance, using the alphas from the Carhart (1997) four factor model. The results confirm our existing results as social ties reduce underpricing and increase the long-run performance, whereas family ties have the opposite effect.

5. Robustness Checks

While the analysis so far has taken into account both the existence of social ties as well as their strength (the q dimension), we have not allowed for possible differential effects of *the different types* of social ties on IPO performance. The results, which are not tabulated in the paper, suggest that ties via shared former employers improve the IPO premium and post-IPO operating performance (at the 10% level or better), whereas the remaining types of social ties do not have any such consistent effect. While ties via the same former employer as well as ties via the same former school are the most important type of social ties (see Table 2), club membership ties is the least frequent type of social tie (together with professional ties). In terms of the impact of family ties and that of conventional and social independence, the results are in line with those from Tables 7, 8 and 9. Finally, the control variables also show similar effects on performance as documented above.

Furthermore, family ties and social ties might not be exogenous. Family firms are likely to have powerful CEOs who prefer loyal and trustworthy "family-related" managers. On the contrary, social ties are likely to be a reflection of success, where successful managers have better connections (Burt, 2001). Social ties are likely to be used to access new innovations (Burt, 1987) and provide a more finely grained information set (Uzzi, 1997), especially in competitive environments (Adler and Kwon, 2002). Hence, we expect social ties to be more prevalent in larger firms as well as hi-tech firms where the board may want to gather a team of close experts to access new markets and pursue further growth opportunities.

To test the potential endogeneity of social ties and family ties, we run a 3-stage least squares (3SLS) system of three equations explaining the strength of family ties, the strength of social

ties, and IPO performance. We use the regressions for family ties and social ties as first-stage regressions, whose predicted values are used in the second-stage regression for IPO performance. To control for the potential endogenous determination of social ties and family ties, we use instruments that refer to characteristics of the US state where the firm is headquartered. These include the percentage of citizens with Protestant church membership, the percentage of citizens with Catholic church membership, the percentage of citizens with a bachelor degree or more, and the rate of marriages per state.[23] While Catholics put more emphasis on the family and their definition of the family is a larger unit, Protestants tend to define their family as being their close relatives only (Hilary and Hui, 2009). The religiosity of the state may thus determine the extent of the family network as well as that of the social network. Moreover, since we look at social ties via the same educational institution, we also consider educational achievement per US state, which is likely to positively affect the strength of social ties. Finally, we look at the rate of marriages per state, and we expect it to positively affect the strength of family ties.[24]

Although not shown in the paper, [25] the Chi-squares for both the social ties and family ties regressions are very high, with 121.37 and 432.14, respectively, which confirms the strength and reliability of our instruments (Staiger and Stock, 1997). We find that social ties are more frequent and stronger in firms located in states with a higher level of educational achievement and those with a higher percentage of Protestants (at the 1%, and 10% level, respectively). On the contrary, family ties are stronger in states with a higher percentage of Catholics, as well as in

[23] Our data on religiosity and religious composition come from the American Religion Data Archive (ARDA), http://www.thearda.com/archive/browse.asp. For the data on marriage, we use the rate of marriages per 1,000 inhabitants in 1990 from the US Census Bureau.
[24] One limitation to our choice of state-specific instruments is that we assume that there is a strong correlation between what the state looks like and what its firms' TMTs look like.
[25] The results are available upon request from the authors.

those states with a greater percentage of married couples (at the 1% and 5% level, respectively). More importantly, the regression results for IPO performance show results that are consistent with Tables 7 and 8. Hence, our results are robust to controlling for the endogenous determination of social ties and family ties.

6. Conclusion

This paper studies the two potentially contrasting effects on IPO pricing as well as post-IPO operating performance of social ties and family ties of the top management team (TMT) with board members. Social ties may either create value or lead to entrenchment and excessive managerial power. Similarly, family ties may reduce manager-owner conflicts of interests or give rise to minority-shareholder expropriation and/ or private benefits of control.

In contrast to research by Hwang and Kim (2009) on mature firms, we find that for IPOs performance is positively related to the strength of social ties, but negatively to the strength of family ties. Controlling for social ties, board independence increases the IPO premium and the post-IPO operating performance. We explain the difference in the impact of social ties on performance between IPO firms and mature firms by the fact that the former may find it more difficult to attract board members and hence social ties may provide access to board directors that would not otherwise be granted. In line with this argument, we find that the factors that drive social (and family) board dependence are very different from those applying to mature firms.

Our results have important policy implications as they suggest that conventionally defined board independence overestimates actual board independence. We observe social ties of TMT members with the board members for the vast majority of our 500 IPO firms, i.e. 329 of our sample firms.

When we adjust conventional board independence for social ties between the TMT members and the outside directors, the percentage of independent board members drops from 36.0% to 28.5%. Further, our regression results show that family ties of the TMT members with the inside directors significantly reduce IPO performance. In contrast, social ties of the TMT members with the inside directors create firm value. These results call for revisiting the way board independence is defined in both regulation and academic research.

Acknowledgements

We are grateful to the editor, Jeffry Netter, as well as an anonymous referee for their detailed comments which have helped improve this manuscript. We would also like to thank the participants at the 12th Workshop on Corporate Governance and Investment at the Leipzig Graduate School of Management (Handelshochschule Leipzig (HHL)) from 6 to 8 October 2011. Finally, this research has benefited from the financial support of the American University of Beirut and the Olayan School of Business.

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Figure 1: A simplex of dimension 1

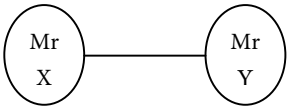


Figure 2: A simplex of dimension 3

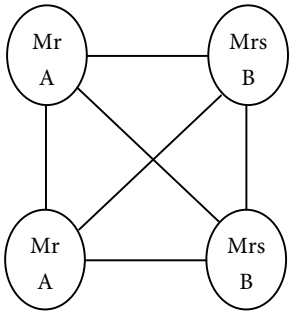
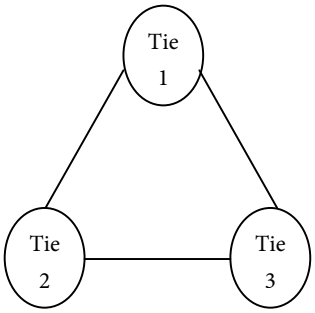
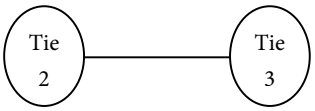


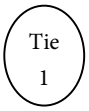
Figure 3: Simplices based on links or ties



