Social Networks and Job Referrals in Recruitment

Marie Lalanne[*]

November 2018

Abstract

This paper investigates whether using recommendations for recruitment can help reduce information asymmetries in the labor market. I use data on all the board directors of large listed US companies between 2004 and 2008. This is linked with extensive information on their social networks and detailed information on the referrals underpinning new independent board appointments. First, I provide some new empirical facts from this novel data combination. Compared to non-referred new directors, referred directors are 10.5 percentage points more likely to share a professional tie with a current board member. However, they are equally likely to be connected through university, army, or leisure activities. Secondly, I use the predictions of a theoretical model to discriminate between information provision and bias in the use of referrals for recruitment. Referrals help select directors with higher ability, in particular the type of ability that is partially observed at the time of hiring. In addition, homophily in networks does not seem to be driving the fact that high ability incumbents recommend high ability entrants.

JEL codes: M5, M12, J21, G34
Keywords: social networks, job referrals, labor market, corporate governance

1 Introduction

Around half of jobs are typically found informally rather than through more formal methods (Topa (2011)). Therefore, both researchers and policy makers have been interested in understanding the consequences on labor markets of such a widespread phenomenon. One specific question of interest has been to understand whether job referrals, or recommendations, help mitigate frictions in matching workers to firms. In fact, referrals can help screen candidates and reduce firms' search costs. When they know candidates, employees can provide firms with valuable and otherwise unobservable information in terms of candidates' productivity or match quality with the firm (Simon and Warner (1992); Galenianos (2013); Dustmann et al. (2015); Pallais and Sands (2016))[1]. However, because referrals rest on individuals' motivations, they might also allow favoritism to take place. The interests of employees do not necessarily align with those of firms. Their incentives to refer a particular candidate might not be related to the candidate's value for the firm but rather to personal and non-job related aspects (Bandiera et al. (2009); Beaman and Magruder (2012)). Understanding which of the two mechanisms prevails is important as they have opposite welfare implications.

Suitable data to investigate this trade-off has proven difficult to obtain for at least two main reasons[2]. One difficulty has been to obtain appropriate data on job referrals. One strand of the literature uses direct data on referrals but at the detriment of focusing on one single firm and therefore casts doubts on the external validity of results[3]. The other strand of the literature uses social networks as proxies for referrals and show that specific social ties cause or are correlated with several common employment patterns[4]. Some of this literature presupposes that the mere existence of these

---

[1]Referrals can also mitigate moral hazard problems if working with the referrer creates peer pressure or emulation to work efficiently, or if the referrer's reputation is at stake (Kugler (2003); Bandiera et al. (2010); Heath (2018)).

[2]Besides data concerns, causality issues are also present as individuals select themselves into social networks and choose whom to refer.

[3]See Beaman and Magruder (2012), Pallais and Sands (2016) for experiments and Brown et al. (2016), Burks et al. (2015), Heath (2018) for firm-level data. Burks et al. (2015) use data on nine firms but information availability and measures obviously vary between firms.

[4]Social ties under investigation are of various types. See Bayer et al. (2008), Hellerstein

social ties triggers actual referrals and the exact mechanism (job information transmission or recommendation) cannot be uncovered. The second difficulty has been to obtain an informative and comparable outcome allowing to discriminate between the opposite welfare consequences of using referrals for recruitment. Most empirical papers from the labor economics literature have relied on measures of workers' "quality"[5] which aren't exempt from limitations (Bramoullé and Huremović (2018)). One important challenge is to obtain a worker's quality measure which is meaningful for the firm - in that respect, wages cannot precisely measure a worker's productivity nor significantly determine a firm's outcomes. A second challenge is the possibility to evaluate this worker's quality measure across various employers - workers' specific productivity measured from tasks they perform on their job cannot be compared across different firms.

This paper provides the first large-scale empirical analysis of the use of social networks *and* job referrals in hiring for high-skilled and high-powered positions across the whole US economy. The data I assembled from several independent sources contain information on all board directors of large publicly listed companies in the US between 2004 and 2008. The database further contains unique, extensive information on the social networks of these directors and detailed information of the referrals underpinning new independent board appointments. This novel data combination of both social networks and job referrals allows me to first investigate a new empirical question: how are connected the new directors that are referred? Secondly, I empirically assess the value of using recommendations for recruitment with the guidance of a theoretical model.

The database I originally built combines job referrals and social networks of new independent directors of US publicly listed firms between 2004 and 2008. Following the Sarbanes-Oxley Act in 2003, the US Securities and Exchange Commission (SEC) made it mandatory for publicly listed firms to disclose detailed data on the board appointment process, including the nom-

---

et al. (2011) and Schmutte (2014) for neighbors; Kramarz and Skans (2014) for family members; Oyer and Schaefer (2016) and Zimmerman (ming) for school mates; Åslund et al. (2014) and Dustmann et al. (2015) for ethnic group members; Munshi (2003), Edin et al. (2003) and Beaman (2011) for fellow countrymen; Hensvik and Skans (2016), Cingano and Rosolia (2012) and Glitz (2017) for previous coworkers and Laschever (2013) for veterans.

[5]Beaman and Magruder (2012) and Pallais and Sands (2016) measure workers' performance on an experimental task; Burks et al. (2015) use various workers' productivity measures, each of which depends on the industry in which workers are employed; Zinovyeva and Bagues (2015) use academic researchers' publications; and Brown et al. (2016), Dustmann et al. (2015), Hensvik and Skans (2016) and Heath (2018) rely on wages.

ination entity of new directors (for instance, when the CEO recommends the new director). I use this information to uncover whether a job referral was made (i.e. if someone on the board nominated the new director) or not. I then link CVs of individuals who have worked in the top hierarchy of US publicly listed firms[6]. I reconstruct directors' social networks over their lifetime along several dimensions (professional networks from listed and private firms and non-professional networks from university, army, sport clubs, charities and other leisure activities). I therefore obtain social networks for both new directors and existing board members.

I first estimate the effect of being socially connected with a board member on the probability to be appointed to her board. I find a positive effect as in the existing literature. Among a group of ten qualified individuals, a candidate who is connected to an existing board member has around a 28 percentage point increase in the probability of obtaining a board seat. I then show some evidence of one mechanism assumed by papers relying on social network data: social ties provide job referrals. Compared to non-referred new directors, referred directors are 10.5 percentage points more likely to be connected to someone on the board through professional networks. Because firms employ several directors and directors usually sit on several boards, I can use both director and firm fixed effects to mitigate endogeneity issues.

Secondly, I use the model of Zinovyeva and Bagues (2015) to assess the value of using referrals for recruitment. In particular, the model predicts that the partially observable type of ability of referred directors should increase with information and decrease with bias. In my setting, this partially observable ability could be seen as directors' soft skills or managerial philosophy. It affects directors' productivity, but it cannot be easily read from her CV. While unobserved by the firm at the time of hiring, it is very likely to be (partially) known by the firm's employees who know candidates from their past. As a result, it is very likely the sort of information employees' referrals bring to the firm. I follow an earlier insight by Bertrand and Schoar (2003) on CEOs and more recently by Cavaco et al. (2017) on directors and estimate firm performance equations. I exploit the fact that directors change firms over time and usually sit on several boards in any particular time period to estimate director fixed effects. I use them as a measure of the partially

---

[6]BoardEx provided me with CVs of top executives and board members working for US publicly listed companies between 1999 and 2014. The larger time span of the CV data allows me to obtain a quite good coverage of social networks during the smaller analysis time span - from 2004 to 2008. More information on these data is available in the data description section.

observable type of directors' ability. Referred directors display a larger such ability compared to non-referred directors, suggesting that the information effect dominates the bias effect. I furthermore provide some evidence on why high ability employees are referring high ability workers - a fact already observed in the literature (Beaman and Magruder (2012); Hensvik and Skans (2016)). My results suggest that homophily in networks is not the main driver of this phenomenon. This last evidence suggests that the presence and use of social networks for recruitment might not necessarily increase inequality between workers belonging to different social circles.

This paper contributes to the empirical literature on job-search networks (Bayer et al. (2008); Hensvik and Skans (2016); Kramarz and Skans (2014)) and referral-based hiring (Beaman and Magruder (2012); Brown et al. (2016); Burks et al. (2015); Pallais and Sands (2016); Heath (2018)) by combining, for the first time to my knowledge, social networks and job referral information. As others have shown at the single-firm level (Beaman and Magruder (2012); Brown et al. (2016); Burks et al. (2015); Pallais and Sands (2016); Heath (2018)), my work also provides evidence that referrals help reduce information asymmetries, but this time for a large set of firms. The director's ability measure I use is both meaningful for firms, as it is "extracted" from their performance, and comparable across different employers which allows me to contribute to the "information-bias" literature (Zinovyeva and Bagues (2015),Li (2017),Bramoullé and Huremović (2018)). Moreover, the directorship position, is, contrary to the existing literature, a highly skilled and highly powered profession, therefore confirming the existence of informal job search methods not only for low-hierarchical or low-skilled jobs nor restricted to economies lacking formal labor market institutions. This paper is also related to a growing empirical literature in finance which investigates whether connections between independent board members and executives affect firm performance and corporate governance outcomes. The earlier part of this literature shows that independent directors' ties to the CEO are associated with worse firm performance and corporate governance measures (Hwang and Kim (2009); Nguyen (2012); Fracassi and Tate (2012); Kramarz and Thesmar (2013); Coles et al. (2014)). However, the more recent studies show that this relation is mitigated when firms' advice needs are taken into account - such as firms operating in innovative industries or firms going through mergers and acquisitions (Schmidt (2015); Kang et al. (2018)). To my knowledge, only one paper directly investigates the relationship between social ties and board appointments per se (Cai et al. (2017)). Their results are consistent with mine: firms with greater advice needs are more likely to hire connected directors, and shareholders positively react to the appoint-

ment of such directors.

The rest of the paper is organized as follows. Section 2 describes the US directors labor market and Section 3 presents the data and some preliminary statistics. Section 4 shows that social ties increase the chances of being hired, as in the literature. Section 5 relates social ties to job referrals and finds evidence that the only ties that matter are the professional ones. Section 6 details how I asses the value of recommendations for recruitment and offers results in favor of information provision. Finally, Section 7 concludes.

2   The Labor Market for US Directors

Publicly listed companies are very large firms whose governance is characterized by a separation of ownership (shareholders own firms) and control (managers run firms) (Jensen and Meckling (1976); Fama and Jensen (1983)). Because of a misalignment of interests between shareholders and managers (Berle and Means (1932)), every publicly listed firm has a corporate board. It is composed of shareholders' representatives whose role is to advise and monitor managers on behalf of shareholders. The corporate board is where the firm's corporate policies are discussed. Managers attend board meetings to give information on the firm's planned strategies. As a result, the board is composed of inside directors (or managers) and of outside directors (shareholders' representatives - also called independent directors - and grey directors[7]). Because appointments of inside and grey directors on the board follow peculiar processes[8], I focus only on appointments of independent directors. Therefore, I investigate the role of job referrals and social networks in hiring an expert who will provide advice on a firm's policies and monitor its executives.

The role of social networks and recommendations is likely to be very important for this type of position for at least two reasons. On the one hand, a director's experience matters more than her diplomas as her function is to evaluate corporate strategies designed by the executive team. In fact, the average age of independent directors is higher than the average age of ex-

---

[7]Grey directors are not current employees but have particular interests with the firm so that they cannot be considered as independent. A grey director is, for example, a provider or a bank representative.

[8]Managers who sit on boards are the firm's top executives and are selected through specific promotion or hiring rules. Some grey directors are on the board because of legal requirements, for instance employees' representatives.

ecutives (61 versus 56 years old). Moreover, the board member position - as an independent - is often used as a pre-retirement period by executives. It allows them to make use of their accumulated knowledge and experience with a lighter workload. Therefore, information on the director's experience is likely to be crucial for the board member position and not as straightforward to obtain as information on diplomas from the CV. On the other hand, because the work of the board is collegial by nature, any information on the director's voting behavior/style or on her managerial philosophy more generally allows a better estimation of her fit with the rest of the board. This type of information is again likely to be absent on her CV. As a result, my data seems particularly well suited to study the role of social networks and job referrals on recruitment as it is based on a specific position in which word-of-mouth recommendations appear extremely important in uncovering a director's unobserved characteristics.

How does board level recruitment occur? Independent directors are usually nominated by the board and are elected by shareholders at annual meetings. Existing studies show that in practice the board largely controls the entire process. The representative candidate runs unopposed and receives 94% of support from shareholders (Cai et al. (2010)). Shareholders rarely exercise their proxy votes - allowing them to propose candidates (Hillman et al. (2011)). And despite three major new reforms in the aftermath of the 2008 financial crisis (majority voting rule, eProxy and elimination of broker voting of uninstructed shares[9]), shareholders still have a limited influence on new director appointments (Cai et al. (2010); Becker and Subramanian (2013)). As the former SEC chairman Arthur Levitt, Jr. said, "a director has a better chance of being struck by lightning than losing an election". Therefore, understanding how the nomination process occurs reveals how the new independent directors are chosen. New independent directors can be nominated by four different entities: shareholders, an executive search firm (if the board outsources the search for candidates), the nomination committee (composed of independent directors), or one of the other current board members (whether executives or other independent directors). Since August 23, 2004 this information must be reported in firms' proxy statements. It is therefore possible to know for each independent board appointment after

---

[9]Majority voting imposes that a director receives a majority of votes to be elected. Previously, for a director to be elected, it sufficed that one shareholder voted for him if the rest abstained. eProxy makes it mandatory for firms to disclose the proxy material online. Elimination of broker voting of uninstructed shares forbids voting by brokers, who were previously allowed to vote in lieu of shareholders who did not vote on time, rendering their shares "uninstructed".

this date whether the new director was referred by a current employee (one director in particular or those belonging to the nomination committee) or not (selected by shareholders or executive search firms).

3   Data and Descriptive Statistics

The dataset is composed of 4 374 independent board appointments occurring between 2004 and 2008 in US publicly listed firms. These appointments are made by 1 359 firms belonging to the S&P 1500 index and represent a total number of 3 820 directors. The distribution of appointments displayed in Table 1 shows that, in each year, some firms appoint several new directors and some directors are appointed to several firms. I exploit this fact to use both director and firm fixed effects in the analysis.

Table 1: Number of Independent Board Appointments by Year

Year	Appointments	Directors	Firms
2004	1 002	976	701
2005	864	837	620
2006	892	861	636
2007	797	770	573
2008	819	792	549
Total	4 374	3 820	1 359

Tables 2 and 3 provide descriptive statistics on appointed directors and on appointing firms. On average, new directors are 56 years old, have been an executive for 11 years and have spent around 7 years on listed boards. This is consistent with what is expected from an expert and experienced worker. Around 30% of them hold an MBA degree, roughly 40% are expert in the industry hiring them and more than 30% of them sit on at least two other boards. 17% of them are women.

Appointing firms have on average 11 board members, of which 80% of them are independent - in line with the mandatory requirement following the Sarbanes-Oxley law of 2003 to have at least 50% of independent directors on board. In the vast majority of cases (76%), the Chairman of the board is an executive. The average firm size has roughly a 12 000 million USD market value of equity, meaning that it belongs to the 1 000 largest listed firms in

Table 2: Summary statistics on appointed directors

	Mean	Std.Dev.	N
Age	56.126	7.313	4 374
Women (prop.)	0.173	-	4 374
MBA degree (prop.)	0.340	-	4 374
IVY League university (prop.)	0.093	-	4 374
Years as an executive	11.376	11.285	4 374
Nb of listed boards	2.993	2.389	4 374
Nb of current listed boards	2.179	1.487	4 374
Busy director (prop.)	0.320	-	4 374
Years on listed boards	6.550	5.993	4 374
Financial expert (prop.)	0.215	-	4 374
Industry expert (prop.)	0.394	-	4 374

A busy director seats on more than two listed boards. An industry expert is a director who has an expertise in the same industry as the appointing firm. A financial expert is a director who has an expertise in the finance sector and/or with a finance degree. Definitions of all variables are provided in Table 10.

the US[10]. Almost half of them (43%) belong to the manufacturing sector (followed by the financial sector (15%) and the service sector (14%)).

3.1 Social networks

Social network information is recovered from individuals' CVs, provided by BoardEx, a UK supplier of data to headhunting companies. BoardEx gathers data on publicly listed companies who reach a market capitalization above 1 million USD (a threshold that is well below the rough average of 12 000 million USD market capitalization among the firms in my sample) and collects CV of individuals who have been board members of these companies. By linking this CV information, I am able to observe the opportunities to network and form social ties all these directors have had among themselves since the beginning of their careers (and even before with respect to their education or military service). I reconstruct individuals' social networks from different environments: *professional networks* include the set of all other individuals who have worked at the same time in the same public or private companies; *education networks* include the set of all other individuals who

---

[10]The average firm size over the same 2004-2008 period for the S&P 500 is 23 275 million USD and the equivalent figure for the S&P 1500 is 8 860 million USD.

Table 3: Summary statistics on appointing companies

	Mean	Std.Dev.	N
Board size	11.241	2.665	4 374
Executives on board (prop.)	0.143	-	4 374
Independent Dir. on board (prop.)	0.796	-	4 374
Women on board (prop.)	0.122	-	4 374
Busy Dir. on board (prop.)	0.349	-	4 374
Executive Chairman on board (prop.)	0.761	-	4 374
Avg board tenure	13.135	3.702	4 374
Nomiation Committee size	4.690	2.710	4 374
Audit Committee size	5.512	1.722	4 374
Compensation Committee size	5.393	1.950	4 374
Firm size	11 630.217	31 261.435	4 374
Firm risk	0.003	0.019	4 374
Firm performance	0.089	0.078	4 374
Firm leverage	0.226	0.178	4 374
Firm growth opportunities	1.229	1.103	4 374
Sector: Manufacturing (prop.)	0.431	-	4 374
Sector: Transportation (prop.)	0.112	-	4 374
Sector: Retail Trade (prop.)	0.092	-	4 374
Sector: Finance (prop.)	0.147	-	4 374
Sector: Services (prop.)	0.144	-	4 374

Board size is the number of directors on board. Busy directors seat on more than two listed boards. Firm size is market value of equity (in millions USD). Firm performance is the return on assets, trimmed at the 1% level. Firm risk is the variance of return on assets over the last five years. Firm leverage is the total debt over total equity. Definitions of all variables are provided in Table 10.

have been studying in the same university or institution at the same time; *IVY League networks* include the set of all other individuals who graduated from the same IVY League university; *alumni networks* include the set of all other individuals who graduated from the same university but not necessarily in the same year; *leisure networks* include the set of all other individuals who were members of the same non for profit organization at the same time such as a charity or a sports club; and *army networks* include the set of all other individuals who were at the same time in the army. While non-professional networks might represent only loose social ties, especially if the university cohort, the sports club or the military unit were large, professional networks are likely to convey more precise information on actual social ties. Because these directors have had a large part of their career on corporate boards or in top management teams (the average number of board members for firms in my sample is 11, as an indication of how large these groups are), if they worked at the same time in a company, they are therefore very likely to actually know each other[11]. Based on this reconstructed social network information, I am able to observe for each newly appointed director in my sample whether she shares a (past or present) social tie with board members, or not in a very detailed way (did the new director and the CEO graduate together from the same university? Was the new director previously working in the same company as another independent director on the board? Is the new director currently sitting in another board with an executive director? And so on.).

3.2   Job referrals

Following the Sarbanes-Oxley Act in 2003, the SEC made it mandatory for publicly listed firms to disclose detailed data on the board appointment process. Among the new disclosure rules that became effective on August 23, 2004, publicly listed firms were asked to report in their proxy statements the source of each new director nomination. I use hand-collected data kindly made available to me by Akyol and Cohen (2013). They selected the S&P 1500 firms in 2006 and tracked every new independent board appointment occurring in these firms between 2004 and 2008. From the proxy statements

---

[11]As I exploit the whole CV of individuals to reconstruct these professional networks, current directors are likely to have started lower down the corporate hierarchy and therefore less likely to really know the higher ranked individuals at that time. Still, given that these individuals became directors later on, it seems likely they were more visible than other juniors because of their particular talent or motivation which make them part of the corporate elite later on.

of these firms, they identified the source of each new director nomination[12]. For my analysis, I consider that for each appointment there is a job referral if the nomination source is the nomination committee or another board member, and that there is no job referral if the nomination source is a shareholder or an executive search firm.

3.3   First evidence on the use of social networks and job referrals

Out of the 4 374 new directorships, around 25% of them concern a director recommended by an executive search firm, 4% by a shareholder and the large remaining share by (at least) one current board member (see Table 4). Job referrals by the board itself are therefore widely used to fill directorship positions. This is in line with the fact that job referrals, by providing information on tacit knowledge and aptitudes, are highly valuable for high-skilled positions and for positions where experience substantially affects productivity, as in the case of board members. Moreover, because the work of the corporate board is collegial by nature, job referrals might also convey valuable information on match quality and productive complementarities. Among the sources of recommendations, the largest share of them come from the nominating committee (45% of cases), as expected from its role. The CEO refers slightly less than other independent directors on the board (10% versus 17% of cases), contrary to theories of excessive CEO power on board appointments.

Table 4 also provides statistics on new directors' social ties to the board. Around 33% of new appointments display some direct connection between entrant and incumbent directors and this percentage goes up to 94% if we consider the indirect connections as well (i.e. the connections of connections). This is not surprising given the relatively small population size of US directors[13]. The social ties overwhelmingly shared with the board are the professional and particularly from listed companies (22% of cases). Corresponding percentages regarding private, education, alumni, IVY league, army and leisure activities connections are 8.9%, 2.6%, 14.2%, 2.6%, 1% and 0.8%. New directors share a social tie with the CEO in around 10% of cases and in twice as many more cases (28.3% versus 11.5%) with non-executives rather

---

[12]For further details on the identification and categorization of director nomination sources from proxy statements of firms, see Akyol and Cohen (2013).

[13]Statistics on S&P 1500 firms between 2007 and 2016 gives 21 396 directors for 139 073 director seats.

than with executives[14]. We also observe a very small occurrence of interlocks - whereby the new independent director is herself executive in another board where there is an independent director as an executive of the appointing company. This first evidence on social connections seems also contrary to an agency view, according to which executives - and in particular the CEO - aim to reduce the monitoring intensity of independent directors by adding to the board their own contacts.

---

[14]Table 11 in the Appendix provides all detailed statistics on social ties, broken-down by type.

Table 4: First evidence on social ties and job referrals

	Mean	Std.Dev.	Min	Max
Job referrals				
Prop. referred by an Exec. Search Firm	0.256	0.437	0	1
Prop. referred by a Shareholder	0.044	0.205	0	1
Prop. referred by the Nomin. Comm.	0.452	0.498	0	1
Prop. referred by the CEO	0.101	0.301	0	1
Prop. referred by another Exec.	0.044	0.205	0	1
Prop. referred by another Indep.	0.171	0.377	0	1
Social ties				
Prop. with a direct tie to the Board	0.326	0.469	0	1
Prop. with an indirect tie to the Board	0.939	0.239	0	1
Nb of board members connected to	2.267	2.549	1	17
Nb of board members	11.241	2.665	4	24
Prop. with a tie to an Exec. Dir.	0.115	0.319	0	1
Prop. with a tie to a Non Exec. Dir.	0.283	0.450	0	1
Prop. with a tie to the CEO	0.097	0.297	0	1
Prop. with a tie to the Nomin. Comm.	0.153	0.360	0	1
Prop. with a tie to another Exec.	0.033	0.178	0	1
Prop. with a tie to another Indep.	0.165	0.371	0	1
Interlock	0.002	0.043	0	1
Interlock being CEO elsewhere	0.001	0.030	0	1
Interlock with the CEO	0.001	0.034	0	1
Interlock CEO to CEO	0.001	0.030	0	1
Prop. with a Listed tie to the Board	0.219	0.414	0	1
Prop. with a Private tie to the Board	0.089	0.285	0	1
Prop. with an Educ. tie to the Board	0.026	0.158	0	1
Prop. with an Alumni tie to the Board	0.142	0.349	0	1
Prop. with an IVY League tie to the Board	0.026	0.160	0	1
Prop. with an Army tie to the Board	0.010	0.101	0	1
Prop. with a Leisure Act. tie to the Board	0.008	0.089	0	1
Observations	4 374			

4   Social ties help being hired

In this section, I detail how I measure the impact of social ties on the probability to be hired and provide a magnitude of this effect.