Mr
D



Miss E



Mrs
W

Figure 4: A simplicial complex

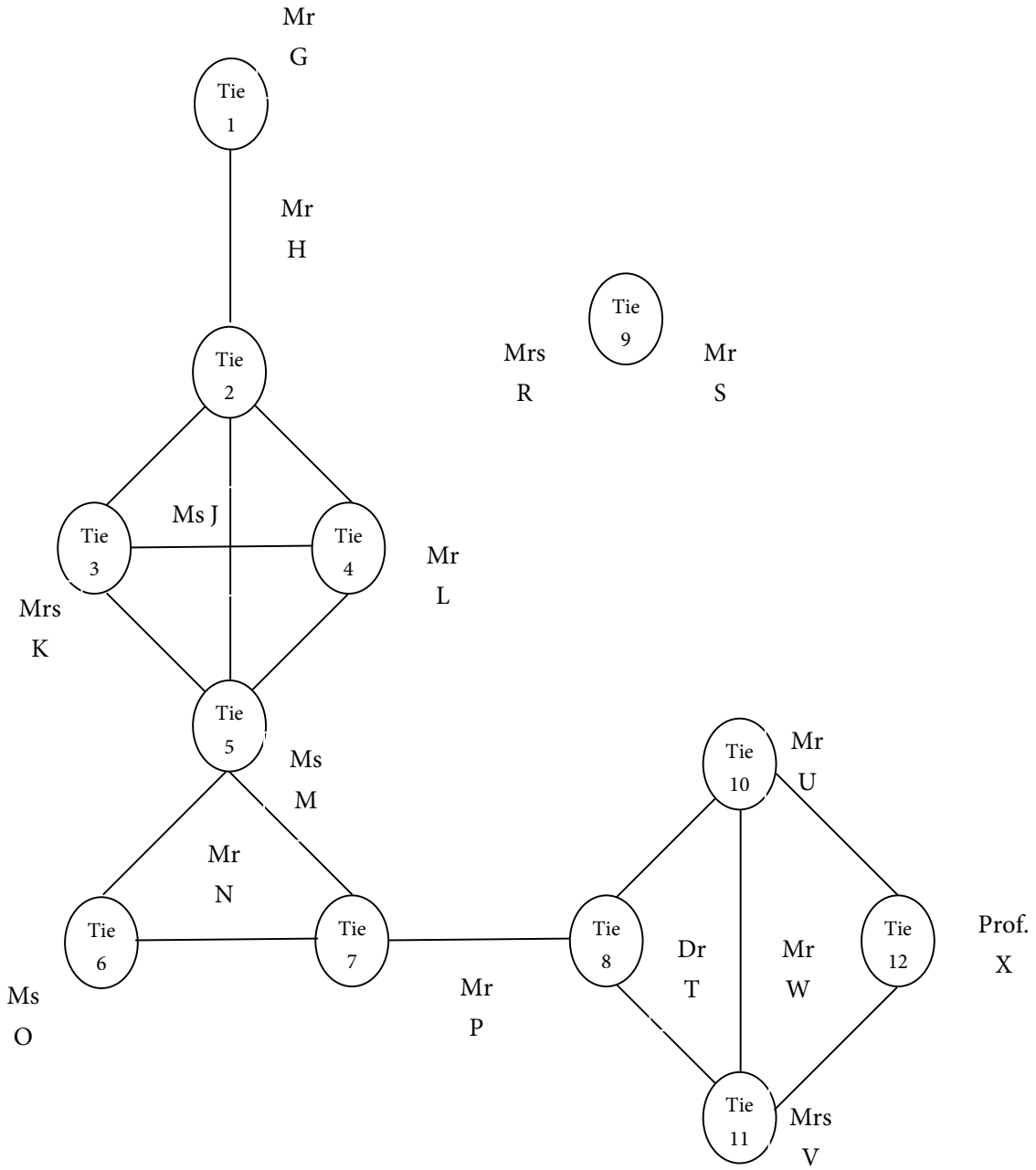


Table 1 - Data Representativeness

Panel A compares the sample with the population in terms of the distribution of IPOs across time. Panel B performs the equivalent comparison across industry sectors. 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), 7371, 7372, 7373, 7374, 7375, 7378, and 7379 (software).

Panel A – Number and Percentage of IPOs per Year

	Sample		Population	
Year	Number	%	Number	%
1997	169	33.80	429	20.61
1998	48	9.60	237	11.38
1999	87	17.40	408	19.60
2000	89	17.80	318	15.27
2001	6	1.20	54	2.59
2002	7	1.40	53	2.55
2003	8	1.60	51	2.45
2004	13	2.60	138	6.63
2005	21	4.20	122	5.86
2006	15	3.00	120	5.76
2007	33	6.60	133	6.39
2008	4	0.80	19	0.91
Total	500	100.00	2082	100.00

Panel B – Number and Percentage of IPOs per Industry

	Sample		Population	
Industry Classification	Number	%	Number	%
Consumer Products and Services	55	11.00	241	11.58
Consumer Staples	13	2.60	62	2.98
Energy and Power	17	3.40	102	4.90
Healthcare	91	18.20	345	16.57
Software & IT Consulting Services	183	36.60	737	35.40
Industrials	38	7.60	158	7.59
Materials	15	3.00	62	2.98
Media and Entertainment	19	3.80	100	4.80
Retail	24	4.80	122	5.86
Telecommunications	45	9.00	150	7.20
Transportation	0	0.00	3	0.14
Hi-tech IPOs		0.364		0.373

Table 2 – Descriptive Statistics for the 500 IPO Firms

This table provides descriptive statistics for the sample of 500 IPOs from 1997 to 2008. *Premium* is the ratio of the difference between the offer price and the book value per share over the offer price. *Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS)* are measures of operating performance. *ROA* is equal to net income over total assets, *ROE* is equal to net income over total equity, and *ROS* is equal to net income over sales; all three are based on the first accounting year ending after the IPO date. The data for ROA, ROE, and ROS are winsorized at the 2.5th percentile and the 97.5th percentile to remove outliers. *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. *Loss dummy* is equal to one if the IPO firm has a net loss in the last year prior to IPO, and zero otherwise. *Pre-IPO Leverage* is the ratio of total debt over total assets in the year preceding the IPO. *Price-to-Book ratio* is equal to the offer price over the book value per share at IPO. *VC dummy* is equal to one if the IPO firm is VC-backed, and zero otherwise. *Entrenchment Index* is calculated based on Bebchuck et al. (2009). *Family Firm* is a dummy that equals one if at least one relative of the founder is an officer, a director, or a 5% minimum blockholder (either individually or as a group) of the firm, and zero otherwise. *Underwriter Reputation* is calculated based on the ranking of Loughran and Ritter (2004). *TMT Size* is the number of top executives reported in the IPO prospectus. *CEO Post-IPO Ownership* is calculated following the IPO date, *CEO duality* is a dummy that equals one if the CEO also serves as the chairman of the board, and zero otherwise. *CEO Tenure* is the number of years the CEO has been in office. *Board Size* is the total number of board members. *Old Directors* is equal to the fraction of directors over the age of 69. *Busy Board* is a dummy equal to one if the board is busy, i.e. a majority of the independent directors concurrently serve on three or more board, and zero otherwise. *Director Ownership* is equal to the percentage of shares owned by directors following the IPO. *CEO from Other Company* is a dummy that equals one if at least one of the directors is the CEO of another firm, and zero otherwise. *Market Return* is the compounded daily return of the Equally-weighted CRSP index over the 20 trading days preceding the day of the offer.

Variable	Mean	Median	s.d.	Min	Max
Short-term IPO Performance					
Premium	0.724	0.735	0.201	0.040	1.412
Operating Performance					
Return on Assets (ROA)	-0.023	0.018	0.185	-0.809	0.695
Return on Equity (ROE)	-0.025	0.008	0.156	-0.726	0.805
Return on Sales (ROS)	-0.013	0.007	0.089	-0.368	0.242
IPO Firm Characteristics					
Price Revision	0.036	0.000	0.248	-0.500	1.000
Market Capitalization	455.423	236.944	927.538	9.073	11139.088
Hi-tech dummy	0.364	0.000	0.482	0.000	1.000
Loss dummy	0.106	0.000	0.308	0.000	1.000
Price-to-Book ratio	2.695	1.904	3.298	0.358	42.692
Pre-IPO Leverage	0.256	0.120	0.439	0.000	6.184
VC dummy	0.620	1.000	0.486	0.000	1.000
Entrenchment Index	2.770	3.000	1.518	0.000	6.000
Family Firm dummy	0.098	0.000	0.298	0.000	1.000
TMT Size	7.236	7.000	2.948	1.000	22.000
Lock-up Period	160.190	180.000	113.864	0.000	1080.000
Underwriter Reputation	7.357	8.100	2.278	0.000	9.100
CEO Characteristics					
Post-IPO Ownership	0.148	0.071	0.184	0.000	0.895
CEO Duality	0.494	0.000	0.500	0.000	1.000
Experience in firm (years)	6.031	3.733	6.590	-0.003	32.383