The empirical model I use to estimate this effect is the following:

$$Y_{ikt} = \alpha + \beta SocialTie_{ikt} + X_{it}\gamma_1 + Z_{kt}\gamma_2 + X_{it}\Gamma Z_{kt} + \delta_i + \eta_k + \theta_t + \epsilon_{ikt} \quad (1)$$

where the outcome variable Y_{ikt} is 1 if director i was appointed to the board of firm k in year t and 0 otherwise, variables X_{it} and Z_{kt} control for individual and firm characteristics[15], δ_i, η_k and θ_t are individual, firm and time fixed effects. The dependent variable $SocialTie_{ikt}$ is 1 if director i shares at least one social tie with at least one director of firm k from before year t and 0 otherwise and I use different definitions of this variable to investigate the impact of more precisely defined social ties in terms of type (professional, education, leisure activities or army) and in terms of reach (CEO, other executive, nomination committee, other independent director). I compute robust standard errors, clustered at the firm level, given that for firms hiring several directors during the sample period, there are multiple firm observations in the estimation.

There are two main interpretation and estimation issues with equation (1). First, social ties are likely to be endogenous to the probability of being appointed. For example, talented candidates will be more likely to be hired. Moreover, talented individuals are also more likely to have been appointed to several boards in the past and therefore to have a large network of professional ties - which increases the probability of sharing a professional tie with a current director of the hiring firm. Similarly, firms with particular corporate cultures, for example firms who choose to tackle economic crisis through massive lay-offs, will look for directors experienced with such policies. A candidate with such experience will therefore be more likely to be hired and to have worked in the past with a current director in another "massive lay-offs" style firm. Therefore, I include both individual and firm fixed effects

---

[15]Time-varying director characteristics include age and age squared, number of years as an executive, average number of years on listed boards, total number of listed boards, total number of current listed boards, busy director, sector, industry and finance expertise dummies. Time-varying board characteristics include board size, average tenure on board, nomination committee size, proportions of executives, independent, busy directors and women on board and an executive chairman dummy. Time-varying firm characteristics include size, leverage, risk, performance and growth opportunities. All their interactions are also included as controls. See Table 10 for more precise definitions of these variables.

as controls for these unobserved characteristics in individuals and firms to limit the endogeneity problem. As firms have several board members and because directors can hold several board positions at the same time, I observe multiple appointments for some directors and some firms over the sample period, allowing me to include both individual and firm fixed effects in the estimations[16].

Secondly, a specificity of the board appointment process is the fact that the list of candidates for a board position is not publicly available and only the nominated and appointed director is disclosed[17]. To select a nominee, the board usually establishes a list of criteria that the new board member must satisfy to fulfil the firm's advice needs. For example, the firm might need an expert in finance as it has to make complex financial investments decisions or a director with previous work experience in China as it aims to export its products to China. The search for suitable candidates is then performed by either an executive search firm, the nomination committee or the board as a whole. Finally, the board interviews the suitable short-listed candidates to select one to be put forward to shareholders for election at the annual general meeting. I first assume that the appointed director has the specific characteristics the board was looking for. Based on this assumption, I mimic the screening job done by executive search firms, nomination committees or boards and reconstruct the set of short-listed candidates for each board position[18]. I perform several robustness checks by varying the number of short-listed candidates[19] and the list of criteria considered. In practice, I use a nearest neighbor matching algorithm that selects the other individuals in the database with the closest characteristics to those of the appointed director[20].

---

[16]24% of directors are appointed more than once during the sample period and 94% of firms are appointing more than one director during the sample period.

[17]Following the discussion in section 2, I indistinguishably call new directors nominated or appointed directors given that directors subject to shareholders' vote usually never fail to be elected.

[18]The data used in this paper is provided by a company whose main business is to sell data to head hunters, such as executive search firms or board members looking for a new director. It is therefore very likely that the entity responsible for the short-listing of candidates (the executive search firm, the nomination committee or the board) uses data similar to the one I use here.

[19]Tables 13 and 14 in the Appendix provide estimation results with pools of 5 and 7 short-listed candidates, respectively.

[20]Results presented in the main text are based on a short-list of 10 candidates selected on: the number of years working as an executive, the average number of years on listed boards, the number of listed boards and the sector speciality, being defined as the sector in which the individual has worked for the longest period.

Social ties might affect the board recruitment process at two different - but not exclusive - levels. On the one hand, on condition of having the characteristics the board is looking for, social ties might help candidates to be selected from the short-list. On the other hand, social ties might help candidates to be included in the short-list, irrespective of other individual characteristics. The global effect is likely to be a combination of both phenomena. Because I do not observe the short-list of candidates, I cannot decompose precisely this effect, but I can obtain likely estimates of the two effects. By selecting a short-list of candidates based on the aforementioned assumption (i.e. similar characteristics as the appointed director's characteristics), I obtain one estimate of the effect of social ties on recruitment through selection from the short-list. If social ties play a role only from the short-list to the board seat, then the new director necessarily has the characteristics the board was looking for. But, social ties might also help selection into the short-list of candidates in the first place and therefore, the new director might not even have the characteristics the board was particularly looking for. By using a pool of random candidates, I can therefore obtain the other estimate of the effect of social ties on recruitment. The "real" estimate is likely to be a combination of the two phenomena previously described.

Table 5: Do social ties affect board appointments?

| | Dependent variable: Appointed by the Board | |
	Selected Candidates	Random Candidates
Tie to the Board	0.286*** (0.0133)	0.283*** (0.0379)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes
Observations	43 740	43 740
R-squared	0.582	0.904
Adjusted R-squared	0.139	0.293

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size and executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Results in Table 5 reveal that, out of a pool of 10 candidates, an individual sharing a social tie with at least one member of the board increases the probability of obtaining a board seat between 28.3 and 28.6 percentage points. In comparison, Burks et al. (2015) find that referred candidates are 6 percentage points more likely to be hired in call centers, 10 percentage points more likely to be hired in the trucking industry and 0.27 percentage points more likely to be hired in the high-tech sector. Brown et al. (2016) show that, on condition of being interviewed, referred candidates are 13.9 percentage points more likely to receive an offer in a mid-sized US firm operating in the financial services industry. Again, the types of jobs investigated in these papers largely differ from the type of job under investigation here. Papers focusing on directorship positions have also found a considerable prevalence of past social ties among board members (Hwang and Kim (2009); Nguyen (2012); Fracassi and Tate (2012); Kramarz and Thesmar (2013); Cai et al. (2017)).

Tables 15, 16 and 17 in the Appendix investigate this effect by type of

social tie (professional, educational or from other activities) and with whom the social tie is shared (the CEO, another executive, nomination committee members or another independent director). It appears that professional ties are the most important. Social ties to the CEO in particular, and to independent directors in general - including those on the nomination committee - are the most helpful. Table 18 investigates the magnitudes of the extensive and intensive margins. While being connected to someone on the board increases the probability of being appointed by about 20 percentage points, each extra connection to the board gives an additional 5 percentage points increase. Finally, in Table 19 I look for evidence of job information transmission by examining the effect of indirect professional ties from listed companies. In line with what intuition would suggest, indirect ties affect the probability to be hired by a smaller magnitude compared to direct ties and, the more distant to the board the director is, the lower her chances of being appointed.

Through which mechanism do social ties help someone to be hired? In the next section I show evidence of one process assumed in the empirical literature but never demonstrated because of data shortcomings: social ties bring job referrals.

5 Professional ties are those leading to job referrals

I investigate in this section whether previous meeting opportunities (i.e. social ties) lead to job referrals, and in particular which social ties are the most useful for referral to a board position. Table 6 first presents evidence on the relationship between social ties and job referrals using t-tests. The distribution of social ties is not unrelated to job referrals: a referred new director has on average more social ties to the board than a non-referred new director (36% chances of having a social tie versus 24%). In particular, referred directors are more likely to share a professional or an educational tie with someone on the board compared to non-referred directors (24% chances versus 16% for listed ties and 29% versus 18% for educational ties) and are almost three times more likely to be socially connected to the CEO and twice as likely to the nomination committee (12% versus 5% and 18% versus 9%). Compared to a non-referred director, a referred director also is more likely to share social ties with the specific board member who recommended her (see Tables 20, 21, 22 and 23 in the Appendix).

19

Table 6: Social Ties by Referred Status (t-tests)

| | Referred by the Board | | | | |
	Ref = 1	Ref = 0	Diff.	Std. Error	Obs.
Any Social Tie	0.3603	0.2365	-0.1238***	0.0157	4 374
Listed Tie	0.2430	0.1585	-0.0846***	0.0139	4 374
Private Tie	0.0944	0.0755	-0.0189*	0.0096	4 374
Educ. Tie	0.0285	0.0181	-0.0105*	0.0053	4 374
Alumni Tie	0.1464	0.1314	-0.0150	0.0118	4 374
IVY League Tie	0.0260	0.0271	0.0011	0.0054	4 374
Army Tie	0.0108	0.0090	-0.0017	0.0034	4 374
Leisure Act. Tie	0.0089	0.0057	-0.0031	0.0030	4 374
Tie to the CEO	0.1172	0.0460	-0.0713***	0.0099	4 374
Tie to another Exec.	0.0380	0.0189	-0.0191**	0.0060	4 374
Tie to the Nomin. Com.	0.1771	0.0903	-0.0868***	0.0121	4 374
Tie to another Indep. Dir.	0.1774	0.1330	-0.0444***	0.0125	4 374

Statistical significance levels: * p<0.05 ** p<0.01 *** p<0.001

I now more formally explore the relationship between social ties and job referrals. I estimate the following model:

$$JobReferral_{ikt} = \alpha + \beta SocialTie_{ikt} + X_{it}\gamma_1 + Z_{kt}\gamma_2 + \delta_k + \theta_t + \epsilon_{ikt} \quad (2)$$

where the outcome $JobReferral_{ikt}$ is 1 if a current member of board k refers entrant i at time t and 0 otherwise. The dependent variable $SocialTie_{ikt}$ is 1 if director i shares a social tie with a board member of firm k from before time t and 0 otherwise. As previously, I use different definitions of this variable to investigate the impact of different types of social ties (professional, education or other activities). Variables X_{it} control for new director i's characteristics[21] and variables Z_{kt} control for firm k's characteristics[22]. δ_k and θ_t

---

[21]New directors' characteristics include age and age squared, number of years as an executive, average number of years on listed boards, number of listed boards, number of current listed boards and busy director, sector, financial and industry expertise dummies. See Table 10 for more precise definitions of these variables.

[22]Firm's characteristics include board size, proportions of executives, independents, women and busy directors, average board tenure, nomination committee size, executive chairman dummy, firm performance, size, leverage, risk and growth opportunities. See Table 10 for more precise definitions of these variables.

are firm and time fixed effects.

Table 7: Which social ties lead to job referrals?

| | Dependent variable: Referred | | |
	I	II	III
Tie	0.0918*** (0.0178)		
Prof. Tie		0.0932*** (0.0191)	
Non Prof. Tie		0.0310 (0.0283)	
Listed Tie			0.105*** (0.0199)
Private Tie			0.0147 (0.0282)
Educ. Tie			-0.0343 (0.0499)
IVY League Tie			0.0396 (0.0550)
Alumni Tie			-0.0159 (0.0243)
Army Tie			0.0383 (0.0789)
Leisure Tie			-0.0134 (0.0962)
Controls, Firm, Year FE	Yes	Yes	Yes
Observations	4 374	4 374	4 374
R-squared	0.6331	0.6329	0.6335
Adjusted R-squared	0.4605	0.4601	0.4600

OLS estimation with standard errors in parentheses, clustered at the company level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Controls include age, age squared, total years as an executive, average number of years on listed boards, total number of listed boards, total number of current listed boards, busy director dummy, sector speciality dummies and financial and industry expertise dummies for new directors; board size, proportions of executives, independents, women and busy directors, average board tenure, nomination committee size, executive chairman dummy, firm performance, size, leverage, risk and growth opportunities for firms; and year dummies.

Compared to non-referred new directors, referred ones have 9 percentage points more chance of sharing a social tie with a current board member (specification I). Looking at which ties matter most, it appears that professional ones, and specifically those from listed companies, are driving the effect (specifications II and III). Referred new directors do not differ in terms of other types of social ties (from private companies, university, army or leisure activities) from non-referred new directors (specification III).

Table 24 in the Appendix provides results of a similar estimation but based on the dyadic dataset. Each observation is a matched pair between a new director i (entrant) and a current director j (incumbent) of firm k. This allows me to control specifically for entrant and incumbent characteristics including fixed effects. Next to a replication of Table 7, there for comparison, Table 24 presents three different estimations at the dyadic level: with firm fixed effect, with entrant and incumbent fixed effects and with firm, entrant and incumbent fixed effects. Results are in line with those in Table 7, though of smaller magnitude. This suggests that unobserved individual heterogeneity explains a substantial fraction of the correlation between tie and referrals.

Overall, these results seem to be in line with the scarce evidence on how directors are selected. In in-depth interviews with Australian non-executive directors, Elms et al. (2015) highlight two important selection criteria: the skills complementarity of the candidate and the group-fit with the board. While the first criteria might be available from candidates' CV, the second criteria is clearly more difficult to assess without extra information. Board members sharing social ties with candidates through previous working history in listed companies are in a better position to evaluate and provide information on this second criteria.

Kramarz and Thesmar (2013) investigate a related question on French directors' appointments. They show the prevalence and detrimental effects of education networks. However, they do not have extensive information on other types of networks as I do. Moreover, the French setting greatly differs from the US setting I investigate here: first, the French elite schooling system is very specific and cannot be directly compared with the US schooling system and second, governance structures are very different between continental Europe and Anglo-Saxon countries, leading to different incentives in board composition. Cai et al. (2017), who use similar data from BoardEx although for a longer period, find results in line with mine: over 75% of the appointed directors share a professional tie with the board and they find evidence for a coordination hypothesis, namely that firms in greater need of board coordination are more likely to appoint connected directors.

Other papers in the literature showing evidence of the workings of other types of social ties (for instance, Beaman and Magruder (2012) on family ties, Bandiera et al. (2009) on ethnic ties) focus on very different types of jobs (task in a laboratory experiment in India, job in a fruit picking division of a UK soft fruit producer). Therefore, it could be argued that types of social

ties play different roles depending on the type of job. For the type of job investigated in the paper, where experience and "management style" matter greatly, professional networks are more likely to bring valuable information than other social networks.

However, even if professional ties are important for board referrals and seem more likely to bring valuable information on candidates, do job referrals really help selecting "good" candidates or just allow favoritism to take place?

6 Job referrals are valuable for recruitment

6.1 Theoretical framework

I present here a simple model of information and bias in decision-making that will lead the empirical investigation. I use models from Li (2017) and Zinovyeva and Bagues (2015).

I consider an entrant i with ability a_i and an incumbent j that has to decide whether to recommend the entrant to the rest of the board or not ($r_{ij} \in \{0,1\}$). For simplicity, I omit the strategic aggregation problem according to which every incumbent makes this decision and the board has to take a final unique decision from all individual decisions.

I assume an entrant's ability a_i can be decomposed into two dimensions: a_{1i} is perfectly observable and a_{2i} is partially observable.

$$a_i = a_{1i} + a_{2i} \tag{3}$$

where a_{1i} and a_{2i} are normally distributed with mean zero and unit variance.

Incumbent j receives a signal s_{ij} on a_{2i}:

$$s_{ij} = a_{2i} + \epsilon_{ij} \tag{4}$$

where ϵ_{ij} is normally distributed and with variance σ_{ij}^2.

Incumbent j can also be connected to entrant i or not ($c_{ij} \in \{0,1\}$) and this information is public knowledge (the board observes it). Crucially here, is the fact that if incumbent j is connected ($c_{ij} = 1$), she might be biased ($b_{ij} > 0$) but her signal s_{ij}^c will be more precise than if she is not (in which case, her signal is s_{ij}^{nc} and her bias is $b_{ij} = 0$).

Incumbent j's payoff is therefore:

$$p_j = \begin{cases} a_i & \text{if entrant } i \text{ is hired and } c_{ij} = 0 \\ a_i + b_{ij} & \text{if entrant } i \text{ is hired and } c_{ij} = 1 \\ u & \text{otherwise} \end{cases}$$

After observing the signal s_{ij}, incumbent j reports her recommendation r_{ij} to the board and the board decides whether to hire entrant i or not.

The perfect Bayesian equilibria of this game is as follows[23]:

1. If $c_{ij} = 0$, there exists a unique informative equilibrium in which

   - Incumbent j refers entrant i ($r_{ij} = 1$) if $E(a_i|s_{ij}^{nc}) > u$ and doesn't otherwise ($r_{ij} = 0$)

   - The board hires entrant i if and only if incumbent j refers her ($r_{ij} = 1$)

2. If $c_{ij} = 1$, there exists a level of bias $b^* > 0$ such that for bias $b_{ij} \leq b^*$ there is a unique informative equilibrium such that

   - Incumbent j refers entrant i ($r_{ij} = 1$) if $E(a_i + b_{ij}|s_{ij}^c) > u$ and doesn't otherwise ($r_{ij} = 0$)

   - The board hires entrant i if and only if incumbent j refers her ($r_{ij} = 1$)

   When $b_{ij} > b^*$, only uninformative equilibria exist and entrant i is never hired.

This first result simply highlights the reason why the board could be willing to follow incumbent j's recommendation despite her connection to entrant i. For a sufficiently small bias ($b_{ij} \leq b^*$), the board will value incumbent j's better information on entrant i's ability.

How exactly do information and bias affect the ability of referred entrant i when she is connected to the incumbent j? I present three theoretical predictions from Zinovyeva and Bagues (2015) that I will test empirically[24].

---

[23]See Li (2017) for a proof.
[24]See Zinovyeva and Bagues (2015) for proofs of the propositions

Proposition 1 The expected observable ability dimension of referred entrant i ($\bar{a}_{1i}$) is (i) decreasing with the bias and (ii) decreasing with the signal's accuracy.

Given two loose assumptions[25],

$$\bar{a}_{1i} = E[a_{1i}|E(a_i + b_{ij}|s_{ij}) > u] = \sqrt{\frac{1 + \sigma_{ij}^2}{2 + \sigma_{ij}^2}} \lambda(x) \tag{5}$$

where $\lambda(.) = \frac{\phi(.)}{1-\Phi(.)}$ is the inverse Mills ratio[26], and $x = (u - b_{ij})\sqrt{\frac{1+\sigma_{ij}^2}{2+\sigma_{ij}^2}}$. Since $\lambda'_x(x) > 0$, $(\bar{a}_{1i})'_{b_{ij}} < 0$ and $(\bar{a}_{1i})'_{\sigma_{ij}^2} > 0$.

Proposition 2 The expected partially observable ability dimension of referred entrant i ($\bar{a}_{2i}$) is (i) decreasing with the bias and (ii) increasing with the signal's accuracy.

Given the same two assumptions,

$$\bar{a}_{2i} = E[a_{2i}|E(a_i + b_{ij}|s_{ij}) > u] = \frac{\lambda(x)}{\sqrt{(1 + \sigma_{ij}^2)(2 + \sigma_{ij}^2)}} \tag{6}$$

Since $\lambda(x) > x$ and $0 < \lambda'_x(x) < 1$, $(\bar{a}_{2i})'_{b_{ij}} < 0$ and $(\bar{a}_{2i})'_{\sigma_{ij}^2} < 0$.

Proposition 3 The expected overall ability of referred entrant i ($\bar{a}_i$) is (i) decreasing with the bias and (ii) increasing with the signal's accuracy.

Given the same two assumptions,

$$\bar{a}_i = E[a_i|E(a_i + b_{ij}|s_{ij}) > u] = \sqrt{\frac{2 + \sigma_{ij}^2}{1 + \sigma_{ij}^2}} \lambda(x) \tag{7}$$

Since $\lambda(x) > x$ and $0 < \lambda'_x(x) < 1$, $(\bar{a}_i)'_{b_{ij}} < 0$ and $(\bar{a}_i)'_{\sigma_{ij}^2} < 0$.

How I measure the observable, partially observable and overall abilities of entrants is detailed in the next section.

---

[25]First, entrant i's ability is independent of the bias b_{ij} and of the accuracy of the signal σ_{ij}^2: $E(a_i|b_{ij}) = E(a_i|\sigma_{ij}) = E(a_i)$. Second, the outside option u is sufficiently large: $u - b_{ij} > 0$.

[26]$\phi(.)$ is the normal density function and $\Phi(.)$ is the normal cumulative distribution function.

6.2 Measuring directors' ability

To estimate directors' partially observed ability (a_{2i}), I use an idea first developed by Bertrand and Schoar (2003) for top managers and implemented for directors - as in my case - by Cavaco et al. (2017). In their paper, Bertrand and Schoar (2003) want to understand whether managers have styles i.e. whether different managers would run a same firm differently. To that aim, they run firm performance equation regressions with time-varying firm characteristics, firm fixed effects, and manager fixed effects. For managers changing firm over time, they are able to recover their fixed effects - a proxy for their style. However, managers changing firms - movers - are very likely to be different compared to managers staying in the same firm for their whole career - stayers. Moreover, manager fixed effects cannot be recovered for stayers (separately from firm fixed effects) and therefore, no information on their style is available. Cavaco et al. (2017), who focus instead on directors and not only on top managers, use a technique developed by Abowd et al. (1999) (hereafter AKM) to recover director fixed effects for movers and (a substantial group of) stayers. In their paper, Abowd et al. (1999) show that director fixed effects can be recovered for all individuals working for "connected" firms. Connected firms are firms who share directors. Directors are shared by companies when they move from one firm to another or when they contemporaneously sit on the boards of different firms, therefore connecting them. For any given group of connected companies, one can recover director fixed effects for all individuals who have ever worked in these firms: movers and stayers.

I make use again here of the whole career history of directors, available from their CV. I keep all directors from the BoardEx database, and not only the directors in my analysis sample i.e. those appointed between 2004 and 2008. Because directors do change firm over time[27] and because they usually hold several directorships in each year[28], I am able to separately identify director fixed effects from firm fixed effects for most of the directors in my analysis sample (out of 3 861 directors for whom I have social networks and job referrals information, I estimate 3 820 director fixed effects[29]) using the AKM framework. I use the estimated director fixed effects as a proxy for the partially observable ability dimension (a_{2i}). This is the part of their ability

---

[27]On average, directors have worked for 9.67 firms from the beginning of their career and until 2014.

[28]On average, directors sit on 1.24 boards in each year.