Board Characteristics					
Board size	6.760	7.000	2.535	2.000	44.000
Old Directors	0.032	0.000	0.080	0.000	0.500
Busy Board	0.076	0.000	0.265	0.000	1.000
Director Ownership	0.316	0.309	0.215	0.000	0.859
CEO from Other Company	0.504	1.000	0.500	0.000	1.000
Market Momentum					
Market Return	0.014	0.018	0.041	-0.128	0.145

Table 3 – TMT and Board Characteristics

This table provides descriptive statistics for TMT and board characteristics in the sample of 500 IPOs from 1997 to 2008. *Social Ties* and *Family Ties* represent the average q of all the ties of TMT members with board members, where q is the number of ties a TMT member shares with all other directors. *Professional Membership Ties, Club Membership Ties, Origin Ties, Former School Ties, Former Employer Ties* represent the average q of the various types of executive social ties with board members. *Family Ties with Inside Directors, Social Ties with Inside Directors, Family Ties with Outside Directors, Social Ties with Outside Directors* represent the average q of all executives with inside and outside directors on the board. *Outside Board Independence* is equal to the proportion of outside directors on the board. *Financial Board Independence* is equal to the proportion of outside directors not financially related to the firm. *Conventional Board Independence* is equal to the proportion of family and financially unrelated outside directors on the board. *Socially Dependent Outside Directors* is equal to the proportion of outside directors that have social ties with the TMT. *Conv. & Soc. Board Independence* is equal to the proportion of financially, family, and socially unrelated outside directors on the board. *Reduction in Board Independence due to Social Ties* is equal to the difference between *Conventional Board Independence* and *Conv. & Soc. Board Independence.*

Variable	Mean	Median	s.d.	Min	Max
TMT Ties with Board members					
TMT Social Ties	0.496	0.444	0.392	0.000	2.000
TMT Family Ties	0.050	0.000	0.125	0.000	0.667
TMT Ties According to the Type of Social Ties					
Professional Membership Ties	0.009	0.000	0.063	0.000	0.750
Club Membership Ties	0.010	0.000	0.068	0.000	1.000
Origin Ties	0.023	0.000	0.105	0.000	0.750
Former School Ties	0.211	0.143	0.244	0.000	1.000
Former Employer Ties	0.323	0.286	0.305	0.000	1.615
TMT Ties According to the Nature of Board Members: Inside Directors vs. Outside Directors					
Family Ties with Inside Directors	0.036	0.000	0.111	0.000	0.667
Social Ties with Inside Directors	0.575	0.551	0.413	0.000	2.000
Family Ties with Outside Directors	0.017	0.000	0.073	0.000	0.667
Social Ties with Outside Directors	0.326	0.290	0.289	0.000	1.500
TMT Ties with Board Members and Board Independence					
Outside Board Independence	0.681	0.714	0.181	0.000	1.000
Financial Board Independence	0.367	0.333	0.214	0.000	0.889
Conventional Board Independence	0.360	0.333	0.220	0.000	1.000
Socially Dependent Outside Directors	0.168	0.111	0.208	0.000	1.000
Conv. & Soc. Board Independence	0.285	0.286	0.202	0.000	1.000
Reduction in Board Independence due to Social Ties	0.075	0.000	0.123	0.667	0.000

Table 4 – Comparative Analysis between IPOs with Tied vs. Non-Tied TMT members

This table provides comparative statistics for IPOs with tied TMT members and those without ties with board members for the sample of 500 IPOs from 1997 to 2008. All variables are defined as in Tables 3 and 4. ***, **, and * denote significance at the 1%, 5%, and 10% level (for the two-sided t-test or the binomial test), respectively.

IPO Firms with	TMT Members without Ties (N = 77)			Tied TMT Members (N = 423)			P-Value for Difference in Means/ Proportions
	Mean	Median	s.d.	Mean	Median	s.d.	
Short-term IPO Performance							
Premium	0.682	0.716	0.192	0.731	0.741	0.202	0.046**
Operating Performance							
Return on Assets (ROA)	-0.035	-0.002	0.150	-0.021	0.020	0.190	0.581
Return on Equity (ROE)	-0.043	0.002	0.114	-0.022	0.009	0.162	0.321
Return on Sales (ROS)	-0.031	-0.003	0.097	-0.010	0.008	0.088	0.100
IPO Firm Characteristics							
Price Revision	0.017	0.000	0.205	0.040	0.000	0.256	0.472
Market Capitalization	294.6	153.1	476.0	484.7	259.7	985.4	0.098*
Hi-tech dummy	0.351	0.000	0.480	0.366	0.000	0.482	0.792
Loss dummy	0.078	0.000	0.270	0.111	0.000	0.315	0.385
Pre-IPO Leverage	0.390	0.159	0.845	0.231	0.119	0.309	0.003***
Price-to-Book ratio	2.802	1.680	5.284	2.676	1.970	2.799	0.757
VC dummy	0.519	1.000	0.503	0.638	1.000	0.481	0.048**
Entrenchment Index	2.922	3.000	1.562	2.742	2.000	1.511	0.340
Family Firm dummy	0.013	0.000	0.114	0.113	0.000	0.318	0.006***
TMT Size	6.000	6.000	2.476	7.461	7.000	2.973	0.000***
Lock-up Period	191. 3	180.0	142.8	154.5	180.0	107.0	0.009***
Underwriter Reputation	6.847	8.100	2.363	7.450	8.100	2.253	0.032**
TMT Ties with Board Members and Board Independence							
TMT Social Ties				0.586	0.500	0.358	
TMT Family Ties				0.059	0.000	0.134	
Outside Board Independence	0.695	0.750	0.182	0.679	0.714	0.181	0.469
Financial Board Independence	0.382	0.333	0.216	0.365	0.333	0.213	0.524
Conventional Board Independence	0.370	0.333	0.242	0.358	0.333	0.217	0.664
Socially Dependent Outside Directors				0.198	0.167	0.213	
Conv. &Soc. Board Independence	0.370	0.333	0.242	0.270	0.250	0.190	0.000***
Reduction in Board Independence due to Social ties				0.088	0.000	0.129	
CEO Characteristics							
CEOs Outside directors	0.545	1.000	0.501	0.496	0.000	0.501	0.430
CEO Post-IPO Ownership	0.165	0.095	0.181	0.144	0.063	0.184	0.363
CEO Duality	0.481	0.000	0.503	0.496	0.000	0.501	0.797
CEO Tenure	6.141	3.500	6.340	6.011	3.750	6.642	0.873

Board Characteristics							
Board size	6.299	6.000	2.090	6.844	7.000	2.601	0.083*
Old Directors	0.039	0.000	0.087	0.031	0.000	0.079	0.429
Busy Board	0.052	0.000	0.223	0.080	0.000	0.272	0.388
Director Ownership	0.289	0.290	0.218	0.320	0.313	0.215	0.245
Market Momentum							
Market Return	0.016	0.022	0.042	0.013	0.018	0.040	0.585

Table 5 – IPO Performance and the Nature of TMT Ties

This table provides descriptive statistics for the sample of 500 IPOs from 1997 to 2008. Panel A presents the sample distribution of IPO firms with and without family and social ties of TMT members with the board of directors. Panels B, C, D, and E report the mean (standard deviation) for premium, return on assets (ROA), return on equity (ROE), and return on sales (ROS), for IPOs with and without family and social ties. All variables are defined as in Tables 3 and 4. ***, **, and * denote significance at the 1%, 5%, and 10% level (for the two-sided test), respectively.

Panel A – Sample Distribution

		Family Ties	
		Yes	No
Social ties	Yes	79	329
	No	15	77

Panel B – Premium

		Family Ties		
		Yes	No	P-Value for Difference in Means
Social ties	Yes	I 0.687 (0.224)	II 0.748 (0.194)	I vs II 0.608
	No	III 0.614 (0.189)	IV 0.682 (0.192)	III vs IV 0.211
P-Value for Diff. in Means	II vs III 0.009***	I vs III 0.236	II vs IV 0.008***	I vs IV 0.875

Panel C – Return on Assets (ROA)

		Family Ties		
		Yes	No	P-Value for Difference in Means
Social ties	Yes	I -0.090 (0.170)	II 0.004 (0.191)	I vs II 0.000***
	No	III -0.129 (0.171)	IV -0.035 (0.150)	III vs IV 0.039**
P-Value for Diff. in Means	II vs III 0.009***	I vs III 0.416	II vs IV 0.143	I vs IV 0.056*

Panel D – Return on Equity (ROE)

		Family Ties		
		Yes	No	P-Value for Difference in Means
Social ties	Yes	I -0.080 (0.138)	II -0.003 (0.166)	I vs II 0.000***
	No	III -0.083 (0.092)	IV -0.043 (0.114)	III vs IV 0.219
P-Value for Diff. in Means	II vs III 0.065*	I vs III 0.951	II vs IV 0.072*	I vs IV 0.099*

Panel E – Return on Sales (ROS)

		Family Ties		
		Yes	No	P-Value for Difference in Means
Social ties	Yes	I -0.039 (0.073)	II -0.001 (0.090)	I vs II 0.001***
	No	III -0.040 (0.066)	IV -0.031 (0.097)	III vs IV 0.728
P-Value for Diff. in Means	II vs III 0.100*	I vs III 0.964	II vs IV 0.025**	I vs IV 0.579

Table 6 – Determinants of Family and Social Ties: The Hwang and Kim Model (2009)

This table presents estimates of the board's family or social dependence and replicates Table 3 in Hwang and Kim (2009). *Social Ties* and *Family Ties* represent the average q of all the ties of TMT members with board members, where q is the number of ties a TMT member shares with all other directors. All other variables are defined as in Tables 3 and 4. All variables, except for the *Loss* dummy which relates to the year before the IPO, are measured at the time of the IPO. 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 test), respectively.

	Social Ties	Family Ties
	(1)	(2)
Constant	0.243	0.226
	0.193	*0.140*
CEO Post-IPO Ownership	-0.074	0.103***
	0.128	*0.040*
CEO Duality	0.093**	0.009
	0.038	*0.009*
CEO Tenure	0.002	0.001
	0.003	*0.001*
Board Size	0.005	0.004*
	0.008	*0.002*
Old Directors	-0.453**	0.039
	0.186	*0.052*
Busy Board	-0.025	-0.029***
	0.066	*0.010*
Director Ownership	0.044	-0.003
	0.094	*0.022*
CEO from Other Company	-0.016	-0.024**
	0.038	*0.010*
Entrenchment Index	-0.021*	-0.004
	0.011	*0.003*
Family Firm	0.133*	0.224***
	0.068	*0.023*
Loss dummy	-0.032	-0.003
	0.060	*0.012*
Ln Market Capitalization	0.012	-0.007
	0.019	*0.006*
Price-to-Book ratio	0.003	0.000
	0.007	*0.001*
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Adjusted R-squared	0.059	0.366
F-statistic	1.979	10.021
Prob(F-statistic)	0.001	0.000

Table 7 –IPO Premium and TMT Ties

The sample consists of 500 IPOs between 1997 and 2008. This table presents the results of the regressions for *Premium*. *Premium* is the ratio of the difference between the offer price and the book value per share over the offer price. The regressions control for the effect of social ties, family ties, and board independence on short-term IPO performance. Regression (3a) includes *Conventional Board Independence*. Regression (3b) includes *Conventional & Social Board Independence*. Regression (3c) includes both *Conventional Board Independence* and *the Reduction in Board Independence due to Social Ties,* the latter being equal to the difference between *Conventional Board Independence* and *Conventional & Social Board Independence*. All other variables are defined as in Tables 3 and 4. 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 test), respectively.

	Premium		
	(3a)	(3b)	(3c)
Constant	0.161	0.199	0.191
	0.304	*0.298*	*0.298*
Social Ties	0.114***	0.134***	0.143***
	0.023	*0.023*	*0.023*
Family Ties	-0.194**	-0.185**	-0.206**
	0.089	*0.087*	*0.087*
Conv. Board Independence	0.059		
	0.048		
Conv. & Soc. Board Independence		0.212***	
		0.050	
Reduction in Board Independence			-0.333***
due to Social Ties			*0.075*
Firm Characteristics			
Ln Market Capitalization	0.057***	0.054***	0.061***
	0.009	*0.009*	*0.009*
Hi-tech dummy	0.046*	0.043*	0.047*
	0.025	*0.025*	*0.025*
Loss dummy	0.006	0.004	0.006
	0.029	*0.028*	*0.028*
Pre-IPO Leverage	-0.012	-0.014	-0.012
	0.020	*0.020*	*0.020*
VC dummy	0.016*	0.016*	0.019**
	0.009	*0.009*	*0.008*
Entrenchment Index	-0.005*	-0.006*	-0.006**
	0.003	*0.003*	*0.003*
Family Firm dummy	-0.044*	-0.043*	-0.045*
	0.023	*0.023*	*0.023*
TMT Size	-0.001	0.001	0.001
	0.003	*0.003*	*0.003*
Lock-up Period	0.000	0.000	0.000
	0.000	*0.000*	*0.000*
Underwriter Reputation	-0.007*	-0.007*	-0.007*
	0.004	*0.004*	*0.004*
CEO Characteristics			
CEO Post-IPO Ownership	0.113**	0.096**	0.108**
	0.054	*0.054*	*0.053*
CEO Duality	-0.010	-0.009	-0.012

	0.019	*0.019*	*0.019*
CEO Tenure	-0.003*	-0.002*	-0.003*
	0.002	*0.001*	*0.001*
Board Characteristics			
Board Size	0.001	-0.002	0.002
	0.004	*0.004*	*0.004*
Older Directors	0.034	0.031	0.065
	0.109	*0.107*	*0.107*
Busy Board	0.002	0.001	0.002
	0.001	*0.001*	*0.001*
Director Ownership	0.011	0.050	-0.053
	0.050	*0.047*	*0.045*
CEO from Other Company	0.005	-0.004	0.011
	0.019	*0.019*	*0.018*
Market Momentum and Industry dummies			
Market Return	0.212*	0.225*	0.231*
	0.124	*0.122*	*0.122*
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Adjusted R-squared	0.166	0.196	0.199
F-statistic	7.310	8.820	8.880
Prob(F-statistic)	0.000	0.000	0.000

Table 8 – Post-IPO Operating Performance and TMT Ties

The sample consists of 500 IPOs between 1997 and 2008. This table presents the results of the regressions for post-IPO operating performance. The dependent variable is the return on assets (ROA), the return on equity (ROE), and the return on sales (ROS), respectively. *ROA, ROE,* and *ROS* measure operating performance for the first accounting year, which ends after the IPO date, and are equal to net income divided by total assets, total equity, and sales, respectively. Regressions (4a), (5a), and (6)a include *Conventional Board Independence*. Regressions (4b), (5b), and (6b) include *Conventional & Social Board Independence*. Regressions (4c), (5c), and (6c) include both *Conventional Board Independence* and the *Reduction in Board Independence due to Social Ties*, the latter being equal to the difference between *Conventional Board Independence* and *Conventional & Social Board Independence*. All other variables are defined as in Tables 3 and 4. 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 test), respectively.