[29]The 41 directors without fixed effects are directors who sat on one board in one year and their fixed effects cannot be disentangled from the error term.

which is not directly observable in their CV by the hiring firm but potentially communicated to the firm by the connected referrer. It captures soft skill ability or managerial philosophy that contributes to firm performance. I run firm performance equation regressions on time-varying director and firm characteristics, time dummies and firm and director fixed effects. Specifically, I estimate the following model:

$$Y_{kt} = \alpha + X_{it}\beta + Z_{kt}\gamma + \delta_i + \eta_k + \theta_t + \epsilon_{ikt} \tag{8}$$

where the dependent variable Y_{kt} is firm k performance at time t, the independent variables X_{it} and Z_{kt} capture time-varying director and firm characteristics[30], and δ_i, η_k and θ_t are director, firm and time fixed effects. As in Cavaco et al. (2017), director fixed effects are normalized - i.e. their sum is zero - such that no director fixed effect is used as a reference to which other director fixed effects depend upon for interpretation. I also compute robust standard errors, clustered at the firm-year level, given that I use multiple firm-year observations in the estimation. I finally exclude observations for directors observed only one period of time in one firm; for these directors, their fixed effects cannot be disentangled from the error term (this occurs in 0.28% of the whole sample and corresponds to 2 358 directors, of which 41 of them belong to my analysis sample.)[31].

---

[30]Time-varying director characteristics include age and age squared, total years as an executive, number of total listed boards, number of current listed boards, time on board, time on board squared, and executive, independent, CEO, Chairman, busy director, sector specialities, financial and industry expertise, and audit, compensation and nomination committee memberships dummies. Time-varying board characteristics include board size, average tenure on board, audit, compensation and nomination committee sizes, proportions of executive, independent, busy directors and women on board, an executive chairman dummy. Time-varying firm characteristics include size, leverage, risk, growth opportunities. See Table 10 for more precise definitions of these variables.

[31]I provide in the Appendix two types of empirical evidence that assumptions underlying the AKM framework are likely not to be violated. Following Card et al. (2013), I first estimate a fully saturated model with a matched component (i.e. with director-firm dummies) and examine whether it outperforms the additive separable one (i.e. with separate director and firm dummies). The R-squared increases but the magnitude of this increase is modest (see Table 25 in the Appendix), as in Card et al. (2013) and Cavaco et al. (2017). Secondly, I plot the average residuals for each decile cell of the estimated director and firm fixed effects to examine whether there are systematic patterns for certain directors working for certain firms (see Figure1 in the Appendix). I observe some deviations for the highest and lowest director deciles and for the lowest firm deciles but still, the average residuals in each cell is lower than 0.8%, which is even smaller than averages reported by Card et al. (2013) and Cavaco et al. (2017). These two pieces of evidence suggest that sorting based on the matched component is likely to be limited in my setting.

The observable ability dimension (a_{1i}) is measured by the linear prediction of the observable individual characteristics included in the firm performance equation (X_{it}). These characteristics are directly available from directors' CVs and therefore assumed to be observed by everyone. Finally, the overall ability (a_i) is simply the sum of the observable and partially observable dimensions, as assumed in the model.

6.3   Information versus bias: what bring referrals?

Observing who is ultimately hired does not allow discrimination between the information value and the bias disadvantage of referrals. To assess the value of using referrals for recruitment, I test instead predictions from propositions 1-3. These are based on the different ability dimensions of new directors.

Formally, I run regressions of directors' ability dimensions on a referral dummy interacted with a connected dummy:

$$\widehat{Ability_{ijkt}} = \alpha + \beta JobReferrals_{ijkt} * SocialTie_{ijt} + X_i\gamma + \eta_k + \theta_t + \epsilon_{ijkt} \quad (9)$$

where the dependent variable $\widehat{Ability_{ijkt}}$ is one of the following:

- the observable ability dimension, $\widehat{a_{1i}}$, measured by the linear prediction of observable individual characteristics;

- the partially observable ability dimension, $\widehat{a_{2i}}$, measured by the estimated director i's fixed effect;

- the overall ability, $\widehat{a_i}$, measured by the sum of the observable ability and of the partially observable ability.

I pool all appointment observations. Therefore, if the same director i is appointed several times to different firms k and/or at different times t, several observations use her estimated ability. The independent variable $JobReferrals_{ijkt}$ is a dummy variable being 1 if director i was referred by incumbent j for the board position in firm k at time t and 0 otherwise. The independent variable $SocialTie_{ijt}$ is a dummy variable being 1 if director i shares a social tie with a member j of the firm's board from before time t and 0 otherwise. I run alternative specifications with $JobReferrals_{ijkt}$ only and $SocialTie_{ijt}$ only instead of their interaction[32]. The variables X_i control for director time-invariant characteristics that might affect directors' ability dimensions such as gender, an MBA degree and having studied in an IVY

---

[32]See Table 26 in the Appendix.

League university. Such time-invariant individual characteristics are somehow included in the director fixed effects and I therefore take them out here[33]. The firm fixed effects η_k and time dummies θ_t control for unobserved characteristics potentially affecting the sorting of directors to companies. Because the outcome variable is estimated, I bootstrap standard errors with 100 replications.

Table 8: Information versus bias: the value of referrals

	Director's Obs. Ability I	Director's Partially Obs. Ability II	Director's Overall Ability III
Ref. & Tie Board	-0.00369***	0.00706***	0.00337**
	(0.000959)	(0.00150)	(0.00112)
Female	0.0142***	-0.0155***	-0.00130
	(0.00112)	(0.00159)	(0.000943)
MBA	0.00633***	-0.00725***	-0.000928
	(0.000853)	(0.00130)	(0.000798)
IVY league	0.000681	0.00112	0.00180
	(0.00173)	(0.00220)	(0.00144)
Firm fixed effects and year dummies	Yes	Yes	Yes
Observations	4 374	4 374	4 374
R-squared	0.408	0.520	0.639
Adjusted R-squared	0.139	0.302	0.475

OLS estimation with bootstrapped standard errors in parentheses. Statistical significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

I use propositions 1-3 to interpret results from Table 8. When the referred entrant is connected to the incumbent, her observable ability dimension is significantly decreased compared to when she is not (specification I). This is in line with proposition 1, according to which the expected observable ability dimension decreases with bias and accuracy of signal. However, the partially observable ability dimension and the overall ability are more significantly increased when the referred entrant is connected to the incumbent than when she is not (specifications II and III). In line with propositions 2 and 3, this suggests that the benefit from signal's accuracy outweighs the detrimental effect of bias. I conclude that, in my context of hiring an expert to a committee, recommendations do provide useful information that domi-

---

[33]Excluding time-invariant director characteristics in regressions using the observable ability dimension as a dependent variable does not qualitatively change the results. See Table **??** in the Appendix.

nates the negative effects of bias. As mentioned earlier, given the importance of soft skills, managerial philosophy and voting style for this type of job, job referrals are indeed likely to convey useful information on these important dimensions for the committee.

6.4 Why are high ability incumbents referring high ability entrants?

High ability incumbents are more likely to refer high ability entrants (Beaman and Magruder (2012); Hensvik and Skans (2016))[34]. This raises the question of whether high ability incumbents know better how to screen high ability entrants or whether high ability incumbents just know more other high ability individuals (homophily in social networks). Beaman and Magruder (2012) suggest that, if properly incentivized, highly productive workers who better understand the task at hand, are more likely to select individuals they know will perform well. Hensvik and Skans (2016) find evidence of homophily in social networks (see also Montgomery (1991) for first theorization). In this section, I shed some light on the two explanations, as I have data on both abilities and social networks of referring incumbents.

I focus on the partially observable ability dimension as, by construction, the observable ability dimension is available to everyone. As I extracted director's fixed effects for all directors in the BoardEx database, I have both entrants' and incumbents' partially observable ability dimension. Moreover, I construct two measures of directors' network characteristics: network size and network quality. Network size is the total number of social contacts a director has. Network quality weights each of her social contact by their partially observable ability dimension (or estimated fixed effect). As they were shown to have the highest role in previous sections, I focus here on contacts from listed companies only.

I use all referred entrant-referring incumbent's dyads and estimate the

---

[34]Also some suggestive evidence in Brown et al. (2016) (more senior referrers may refer better-quality new hires) and in Burks et al. (2015) ("referrers tend to refer people like themselves in productivity" in the trucking industry).

following model:

$$
\begin{aligned}
\widehat{Entrant\_Ability}_{ijkt} &= \alpha + \beta \widehat{Incumbent\_Ability}_{ijkt} \\
&+ \gamma_1 NetworkSize_{jt} \\
&+ \gamma_2 NetworkSize_{jt} * \widehat{Incumbent\_Ability}_{ijkt} \\
&+ \gamma_3 NetworkQuality_{jt} \\
&+ \gamma_4 NetworkQuality_{jt} * \widehat{Incumbent\_Ability}_{ijkt} \\
&+ X_{it}\delta_1 + X_{jt}\delta_2 + Z_{kt}\delta_3 + \theta_t + \epsilon_{ijkt} \qquad (10)
\end{aligned}
$$

where $\widehat{Entrant\_Ability}_{ijkt}$ and $\widehat{Incumbent\_Ability}_{ijkt}$ are entrant i's and incumbent j's respective partially observable ability dimensions. As previously, I pool appointments' observations. Therefore, $\widehat{Entrant\_Ability}_{ijkt}$ is used in several observations if entrant i is appointed several times. Similarly, if incumbent j refers for different firms or at different points in time, $\widehat{Incumbent\_Ability}_{ijkt}$ is used in several observations. Network size and quality are included for both entrants and incumbents. Importantly, I interact incumbent's network size and quality with their partially observable ability dimension. This allows investigation into whether higher ability incumbents leverage their network characteristics differently compared to lower ability incumbents. As previously, X_{it}, X_{jt} and Z_{kt} measure entrant, incumbent and firm characteristics and θ_t controls for time.

Table 9: High ability incumbents do not have better networks to select high ability entrants from

| | Dependent variable: Entrant's Ability | | | |
	I	II	III	IV
Incumbent's Ability	0.111***	0.110***	0.105***	0.170**
	(0.0196)	(0.0194)	(0.0188)	(0.0546)
Entrant's Net. Size		0.00176*	0.00176*	0.00174*
		(0.000740)	(0.000741)	(0.000736)
Entrant's Net. Qual.		0.164***	0.163***	0.161***
		(0.0399)	(0.0401)	(0.0394)
Incumbent's Net. Size			-0.0000369	0.0000295
			(0.000382)	(0.000391)
Incumbent's Net. Size* Incumbent's Ability				-0.0124
				(0.0109)
Incumbent's Net. Qual.			0.0448	0.0448
			(0.0319)	(0.0320)
Incumbent's Net. Qual.* Incumbent's Ability				1.065
				(0.897)
Controls	Yes	Yes	Yes	Yes
Observations	7 789	7 789	7 789	7 789
R-squared	0.591	0.598	0.598	0.600

OLS estimation with clustered standard errors at the entrant and incumbent levels. Statistical significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Controls include age, age squared, total years as an executive, average number of years on listed boards, total number of listed boards, total number of current listed boards and busy director, financial and industry expertise, female, MBA and IVY League dummies for new directors; age, age squared, total years as an executive, average number of years on listed boards, total number of listed boards, total number of current listed boards, time on board, time on board squared, and position (CEO, Chairman, Executive, Independent), busy director, financial expertise, committee membership dummies for already sitting directors; board size, board, proportions of executives, independents, women and busy directors, average board tenure, all committee sizes, executive chairman dummy, board network size and quality, firm performance, size, leverage, risk, growth opportunities and sector for firms; and year dummies.

Entrants' Ability and Incumbents' Ability are their respective estimated partially observed ability dimensions. Network size and quality are computed for social contacts from listed firms.

Table 9 shows that referred entrants' ability is positively associated with their referring incumbent's ability, as in the literature (specification I). Entrants' network size and entrants' network quality are both related to entrants' ability, suggesting that there is homophily in networks: high ability entrants have high ability contacts (specification II). However, incumbents' network size - the total number of contacts from which an incumbent can select a potential director to refer - and network quality - capturing the average ability of contacts in the incumbent's network - do not explain the referred entrant's ability (specification III). Interacting these measures with the incumbent's ability allows us to understand whether the use of network characteristics to provide a recommendation is mediated by the incumbent's ability. None of these interactions is associated with the referred director's ability (specification IV). This suggests that, compared to low ability referring incumbents, high ability referring incumbents are not more able to leverage their networks to select high ability directors.

7 Conclusion

Job referrals are disproportionally used in the labor market and have important economic impacts for both firms and workers. Yet a large part of the literature relies on social network data, rather than actual job referrals to investigate the causes and consequences of the use of this informal search method. This paper links data on both social networks of various types and job referrals to understand better which social networks matter for obtaining referrals and jobs. I find that professional networks - the set of previous colleagues - matter the most for both obtaining job referrals and being hired in high-skill positions, where implicit knowledge and fit with the team are important determinants of productivity. Given that other research has shown the importance of family, neighbors or ethnic ties on different types of jobs, my work suggests that different social networks matter for different jobs.

Understanding the role of job referrals in recruitment, whether providing information on candidates or allowing favoritism, and particularly which effect dominates, further help to determine whether it is pervasive for the economy or not, in terms of firm performance and systematic exclusion of unconnected "good" workers. This paper contributes to the empirical evidence showing that job referrals provide signals on workers' quality beyond those which can be inferred from the CV (Simon and Warner (1992); Beaman and Magruder (2012); Dustmann et al. (2015); Hensvik and Skans (2016); Pallais and Sands (2016)). Job referrals in my setting also are likely to con-

vey information on the match quality. Further research should investigate this aspect, to contribute to the labor market but also corporate governance literatures.

References

Abowd, J. M., Kramarz, F., and Margolis, D. N. (1999). High wage workers and high wage firms. *Econometrica*, 67(2):251–333.

Akyol, A. C. and Cohen, L. (2013). Who chooses board members? In *Advances in Financial Economics*, pages 43–77. Emerald Group Publishing Limited.

Åslund, O., Hensvik, L., and Skans, O. N. (2014). Seeking similarity: How immigrants and natives manage in the labor market. *Journal of Labor Economics*, 32(3):405–441.

Bandiera, O., Barankay, I., and Rasul, I. (2009). Social connections and incentives in the workplace: Evidence from personnel data. *Econometrica*, 77(4):1047–1094.

Bandiera, O., Barankay, I., and Rasul, I. (2010). Social incentives in the workplace. *The Review of Economic Studies*, 77(2):417–458.

Bayer, P., Ross, S. L., and Topa, G. (2008). Place of work and place of residence: Informal hiring networks and labor market outcomes. *Journal of Political Economy*, 116(6):1150–1196.

Beaman, L. and Magruder, J. (2012). Who gets the job referral? Evidence from a social networks experiment. *The American Economic Review*, 102(7):3574–3593.

Beaman, L. A. (2011). Social networks and the dynamics of labour market outcomes: Evidence from refugees resettled in the US. *The Review of Economic Studies*, 79(1):128–161.

Becker, B. and Subramanian, G. (2013). Improving director elections. *Harvard Business Law Review*, 3:1.

Berle, A. and Means, G. (1932). The modern corporation and private property macmillan. *New York*.

Bertrand, M. and Schoar, A. (2003). Managing with style: The effect of managers on firm policies. *The Quarterly Journal of Economics*, 118(4):1169–1208.

Bramoullé, Y. and Huremović, K. (2018). Promotion through connections: Favors or information? *Working Paper*.

Brown, M., Setren, E., and Topa, G. (2016). Do informal referrals lead to better matches? Evidence from a firms employee referral system. *Journal of Labor Economics*, 34(1):161–209.

Burks, S. V., Cowgill, B., Hoffman, M., and Housman, M. (2015). The value of hiring through employee referrals. *The Quarterly Journal of Economics*, 130(2):805–839.

Cai, J., Garner, J., and Walkling, R. (2010). Shareholder access to the boardroom: A survey of recent evidence. *Journal of Applied Finance*, 20(2):15.

Cai, J., Nguyen, T., and Walkling, R. A. (2017). Director appointments – It is who you know. *Working Paper*.

Card, D., Heining, J., and Kline, P. (2013). Workplace heterogeneity and the rise of west german wage inequality. *The Quarterly Journal of Economics*, 128(3):967–1015.

Cavaco, S., Crifo, P., Rebérioux, A., and Roudaut, G. (2017). Independent directors: Less informed but better selected than affiliated board members? *Journal of Corporate Finance*, 43:106–121.

Cingano, F. and Rosolia, A. (2012). People I know: Job search and social networks. *Journal of Labor Economics*, 30(2):291–332.

Coles, J. L., Daniel, N. D., and Naveen, L. (2014). Co-opted boards. *The Review of Financial Studies*, 27(6):1751–1796.

Dustmann, C., Glitz, A., Schönberg, U., and Brücker, H. (2015). Referral-based job search networks. *The Review of Economic Studies*, 83(2):514–546.

Edin, P.-A., Fredriksson, P., and Åslund, O. (2003). Ethnic enclaves and the economic success of immigrants: Evidence from a natural experiment. *The Quarterly Journal of Economics*, 118(1):329–357.

Elms, N., Nicholson, G., and Pugliese, A. (2015). The importance of group-fit in new director selection. *Management Decision*, 53(6):1312–1328.

Fama, E. F. and Jensen, M. C. (1983). Separation of ownership and control. *Journal of Law and Economics*, pages 301–325.

Fracassi, C. and Tate, G. (2012). External networking and internal firm governance. *The Journal of Finance*, 67(1):153–194.

36

Galenianos, M. (2013). Learning about match quality and the use of referrals. *Review of Economic Dynamics*, 16(4):668–690.

Glitz, A. (2017). Coworker networks in the labour market. *Labour Economics*, 44:218–230.

Heath, R. (2018). Why do firms hire using referrals? Evidence from bangladeshi garment factories. *Journal of Political Economy*, 126(4):1691–1746.

Hellerstein, J. K., McInerney, M., and Neumark, D. (2011). Neighbors and coworkers: The importance of residential labor market networks. *Journal of Labor Economics*, 29(4):659–695.

Hensvik, L. and Skans, O. N. (2016). Social networks, employee selection, and labor market outcomes. *Journal of Labor Economics*, 34(4):825–867.

Hillman, A. J., Shropshire, C., Certo, S. T., Dalton, D. R., and Dalton, C. M. (2011). What I like about you: A multilevel study of shareholder discontent with director monitoring. *Organization Science*, 22(3):675–687.

Hwang, B.-H. and Kim, S. (2009). It pays to have friends. *Journal of Financial Economics*, 93(1):138–158.

Jensen, M. C. and Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4):305–360.

Kang, J.-K., Liu, W.-L., Low, A., and Zhang, L. (2018). Friendly boards and innovation. *Journal of Empirical Finance*, 45:1–25.

Kramarz, F. and Skans, O. N. (2014). When strong ties are strong: Networks and youth labour market entry. *Review of Economic Studies*, 81(3):1164–1200.

Kramarz, F. and Thesmar, D. (2013). Social networks in the boardroom. *Journal of the European Economic Association*, 11(4):780–807.

Kugler, A. D. (2003). Employee referrals and efficiency wages. *Labour Economics*, 10(5):531–556.

Laschever, R. (2013). The doughboys network: Social interactions and the employment of World War I veterans. *Working Paper*.

Li, D. (2017). Expertise versus bias in evaluation: Evidence from the nih. *American Economic Journal: Applied Economics*, 9(2):60–92.

Montgomery, J. D. (1991). Social networks and labor-market outcomes: Toward an economic analysis. *The American Economic Review*, 81(5):1408–1418.

Munshi, K. (2003). Networks in the modern economy: Mexican migrants in the us labor market. *The Quarterly Journal of Economics*, 118(2):549–599.

Nguyen, B. D. (2012). Does the Rolodex matter? Corporate elite's small world and the effectiveness of boards of directors. *Management Science*, 58(2):236–252.

Oyer, P. and Schaefer, S. (2016). Firm/employee matching: An industry study of us lawyers. *ILR Review*, 69(2):378–404.

Pallais, A. and Sands, E. G. (2016). Why the referential treatment? Evidence from field experiments on referrals. *Journal of Political Economy*, 124(6):1793–1828.

Schmidt, B. (2015). Costs and benefits of friendly boards during mergers and acquisitions. *Journal of Financial Economics*, 117(2):424–447.

Schmutte, I. M. (2014). Job referral networks and the determination of earnings in local labor markets. *Journal of Labor Economics*, 33(1):1–32.

Simon, C. J. and Warner, J. T. (1992). Matchmaker, matchmaker: The effect of old boy networks on job match quality, earnings, and tenure. *Journal of Labor Economics*, 10(3):306–330.

Topa, G. (2011). Labor markets and referrals. *Handbook of Social Economics*, 1:1193–1221.

Zimmerman, S. D. (Forthcoming). Elite colleges and upward mobility to top jobs and top incomes. *American Economic Review*.

Zinovyeva, N. and Bagues, M. (2015). The role of connections in academic promotions. *American Economic Journal: Applied Economics*, 7(2):264–92.

Appendix

Table 10: Control Variables

Variables	Description
Director Controls	
Female dummy	1 if the director is female and 0 otherwise
MBA dummy	1 if the director holds an MBA degree and 0 otherwise
IVY League dummy	if the director graduated from an IVY League university and 0 otherwise
Age	Director's age in years
Number of boards to date	Number of listed boards on which the director has sat to date
Number of current boards	Number of listed boards on which the director is sitting
Busy director dummy	1 if the director is sitting on more than two listed boards and 0 otherwise
Average number of years on boards	Average number of years spent on listed boards
Number of years as executive	Number of years spent as an executive
Sector expertise dummies	1 for sectors in which the director has expertise and 0 otherwise. The director is considered to have an expertise in a sector if he has worked in that sector for the highest number of years.
Current sector dummies	1 for the sector in which the director is currently working and 0 otherwise.
Industry expert dummy	1 if the director has an expertise in the appointing firm's industry and 0 otherwise
Financial expert dummy	1 if the director has an expertise in the finance sector and/or if he holds a financial degree and 0 otherwise
Committee membership dummies	1 if the director is a member of the committee (compensation, audit or nomination) and 0 otherwise
Network size	Total number of social contacts
Network quality	Total number of social contacts, weighted by their estimated (unobserved) ability
Firm Controls	
Board size	Number of directors on board
Proportion of executives	Proportion of executives on board
Proportion of independent directors	Proportion of independent directors on board
Proportion of busy directors	Proportion of busy directors on board
Proportion of women	Proportion of women on board
Executive chairman dummy	Executive Chairman on board
Average board tenure	Average board tenure over all directors on board
Nomination committee size	Number of directors on the nomination committee
Audit committee size	Number of directors on the audit committee
Compensation committee size	Number of directors on the compensation committee
Firm performance	Return on assets, excluding extreme 1% percentile
Firm risk	Variance of return on assets over the last five years
Firm size	Log of market value of equity
Firm leverage	Total debt over total equity
Firm growth opportunities	Market-to-book ratio
Sector dummies	Sectors categorized at the one-digit level
Board network size	Total number of social contacts from all board members
Board network quality	Total number of social contacts from all board members, weighted by their estimated (unobserved) ability

Table 11: Evidence on social ties

	Mean	Std.Dev.	Min	Max
Professional ties - Listed companies				
Prop. with a direct tie to the board	0.219	0.414	0	1
Prop. with an indirect tie to the board	0.617	0.486	0	1
Shortest path to reach the board	2.043	0.813	1	7
Prop. with a tie to the CEO	0.072	0.258	0	1
Prop. with a tie to another Exec. Dir.	0.025	0.157	0	1
Prop. with a tie to the Nomin. Comm.	0.105	0.307	0	1
Prop. with a tie to another Indep. Dir.	0.115	0.320	0	1
Professional ties - Private companies				
Prop. with a direct tie to the board	0.089	0.285	0	1
Prop. with an indirect tie to the board	0.750	0.433	0	1
Shortest path to reach the board	2.825	1.023	1	8
Prop. with a tie to the CEO	0.018	0.132	0	1
Prop. with a tie to another Exec. Dir.	0.008	0.089	0	1
Prop. with a tie to the Nomin. Comm.	0.032	0.177	0	1
Prop. with a tie to another Indep. Dir.	0.039	0.194	0	1
Personal ties - Education				
Prop. with a direct tie to the board	0.026	0.158	0	1
Prop. with an indirect tie to the board	0.820	0.384	0	1
Shortest path to reach the board	2.804	0.814	1	9
Prop. with a tie to the CEO	0.007	0.084	0	1
Prop. with a tie to another Exec. Dir.	0.001	0.034	0	1
Prop. with a tie to the Nomin. Comm.	0.008	0.087	0	1
Prop. with a tie to another Indep. Dir.	0.010	0.098	0	1

*Shortest path to reach the board measures the number of links before reaching the board.