	ROA			ROE			ROS		
	(4a)	(4b)	(4c)	(5a)	(5b)	(5c)	(6a)	(6b)	(6c)
Constant	-0.019	-0.044	-0.035	-0.346	-0.356	-0.320	0.715	0.732	0.675
	0.193	*0.193*	*0.194*	*0.300*	*0.299*	*0.299*	*1.006*	*1.004*	*1.006*
Social Ties	0.089***	0.099***	0.096***	0.146***	0.155***	0.157***	0.253***	0.274***	0.269***
	0.023	*0.024*	*0.024*	*0.035*	*0.035*	*0.036*	*0.070*	*0.071*	*0.072*
Family Ties	-0.311***	-0.311***	-0.320***	-0.613***	-0.613***	-0.623***	-0.581**	-0.581**	-0.606**
	0.089	*0.088*	*0.089*	*0.131*	*0.131*	*0.131*	*0.267*	*0.267*	*0.267*
Conv. Board Independence	0.073			0.045			0.148		
	0.050			*0.074*			*0.152*		
Conv. & Soc. Board Independence		0.117**			0.111*			0.250*	
		0.053			*0.065*			*0.132*	
Reduction in Board Independence due to Social Ties			-0.078*			-0.133**			-0.188*
			0.046			*0.058*			*0.105*
Firm Characteristics									
Ln Market Capitalization	0.027***	0.027***	0.031***	0.033**	0.032**	0.036**	0.045*	0.043*	0.051*
	0.010	*0.010*	*0.010*	*0.015*	*0.015*	*0.015*	*0.026*	*0.026*	*0.026*
Hi-tech dummy	-0.037*	-0.038*	-0.036*	-0.043**	-0.045**	-0.043**	-0.098*	-0.101*	-0.097*
	0.020	*0.020*	*0.020*	*0.020*	*0.020*	*0.020*	*0.053*	*0.052*	*0.053*
Loss dummy	-0.009	-0.009	-0.009	-0.043*	-0.042*	-0.042*	-0.106*	-0.104*	-0.106*
	0.030	*0.030*	*0.030*	*0.022*	*0.022*	*0.022*	*0.060*	*0.060*	*0.056*
Pre-IPO Leverage	-0.015	-0.016	-0.016	-0.030	-0.031	-0.031	-0.070	-0.072	-0.070
	0.020	*0.020*	*0.020*	*0.030*	*0.030*	*0.030*	*0.060*	*0.060*	*0.060*
Price-to-Book ratio	-0.001	-0.001	-0.002	-0.003	-0.003	-0.003	0.005	0.005	0.004
	0.003	*0.003*	*0.003*	*0.004*	*0.004*	*0.004*	*0.008*	*0.008*	*0.008*
VC dummy	-0.006	-0.003	-0.015	0.014	0.019	0.007	0.006	0.023	0.012
	0.024	*0.024*	*0.023*	*0.035*	*0.035*	*0.034*	*0.071*	*0.070*	*0.069*
Entrenchment Index	-0.008*	-0.009*	-0.009*	-0.015*	-0.016*	-0.016*	-0.022	-0.024	-0.023

	0.005	*0.005*	*0.005*	*0.009*	*0.009*	*0.010*	*0.019*	*0.019*	*0.019*
Family Firm dummy	-0.004	-0.003	-0.004	-0.009	-0.007	-0.008	-0.073	-0.070	-0.075
	0.035	*0.035*	*0.035*	*0.052*	*0.051*	*0.052*	*0.104*	*0.104*	*0.104*
TMT Size	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.006	-0.005	-0.006
	0.003	*0.003*	*0.003*	*0.005*	*0.005*	*0.005*	*0.010*	*0.010*	*0.010*
Lock-up Period	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Underwriter Reputation	-0.003	-0.003	-0.004	-0.002	-0.003	-0.003	0.015	0.014	0.014
	0.006	*0.006*	*0.006*	*0.008*	*0.008*	*0.008*	*0.017*	*0.017*	*0.017*
CEO Characteristics									
CEO Post-IPO Ownership	-0.002	-0.010	0.003	-0.067	-0.073	-0.067	-0.087	-0.100	-0.080
	0.057	*0.056*	*0.056*	*0.083*	*0.083*	*0.083*	*0.169*	*0.169*	*0.168*
CEO Duality	0.004	0.004	0.003	0.010	0.010	0.009	0.052	0.053	0.050
	0.020	*0.020*	*0.020*	*0.030*	*0.030*	*0.030*	*0.060*	*0.060*	*0.060*
Experience in firm (years)	0.000	0.000	0.000	0.002	0.002	0.002	-0.001	-0.001	-0.001
	0.002	*0.002*	*0.002*	*0.002*	*0.002*	*0.002*	*0.005*	*0.005*	*0.005*
Board Characteristics									
Board Size	0.002	0.001	0.003	0.000	-0.001	0.001	-0.005	-0.007	-0.002
	0.004	*0.004*	*0.004*	*0.006*	*0.006*	*0.005*	*0.011*	*0.011*	*0.011*
Older Directors	0.101	0.108	0.117	0.085	0.088	0.105	0.204	0.214	0.240
	0.124	*0.124*	*0.124*	*0.184*	*0.183*	*0.184*	*0.374*	*0.373*	*0.374*
Board Busyness	0.000	0.000	0.000	0.048**	0.053**	0.049**	0.033*	0.024**	0.037*
	0.001	*0.001*	*0.001*	*0.023*	*0.023*	*0.023*	*0.017*	*0.011*	*0.021*
Director Ownership	0.073	0.078	0.032	0.041	0.056	0.006	0.141	0.154	0.056
	0.053	*0.051*	*0.049*	*0.078*	*0.075*	*0.072*	*0.157*	*0.151*	*0.146*
Nbr CEOs Outside directors	0.028*	0.025*	0.032**	0.050*	0.046*	0.054**	0.055*	0.062*	0.045*
	0.016	*0.015*	*0.015*	*0.025*	*0.025*	*0.025*	*0.030*	*0.034*	*0.026*
Market Momentum and Industry dummies									
Market Return	-0.077	-0.085	-0.114	-0.017	-0.012	-0.057	0.721	0.712	0.628
	0.222	*0.221*	*0.222*	*0.333*	*0.331*	*0.332*	*0.668*	*0.664*	*0.667*
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.096	0.103	0.094	0.128	0.132	0.131	0.094	0.102	0.092
F-statistic	4.263	4.431	4.200	2.450	2.500	2.480	2.352	2.416	2.336
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 9 – IPO Performance and TMT Ties with Inside Directors and Those with Outside Directors

This table controls for the differential effect of the nature of ties of the TMT members with either inside or outside directors on IPO pricing and post-IPO operating performance. The regressions contain the same firm, CEO and board characteristics as well as year dummies, the market return and the industry dummies as in the regressions in Table 8. The sample consists of 500 IPOs between 1997 and 2008. The dependent variable is *Premium*, *ROA*, *ROE*, and *ROS*, respectively. *Premium* is the ratio of the difference between the offer price and the book value per share over the offer price. *ROA* is the return on assets, *ROE* is the return on equity, and *ROS* is the return on sales. All variables are calculated at the end of the first accounting year following the IPO date. All other variables are defined as in Tables 3 and 4. 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 test), respectively.