A shortest path of 1 means the individual is (directly) linked with a board member.

	Mean	Std.Dev.	Min	Max
Personal ties - Alumni				
Prop. with a direct tie to the board	0.142	0.349	0	1
Prop. with an indirect tie to the board	0.713	0.453	0	1
Shortest path to reach the board	1.895	0.467	1	4
Prop. with a tie to the CEO	0.028	0.165	0	1
Prop. with a tie to another Exec. Dir.	0.010	0.099	0	1
Prop. with a tie to the Nomin. Comm.	0.057	0.233	0	1
Prop. with a tie to another Indep. Dir.	0.073	0.260	0	1
Personal ties - IVY League				
Prop. with a direct tie to the board	0.026	0.160	0	1
Prop. with an indirect tie to the board	0.079	0.269	0	1
Shortest path to reach the board	1.749	0.434	1	2
Prop. with a tie to the CEO	0.003	0.058	0	1
Prop. with a tie to another Exec. Dir.	0.003	0.054	0	1
Prop. with a tie to the Nomin. Comm.	0.010	0.098	0	1
Prop. with a tie to another Indep. Dir.	0.013	0.115	0	1
Personal ties - Army				
Prop. with a direct tie to the board	0.010	0.101	0	1
Prop. with an indirect tie to the board	0.035	0.184	0	1
Shortest path to reach the board	2.111	0.900	1	6
Prop. with a tie to the CEO	0.002	0.045	0	1
Prop. with a tie to another Exec. Dir.	0.000	0.015	0	1
Prop. with a tie to the Nomin. Comm.	0.004	0.066	0	1
Prop. with a tie to another Indep. Dir.	0.005	0.069	0	1
Personal ties - Leisure activities				
Prop. with a direct tie to the board	0.008	0.089	0	1
Prop. with an indirect tie to the board	0.066	0.248	0	1
Shortest path to reach the board	3.920	1.888	1	10
Prop. with a tie to the CEO	0.003	0.054	0	1
Prop. with a tie to another Exec. Dir.	0.000	0.000	0	0
Prop. with a tie to the Nomin. Comm.	0.004	0.062	0	1
Prop. with a tie to another Indep. Dir.	0.004	0.066	0	1
Observations	4 374			

*Shortest path to reach the board measures the number of links before reaching the board.

A shortest path of 1 means the individual is (directly) linked with a board member.

Table 13: Do social ties affect board appointments? Pools of 5 candidates

| | Dependent variable: Appointed by the Board | |
	Selected Candidates	Random Candidates
Tie to the Board	0.407***	0.328**
	(0.0265)	(0.103)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes
Observations	21 870	21 870
R-squared	0.757	0.976
Adjusted R-squared	0.162	0.420

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size and executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Table 14: Do social ties affect board appointments? Pools of 7 candidates

| | Dependent variable: Appointed by the Board | |
	Selected Candidates	Random Candidates
Tie to the Board	0.350***	0.399***
	(0.0187)	(0.0562)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes
Observations	30 618	30 618
R-squared	0.671	0.950
Adjusted R-squared	0.149	0.391

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size and executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Table 15: Which type of social ties affect board appointments?

| | Dependent variable: Appointed by the Board | | | | | |
	Selected Candidates	Random Candidates	Selected Candidates	Random Candidates	Selected Candidates	Random Candidates
Prof. Tie	0.329*** (0.0159)	0.316*** (0.0407)	0.328*** (0.0159)	0.312*** (0.0407)		
Listed Tie					0.305*** (0.0172)	0.289*** (0.0447)
Private Tie					0.312*** (0.0281)	0.286*** (0.0657)
Non Prof. Tie	0.134*** (0.0195)	0.152* (0.0616)				
Non Prof. Non Educ. Tie			0.162*** (0.0277)	0.169* (0.0761)		
Army Tie					0.118* (0.0491)	-0.0124 (0.158)
Leisure Act. Tie					0.312*** (0.0890)	0.405* (0.205)
Educ. Tie			0.0354 (0.0278)	0.0480 (0.0958)	0.0466 (0.0278)	0.0465 (0.0953)
Alumni Tie			0.0467*** (0.0135)	0.0763 (0.0464)	0.0511*** (0.0135)	0.0861 (0.0468)
IVY League Tie			-0.0405 (0.0229)	-0.144 (0.0849)	-0.0422 (0.0227)	-0.140 (0.0848)
Individual and firm fixed effects, year dummies and controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43 740	43 740	43 740	43 740	43 740	43 740
R-squared	0.586	0.905	0.587	0.905	0.588	0.905
Adjusted R-squared	0.147	0.299	0.149	0.301	0.150	0.302

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size, executive chairman dummy. Remaining controls include all interactions of director and firm controls.

44

Table 16: Social ties to whom affect board appointments?

| | Dependent variable: Appointed by the Board | | | |
	Selected Candidates	Random Candidates	Selected Candidates	Random Candidates
Tie to an Exec. Dir.	0.357*** (0.0286)	0.301*** (0.0711)		
Tie to a non Exec. Dir.	0.232*** (0.0137)	0.233*** (0.0391)		
Tie to the CEO			0.302*** (0.0321)	0.244** (0.0793)
Tie to an other Exec.			0.205*** (0.0545)	0.183 (0.134)
Tie to the Nomin. Comm.			0.229*** (0.0206)	0.190*** (0.0570)
Tie to an other Indep. Dir.			0.181*** (0.0157)	0.185*** (0.0459)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes	Yes	Yes
Observations	43 740	43 740	43 740	43 740
R-squared	0.588	0.905	0.586	0.905
Adjusted R-squared	0.150	0.302	0.147	0.298

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size, executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Table 17: Which social ties affect board appointments?

| | Dependent variable: Appointed by the Board | | | |
	Selected Candidates	Random Candidates	Selected Candidates	Random Candidates
Prof. Tie Exec.	0.360***	0.282***		
	(0.0310)	(0.0774)		
Non Prof. Tie Exec.	0.238***	0.227		
	(0.0572)	(0.144)		
Prof. Tie non Exec.	0.267***	0.262***		
	(0.0169)	(0.0424)		
Non Prof. Tie non Exec.	0.115***	0.126*		
	(0.0206)	(0.0606)		
Listed Tie CEO			0.254***	0.196
			(0.0407)	(0.105)
Private Tie CEO			0.287**	0.272
			(0.0883)	(0.172)
Educ. Tie CEO			0.185*	0.0383
			(0.0818)	(0.246)
Alumni Tie CEO			0.0500	0.184
			(0.0293)	(0.104)
IVY League Tie CEO			-0.0151	-0.168
			(0.0652)	(0.216)
Army Tie CEO			0.266	0.291
			(0.157)	(0.383)
Leisure Act. Tie CEO			0.112	0.123
			(0.190)	(0.403)
Listed Tie Nomin. Comm.			0.216***	0.199**
			(0.0270)	(0.0756)
Private Tie Nomin. Comm.			0.295***	0.176
			(0.0453)	(0.115)
Educ. Tie Nomin. Comm.			0.0194	-0.0557
			(0.0442)	(0.158)
Alumni Tie Nomin. Comm.			0.0579**	0.0712
			(0.0192)	(0.0659)
IVY League Tie Nomin. Comm.			-0.0373	-0.211
			(0.0344)	(0.154)
Army Tie Nomin. Comm.			0.0300	0.0836
			(0.0690)	(0.253)
Leisure Act. Tie Nomin. Comm.			0.214	0.407
			(0.127)	(0.250)
Listed Tie other Exec.			0.138*	0.0154
			(0.0670)	(0.142)
Private Tie other Exec.			0.211	0.326
			(0.145)	(0.264)
Educ. Tie other Exec.			0.0186	0.699*
			(0.131)	(0.354)
Alumni Tie other Exec.			0.0131	0.175
			(0.0608)	(0.234)
IVY League Tie other Exec.			0.0547	-0.168
			(0.0994)	(0.285)
Army Tie other Exec.			0.414	-0.313
			(0.478)	(0.722)
Leisure Act. Tie other Exec.			-0.669**	0
			(0.224)	(.)
Listed Tie other Indep.			0.197***	0.175**
			(0.0213)	(0.0568)
Private Tie other Indep.			0.190***	0.228*
			(0.0383)	(0.101)
Educ. Tie other Indep.			0.000457	-0.0105
			(0.0394)	(0.124)
Alumni Tie other Indep.			0.0268	0.0666
			(0.0164)	(0.0576)
IVY League Tie other Indep.			-0.0271	-0.0896
			(0.0282)	(0.105)
Army Tie other Indep.			0.116	0.0795
			(0.0717)	(0.213)
Leisure Act. Tie other Indep.			0.397**	0.214
			(0.129)	(0.284)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes	Yes	Yes
Observations	43 740	43 740	43 740	43 740
R-squared	0.590	0.906	0.587	0.906
Adjusted R-squared	0.156	0.305	0.148	0.303

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector specialist dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size, executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Table 18: Do social ties affect board appointments? Extensive versus intensive margins

| | Dependent variable: Appointed by the Board | |
	Selected Candidates	Random Candidates
Tie to the Board	0.197***	0.206***
	(0.0161)	(0.0466)
Nb of Ties to the Board	0.0542***	0.0413**
	(0.00642)	(0.0139)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes
Observations	43 740	43 740
R-squared	0.587	0.905
Adjusted R-squared	0.149	0.300

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size, executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Table 19: Do professional ties help job information transmission?

| | Dependent variable: Appointed by the Board | |
	Selected Candidates	Random Candidates
Listed Tie to the Board	0.394*** (0.0267)	0.291*** (0.0626)
Indirect Listed Tie to the Board	0.125*** (0.0268)	0.0429 (0.0590)
Shortest Path to the Board through Listed Network	-0.0492*** (0.00577)	-0.0509*** (0.0141)
Indiv. and firm fixed effects, year dummies and controls	Yes	Yes
Observations	43 740	43 740
R-squared	0.579	0.904
Adjusted R-squared	0.133	0.292

Robust standard errors in parentheses, clustered at the firm level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Director controls include age, age squared, number of years as an executive, average years on listed boards, number of listed boards, number of current listed boards, busy director, finance and industry expert and sector speciality dummies. Firm controls include firm size, risk, leverage, performance and growth opportunities, number of directors on board, proportions of executives, independent directors, busy directors and women on board, average board tenure, nomination committee size, executive chairman dummy. Remaining controls include all interactions of director and firm controls.