	Premium	ROA	ROE	ROS
	(7)	(8)	(9)	(10)
Constant	0.384***	-0.139**	-0.328	0.841
	0.062	*0.056*	*0.301*	*1.011*
Family Ties with Outside Directors	0.056	-0.162	0.082	-0.202
	0.199	*0.218*	*0.311*	*0.630*
Social Ties with Outside Directors	-0.043	-0.006	-0.060	0.153
	0.054	*0.048*	*0.085*	*0.170*
Family Ties with Inside Directors	-0.220**	-0.246***	-0.633***	-0.571**
	0.096	*0.077*	*0.150*	*0.254*
Social Ties with Inside Directors	0.140***	0.079***	0.155***	0.140*
	0.037	*0.028*	*0.056*	*0.075*
Conv. & Soc. Board Independence	0.198***	0.099**	0.115*	0.220*
	0.047	*0.047*	*0.079*	*0.114*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies and Market Return	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.170	0.102	0.122	0.094
F-statistic	7.793	4.173	2.300	2.397
Prob(F-statistic)	0.000	0.000	0.000	0.000

Table 10 – The Impact of the Type of Firm on the Link between TMT Ties and IPO Performance

This table controls for the potentially different effect of type of firm on the impact of social ties as well as family ties on IPO performance. The regressions contain the same firm, CEO and board characteristics as well as year dummies, the market return and the industry dummies as in the regressions in Table 8. The panels study the differential effect of VC backing (Panel A), high technology (Panel B), above median price-to-book ratio (Panel C), intangible assets as a percentage of total assets (Panel D), research and development expenditure as a percentage of total assets (Panel E), regulated industries (Panel F) and the natural logarithm of market capitalization, i.e. *LSize* (Panel G). The sample consists of 500 IPOs between 1997 and 2008. The dependent variable is *Premium*, *ROA, ROE,* and *ROS*, respectively. All variables are defined as in Tables 3 and 4. 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 test), respectively.

	Premium	ROA	ROE	ROS
Panel A – IPO Performance, TMT Ties, and VC dummy				
	(11a)	(12a)	(13a)	(14a)
Constant	0.373***	-0.130*	-0.347	0.791
	0.061	*0.067*	*0.301*	*1.004*
VC dummy	0.007	-0.057*	0.011	-0.155*
	0.028	*0.030*	*0.049*	*0.088*
Social Ties	0.159***	0.048*	0.133**	0.041
	0.035	*0.036*	*0.056*	*0.111*
Social Ties x VC dummy	-0.051	0.074*	0.034*	0.377***
	0.044	*0.045*	*0.020*	*0.140*
Family Ties	-0.295***	-0.316***	-0.550***	-0.375*
	0.095	*0.094*	*0.157*	*0.326*
Family Ties x VC dummy	0.091	0.057	-0.138	-0.274
	0.135	*0.133*	*0.211*	*0.433*
Conv. & Soc. Board Independence	0.198***	0.095**	0.109*	0.235*
	0.045	*0.047*	*0.065*	*0.131*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
djusted R-squared	0.174	0.109	0.129	0.103
F-statistic	8.030	4.410	2.390	2.445
Prob(F-statistic)	0.000	0.000	0.000	0.000
Panel B – IPO Performance, TMT Ties, and Hi-tech dummy				
	(11b)	(12b)	(13b)	(14b)
Constant	0.394***	-0.154**	-0.337	0.764
	0.059	*0.065*	*0.300*	*1.009*
Hi-tech dummy	0.077***	-0.063**	-0.080*	-0.143*
	0.029	*0.031*	*0.045*	*0.083*
Social Ties	0.146***	0.072***	0.136***	0.249***
	0.027	*0.027*	*0.043*	*0.086*
Social Ties x Hi-tech dummy	-0.067*	0.067*	0.051*	0.070
	0.040	*0.039*	*0.030*	*0.049*
Family Ties	-0.336***	-0.308***	-0.645***	-0.604**
	0.080	*0.079*	*0.140*	*0.289*

Family Ties x Hi-tech dummy	0.371	0.039	0.149	0.093
	0.157	*0.157*	*0.242*	*0.492*
Conv. & Soc. Board Independence	0.193***	0.101**	0.108*	0.247*
	0.045	*0.047*	*0.065*	*0.132*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.183	0.107	0.130	0.093
F-statistic	8.440	4.350	2.410	2.349
Prob(F-statistic)	0.000	0.000	0.000	0.000

Panel C – IPO Performance, TMT Ties, and Above Median Price-to-Book Ratio

	(11c)	(12c)	(13c)	(14c)
Constant	0.554***	-0.019	-0.292	0.974
	0.208	*0.181*	*0.303*	*1.008*
High P/B ratio	0.113***	-0.044*	-0.029	-0.110
	0.030	*0.025*	*0.047*	*0.095*
Social Ties	0.107**	0.293**	0.101**	0.104*
	0.049	*0.132*	*0.050*	*0.062*
Social Ties x High P/B ratio	0.022	0.115**	0.103*	0.326**
	0.048	*0.052*	*0.062*	*0.137*
Family Ties	-0.135*	-0.715**	-0.580***	-0.497*
	0.076	*0.395*	*0.176*	*0.302*
Family Ties x High P/B ratio	-0.225	-0.273*	-0.082	-0.233
	0.175	*0.165*	*0.206*	*0.424*
Conv. & Soc. Board Independence	0.221***	0.120**	0.110*	0.240*
	0.049	*0.054*	*0.065*	*0.131*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.241	0.106	0.133	0.091
F-statistic	3.440	1.750	2.440	2.226
Prob(F-statistic)	0.000	0.001	0.000	0.000

Panel D – IPO Performance, TMT Ties, and Intangible Assets

	(11d)	(12d)	(13d)	(14d)
Constant	0.473**	-0.230	-0.401	0.708
	0.215	*0.217*	*0.298*	*1.009*
Intangible Assets	-0.029	0.039	-0.090	0.081
	0.099	*0.102*	*0.138*	*0.278*
Social Ties	0.200**	0.355***	0.137***	0.258***
	0.094	*0.136*	*0.039*	*0.080*
Social Ties x Intangible Assets	0.010	0.042	0.273*	0.194
	0.144	*0.152*	*0.165*	*0.406*
Family Ties	-0.210	-0.771*	-0.480***	-0.454*
	0.544	*0.438*	*0.140*	*0.262*
Family Ties x Intangible Assets	-0.039	-0.413	-1.551***	-1.503*
	0.466	*0.469*	*0.593*	*0.905*
Conv. & Soc. Board Independence	0.218***	0.122**	0.090	0.233*

	0.051	*0.054*	*0.065*	*0.133*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.182	0.093	0.142	0.089
F-statistic	2.700	1.650	2.520	2.175
Prob(F-statistic)	0.000	0.002	0.000	0.000

Panel E – IPO Performance, TMT Ties, and Research & Development (R&D)

	(11e)	(12e)	(13e)	(14e)
Constant	0.474**	-0.223	-0.353	0.632
	0.215	*0.216*	*0.301*	*1.004*
R&D	-0.003	-0.046	-0.030	-0.213*
	0.041	*0.043*	*0.059*	*0.119*
Social Ties	0.145**	0.357***	0.160****	0.248***
	0.061	*0.131*	*0.039*	*0.077*
Social Ties x R&D	0.046	-0.026	-0.075	0.136
	0.105	*0.110*	*0.149*	*0.302*
Family Ties	-0.236	-0.884**	-0.616***	-0.451*
	0.541	*0.382*	*0.138*	*0.255*
Family Ties x R&D	-0.620*	-0.218	-0.202	-1.505
	0.323	*0.518*	*0.685*	*1.384*
Conv. & Soc. Board Independence	0.219***	0.125**	0.113*	0.261**
	0.050	*0.054*	*0.065*	*0.131*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.186	0.100	0.129	0.089
F-statistic	2.750	1.700	2.370	2.200
Prob(F-statistic)	0.000	0.001	0.000	0.000

Panel F – IPO Performance, TMT Ties, and Regulated Industry dummy

	(11f)	(12f)	(13f)	(14f)
Constant	0.513**	-0.263	-0.188	0.660
	0.210	*0.206*	*0.338*	*1.005*
Regulated	-0.105**	0.105*	0.284	0.321
	0.051	*0.055*	*0.200*	*0.401*
Social Ties	0.133***	0.123***	0.173***	0.317***
	0.024	*0.025*	*0.037*	*0.075*
Social Ties x Regulated	0.015	-0.115*	-0.145*	-0.280
	0.066	*0.069*	*0.088*	*0.177*
Family Ties	-0.208**	-0.274***	-0.575***	-0.497***
	0.088	*0.090*	*0.134*	*0.274*
Family Ties x Regulated	0.209	-0.039	-0.324	-0.864
	0.249	*0.252*	*0.367*	*0.739*
Conv. & Soc. Board Independence	0.221***	0.134**	0.106*	0.238*
	0.049	*0.053*	*0.065*	*0.132*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes

Board Characteristics	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.199	0.103	0.135	0.088
F-statistic	3.640	2.000	2.430	2.189
Prob(F-statistic)	0.000	0.000	0.000	0.000

Panel G – IPO Performance, TMT Ties, and Firm Size

	(11g)	(12g)	(13g)	(14g)
Constant	0.410*	-0.035	-0.371	1.045
	0.217	*0.187*	*0.299*	*1.011*
LSize	0.074***	0.018*	0.027*	0.017
	0.014	*0.011*	*0.016*	*0.035*
Social Ties	0.398***	0.251*	0.129***	0.184**
	0.149	*0.138*	*0.043*	*0.086*
Social Ties x LSize	-0.039*	0.016	0.068*	0.218**
	0.020	*0.021*	*0.038*	*0.114*
Family Ties	-0.124*	-0.437*	-0.457***	-0.335*
	0.069	*0.265*	*0.154*	*0.197*
Family Ties x LSize	-0.035	-0.075	-0.406**	-0.655*
	0.057	*0.057*	*0.201*	*0.395*
Conv. & Soc. Board Independence	-0.218***	0.123***	0.105*	0.257*
	0.050	*0.054*	*0.060*	*0.132*
Firm Characteristics	Yes	Yes	Yes	Yes
CEO Characteristics	Yes	Yes	Yes	Yes
Board Characteristics	Yes	Yes	Yes	Yes
Year dummies and Market Return	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.192	0.097	0.137	0.104
F-statistic	2.850	1.690	2.490	2.480
Prob(F-statistic)	0.000	0.002	0.000	0.000

APPENDIX A

MANAGEMENT
EXECUTIVE OFFICERS AND DIRECTORS

The following table sets forth, as of December 31, 1999, certain information concerning our executive officers, directors and other key management personnel:

NAME	AGE	POSITION
Peter J. Goettner	35	President, Chief Executive Officer, Chairman of the Board
Umberto Milletti	34	General Manager of Products
Steven C. Zahm	35	Vice President
Michael W. Pope	33	Vice President, Chief Financial Officer
Todd A. Clyde	35	Vice President, Learning Solutions
Michael W. Lodato	35	Vice President, Marketing and Business Development
J. Adriaan Theron	51	Vice President, Sales
Linda T. Drumright	39	Vice President, Engineering
Lyle E. Nevels	36	Vice President, Operations
Paul J. Pastrone	39	Vice President, Global Business Development
Adam D. Levy	37	General Counsel
Samuel D. Kingsland(1)	30	Director
Steven L. Eskenazi(1)	37	Director
William H. Lane, III(1)(2)	61	Director
E. Follett Carter(1)(2)	57	Director
Jon C. Madonna(2)	56	Director
Roderick C. McGeary	49	Director

(1) Member of the compensation committee.
(2) Member of the audit committee.

Peter J. Goettner has served as our President, Chief Executive Officer and Chairman of our Board of Directors since he co-founded DigitalThink in April 1996. From January 1996 to April 1996, Mr. Goettner was developing the business and financing plan for DigitalThink. From November 1993 to December 1995, Mr. Goettner served as Director of Marketing for ***Knowledge Revolution***, a developer of educational and engineering software. Mr. Goettner holds a B.S. in Electrical Engineering from the University of Michigan and an M.B.A. from the Haas School of Business at the University of California at Berkeley.

Umberto Milletti is one of our co-founders and has served as our General Manager of Products since April 1996. From March 1993 to March 1996, Mr. Milletti was Director of Product Development at ***Knowledge Revolution***. Mr. Milletti holds a B.S. in Electrical Engineering from Tufts University and an M.S. in Electrical Engineering and Computer Science from the University of California at Berkeley.

Steven C. Zahm is one of our co-founders and has served as our Vice President since April 1996. From November 1992 to March 1996, Mr. Zahm was Director of Digital Media/High-Tech Consulting at Prophet Brand Strategy, a strategic management consulting firm. Mr. Zahm holds a B.A. in History and Economics from Stanford University and an M.B.A. from the Haas School of Business at the University of California at Berkeley.

Michael W. Pope has served as our Vice President, Chief Financial Officer since October 1999. From June 1992 to October 1999, Mr. Pope served in various positions at Dionex Corporation, a manufacturer and marketer of chromatography systems and related products for chemical analysis, most recently as Chief Financial Officer from April 1994 to October 1999. Mr. Pope holds a B.A. in Quantitative Economics from Stanford University and an M.B.A. from the Haas School of Business at the University of California at Berkeley.

Todd A. Clyde has served as our Vice President, Learning Solutions since March 1998. From October 1986 to March 1998, Mr. Clyde held several positions with Andersen Consulting, most recently Senior Manager. Mr. Clyde holds a B.A. in Management Science from the University of California at San Diego.

Michael W. Lodato has served as our Vice President, Marketing and Business Development since April 1999. From October 1996 to April 1999, Mr. Lodato held several positions at Siebel Systems, a sales and customer support

software developer, including Senior Director, Strategic Accounts and Senior Director, Product Marketing. From June 1994 to October 1996, Mr. Lodato was a Director, Enterprise Architecture and Strategy at **Sybase**, Inc., a database software provider. Mr. Lodato holds a B.A. in Management Science from the University of California at San Diego.

J. Adriaan Theron has served as our Vice President, Sales since March 1999. From January 1997 to February 1999, Mr. Theron was the Vice President of Sales and Marketing for Plexus Technology, a division of BancTec, Inc., a systems integration and services company. From August 1995 to December 1996, Mr. Theron served as Vice President of Marketing and Regional Sales Manager of SQL Financials International, an e-commerce software company. From January 1993 to July 1995, Mr. Theron was the Corporate Vice President, Sales and Marketing for Learnsoft Corporate Training, Inc., a provider of technical training. Mr. Theron attended Pretoria University in South Africa.

Linda T. Drumright has served as our Vice President, Engineering since October 1999. From August 1998 to October 1999, Ms. Drumright served as Vice President, Budgeting, Planning and Forecasting Application Product Development for Hyperion Solutions Corporation, a developer of enterprise analytic application software. Prior to that, from July 1997 to August 1998, she was the Senior Director of the Tools and Applications Division at Arbor Software Corp., a database software developer, and from June 1990 to July 1997, she held several technical positions, including Senior Manager, at **Sybase**, Inc. Ms. Drumright holds a B.A. in Computer Science from the University of California at Berkeley.

Lyle E. Nevels has served as our Vice President, Operations since June 1999 and our Director of Support Operations from May 1998 to May 1999. From April 1996 to April 1998, Mr. Nevels was Director, Customer Satisfaction Center at AutoDesk, Inc., a developer of design and drafting software and multimedia tools. Prior to that, from November 1983 to March 1996, Mr. Nevels held various senior management positions at Apple Computer for over 13 years, most recently as Senior Manager of Licensing Operations. Mr. Nevels holds a B.S. in Organizational Behavior from the **University of San Francisco**.