Table 20: Social Ties and Job Referrals by the CEO (t-tests)

| | Referred by the CEO | | | | |
	Ref = 1	Ref = 0	Diff.	Std. Error	Obs.
Any Social Tie	0.2109	0.0847	-0.1262***	0.0148	4 374
Listed Tie	0.1587	0.0618	-0.0969***	0.0129	4 374
Private Tie	0.0385	0.0155	-0.0230***	0.0066	4 374
Educ. Tie	0.0068	0.0071	0.0003	0.0042	4 374
Alumni Tie	0.0408	0.0264	-0.0144	0.0083	4 374
IVY League Tie	0.0045	0.0033	-0.0012	0.0029	4 374
Army Tie	0.0023	0.0020	-0.0002	0.0023	4 374
Leisure Act. Tie	0.0068	0.0025	-0.0043	0.0027	4 374

Statistical significance levels: * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 21: Social Ties and Job Referrals by the Nomination Committee (t-tests)

| | Referred by the Nomin. Com. | | | | |
	Ref = 1	Ref = 0	Diff.	Std. Error	Obs.
Any Social Tie	0.1752	0.1346	-0.0406***	0.0109	4 374
Listed Tie	0.1241	0.0896	-0.0344***	0.0093	4 374
Private Tie	0.0375	0.0279	-0.0095	0.0054	4 374
Educ. Tie	0.0086	0.0067	-0.0019	0.0026	4 374
Alumni Tie	0.0613	0.0542	-0.0071	0.0071	4 374
IVY League Tie	0.0106	0.0088	-0.0019	0.0030	4 374
Army Tie	0.0030	0.0054	0.0024	0.0020	4 374
Leisure Act. Tie	0.0035	0.0042	0.0006	0.0019	4 374

Statistical significance levels: * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 22: Social Ties and Job Referrals by another Executive (t-tests)

| | Referred by another Exec. | | | | |
	Ref = 1	Ref = 0	Diff.	Std. Error	Obs.
Any Social Tie	0.0781	0.0306	-0.0475***	0.0131	4 374
Listed Tie	0.0625	0.0234	-0.0391***	0.0115	4 374
Private Tie	0.0156	0.0077	-0.0080	0.0066	4 374
Educ. Tie	0.0000	0.0012	0.0012	0.0025	4 374
Alumni Tie	0.0365	0.0086	-0.0279***	0.0073	4 374
IVY League Tie	0.0156	0.0024	-0.0132***	0.0040	4 374
Army Tie	0.0000	0.0002	0.0002	0.0011	4 374
Leisure Act. Tie	0.0000	0.0000	0.0000	0.0000	4 374

Statistical significance levels: * p<0.05 ** p<0.01 *** p<0.001

Table 23: Social Ties and Job Referrals by another Independent Director (t-tests)

| | Referred by another Indep. Dir. | | | | |
	Ref = 1	Ref = 0	Diff.	Std. Error	Obs.
Any Social Tie	0.2320	0.1512	-0.0808***	0.0148	4 374
Listed Tie	0.1507	0.1082	-0.0425***	0.0128	4 374
Private Tie	0.0493	0.0373	-0.0121	0.0078	4 374
Educ. Tie	0.0187	0.0077	-0.0109**	0.0039	4 374
Alumni Tie	0.0813	0.0715	-0.0099	0.0104	4 374
IVY League Tie	0.0133	0.0135	0.0002	0.0046	4 374
Army Tie	0.0067	0.0044	-0.0023	0.0028	4 374
Leisure Act. Tie	0.0093	0.0033	-0.0060*	0.0026	4 374

Statistical significance levels: * p<0.05 ** p<0.01 *** p<0.001

Table 24: Which social ties lead to job referrals?

	Appointment Level			Dyad Level			Dyad Level			Dyad Level		
						Dependent variable: Referred						
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Tie	0.0918***			0.0442***			0.0273*			0.0186+		
	(0.0178)			(0.00863)			(0.0111)			(0.0110)		
Prof. Tie		0.0932***			0.0433***			0.0293*			0.0193	
		(0.0191)			(0.00922)			(0.0122)			(0.0122)	
Non Prof. Tie		0.0310			0.0508*			0.0257			0.0249	
		(0.0283)			(0.0221)			(0.0245)			(0.0236)	
Listed Tie			0.105***			0.0445***			0.0276*			0.0187
			(0.0199)			(0.0101)			(0.0139)			(0.0140)
Private Tie			0.0147			0.0186			0.0257			0.0144
			(0.0282)			(0.0187)			(0.0209)			(0.0204)
Educ. Tie			-0.0343			0.0330			0.0419			0.0297
			(0.0499)			(0.0403)			(0.0459)			(0.0423)
IVY League Tie			0.0396			0.0418			0.0205			0.0282
			(0.0550)			(0.0354)			(0.0394)			(0.0382)
Alumni Tie			-0.0159			-0.0151			0.00309			0.00795
			(0.0243)			(0.0149)			(0.0173)			(0.0169)
Army Tie			0.0383			-0.00814			-0.0260			-0.00867
			(0.0789)			(0.0583)			(0.0585)			(0.0564)
Leisure Tie			-0.0134			0.00137			-0.0297			-0.0305
			(0.0962)			(0.0562)			(0.0690)			(0.0650)
CEO				0.0382***	0.0382***	0.0387***	0.0302	0.0301	0.0306	0.0413+	0.0412+	0.0413+
				(0.00970)	(0.00970)	(0.00971)	(0.0236)	(0.0236)	(0.0236)	(0.0241)	(0.0241)	(0.0241)
Chairman				0.0274***	0.0274***	0.0275***	0.00384	0.00376	0.00357	0.00212	0.00212	0.00198
				(0.00665)	(0.00666)	(0.00666)	(0.0150)	(0.0150)	(0.0150)	(0.0148)	(0.0148)	(0.0148)
Executive				0.0338***	0.0338***	0.0336***	0.114***	0.114***	0.114***	0.0857**	0.0858**	0.0859**
				(0.00955)	(0.00955)	(0.00955)	(0.0263)	(0.0263)	(0.0263)	(0.0267)	(0.0267)	(0.0267)
Independent Director				0.181***	0.181***	0.181***	0.222***	0.222***	0.222***	0.206***	0.207***	0.206***
				(0.00690)	(0.00690)	(0.00690)	(0.0188)	(0.0188)	(0.0188)	(0.0189)	(0.0189)	(0.0189)
Nomination Committee				0.252***	0.252***	0.252***	0.197***	0.197***	0.198***	0.196***	0.196***	0.196***
				(0.00544)	(0.00544)	(0.00544)	(0.0103)	(0.0103)	(0.0103)	(0.0106)	(0.0106)	(0.0106)
Controls, Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Entrant & Incumbent FE	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4 374	4 374	4 374	39 943	39 943	39 943	39 943	39 943	39 943	39 943	39 943	39 943
R-squared	0.63307	0.63292	0.63348	0.31057	0.31061	0.31051	0.70513	0.70515	0.70517	0.73273	0.73274	0.73276
Adjusted R-squared	0.46046	0.46006	0.45997	0.28497	0.28500	0.28480	0.53420	0.53421	0.53415	0.5688	0.5688	0.5687

OLS estimation with standard errors in parentheses, clustered at the company level. Statistical significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Controls include age, age squared, total years as an executive, average number of years on listed boards, total number of listed boards, total number of current listed boards, busy director dummy, sector speciality dummies and financial and industry expertise dummies for new directors; board size, proportions of executives, independents, women and busy directors, average board tenure, nomination committee size, executive chairman dummy, firm performance, size, leverage, risk and growth opportunities for firms; and year dummies.

51

Figure 1: Average residuals by director and firm fixed effects deciles
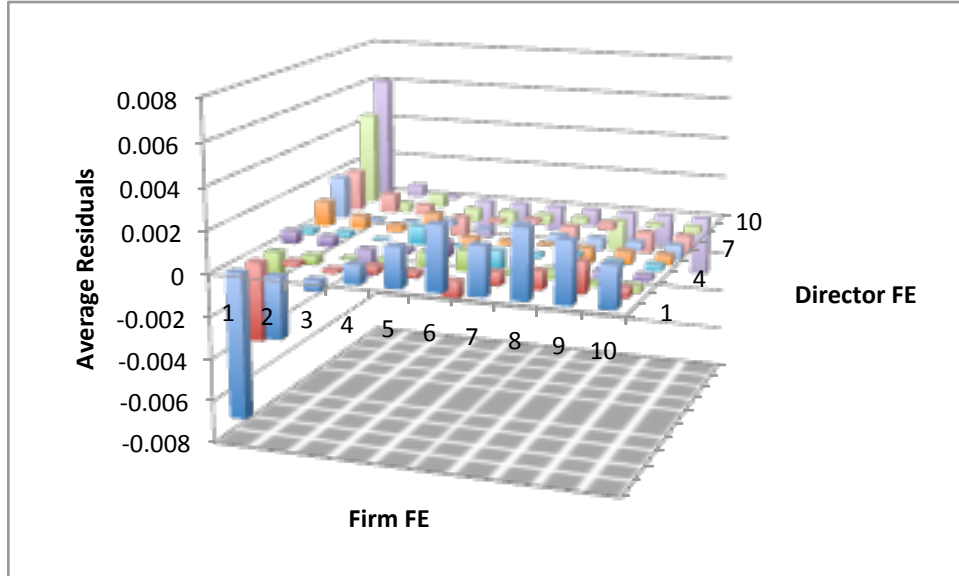

Table 25: Test of sorting based on the idiosyncratic match component

	No FE	Director & Firm FE	Job FE	Director, Firm & Job FE
R-Squared	0.2524	0.7418	0.7630	0.7572

Table 26: Information versus bias: the value of referrals - Referral or Tie dummy not interacted

	Director's Obs. Quality			Director's Non Perf. Obs. Quality			Director's Overall Quality		
	I	II	III	IV	V	VI	VII	VIII	IX
Ref. Board	-0.00753*** (0.00147)			0.00855*** (0.00195)			0.00102 (0.00137)		
Tie Board		-0.00221* (0.000967)			0.00502*** (0.00151)			0.00281** (0.000969)	
Ref. & Tie Board			-0.00369*** (0.000959)			0.00706*** (0.00150)			0.00337*** (0.00112)
Female	0.0142*** (0.00112)	0.0143*** (0.00112)	0.0142*** (0.00112)	-0.0156*** (0.00157)	-0.0156*** (0.00160)	-0.0155*** (0.00159)	-0.00145 (0.000928)	-0.00134 (0.000942)	-0.00130 (0.000943)
MBA	0.00618*** (0.000871)	0.00637*** (0.000850)	0.00633*** (0.000853)	-0.00710*** (0.00133)	-0.00735*** (0.00130)	-0.00725*** (0.00130)	-0.000927 (0.000812)	-0.000980 (0.000805)	-0.000928 (0.000798)
IVY league	0.000777 (0.00174)	0.000662 (0.00174)	0.000681 (0.00173)	0.000991 (0.00220)	0.00117 (0.00220)	0.00112 (0.00220)	0.00177 (0.00144)	0.00183 (0.00144)	0.00180 (0.00144)
Firm fixed effects and year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4 374	4 374	4 374	4 374	4 374	4 374	4 374	4 374	4 374
R-squared	0.411	0.407	0.408	0.520	0.519	0.520	0.638	0.639	0.639
Adjusted R-squared	0.144	0.137	0.139	0.302	0.300	0.302	0.473	0.475	0.475

OLS estimation with bootstrapped standard errors in parentheses. Statistical significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

53

Table 27: Information versus bias: the value of referrals - Without fixed individual characteristics

	Director's Obs. Quality		
	I	II	III
Ref. Board	-0.00828***		
	(0.00151)		
Tie Board		-0.00266**	
		(0.000996)	
Ref. & Tie Board			-0.00440***
			(0.000984)
Firm fixed effects and year dummies	Yes	Yes	Yes
Observations	4 374	4 374	4 374
R-squared	0.379	0.373	0.375
Adjusted R-squared	0.0979	0.0898	0.0921

OLS estimation with bootstrapped standard errors in parentheses. Statistical significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$