Paul J. Pastrone has served as our Vice President, Global Business Development since July 1999. From January 1998 to July 1999, Mr. Pastrone was Vice President and Research Director of Software, Systems and Internet at **Gartner Group**, Inc., a market research organization. From September 1988 to December 1997, Mr. Pastrone was a Senior Vice President at International Data Corporation, a market research organization. Mr. Pastrone received a B.A. from the University of California at Berkeley and an M.A. in International Business Relations from the Fletcher School of Law & Diplomacy.

Adam D. Levy has served as our General Counsel since October 1999. From September 1994 through October 1999, Mr. Levy was an Associate at the law firm of Wilson Sonsini Goodrich and Rosati. Mr. Levy holds a B.A. in Economics from Haverford College and a J.D. from Georgetown University.

Samuel D. Kingsland has been a member of our board of directors since August 1996. Mr. Kingsland is a founding member of H & Q Venture Associates, LLC, a venture capital firm formed in July 1998. From January 1991 to July 1998, Mr. Kingsland held several positions, most recently as Principal, within the venture capital group of Hambrecht & Quist, Inc., an investment banking firm. Mr. Kingsland is a director of several private companies. Mr. Kingsland received a B.A. from Dartmouth College.

Steven L. Eskenazi has been a member of our board of directors since June 1997. Since March 1997, Mr. Eskenazi has been a General Partner of the Walden Group, a venture capital firm. From February 1990 to March 1997, Mr. Eskenazi was Managing Director in charge of New Media Research for Deutsche Banc Alex. Brown, an investment banking company. Mr. Eskenazi also serves on the board of several private companies. Mr. Eskenazi holds a B.S. in Applied Mathematics from Union College and an M.B.A. from the Amos Tuck School of Management Dartmouth College.

William H. Lane, III has been a member of our board of directors since February 1999. Since 1996, Mr. Lane has been the President of Canyon Vista, Inc., a management consulting company. Mr. Lane retired from Intuit Inc., a financial software company, in July 1996, having served as its Vice President, Chief Financial Officer, Secretary and Treasurer from January 1994 to April 1996. Mr. Lane served in a similar capacity at ChipSoft, Inc., a tax preparation software company, from July 1991 until its acquisition by Intuit in December 1993. Mr. Lane is also a director of public companies Cyberian Outpost, Inc., MetaCreations Corp. and International Microcomputer Software, Inc. and several private companies. Mr. Lane holds an A.B. from **Columbia University**.

E. Follett Carter has been a member of our board of directors since June 1999. From October 1996 to his retirement in October 1999, Mr. Carter was the President of **Gartner Group** Distribution, a subsidiary of the Gartner Group, Inc., and Gartner Group's Chief Marketing Officer. From October 1993 to September 1996, Mr.

Carter was the Executive Vice President, Sales and Marketing for the Gartner Group, Inc. Mr. Carter is also a director of several private companies. Mr. Carter holds a B.A. from Case Western Reserve University and an M.B.A. from **Columbia University**.

Jon C. Madonna has been a member of our board of directors since January 2000. Since December 1998, Mr. Madonna has been the President and Chief Executive Officer of Carlson Wagonlit Travel, a leading business travel and expense management company. From January 1997 to October 1998, Mr. Madonna was Vice Chairman of The Travelers Group, a financial services and insurance company, and Vice Chairman of Travelers Property and Casualty and Chief Executive Officer of the Personal Lines business. Previously, Mr. Madonna was with KPMG Peat Marwick for 28 years, where he held numerous senior leadership positions including Chairman, KPMG International from July 1995 to January 1998 and Chairman and Chief Executive Officer, **KPMG** Peat Marwick, USA from 1990 to October 1996. Mr. Madonna is also a director of Neuberger Berman, Inc., an independent investment advisor and Tidewater, Inc., a provider of services and equipment to the offshore energy industry. Mr. Madonna holds a B.S. from the **University of San Francisco**.

Roderick C. McGeary has been a member of our board of directors since January 2000. Mr. McGeary is a national managing partner of **KPMG** Consulting, an international consulting organization, a part of KPMG Peat Marwick LLP, and a member of KPMG Consulting's management committee. Mr. McGeary joined KPMG in 1972 as an audit professional and was elected partner in 1981. In January 1994, Mr. McGeary was named partner-in-charge of KPMG's West Coast Systems practice and in 1997, he was named a member of a two-person executive team that directs all KPMG Consulting services. Mr. McGeary received his B.S. from Lehigh University.

Notes: Ties that are shared by the members of the top management team (TMT) are highlighted. For each tie the same color and type of font (bold versus regular) is used throughout.

Source: IPO prospectus of digitalthink.com

APPENDIX B

Table B.1 – Matrix M of a two-mode network

	Tie 1	Tie 2	Tie 3	Tie 4	Tie 5	Tie 6	Tie 7	Tie 8	Tie 9	Tie 10	Tie 11	Tie 12
Mr G	1	0	0	0	0	0	0	0	0	0	0	0
Mr H	1	1	0	0	0	0	0	0	0	0	0	0
Mrs R	0	0	0	0	0	0	0	0	1	0	0	0
Mr S	0	0	0	0	0	0	0	0	1	0	0	0
Mrs K	0	0	1	0	0	0	0	0	0	0	0	0
Mr L	0	0	0	1	0	0	0	0	0	0	0	0
Ms J	0	1	1	1	1	0	0	0	0	0	0	0
Ms M	0	0	0	0	1	0	0	0	0	0	0	0
Mr N	0	0	0	0	1	1	1	0	0	0	0	0
Ms O	0	0	0	0	0	1	0	0	0	0	0	0
Mr P	0	0	0	0	0	0	1	1	0	0	0	0
Dr T	0	0	0	0	0	0	0	1	0	1	1	0
Mr U	0	0	0	0	0	0	0	0	0	1	0	0
Mr W	0	0	0	0	0	0	0	0	0	1	1	1
Mrs V	0	0	0	0	0	0	0	0	0	0	1	0
Prof. X	0	0	0	0	0	0	0	0	0	0	0	1

Table B.2 – M×M' – Ω

The minus sign represents a dimension of -1, i.e. the two individuals in question do not share a face.

	Mr G	Mr H	Mrs R	Mr S	Mrs K	Mr L	Ms J	Ms M	Mr N	Ms O	Mr P	Dr T	Mr U	Mr W	Mrs V	Prof. X
Mr G	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mr H	0	1	-	-	-	-	0	-	-	-	-	-	-	-	-	-
Mrs R	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Mr S	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Mrs K	-	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
Mr L	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-
Ms J	-	0	-	-	0	0	3	0	0	-	-	-	-	-	-	-
Ms M	-	-	-	-	-	-	0	0	0	-	-	-	-	-	-	-
Mr N	-	-	-	-	-	-	0	0	2	0	0	-	-	-	-	-
Ms O	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-
Mr P	-	-	-	-	-	-	-	-	0	-	1	0	-	-	-	-
Dr T	-	-	-	-	-	-	-	-	-	-	0	2	0	1	0	-
Mr U	-	-	-	-	-	-	-	-	-	-	-	0	0	0	-	-
Mr W	-	-	-	-	-	-	-	-	-	-	-	1	0	2	0	0
Mrs V	-	-	-	-	-	-	-	-	-	-	-	0	-	0	0	-
Prof. X	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0

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The European Corporate Governance Institute has been established to improve *corporate governance through fostering independent scientific research and related activities.*

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The views expressed in this working paper are those of the authors, not those of the ECGI or its members.

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